Abstract

Objective: to assess levels of fruit and vegetable consumption in elderly people, and to examine the socio-economic, physical and psychological factors which influence this consumption.

Methods: a three-phase survey: face to face interviews; self-completed dietary diaries with a food frequency questionnaire; and follow-up face-to-face interviews.

Participants: 445 elderly people (aged 65+) randomly selected from general practitioner lists in urban Nottingham and rural Nottinghamshire, Lincolnshire and Leicestershire.

Results: the recommended target of five portions of fruit and vegetables a day was achieved by less than half the respondents: 37% of those living in the urban area and 51% of those living in the rural area. Low fruit and vegetable consumption was particularly associated with being male, smoking and having low levels of social engagement.

Conclusions: most elderly people consume less than the recommended levels of fruit and vegetables. Health programmes promoting fruit and vegetable consumption may not be successfully reaching elderly people and need to target those particularly at risk of low consumption.

Keywords: dietary recommendations, fruit and vegetables

Introduction

Fruit and vegetable consumption may reduce the risk of several chronic diseases, including cancers, cardiovascular disease, coronary heart disease, hypertension and stroke [1–7]. The World Health Organisation therefore recommends the consumption of at least 400 g, or five portions, of fruit and vegetables a day [5, 8–10]. Most adults’ consumption falls short of this recommendation, with only 32% of American respondents [11] and 4% of Scottish respondents [12] meeting the ‘five a day’ targets. Fruit and vegetable intake has been found to be higher in older, as opposed to younger, adults [12–16], but little is known about the typical fruit and vegetable intake of elderly people in the UK. The benefits of fruit and vegetable consumption continue into old age: the consumption of vegetables in old age has been found to be associated with a reduction in cancer mortality [7]. With advancing age, the requirements for some antioxidants may be increased [17, 18].

The factors which may affect fruit and vegetable consumption are: socio-economic circumstances, physical factors and psychological wellbeing. Being male [12, 15, 19], having a lower income, lower educational attainment and lower occupational status have been associated with eating less fruit and vegetables [12, 13, 15, 19–21]. Physical health may play a role in fruit and vegetable consumption, reducing appetite and the ability to shop and cook; and smokers eat less fruit and vegetables than non-smokers [12, 15, 22, 23]. Psychological well being also plays a role in diet, with participation in a greater variety of social and physical...
activities [21], a higher life satisfaction [24] and fewer problematic life events [21] being associated with more adequate diets, and lower mortality [25] in elderly subjects. Previous research has looked at the possible influences on fruit and vegetable consumption in isolation, or in combination with only a few other influences. We have estimated the proportion of elderly people who are meeting the 'five-a-day' target, and assessed the levels of fruit and vegetable consumption in relation to socio-economic, physical and psycho-social factors.

Subjects and methods

Sample
The study was conducted in two areas: an urban area (the city of Nottingham) and a rural area comprising parts of Nottinghamshire, Lincolnshire and Leicestershire. Of 159 general practitioners (GPs) with patients living in Nottingham, 127 (78%) agreed to support the study. With the consent of these GPs, Nottinghamshire Family Health Services Authority age/sex lists were used to identify all non-institutionalized individuals aged 65 years and over living within the Nottingham area. From the resulting sample of 26055, 1584 individuals were randomly selected. The target was to complete 800 interviews. The sample was stratified at age 75 with equal probability representation in the age groups 65-74 and 75+.

Of 76 GPs with patients living in the rural area, 47 (62%) agreed to support the study. With the consent of these GPs, Family Health Services Authority age/sex lists were used to identify all non-institutionalized individuals aged 55 and over. From the resulting sample of 4408, 669 individuals were randomly selected. The target was to complete 400 interviews. The sample was stratified at ages 65 and 75 with equal probability of representation in the age groups 55-64, 65-74 and 75+. Respondents aged 65+ were included in this analysis.

Data collection
The study comprised three phases of data collection. In phase I, face-to-face interviews were conducted with the whole sample using a structured questionnaire on diet, shopping behaviour, household and socio-economic circumstances, physical health and psychological well-being. All interviews were conducted on a laptop computer in the respondents' own homes. Data collection took place over 17 months (January 1994 - May 1995).

Physical health was measured using a 14-item health index covering the presence or absence of: heart, stomach, eyesight, sleep or foot problems; giddiness, headaches, urinary incontinence, arthritis, falls, long-term disabilities and drug and walking aid use, and contact with (primary and secondary care) medical services [26]. Psychological well-being was measured using the 20-item Brief Assessment of Social Engagement scale, documenting the amount of contact with friends, relatives or interest groups, and satisfaction with this level of contact; the frequency of taking holidays, reading the paper, voting and using the public library; and ownership of a telephone, car, television and radio [27].

On completion of phase I, a 50% sub-sample of respondents participated in phase II, completing a self-administered 4-day dietary diary and food frequency questionnaire from which fruit and vegetable consumption was calculated.

A further 50% sub-sample of phase II respondents participated in phase III: a face-to-face follow-up interview examining influences on food choices as well as nutritional and food safety knowledge.

Fruit and vegetable intake
Foods that contributed at least 5% of any major nutrient to the diet were included in the food frequency questionnaire completed by phase II respondents [28, 29]. Respondents were asked to indicate how many times per day, week or month they consumed each item. The food frequency data and Ministry of Agriculture Fisheries and Food food portion size tables [30] were used to calculate the portions of fruit and vegetables consumed per person per day. The fruit and vegetables which contributed to the recommended five portions a day were based on the advice of Williams [9]. Frozen and canned fruit and vegetables, fruit juice, dried fruit, baked beans and other pulses were included; potatoes and nuts were excluded. Composite or processed foods were included provided they contained enough fruit or vegetables [31]. Analysis was also conducted excluding beans and pulses, as these foods could be considered as alternatives to meat rather than as vegetables (personal communication, Ministry of Agriculture Fisheries and Food).

Statistical analysis
To compensate for the intentional over-sampling of those aged 75+, the sample was weighted back to the expected frequency of individuals as indicated by the 1991 census. The present analyses use weighted data except in the three multiple regression analyses. Stepwise multiple regression was used to identify the independent contribution of socio-economic circumstances, physical health and psychological well-being to the consumption of fruit and vegetables. Three multiple regression analyses were conducted with fruit and vegetable consumption, fruit consumption and vegetable consumption as the dependent variables. In
Fruit and vegetable consumption in later life

all models the independent variables were socio-economic circumstances (sex, age, social class, urban or rural area of residence), physical health (health index, smoker—yes or no) and psychological well-being (social engagement scale). All analyses were performed using SPSS v6.0 [32].

Results

In the urban area, 1281 respondents were asked to take part in the study and 809 (63%) completed the phase I interview. Of these, 361 (45%) completed a phase II food frequency questionnaire and 177 (49%) of these a phase III follow-up interview. Respondents who were aged 65 and over and completed a phase II food frequency questionnaire were included in this analysis: 312 weighted respondents. In the rural area 401 (72%) of the 555 respondents who were asked to take part in the study completed the phase I interview. Of these, 211 (53%) completed a phase II food frequency questionnaire and 106 (50%) of these a phase III follow-up interview, giving 133 weighted respondents aged 65+.

The socio-economic characteristics of the two samples are shown in Table 1. While the refusal rate was relatively high (37% in the urban area, 28% in the rural area), in terms of age, sex and the number of individuals living alone, the resulting sample closely matched the host population as described in the 1991 census.

Fruit and vegetable consumption was dichotomized into ≥5 and <5 portions a day. Rural respondents were more likely than urban respondents to eat at least five portions a day: 115 (37%) of the urban respondents and 67 (51%) of the rural respondents achieved this goal. The mean daily consumptions of fruit and vegetables were 4.5 servings (SD 2.1) in the urban area and 4.8 servings (SD 1.9) in the rural area. In the multiple regression analysis three variables were independent predictors of a higher fruit and vegetable consumption: not smoking ($R^2 = 0.1159$), a higher social engagement score ($R^2 = 0.1770$) and female sex ($R^2 = 0.1913$; Table 2).

Figure 1 illustrates the types of fruits and vegetables eaten in the two areas. Vegetables contributed just over half of the daily consumption of fruit and vegetables. Most of the vegetables eaten were fresh or frozen, most commonly carrots, fresh peas and onions. About one-quarter of the vegetables eaten were salad vegetables, most commonly tomatoes. Most of the fruit eaten was

Table 1. Socio-economic characteristics (weighted) of urban ($n = 312$) and rural ($n = 133$) phase II respondents

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>53.8</td>
<td>58.9</td>
</tr>
<tr>
<td>Male</td>
<td>46.2</td>
<td>41.1</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>62.8</td>
<td>63.3</td>
</tr>
<tr>
<td>75+</td>
<td>37.2</td>
<td>36.7</td>
</tr>
<tr>
<td>Social class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>2.5</td>
<td>7.3</td>
</tr>
<tr>
<td>Managerial</td>
<td>16.5</td>
<td>39.7</td>
</tr>
<tr>
<td>Skilled non-manual</td>
<td>22.7</td>
<td>23.6</td>
</tr>
<tr>
<td>Skilled manual</td>
<td>37.7</td>
<td>17.4</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>15.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Unskilled</td>
<td>5.5</td>
<td>6.0</td>
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</table>

Table 2. Multiple regression results

<table>
<thead>
<tr>
<th>Variable/independent predictor</th>
<th>$R^2$</th>
<th>Value</th>
<th>Change $^b$</th>
<th>$\beta$</th>
<th>$P$ value</th>
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<tbody>
<tr>
<td>Fruit and vegetable consumption</td>
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<td></td>
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<td></td>
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<tr>
<td>Smoking</td>
<td>0.1159</td>
<td>11.6</td>
<td>-0.3404</td>
<td>&lt;0.00001</td>
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<tr>
<td>Social engagement score</td>
<td>0.1770</td>
<td>6.1</td>
<td>0.2513</td>
<td>&lt;0.00001</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>0.1913</td>
<td>1.4</td>
<td>0.1206</td>
<td>&lt;0.03</td>
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<tr>
<td>Fruit consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>0.0812</td>
<td>8.1</td>
<td>-0.2850</td>
<td>&lt;0.00001</td>
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<tr>
<td>Social engagement score</td>
<td>0.1329</td>
<td>5.2</td>
<td>0.2310</td>
<td>&lt;0.00001</td>
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<tr>
<td>Sex</td>
<td>0.1601</td>
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<td>0.1662</td>
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<tr>
<td>Social class</td>
<td>0.1723</td>
<td>1.2</td>
<td>-0.1207</td>
<td>&lt;0.03</td>
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<tr>
<td>Vegetable consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>0.0460</td>
<td>4.6</td>
<td>-0.2143</td>
<td>&lt;0.0002</td>
<td></td>
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<tr>
<td>Age</td>
<td>0.0954</td>
<td>4.9</td>
<td>-0.2235</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
</tbody>
</table>

$^a$Independent variables: sex, age, urban or rural area of residence, health score, social engagement score and social class.

$^b$% increase in variation explained.
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Figure 1. Types of fruits and vegetables eaten.

Fruit and vegetables
Mean 4.6 portions
100%

Vegetables
Mean 2.6 portions
55.7%
Fresh and frozen vegetables 84%
Salad vegetables 22.7%
Canned vegetables 7.6%
Baked beans and pulses 4.5%
Homemade vegetable soup 1.2%

Fruit
Mean 2.0 portions
44.3%
Fresh fruit 77%
Fruit juice 13.2%
Dried fruit 4.4%
Fruit canned in syrup 2.9%
Fruit canned in juice 2.5%

Discussion

We examined the fruit and vegetable consumption of 445 elderly people and found that the recommended target of five portions of fruit and vegetables a day was being achieved by less than half them: 37% of those living in the urban area and 51% of those living in the rural area. This level of consumption, whilst falling short of the ideal, is higher than that reported in studies of younger people [11, 12, 15].

Smoking was the most important predictor of a low fruit and vegetable consumption. This is consistent with research in younger age groups [12, 15, 22, 23]. Female gender and a higher social class were independently associated with a high fruit consumption, but no such differences were observed in vegetable consumption. Fruit may be seen as a low-calorie food, and thus be eaten more by women. Fruit often has a higher cost per calorie than vegetables, which may explain why more fruit is eaten by those of a higher social class. Age was associated with vegetable consumption, with older respondents eating fewer vegetables. This might be due to a reduction in appetite or a lower taste acuity with advancing age [33], or to a reduction in the physical ability to prepare vegetables (although this association was independent of physical health status).

Respondents who were more socially engaged ate more fruit, but not more vegetables, than those with less social engagement. The social engagement scale measures the degree to which individuals engage actively (going on holiday, attending religious meetings) or symbolically (reading the newspaper) in the social milieu. It also includes questions about loneliness and satisfaction with levels of contact with others. It can be seen as a proxy for healthy ageing, with a higher score indicating a more socially, mentally, physically and emotionally active lifestyle and higher morale. There has been much research on the importance of social support on health and mortality, with individuals who have social support tending to be in better physical [34] and psychological [35] health and having a lower mortality [36]. Fruit consumption may be an intervening variable between low social support and poor health.

These analyses have demonstrated that many elderly people are not eating enough fruit and vegetables. Health education programmes promoting fruit and vegetable consumption need to target those elderly people who are particularly at risk of a low consumption: men who smoke and have a low level of social engagement.

Key points
- Less than half the elderly subjects were eating five portions of fruit and vegetables a day: 37% of those living in the urban area and 51% of those in the rural area.
- Low fruit and vegetable consumption was particularly associated with being male, smoking and having low levels of social engagement.
- Health education programmes should target those groups of elderly people who are particularly at risk of low consumption.

Acknowledgements

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