

# Factors influencing eating a varied diet in old age

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## Abstract

*Objective:* To investigate the influences of resources and food-related goals on the variety of food choice among older people.

*Design:* A questionnaire-based survey in eight European countries: Poland, Portugal, United Kingdom, Germany, Sweden, Denmark, Italy and Spain.

*Subjects:* Participants (*n* 3200) were above 65 years of age and living in their own homes. The samples were quota samples, eight groups of fifty in each country, based on gender, age and living circumstances, reflecting the diversity of each of the national populations based on education, income and urbanization of living environment.

*Results:* Hierarchical multiple regression analysis showed that income, health status, access to a car and living arrangement affected the level of dietary variety. The perceived level of different food-related resources impacted the consumption of a varied diet over and above actual resource levels. Food-related goals contributed to variety of food intake that was not accounted for by the amount of material resources possessed or the social and other resources perceived to be possessed.

*Conclusions:* Older people's variety of food intake depended on material resources (e.g. monthly income, access to a car, living arrangement, physical and mental health). However, in addition to these variables, the way older people perceived other resources, such as their level of appetite, their food knowledge, their perception of the distance to the shops, access to high-quality products, having better kitchen facilities, access to good service providers and support from friends and neighbours, all contributed to how varied a diet they ate.

**Keywords**  
Europe  
Older people  
Dietary variety  
Perceived resources  
Goals

Older people represent an increasing proportion of the population<sup>(1)</sup>. Health or its absence in this rapidly increasing population not only affects the individuals themselves, but also has serious implications for demands on health care and other social resources. Cross-cultural studies<sup>(2–4)</sup> examining lifestyle variables and health suggest that diet is an important predictor of survival. For elderly individuals, inadequate nutrition can increase the incidence and severity of disease, hastening loss of independence. It is thus important to understand what influences older people's food choices to help ensure healthier diets<sup>(5)</sup>.

Studies suggest that Mediterranean-style diets as well as limited intake of red meat and high cereal-fibre consumption reduce CVD and cancer in older people, suggesting that eating a diet that is high in fruits, vegetables, nuts, cereals and low in red meat is healthy<sup>(6–9)</sup>. Thus a varied diet is seen as a healthy diet, as food variety enables food component needs to be met adequately and comprehensively<sup>(2,10–12)</sup>.

The ability to choose a diet with sufficient quality and variety to meet daily nutrient needs may be adversely affected by the pathological, physiological, economic and societal factors that accompany ageing<sup>(13)</sup>. For example, gradual loss of health due to the effects of chronic diseases such as arthritis or diabetes can impair the ability to obtain, prepare and enjoy nutritious foods<sup>(14)</sup>. The decline in the ability to taste and smell may result in changes to food selection and preference, leading to changes in energy and/or nutrient intake<sup>(15,16)</sup>. This is confirmed by nutritional surveys showing a reduced variety in older people's diets<sup>(17)</sup>. In addition, Duffy *et al.*<sup>(18)</sup> found that women with impaired ability to smell not only had lower preferences for some nutritious foods and higher intakes of sweets and fats, but also had less interest in food-related activities such as cooking. However, while the decline in sensory-specific satiety may influence variety of food choice, social and environmental resources and older people's food-related goals may override the

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importance of the physiological factor in ensuring a varied and balanced diet.

Past research suggests that high level of income, good physical and mental health, mobility in terms of having access to a car and the number of social contacts are resources that may affect older people's eating habits<sup>(13,18–20)</sup>. Lower levels of economic resources are associated with greater risk of experiencing hunger and food insufficiency<sup>(21,22)</sup>. Some research<sup>(23)</sup> suggests that it costs more to eat healthily; thus low income restricts not just quantity but also the nutritional quality of the food purchased. Research also shows that health problems related to inadequate nutrition are more prevalent in rural areas, where transportation to and from shops is mentioned as a structural barrier to obtaining adequate food<sup>(14,24,25)</sup>. Thus higher economic status and access to a car may be resources that may contribute to older people having a more varied diet.

Loneliness due to loss of spouse or friends can diminish the social reasons for and pleasure associated with eating<sup>(26,27)</sup>. Eating regular meals and having an adequate diet have in part been found to depend on eating with others<sup>(26–28)</sup>. However, Walker and Beauchene<sup>(27)</sup> showed that people's number of social contacts bore no relationship to food choice. Revenson and Johnson<sup>(29)</sup> claimed it is the dissatisfaction with available relationships rather than the number of social contacts that is a powerful indicator of loneliness and cause of reduced intake, suggesting that for social resources the perceived quality of a resource is more important than the actual level.

Studies show that knowledge-based resources such as food knowledge and cooking skills also impact on food choice<sup>(30,31)</sup>. That is, those who think they have a good understanding of foods and feel highly skilled eat a more varied a diet than those who feel that their knowledge and skills are limited. This implies that older people's perceptions of food-related resources influence their food intake over and above actual resources.

Research has shown that the goals people have in life affect their food choice and the satisfaction they feel with their life<sup>(32–35)</sup>. People's judgement of the healthiness of food was influenced by whether or not they had dieting as a food-related goal<sup>(32)</sup>. Diener and Fujita<sup>(34)</sup> showed that people tend to have goals relevant to their strongest resources and people who have the resources relevant to their goals/strivings exhibit the highest subjective well-being. Similar findings were observed in relation to food and older people by Dean *et al.*<sup>(35)</sup>.

Through testing the following hypotheses, the present study aimed to investigate the influence of resources and food-related goals on the variety of older people's food choice:

1. Income, health status, access to a car and living arrangement will affect the level of dietary variety.

2. Perceived level of different food-related resources will impact on the consumption of a varied diet over and above actual resource levels.
3. Food-related goals will contribute to variety of food intake that is not accounted for by the amount of material resources possessed or the social and other resources perceived to be possessed.

## Method

A survey was conducted in eight European countries: Poland, Portugal, United Kingdom, Germany, Sweden, Denmark, Italy and Spain. Questionnaires were administered face-to-face by trained interviewers. The questionnaire was developed in English, translated and back-translated before it was piloted in each country.

## Sample

Data collection took place in the autumn of 2005. In total 3200 participants (400 from each country), who were above 65 years of age and living in their own homes, were sampled using telephone recruitment from senior day centres and some snowballing by marketing companies (Table 1). The questionnaire was administered face-to-face by trained interviewers using computer-aided personal interviewing. All respondents participated at least to some degree in either procurement or preparation of food in the household. The samples were quota samples, eight groups of fifty in each country, based on gender, age (<75 years *v.* ≥75 years) and living circumstances (living alone *v.* living with a partner), reflecting the diversity of each of the national populations based on education, income and urbanization of living environment (urban/suburban/rural). The sample was taken from at least three geographical locations in each country. Non-response was not logged.

## Measures

The selection process of resources and food-related goals potentially relevant for seniors' satisfaction with their food-related life was based on an analysis of eighty in-depth interviews with seniors (ten participants from each of the above eight quota groups) in each of the eight countries. The most frequently named food-related resources and goals were collected from these qualitative data, resulting in the extraction of eleven goals (rated for importance on a 5-point scale from not important to extremely important) and twenty-two resources (assessed through agreement with the statement 'Do you agree or disagree that you have a good (resource name)?' on a 5-point scale from strongly disagree to strongly agree) which were included in the questionnaire (Table 2).

Nutritional adequacy was measured using a weekly food variety score<sup>(36)</sup> that measures food variety according to the biological/botanical origins of the food, e.g. all

**Table 1** Characteristics of participants in the eight countries

	Sweden	Denmark	Germany	Poland	UK	Italy	Spain	Portugal
Number	400	417	430	422	400	409	413	400
Gender (%)								
Men	50	49	48	48	52	49	50	50
Women	50	51	52	52	48	51	50	50
Living (%)								
Alone	48	50	50	52	51	50	50	50
With a partner	52	50	50	48	49	50	50	50
Age group (%)								
<75 years	51	50	51	50	53	50	50	50
≥75 years	49	50	49	50	47	50	50	50
Health status								
Physical	49.3	49.0	45.0	42.0	46.4	46.7	44.1	42.9
Mental	52.1	54.6	52.3	50.4	53.1	49.2	50.3	48.1
Access to car (%)	59	71	63	38	63	66	33	33
Food variety score	31.2	28.9	27.7	27.8	28.0	26.6	28.0	27.3

citrus fruits are grouped together. Foods can be added up, with each biologically distinct food group scoring only once, no matter how often the foods within this group are eaten, but a minimum quantity of about 2 tablespoons must be consumed before it can be scored. Foods from these various sources can be scored and the total used as an indication of adequate nutrient intake. A food variety score of at least 15 over one week is generally nutritionally adequate. A score of 30 over a week or 12 in a day is considered excellent. The weekly food score has been used in different countries such as Australia, Japan and Vietnam<sup>(36–40)</sup>. As the score measures food groups rather than particular foods, this measure was chosen as it was thought to be an ideal tool to compare nutritional intake across different countries.

Further, participants' levels of actual resources were measured with respect to car availability, living arrangement, monthly income, and physical (PCS8) and mental health (MCS8) as measured by the SF-8 Health Survey<sup>(41)</sup>. Demographics (e.g. gender, age, education, weight and height) were also obtained.

## Results

Correlations between the predictor variables (only  $r > |0.3|$  are reported here) showed high positive correlations of monthly income with car availability ( $r = 0.40$ ), good dental health ( $r = 0.29$ ) and perception of a good income ( $r = 0.53$ ) and negative correlation with the goal of keeping expenditure low ( $r = -0.40$ ). Further, measured physical health (PCS8) was positively correlated with measured mental health (MCS8;  $r = 0.37$ ), perception of good health ( $r = 0.58$ ) and perceived mobility level ( $r = 0.53$ ). In addition, measured mental health was positively correlated with perceived good health ( $r = 0.41$ ). As expected, those who perceived themselves to be in good health also saw themselves as having good dental health ( $r = 0.30$ ) and good mobility ( $r = 0.41$ ). Living arrangement (alone *v.* with a partner)

was highly negatively correlated with sharing meals with others ( $r = -0.61$ ) and with the goal of eating in the company of others ( $r = -0.35$ ). In terms of perceived resource levels, cooking skills was positively correlated with food knowledge ( $r = 0.43$ ) and good income was positively correlated with having access to high-quality products/brands ( $r = 0.33$ ) and negatively correlated with the goal of keeping expenditure low ( $r = -0.41$ ). Moreover, the resource of having access to convenient products was positively correlated with the perceived resource level of low prices ( $r = 0.31$ ), access to new products ( $r = 0.34$ ) and access to high-quality products/brands ( $r = 0.32$ ).

The influence of material resources (income, physical health, mental health, access to a car and living arrangement) on varied eating was investigated by hierarchical multiple regression analysis where the regression of the summed measure of varied eating *v.* monthly income, PCS8, MCS8, living alone/with partner and having a car was performed, in the first step. In order to see whether perceived resources could add to the prediction of varied eating, the twenty-two perceived levels of resources were added as a second step. To analyse whether people's goals contribute to their eating habits over and above the influences of perceived and actual resources, the eleven individual goals were entered into the hierarchical analysis as a third step.

### **Actual resources and their influence on variety of diet**

Multiple regression of varied eating *v.* the five objective resource levels (adjusted  $R^2 = 0.07$ ,  $F(5, 1479) = 22.39$ ,  $P < 0.001$ ) revealed significant independent effects for living arrangement ( $\beta = -0.09$ ,  $P < 0.001$ ), car availability ( $\beta = -0.10$ ,  $P = 0.01$ ), physical health ( $\beta = 0.10$ ,  $P < 0.001$ ), mental health ( $\beta = 0.07$ ,  $P < 0.001$ ) and monthly income ( $\beta = 0.09$ ,  $P < 0.001$ ). This suggests that those who live with a partner eat a more varied diet than those who live alone. Also, those who have access to a car have a more varied diet. In addition, mental and

**Table 2** Multiple hierarchical regression of summed eating habits *v.* perceived resources and goals among older people (*n* 1484) from eight European countries

	Step 1			Step 2			Step 3		
	<i>B</i>	SE	$\beta$	<i>B</i>	SE	$\beta$	<i>B</i>	SE	$\beta$
Constant	25.75			10.78	2.00		8.67	2.12	
Monthly income	0.20		0.09**	0.10	0.07	0.04	0.15	0.07	0.07*
PCS8	0.06		0.1**	0.06	0.02	0.09**	0.06	0.02	0.10**
MCS8	0.05		0.07*	0.03	0.02	0.04	0.03	0.02	0.05
Car in household	-1.32		-0.1***	-1.18	0.34	-0.09**	-1.13	0.34	-0.09**
Living circumstance	-1.06		-0.08**	-0.71	0.39	0.06	-0.63	0.39	-0.05
<b>Resources</b>									
Being in good health				-0.24	0.19	-0.04	-0.27	0.19	-0.04
A good appetite for food				0.73	0.19	0.10***	0.67	0.19	0.09**
Good dental health				-0.04	0.14	-0.00	-0.09	0.14	-0.02
Good cooking skills				0.02	0.16	0.00	-0.22	0.17	-0.04
A good general knowledge about food and nutrition				1.35	0.19	0.2***	1.14	0.19	0.17***
Being able to get around on foot (mobility)				-0.8	0.18	-0.10	-0.01	0.18	-0.00
Ability to taste and smell well				0.24	0.21	0.03	0.15	0.21	0.02
Adequate income				-0.02	0.16	-0.00	-0.01	0.17	-0.00
Access to food at low prices				-0.16	0.16	-0.03	-0.18	0.16	-0.03
Access to food that is quick and easy to prepare				-0.47	0.17	-0.08**	-0.51	0.17	-0.08**
Access to good service providers, e.g. a day centre or meals on wheels				0.67	0.11	0.15***	0.70	0.11	0.16***
Food storage				0.10	0.20	0.01	0.10	0.25	0.01
Access to new and different types of food products				0.33	0.17	0.05	0.33	0.17	0.06
Access to convenient means of public or private transportation				0.04	0.17	0.01	0.02	0.17	0.00
A short distance to your normal food shops				0.32	0.16	0.05*	0.24	0.16	0.04
Appropriate kitchen appliances and equipment to make cooking easier				0.55	0.19	0.08**	0.46	0.19	0.06*
Access to organic food				0.12	0.14	0.02	0.21	0.14	0.04
Access to high-quality food products and brands				0.58	0.18	0.09**	0.52	0.18	0.08**
Sharing your meals with other people (including your partner or spouse)				0.24	0.15	0.05	0.12	0.17	0.03
Being able to receive support from authorities or private organizations				0.02	0.14	0.00	-0.04	0.14	-0.01
Having a neighbour or close friend who will help you when you need it				0.30	0.14	0.06*	0.34	0.13	0.06*
Having members of your family who will help you when you need it				-0.19	0.15	-0.03	-0.18	0.15	-0.03
<b>Goals</b>									
Keep your expenditures as low as possible							0.12	0.16	0.02
Eat a healthy diet							-0.17	0.19	-0.02
Choose food products and dishes that are quick and easy to prepare							0.04	0.13	0.01
Control your weight through your choice of food							0.38	0.14	0.08**
Choose food products and dishes that you enjoy eating							-0.11	0.22	-0.01
Vary your menu and have a wide range of foods and dishes							0.95	0.20	0.13***
Eat your meals in the company of other people							-0.11	0.16	-0.02
Arrange shopping and preparation of meals so that you don't need help from others							-0.03	0.14	-0.01
Maintain the cultural traditions of your country or region in relation to food and meals							0.09	0.14	0.02
Eat your daily meals in nice surroundings							-0.03	0.20	-0.00
Be able to cook meals for others							0.29	0.14	0.06*

$R^2 = 0.07$  for step 1;  $\Delta R^2 = 0.13$  for step 2;  $\Delta R^2 = 0.03$  for step 3.  
Coefficient was statistically significant: \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

physical health affects variety of diet such that those who are in better health have a more varied diet. Finally, income affects variety of diet such that the higher the income the more the variety in the person's diet. As the  $\beta$  coefficients of all the predictor variables are similar in value, this suggests that the sizes of the effects of living arrangements, car availability, physical health, mental health and monthly income on the variety of the diet consumed are roughly equal.

### ***Perceived resources and their influence on variety of diet***

Regression of varied eating *v.* the twenty-two perceived resource levels as the second step revealed that the increase in explained variance (change in  $R^2 = 13\%$ ) was significant ( $F$  change (22, 1457) = 10.74,  $P < 0.001$ ). Good appetite ( $\beta = 0.10$ ,  $P < 0.001$ ), food knowledge ( $\beta = 0.20$ ,  $P < 0.001$ ), access to convenient food products ( $\beta = -0.08$ ,  $P < 0.01$ ), access to a good food service

provider ( $\beta = 0.15$ ,  $P < 0.001$ ), kitchen appliances ( $\beta = 0.08$ ,  $P < 0.01$ ), short distance to the shops ( $\beta = 0.05$ ,  $P < 0.05$ ), access to high-quality products ( $\beta = 0.09$ ,  $P < 0.01$ ) and support from friends and neighbours ( $\beta = 0.06$ ,  $P < 0.05$ ) were shown to be significant predictors while good health, good dental health, cooking skills, mobility, ability to smell/taste, good income, low prices, access to new products, access to food storage, convenient transport, access to organic products, sharing meals with others, formal support and support from family were not seen as influencing a varied diet. This suggests that those who have a good appetite, a good knowledge of different foods and less access to convenient foods, but good access to a good service provider, have a more varied diet than those whose appetite is poor, whose food knowledge is low, have good access to convenient foods but do not have good access to a good service provider. In addition, those who have good kitchen appliances, good access to high-quality products, have a short distance to go to the shops and have the support of friends and neighbours have a more varied diet than those who think they are low on these resources. It is important to note that some of the perceived resources like income, access to transport, sharing meals and health may be insignificant here because the effects of these were already captured by related objective measures in the first step. Food knowledge, access to a good service provider and good appetite appear to be stronger predictors than the other five significant predictors.

### ***Influence of goals on variety of diet***

Regression of varied eating *v.* the eleven goals in the third step found that the increase in explained variance of 3% was significant ( $F$  change (11, 1446) = 4.31,  $P < 0.001$ ). Goals such as controlling weight ( $\beta = 0.08$ ,  $P < 0.01$ ), having a variety of foods on the menu ( $\beta = 0.13$ ,  $P < 0.001$ ) and cooking for others ( $\beta = 0.06$ ,  $P < 0.05$ ) were significant predictors, whereas keeping expenditure low, eating a healthy diet, choosing convenient food, enjoying food and meals, eating in other's company, not receiving help, maintaining food culture and eating in a nice surrounding were found not to influence a varied food choice. This suggests that those who want to eat a varied diet or control their diet or cook for others eat a more varied diet than those who do not strive to achieve these goals. Of these goals, wanting to have a variety of foods on the menu was the best predictor of having a varied diet.

### **Discussion**

Results showed that the actual resources older people have affect the quality of their diet in terms of how many different foods they eat. This is not surprising as we would expect people with more money to be able to afford a better quality and variety of food. These results

confirm previous findings<sup>(13,23,42,43)</sup>. For example, Nord<sup>(42)</sup> found that three-quarters of food-insecure elderly households obtained enough food to avoid hunger by eating a less varied diet. Banister and Bowling<sup>(19)</sup> found that those older people able to travel by car to shops were able to buy and consume a wider range of food.

The impact of physical and mental health on dietary variety is also plausible, as those who are not in pain, have more energy and without emotional problems are more likely to eat a varied diet. This is in line with previous findings<sup>(14)</sup> showing health to affect food-related behaviours. The finding that those who live alone eat a narrower diet than those living with a partner fits well with previous research<sup>(20)</sup>. Loneliness and lack of incentive to cook for one may contribute to why those who live alone eat a less varied diet. Studies have shown that eating with a television on or eating in a communal setting (e.g. community centres) widens the diet of those who live alone<sup>(44,45)</sup>.

In addition to the actual resources, perceived resources were found to influence older people's diets. Those who think they have a good appetite and know a lot about food were found to eat a more varied diet than those who said their appetite was poor or didn't know much about food. This suggests that increasing older people's food knowledge, by means such as information provision and cooking classes, may be a possible way to increase dietary variety. Increasing older people's access to a good service provider and improving their kitchen facilities are alternative means of increasing dietary variety. Sharpe *et al.*<sup>(13)</sup> also found that lack of access to services such as meals on wheels served as a barrier to healthy eating for rural elderly.

Increasing access to high-quality meals was also found to increase older people's varied food intake, although access to organic foods or new products did not have significant effects. This suggests that older people's diets could be improved by providing good-quality foods that are familiar rather than new products and not necessarily organically grown.

In terms of social resources, having help from friends and neighbours rather than family increased the variety of older people's diets. This suggests that friends' and neighbours' help may be related to food inasmuch as they may help with the shopping or taking the person to the shops, whereas help from family may be needed when there is illness or on more serious matters. Interestingly, while living with a partner did affect the quality of the diet, sharing meals with others did not contribute to a varied diet, suggesting that those who share meals with others eat the same range of foods as those who do not share meals with others.

The study also found that older people's food-related goals had an independent influence on their quality of diet over and above their actual and perceived resources. Unsurprisingly, those whose food-related goals include

eating a varied diet ate a greater variety of foods than those who did not have this as a goal. Thus one way to change a narrow diet would be to find ways to influence older people to have this as one of their food-related goals, perhaps through information expounding the merits of a varied diet as well as examples of how to increase variety in a diet. In addition, those who wanted to cook for others also had a more varied diet than those who did not have this as a goal. Here too providing recipes and information to those who want to cook for others on how to increase the variety of foods used in their cooking can help. Surprisingly, those who wanted to control their weight also were found to have a more varied diet; similar results were demonstrated by Oaks and Slotterback<sup>(32)</sup> where people's judgement of healthiness of food was influenced by whether or not they had dieting as a food-related goal. It could be argued that when trying to lose weight one needs to think more about what one eats and plan the meals carefully. This may give people the opportunity to think about the variety of foods they can eat, influencing their food intake. It could also be that when wanting to lose weight people have to learn more about foods in general and the increase in food knowledge may help to increase the types of foods they eat, as discussed earlier.

Taken together, the present results suggest that older people's variety of food intake does depend on resources such as their monthly income, whether they have access to a car, their living arrangement and their physical and mental health. However, in addition to these variables, the way older people perceive other resources such as their level of appetite, their food knowledge, their perception of the distance to the shops, access to high-quality products, having better kitchen facilities, access to good service providers and support from their friends and neighbours all contribute to how varied a diet they eat. Further, older people's goals such as wanting to eat a varied diet, wanting to cook for others and wanting to control their weight also influence the variety in their diet.

The findings that perceived levels of resources and food-related goals impact on dietary variety gives additional means of possible interventions that can be used to encourage and influence older people's variety of diet. The results suggest that by encouraging older people to adopt certain food-related goals, such as wanting to eat a varied diet, wanting to cook for others or watching their weight, it would be possible to change their eating habits. Similarly, by increasing older people's food and nutrition knowledge it may be possible to increase dietary variety. A varied diet could also be fostered by making high-quality products accessible to older people.

The study has a number of limitations. Food variety was measured using the weekly food variety score as it was easy to use across different countries. There are many other ways of measuring variety<sup>(46)</sup>. Future studies should compare how the different food variety measures square

up against this one. There were only a limited number of indicators available for objective resources, and most resources were measured only as perceived by respondents. A more complete set of objective resource indicators could not only shed more light on the relationship between objective and perceived resources, but also aid in deriving implications for how older people's endowment with relevant resources can be improved. We should also note that responses to an inventory of self-reported resource items may be subject to halo effects. Future research should investigate the mechanisms through which these above-mentioned possible interventions influence dietary change. Further, additional food-related goals that may increase variety in older people's diet should be elicited and their effects studied in order to develop further intervention strategies and policies, resulting in a healthier elderly population.

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