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Nutritional perspectives in a health-promoting program for community-dwelling older adults | Julie Johannesson



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**SAHLGRENKA ACADEMY
INSTITUTE OF MEDICINE**



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UNIVERSITY OF GOTHENBURG

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ABSTRACT

Aim: The main purpose of this licentiate thesis was to investigate nutritional perspectives for independently living older adults participating in a health-promoting program.

Setting: The papers included in this licentiate thesis were based on the health-promoting intervention “Elderly Persons in the Risk Zone” (EPiR) which was conducted in two districts of a medium-sized city in western Sweden. Participants were cognitively intact, independently living, older adults (≥ 80 years). EPiR consisted of two intervention groups, a preventive home visit and multi-professional senior meetings, as well as one control group.

Method: In paper I, secondary data from EPiR was used and meal frequency and vegetable intake at baseline were related to the development of frailty at the 12- and 24-month follow-ups. In paper II, gender differences regarding practice, knowledge and attitudes to food habits and meal patterns were explored among participants remaining at the 12-months follow-up in EPiR.

Results: In paper I, participants reported an average meal frequency of four meals per day and 57 % of the participants reported that they had vegetables every day. It was found that meal frequency and vegetable intake did not predict the risk of developing frailty in older adults.

Paper II showed that women took a greater responsibility for planning, shopping and cooking food than men did. A large proportion of the men did not believe that they were able to cook.

Discussion: The studies in this licentiate thesis were conducted on a group of independently living older adults living in a district where education levels are somewhat higher and sickness rates slightly lower than in the rest of the city.

This could imply a higher awareness of health and nutrition among the participants, which in turn might have affected the results.

Conclusion: In this group of older adults, meal frequency or vegetable intake was not associated with the development of frailty. The differences between men and women regarding knowledge and attitudes towards food and cooking (paper II) may indicate that future support for older adults might need to be adjusted for gender. However, these differences may be dependent on the gender roles of this generation where women were expected to take responsibility for household work.

Keywords: Aged 80 and over, Independent living, Frailty, Feeding behaviour, Meals, Vegetables

SAMMANFATTNING PÅ SVENSKA

Frågeställning: Huvudsyftet med licentiatavhandlingen var att studera långtidseffekterna av ett hälsofrämjande program för äldre, hemmaboende personer ur ett nutitionsperspektiv.

Metoder: Underlaget till studierna i den här licentiatsavhandlingen baseras på den hälsofrämjande interventionen ”Elderly Persons in the Risk Zone” (EPiR). EPiR riktade sig till äldre hemmaboende personer (≥ 80 år) som var kognitivt intakta och klarade sig på egen hand. EPiR bestod av två interventioner: ett förebyggande hembesök och multiprofessionella seniorträffar med ett uppföljande hembesök, och en kontrollgrupp.

I studie I användes sekundärdata från EPiR där måltidsfrekvens och grönsaksintag vid baslinjen ställdes i relation till utvecklandet av skörhet (frailty) vid 12- och 24-månadersuppföljningarna.

I studie II intervjuades deltagare från 12-månadersuppföljningen av EPiR där könsskillnader gällande praktik, kunskap och attityder till matvanor och måltidsmönster studerades.

Resultat: Studie I visade att deltagarna åt i genomsnitt fyra måltider per dag och 57 % rapporterade att de åt grönsaker varje dag. Det fanns ingen signifikant relation mellan måltidsfrekvens eller grönsaksintag och risken att utveckla skörhet vid 12- eller 24-månadersuppföljningarna.

Studie II visade att kvinnor tar ett större ansvar för planering, inköp och tillagning av mat än män, och att en stor andel av männen ansåg att de inte hade tillräckliga kunskaper om matlagning.

Diskussion: Studierna i licentiatavhandlingen genomfördes med äldre personer boendes i ett välbärgat område där en större andel hade högre utbildning och där

sjuktalet var lägre än i övriga staden, detta kan ha inneburit att deltagarnas medvetenhet om kost och hälsa var större, vilket i sin tur kan ha påverkat resultaten.

Slutsatser: I den här gruppen äldre personer fanns inget samband mellan måltidsfrekvens och grönsaksintag med risken att utveckla skörhet. De skillnader som påvisades mellan män och kvinnor gällande kunskap och attityder till mat och matlagning (studie II), kan tyda på att framtida stöd till äldre människor kan behöva anpassas efter kön. Dessa skillnader kan dock bero på att könsrollerna i denna generation innebar att kvinnor förväntades ta ansvar för hushållsarbetet.

LIST OF PAPERS

This licentiate thesis is based on the following studies, referred to in the text by their Roman numerals.

- I. Johannesson J, Rothenberg E, Gustafsson S, Slinde F.
Meal frequency and vegetable intake does not predict the development of frailty in older adults
Submitted

- II. Johannesson J, Rothenberg E, Dahlin-Ivanoff S, Slinde F.
Gender differences in practice, knowledge and attitudes regarding food habits and meal patterns among community dwelling older adults
Journal of Aging Research and Clinical Practice, 2016; 5(4), 220-228

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ABBREVIATIONS

ADL	Activities of Daily Living
BMI	Body Mass Index
EPiR	Elderly Persons in the Risk Zone
FFQ	Food Frequency Questionnaire
MMSE	Mini Mental State Examination
PHV	Preventive Home Visit

1. BACKGROUND

1.1 Aging

Older adults constitute an increasing proportion of the population in almost every country in the world. They continue to live increasingly longer and a large proportion of older adults remain living in their own homes at advanced ages. Many feel healthy and have the ability to continue to adapt themselves to their various living situations. Globally, the number of people aged 80 years or over is growing even faster than the number of older persons overall. Prognoses indicate that in 2050 the oldest-old will have more than tripled in number since 2015 (1). Among the Swedish population, five per cent were 80 years or older in 2016 (2). Whilst people are living longer, and are in many cases healthier than ever, there is concern in many countries that the group of older population will get larger than the traditional working age group. This, in turn, puts pressure on pension systems and health systems, as there is a growing demand for service and care associated with old age (1).

The most common way to describe aging is chronically, even though the function at a certain age is more interesting than the years you live (3). In many western countries, the age of 65 years is often viewed as the start of older age, and is often referred to as retirement age. As persons over 65 years are, on a group level, heterogeneous with a large span in age, gender, health status and education (3), older adults are often divided into younger old (aged 65-80 years) or very old (aged 80 years or older) (4). Older age can also be explained in different life course levels, so called “ages” (5). The third age begins when a person retires from productive work, is able to choose how to spend his or her time and has no or little functional decline. The fourth age is characterized by the onset of functional decline and the occurrence of illness, not found in the

third age. The fourth age often results in dependence in everyday life and quality of life might be reduced (5).

Aging is a normal process that all living individuals go through, and the way in which individuals age depends on genetics, lifestyle choices, health habits, illnesses, environment and work and affects the body physically, mentally and emotionally. The biological and psychological decline of all cellular and bodily functions during a lifetime is a natural process of life; it implies a time-dependent progressive deterioration (3). These irreversible changes gradually change a vital adult person into a vulnerable older adult, and may lead to frailty and an increased sensitivity to be affected by age-related diseases (6). The risk of chronic disease increases with age, but growing older does not have to imply becoming disabled. Effective intervention programs may help older adults to maintain or improve their health status (7).

Addressing basic needs, optimizing health and well-being, promoting social engagement and supporting independence is commonly expressed as healthy aging, successful aging or active aging. Healthy aging could be described as “the process of developing and maintaining the functional ability that enables wellbeing in older age” (8). Successful aging includes low probability of disease and disease-related disability and a high cognitive and physical functional capacity (9). Active aging refers to when health opportunities in order to enhance quality of life are optimized, i.e. people’s capacity of making flexible choices in the way they spend time during life as growing older (10).

As the world population is aging and as many diseases in later life are preventable, health care for older adults is a major concern. Health promotion in all stages has an important role in ensuring healthy aging. Factors related to adult lifestyle such as smoking, alcohol consumption, levels of physical activity and diet are connected to decline. By adopting a healthy lifestyle and being active in

one's own care by healthy eating, appropriate physical activity, not smoking and using alcohol wisely in older age, disease and functional decline may be prevented, as well as quality of life will be improved. Primary prevention such as the avoidance of tobacco in order to prevent the onset of disease and secondary prevention, used to identify and treat or cure diseases in their presymptomatic stage or to prevent the progression of disease (screening for detection of chronic disease etc.) contribute to reduce the risk of disabilities (11,12). Health promotion enables people to increase their level of taking control over and improving their health and has shown to increase average life expectancy and improve older adults' quality of life so that they can remain healthy, active and independent (10). Health promotion activities, including changes in dietary habits, can contribute to an increase in life expectancy and better health and is relevant across the age span.

1.2 Frailty

A frequently used concept indicating that an older person is at increased risk for morbidity and mortality is frailty (13). Generally, frailty is described as a syndrome of loss of muscle mass and strength, fatigue, and decreased physiologic reserve with associated increased vulnerability to physiologic stressors, such as illness or hospitalization. No standardized way to define or operationalize frailty has been agreed upon among researchers, even though there are several different definitions.

The most commonly used definition is the phenotypic definition by Fried and co-workers (14) and is expressed as "a physiologic state of increased vulnerability to stressors that result from decreased physiologic reserves, and even dysregulation, of multiple physiologic systems". The definition provides a specific list of objective, measurable criteria for frailty where three or more of

the following criteria are taken in to account: unintentional weight loss, self-reported exhaustion, weakness (grip strength), slow walking speed and low physical activity (14). Several other factors such as cognition and vision could also be included when considering frailty as these components have shown to be related to frailty (15,16).

Frailty is considered highly prevalent within the aging population. It has been shown to be more common among women than men and increases with age (14,17). In order to identify frailty, potential risk factors could be organized into categories: physiologic, medical illness/comorbidity, sociodemographic and psychological and disability (18). Several physiologic changes such as altered immune function, sarcopenia (i.e. age-related loss of skeletal muscle mass and function (19)) and weight loss have been associated with frailty (18), and specific chronic diseases have shown to be risk factors. Lower socioeconomic status (20) as well as a psychological factors such as depression have been associated with the symptoms of frailty in some studies (14). Finally, frailty was found to increase when self-reported health decreased from very good/good to fair/poor (21) and has been considered as a reliable measure of the overall health of older adults (22).

Poor nutrition has been related to frailty (23) and a healthy dietary pattern has been associated with a lower risk of becoming frail (17,24). Specifically, low intake of certain micronutrients such as vitamins D, E, C and folate and protein have been associated with higher risk of frailty (23). Inadequate nutritional intake is a clinical marker of frailty as nutritional intake provides the energy and essential nutrients needed for all organs and bodily functions, and therefore nutritional intake has an important role in preventing and postponing deterioration (25).

1.3 Nutritional perspectives on aging

Aging may involve a decrease in body weight as a natural part of aging (26) and a decline in energy intake and quantity of food consumed has also been found, even in healthy people (27,28). Older persons tend to be less hungry than younger persons after an overnight fast, and after a standard meal both the desire to eat and feelings of hunger were less in older persons than in younger (29,30). Insufficient food intake among older adults increases the risk of many nutrition-related illnesses (30) and may precede hospitalization of older adults. Older persons are also less capable of returning to their previous weight after a disruption to their food intake than younger persons are (31). The need for nutrients in old age is much the same as at younger ages and this is even increased in conditions of illness, meaning that the diet of older adults has to be full and with focus on the content of nutrients (32). For both genders, there is an increased risk of death when there is a significant decrease in body weight (33,34).

A decline in food intake may be caused by socioeconomic factors (education, distance to food store etc.) as well as by psychological (social activity, mental awareness etc.) physiological (age, gender, appetite, physical activity etc.) and pathological factors (acute and chronic diseases, disability etc.) (35). Meals taken alone acquire less energy than meals eaten with company; an extensive friendship network could be positively related to appetite and nutrient intake. In contrast, widowhood, for example, may cause a decrease in meal enjoyment, poorer appetite and weight loss (35). Depression and loss or deterioration of social networks may cause loss of the motivation to eat (36).

1.3.1 Food habits

The term ‘food habits’ refers to the way a person eats, considered in terms of what types of food are eaten, in what quantities and when (37). Just as for the population in general, regular and varied meals are important for older adults (38). Along with social community, meaningfulness and physical activity, food habits are one of the four cornerstones for an active and healthy aging (10). Good food habits provide benefits such as improved well-being, reduced risk of osteoporosis, cardiovascular disease and type 2 diabetes. Food and enjoyable meals are of great importance to health and wellbeing and with good food habits, the opportunity to live a long life increases (39).

Meal frequency

A “meal” has been defined as one of the main eating occasions of the day occurring in the morning, midday and in the evening. Any food taken outside these eating times is a “snack” (40). Meal frequency is usually defined as number of meals per day but there is no definition to find in the literature for what is a high meal frequency or a low frequency. In paper I, the recommendation from the booklet that the participants in one of the interventions, the senior meetings group, received was followed. To get enough energy and nutrients to cover nutritional needs and maintain weight, participants were advised to have three main meals (breakfast, lunch and dinner) and two to three snacks evenly spread throughout the day (41).

The literature regarding meal frequency differs. Gatenby (42) found that in previous research regarding all ages, meal frequency was associated with reduction in blood cholesterol, improved appetite control and improved glucose tolerance. Possible relationships between eating frequency, energy intake and body weight were also found, suggesting that increased eating frequency is

associated with improved body weight control and reduced probability of over-eating. Further, Rolls and co-workers (30) found that men who were older consumed significantly less energy than those in the younger group, they became faster satiated and less hungry at the following meal. Low food intake in older individuals increases the risk for many nutrition-related acute or chronic illnesses, therefore, meal frequency is of importance. However, the literature is not comprehensive and individual variations occur.

Vegetable Intake

An intake of a healthy diet with a high content of fruit and vegetables is well known to be associated with a healthy lifestyle and has been found to promote health and reduce the risk of several chronic diseases. Fruit and vegetable consumption is therefore an important issue among older adults as well as among the general population (43–46). Generally, an intake of at least 400-500 grams a day is recommended as a part of a healthy diet (43,47,48). Several studies (17,49) have shown that the Mediterranean diet, which consists of a high fruit and vegetable intake, improves health and quality of life. This diet appears to be effective at reducing the risk of mortality and disease outcomes and has been considered as a central component for successful aging (49,50).

2. AIM

The general aim of this licentiate thesis was to investigate nutritional perspectives for independently living older adults participating in a health-promoting program.

The specific aims of the papers were:

- I. To examine if a relationship exists between meal frequency or vegetable intake and the development of frailty in a population of persons 80 years and older.
- II. To study gender differences among community-dwelling older adults according to practice, knowledge and attitudes regarding food habits and meal patterns.

3. SUBJECTS AND METHODS

The present licentiate thesis includes two papers and one thesis frame.

Paper I is a secondary analysis of the health-promoting intervention study Elderly Persons in the Risk Zone (EPiR).

Paper II is a telephone interview with participants remaining from the 12-months follow-up of the EPiR-cohort.

3.1 Elderly Persons in the Risk Zone

3.1.1 Design

Elderly Persons in the Risk Zone (EPiR) (51) was a randomised, single-blind, controlled, three-armed trial conducted between November 2007 and May 2011 in Gothenburg, Sweden. The overall aim of the intervention was to delay the progression of frailty in older adults, preserve their health and quality of life, and to minimize the need for health care.

The study comprised of two intervention groups, a preventive home visit (PHV) and multiprofessional senior meetings, as well as one control group. The PHV group received one home visit including information and advice about what the municipality could provide in activities and services for seniors. The PHV was guided by a protocol with room for the participants to ask questions about areas that interested them, but there was no specific information about nutrition. Senior meetings included four weekly meetings with one follow-up home visit. A maximum of six persons attended each meeting and a booklet covering different areas of health was especially designed for the intervention (41). One of the sections concerned food and meals, and the professional was encouraged to ask the participants about their meal habits during one of the meetings.

Participants in the control group accessed the ordinary range of community services on their own. Figure 1 shows an overview of which study-arm respective paper is based on.

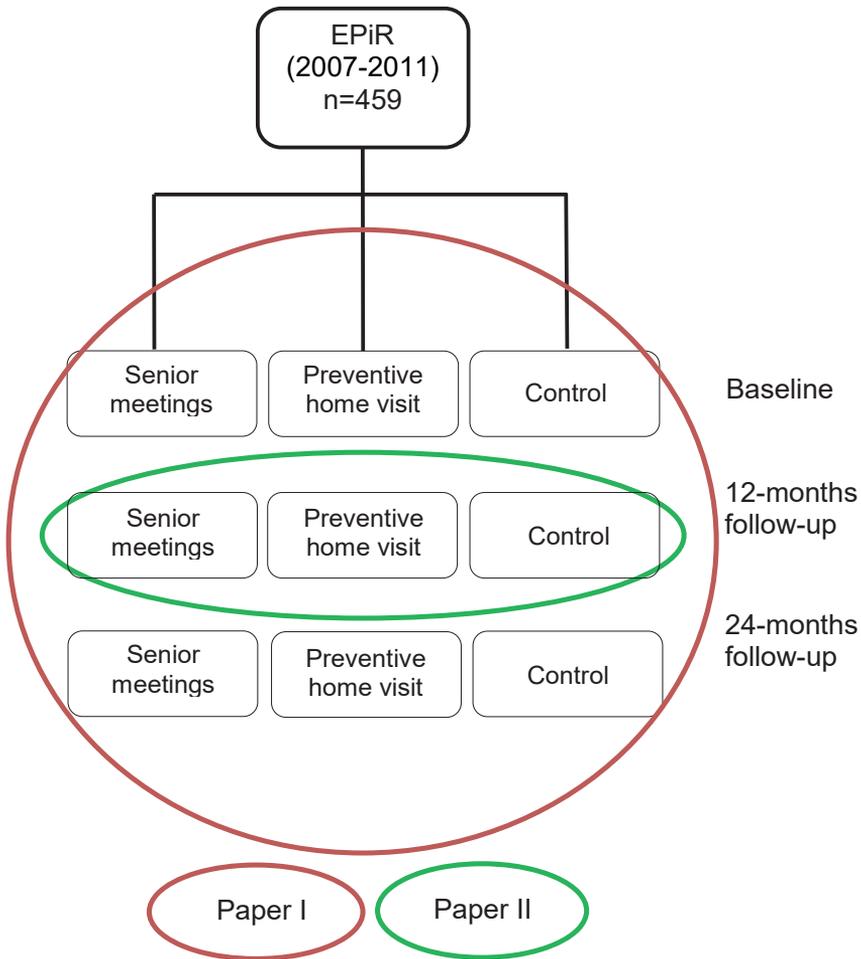


Figure 1. Overview of the study-arms in EPIR and on which follow-ups the respective papers are based on.

3.1.2 Participants

Eligible persons for EPiR were drawn from official registers of all persons aged 80 years or older living in two urban districts in Gothenburg, Sweden. The two urban districts were situated outside the city centre, but within the city limits, with a mix of self-owned houses and apartment blocks. The general education level and income level of the residents were slightly higher, and the sickness rate somewhat lower than the population in Gothenburg as a whole (52). Equal numbers from the two urban districts were randomly assigned until the intended sample size was reached. An invitation letter was sent to all persons in the sample, and after a follow-up telephone call, 546 persons consented to participate. Those who were living in their ordinary housing without being dependent on the municipal home help service or care arranged by the municipality, who were independent from another person in Activities of Daily Living (ADL), and cognitively intact according to the Mini Mental State Examination score (MMSE) (≥ 25) fulfilled the inclusion criteria. Based on a power calculation, and after written informed consent had been obtained, a total of 459 older adults were randomly assigned to one of the three study-arms by a research assistant (Figure 2).

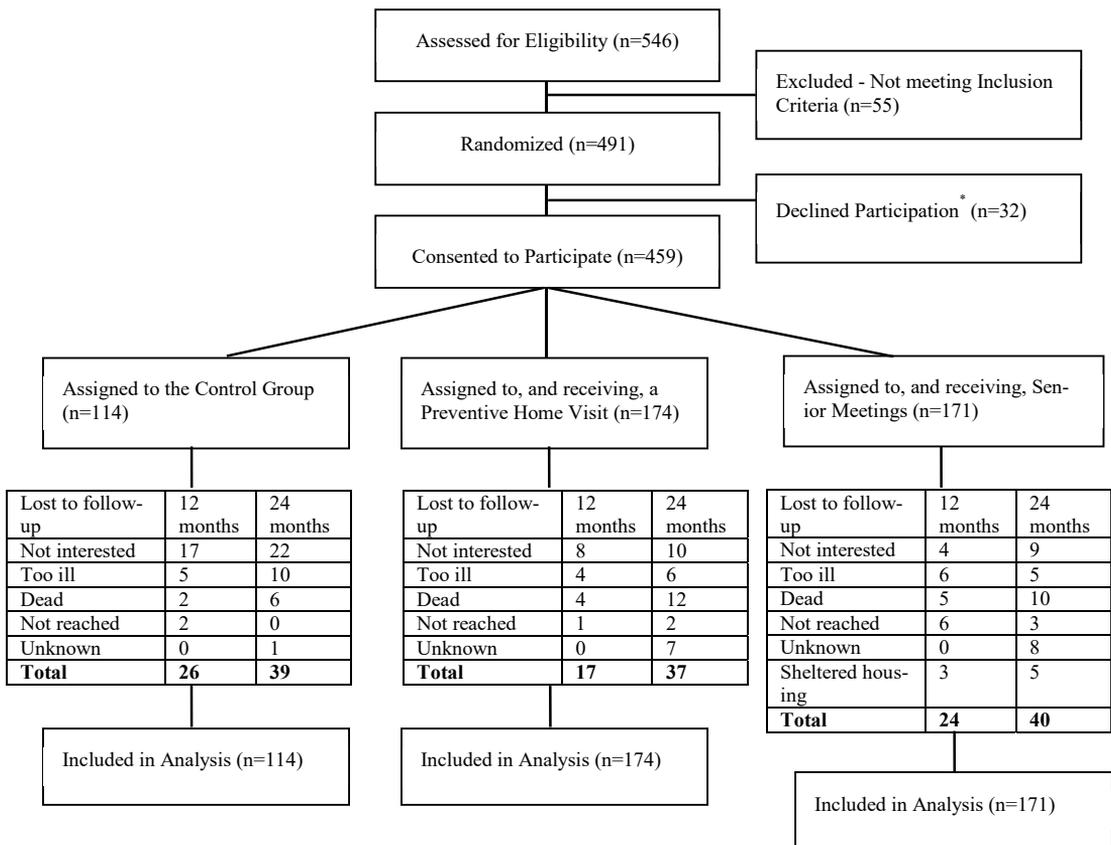


Figure 2. Flow of participants through the study *Elderly Persons in the Risk Zone* and reasons for declining participation at 12- and 24-months follow-ups. *Reasons for declining participation, please see study protocol (51).

3.1.3 Data collection

Data was collected by structured face-to-face interviews in the participants' own home. Research assistants with different backgrounds (occupational therapist, physiotherapist, social worker and registered nurse) performed the interviews. They were all trained in assessing, interviewing and observing. Study protocol meetings were held regularly to ensure standardization. The follow-up time was two years with intervals at 3, 12 and 24 months.

3.2 Paper I

3.2.1 Design

Paper I was a secondary analysis of the EPiR study. Data concerning meal frequency and vegetable intake at baseline, and frailty at the 12- and 24-months follow-ups completed in June 2011 was used.

3.2.2 Participants

In paper I, 371 participants with complete baseline data on the selected variables were retrieved from EPiR. Those who were found to be frail at baseline or were missing, were excluded from this secondary analysis. At the 12-months follow-up there were 265 individuals and at the 24-month follow-up 200 individuals remaining. For baseline characteristics, see table 1.

Table 1. Baseline characteristics of the study population (n=371)

Variable	
Female, n (%)	230 (62)
Age, mean, \pm s.d. (range)	84.0 \pm 3.3 (80-97)
Age, by groups, n (%)	
80-84	219 (59)
85-100	152 (41)
Education level, n (%)	
Non-academic degree	293 (79)
Academic degree	78 (21)
Living alone, n (%)	194 (52)

Abbreviations: s.d. Standard deviation

3.2.3 Data collection

Paper I used data that concerns meal frequency, vegetable intake and frailty from the questionnaire-based face-to-face interviews in EPiR.

3.2.4 Measurements

Dependent variable

Frailty

The main focus in paper I was to study if there was an association between the two variables meal frequency and vegetable intake and frailty. The degree of frailty was measured by using eight frailty indicators: weakness, fatigue, weight

loss, low physical activity, poor balance, slow gait speed, visual impairment and cognition. Weakness (grip strength) was measured by North Coast dynamometer (53) where reduced strength was below 13 kg for women and 21 kg for men for the dominant hand, and below 10 kg for women and 18 kg for men for the non-dominant hand. Fatigue and weight-loss was measured with two questions from The Göteborg Quality of Life Instrument (54): “Have you suffered any general fatigue/tiredness over the last three months?” and “Have you suffered from any weight loss over the last three months?” An affirmative answer was considered as a frailty indicator. Low physical activity was defined as one or two walks per week or less. Poor balance was considered if the Bergs Balance Scale (55) score was 47 or lower (maximum 56 points). Walking four metres in 6.7 seconds or less was considered as low gait speed (56). Visual impairment was measured with the KM chart and if ≤ 0.5 for both eyes, visual acuity was regarded as impaired (57). Cognition was measured with the MMSE (58), where impaired cognition was considered below 25 points. In paper I, the sum of frailty indicators were dichotomized into “not frail” (0-2 indicators) and “frail” (>3 indicators) according to recommendations by Fried (14).

Explanatory variables

Meal frequency

Meal frequency was studied by asking: “Do you usually have breakfast?”, “Do you usually have lunch?”, “Do you usually have dinner/evening meal?” and “Do you usually have a snack, if yes how many times per day?” The response alternatives “yes” and “no” were added up together with the number of snacks per day and were thereafter dichotomized into 0-3 and 4-7 meals per day. The dichotomization was determined from the booklet that the participants in senior

meetings received where it is recommended to have at least three main meals and two to three snacks per day (41,47).

Vegetable intake

Regarding vegetable intake, participants were asked, “How often do you have vegetables in your diet?” The response alternatives were “every meal”, “at least one meal per day”, “almost every day”, “about once a week”, “almost never” and “never”. The response alternatives were dichotomized into “every day” (“every meal, “at least one meal per day”) and “seldom or almost never” (“almost every day, “about once a week”, “almost never” and “never”).

Possible confounding variables

The following variables were found as possible confounders: gender, age, education, living alone and study-arm group. Age was dichotomized into the age groups 80-84 years and 85-100 years with the median age as cut-off. Education was dichotomized into low education (incomplete education/college or lower degree) and high education/tertiary education (university or college). Participants who were not living with a cohabitant or spouse were dichotomized as living alone. Study-arm groups were PHV, senior meetings group and control group.

3.3 Paper II

3.3.1 Design

Paper II was a cross-sectional study based on participants remaining at the 12-month follow-up of EPiR. A questionnaire was designed to assess practice, knowledge and attitudes regarding food habits and meal patterns.

3.3.2 Participants

The 366 participants remaining at the 12-month follow-up of EPiR received an invitation to a telephone interview. Two hundred and ninety-seven (81%) older adults accepted the invitation and answered the questionnaire. Mean age was 87 years (range 83-100) and 66 % were women.

3.3.3 Data collection

Paper II was based on a telephone interview. The questionnaire used was partly based on questions from two previous Swedish population studies, the H70 study (59) and the Johanneberg study (60), with the addition of new questions for the purpose of the present paper. The final questionnaire contained questions regarding shopping and cooking responsibilities, eating alone or with others, opinions concerning food and health, meal patterns and questions regarding earlier food habits (see appendix). Participants received an invitation letter telling them when the phone call would take place. The interviews lasted on average for 16 minutes.

3.4 Statistical analyses

Before the start of EPiR, a power calculation was calculated based on the expected relative change in functional abilities over time between study-arms. Based on 80 % power to detect significance ($p=0.05$, two-sided), it was found that a total of 300 persons were needed. To allow for dropouts, a total of 459 persons were included in the EPiR study.

For both paper I and II, descriptive statistics and categorical data are presented as frequency and percentage, n (%). Continuous data are given as the mean and standard deviation (SD). For baseline characteristics, t-test and Chi-2 test were used.

In paper I, binary logistic regression was used to examine if there was any relationship between meal frequency and frailty or vegetable intake and frailty.

Two-sided significance tests were used throughout and statistical significance was accepted at the 5 % level ($p<0.05$). Analyses were performed using IBM SPSS Statistics for Windows, version 21.0 released 2012, and version 24.0 released 2016. IBM Corp. Armonk, NY.

3.5 Ethical considerations

The Regional Ethical Review Board in Gothenburg approved the Elderly Persons in the Risk Zone study (# 650-07). For paper II, an additional application for the telephone interviews was approved. EPiR was registered at Clinical Trials Gov (NCT00877058).

The studies were conducted in accordance with the Helsinki declaration and were guided by the ethical principles of respect for autonomy, beneficence and justice (61).

All participants were informed both by a letter and in person, that participation was completely voluntary and that they could decline at any time without giving a reason. After the end of EPIR, participants from the control group were asked if they wished to take part in either of the two interventions, which, at that time, had been implemented in the common routines of the urban district. Written informed consent had been obtained from all participants in the studies.

The interviews in paper I were conducted in the participants' own homes and as they were time-consuming, they could be tiring for the participant. Some questions were also of a sensitive nature. The research assistants were very careful about telling the participants that it was voluntary to answer the questions or perform the test, and in some cases, the interview was divided into two parts or followed by a telephone call.

4. RESULTS

The results are described in detail in the separate papers (Paper I and II). This section comprises a summary of the specific findings in each paper.

4.1 Paper I

In paper I, which was a secondary analysis of EPiR, 371 community-dwelling persons aged 80 years or older were included. Sixty two percent were women and the mean age was 84 years (S.D \pm 3.3, range 80-97 years). Just over half of the participants (52 %) were living on their own and 21 % had an academic degree. At the 12-month follow-up, 54 persons (15 %) had become frail and an additional 76 persons at the 24-month follow-up.

Among all participants, meal frequency ranged between two and seven meals per day. Mean meal frequency was 4.2 ± 0.9 meals per day, women had a somewhat higher meal frequency than men ($p=0.02$). There was no relationship found between meal frequency at baseline and frailty at 12 months ($p=0.8$), or 24 months ($p=0.36$). The non-significant result remained after adjusting the model for age, gender, education, living alone and study-arm (Table 2).

Very few, only one per cent, claimed that they never ate vegetables, 57 % had vegetables with at least one meal per day. No significant relationship was found between frequency of vegetable intake at baseline and frailty at 12 months ($p=0.26$) or 24 months ($p=0.87$) (Table 2). Adjusting for age, gender, education, living alone and study-arm did not affect the results.

Table 2. Relationship between meal frequency, vegetable intake and frailty

	Odds ratio	C.I.	p-value
Frailty at 12 months and Meal Frequency, n=319			
Unadjusted	1.10	0.53-2.28	0.80
Frailty at 24 months and Meal Frequency, n=229			
Unadjusted	0.69	0.31-1.53	0.36
Frailty at 12 months and Vegetable intake, n=319			
Unadjusted	1.22	0.86-1.73	0.26
Frailty at 24 months and Vegetable intake, n=229			
Unadjusted	1.03	0.71-1.49	0.87

Abbreviations: C.I Confidence Interval

4.2 Paper II

In paper II, 366 persons from the one-year follow-up of EPiR were invited to a telephone interview, 297 accepted participation. The mean age was 87 years (SD±3) (range 83-100) and 66 % were women. Almost half of the participants (46 %, n=134) were living alone and 21 % (n=61) had an academic degree. Men were more likely to have a higher education (p=0.03) and women were more often widows (p<0.00). At the time of retirement nine percent (n=18) of the women had not been employed outside the home. Just over half of the participants (56 %, n=167) used to weigh themselves regularly and a majority (70 %, n=207) were satisfied with their current body weight. A large proportion of women (86 %, n=166) and men (91 %, n=94) reported having a good or very good appetite.

Almost all participants, regardless of gender, had their main meal at home. Very few (n=4) went to a restaurant or meeting place for seniors, and only seven persons received ready-to-serve meals (meals on wheels). Women more often reported that their habits regarding cooking, meal patterns and choice of foods had changed during recent years ($p=0.007$), and the main reasons were becoming a widow (41 %) or their own retirement (19 %).

Women went shopping for food on their own more often, and both women and men claimed that women were the ones who were responsible for shopping at the store rather than men. Among the married or cohabiting participants, women more often had the sole responsibility for planning food shopping and cooking ($p<0.000$). Further, women were more likely to think of cooking as a routine or something they just had to do. Few men (13 %, n=13) took a great interest in cooking and one third (36 %, n=37) of men thought that cooking was something they were not able to do.

5. DISCUSSION

The general aim of this licentiate thesis was to investigate nutritional perspectives for independently living older adults participating in a health-promoting program. The main findings were that there was no association between meal frequency or vegetable intake and the development of frailty in this group of older adults. However, several gender differences according to practice, knowledge and attitudes regarding food habits and meal patterns were identified.

5.1 Methodological aspects

Participants in the EPiR study were all independently living, cognitively intact and 80 years or older. At the time of inclusion, all participants were in good health. The location of participants' homes was a prosperous area of a medium-sized city in western Sweden where education levels were somewhat higher and sickness levels slightly lower than in the rest of the city (52). This makes it possible that the setting of the intervention could have affected the outcome (62,63) limiting the generalizability of the study as they might have been more aware of life-style and health-related issues than older adults in the general population. This could also contribute to higher motivation to participate in the study. A study held in another part of the city with other social conditions might have given a different outcome.

For paper I, the outcome may have been affected by the skills and knowledge of the interviewers who were all from different professions (64). The interviewers might have had preconceptions about food-related issues and when interviewing, there is a risk that questions might be asked in a guiding way that could influence the respondent's answer in order to please the interviewer. It is also

possible that the questions could have been interpreted differently than was meant (65), for example, the word for dinner is the same as lunch in some regions in Sweden. Although, there was a protocol to follow, questions could have been described in different ways and we do not know the time devoted to food-related questions. However, the fact that the interviewer followed a protocol during the interview makes it possible to consider that the questions are interpreted in the same way at follow-ups and thereby reducing the risk of bias.

The questions regarding meals and vegetables used in paper I were derived from an extensive interview, which concerned a broad perspective of the older person's life situation. As paper I is a secondary analysis of the outcome from EPIR, the results may have been affected by the design of EPIR and its possible limitations. The questions regarding food habits and meal patterns in EPIR only ask if the participants have certain meals (e.g. breakfast, lunch and dinner) and how many snacks in a day, and if the participants eat vegetables and if so, how often. These questions might seem rather superficial and do not give any deeper knowledge about the older adults' nutritional status. The manual used by the research assistant does not enclose a description how to define "a meal", neither is it described for the participant, which would be preferable as it otherwise leaves it to be freely interpreted. A clear definition of what was included in the concept "vegetable" would have made it possible to separate vegetables from root vegetables and fruit in order to achieve complete information. Those participating in "senior meetings" received a booklet recommending them a daily intake of vegetables, fruit and berries. Depending on how the respondent interprets "vegetables", root vegetables, fruit and berries might be excluded when answering and the results will be underestimated, which could be a weakness to the study. The booklet constituted an important tool for senior meetings and something possible to return to in order to refresh their memory. Having a chance to discuss topics in the booklet that were already familiar was a positive

experience and new experiences could help participants prevent health problems before they appear (66). A broader range of questions concerning, for example, the intake of specific nutrients, weight change etc. would have improved the opportunities to explore nutritional perspectives among older adults on a deeper basis. However, it is well known that people tend to under- or overestimate their intake when performing dietary surveys (67). Also, gender is seldom considered when discussing these surveys, men are often underrepresented in dietary surveys, an important issue when paying attention to portion size, food choices, gender differences in diet-related diseases and knowledge and involvement in cooking (68).

In paper II, interviews were conducted by telephone, a method chosen as from a time perspective it was not possible to visit all eligible participants and perform the interview in their homes. When talking to participants directly there is an opportunity to explain and clarify the questions if there would have been any uncertainties. In addition, an experienced dietician conducted the interviews, which is a strength. Therefore, a telephone interview was considered a good option. The response rate was high, 81%, which was a strength. The participants received a letter in advance with information about the interview and those with hearing problems were offered to answer the questionnaire in writing and then send it back by post, which probably contributed to the high response rate.

In a future study, to get a broader and deeper knowledge regarding older adults' food habits, it would be desirable to ask more detailed questions than the superficial questions in EPiR, also considering that there were some methodological issues in the study. In turn, this would mean that more time would be needed for each interview, which might not be preferable when considering the age of the participants as it could be tiring with time-consuming interviews.

5.2 Discussion of the results

Nutrition affects healthy aging and is in turn affected by several different factors, such as environmental factors, genetics, culture, social activities etcetera. In this licentiate thesis, the focus is on food habits including meal patterns and vegetable intake.

There was no difference found between men and women concerning frequency of vegetable intake in our study (paper I). In a study (69) reviewing articles regarding changes in nutrient intakes and dietary habits from adulthood through old age, it was found that women were more health conscious than men and particularly older women were more likely to consume fruits and vegetables. The higher intake of fruit and vegetables was confirmed by food pattern data, showing an increased intake of vitamin A, C, and potassium, nutrients found especially in fruit and vegetables, among women. These findings have also been confirmed in other studies (70,71).

However, vegetable intake was only asked for as a marker for healthy food habits and thereby an indicator of a healthy lifestyle (72–74), which is a limitation to this study and should be taken in consideration when interpreting the results. Still, studies have shown that most older adults consume less than the recommended levels (75,76), therefore, the intake of fruit and vegetables constitute a possible target for health-promotion intervention in older adults.

No relationship between meal frequency and frailty or frequency of vegetable intake and frailty was found in paper I. Previously, a low intake of energy and selected nutrients among older adults has been shown to be associated with frailty (23). This study used a Food Frequency Questionnaire to evaluate dietary intake which provided the prerequisites for a more detailed analysis which was not possible in the EPiR study as it did not provide that kind of information.

In paper II, it was found that a large proportion of the women had changed their habits regarding cooking, meal patterns and choice of food due to major changes in life, such as becoming a widow or their own retirement. Life events such as widowhood in later life affect older adults' social roles, which are reflected in food-related behaviour such as the responsibility for food and cooking (77). The results from paper II also indicated that eating alone was not enjoyable, which has also been described in an earlier study by Sidenvall (78). Further research regarding social influences has shown that the number of people present at a meal occasion was positively correlated with meal size. Meals eaten with others contained more carbohydrate, fat, protein and total calories (79). This sheds light on the importance of encouraging older adults who have recently become lonely to go to dining places for seniors or to have meals with friends and relatives regularly. It could also be important to encourage older adults to take part in other social events for older adults in order to achieve a healthy, active aging.

A majority of men interviewed in paper II thought that cooking was something they were not able to do. In the generation to which the men in our interviews belong, it was common that women were not employed outside the home and with that responsible for the household including cooking and shopping. This could be a reason to why men had not been involved in the cooking or planning for food while living with a spouse. Even though we only asked a few questions regarding cooking and that we did not know about their earlier cooking knowledge, these findings may indicate a future need for tailored social support to suit individuals' needs.

6. CONCLUSION

It was found that meal frequency and vegetable intake did not predict the development of frailty in older adults. It was also shown that women took a greater responsibility for planning, shopping and cooking food than men did. The studies in this licentiate thesis were conducted on a group of independently living older adults. The setting of the study was a prosperous area of a medium sized city in western Sweden, where education levels are higher and sickness rates are lower than in the rest of the city. This might have influenced the participants in that they might have a higher awareness of health and nutrition, which in turn might have influenced the results. The differences between men and women regarding knowledge and attitudes towards food and cooking may indicate that future support for older adults may need to be customized by gender, but the result may also be attributed to the gender roles of this generation.

7. FUTURE PERSPECTIVES

As aging is an individual, varying process and older adults form a heterogeneous group and due to increasing life expectancy, there is a great need for knowledge and understanding of how food and nutrition affect older adults' capability to maintain independence and health. A life style intervention may increase the motivation to change food habits even in an aged population. Despite the limitations in the studies, they provide some insights for future research. Future studies, including older adults with more varying preconditions, would provide a broader perspective of the area. For example, it would be interesting to study older adults from other socio-economic groups or older adults who have an immigration background.

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APPENDIX

The questionnaire used in paper II.

Kod

Datum

 - -

år

mån

dag

Starttid

 :

LIVSLOTS - FRÅGOR OM MAT OCH MATVANOR

1. Vem är det som vanligen handlar mat i ditt hushåll?

Jag själv ensam

Jag tillsammans med någon, vem?

Make/maka/sambo

Släktingar/vänner/grannar

Hemtjänsten

Privat anställd hjälp

Annan, vem?

2. Vem ansvarar för vad som ska inhandlas?

Jag själv ensam

Jag tillsammans med någon, vem?

Make/maka/sambo

Släktingar/vänner/grannar

Hemtjänsten

Annan, vem?

3. Vem lagar de flesta måltider hemma hos dig?

Jag själv ensam

Jag tillsammans med någon, vem?

Make/maka/sambo

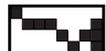
Släktingar/vänner/grannar

Hemtjänsten

Privat anställd hjälp

Tar emot färdiglagad mat

Annan, vem?



4. Har du någon hjälp med maten?

Ja

Nej

5. Om ja, vad?

Handla

Lagad mat och eller frukost

Värma/servera maten

Ta hand om rester efter måltid

6. Behöver du hjälp i måltidssituationen?

Ja

Nej

7. Om ja, med att:

Lägga upp maten på tallriken

Hälla upp dryck i glas

Dela maten på tallriken

Hjälp att äta

Annat, vad?

8. Får du den här hjälpen?

Ja

Nej

9. Hur länge har du haft den hjälpen?

0-6 mån

6-12 mån

12-24 mån

Mer än 24 mån

10. Var äter du vanligen dagens huvudmål?

Hemma

Restaurang/Lunchställe/Träffpunkt

Hos släkting/vän/granne

Någon annanstans, i så fall var?



11. Hur ofta äter du tillsammans med andra?

- Nästan varje dag
- Någon gång per vecka
- Någon gång per månad
- Mer sällan
- Aldrig

12. Om du har möjlighet att välja, äter du helst:

- Ensam => gå till fråga 13
- Tillsammans med andra => gå till fråga 14

13. Anledningen till att du äter ensam är: (flera alternativ kan väljas)

- Jag saknar sällskap
- Jag vill vara ensam
- Jag vill ha lugn och ro
- Jag tycker det är svårt att äta inför/tillsammans med andra
- Jag måste koncentrera mig helt och hållet på maten
- Jag spiller lätt
- Annat, vad?

14. Anledningen till att du äter tillsammans med andra är:

- Jag vill ha sällskap
- Jag behöver hjälp
- Annat, vad?

15. Om du äter tillsammans med andra, vem brukar du äta tillsammans med då?

- Make/maka/sambo
- Släktingar/vänner/grannar
- Personal från hemtjänsten
- Annan, vem?



16. Har du något av följande besvär:

- Svårigheter att tugga
- Svårigheter att svälja
- Matsmältningsproblem eller halsbränna
- Sår i munnen
- Torr i munnen
- Dålig passning på tandprotesen
- Förändrad smakupplevelse
- Annat, vad?
- Har inga besvär i samband med ätandet

17. Har du:

- Egna tänder
- Delvis egna tänder
- Brygga/implantat
- Hel tandprotes
- Delvis tandprotes

18. Finns det några livsmedel som du anser är nyttiga för hälsan?

19. Finns det några livsmedel som du anser är mindre bra/skadliga för hälsan?

20. Känner du till några livsmedel som kan bota sjukdomar?

21. Vilka livsmedel anser du är nyttiga för äldre?



22. Finns det några livsmedel som är mindre bra/skadliga för äldre?

23. Om du jämför dig med andra, tar det längre tid för dig att äta en måltid?

Ja

Nej

Om ja, varför?



Måltidsmönster

Beskriv hur du brukar äta under ett dygn. Ange tidpunkten för ätande och **kryssa** för den typ av måltid som överensstämmer bäst.

Glöm ej mellanmål och eventuellt annat småätande samt drycker.

Observera att man kan äta flera huvudmåltider på en dag.

Tid/Klockslag	Typ av måltid			
	<u>Huvudmåltid</u> ex. lagad mat, husmanskost, soppa m bröd	<u>Lättare</u> <u>måltid/Frukost</u> ex. gröt, flingor, smörgåsar, soppa, sallad, omelett	<u>Mellanmål</u> ex. en smörgås, kex, bulle, kaka, frukt, godis, glass (ev med dryck)	<u>Dryck, enbart</u> ex, kaffe, te, juice, mjölk, öl, vin, saft
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24. Får du färdiglagad mat levererad hem till dig?

Ja

Nej

Om nej, gå vidare till fråga 35 på sidan 9.

25. Om ja, vad för mat är det du får?

Varm mat

Kall mat, klar att värma i mikrovågsugn

Fryst mat

26. Kan du välja mellan flera olika huvudrätter?

Ja

Nej

Vet inte

27. Brukar du välja någon form av specialkost?

Ja

Om ja, vad?

Nej

28. Kan du beställa tillägg till den färdiglagade maten?

Ja

Nej

29. Om ja, vad kan du välja?

Bröd/Smör

Sallad

Dessert

Annat, vad?

30. Om du tar emot färdiglagad mat, hur många rätter per vecka?

--	--



31. Äter du hela portionen vid ett tillfälle?

- Ja
- Nej, jag delar den upp den på två eller flera måltider
- Nej, jag delar den med någon annan

32. Om nej, vad är orsaken till att maten delas upp på två eller flera måltider?

- Orkar inte all mat
- Ekonomiska skäl
- Annat, vad?

33. Jag äter maten direkt ur förpackningen

- Ja
- Nej

Om ja, gör jag det därför att...

34. Om du inte lagar din mat själv, vad är viktigast för dig när du serveras mat? (ett svar)

- Att det smakar gott
- Näringsinnehållet
- Portionsstorlek, att den är lagom stor/liten
- Snabbt och enkelt att värma/laga till
- Att maten är tilltalande upplagd på tallriken
- Att det är snyggt dukat på bordet
- Det är maträtter jag känner igen/har ätit förr
- Priset



35. Uppskattar du maten lika mycket som förr, dvs. före 65 års ålder?

Ja

Nej

36. Om nej, varför inte?

Mat intresserar mig inte

Jag saknar sällskap vid måltiderna

Jag har tappat intresset för matlagning

Aptiten har minskat

Maten smakar inte lika bra som förr

Maten luktar inte lika gott

Matsmältningsproblem

Annat, ange vad

37. Äter du för att:

Det är gott

Jag behöver näringsämnen

Gå upp i vikt

Gå ner i vikt

Bara för att bli mätt

För att jag vet att jag måste

38. Hur är din inställning till matlagning? (ett svar)

Något jag inte kan

Ett "nödvändigt ont"

En självklar rutin

Ett stort intresse

39. Under min yrkesverksamma tid brukade jag på arbetstid äta:

Hemma

Medhavd mat

I personalmatsal

På restaurang

Inget regelbundet



40. Undviker du någon speciell sorts livsmedel eller dryck relaterat till din hälsa?

Nej

Ja

a) Om ja, vilka livsmedel undviker du?

b) Vad är anledningen till att du undviker dessa livsmedel?

c) Hur länge har du undvikit dessa livsmedel?

41. När äter du dagens första mål?

 :

42. När äter du sista målet?

 :

43. Har dina vanor under senare år förändrats gällande matlagning, måltidsmönster (regelbundenhet) och val av livsmedel?

Ja

Nej

a) När ändrades dina matvanor?

b) På vilket sätt har de ändrats?

c) Vad var orsaken till förändringen i dina matvanor?

44. Hur beskriver du din aptit?

Mycket bra

Bra

Mindre bra

Dålig

45. Hur skulle du beskriva din aptit idag jämfört med under din yrkesverksamma ålder?

- Oförändrad
- Bättre
- Sämre
- Vet ej

46. Om din aptit har förändrats, vet du vad som orsakade den förändringen?

47. Väger du dig regelbundet?

- Ja
- Nej

48. Längd cm

49. Vikt , kg

50. När vägde och mätte du dig senast?

51. Har din vikt sedan yrkesverksam ålder ändrats?

- Ökat
- Minskat
- Är oförändrad

52. Vikt

- Jag är nöjd med min vikt
- Jag skulle vilja gå upp i vikt
- Jag skulle vilja gå ner i vikt

Sluttid :

Tack för din medverkan!



Meal frequency and vegetable intake does not predict the development of frailty in older adults

Short title: Meal frequency, vegetable intake and frailty

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Abstract

Background

Frailty is considered highly prevalent among the aging population. Fruit and vegetable intake is associated with positive health outcomes across the life-span, however, the relationship with health benefits among older adults has received little attention.

Aim

The aim was to examine if a relationship exists between meal frequency or frequency of vegetable intake and the development of frailty in a population of older adults.

Methods

A total of 371 individuals, 80 years or older, from the study “Elderly Persons in the Risk Zone” were included. Data was collected in the participants’ home by face-to-face interviews up to 24 months after the intervention. Baseline data were calculated using Chi2-test; statistical significance was accepted at the 5% level. Binary logistic regression was used for the relationship between meal frequency or vegetable intake and frailty.

Results

Mean meal frequency was 4.2 ± 0.9 meals per day; women seem to have a somewhat higher meal frequency than men ($p=0.02$). 57 % of the participants had vegetables with at least one meal per day. No significant relationship was found between meal frequency or vegetable intake and frailty at 12 or 24 months follow-ups.

Conclusion

Among this group of older adults (80+), meal frequency was slightly higher among women than men, and just over half of the participants had vegetables with at least one meal a day. The risk of developing frailty was not associated with meal frequency or vegetable intake. The questions in this study were meant as indicators for healthy food habits.

Keywords: Aged 80 and older, Meal Frequency, Vegetable intake, Frailty, Community dwelling

Trial registration

Registered at ClinicalTrials.Gov. Trial Registration: NCT00877058,
<https://clinicaltrials.gov/ct2/show/NCT00877058>.

Meal frequency and vegetable intake does not predict the development of frailty in older adults

Short title: Meal frequency, vegetable intake and frailty

Introduction

Within the aging population, frailty is considered highly prevalent (Fried et al., 2001). Frailty increases with age and is more common among women than men. A systematic review reported a prevalence of 11 % in community-dwelling adults >65 years (Collard et al., 2012). The prevalence of frailty in Sweden for those aged over 65 years is similar, almost 9 % (Santos-Eggimann et al., 2009). Up to date, there is no consensus on how to define frailty (Rodríguez-Mañas et al., 2013), although the physical frailty phenotype suggested by Fried et al (2001) is frequently used to operationalize the concept. Fried and co-workers' definition of frailty includes a clinical syndrome in which three or more of the following criteria are present: unintentional weight loss, self-reported exhaustion, weakness, slow walking speed, and low physical activity.

Inadequate nutritional intake is an important risk factor for frailty. Nutrition-related problems among frail older adults have shown to be common; it was found to be in 35 % of a cohort of community-dwelling individuals >85 years (Badia Farre et al., 2014). There is evidence that nutrition has an important role in preventing and postponing deterioration of health (Bonney et al., 2015). As it provides the energy and essential nutrients needed for all organs and bodily functions, nutrition is a contributing factor in this complex causality (Porter Starr et al., 2015). There is a relationship between dietary patterns and the risk of developing frailty. In a study by Bollwein et al (2012), frail people were shown to have a significant lower dietary score, and as a low energy intake is related to an increased risk of frailty, maintaining good eating habits is essential (Serra-Prat et al., 2016). Among older adults (>65) in Sweden, 49 % were found to have less than four eating episodes per day (Söderström et al., 2013). Further, Quandt and co-workers (1997) found that only 65 % consumed three meals every day, and less than one third had a snack regularly. Since the aging process has been shown to be associated with a reduction in energy intakes (Wakimoto and Block, 2001) snacking is important for older adults as it contributes to an increased daily energy and nutrient intake (Zizza et al., 2007).

Among researchers and the general population, it is agreed that consuming fruit and vegetables during adulthood contributes to life-long health benefits (Nordic council of ministers, 2012; WHO, 2004), including reduced risk of several chronic diseases, disease-specific mortality and general mortality (Wang et al., 2014; WCRF, 2016). The correlation between eating fruit and vegetables and health benefits among older adults has received little attention; most studies are cross-sectional or do not include older adults (Nicklett and Kadell, 2013). However, there is some evidence that an intake of a healthy diet with a high content of fruit and vegetables during adulthood may be associated with a reduced risk of depression, a slower rate of cognitive decline, fewer mobility limitations and less disability (García-Esquinas et al., 2016). Within the general population, health behaviours such as high fruit and vegetable consumption are associated with better physical functional health (Myint et al., 2007). Neville and co-workers (2013) suggest that an increased intake of fruit and vegetables in older healthy people improves grip strength. In addition, Bouillon et al (2013) showed that not consuming fruit and vegetables during adulthood (45-60 years) was associated with an increased risk of pre-frailty and frailty after a follow-up of 10.5 years. García and co-workers (2016) found that community-dwelling older adults consuming fruit and vegetables decrease the short-term risk of frailty in a dose-response manner.

To sum up, frailty is considered highly prevalent among older adults, and frailty is associated with an inadequate nutrition intake. Maintaining healthy food habits in older age is important to reduce the risk of developing frailty. An adequate vegetable intake has shown to be beneficial in the terms of better physical health. In this study we evaluate the meal frequency and the frequency of vegetable intake as indicators of healthy food habits in relation to risk of frailty among older adults aged 80 years or older as frailty is prevalent in this age group and since most studies in this area have been conducted on older adults aged >65 years. The aim of this study was therefore to examine if a relationship exists between meal frequency or vegetable intake and the development of frailty in a population of persons 80 years and older.

Methods

Sample

This prospective cohort study is a secondary analysis of data from the health-promoting study “Elderly Persons in the Risk Zone” (EPiR), a randomized, single-blind and three-

armed trial (n=459) with follow-ups for up to two years. EPiR was set up to evaluate the effects of a preventive home visit and multi-professional senior group meetings among independent community-dwelling older adults aged 80 years or older (Dahlin-Ivanoff et al., 2010). A power calculation preceded the EPiR study (Dahlin-Ivanoff et al., 2010); to get a power of 80 % at least 300 persons were needed, thus, 459 persons were included to allow for dropouts.

The inclusion criteria for EPiR were: 80 years or older, living in ordinary housing, being cognitively intact, and independent of help from others. The overall aim with the EPiR study was to delay the progression of frailty, to maintain their health, quality of life and minimize the need for health care (Gustafsson et al., 2012).

The study arms in EPiR comprised two health-promoting interventions and a control group. The Preventive Home Visit group (PHV) received one home visit including information and advice about what the municipality could provide in activities and services for seniors, etcetera. The multiprofessional Senior Meetings group included four weekly discussion-based meetings with a maximum of six persons, and one follow-up home visit. A booklet covering different areas of health was especially designed for the intervention (Vårdalinstitutet, 2009). Participants in the control group accessed the ordinary range of community services on their own.

The EPiR study was conducted in two urban districts, each containing a mix of self-owned houses and apartment blocks in Gothenburg, Sweden. The general education level and income level of residents were slightly higher, and the sickness rate somewhat lower than in the general population in Gothenburg (Gustafsson et al., 2012). Data at baseline, 3 months, 12 months and 24 months follow-ups were collected at face-to-face structured interviews in the participant's home. The interview was comprehensive and not only included questions concerning food habits but also, for example, frailty, risk of falling, self-determination, self-rated health, life satisfaction and activities of daily living (ADL). Results from EPiR showed that it is possible to delay deterioration in health outcomes measured as morbidity, self-rated health and satisfaction with health in very old persons at risk of frailty (Behm et al., 2014).

The present study is a secondary analysis of EPiR and uses data concerning frailty, meal frequency and frequency of vegetable intake at baseline and the 12 and 24 months follow-ups completed in June 2011. Eighty-four participants were found to be frail at baseline and four were missing and therefore excluded from this secondary analysis. A total of 371

individuals with complete baseline data on the selected measurement points were retrieved from EPiR. At twelve months, there were 265 individuals and at 24 months 200 individuals remaining which means that the dropout rate for this secondary analysis was 29 % at 12 months and 46 % at 24 months.

Ethics, consent and permissions

EPiR was approved by The Regional Ethical Review Board in Gothenburg (# 650-07) and was registered at Clinical Trials Gov (NCT00877058). Written informed consent was obtained from the participants.

Measurements

Data concerning the selected measures were assessed by face-to-face interviews and observations according to a study manual at baseline, 12 and 24 months follow-up of the EPiR study. The study manual consisted of explanations, for example, of how the interviewer should instruct the participant in the practical matters, how the questions should be asked and answers interpreted to enhance the quality of the outcome.

Dependent variable

Frailty

The degree of frailty was measured by using eight frailty indicators: weakness, fatigue, weight loss, physical activity, poor balance, slow gait speed, visual impairment and cognition. Weakness (grip strength) was measured by North Coast dynamometer (Mathiowetz et al., 1985) where reduced strength was below 13 kg for women and 21 kg for men (dominant hand) and below 10 kg for women and 18 kg for men (non-dominant hand). Fatigue and weight loss was measured with two questions from The Göteborg Quality of Life instrument (Tibblin et al., 1989): “Have you suffered any general fatigue/tiredness over the last three months?” and “Have you suffered from any weight loss over the last three months?” An affirmative answer was considered as a frailty indicator. Low physical activity was defined as one or two walks per week or less. Poor balance was considered if the Bergs Balance Scale (Berg et al., 1992) score was 47 or lower (maximum 56 points). Walking four metres in 6.7 seconds or less was considered as low gait speed (Peterson et al., 2009). Visual impairment was measured with the KM chart and if ≤ 0.5 for both eyes, visual acuity was regarded as impaired (Claesson et al., 2013). Cognition was measured with the Mini Mental State Examination (MMSE) (Folstein et al., 1975), where impaired cognition was

considered as below 25 points. In this secondary analysis of EPiR, the sum of the frailty indicators were dichotomized into “not frail” (0-2 indicators) and “frail” (>3 indicators) according to recommendations by Fried (2001).

Explanatory variables

Meal frequency

In the face-to-face interviews, participants were asked “Do you usually have breakfast?”, “Do you usually have lunch?”, “Do you usually have dinner/evening meal?” and “Do you usually have a snack, if yes, how many times per day?” In this secondary analysis, response alternative “yes” and the number of snacks per day were calculated into number of meal occasions per day and then, referring to the booklet (Vårdalinstitutet, 2009) and an earlier study in EPiR (Johannesson et al., 2016), dichotomized into 0-3 meals and 4-7 meals.

Frequency of vegetable intake

Questions regarding vegetables concerned vegetables only, and fruit was not specifically asked for. The question asked was “How often do you have vegetables in your diet?” The response alternatives were “every meal”, “at least once per day”, “almost every day”, “about once a week”, “almost never” and “never”.

Possible confounding variables

Gender, age, education, living alone and study arm were considered as possible confounding variables in this secondary analysis. Median age was calculated and dichotomized into 80-84 years and 85-100 years with median age as cut-off. Participants with an academic degree or an incomplete academic education were dichotomized as “higher education”. Participants, who were not living with a cohabitant or spouse, were dichotomized as “living alone”. Study arm groups were PHV, Senior Meetings group and control group.

Statistical analysis

The descriptive results are presented as mean and standard deviation (SD). To analyse differences between gender, age groups, and study arm groups the Chi² test was used. Two-sided significance tests were used throughout. Statistical significance was accepted at the 5 % level ($p < 0.05$). Binary logistic regression was used to examine the relationship between frailty and meal frequency, and the relationship between frailty and frequency of vegetable intake. All calculations were conducted per protocol according to recommended

assumptions regarding regression (Altman, 1990). All statistical analyses were performed using IBM SPSS Statistics, version 21.0 (IBM Corp., Armonk, NY, USA 2012).

Results

Study population characteristics

A total of 371 community-dwelling persons with the mean age (standard deviation) 84 ± 3.3 years (range 80-97) were included in the present study. In total, 62 % were women and 52 % were living alone. Baseline characteristics are presented in table 1. At baseline, none of the included persons were frail. At the twelve months follow-up, 54 persons (15 %) had become frail and an additional 76 persons at the 24 months follow-up, see figure 1.

Insert Table 1 about here

Insert Figure 1 about here

Meal frequency

At baseline, mean meal frequency was 4.2 ± 0.9 meals per day, ranging from 2 to 7 meals; women appear to have a somewhat higher meal frequency than men ($p=0.02$). No significant difference was found between age groups (80-84, 85-100) ($p=0.28$).

No significant relationship was found between meal frequency at baseline and frailty at 12 months ($p=0.8$) or 24 months ($p=0.36$) (Table 2). When the model was adjusted for age, gender, education, living alone and study arm, the non-significant result remained for both 12 and 24 months (results not shown). However, the odds for frailty increased with 12 % for every one year increase in age ($p=0.01$) at 12 months and 14 % ($p=0.01$) at 24 months, when comparing individuals with the same meal frequency. The odds ratio (95 % C.I) for developing frailty was 2.12 (1.08-4.16) at 12 months for women compared to men, given that they have the same meal frequency.

Frequency of vegetable intake

Fifty-seven percent reported having vegetables with at least one meal per day. Very few, one percent, claimed that they never ate vegetables. There was no difference between women and men according to frequency of vegetable intake ($p=0.69$), and there was no significant difference between age groups (80-84, 85-100) according to frequency of vegetable intake ($p=0.84$).

There was no significant relationship found between frequency of vegetable intake at baseline and frailty at 12 months ($p=0.26$) or 24 months ($p=0.87$) (Table 2). When the model was adjusted for age, gender, education, living alone and study arm, the non-significant results remained for both 12 and 24 months (results not shown). However, the odds for frailty increased with 12 % for every one year increase in age, given that they have the same vegetable intake ($p=0.01$) at 12 months, and 13 % ($p=0.01$) at 24 months. The odds ratio (95 % C.I) of developing frailty was 2.13 (1.09-4.19) at 12 months for women compared to men given that they had the same vegetable intake.

Insert Table 2 about here

Discussion

In this study, we found no significant relationship between meal frequency or vegetable intake and the development of frailty among a population of older adults aged 80 years and older.

Materials and methods discussion

In this secondary analysis of data from the EPiR, frailty was one of the dependent variables and consequently, those who were frail at baseline were excluded. This caused an accumulated dropout rate and thereby, a lack of power, meaning that the present results need to be interpreted with caution.

Participants in the EPiR study were in slightly better condition than Swedish 80-year olds in general (Socialstyrelsen and Folkhälsoinstitutet, 2013); a majority owned their own homes;

education- and income levels were slightly higher, and the prevalence of disease somewhat lower compared to Gothenburg as a whole (Gustafsson et al., 2012). It is known that factors like education, housing and social class may affect individual's health (Flowerdew et al., 2008). Accordingly, our results may have been influenced by the fact that participants' awareness of lifestyle and health-related issues might have been higher, and therefore participants had a better starting point than if the study had been conducted in a less prosperous area. Nevertheless, participants are all aged 80 years or over, an age group where deterioration in health is expected as a natural part of life.

Studies investigating the relationship between dietary patterns and frailty in older adults are scarce, vary in methodology and the majority concern people aged 65 years or older (MacDonell et al., 2016). One of the strengths of this study is therefore the age of the present population.

The most commonly used method to define frailty is the phenotypic definition of frailty by Fried et al (2001), which is also recommended by researchers for measuring frailty (Clegg et al., 2013). Balance, visual impairment and cognition also have documented importance for the outcome of frailty (Ávila-Funes et al., 2009; Klein et al., 2003) and have therefore been added in the operationalization of frailty in EPiR to get a broader understanding of the concept of frailty. As far as we know, this model with eight indicators of frailty has only been used in EPiR earlier (Behm et al., 2015), and in a recent report from EPiR (Zidén et al., 2014) both PHV and Senior meetings were shown to have a positive effect on single indicators such as balance and walking speed in the long term. As the eight frailty indicator model has not been widely used, and as researchers discuss whether different methods are sensitive enough to evaluate intervention studies (Cesari et al., 2014), this needs to be further studied.

In this secondary analysis, we have chosen to dichotomize variables. Meal frequency was dichotomized into 0-3 and 4-7 meals per day following the Swedish recommendations of having three main meals and at least one snack per day (Nordic council of ministers, 2012). Dichotomization is a method that hides small stepwise changes and thereby provides a simplified version with the consequence that nuance may be erased. On the other hand, the dichotomization makes an outcome more robust. As there is a clear cut-off for meals per day, it was considered the best solution for this variable. Concerning vegetable intake, as it was discovered that information was lost when analysing the vegetable variable as dichotomized, a stepwise analysis was decided as a more equitable way to present this

variable. Age, gender, living alone and education were chosen as possible confounders in this secondary analysis since loneliness, low income level and gender are risk factors for an inadequate nutrition intake among older adults (Locher et al., 2005). However, in the present study these factors did not affect the results.

The definition of a meal in research varies, a standardised way for definition is not yet agreed and available research methods are therefore heterogeneous. An accepted definition is necessary to be able to define meals in a standardised way in order to acquire comparable results. Eating frequency has been positively correlated with total energy intake (Holmbäck et al., 2010) in studies conducted on younger adults. Those having breakfast (Barr et al., 2013) or regular snacks (Zizza et al., 2007) had a significant higher intake of energy and certain micronutrients compared to those who left out breakfast and/or a snack. Participants were asked if they had breakfast, lunch, dinner/evening meal and/or a snack. Meal and snack could be interpreted in different ways, lunch could be the same as dinner and vice versa, and a snack could be any smaller meal. However, in the present study we focused on the number of meals, and not the content of the meal. Only having a cup of coffee or tea did not count as a snack; this reduces the risk that a non-energy intake has been counted as a snack. In our sample, there were very few persons who did not eat vegetables at all, which might be a reason for why there was no relationship found. As there were possible methodological shortcomings in this study, which may have affected the results, in a future study it would be interesting to examine groups of older adults that diverge more widely in consumption, and to include fruit in the questionnaire.

The questions that were relevant for this secondary analysis were a part of the questionnaire in EPiR, a somewhat time-consuming interview, as it concerned questions regarding a broad view of the older adult's life and a more detailed analysis of the vegetable intake was therefore not possible. The aim was not to perform a complete dietary survey; the questions were meant as indicators for healthy food habits aiming to get a general description of this population of older adults. It was not specified what was included in the notion of vegetables and the amount was not asked for, which could be a limitation to this study as we otherwise could have been able to present detailed results concerning vegetable intake. We therefore do not know what the participants interpreted as a vegetable. Also, fruit is not specifically mentioned in the questionnaire, meaning that some people might have included fruit intake with the vegetable intake and some not. Further, as participants were only asked if they had vegetables with each meal, daily or more seldom, we do not know the size of the portion of

vegetables. If the amount of vegetable intake had been known, a cut-off for what counts as a daily portion could have been used and a more specific result would have been available. The number of meals among the participants ranged between two and seven meals per day, meaning that the variation of vegetable intake occasions among those who answered “every meal” is large. This, in turn, complicates the possibility to evaluate the frequency of vegetable intake. A more detailed analysis would have made it possible to be able to present a broader view of older adults’ vegetable intake. To achieve this, a specific dietary assessment method such as the comprehensive Food Frequency Questionnaire (FFQ) or a Diet History would have been needed. It also has to be borne in mind that the present population constitutes individuals that are of a very high age, and might not manage an interview lasting for several hours. We asked for the vegetable intake as a marker for healthy food habits (Nordic council of ministers, 2012) and thereby an indicator of a healthy lifestyle (Anderson et al., 2011).

Results discussion

The main result of this secondary analysis was that no relationship was found between the number of meals or the frequency of vegetable intake and frailty at the 12 or 24 months follow-ups in the EPiR study. However, considering confounders, we did not see any impact on the results when adjusting for gender, education, living alone or study arm at 12 or 24 months follow-up. As frailty is strongly connected to age, it could be expected that the high age of our participants would influence the results. A decrease in number of meals associated with aging and thereby increasing frailty (Collard et al., 2012) are probable reasons. Community-dwelling older adults (80+) independent of municipal home-help services must themselves ensure that they maintain healthy food habits, including regular and nutritious meals.

According to Collard (2012), gender was connected to frailty in that women have a longer life expectancy and therefore are more likely to develop frailty as frailty increases with age. Change of lifestyle related to aging and loneliness, such as becoming a widow or a widower, could mean that the enjoyment of cooking decreases and mealtime habits change (Sidenvall et al., 2000), in turn leading to a decreased intake of nutrients and an increased risk of developing frailty. Education was also one possible confounder as a higher level of education could mean that participants’ knowledge of nutrition is higher. Considering that our participants are of a very high age, this might not affect the outcome.

It has been reported that older adults >70 years, especially women, are more likely than younger persons to consume fruit and vegetables in line with the recommendations (Livsmedelsverket, 2012; Wakimoto and Block, 2001). In a study by Rothenberg and co-workers (1993) regarding older persons aged >70 years; women ate significantly more fruit than men, and there were no differences between age groups. Further, among older adults 70 years old from the H70 studies (Eiben et al., 2004), it was shown that there was a large increase in vegetable consumption in the two later born cohorts when comparing four birth cohorts studied in 1971 and 2000. In our study, we found no difference between men and women concerning frequency of vegetable intake. However, the questions in the present study were not designed to measure quantities or what kind of vegetables that had been consumed. They were only considered as indicators for healthy food habits. Several studies (Myint et al., 2007; Sabia et al., 2014; WCRF, 2016) have shown that intake of fruit and vegetables is associated with life-long health benefits. Therefore, further studies are important to explore whether there is any association between fruit and vegetable intake and the risk of frailty in a population of very old adults.

Conclusion

Among the participants in this secondary analysis of EPiR, women had a slightly higher meal frequency than men, and just over half of the participants had vegetables with at least one meal each day. We did not find any relationship between meal frequency or vegetable intake and the risk of developing frailty, which might be explained by methodological shortcomings. In future studies it is important to explore whether there is any association between fruit and vegetable intake and the risk of frailty in a population of older adults.

Declarations:**Funding**

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Availability of data and materials

The dataset used and analysed during the current study is available from the corresponding author on reasonable request.

Authors' contributions

JJ and SG collected the data. JJ performed the data analyses and was the primary author of the paper. ER, FS and SG contributed to writing and reviewing the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that there is no conflict of interest.

Consent for publication

Not applicable

Ethical approval

EPiR was approved by The Regional Ethical Review Board in Gothenburg (# 650-07) and was registered at Clinical Trials Gov (NCT00877058). Written informed consent was obtained from the participants.

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Figures and tables

Figure 1.

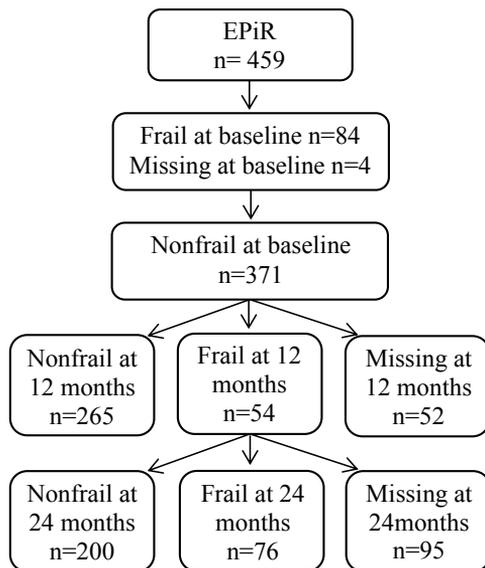


Figure 1. Flow of the participants throughout the study.

Table 1.

Baseline characteristics of the study population (n=371)

Variable	
Female, n (%)	230 (62)
Age, mean, \pm s.d. (range)	84.0 \pm 3.3 (80-97)
Age, by groups, n (%)	
80-84	219 (59)
85-100	152 (41)
Education level, n (%)	
Non-academic degree	293 (79)
Academic degree	78 (21)
Living alone, n (%)	194 (52)

Abbreviations: s.d. Standard deviation

Table 2.

Relationship between meal frequency, vegetable intake and frailty

	Odds ratio	C.I.	p-value
Frailty at 12 months and Meal Frequency, n=319			
Unadjusted	1.10	0.53-2.28	0.80
Frailty at 24 months and Meal Frequency, n=229			
Unadjusted	0.69	0.31-1.53	0.36
Frailty at 12 months and Vegetable intake, n=319			
Unadjusted	1.22	0.86-1.73	0.26
Frailty at 24 months and Vegetable intake, n=229			
Unadjusted	1.03	0.71-1.49	0.87

Abbreviations: C.I Confidence Interval

ORIGINAL RESEARCH

GENDER DIFFERENCES IN PRACTICE, KNOWLEDGE AND ATTITUDES REGARDING FOOD HABITS AND MEAL PATTERNS AMONG COMMUNITY DWELLING OLDER ADULTS

J. Johannesson¹, E. Rothenberg^{1,2}, S. Dahlin Ivanoff³, F. Slinde¹

Abstract: *Objective:* To study gender differences in older adults according to practice, knowledge and attitudes regarding food habits and meal patterns. *Design:* Cross-sectional study. *Setting:* Two urban districts of Gothenburg, Sweden. *Participants:* A total of 297 individuals were included, 102 men and 195 women. They were 80 years or older and living in ordinary housing without being dependent upon the municipal home help services or help from another person in Activities of Daily Life, and cognitively intact, defined as having a score of 25 or higher in the Mini Mental State Examination. *Measurements:* Telephone interviews regarding food habits and meal patterns were conducted. *Results:* Almost all participants (99%) ate their main meal at home and men preferred company at meals more often ($p < 0.001$). Women had the sole responsibility to shop for food more often ($p < 0.000$), and generally regarded cooking as a routine or something they just had to do. Among men, few (13%) took a great interest in cooking and 36 % of the men stated that cooking was something they were not capable of performing ($p < 0.000$). Men had company at meals every day more often (71% vs 40%). Respondents stated that loneliness took away the enjoyment of cooking and changed their habits when becoming a widow or widower. *Conclusion:* Women take greater responsibility for the household than men, regardless of marital status. A large proportion of the men thought cooking was something they were not able to do. The findings in this study may indicate a possible gender difference in the need for societal support.

Key words: Aged 80 and over, nutritional status, food habits, household responsibilities, lived experience.

Introduction

As aging is an individually varying process influenced by various factors, such as lifestyle, disease and genetic disposition, older adults therefore form a heterogeneous group (1). As long as older adults stay healthy they seem to maintain good food habits and nutritionally adequate diets. This has been shown in several population based studies such as the H70 which was performed in Sweden (2, 3), and the SENECA-study which was performed in seven different countries (4).

Malnutrition could be defined as a nutritional state of lack or excess of energy, protein and other nutrients that cause measurable adverse effects on body structure, function and clinical course (5). Studies on independent living older adults show that there is a significant association between individuals suffering

from poor nutritional status and an increasing level of frailty (6) and disease (7). Naseer et al's study on home-living and special housing residents showed that the risk of malnutrition was associated with a higher risk of mortality (8). Among hospitalized, older, chronically ill adults almost half are malnourished (9). The reasons are lower reserves of physiological and psychological systems, multiple chronic diseases and many drugs in combination which may lead to increased morbidity and mortality (10). Unintentional weight loss is also an indicator of frailty, and could be defined as "psychological state of increased vulnerability to stressors that result from decreased physiologic reserves, and even dysregulation, of multiple physiologic systems" (11), with increasing incidence by age and with negative health consequences. Frailty has been reported to be up to twofold higher in women than men (12). A consensus group of gerontology researchers recommends that physical frailty should be measured according to the phenotype model developed by Fried and co-workers, which takes into account the presence of three or more of the following criteria: unintentional weight loss, self-reported exhaustion, low energy expenditure, slow gait speed and weak grip strength (13).

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Factors such as appetite (14), ability to chew and swallow (15), and smell and taste (16) may be affected by frailty, therefore it is important to reach a better understanding of how these factors influence eating and the ability to satisfy nutritional needs in old age.

In 2014, 5 % of the Swedish population were 80 years of age or older, 62 % of them were women and 38 % men (17). Among these, 23.8 % (30 % men, 70 % women), were approved home help service and 14 % lived permanently in special housing (27 % men and 73 % women). The figures for Gothenburg were similar (18). About 2/3 of this population live in ordinary housing and are not dependent on the municipal home help service or care.

Vitolins et al (19) studied gender variation in dietary intake among rural older adults (≥ 70 yrs) in the United States. Men had significantly higher nutrient intake than women, and age was not significantly associated with the intake levels of any of the measured nutrients. To our knowledge, there are few studies concerning gender differences in nutritional risk (20–22).

Sidenvall et al (23) found that widows and single women did not enjoy cooking for themselves and thought it was difficult to plan their food only for themselves, therefore they often left out meals. Cohabiting women planned their cooking according to their husbands' taste. Meals with company were enjoyed most, and taken for granted by cohabiting women. Single women lost their appetite due to loneliness and the lack of everyday company (23). Wham and Bowden (24) found that eating alone was the most common nutrition risk factor among single-living men in New Zealand. Individual circumstances influenced their eating practices; limited finances and lack of personal transport also limit healthy eating. There was also a lack of nutrition knowledge and cooking skills among the participating men. However, Morais et al (25) and Saka et al (26) found that gender did not have a significant impact on nutritional risk. Quandt and Chao (21) found that women were at increased nutritional risk compared to men using the Nutritional Risk Index (NRI), women also had a higher average age and they were more likely to live alone. Men were more often married whilst women were widows.

Due to the increasing life expectancy and due to the lack of studies, there is a great need for knowledge and understanding of how food habits and meal patterns affect older people's capability to maintain independence and health. Several factors are involved. In the present paper we have chosen to look specifically at the gender aspect since in these age groups men and women in general have had different roles in the household with women by tradition taking a greater responsibility for food supply and cooking.

The aim of this study was therefore to study gender differences among community dwelling older adults according to practice, knowledge and attitudes regarding food habits and meal patterns.

Methods

Participants and setting

Participants were recruited from the one-year follow-up of "Elderly in the risk zone" (EPIr) (27) conducted 2008 to 2011 in two urban districts in Gothenburg, the second largest city in Sweden with approximately 600 000 inhabitants. In the two districts people 80 years and older account for 8 % and 7 % respectively of the population, compared to 5% of Gothenburg and Sweden as a whole (28). They are situated outside the city centre but within the city limits, and contain a mix of self-owned houses and apartment buildings. The general educational and income levels are slightly higher, and the prevalence of disease somewhat lower, than in the general population of Gothenburg (29). The EPIr study included 459 community-dwelling individuals aged 80 years of age or over. Those who were independent of help from the community in all activities according to Activities of Daily Living (ADL) and with a Mini Mental State Examination (MMSE) (30) of >25 at baseline were included. After one year 366 individuals remained in the EPIr study and were eligible for the current study. The main reason for drop-out between baseline and one-year follow-up in the EPIr-study was "not interested". Remaining individuals were invited to the current study and 297 accepted participation (Figure 1 and table 1).

Figure 1
Flow of the participants throughout the study. Reasons for declining participation.

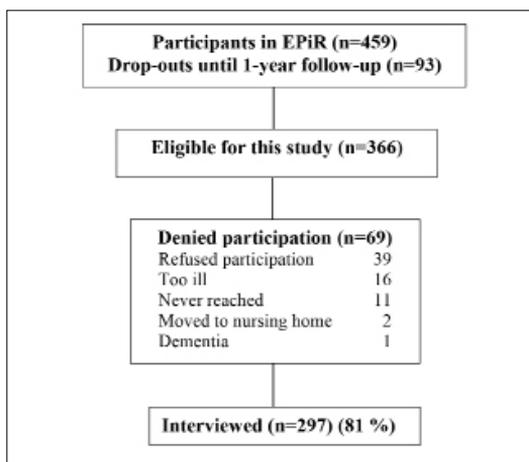


Table 1
 Characteristics of the participants in the study, n (%)

	Total sample n=297	Men n=103	Women n=194	p-value ¹
<i>Marital status, n (%)</i>				<0.000
Married/Cohabiting	134 (46)	79 (77)	55 (29)	
Widow/Widower	130 (44)	18 (18)	112 (59)	
Single/Divorced	29 (10)	5 (5)	24 (12)	
<i>Education, n (%)</i>				<0.000
Lower education	236 (79)	70 (68)	166 (86)	
Higher education or University degree	61 (21)	33 (32)	28 (14)	
<i>Type of housing, n (%)</i>				0.034
Rented flat	128 (44)	43 (43)	85 (45)	
Condominium	93 (32)	25 (25)	68 (36)	
Villa/town house	69 (24)	32 (32)	37 (19)	
<i>Dental status, n (%)</i>				0.944
Own teeth	153 (52)	53 (52)	100 (51)	
Partially own teeth	111 (37)	40 (39)	71 (37)	
Dental implants	17 (6)	5 (5)	12 (6)	
Dentures	16 (5)	5 (4)	11 (6)	
<i>BMI</i>				0.363
<24 kg/m ²	159 (56)	54 (53)	105 (58)	
24-29 kg/m ²	99 (35)	41 (40)	58 (32)	
>29 kg/m ²	24 (9)	7 (7)	17 (9)	
<i>Weight, n (%)</i>				0.426
Satisfied	207 (70)	75 (73)	132 (68)	
Wish to gain	11 (4)	5 (5)	6 (3)	
Wish to lose	78 (26)	23 (22)	55 (29)	
<i>Weighed themselves regularly, n (%)</i>				0.082
Yes	167 (56)	65 (63)	102 (53)	
No	130 (44)	38 (37)	92 (47)	
<i>Weight change since working age, n (%)</i>				0.155
Gained	79 (27)	21 (20)	58 (30)	
Lost	94 (32)	33 (32)	61 (32)	
Stable	123 (41)	49 (48)	74 (38)	

1. Chi-square test

Assessment of practice, knowledge and attitudes regarding food habits and meal patterns

To assess practice, knowledge and attitudes regarding food habits and meal patterns a telephone interview was performed using a questionnaire. The questionnaire was partly based on questions from two previous Swedish population studies (2, 31), with the addition of new questions for the purpose of the present study. In this

study, food habits could be understood as the way in which people select, cook, serve and eat food that is available to them. Meal pattern was identified using the method from Bertéus Forslund et al (32), and was defined as all intake occasions of any food or drink consumed at any time point.

Attitude is defined as the way that one thinks and feels about somebody or something and the way that one behaves towards somebody or something that shows one's thoughts and feelings (33). Practice is to perform or do something regularly as an ordinary part of one's life

(33).

Background variables such as age, gender, marital status, type of housing and education were collected from baseline data in EPIR (27).

The questionnaire was tested, using a telephone interview, on a small group (n=5) from the EPIR-cohort, and revised according to reflections from the interviewer and comments from the respondents. The final questionnaire consisted of 52 questions. Those concerning food choices and food habits were open questions; the remaining had given alternatives.

The questionnaire started with questions regarding shopping and cooking responsibilities, followed by questions concerning eating alone or with others, location of eating and if there were problems associated with eating and dental status. Further on, opinions concerning foods and health, followed by meal patterns, were asked for. Those who had home delivered meals ("meals on wheels") were requested to answer how often they received meals and if they had a choice of different meals. The questionnaire ended with questions regarding earlier food habits, appetite, self-reported body weight and height and time point for these last measurements.

Body Mass Index (BMI) calculated as kg/m² and based on self-reported weight and height, was used as a crude measure of nutritional status. The cut-off for underweight was set at BMI < 24 kg/m², normal weight BMI 24-29 kg/m² and overweight >29 kg/m² according to Beck and Ovesen (34).

The interviews were conducted by an experienced dietician (JJ) and lasted for 16 minutes (6-74) in mean. Six persons had hearing problems and were asked to fill in the form at home and return it by post.

Statistical analyses

The descriptive results are presented as mean and standard deviation. To analyse differences between groups the Chi2 test was used. Student's t-test was used for continuous variables. Two-sided significance tests were used throughout. Statistical significance was accepted at the 5 % level (p<0.05). Statistical analyses were performed using PASW Statistics, version 21.0 (IBM SPSS Inc, Chicago, IL).

A power calculation was performed at baseline for the EPIR-study and it was estimated that about 450 individuals would need to be included to allow for drop-outs. This study is conducted at the one-year follow-up (35).

Ethical considerations

The study was approved by the Regional Ethical Review board in Gothenburg ref no: 650-07.

The information to the participants was given both in a written letter and in person and it was clearly stated that participation was completely voluntary and they could

decline at any time without giving a reason.

Results

To the present study, the remaining 366 individuals from the one year follow-up from the EPIR-cohort were invited. Eligible individuals received a letter with an invitation to a telephone interview regarding practice, knowledge and attitudes regarding food habits and meal patterns. The questionnaire was also included in the letter. The letter was followed by a telephone interview after a week when eligible individuals could accept or refuse participation. The flowchart of participation is shown in Figure 1.

Sixty-nine individuals (19%) did not agree to participate in the current study. There was no significant difference concerning gender, marital status, and type of living or education among the individuals who denied participation compared to the participants. Regarding age there was a significant difference; the ones who did not participate were significantly older. The main reason for declining participation was "not interested" (9 %). Since participating in the EPIR, 18 individuals were deceased (4 %) (Figure 1).

Among those interviewed, 66 % were women; mean age 87 yrs (SD ±3) for both genders (range 83-100). Marital status, level of education, type of housing and dental status is shown in table 1. Women had a higher education more seldom and were more often widows, compared to men (table 1). At the time of retirement, nine per cent (n=18) of the women were housewives, none of the men (p=0.000).

A majority, 70 % (n=207), reported that they were satisfied with their present body weight and 56 % (n=167) used to weigh themselves regularly, yet 26 % (n=78) expressed a wish to lose weight and 4% (n=11) had a wish to gain weight (table 1). Self-reported mean BMI was 24 kg/m² (range 15.4-37.3 kg/m²) (SD ± 3.2 kg/m²) for both genders (table 1).

Concerning appetite, 91 % (n=94) of men and 86 % (n=166) of women reported good or very good appetite. Among those who considered themselves having a poor appetite, 69 % (n=24) reported a BMI lower than 24 kg/m² and 57 % (n=21) (both genders) were widows/widowers, ns.

Both genders, men 76 % (n=78), and women 68 % (n=130), considered that their appetite had remained stable since working age; difference (ns) between genders.

Practice regarding food habits and meal patterns

Independent of gender almost all participants had their main meal at home; only a few (n=4) went to a restaurant or meeting place for seniors. A small number (2 %, n=7) received ready-to-serve meals (meals on wheels).

Table 2
Participant's practice, knowledge and attitudes regarding food habits and meal patterns, n (%)

	Total sample n=297	Men n=103	Women n=194	p-value ¹
<i>I usually have my main meal, n (%)</i>				0.089
At home	292 (99)	100 (97)	192 (99)	
Restaurant/Senior meeting place	4 (1)	3 (3)	1 (1)	
Relatives' house	0 (0)	0 (0)	0 (0)	
Other	0 (0)	0 (0)	0 (0)	
<i>Eating with company, frequency, n (%)</i>				<0.000
Almost every day	119 (40)	73 (71)	46 (24)	
Once a week	70 (24)	12 (12)	58 (30)	
More seldom	100 (34)	16 (15)	84 (43)	
Never	7 (2)	2 (2)	5 (3)	
<i>Appreciates food as before the age of 65, n (%)</i>				<0.001
Yes	214 (72)	87 (85)	127 (66)	
No	82 (28)	16 (15)	66 (34)	
<i>Attitudes towards company at meals, n (%)</i>				<0.001
Yes	201 (70)	85 (84)	116 (63)	
No	85 (30)	16 (16)	69 (37)	
<i>Avoids foods and beverages related to health, n (%)</i>				0.035
Yes	95 (32)	25 (24)	70 (36)	
No	201 (68)	78 (76)	123 (64)	
<i>Changed habits in recent years², n (%)</i>				0.007
Yes	114 (38)	29 (28)	85 (44)	
No	182 (62)	74 (72)	108 (56)	

¹ Chi-Square test; ² Habits regarding cooking, meal patterns and choice of foods.

Compared to women, men more often had company at meals every day (table 2). Nevertheless, 77 % (n=79) of men had a wife or cohabitant compared with 29 % (n=55) of the women. If there was a choice, 84 % (n=85) of the men and just 2/3 of the women (63 %, n=116), preferred to have company at meals.

Regarding eating related problems, no significant differences between the genders were found (table 2).

Women tend to avoid different kinds of foods or beverages, related to their health more often compared to men. Sweet foods (15 %), indigestible foods (14 %), fatty foods (13 %) and different kinds of fruits and vegetables (13 %) were the most commonly reported. The main reasons for excluding these foods were different kinds of digestive symptoms (36 %), diabetes (13 %) and bile

problems (9 %).

A larger proportion of women reported that their habits regarding cooking, meal patterns and choice of foods had changed during recent years (p=0.007). The main reasons were becoming a widow (41 %) or their own retirement (19 %) (table 2).

Knowledge and attitudes regarding food habits and meal patterns

Women more often than men went shopping for food on their own and men reported more frequently that their spouse/cohabitant did the food shopping. Both women and men reported that women were the ones

Table 3
Participants practice, knowledge and attitudes regarding food habits, n (%)

	Total sample n=297	Men n=103	Women n=194	p-value ¹
<i>Who does the shopping, n (%)</i>				<0.000
Myself	173 (58)	38 (37)	135 (70)	
Myself with company	79 (27)	41 (40)	38 (20)	
Spouse	27 (9)	20 (19)	7 (3)	
Others	18 (6)	4 (4)	14 (7)	
<i>Responsible for what to buy, n (%)</i>				<0.000
Myself	199 (67)	36 (35)	163 (84)	
Myself with company	61 (20)	36 (35)	25 (13)	
Spouse	36 (12)	31 (30)	5 (2)	
Others	1 (1)	0 (0)	1 (1)	
<i>Mainly does the cooking, n (%)</i>				<0.000
Myself	212 (71)	34 (33)	178 (92)	
Myself with company	20 (7)	15 (15)	5 (2)	
Spouse	56 (19)	50 (48)	6 (3)	
Relatives/Friends/Neighbours	3 (1)	2 (2)	1 (1)	
Delivered meals	6 (2)	2 (2)	4 (2)	
<i>Attitudes about cooking, n (%)</i>				<0.000
Not able to do	45 (15)	37 (36)	8 (4)	
Just have to do	55 (19)	18 (18)	37 (19)	
An obvious routine	146 (49)	34 (33)	112 (58)	
A great interest	50 (17)	13 (13)	37 (19)	

¹ Chi-Square test

who were responsible for shopping at the store rather than men (table 3). A large percentage of both men and women still appreciated food as much as they did before they were at the age of 65 (table 2). Among the married/cohabiting respondents there was a significant difference ($p < 0.000$) between genders regarding responsibility for planning food shopping and cooking. The women more often had sole responsibility, and thought of cooking as a routine or something they just had to do, while some, 19 %, expressed great interest in cooking. Among men, few took a great interest in cooking and 36 % stated that this was something they were not capable of performing (table 3).

Discussion

In this study we have identified several gender differences according to practice, knowledge and attitudes regarding food habits and meal patterns among community dwelling older adults indicating a possible gender difference in the need for societal support according to these matters.

Materials and methods discussion

Subject characteristics indicate that the present population is in better condition than Swedish 80-year olds in general (36); education and income levels were somewhat better; 56 % own their homes; prevalence of disease is slightly lower and at baseline they were independent in ADL (29). Lindblad et al (37) studied a sub-sample of individuals from EPiR; results showed that body energy and protein stores and muscle strength were well-preserved in this group indicating good functional status.

Almost 50 % still lived with their spouse or a cohabitant, and as shown by Larsson et al (38), marital status is significantly connected with the use of eldercare and home help; unmarried and single people, both men and women, are more likely to receive home help services and to move in to institutional care than those living with a spouse. Among persons 65 years or older in Gothenburg, 10 per cent receive home help (39). This is important when interpreting differences among participants with regard to activities in the household such as shopping for food or cooking.

Since participants already participated in the EPiR-study, many of them were motivated to answer an additional survey, which certainly contributed to the high response rate of 81 %. As the questionnaire was sent in advance, respondents were prepared and this made it easier for them to answer the questions during the telephone interview.

The questionnaire worked well, participants did not need explanation of the questions in detail. Even though it was extensive, respondents did not seem to get tired and they managed to answer adequately.

However, individuals with cognitive impairment had already been excluded from the EPiR interviews.

A weakness of this study is that we did not measure weight and height; these figures are self-reported. A measurement taken by the interviewer may have given a more reliable result, but was not possible due to telephone interview. Also, the study took place in two prosperous districts and as community demographics have an impact on public health interventions, this might have affected the results and limits generalisation (40).

The strength is that, to our knowledge, there are few studies concerning gender differences among elderly individuals living in their own homes regarding practice, knowledge and attitudes regarding food habits and meal patterns in accordance with their capability to maintain independence and health.

Power et al (41) studied the frequency of consumption of the major food groups among a group of elderly and detected gender differences especially among males aged 64-75 yrs. Maharana et al (42) studied gender differences concerning health and food expenditures and findings indicated a wide gender disparity, being higher among men than women, though narrowing the gap with time.

Results discussion

Almost half of the female respondents reported that they had changed their habits regarding cooking, meal patterns and choice of foods during recent years. However, both genders thought their appetite had remained stable since working age. Sidenvall et al (23, 43) found that elderly individuals were affected by changes in their family; a loss of a spouse could mean losing the whole meaning of cooking, resulting in meal skipping and decreased nutrition intake. The results in the present study are in agreement with the findings by Sidenvall et al; loneliness was expressed as a reason for not enjoying cooking or eating alone (23). Tinker (44) stated that, the older a person becomes, isolation is increasingly recognized as a dilemma, and according to Dykstra et al (45), the increase in loneliness can be different depending on earlier family structures, i.e. single-living individuals can be less lonely and the ones whose spouse has died show the greatest increase in loneliness. Locher et al (20) noted that social isolation, low income level and limited independency in later life contributed to nutritional risks.

Gender was a risk factor for older person's nutritional intake. McDonald and co-workers interviewed widowers to identify risk for nutrition problems and considered that socioeconomic factors, informal and formal support were important for being able to maintain nutritional self-management (46).

Sidenvall et al (23), also reported that elderly women did not want to go to a local restaurant as they found it depressing to eat with sick and disabled persons, and they did not like to talk to persons in the restaurant who they did not know.

The municipality provides a few dining places for seniors where it is possible to have a nutritious meal, and company. One dining place also has a meal hostess who assists the guests, although they are not so frequently visited by the respondents in this study; the reasons why are unknown to us but would be interesting to study further.

In the 1950's, 12 % of married women and 90 % of men were gainfully employed in Sweden (47). Since the country went through a social transition due to industrialization during the 20th century, women's position in society gradually changed with a growing proportion of women working outside the home, particularly after the Second World War (48). In the first half of the 20th century, men commonly left home for work while women took care of the children and the household, and with it, the cooking for the family. Fjellström found in her thesis that among the older generation women have had the duty to prepare, serve and cook food, even among those with paid employment (49). Furthermore, it has been shown that cooking is closely linked with feminine identity (50).

We only asked a few questions about cooking and we did not know what cooking knowledge the respondents had from earlier in life. Many men expressed that they were not interested or were unable to cook. It might also be a generational issue that women go more often to the food stores and are responsible for shopping; as she is the one who does the cooking, she therefore knows what needs to be bought. If the woman has always been the one who was in charge in the kitchen, she still is (43).

Food avoidance due to health problems was expressed during the interviews; a few persons said that they avoided certain kinds of foods they thought were unhealthy. The cause however, differed. Avoidance of food among community-dwelling older adults is not well described in the literature. Savoca et al (51) has studied avoidance and modification of foods among the elderly related to their dental and oral status, finding it related to significant differences in dietary quality. Quandt et al (52) found that whole fruit and raw vegetables were the most commonly avoided foods, also due to oral health. Quandt et al (52) considers that dietary variation is associated with health maintenance and disease prevention among older adults. However, the risk of a lower intake of energy and nutrients due to avoidance for other reasons

is not well described in the literature.

As shown in table 1, the dental status among the participants in this study seems good; only 5 % had dentures. A contributing reason could be, as stated, that the present population is in better condition than Swedish 80 year-olds in general, and dental status is related to socioeconomic status (53). Social network and lifestyle factors are significant predictors for dental status as shown by Österberg et al (53), concerning 70-year olds in Gothenburg. This is also confirmed by Hugoson and Koch (54) for another area in Sweden. Petersen and Yamamoto (55) showed that loss of teeth (edentulism) is highly associated with socio-economic status and is prevalent among the elderly all over the world.

There are few previous studies looking at gender differences according to practice, knowledge and attitudes regarding food habits and meal patterns among elderly. Most of the earlier studies are focused on nutrient intakes, malnutrition, pharmaceuticals or other diseases and have often been carried out in nursing homes or in younger populations (19, 21, 22, 41, 42, 56–59).

Further studies of other socio-economic groups of older adults are needed. Whether the gender differences identified in the current study affect the development of frailty or malnutrition also remains to be studied in the future. Due to the increasing life expectancy and due to the lack of studies of older adults, there is a great need for knowledge and understanding of how food habits and meal patterns affect their capability to maintain independence and health and how gender influences these relationships. However, the findings in this study may indicate a possible gender difference in the need for societal support.

Conclusions

Women in the present study take a greater responsibility for the planning and cooking of meals than men, regardless of marital status. A large proportion of the men thought cooking was something they were not able to do. Both genders had a good or very good appetite and considered that their appetite had remained stable since working age. More than half of those who reported poor appetite were widows/widowers. Further studies of how food habits and meal patterns affect older people's capability to maintain independence and how gender influences these relationships are needed.

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Conflict of interest: JJ, ER, SDI and FS have no conflicts of interest to declare.

Ethical Standards: The study complies with the current laws of Sweden. The Regional Ethical Review board in Gothenburg ref no: 650-07.

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