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# Older Women and Food

*Dietary Intake and Meals in Self-Managing and Disabled Swedish Females Living at Home*

BY

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ACTA UNIVERSITATIS UPSALIENSIS
UPPSALA 2002

Dissertation for the Degree of Doctor of Philosophy in Domestic Sciences presented at Uppsala University in 2002

ABSTRACT

Andersson, J. 2002. Older Women and Food. Dietary Intake and Meals in Self-managing and Disabled Swedish Females Living at Home. Acta Universitatis Upsaliensis. *Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences 117, 66 pp.* Uppsala. ISBN 91-554-5382-1.

The aim of the present thesis was to study elderly self-managing and disabled women's dietary intake and meals in relation to age, household structure (single-living or cohabitant), disability and cooking ability. The women were aged 64-88 years and living at home, in the mid-eastern part of Sweden. The self-managing women were randomly selected. The disabled women – suffering from Parkinson's disease, rheumatoid arthritis or stroke – were selected from patient records. A total of 139 self-managing and 63 disabled women participated. Two dietary assessment methods were used: a repeated 24-h recall and a three-day estimated food diary, providing dietary intake for five non-consecutive days. The results indicate that elderly women still living in their homes seem to manage a sufficient dietary intake despite disability and high age. The reported energy intakes in all groups of women were low, which might be explained by an actual low intake and/or under-reporting. The portion sizes seemed to be smaller in the highest age group, leading to lower intakes of some nutrients. Thus also the nutrient density of the food should be given greater consideration. The meal pattern was shown to be regular and the distribution of main meals and snacks was found to be satisfactory. Meals and snacks that were defined as such by the women themselves thus seem to be more significant from an energy and nutritional perspective. Perceived cooking ability co-varied with energy and nutrient intake as well as with meal pattern.

Further, a qualitative dietary assessment method, FBCE, was analysed. It was concluded that it must be supplemented with a dietary assessment method providing energy intake figures to ensure a sufficient intake, especially when studying groups at risk for low energy intake.

Furthermore, the aim was to perform a dropout analysis. When studying older women and food, a low participation rate might be expected since the most active, the very ill as well as the disabled tend to decline participation, but also since food is a gender issue. Food could, especially for women, be a sensitive area of discussion, even though older women seem to choose ”healthy foods” and eat ”proper meals”.

*Key words: elderly, women, dietary intake, meals, self-managing, disabled, dietary assessment methods, participation rate.*

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ISSN 0282-7492
ISBN 91-554-5382-1

Printed in Sweden by Uppsala University, Tryck & Medier, Uppsala 2002

## LIST OF ORIGINAL PAPERS

The thesis is based on the following studies, which will be referred to in the text by their Roman numerals:

I. Nydahl M, Andersson J, Sidenvall B, Gustafsson K and Fjellström C. Food and nutrient intake in a group of self-managing elderly Swedish women. Accepted for publication in the Journal of Nutrition, Health and Aging.

II. Andersson J, Gustafsson K, Fjellström C, Sidenvall B and Nydahl M. Five-day food intake in elderly female outpatients with Parkinson's disease, rheumatoid arthritis or stroke. Submitted for publication.

III. Andersson J, Nydahl M, Gustafsson K, Sidenvall B and Fjellström C. Meals and eating events among elderly self-managing and disabled women. Submitted for publication.

IV. Gustafsson K, Andersson J, Andersson I, Nydahl M, Sjödén PO and Sidenvall B. Associations between perceived cooking ability, dietary intake and meal patterns among elderly women. Scandinavian Journal of Nutrition. 2002, 46; 1; 31-39

V. Andersson J, Gustafsson K, Fjellström C, Sidenvall B and Nydahl M. Meals and energy intake among elderly women - an analysis of qualitative and quantitative dietary assessment methods. Journal of Human Nutrition and Dietetics. 2001; 14; 467-476.

VI. Sidenvall B, Fjellström C, Andersson J, Gustafsson K, Nygren U and Nydahl M. Reasons among older Swedish women of not participating in a food survey. European Journal of Clinical Nutrition. 2002; 56; 561-567.

## CONTRIBUTION TO STUDIES

*Study I:* JA was responsible for critical evaluation of study design, performed data collection, data computation and statistical analysis, created tables for data presentation, critical discussions of analysis, drafts and manuscript.

*Study II:* JA was responsible for critical discussion of study design, data collection, data computation, data analysis and writing the paper.

*Study III:* JA was responsible for critical evaluation of study design, data collection and data computation, categorisation of data and data analysis, theoretical discussions and writing the paper.

*Study IV:* JA was responsible for data collection, data computation, and categorisation of groups, critical discussions of analysis, drafts and manuscript.

*Study V:* JA was responsible for critical evaluation of study design, data collection, data computation, data analysis and writing the paper.

*Study VI:* JA was responsible for (a large part of the) data collection, and critical discussions of data analysis, drafts and manuscript during preparation.

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## SVENSK SAMMANFATTNING

Det övergripande syftet med denna avhandling var att studera kostintag och måltider hos äldre kvinnor, med och utan diagnoserna Parkinsons sjukdom (PD), reumatoid artrit (RA) eller stroke. Kostintaget studerades specifikt i relation till ålder, hushållsstruktur (ensam- eller sammanboende), diagnos och förmågan att laga mat. Måltider studerades i relation till diagnos och förmågan att laga mat. Kvinnorna var i åldern 64-88 år och hemmaboende i Mälardalen i Sverige. Kvinnor utan de specifika diagnoserna, var slumpmässigt utvalda och de kvinnor som hade PD, RA eller stroke, valdes från patientjournaler. Totalt deltog 139 kvinnor utan och 63 kvinnor med nämnda diagnoser.

Två kostundersökningsmetoder: en upprepad 24-timmars intervju och en tre dagars uppskattad matdagbok användes för att studera kostintag och måltider. Sammanlagt gav detta kostdata för totalt fem, icke sammanhängande dagar.

Resultaten tyder på att äldre hemmaboende kvinnor verkar upprätthålla ett tillräckligt kostintag trots hög ålder och sjukdom i form av PD, RA eller stroke. Det rapporterade energiintaget var lågt i alla grupper av kvinnor, vilket kan förklaras av ett verkligt lågt intag och/eller underrapportering. I de äldsta grupperna tenderade portionsstorlekarna att vara mindre, vilket ledde till ett lågt intag av vissa vitaminer och mineralämnen. Därför bör näringstätheten i kosten uppmärksammas. Måltidsmönstret var regelbundet och fördelningen av huvudmåltider och mellanmål var tillfredsställande. De måltider och mellanmål som av kvinnorna hade getts ett namn t ex morgonmål eller middag, var mer betydelsefulla beträffande energi och energigivande näringsämnen än de ättillfällen som kvinnorna inte hade någon speciell beteckning för. Den upplevda förmågan att laga mat samvarierade med energi, näringsintag och måltidsmönster.

En kvalitativ kostundersökningsmetod som utvecklats för att klassificera måltider efter deras livsmedelsinnehåll, utvärderades. Slutsatsen blev att metoden bör kompletteras med en kostundersökningsmetod som registrerar energiintaget för att säkert kunna beräkna vilket energiintag grupper har som ligger i riskzonen för ett lågt energiintag, exempelvis äldre kvinnor.

Bland kvinnor utan de specifika diagnoserna genomfördes en bortfallsanalys. När äldre kvinnors kost studeras kan en låg deltagarnivå förväntas eftersom de mest aktiva, men också sjuka och funktionshindrade, tenderar att tacka nej till deltagande. Mat kan också vara en känslig fråga att diskutera framför allt för kvinnor som oftast är huvudansvariga för mat i hemmet, även om äldre kvinnor i denna undersökning visar att de väljer ”hälsosamma” livsmedel och äter ”riktiga måltider”.

## ABBREVIATIONS

| | |
|---|---|
| BMI | Body Mass Index |
| BMR | Basal Metabolic Rate |
| EE | Eating Events |
| EI | Energy Intake |
| $EI_{rep}/BMR_{est}$ | Reported Energy Intake: estimated Basal Metabolic Rate |
| E% | Energy Percent |
| FBCE | Food Based Classification of Eating episodes |
| g/MJ | Nutrient density, gram per Mega Joule |
| kcal | Energy, Kilocalories |
| kJ | Energy, Kilo Joule |
| MENEW | Meals, Eating Habits and Nutrient intake among Elderly Women |
| MJ | Energy, Mega Joule |
| PAL | Physical Activity Level |
| PD | Parkinson's Disease |
| RA | Rheumatoid Arthritis |
| SNR | Swedish Nutrition Recommendations |

## DEFINITIONS

Dietary habits = dietary intake and meal pattern
Dietary intake = could involve intake of energy yielding nutrients, food items and dishes
Eating events = meals and snacks
Elderly = older
Household structure = single-living or cohabiting
Living at home = not institutionalised
Meal = one type of eating event

# INTRODUCTION

## Health aspects in the ageing society

No other country in Europe has such a great proportion of elderly in the population as does Sweden. About 1.5 million persons out of 8.9, i.e. 17%, are over 65 years of age (Statistics Sweden, 2001). The elderly are an increasing group also in other Western societies (Dirren, 1994). Parallel with an increasing ageing population, the younger segments of the population are decreasing, creating problems within the caring sector. The gap between those elderly who will need help and those employed workers who will provide the tax revenues necessary to provide such care has been on the agenda for some time (Fjellström et al., 2001). Old age has thus, during the past decades, been seen as a demographic problem in the Western world. A consequence of this is discussions of how the elderly care sector within society can be developed so as to give the individual possibilities to take control of her/his own health and quality of life (Tucker and Reicks, 2002). Since every facet of society will be affected by the ageing society, food consumed in everyday life is one important area to be recognised in this context. Adequate food habits are thus seen as a prerequisite to keeping good health and being able to live independently as long as possible.

In Sweden there are three times more women than men in the higher ages (The National Board of Health and Welfare, 2000). The average life span is 82 years for women and 77 years for men, which implies that the number of households with older women living alone is high since women live longer than men (Statistics Sweden, 2000). In Sweden, the number of elderly over 75 years and living alone increased from 53% to 58% between 1994 and 2000. The corresponding numbers for over 80 years were 59 to 67%. About 50% of the single living persons have been living alone for the 10 latest years (The National Board of Health and Welfare, 2000). The increase in households with one person over 65 years in Sweden is estimated to 11-13% until year 2010 (Andersson, 1994). Thus the number of old people, and especially single-living women, is to be expected to increase in Swedish society in the near future.

Despite a high age, numerous elderly enjoy good health and live an active life. Others live long despite disease and need a great deal of care and medical treatment during many years. The SENECA study (Survey in Europe in Nutrition and the Elderly: a Concerted Action), which was conducted in twelve European countries, among 2600 respondents 70-75 years of age (however not in Sweden), showed that elderly in Europe have a good ageing process (Dirren, 1994). In a Swedish study, in the age group over 75, 86% considered that their health was very good or fairly good. Among the oldest (over 85) the corresponding number was 84% for both men and women (The National Board of Health and Welfare, 2000). During the past 20 years, self-reported health has improved among elderly aged 65-84 years, as has the ability to move. The

presence of disability has also decreased, although there was a tendency that lingering illness increased (The National Board of Health and Welfare, 2001).

Still, with increasing age, the frequency of disease rises, such as restricted mobility and handicap, which thus will foremost effect women since they have a longer life span (The National Board of Health and Welfare, 2001). Among people surveyed in 1990, 69% were found to have at least one long-standing illness that influenced their mobility (Smith and Browne, 1992). Conditions associated with the ageing process are rheumatism, arthritis, stroke, cancer, coronary heart disease, dementia, diabetes and osteoporosis (Dirren, 1994; Herne, 1995; The National Board of Health and Welfare, 1997).

With high age the total energy expenditure decreases, which depends mostly on decreasing physical activity (McCormack, 1997). The metabolism can however also be in a catabolic state when suffering from chronic diseases, or there can be an increased need for energy when, e.g., infection or inflammation is present (McCormack, 1997; Tierney, 1996). Thus, the need for essential nutrients could be increased, requiring a nutrient dense diet (Hoffman, 1993; Pannemans and Westerterp, 1995; Steen, 1999; The Swedish National Food Administration, 1997b). As older persons may eat smaller portions (due to decreased physical activity and/or illness), this could affect the dietary intake such that it becomes increasingly difficult to meet the micronutrient requirements, especially for those over 80 years (de Jong, 1999; Steen, 1999).

**Dietary habits among the elderly**

Elderly people's food choice and nutrient intake, from a health and quality perspective, could be analysed in relation to energy intake and nutrient density, including micronutrients since a scarcity of these is considered the primary risk factor in older peoples dietary intake (de Jong, 1999; Hoffman, 1993; McCormack, 1997).

Energy intake among elderly constitutes a specific problem. Swedish studies have shown that up to 5% of home-living elderly were malnourished according to a specific definition of malnutrition (Cederholm and Hellström, 1992; Thorslund et al., 1990). In these studies, nutritional assessment measures such as weight loss, weight index, anthropometric measures, serumalbumin and delayed cutaneous hypersensitivity reaction were used to determine malnutrition. Results from other international studies of free-living or non-institutionalized elderly (Buttriss, 1999; Maisey et al., 1995; Nes et al., 1992; Pedersen, 2001; Vincent et al., 1998; Wright et al., 1995; Wylie et al., 1999) and homebound elderly (Gray-Donald et al., 1994; Millen Posner et al., 1987) have also reported low energy intakes. In a group of elderly in Norway, up to 10% were at risk for energy deficiency (Nes et al., 1992). However, under-reporting has been discussed as a contributing factor to these low energy intake figures (Nes et al., 1992; Pedersen, 2001; Wright et al., 1995). In the SENECA

study, great variability in energy intake between the different centres was seen (Dirren, 1994).

For elderly over 65 years in the US, the overall prevalence of frailty in a community-dwelling population (a group of over 5300 persons) was 6.9 percent. It increased with age and was greater in those with lower socio-economic status (Fried et al., 2001). Frailty can be defined as a clinical syndrome where three or more of the following criteria are present, unintentional weight loss, self-reported exhaustion, weakness, slow walking speed and low physical activity. Frailty was associated with a higher risk for adverse health outcomes such as mortality, disability, falls and hospitalisation (Fried et al., 2001). In Swedish and international studies, it was shown that the prevalence of malnutrition was high among patients admitted to hospital and medical outpatients, with numbers from 11% to 60% (Cederholm and Hellström, 1992; Larsson et al., 1990; McWhirter and Pennington, 1994; Mowe et al., 1994; Wilson et al., 1998). In the study of Mowe et al. (1994), reduced nutritional status among elderly, recently hospitalised patients appeared to depend on problems with buying, cooking and eating food that existed long before admittance to hospital. Among frail elderly, a decline in energy intake has been seen, which in turn has been associated with small portions and a slower rate of eating and fewer snacks between meals (Morley, 1997). De Graaf (2000) also explains a decrease in food intake in old age with a decrease in snacking. Other studies have shown that the intake of vegetables and fruits decreases with age (Donkin et al., 1998; McKie et al., 2000) and there also seems to be a decrease in variation of the diet in old age (Fanelli and Stevenhagen, 1985).

The composition of energy yielding nutrients in elderly persons' diet in Europe and Scandinavia, including Millen-Posner's study performed in the US, shows a large range in different elderly populations (Becker and Pearson, In press; Buttriss, 1999; Dirren, 1994; Griep et al., 1996; Maisey et al., 1995; Millen Posner et al., 1987; Nes et al., 1992; Pedersen, 2001; Rothenberg et al., 1993). For protein the range was between 13 and 19 energy percent (E%), for fat between 33 and 45 E% and carbohydrates between 41 and 57 E%. There was a general tendency in these studies that the fat E% was too high while the contribution of carbohydrates was too low compared to recommendations for the elderly population.

The intake of certain vitamins and minerals may be problematic in an elderly population. For example, the intake of vitamin D, E, selenium and folate has been shown to be lower than recommended among elderly as well as younger populations (Bates et al., 1999; Becker, 1999; Hoffman, 1993; Karlsson et al., 1999; Millen Posner et al., 1987; Nes et al., 1992; Sonn et al., 1998). However, in a Swedish study it was shown that older persons compared to younger had a higher intake of vitamin D, C and $B_{12}$, though intakes of vitamin E, folate and selenium were below recommendations (Becker and Pearson, In press). In the

SENECA study, great variability in nutrient intake across the different centres was seen. These data also revealed that diets among elderly persons and a considerable proportion of participants from some centres showed such low intakes of nutrients that they were at risk for deficiencies (Amorin Cruz et al., 1991; Dirren, 1994).

Several dietary studies of older persons' food consumption show, however, that they, despite different energy levels, have much the same food choice and nutrient intake as younger age groups (Becker and Pearson, In press; Maisey et al., 1995; McCormack, 1997; Nes et al., 1992; Wright et al., 1995). In a Swedish nation-wide study among 2000 adults aged 18-74 years, it was shown, however, that elderly had a ”better” diet compared to younger persons (Becker and Pearson, In press). Traditional foods such as potatoes and roots, fish, shellfish, offal, porridge, but also buns and cakes, were consumed in higher amounts while consumption of lemonade, soft drinks, sweets, nuts and crisps was lower. Younger persons, as could be expected, consumed more of modern foods such as pasta, rice and pizza. The older persons reported consuming more fruit and vegetables than younger persons. In yet another Swedish study by Rothenberg (1997) elderly person's food choice was reported to have changed during the past decades towards more pasta and rice in place of potatoes.

Several studies of old people have published data revealing that food items consumed frequently and significantly contributing to the total daily energy intake among this population group were grain products, milk products, vegetables (including potatoes) fruits and non-alcoholic drinks (Becker and Pearson, In press; Maisey et al., 1995; Nes et al., 1992; Pedersen, 2001; Rothenberg et al., 1993). In a study by Smithers (1998), the most commonly consumed foods among British free-living elderly were tea, potatoes (mashed, boiled or baked), white bread and biscuits, which were consumed by more than 70% of the participants. Bacon and ham were the most common meats, consumed by 2/3 of the participants. Cereals and cereal products were the main source of energy and provided 34% of the energy intake, followed by meat and meat products, milk and other milk products, vegetables and potatoes. In a group of elderly Scottish people aged 75 and over, a similar food choice was found, milk, potatoes and bread were important foods as well as buns, cakes and breakfast cereals. However, in this group, the consumption of fruits and vegetables was reported to be low (McKie et al., 2000). As compared to the free-living group, elderly living at an institution tended to have a more traditional diet (Smithers et al., 1998). Yet, persons aged 56-91 years in the UK claimed that they mostly used semi-skimmed milk, low fat spread, and wholemeal bread, despite finding the flavour of certain less healthy foods more palatable (Lilley and Johnson, 1996).

*Meals and snacks among the elderly*

Looking more specifically at elderly persons meal patterns and meal types, it has been shown that a regular pattern including warm meals increases the

possibility for a nourishing diet (Schlettwein-Gsell et al., 1999). On the other hand, de Graaf (2000) implies that the relationship between meal pattern, meal frequency and energy intake is not clear. Hot meals, however, contributed a considerable part of the daily energy and nutrient intake among elderly in the SENECA study (Schlettwein-Gsell et al., 1999). Most participants consumed a cooked meal every day and the midday meal provided the largest daily energy contribution in participants from all but one town. In another study, the energy contribution from dinner meals seemed to decrease with increased age, due to a change in the nutrient composition, such as less fat and more carbohydrates (Vincent et al., 1998). However, dinner was the only meal that notably changed with age, and it was compensated by an increased energy contribution from breakfast or lunch. Lunch meals contributed the most energy during the day. McKie (1999) concluded that having a pattern of regular meals facilitated what the participants considered as an adequate diet to ”keep well”. In a recently published Swedish study among old women, a ”proper meal” was considered equal to a cooked meal with potatoes, meat and vegetables, often served with gravy (Sidenvall et al., 2001). This was in accordance with what was shown by Murcott (1982) – a proper meal is always a cooked dinner.

The mean number of eating events per day in Sweden was reported to 4.1 in a Nordic study (Mäkelä et al., 1999). Fifty-nine percent reported consuming one hot meal and 34 reported two hot meals per day. The percentage of people consuming hot meals around noon was 54. Among Swedish home-living elderly (75 years and over), 76 % reported consuming 3 meals per day, 41% consumed one snack and 32% consumed 2-3 snacks (The National Board of Health and Welfare, 2000). In a selected Swedish affluent and educated elderly population, 76% consumed 3 main meals a day, whereas the total mean intake of eating events was 4.6 (Rothenberg et al., 1994). Among persons in Kentucky, 55 to 96 years of age, 65% consumed three meals a day and less than one third snacked regularly (Quandt et al., 1997). Quandt and coworkers concluded that their results on meal skipping, little snacking and consumption of meals with low energy density could be interpreted as a risk for malnutrition among this population group. Figures on contribution of different meals and snacks to total daily energy intake from a study performed in the Netherlands, likewise concludes that the contribution of snacks to total daily energy intake seems to decrease with increasing age (de Graaf, 2000). Snacks also contributed a lower amount of the total energy intake among elderly than in other age groups, as shown in a study by Summerbell et al. (1995). In the SENECA study, there was great variation among elderly in different countries; snacks contributed from 6 to 30% of the total energy intake (Schlettwein- Gsell and Barclay, 1996). This could be explained by a higher frequency of eating events.

Proper food among an elderly Scottish population was regarded as fresh natural ingredients such as fresh meat and fresh vegetables as well as variation in food intake. Convenience foods were often disliked and were seen as junk or rubbish

foods (McKie, 1999). Healthy eating was furthermore conceptualised as ”proper meals”, and these meals were characterised as dinner and clearly distinguished from light meals and snacks.

Sweden is the only country in the world that has recommendations regarding the distribution of energy in meals during the day (The Swedish National Food Administration, 1997b). The recommendations are developed for healthy persons with a low to moderate level of physical activity. The recommended composition of the diet for elderly is the same as for healthy younger and middle-aged persons. An appropriate meal pattern is considered to be three main meals and two to three snacks during the day, where the main meals combined should contribute 70-95% of the daily energy intake, and snacks the remaining 5-30%. It is suggested that the distribution of energy in separate meals could be as follows breakfast (morning meal) 20-25%, lunch (midday-meal) 25-35% and dinner (evening meal) 25-35%. Further, the intake of energy and nutrients should be spread over the day, which is especially important for elderly that may have a bad appetite and small portion sizes. This can be interpreted as indicating that snacks are important in elderly persons' diet and might therefore constitute about 30% of the total energy intake.

**Older women and food**

*Dietary habits in general*

In most Western societies, food is still considered women’s work and responsibility (DeVault, 1991). Studies of food habits among the elderly have shown that dietary intake differs between men and women. The SENECA study showed, for example, a wide range in reported energy intake among elderly from different centres in Europe, especially among women, some of whom had quite low intakes with risk for malnutrition, others with risk for overweight (Dirren, 1994). For elderly over 65 years in the US, the overall prevalence of frailty in a community-dwelling population was 6.9 percent (in a group of over 5300 persons) and was greater in women than in men (Fried et al., 2001). In a Swedish study, it was shown that women were malnourished to a higher degree than were men on admission to hospital, with the highest frequency of malnutrition among women over 79 years (Larsson et al., 1990).

Women had higher intakes than men for several nutrients, for example retinol, vitamin C and calcium, when energy intakes were adjusted (Bates et al., 1999). In the SENECA study, women from most centres had higher nutrient density diets than did men, with the exception of iron, probably depending on a wiser selection of foods (Amorin Cruz et al., 1996; Amorin Cruz et al., 1991). Among elderly Norwegian men and women, no such differences in the nutrient intake were seen (Nes et al., 1992). In a Swedish study, women reported a lower intake of major vitamins compared to men (Becker and Pearson, In press). This could probably be explained by a higher intake of energy among men.

When looking at dietary intake from a gender perspective, women appear to make consistently healthier food choices than do men. In a study from the US in which the conceptual differences between meals were investigated, older women rated both their recent and ideal meals as healthier than did the other respondents (Rappoport et al., 2001). In a study by Krondl et al. (1982) women's diets were generally of a higher quality than men's and tended to be more varied. However, in the SENECA study, men in general had higher mean intakes of various food groups than did women (Schroll et al., 1996), and in a Scottish study women reported consuming less food groups than did men (McKie et al., 2000). Overall, more women than men had poor quality diets in a study of persons aged 55 years and older in the US (Davies et al., 1985). Among elderly Norwegians, the women consumed less bread, meat and alcoholic beverages than did men, and there was also a tendency for women to have higher intakes of milk products, fish and fruits in the diet (Nes et al., 1992). In a British study among elderly aged 65 and over, women consumed more butter, full-fat milk, certain beverages, cakes, fruit and vegetables, but less egg, sugar, and certain meat products and alcoholic drinks than did men (Bates et al., 1999).

*Household structure and women's dietary habits*

For women in the older generation, the tradition has been to be responsible for meal planning, food shopping and food preparation in the household (DeVault, 1991; Fjellström et al., 2001; Sidenvall et al., 2000; Sidenvall et al., 2001). Older women are dependent on continuities in their daily life, including domestic and social activities. After retirement they want to be able to continue cooking and have control over planning, shopping, etc. as independence is highly valued among old women (Fjellström et al., 2001; Gustafsson et al., In press; Sidenvall et al., 2001). Thus, for most couples, retirement seems to mean a small change in the organisation of domestic tasks, i.e. cooking is still the woman's work (Fennell et al., 1994, 1994 #147; Fjellström et al., 2001). In a Swedish study among retired women, the "meaning of cooking" was to prepare a homemade dish and serve it to family members (Sidenvall et al., 2000). However, widows experienced having lost the whole meaning of cooking when they had no one to cook for (DeVault, 1991; Sidenvall et al., 2000). Elderly men and women in the US often had opposite viewpoints about food preparations when they lived alone in their later years. Widowed women, though very skilled, wanted a release from this responsibility, while men took on food preparation as a new responsibility. Women viewed cooking as a burden that they preferred to give up when they were alone, while men saw cooking as enjoyable (Winter Falk et al., 1996). In a study among rural widows aged 70-96 years living in the US, the women acknowledged that what they had done while married reflected the preferences of their husbands (Quandt et al., 2000). Scottish elderly wives were ensuring that husbands consumed a good and varied, often traditional diet (McKie et al., 2000). Households with a female influence on diet were significantly better in terms of total frequency of consumption of fruit and vegetables. Single-living women more than single-

living men are still sceptical towards consuming food that is easy to cook and prepare (Donkin et al., 1998). However, after becoming a widow, the woman invariably changed her diet to consume lighter foods, for example fish and fruit (McKie et al., 2000). Consequently widowhood could be accompanied by several changes in food intake that could result in a less adequate dietary intake. For example less frequent eating, smaller portion sizes, fewer meals or eating the same foods for several days, i.e. simplifying food in every day life, could lead to an insufficient intake of some nutrients (Gustafsson and Sidenvall, 2002; Quandt et al., 2000; Sidenvall et al., 2000).

Thus, the household structure might have an effect on the dietary intake. However, data from previous studies on dietary intake of single-living older women are equivocal. Studies suggest that elderly women who live alone have a poorer quality diet compared with cohabiting women (Davies et al., 1985; Krondl et al., 1982). Yet, other studies do not show any coherence between living alone and dietary intake (Donkin et al., 1998; Garry et al., 1982; Mowe et al., 1994; Cass Ryan and Bower, 1989). Thus, ageing, gender and household structure can affect the dietary intake among older persons. Also social class can have an effect on dietary intake (Herne, 1995; Mennell et al., 1992; Smithers et al., 1998). Furthermore disability due to mobility problems can also influence the dietary intake.

**Food intake among women with disabilities**

Few dietary studies have been performed among disabled elderly living at home. Nes et al. (1992) found that women who experienced difficulties in shopping and preparing their own meals had a lower intake of energy and nutrients than did women without such problems. In addition, in a study by Wylie et al. (1999) it was shown that restricted mobility in older persons had an influence on shopping and preparation of food, which in turn resulted in an infrequent intake of cooked meals leading to insufficient nutrient intake. Apart from the possible negative influence of reduced appetite, it has been suggested that elderly decrease their energy intake in response to decreased levels of activity associated with disability (Munro et al., 1987). However, when comparing a group of disabled elderly with a group of self-managing elderly, in the same age group (70 years), few differences were seen in energy, nutrient and food intake between the able and disabled (Sonn et al., 1998).

Diseases like Parkinson's disease (PD), rheumatoid arthritis (RA) and stroke are known to involve physical disability as well as problems in the meal situation. In studies among women with PD, eating problems such as handling food on the plate, transportation of food to the mouth, manipulating food in the mouth and swallowing are common and have been discussed, however few studies on food intake have been performed (Andersson and Sidenvall, 2001; Athlin et al., 1989). Depression and cognitive impairment may reduce appetite, and nausea and anorexia can be caused by anti-Parkinsonian medications (Kempster and Wahlqvist, 1994).

Among women with RA, morning pain, stiffness, inflammations in joints, muscle weakness and reduced grip force can cause difficulties in conducting daily activities such as cooking (Nordenskiöld, 1996). The effects of the diet in RA have been widely discussed, and the focus on dietary issues has been on particular food components, for example fish oil and antioxidants or special diets such as vegetarian or fasting (Mangge et al., 1999). In a study by Winter Falk et al. (1996) it was shown that food choice among an elderly population was influenced by physical debilitations such as arthritis, which could limit activities such as cooking. Also among persons with PD and RA, the metabolism can be affected by the disease (Kempster and Wahlqvist, 1994; Roubenoff et al., 1994).

Persons with stroke may have cognitive and physical dysfunctions resulting in eating problems related to localisation and manipulation of food on the plate, chewing, swallowing and being alert during eating (Axelsson, 1988; Jacobsson et al., 2000; Westergren, 2001). However, studies on food intake among home-living women with stroke have not been performed. Further, difficulties with leaving the house and doing daily housework are common (Pound and Gompertz, 1998). Neurological deficits such as disturbed level of consciousness, motor weakness, disturbance of sensory function, dysphagia and visual field defects have a variable impact on nutrient demands and actual intake. Also hemiplegia can affect the nutritional intake in several ways (Gariballa and Sinclair, 1998). It has been shown that the proportion of undernourished patients was higher on discharge than on admission to hospital and many stroke patients were likely to suffer from protein-energy malnutrition also during hospital stay (Dávalos et al., 1996; Gariballa and Sinclair, 1998). It was also shown that 8-16% of patients with stroke were malnourished by the onset of the disease (Dávalos et al., 1996; Unosson et al., 1994).

Naturally all these factors imply problems for the three disease groups described, involving disability in managing a sufficient food intake.

*Food service in the ageing society*

To live at home and be self-managing when elderly can be problematic, and therefore help from the society may be necessary due to disability. In a study by the National Board of Health and Welfare, it was shown that 14% of the elderly (aged 75 years and older) in Sweden had home care services (The National Board of Health and Welfare, 2000). However, 52% of home-living persons over 80 years of age had some kind of public assistance when all kinds of support are included as well as mobility service (The National Board of Health and Welfare, 2000). About 22% in the age group over 80 live in special housing for the elderly (The National Board of Health and Welfare, 2000). Still, an increasingly group of elderly is outside the official elderly care (Szebehely, 2000). Irrespective of functional ability, more people had no home care services in year 2000 compared to 1994, and among those with home care services the number of hours have decreased. Today the age threshold for

receiving care is higher (The National Board of Health and Welfare, 2000). This means that old people getting home care services are mostly fragile or sick elderly, those who need a great deal of help and care during day and night. The elderly who no longer receive home care service probably get more help from relatives or next of kin, have private home help or possibly help from volunteers. It has also been shown that the society in Sweden is more likely to give home help to cohabiting households where the woman is fragile, than the contrary, i.e. when the husband is fragile (Szebehely, 2000). It may thus be concluded that even when older and ill, there are more expectation on the woman to take care of the household, including the care of her husband. Therefore, a great many old people, especially women, are not receiving help from society today regarding food shopping or cooking, and thus are self-managing whether they like it or not, which can affect food habits as exemplified by lower energy and nutrient intakes.

**Dietary assessment methods in food and meal research**

*Quantitative dietary assessment methods*

Dietary data can be obtained for a variety of purposes and the selection of method depends on the objectives of the study and how the data will be used. Factors that have to be taken into consideration when choosing the right method are resources concerning time for both researchers and subjects. When investigating the dietary intake in the elderly, dietary assessment methods such as 24-hour recall, dietary history, diet records or food frequency questionnaire have often been used (Dirren, 1994; Nes et al., 1992; Rothenberg et al., 1993; Schlettwein-Gsell et al., 1999; Schroll et al., 1996). Quantitative dietary assessment methods can be either retrospective or prospective. A common retrospective method for estimating the dietary intake is the 24-hour recall. The method is easy to use, though it is dependent on an adequate memory, and is therefore inappropriate to use among persons with short-term memory problems (Ausman and Russell, 1999). The subject must remember intake of food and beverages as well as estimate the portion sizes for the previous day. However a 24-h recall is easy to perform either at a visit or by telephone.

When using a prospective dietary assessment method, such as food diary, the subjects record their intake of foods and beverages during a number of days. A weighed dietary record requires a great deal from the subjects, as all food items should be weighed during the registration period (Cameron and Van Staveren, 1988). An alternative is an estimated food diary, which is less cumbersome since the dietary intake will be estimated, preferably with the help of household measures, pictures of food items and dishes. However, prospective dietary methods may have an effect on the dietary intake, as the subject might be changing or avoiding recording their dietary intake to make the registration easier or seem healthier (Cameron and Van Staveren, 1988). Both a 24-hour recall and a food diary register the food intake and give information about the meal pattern and meal type, which cannot be obtained by a food frequency questionnaire.

Today it is well agreed that there are limitations with all dietary assessment methods. The 24-hour recall is inappropriate to use for older persons with short-term memory problems (Ausman and Russell, 1999). According to Johansson et al (2001) it seems difficult to receive reasonable energy intakes with 24-hour recalls performed by telephone only. However, when comparing 24-hour recall with weighed records the methods agreed well, and even closer agreements would be expected if repeated measures were available. Diet records also showed the best agreement with weighed records (Bingham et al., 1994a). A validation of a three-day estimated dietary record used in the elderly showed that the method was suitable to determine energy and major nutrient intakes (Lührmann et al., 1999). However, one problem with food diaries is that the subjects tend to eat less after several days of recording which can be interpreted as that a limited number of days is suitable when using this method (Cameron and Van Staveren, 1988; Gersovitz et.al., 1978). Similar estimates of energy and nutrient intake were received when comparing a 24-hour recall and a 1-day food record among older persons. However for older women, the mean protein value was higher for the recall data (Fanelli and Stevenhagen, 1986). Further, as nutrient intake varies daily, several days of dietary intake might be needed for dietary assessment (Nelson et al., 1989).

The validity of dietary assessment has been debated, primarily concerning estimates of the under-reporting associated with self-reports of dietary intake. Self-reported food intake generally underestimates the actual food intake (Black, 2000; Black et al., 1991) and it has been shown that the energy intake can be underestimated by up to 20% among older persons (Tomoyasu et al., 1999). However, there were no differences between men and women, or between single-living or married persons. It has been shown that obese persons underestimate their dietary intake to a higher extent than do non-obese, and that older women under-report to a greater extent than do older men (Johnson et al., 1994; Rothenberg et al., 1997; Tomoyasu et al., 1999).

Under-reporting may involve different problems: food items in certain food groups might be less reported. They can be reported less frequently, and they can be reported in smaller portion sizes (Becker et al., 1999; Krebs-Smith et al., 2000). Among Finnish adults aged 25-64 years, body mass index (BMI) over 25 $kg/m^2$, female gender, age over 45 years and a high educational level predicted underreporting (Hirvonen et al., 1997). It was also shown that the under-reporters, both males and females, consumed significantly more vegetables, fish, meat, potatoes, fruit and berries than did the others. They also reported a lower consumption of fat. Bingham et al. (1995) found that intake of foods such as cakes, milk and confectionery was reported lower in under-reporters and that meat, fish, vegetables and fruits did not differ. Food items considered as socially undesirable, i.e. high in fat and sugar, were reported in smaller amounts than were socially desirable foods (Johansson et al., 2001). In this study, the main predictor for under-reporting was BMI, but also age and smoking could be contributing factors. In a Swedish study, the reported intakes

of almost all foods were under-reported. However the macronutrient intake was not greatly affected and the intakes of almost all foods were lower among under-reporters compared to those with acceptable energy intakes (Becker et al., 1999). In a Norwegian study among persons aged 19-79 years, the reported energy intake was influenced by attitudes about the person's body weight. A large proportion of the under-reporters was obese, and wanted to reduce their body weight. The under-reporters reported consuming fewer foods rich in fat and sugar than did the others (Johansson et al., 1998). Body dissatisfaction and a belief that a body size smaller than one's own was healthier were also associated with a lower accuracy of reported energy intake (Taren et al., 1999). It has been shown that in both obese and non-obese women, the energy from meals was accurately reported while energy from snack foods eaten between meals was significantly under-reported (Poppitt et al., 1998).

Most quantitative methods are dependent on food composition tables, except for methods that involve duplicate food samplings and direct chemical analysis. The food composition table can only approximate the nutrient content in different food items that have been consumed (Torelm, 1997). This must be kept in mind when evaluating the dietary intake investigated (Berglund, 1998).

*Studying meals*

The question "What is a meal?" can be answered from different perspectives. In traditional food surveys in Western society, meals are equivalent to eating events such as breakfast, lunch and dinner. In addition to these meals all other eating events can be classified as snacks (de Graaf, 2000). De Graaf also gives meals a nutritional definition, which refers to the frequency, distribution and variability of energy and nutrient intake across the day in relation to eating events such as meals and snacks. The contribution of total daily intake of meals and snacks is also of special interest for de Graaf.

According to Mäkelä et al. (1999) three relevant dimensions of meals can be distinguished: eating pattern, meals format and the social organisation of eating. The eating pattern is defined by three different elements: time, the number of eating events, and the alternation of hot and cold meals and snacks. The meal format takes both the composition of the main course and the sequence of the whole meal into account. Thus, meals can be studied both from a cultural and nutritional perspective. A classical approach to defining the structure of meals was suggested by Douglas (1975) who analysed the structure of daily meals by using classifications and categories of binary oppositions from a cultural point of view.

As mentioned, quantitative dietary assessment methods are time-consuming and demanding to use both for the subject and the investigator (Gibson, 1990). Thus, development of qualitative dietary methods for evaluating and screening food intake, for example among elderly, has been pursued (Lennernäs et al., 1993a; Sidenvall et al., 1996). Such methods focus primarily on meal patterns

and choice of food items and not on specific nutrients, meaning that energy and nutrient intake is not investigated specifically and can thus not be calculated. One qualitative method developed and used in Sweden for evaluation of dietary intake is the Food-Based Classification of Eating episodes model (FBCE) (Lennernäs and Andersson, 1999; Lennernäs et al., 1993a). The objective of the FBCE is to describe the food quality by a simplified classification of different meals and snacks; for further information regarding the model, see the subjects and methods sections. The model is meant to be used to evaluate whether the diet is satisfying without specifically knowing the amount of food eaten, according to the authors (Lennernäs and Andersson, 1999; Lennernäs et al., 1993a). The model has been used on shift-workers (Lennernäs et al., 1993b), geriatric patients (Sidenvall et al., 1996), leg ulcer patients (Wissing et al., 1998; Wissing et al., 2000) as well as in obese and normal-weighted men (Andersson et al., 2000). However, it has only been used on population groups in Sweden and by the researcher who developed the method (Lennernäs and Andersson, 1999; Lennernäs et al., 1993a).

**Participation in food surveys with focus on elderly**

Studies performed in elderly still living at home have shown a low participation rate with figures from 20 to 51% (van't Hof et al., 1991; Westenbrink et al., 1989; Wright et al., 1995). Maisey et al. (1995) describes more difficulties in recruiting persons in the older age group, i.e. persons over 80 years compared to those younger than 75. The participation rate ranged from 67% among those under 70 years to 20% of those over 85 years. However, it has been shown that participation rates are low in dietary studies, especially among elderly women (Becker and Pearson, In press; Harris et al., 1989; Johansson et al., 1997; van't Hof et al., 1991; Wright et al., 1995).

Several studies regarding dietary intake in the elderly included participants that generally seemed to be healthier and had better dietary habits than non-participants (Pedersen, 2001; Rothenberg, 1997; Schroll et al., 1996). This means that generalising the results to an older population might not be possible. For example, the elderly in the SENECA study may not be representative of the general European elderly population, but they are representative of elderly people living independently in small European towns, since the non-response and dropout was high (Schroll et al., 1996). In a Swedish nation-wide study, the non-participation was about 40%, whereas it was highest among women older than 55 years (Becker and Pearson, In press).

To participate in a food survey is time consuming for the subject, which can be a factor contributing to declining, especially for old and/or disabled persons. Another major reason for unwillingness to participate in food surveys might be that eating habits are personal matters that most people are not willing to report in detail (Isaksson, 1998). People's knowledge of healthy or unhealthy foods can also affect their willingness to participate. Johansson et al (2001) showed that socially undesirable foods were reported in smaller amounts by under-

reporters. Under-reporting were also correlated with a high BMI (Becker et al., 1999; Johansson et al., 1998). Hirvonen et al. (1997) showed that females over 45 years and with a high BMI had a tendency towards under-reporting.

## GENERAL AIMS OF THE THESIS

The overall aim of this thesis was to study elderly home-living self-managing and disabled women's dietary intake and meals in relation to age, household structure, disability and cooking ability. The aim was further to analyse whether a qualitative method in relation to traditional dietary assessment methods was adequate to establish sufficient energy intake and energy content in separate meals in this population group. Furthermore, the aim was to perform a dropout analysis.

The thesis comprises six studies with the following aims:

I to investigate intake of energy and selected nutrients as well as food intake in self-managing, elderly women (64-88 years) living at home. Comparisons were made between age groups and household structure concerning energy and selected nutrients.

II to describe and analyse the intake of energy and selected nutrients as well as food intake in disabled elderly women (64-88 years) living at home, i.e. women with Parkinson's disease, rheumatoid arthritis or stroke. Comparisons were made between the disability groups.

III to describe the frequency and distribution of home-living self-managing and disabled elderly (64-88 years) women's eating events, as well as to investigate which definition/names the women had given their different eating events and to categorise these into meals and snacks. An additional aim was to study the composition of meals and snacks, and analyse the nutritional significance of these eating events in terms of energy and macronutrients.

IV to investigate the extent to which intake of energy and selected nutrients as well as meal patterns co-vary with perceived ability to cook among older self-managing and disabled women (64-88 years) living at home.

V to analyse whether a qualitative method, in relation to traditional dietary assessment methods was adequate to establish sufficient energy intake and energy content in separate meals, in a population of self-managing elderly women (64-88 years) living at home.

VI to examine participation rate among self-managing elderly women (64-88 years) living at home and the main reasons for exclusion and declining as stated by the women themselves according to municipality, age group and household structure.

## SUBJECTS AND METHODS

### The MENEW project

The interdisciplinary MENEW project (*Meals, Eating habits and Nutrient intake among Elderly Women*) started in the spring of 1997. The project is a collaboration between the Department of Domestic Sciences and the Department of Public Health and Caring Sciences at Uppsala University. Three senior researchers, Christina Fjellström, Birgitta Sidenvall and Margaretha Nydahl, initiated the project. A number of publications (Andersson and Sidenvall, 2001; Fjellström et al., 2001; Sidenvall, 1999; Sidenvall and Fjellström, 2000; Sidenvall et al., 2000; Sidenvall et al., 2001) and two theses (the present one and *Health perceptions, eating habits and food management among older women*, by Kerstin Gustafsson) are the results of the project.

The design of the project is descriptive and explorative. The overall aim of the MENEW project was to study home-living elderly women's food and meal habits, as well as nutrient intake in relation to household structure, age and self-management. Furthermore, the aim was also to elucidate how cultural and social aspects affected food-related strategies in everyday life among these women. Self-managing women participated in Part I, whereas disabled women (with Parkinson's disease, Rheumatoid arthritis or stroke) participated in Part II of the MENEW project. The self-managing women were selected on the basis that they were responsible for their own meals and dietary intake. The disabled women were selected on the basis of the disease (PD, RA or stroke), as these have been shown to impede management of a sufficient dietary intake. Disability was present in most of these women, and thus the group will be referred to as disabled in this thesis. However, in Study II, instead of disabled, the terms outpatients is used, which actually means the same thing.

This broad aim required quantitative dietary assessment methods as well as qualitative interviews. A repeated 24-h recall and a three-day food diary were chosen to show the individual meal pattern, the composition of each meal (meal type) and the cultural meal classification (i.e. what they called each eating event), as well as to obtain information regarding food choice and nutrient intake. Qualitative interviews were performed with half of the self-managing and 2/3 of the disabled women.

The studies in this thesis are presented in Table 1, as well as their respective profile of women, sample, methods used and the number of days on which dietary data are based.

**Self-managing women (Studies I, III-VI)**
The possible self-managing, non-disabled women were aged 64-88 years and living at home, in three towns and their surroundings in mid-eastern Sweden. One town was larger (187,302 inhabitants) and the other two were smaller (21,748 and 36,121 inhabitants, respectively). Subject selection was conducted systematically, for age groups (64-68, 74-78, 84-88 years) and household structure (single-living and cohabiting) and randomised from the Swedish population register of 9500 women. A total of 570 women were selected and invited to participate in the study by letter containing information about the study. However, 65 women were excluded as they could not be reached by phone, and was not further investigated. This means that 505 women were further investigated and comprised the sample in Study VI, (see Table 2).

Within a week, the women were contacted by telephone by one of the investigators. The inclusion criteria were that the women were required to be healthy according to their own definitions, self-managing regarding the meal situation, to have proper time-orientation and be mentally able. The investigator determined the latter two points by asking for directions to the woman's home and by carrying on a conversation over the phone. During the phone call, which could be characterized as an informal conversation, the researcher gave information about the study and the woman decided whether she wished to participate. If the woman did not fulfil the inclusion criteria, the reasons for exclusion were documented and, if she declined participation, her explanations were documented. All statements were recorded as literally as possible for each woman. The calls lasted from a few to 30 minutes.

One hundred and six women were excluded, as they did not fulfil the inclusion criteria. Of the remaining 399 women, 240 declined to participate. The main reasons for declining were old age, tiredness and/or illness. A complete analysis of the participation rate and reasons for not participating in Part I of the MENEW project are presented in Study VI and will be discussed in the results and discussion section. Thus, a total of 159 women were visited by one of the five investigators in the MENEW project, i.e. trained dieticians and nurses, (BS, CF, JA, KG, MN) which means that the inclusion rate was 40%. The inclusion of women started in the spring of 1997 and ended in the spring of 1998. All five researchers interviewed women in all age groups and both household structures.

In Studies I and V, twenty-four of the self-managing women were excluded from further analysis due to incomplete data, meaning that they did not fulfil 5 days of dietary data, bodyweight or height. This left 135 women and a final participation rate of 34%. In Study III, data from 139 women were included. Four women that were excluded from Studies I and V due to missing data on bodyweight or height were included in this study. The final participation rate in this study was thus 35%.

**Disabled women (Studies II-IV)**
The disabled women were aged 64-88 years, and living at home in a county in mid-eastern Sweden. Inclusion criteria for the disabled women included having a diagnosis of Parkinson's disease (PD), rheumatoid arhritits (RA) or stroke. The women should still be living in their homes and should not have a diagnosis of dementia or aphasia. Each woman had only one of the diseases (PD, RA or stroke) and was not diagnosed with any other severe disease. Inclusion of women with PD or stroke was determined from a patient register at either a geriatric, neurological or medicine clinic at a university hospital. A consecutive selection of these women was performed. For women with RA, however, a research nurse at the rheumatology clinic selected women based on the inclusion criteria. The nurse contacted the women by phone to ask about their willingness to participate in the study. A total of one hundred and seventy-three women were potential participants (see Table 3).

Since one aim was to compare household types (single-living and cohabiting women) and age groups (64-68, 74-78 and 84-88) among self-managing women, as well as disability among disabled women (PD, RA and stroke), the aim was to include almost equal numbers of women in each group.

The disabled women received a letter containing information about the study and inviting them to participate. Within a week's time, the women were contacted by telephone by one of the investigators. Twenty-three women were excluded, as they did not fulfil inclusion criteria or could not be reached by phone. Seventy-seven women declined to participate, meaning that 73 women did participate in the study. Thus, the inclusion rate was 49%. The main reasons for declining, according to the women themselves, were: tiredness, problems with the disease and/or other severe diseases. The participation of the women started in June 1998 and continued until November 1999. Thus, seasonal food variations were included in the material.

The women were visited by one of three researchers (IA, JA, KG). Ten of the women were excluded from further data analysis because of incomplete data, primarily missing entries in the food diary, leaving 63 women in Studies II and III, respectively. The final participation rate was thus 42%.

In Study IV, all women were selected primarily on the basis of participation in qualitative interviews. Equal numbers of self-managing women and disabled women from each disease group, i.e. PD, RA and stroke, were included as well as equal representation of age and household structure. Three women were excluded due to a missing 24-h recall, thus Study IV was based on data from 17 self-managing women and 52 outpatients giving a total of 69 women.

Table 1. Presentation of the Studies I-VI.

| Study | Women's profile | Sample | Methods | Total number of days of dietary intake |
|---|---|---|---|---|
| I | Self-managing[a] | 135 | 24-h recall+food record | 5 |
| II | Disabled[a] | 63 | 24-h recall+food record | 5 |
| III | Self-managing and disabled[a] | 139 and 63 | 24-h recall+food record | 5 |
| IV | Self-managing and disabled[a] | 17 and 52 | 24-h recall+qualitative interviews | 2 |
| V | Self-managing[a] | 135 | 24-h recall+food record+(FBCE) | 5 |
| VI | Possible self-managing[b] | 346 | Content analysis | - |

[a]All women were selected from the MENEW project.
[b]Women not participating in the dietary studies (505-159=346)

Table 2. Number of self-managing women, household structure and age groups, invited, excluded and declining (Studies I, III-VI).

| | All | Single-living | Co-habiting | Age 64-68 | Age 74-78 | Age 84-88 |
|---|---|---|---|---|---|---|
| Invited | 505 | 260 | 245 | 136 | 158 | 211 |
| Excluded | 106 | 52 | 54 | 22 | 22 | 62 |
| Possible participants | 399 | 208 | 191 | 114 | 136 | 149 |
| Declining | 240 | 128 | 112 | 64 | 82 | 94 |
| Participated | 159 | 80 | 79 | 50 | 54 | 55 |
| Inclusion rate | 40% | 39% | 44% | 44% | 40% | 37% |
| Data presented on | 135/139 | 76/77 | 59/62 | 44/48 | 48/49 | 43/44 |
| Final participation rate | 34%/35% | 36%/37% | 31%/32% | 39%/40% | 35%/36% | 29%/30% |

Table 3. Number of women with Parkinson's disease (PD), rheumatoid arthritis (RA) and stroke invited, excluded and declining (Studies II-IV).

| | All | PD | RA | Stroke |
|---|---|---|---|---|
| Invited | 173 | 43 | 70 | 60 |
| Excluded | 23 | 4 | 1 | 18 |
| Possible participants | 150 | 39 | 69 | 42 |
| Declining | 77 | 15 | 44 | 18 |
| Participated | 73 | 24 | 25 | 24 |
| Inclusion rate | 49% | 62% | 36% | 57% |
| Data presented on | 63 | 21 | 24 | 18 |
| Final participation rate | 42% | 54% | 35% | 43% |

**Collection of quantitative data, dietary assessment methods**

The same methods and data collection procedures were used among self-managing and disabled women. At a visit in the woman's home, a first 24-hour recall was conducted. It was performed according to a proposed standardised method (Gibson, 1990). The interviewer thereafter supplied the woman with a food diary, explaining the written instructions for how to record her dietary intake during three consecutive days (Gibson, 1990) with one weekend day included. The woman was asked to write down everything she ate and drank, by estimating portion sizes using household measures such as pieces, glasses, cups, spoons, decilitres etc and noting the type of food and time of her eating/drinking event in the food diary. She was also asked to describe the type of foods and beverages consumed in as detailed a manner as possible. To help the woman estimate the amount of food and beverages consumed ”The meal model” was also used. It is a picture book showing different portion sizes for different kinds of food (The Swedish National Food Administration, 1997a). The book is suggested as a guide for estimating portions of meal components and sizes of certain food items as well as the thickness of sliced food items. The meal model has been improved after validation (Håglin et al., 1995). After registration in the food diary, the self-managing women sent it to the investigator in a pre-addressed and stamped envelope. A repeated 24-h recall was conducted by telephone, about one week after the first, but the women did not know which specific day to report from in advance. During this conversation, the investigator could also clarify inconsistencies in the woman's food diary. The disabled women were, however, visited a second time, about a week after the first visit for a second 24-h recall. During this second visit, the investigator could also clarify inconsistencies in the woman's food diary. The disabled women were personally visited a second time to facilitate data collection.

Trained dieticians coded the data according to the food portion sizes and weights estimated by the women. When weights of food items were missing, standard portion sizes were used according to a weight table (The Swedish National Food Administration, 1992). The database used was PC-kost (The Swedish National Food Administration, 1999), which includes about 1600 food items. Food items not included in the database were coded as a similar food item. Data were used to calculate intake of energy, energy yielding nutrients, selected nutrients and also the number of eating/drinking events, using the MAT's nutrient calculations system (Nordin, 1999).

In the 24-h recalls and the food diaries, the women stated the name of the eating event. Each eating event (Study III) was defined as food items or beverages consumed at one registration time. Thus, the categorisation of each eating event was primarily performed by the women themselves. In the second stage, when analysing eating events, they were nutritionally defined according to de Graafs guidelines (2000).

Registrations in the food diaries were in most cases started on a Thursday or a Sunday, to include one weekend-day. The 24 h recalls were performed at weekdays; thus, Fridays and Saturdays are not included in that material, i.e. the 24-h recall material. However, when merging the two methods all days of the week were represented. In the quantitative analysis (Studies I, II, III, V), the two dietary assessment methods were combined, which means that the calculations of dietary intake were based on five non-consecutive days of food registration. In Study IV, a repeated 24 h recall was used.

The qualitative *Food based classification of eating episodes model* (FBCE) was used (Study V) to analyse whether a qualitative method in relation to traditional dietary assessment methods was adequate to establish sufficient energy intake and energy content in separate meals in a population of elderly women. The model can be used to classify meals into a system of meal categories and the model includes 4 ”main” meals and 3 ”snack” meals (Lennernäs and Andersson, 1999; Lennernäs et al., 1993a). FBCE was developed to categorize eating events when data on consumed amounts are considered neither necessary nor possible to collect. According to the FBCE model, the definition of a complete meal should correspond to dietary guidelines, since the other meal types lack a specific source of key nutrients when compared to a complete meal. A complete meal could be classified as prepared or quick-prepared. A prepared meal means that the starchy source e.g. potatoes, rice, pasta, pizza-bottom or pie-shells had been prepared. A quick-prepared meal denotes breakfast cereals or bread.

**Qualitative interviews and field notes**

Qualitative interviews with an ethnographic approach were used in Study IV (Hammersley and Atkinson, 2001; Spradley, 1979). The interviews were performed in the women’s home and concerned their experiences of the meal. The interviews were based on an interview guide with open-ended questions covering family situation, food-related work and meal situation. For women suffering from a disease, i.e. disabled women with PD, RA or stroke, duration and symptoms were discussed, as well as how this influenced food-related work and how problems were handled. Field notes were taken concerning the condition of the women and their functioning in the home, based on a general visual assessment, i.e. how they functioned during the interview procedure, by each interviewer. The interviews were tape-recorded and lasted approximately 30-90 min and were transcribed verbatim. Supplementary questions were asked at a second visit and unclear points were checked and sorted out. For self-managing women this was done by telephone.

*Categorisation*

Based on the qualitative interviews and field notes, the women were classified in into three groups according to their ability to cook their principal meals i.e. main meals (Study IV). *1. Cooking group:* cooking with fresh ingredients and limited use of pre-prepared food items. *2. Part cooking group:* cooking was

simplified by the use of pre-prepared foods, convenience foods (ready made meals for re-heating) and aids. Some of the women received help from husbands or relatives. *3. No cooking-group:* no own cooking. In this group husbands had taken over, convenience foods were bought or ”Meals on Wheels” was used. The eating events (Study IV) were classified in the following categories: hot breakfast, cold breakfast, hot meals and other eating events.

*Body weight and height*
Body weight and height were measured during the home visit and used to calculate body mass index (BMI) and to estimate basal metabolic rate ($BMR_{est}$). Bodyweight and height were measured without shoes, but with light clothes on. $BMR_{est}$ was calculated according to the Schofield equation (Schofield et al., 1985). The Goldberg cut-off for reported energy intake: estimated basal metabolic rate ($EI_{rep}$:$BMR_{est}$) was calculated as suggested by Black, i.e. the cut-off values were calculated with Black's suggested numbers (Black, 2000), with the exception of within-subject variation in energy intake, which was calculated from the present material (Studies I and II).

*Cut-offs and PAL-value*
Among self-managing women (Study I), the group-level cut-offs for under-reporting and over-reporting were calculated as 1.54 and 1.66, respectively. The individual-level cut-offs were calculated as 1.07 for under-reporting and 2.38 for over-reporting. The physical activity level (PAL) was estimated to 1.6, since the women were assumed to have a sedentary lifestyle due to high age (Black, 2000; Nordic Council of Ministers, 1996). Among the disabled women (Study II), the group-level cut-offs for under-reporting and over-reporting were calculated as 1.32 and 1.48, respectively. The individual-level cut-offs were calculated as 0.89 for under-reporting and 2.20 for over-reporting. PAL was estimated to 1.4, since the women were assumed to have a very low physical activity level (Black, 2000; Nordic Council of Ministers, 1996). PAL was estimated to 1.6 for the cooking group, 1.4 for the part cooking group, and 1.3 for the no cooking group (study IV) (Black, 2000; Nordic Council of Ministers, 1996). The estimations of PAL were based on the knowledge of the women from the qualitative interviews and field notes.

**Ethical considerations**
The study was approved by the Research Ethics Committee of the Faculty of Medicine, Uppsala University. The ethical rules from the Swedish Research council were also considered. Informed consent of the participating women was obtained before starting the study, after received written information in a letter and a discussion over the phone with one of the researchers. The women were informed that participation was voluntary and that they could withdraw from the study at any time. All information has been treated confidentially. The interviews, collection of dietary data and measuring of body weight and height were performed in the women’s home during the visit. Risk of breach of

integrity at the visits might be present. In this study it was prevented by letting the woman decide when and where to meet the researcher and whether she wanted to have her bodyweight and height measured or not. In some cases the meeting was set up in an official hall, for example at a library or at the hospital. Some women had a friend visiting during the meeting to feel more secure and some women had their husband take part in the interview.

**Statistical methods**

The statistical software Minitab® version 12.1 and 13.0 (Minitab, 1998; Minitab, 2000) was used to analyse data in Studies I-III and V. In Study IV, the analyses were performed with the statistical software package Statview, version 5.0. The main results are presented as means with standard deviations. A p-value of $<0.05$ was considered significant.

The data from the two dietary assessment methods were merged to obtain a mean value concerning energy and nutrient intake from five non-consecutive days, i.e. the habitual dietary intake (Studies I-III and V). Paired t-test was used for comparison between the two dietary methods regarding dietary intake. Intake of energy, energy yielding nutrients and selected nutrients as well as intake of certain food groups was compared. When merging the two dietary assessment methods, the measurement error decreased for intake of energy, energy yielding nutrients and selected nutrients, which indicates the appropriateness of combining the two methods.

The non-parametric Kruskall-Wallis test was used to test inter-investigator differences in measurement regarding energy intake of the subjects for both self-managing and disabled women.

*Study I, self-managing women*

For comparisons between household structure, the two-sample t-test was used. One-way analysis of variance, (ANOVA), was applied to test differences in age groups. To analyse differences for significance, Tukey's multiple comparison test was used. The statistical analyses were used to test differences in energy, energy yielding nutrients, selected nutrients and nutrient density, as well as differences in body weight and BMI. Two-sample T-test was used for comparisons between under-reporters and non-under-reporters regarding reported intake of energy yielding nutrients, selected vitamins and minerals and food intake.

*Study II, disabled women*

ANOVA was used to analyse differences among the three groups of disabled women regarding intake of energy, energy yielding nutrients, selected nutrients, nutrient density as well as regarding age, body weight and BMI. Tukey's multiple comparison test was used for further analysis of between-group differences. The nutrient densities for intake of vitamin retinol and $B_{12}$ were non-distributed and therefore analysed by the Kruskall-Wallis test.

*Study III, self-managing women and disabled women*
No statistical analysis were performed due to different sampling procedures for inclusion of self-managing and disabled women in the study.

*Study IV, self-managing women and disabled women*
Paired t-tests were used for comparison between the first and the second 24-h recall. The three groups of women, i.e. cooking-group, part cooking-group and no cooking-group, were compared by the Kruskal-Wallis non-parametric analysis of variance. Post-tests, i.e. multiple comparisons between groups, were performed when a significant overall difference was obtained. Unpaired t-tests were used for comparisons between meal types.

*Study V, self-managing women*
A paired t-test was used for comparison between energy from quick prepared and prepared meals.

*Study VI*
Chi-square tests were used to analyse differences in participation, exclusion and declining among different categories of women. Content analysis was used to analyse reasons for exclusion and women's stated explanations for their declining to participate. Each woman's most dominant explanation was used in the analysis.

## RESULTS AND DISCUSSION

### Dietary intake

In this thesis dietary intake and meals among older women, self-managing and disabled have been studied. The intake of energy and selected nutrients was especially studied in relation to age, household structure, disability and cooking ability. The reported dietary intakes are presented for self-managing women (Studies I, III and V) and for disabled women (Studies II and III). In Study IV the dietary intakes are presented for self-managing and disabled women according to cooking ability. The results will be discussed in relation to intakes of energy, energy yielding nutrients, selected nutrients, and nutrient density, foods and meal pattern. Characteristics of the participating women (Studies I to V) are presented in Table 4.

Table 4. Characteristics of the women participating in Studies I-V.

| Study | Women[a] | n | Age, years | Body weight, kg | BMI, $kg/m^2$ | $EI_{rep}/BMR_{est}$ | Total number of days of dietary data |
|---|---|---|---|---|---|---|---|
| I, V | Self-managing | 135 | 75.9±8.0 | 68±11 | 25.9±4.1 | 1.24±0.36 | 675 |
| II, III | Disabled | 63 | 73.4±6.6 | 66±11[b] | 25.7±4.1[b] | 1.22±0.34[b] | 315 |
| III | Self-managing | 139 | 75.8±8.0 | 68±11[c] | 25.9±4.1[c] | 1.24±0.36[c] | 695 |
| IV | Self-managing (17) and disabled (52) | | | | | | |
| | *Cooking group* | 24 | 74.7±8.1 | 68±10[d] | 26.5±3.8[d] | 1.27±0.3[d] | 48 |
| | *Part cooking group* | 31 | 73.8±6.0 | 64±11[d] | 24.5±3.1[d] | 1.13±0.32[d] | 62 |
| | *No cooking group* | 14 | 75.9±6.6 | 65±16[c] | 26.0±4.0[c] | 1.30±0.39[c] | 28 |

[a] All women were selected from the MENEW project. Each of the three cooking groups consisted of both self-managing and disabled women.
[b] Data missing on 4 persons.
[c] Data missing on 1 person.
[d] Data missing on 5 persons.

*Energy intake*

The mean reported energy intakes and distribution of energy yielding nutrients for all groups of women are shown in Table 5. The mean reported energy intakes were lower than suggested by Swedish Nutrition Recommendations (SNR) in all groups of women (The Swedish National Food Administration, 1997b). However, the energy intakes among the self-managing women (Study I) were in accordance with comparable studies of elderly women in Sweden and other parts of Europe (Buttriss, 1999; Dirren, 1994; Karlsson et al., 1999; Maisey et al., 1995; Mowe et al., 1994; Nes et al., 1992; Vincent et al., 1998; Wright et al., 1995). These studies have reported low energy intakes as well as risk for energy deficiency. Generally, the values often presented for energy intake in most dietary studies are mean values that do not show the individual range, which means that some persons might have a very low or very high intake of energy. In Study V, it was shown that a small group of women had a very low energy intake, thus representing those individuals most at risk for malnutrition, similar to reports on older women in other studies (Larsson et al., 1990).

However, other studies have reported higher energy intakes among home-living elderly women. The mean intakes in a nationwide Swedish study and among elderly women in Gothenburg as well as in Denmark seemed to be higher than figures presented in this thesis (Study I) (Becker and Pearson, In press; Pedersen, 2001; Rothenberg et al., 1993). The higher intakes in these studies might depend on different dietary assessment methods used and/or that these population groups differed with respect to age and composition, for example health status. Under-reporting has also been discussed as a contributing factor to low energy intakes in several studies (Nes et al., 1992; Pedersen, 2001; Wright et al., 1995) and will be discussed further on.

There were no statistically significant differences for energy intake in the groups of self-managing women regarding household structure and age. However, differences might have been expected as it has been shown that widowhood could be accompanied by several changes in dietary intakes compared to cohabiting women (Gustafsson and Sidenvall, 2002; Quandt et al., 2000; Sidenvall et al., 2000). However, these qualitative studies examined how women experienced how they had changed their diets. In this study, dietary assessment methods were used to calculate women's reported intake in more detail. Furthermore, in the study by Gustafsson and Sidenvall (2002) and Sidenvall (2000), the subjects were the same as those participating in this thesis. Still in the qualitative interviews it could be the individuals at risk for malnutrition that have been studied. In this study, all single-living women consisted of one group and widows were not specifically categorised. One could presume that, despite the fact that no statistical differences were shown, there was a tendency for the older age group compared to the youngest age group to have lower intakes, as the values were numerically lower. This may be explained by the fact that the groups were to small to allow detection of actual

differences. Differences according to age could thus be expected, since the energy intake seems to decrease with increased age (de Graaf, 2000; Morley, 1997).

When comparing the energy intakes among the disabled women (Study II) to other studies of homebound elderly (Gray-Donald et al., 1994; Millen Posner et al., 1987), medical outpatients (Wissing et al., 1998) and elderly living at home with a disability (Sonn et al., 1998), our results were consistent with these findings. For disabled women there were no statistically significant differences regarding disability and energy intake, but women with perceived disability in food-related work (Study IV) tended to have a lower energy intake compared to women without such disability. These results show that elderly women with a disability were also at risk for low energy intake. Other studies have shown that disabled elderly at hospital or institution are at an even greater risk (Elmståhl et al., 1997; Karlsson et al., 1999; Mowe et al., 1994). In the long run, a low energy intake may have consequences for the nutritional status. Older women with chronic diseases, which could be seen as a preliminary stage to hospitalisation, are a group that should receive attention regarding food intake and meals.

An interesting result is that this group of women, with a great range in age, both self-managing and disabled, have reported much the same energy intake. Could it be that women, even an older female population group, are constantly thinking about healthy food (Lilley and Johnson, 1996; McKie, 1999) and eating small portions of food (Morley, 1997)? Thus, does gender have more effect on energy intake than both age and household structure? This is something that should be further investigated. On the other hand, under-reporting among older women, as discussed further on, complicates these results.

The distribution of energy yielding nutrients was slightly higher for fat and lower for carbohydrates than recommended, in all groups (Table 5) (The Swedish National Food Administration, 1997b). The present values correlated to a higher extent with Swedish recommendations than did those from other Swedish population groups at different ages (Becker, 1999). The results in this thesis were in accordance with studies on other elderly women in Sweden (Becker and Pearson, In press; Rothenberg et al., 1993) and Europe (Buttriss, 1999; Dirren, 1994; Griep et al., 1996; Maisey et al., 1995; Millen Posner et al., 1987; Nes et al., 1992; Pedersen, 2001).

*Intake of selected nutrients*

Low intakes of vitamins and minerals are likely to accompany low energy intakes (Amorin Cruz et al., 1996). Low intakes of especially vitamin D, E, folate and selenium have been seen as a problem in an elderly population (Bates et al., 1999; Becker, 1999; Hoffman, 1993; Karlsson et al., 1999; Millen Posner et al., 1987; Nes et al., 1992; Sonn et al., 1998). In a Swedish study of

women older than 61 years, intakes of vitamin E, folate and selenium were below recommendations (Becker and Pearson, In press). This has also been confirmed in this thesis (Studies I, II and IV). The intakes of selected nutrients for all groups of women can be seen in Table 6. Compared to SNR, mean figures for vitamin D, folate, iron and selenium were lower in all groups than those suggested. In all groups except no cooking group, the intake of vitamin E (α-tocopherol) was also lower. The intake of niacin among women with PD and stroke, and the intake of calcium in the age group 84-88, was lower than recommended.

The oldest age group had significantly lower intakes also of protein, folate, thiamine, niacin, $B_6$ and selenium. Overall, the highest intake figures were obtained in the youngest age group, while the lowest intake figures were obtained in the oldest age group. This might be explained by smaller portion sizes in the oldest group. Overall the lower intake of the micronutrients presented might be explained by lower portion sizes in this group of older women, and especially of those over 80 years, as has been discussed (de Jong, 1999; Steen, 1999). In the SENECA study, great variability in the nutrient intake between the different centres was seen and a considerable proportion of participants from some centres showed low intakes of nutrients and were thus at risk for deficiencies (Amorin Cruz et al., 1991; Dirren, 1994).

The only difference that was seen between household structure was a significantly higher intake of selenium among single-living women. No significant differences in nutrient intake were seen between the disabled groups (Study II) or cooking groups (Study IV). However, regarding intake of vitamin E (α-tocopherol) and selenium, it can be difficult to measure since values presented in the database might be unreliable.

The nutrient density, i.e. the quality of the diet, was adequate for most nutrients (Table 7). This is positive, as elderly persons in most centres in the SENECA study had diets that did not meet the nutrient densities recommended (Amorin Cruz et al., 1991). There were no significant differences in nutrient density figures for self-managing women between age groups or household structure, nor were there such differences between the three groups of disabled women. However, the recommendations for nutrient density are not intended to apply to population groups consuming less than about 8 MJ, whereas the present figures should be interpreted with caution (The Swedish National Food Administration, 1997b). This means that, among the elderly women studied here, the recommended nutrient density for some nutrients could possibly be even higher. On the other hand, the recommended figures for the nutrients studied might have been set rather high, with no certainty as to what consequences of lower intake, especially in elderly persons, are for nutrient density.

Table 5. Intake of energy in mega joule (MJ) and energy yielding nutrients in energy percent (E%) among elderly women (in study I-V). Data for self-managing and disabled women are based on 5 days non-consecutive data, whereas data from cooking groups are based on 2 days from a repeated 24 h recall.

| | All self-managing (n=135) | 64-68 years (n=44) | 74-78 years (n=48) | 84-88 years (n=43) | All disabled (n=63) | PD (n=21) | RA (n=24) | Stroke (n=18) | Cooking group (n=24) | Part-cooking group (n=31) | No cooking group (n=14) | *SNR*[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Energy, MJ | 6.8±1.9 | 7.1±2.0 | 7.0±2.0 | 6.3±1.7 | 6.4±1.7 | 6.6±1.9 | 6.5±1.7 | 5.9±1.5 | 6.9±1.8 | 5.9±1.5 | 6.2±1.8 | |
| *(SNR[a] energy, MJ)* | *8.2-8.3* | *8.3* | *8.2* | *8.2* | *7.4-7.6* | *7.4-7.6* | *7.4-7.6* | *7.4-7.6* | *8.8* | *7.4* | *6.9* | |
| Protein, E% | 16±2 | 16±2 | 16±2 | 15±2 | 16±3 | 16±3 | 16±3 | 17±3 | 16±3 | 16±3 | 16±3 | *10-15* |
| Fat, E% | 33±5 | 33±5 | 33±6 | 34±4 | 33±6 | 33±4 | 33±7 | 33±6 | 32±5 | 32±6 | 36±8 | *≤30* |
| Carbohydrates, E% | 50±6 | 50±6 | 50±7 | 51±5 | 50±6 | 50±6 | 50±8 | 49±5 | 52±6 | 51±8 | 48±9 | *55-60* |

[a] Swedish Nutrient Recommendations 1997.

Table 6. Intake of selected nutrients (in milligrams or micrograms) among elderly women (Studies I-V). Data for self-managing and disabled are based on 5 days non-consecutive data, whereas data from cooking groups are based on 2 days from a repeated 24 h recall.

| | All self-managing (n=135) | 64-68 years (n=44) | 74-78 years (n=48) | 84-88 years (n=43) | All disabled (n=63) | PD (n=21) | RA (n=24) | Stroke (n=18) | Cooking group (n=24) | Part-cooking group (n=31) | No cooking group (n=14) | *SNR* [a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Retinol ekv, RE | 1176± | 1204± | 1208± | 1112± | 1075± | 1063± | 1180± | 948± | 1337± | 1156± | 839± | *800* |
| Vitamin D, µg | 4.8±2.7 | 4.9±2.5 | 5.2±3.1 | 4.3±2.5 | 5±3 | 5±3 | 5±2 | 5±3 | 5±4 | 5±4 | 6±4 | *10* |
| Vitamin E[b], mg | 5.9±2.2 | 6.3±2.4 | 5.9±1.8 | 5.4±2.2 | 6±2 | 6±2 | 6±2 | 5±2 | 7.2±2.4 | 6±2.4 | 8.8±4.8 | *8* |
| Ascorbic acid, mg | 93±58 | 107±68 | 92±50 | 78±50 | 83±56 | 75±44 | 101±68 | 68±54 | 95±64 | 84±81 | 71±58 | *60* |
| Thiamine, mg | 1.1±0.4 | 1.2±0.4 | 1.1±0.4 | 1.0±0.3 | 1.0±03 | 1.0±03 | 1.0±03 | 1.0±03 | * | * | * | *1.0* |
| Riboflavin, mg | 1.5±0.6 | 1.6±0.5 | 1.6±0.8 | 1.3±0.4 | 1.4±0.5 | 1.5±0.8 | 1.5±0.4 | 1.3±0.4 | 1.5±0.6 | 1.7±0.6 | 1.3±0.4 | *1.2* |
| Niacin, NE | 14±5 | 14±4 | 13±6 | 13±5 | 13±3 | 12±3 | 14±3 | 12±3 | 13±5 | 12±5 | 13±5 | *13* |
| $B_6$, mg | 1.6±0.4 | 1.7±0.4 | 1.6±0.4 | 1.4±0.4 | 1.6±0.4 | 1.6±0.4 | 1.6±0.3 | 1.6±0.4 | 1.8±0.8 | 1.5±0.5 | 1.4±0.4 | *1.1* |
| $B_{12}$, µg | 6.1±7.6 | 6.3±5.4 | 6.6±10.9 | 5.3±4.3 | 5.5±4.4 | 5.8±4.6 | 5.6±5.0 | 5.1±3? | 6.9±7.5 | 6.7±10.3 | 5.1±4.8 | *2.0* |
| Folate, µg | 200±87 | 217±80 | 208±106 | 173±63 | 184±60 | 193±72 | 195±58 | 160±42 | 199±82 | 170±67 | 156±59 | *300* |
| Calcium, mg | 864±403 | 883±402 | 926±472 | 777±302 | 833±347 | 883±508 | 814±238 | 801±235 | 855±364 | 742±330 | 770±296 | *800* |
| Iron, mg | 8.5±3 | 9±3 | 8±3 | 8±3 | 9±3 | 9±4 | 9±4 | 8±2 | 9±4 | 8±4 | 8±3 | *10* |
| Selenium, µg | 29±11 | 32±12 | 30±11 | 26±8 | 29±13 | 30±17 | 29±27 | 28±8 | * | * | * | *40* |

[a] Swedish Nutrient Recommendations 1997
[b] alpha-tocopherol equivalents
* no values were presented in Study IV

Table 7. Nutrient density (intake in milligram or microgram per mega joule) of selected nutrients among elderly women (Studies I-V). Data for self-managing and disabled women are based on 5 days non-consecutive data, whereas data from cooking groups are based on 2 days from a repeated 24 h recall.

| | All self-managing (n=135) | 64-68 years (n=44) | 74-78 years (n=48) | 84-88 years (n=43) | All disabled (n=63) | PD (n=21) | RA (n=24) | Stroke (n=18) | Cooking group (n=24) | Part-cooking group (n=31) | No cooking group (n=14) | *SNR*[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vitamin A, µg | 174±140 | 1176±140 | 1118±1151 | 1284±1017 | 169±124 | 157±114 | 186±148 | 159±103 | 202±215 | 196±258 | 128±48 | *100* |
| Vitamin D, µg | 0.7±0.3 | 0.7±0.4 | 0.8±0.6 | 0.8±0.5 | 0.8±0.4 | 0.8±0.3 | 0.8±0.3 | 0.9±0.5 | 0.7±0.5 | 0.8±0.6 | 1.0±0.6 | *0.6* |
| Vitamin E[b], µg | 0.9±0.2 | 0.9±0.2 | 0.9±0.4 | 0.9±0.3 | 0.9±0.3 | 0.8±0.2 | 0.9±0.2 | 0.9±0.4 | 0.8±0.2 | 0.9±0.2 | 1.0±0.3 | *1.0* |
| Vitamin C, mg | 13.8±8.5 | 14±8 | 12±10 | 18±14 | 13±8 | 11±6 | 15±9 | 11±8 | 14±9 | 14±11 | 11±8 | *7.0* |
| Thiamine, mg | 0.17±0.04 | 0.18±0.07 | 0.16±0.05 | 0.16±0.04 | 0.16±0.04 | 0.15±0.03 | 0.16±0.04 | 0.17±0.05 | * | * | * | *0.13* |
| Riboflavin, mg | 0.22±0.04 | 0.22±0.05 | 0.22±0.06 | 0.21±0.05 | 0.23±0.06 | 0.22±0.06 | 0.23±0.06 | 0.23±0.07 | 0.22±0.7 | 0.23±0.09 | 0.21±0.6 | *0.14* |
| Niacin, NE | 3.7±0.6 | 2.1±0.6 | 2.0±0.7 | 2.0±0.5 | 2.1±0.6 | 1.9±0.4 | 2.2±0.6 | 2.1±0.6 | 3.8±0.6 | 3.9±0.9 | 3.7±1.3 | *1.6* |
| $B_6$, mg | 0.24±0.04 | 0.27±0.07 | 0.23±0.06 | 0.23±0.05 | 0.26±0.07 | 0.24±0.04 | 0.26±0.05 | 0.29±0.10 | 1.8±0.8 | 1.5±0.5 | 1.4±0.5 | *0.13* |
| $B_{12}$, µg | 0.9±1.0 | 0.7±0.5 | 0.8±0.8 | 1.0±1.0 | 0.9±0.7 | 0.9±0.6 | 0.9±0.9 | 0.9±0.5 | 1.0±1.1 | 1.1±1.7 | 0.8±0.6 | *0.2* |
| Folate, µg | 29±9 | 29±9 | 28±8 | 31±12 | 29±7 | 29±8 | 30±7 | 28±7 | 29±10 | 29±10 | 26±8 | *36* |
| Calcium, mg | 125±32 | 126±31 | 123±36 | 131±34 | 132±35 | 132±38 | 128±30 | 137±37 | 124±35 | 126±41 | 127±43 | *110* |
| Iron, mg | 1.3±0.3 | 1.4±0.6 | 1.3±0.7 | 1.2±0.5 | 1.4±0.4 | 1.4±0.4 | 1.4±0.4 | 1.3±0.4 | 1.3±0.5 | 1.4±0.5 | 1.2±0.3 | *1.4-2.1* |
| Selenium, µg | 4±1 | 4±2 | 4±2 | 4±2 | 5±2 | 5±2 | 5±2 | 5±2 | * | * | * | *5* |

[a] Recommended nutrient density according to Swedish Nutrition Recommendations 1997, for planning of diets for groups of individuality > 7 years with a heterogeneous composition.
[b] alpha-tocopherol equivalents
* no values were presented in study IV

*Food intake*

Food intake was studied for self-managing women (Study I) and disabled women (Study II). In Study I, where the focus was on intake of energy and nutrients, the food intake was looked at. It was shown that the food items consumed in largest amounts among self-managing women were non-energy drinks, i.e. coffee, tea and water, milk products, fruit, berries and juice as well as potatoes. The food intake among disabled women was more thoroughly investigated than among self-managing women. Among disabled women food items consumed in largest amounts were also non-energy drinks, i.e. coffee, tea and water, milk products, fruit, berries and juice, potatoes and vegetables. The most frequently consumed foods among disabled women were bread, coffee, tea and water, milk products, buns and cookies, and spreads. Buns and cookies contributed the most energy during the day, followed by milk products, bread, pancakes, pizza, pie and sausage. The results suggest that easily prepared and eaten foods were frequently consumed among the disabled women. The most likely explanation might be that these women, still living in their homes, have diseases that affect their ability to prepare and cook foods (Study IV). However, one might expect that disabled women would choose fewer food items to simplify cooking and eating. On the contrary, they chose many different foods items, for example potatoes (97% of the women), that could be considered more difficult to prepare and cook than pasta or rice, which they reported eating much less of (33% and 30% of the women, respectively), since potatoes often need to be washed and peeled. Further, the frequent consumption of potatoes indicated that the women were eating a hot meal every day. According to Rothenberg (1997) elderly persons' food choice was reported to be changing to more pasta and rice in place of potatoes, however among the elderly studied in this thesis (Studies I, II) potatoes can be considered as staple food in the main meals (Study III).

The food intake figures seem to be in accordance with other studies regarding food choice among elderly women, where cereals, milk products, vegetables (including potatoes), fruits and non-alcoholic drinks contributed significantly to the total daily energy intake (Becker and Pearson, In press; Maisey et al., 1995; Nes et al., 1992; Pedersen, 2001; Rothenberg et al., 1993). These figures also tend to indicate that older women choose "healthy foods" (Lilley and Johnson, 1996; McKie, 1999).

*Eating events and meal pattern*

The mean number of eating events was 5.2 and 5.5 among self-managing and disabled women, respectively. Among women with PD, the mean number was 6.1, in the RA group 5.5 and stroke group 4.9. In the cooking group, the mean number of eating events was 5.4, in part-cooking group 5.2 and in no-cooking group 5.1. These elderly had a higher frequency of eating events compared with another Swedish study including persons in different ages, where the reported mean number of eating events was 4.1 (The National Board of Health and Welfare, 2000) and another Swedish study in an elderly population where

the mean number of eating events was 4.6 (Rothenberg et al., 1994). However, in the present study (III), each eating event represented an individual recording, each at different times during a 24-h period. This might have contributed to the high mean number of eating events. Women with PD and RA had the highest frequency of eating events, which is difficult to explain. One possible explanation could be that these women are on medical treatment, and when taking their medicine they need to eat or drink something together with their medicine. This was indicated in the qualitative interviews (unpublished data). As elderly might have problems with bad appetite and/or too small portion sizes, it is recommended for them to spread eating events over the day. Several eating events facilitate an increased energy intake (de Graaf, 2000; Morley, 1997).

In Study III, self-managing and disabled women's frequency and composition of eating events based on the women's own definitions of their eating events, and subsequent categorisation of their diet according to de Graaf (2000) into meals and snacks were studied. The most frequent names for eating events used by the women were grouped together in meals (breakfast, lunch and dinner) and snacks (morning, evening and tea & coffee, which also included a group of eating events for which the women had no specific term or had given a specific name to – no-named snacks). Meals represented 38% of all eating events among both self-managing and disabled women. Snacks represented 62% of all eating events in the two groups of women (Table 8). The meals and snacks to which the women had given names contributed about 96% of the reported total energy intake, whereas the group of eating events for which the women had no specific terms or name contributed only 3-4% of the reported total energy intake. Thus, what is important to recognize in this context is that meals and snacks defined as such by the women were most significant from an energy perspective. The meals (breakfast, lunch and dinner) contributed 74% of the total daily energy intake, which was in accordance with Swedish recommendations that meals should contribute 70-95% of the total daily energy intake (The Swedish National Food Administration, 1997b). Snacks given specific names by the women (morning, evening and tea or coffee) contributed 22-23% of the total daily energy intake. This is positive since several smaller eating events might be easier to consume than few large, especially among older persons since reduced appetite might be present (de Jong, 1999; Morley, 1997; Steen, 1999). This can also be interpreted as indicating that the frequency of snacks was high, which is encouraging in this older population as reduced snacking has been shown to be a risk factor for malnutrition (Quandt et al., 1997).

However, a group of eating events were not given specific names by the women. These eating and drinking events represented 30-33% of all eating events during the day and night and were consumed at every hour during this period. Each eating event could be estimated to contribute between 5-90 kcal, and could thus include half a glass of lemonade, a pastille, half a cookie and so

on. However, these non-defined snacks contributed only 3-4% of the total daily energy intake. This indicates that named meals and snacks were not only nutritionally, but also culturally significant for these women. This means that certain snacks, that are defined and regular, are important energy sources for old women, at least in this study. On the other hand, the kind of ”grazing” that was seen among these women had no effect on their energy intake. Grazing could include a glass of lemonade, soda drinks, water and small pieces of chocolate, candy, throat pastille, a grape and so on.

A regular pattern of cooked meals improves the possibility of having a nourishing diet as a significant amount of the daily energy and nutrient intake comes from hot meals (Schlettwein-Gsell et al., 1999). Almost 90% of the women reported consuming a dinner meal. The most energy dense meal was dinner (see Table 8). An average dinner consisted of 2536 kJ (606 kcal) and 2335 kJ (558 kcal) among self-managing and disabled women, respectively. In a dinner, the most common food items were vegetables, potatoes or potato dishes, meat or fowl and different beverages. This could also be interpreted as ”a proper meal”, that among elderly Swedish women, was considered equal to a cooked meal with potatoes, meat and vegetables, often served with gravy (Sidenvall et al., 2001). It could thus be expected that a cooked meal would often include more energy dense food items, greater portion sizes and/or a higher frequency of desserts. Also, probably more fatty and sugary foods as well as alcohol are to be included in a dinner as opposed to a lunch meal.

In this study (III), about 93% of the women reported eating breakfast and about 65% reported eating a lunch meal. A lunch could also be prepared, but could also consist of bread and dairy products. In a lunch the most common food items were vegetables, beverages, bread, milk products and spread. In breakfasts, bread, milk products, beverages, spread and cheese were common. This was also in accordance with Study IV, where it was shown that a cold breakfast was much more common than a hot breakfast. In morning and evening snacks, bread, spread and beverages as well as dairy products were frequently consumed. In snacks named tea or coffee, food items such as beverages and buns, cakes and biscuits were most frequently consumed along with coffee or tea.

The distribution of meals and snacks during both day and night in both groups of women was reported from early in the morning to late night (from 4.45 to 00.10). The distribution of the energy intake during the day indicated three main meals contributed most of the daily energy among disabled women (Study II), which was in accordance with Swedish recommendations suggesting 3 main meals and 2-3 snacks spread over the day (The Swedish National Food Administration, 1997b). This is also the ”traditional” meal pattern in Sweden. However, the women seemed to eat snacks at different times throughout the day, implying that they were used to individual meal times both in the morning and evening.

In Study IV, eating events classified as hot or cold breakfasts, hot meals and other eating events were studied according to the degree of each woman's cooking ability. The number of eating events did not differ significantly between groups, although there was a slight trend towards fewer eating events with increased cooking disability. The frequency of hot meals was similar in all groups and such meals contributed to the daily energy intake by 43% for the cooking group, 45% for the part-cooking group and 39% for the no-cooking group. The hot meals in the part-cooking group contributed most energy of the total daily intake compared to other groups. However, the hot meals in the part-cooking group consisted of significantly lower energy than the other groups [cooking group 2380 kJ (568 kcal); part-cooking group 1950 kJ (465 kcal), no-cooking group 2050 kJ (489 kcal)]. This indicates that hot meals are important for energy contribution, but that portion sizes may decrease with disability. This can be interpreted as indicating a tendency for energy intake to decrease with disability, which is in accordance with other studies on elderly with a disability (Nes et al., 1992; Wylie et al., 1999).

In Study V, the eating events were classified according to a qualitative method, the Food Based Classification of Eating episodes model (FBCE) (Lennernäs and Andersson, 1999; Lennernäs et al., 1993a) to analyse whether this qualitative dietary assessment method could be used among older women. FBCE showed that 57% of all eating events were classified as meals and 43% as snacks. When comparing this to the women's own naming of their meals and categorising according to de Graaf (2000), about 74% of the eating events were classified as meals and the rest as snacks. According to FBCE, the most common eating events among self-managing women were incomplete meals and complete meals. These meals can be either prepared or quick-prepared. In this study prepared complete meals contributed significantly more energy per meal than did quick prepared complete meals. This might be explained by the fact that when preparing a meal more energy dense food items are included or perhaps the portion sizes might be larger. This could also be compared to Study IV, where hot meals contributed the most energy of the meals. A prepared meal was more energy dense and could probably also be called a dinner or lunch, as prepared meals for older women are lunch and dinner (Study III).

Table 8. Frequency and of end energy content in eating events to which elderly self-managing women (n=139) during totally 695 days and disabled women (n=63) during totally 315 days of dietary registration had given names (Study III).

| Eating events | % of eating events | | % of daily energy from eating events | | % of women consuming | | Mean energy in KJ (kcal) according to eating events | |
|---|---|---|---|---|---|---|---|---|
| | Self-managing | Disabled | Self-managing | Disabled | Self-managing | Disabled | Self-managing | Disabled |
| *Meals* | | | | | | | | |
| Breakfast | 15.8 | 15.1 | 20.7 | 20.5 | 92 | 94 | 1510±694 (361±166) | 1360±665 (325±159) |
| Lunch | 9.1 | 8.9 | 23.8 | 20.7 | 66 | 64 | 2067±1038 (494±248) | 1707±837 (408±200) |
| Dinner | 13.1 | 14.0 | 29.6 | 32.8 | 89 | 89 | 2536±1222 (606±292) | 2335±1029 (558±246) |
| *Total* | *38* | *38* | *74.1* | *74.0* | | | | |
| *Snacks* | | | | | | | | |
| Morning | 4.9 | 5.8 | 8.2 | 8.9 | 38 | 49 | 762±607 (182±145) | 879±745 (210±178) |
| Evening | 10.0 | 7.3 | 12.0 | 11.0 | 77 | 62 | 1213±791 (290±189) | 1046±615 (250±147) |
| Tea & coffee | 16.8 | 15.4 | 2.5 | 2.1 | 87 | 90 | 791±544 (189±130) | 711±548 (170±131) |
| No-named | 30.3 | 33.5 | 3.2 | 4.0 | | | | |
| *Total* | *62* | *62* | *25.9* | *26.0* | | | | |

The ten complete meals, both prepared and quick prepared, with the lowest energy content on an individual level were however analysed in order to use the method on an individual level in relation to energy intake. Each of the 20 meals represented an individual woman. Only four of these 20 women had a sufficient energy intake according to recommendations, as the total energy intake during the day ranged from 3.6 to 9.5 MJ (The Swedish National Food Administration, 1997b). It was found that the qualitative method, FBCE, was useful to describe the diet among a group of elderly women. However, on an individual level, some complete meals were low or very low in terms of portion size and consequently low in energy. This could explain why there were differences between classifying meals and snacks between FBCE model and using de Graafs definition and the women's own definitions on meals and snacks. Eating a main meal with low energy content can be acceptable occasionally, but if such meals are eaten regularly there might be a risk that the total energy intake will be too low and will not be detected with this method. Thus the women's own definition of meals was more useful in showing their nutritional significance than were researchers' categorisations of meals. Still, FBCE might be more appropriate when making cross-study comparisons.

**Evaluation of dietary intake**

An important issue regarding the validity of dietary assessment methods is estimating the under-reporting in subjects' self-reports. It is now generally recognised that self-reported food intake underestimates actual food intake (Black, 2000; Black et al., 1991), and that this underestimation amounts to up to 20% of the energy intake among elderly (Tomoyasu et al., 1999). This might to some extent explain the present low energy intake figures (Studies I, II and IV). With this in mind it could be expected that this group of elderly women actually have a sufficient energy and nutrient intake, that is if about 20% is added to the energy intake. On the other hand, since no physical activity registration was done, it is difficult to ensure that older women are not at risk concerning dietary intake.

To evaluate dietary data, the doubly labelled water technique is an efficient but expensive method to use (Goldberg and Black, 1998). Another way to evaluate dietary intake data is to calculate the quotient between the reported energy intake ($EI_{rep}$) and an estimation of the basal metabolic rate ($BMR_{est}$). Among the present self-managing women the $EI_{rep}$:$BMR_{est}$ figures (see Table 4) indicate obvious under-reporting at the group level, with an overall mean of 1.24 compared to the suggested cut-off at 1.54. Comparing the values at the individual level, 43 of the 135 women had lower values than 1.07, suggesting 32% could be under-reporters. Among disabled women, the $EI_{rep}$:$BMR_{est}$ figures indicate obvious under-reporting at the group level, with an overall mean of 1.22 compared to the suggested cut-off at 1.32. Comparing the values at the individual level, 9 of the 63 women had lower values than 0.89, suggesting that these 14% could be under-reporters.

The low $EI_{rep}$:$BMR_{est}$ found in all groups of women might partly be explained by the fact that all women completing the recordings on five non-consecutive days were included (Studies I-III, and V). In determining under-reporting, it is difficult to decide exactly where the cut-off points should be set, since these calculations were primarily based on ”standard values”, as suggested by Black (Black, 2000). We also know that a few of the women intended to lose weight. Further, weight loss after stroke is common. Weight stability is necessary for interpretation of $EI_{rep}$:$BMR_{est}$ (Hambraeus, 1998).

Some of the disabled women were more seriously affected by their disease than others, and may have a low intake of foods and energy due to a downward spiral. We chose not to report disease duration since it does not show the impact of the disease on the ability to manage daily life. It is well known that for all three disease groups, the condition of illness can differ from day to day. RA appears in periods, and PD is a progressive degenerative disease. However, as dietary data were collected for five non-consecutive days, the chance of including both ”good” and ”bad” days might be improved. As the inclusion of these women was done from medical registers, i.e. patient records, we are aware of that the women most probably represent a broad spectrum of the diseases, further they did not suffer from dementia. Some women in the RA group might have been avoiding certain food items to keep their disease in check. Setting a cut-off limit among women with PD and RA is difficult since the disease itself may affect the metabolism (Davies et al., 1994; Kempster and Wahlqvist, 1994; Markus et al., 1993; Roubenoff et al., 1994). Still it is important to study older persons with these diseases, but in doing so cut-offs should be used carefully. It is essential to examine whether reasonable cut-off points for $EI_{rep}$:$BMR_{est}$ influence estimates of nutrient and food intake. Studies have shown that older women under-report to a greater extent than do older men, and obese individuals under-report to a greater extent than do non-obese (Johnson et al., 1994; Rothenberg et al., 1997). There was a tendency that self-managing and disabled women classified as under-reporters had higher BMI-values than did women not classified as under-reporters, which is in accordance with other studies (Hirvonen et al., 1997; Johansson et al., 2001; Poppitt et al., 1998). In Study I, women classified as under-reporters were compared with those not classified as such. There was a general underestimation regarding the majority of energy yielding nutrients, selected nutrients as well as energy-dense foods, which was in accordance to other studies performed in Sweden (Becker et al., 1999; Johansson et al., 2001). However, Poppitt et al. (1998) showed that the energy intake from meals was accurately reported while energy from snacks eaten between meals was significantly under-reported. Yet, the intake of snacks in the present study (Study III) was quite high.

Apart from underreporting, several different factors, such as poor appetite, loneliness, high intake of medicine and low physical activity, might contribute to low energy intakes (de Jong, 2000; Kempster and Wahlqvist, 1994; MacIntosh et al., 2000; McCormack, 1997). In Study II, disability could be

added as another main factor (Sem et al., 1988; Wylie et al., 1999). Moreover, while recording food intake, the women might have been more attentive to what they were actually eating and in what quantities (Gibson, 1990), which might have affected energy intake in a negative way.

**Dietary assessment methods**

A combination of dietary assessment methods, a repeated 24-h recall and a 3-day estimated food record, were used (Studies I, II, III and V). The methods were chosen to give information about individual meal patterns, composition of each meal as well as food choice and nutrient intake, therefore a food frequency questionnaire or a diet history could not have been used. The chosen methods were used in close temporal proximity to actual consumption. Furthermore, elderly often have a regular meal pattern, which makes it easier for them to keep records ”in the meal situation”, as was shown by the women studied in the project. According to Wirfält (1998, p 57) the 24-h recall is a ’true recall of distinct, discrete events in the very recent past’. Thus, it was judged a suitable method, since the ability to remember was ascertained during the phone call before inclusion and at the visit in the woman’s home. Performance of the interviews in the women’s home was supposed to facilitate accurate recall of food intake. Another advantage was that the researcher could check the sizes of cups and glasses, which may have enhanced the validity of the intake data. In Study IV, two 24-h recalls were used, based on two non-consecutive days of food intake, which entails a risk for distortion of results concerning nutrients that occur in abundance in food items that are rarely consumed. No difference was seen in energy intakes when comparing the 24-h recalls performed among self-managing women in their homes or by telephone (Study IV). This method is not representative at the individual level, and a reliable picture is therefore impossible to give for any of the presented nutrients. In this study, qualitative data provided useful information in combination with dietary data.

The estimated food diary may be an easier and less burdensome method to use for the subject, compared to a weighed record where everything is supposed to be weighed before eating (Cameron and Van Staveren, 1988). However, it is well known that there are problems with all dietary assessment methods such as underestimation of the dietary intake. It was shown for some women, mostly disabled, that it was difficult to fill in the food diary.

The merging of the two dietary methods, i.e. 24-h recall and food diary, was done mostly for practical reasons such that it was easier to present the result as one mean value. According to Cameron and Van Staveren (1988) a combination of two methods might give more information or might make a study easier to carry out. Further, according to Bingham (1994b) errors between methods are not usually correlated, which means that improved estimates can be obtained from a combination of two or more methods of dietary assessment. Merging methods is not common, though it has been done

to show pre-school children's food intake at home and at pre-school, where estimated and weighted food records were merged (Sepp, 2002).

In this thesis a picture of the habitual dietary intake was desirable, which was obtained when combining the methods. The criterion for doing this was that there were no statistical differences in intake of energy, energy yielding nutrients or selected nutrients. Further, the measurement error decreased, which indicates that it was appropriate. Still, some minor differences were seen in food intake. There were minor differences with respect to food items for the two dietary assessments methods used. For self-managing women (Study I), the figures from the 24-h recall were significantly higher for fruit, berries and juice, spread, meat/meat products and coffee, while the intake of vegetables was higher according to the food diary. Minor differences were also present between the two methods when studying food intake among disabled women (Study II). Intakes of food groups such as sausage were significantly higher for the 24-h recall, whereas following figures from the food diary were significantly higher for vegetables, alcoholic drinks, pancakes and waffles, and sauces. The few differences between the two dietary methods in terms of the reported food intake are difficult to explain, as there were no differences in intake of energy, energy yielding nutrients or selected nutrients between the two dietary assessments methods for both self-managing and disabled women. One explanation might be that the women tend to forget or underestimate certain food items when self-reporting items such as alcohol, pancakes, waffles and vegetables, and this might be more difficult to estimate using household measures.

Collection of data in large projects requires more than one person. In these studies (I-VI), six researchers have collected data. The inter-investigator effect was controlled for by having all researchers interview women in all age groups and both household structures. There were no differences regarding the subject's energy intakes for interviewers when tested by the Kruskall-Wallis non-parametric test, neither among self-managing nor disabled women.

**Participation and non-participation**

Study VI describes reasons for possible self-managing women not participating in the MENEW project. The participating women were randomly selected from a population register. Of 505 contacted women, 106 were excluded from the study, with a significantly higher proportion of women in the highest age group, i.e. 84-88 years. The reasons for exclusion did not differ significantly between municipalities. "Illness, disability or dementia but living at home" and "Living in an institution for old people" covered 67% of the exclusions, with women in their 80s dominating these categories. However, it can be discussed whether the criteria for inclusion, i.e. that the women were required to be healthy according to their own definitions, self-managing regarding the meal situation, to have proper time-orientation and be mentally able, have excluded women that could be considered as frail. With age, disability and disease

increase and requiring women to define themselves as healthy might have been too high a criterion. The rigorous inclusion criteria might also have contributed to the high number of excluded women. These women would have been valuable to include in the MENEW project. On the other hand, in Sweden, 86% of people aged 75 and over considered their health very good or fairly good when answering a questionnaire. (The National Board of Health and Welfare, 2000).

Two hundred and forty women (60%) declined participation. There were no significant differences regarding percentage of declining women and household structure or in the municipalities, however the rate was somewhat higher in town C than in A and B. This might be explained by the fact that the police authorities in municipality C had warned old people not to let strangers into their homes due to a wave of burglary (unpublished data). Fear of home-visits may be hidden in several of the explanations given for declining (Study VI). Harris et al. (1989) found that older people were unwilling to participate in in-home visits. Many of the women that declined participation could also be defined as frail, as frailty has been associated with, for example, self-reported exhaustion, weakness, unintentional weight loss, slow walking speed and low physical activity (Fried et al., 2001).

The most common explanations for declining participation are shown in Table 9. ”Tired, fragile, ill or having a bad memory” was most often expressed among women in their 80s, and ”Lack of time” among those in their 60s. ”Unwillingness to participate in scientific studies” was one type of declining explanation most often used by single-living women. Together these three categories cover 57% of the explanations given. The participation rate varied for the three municipalities, as it did among single-living and cohabiting women in different age groups, but there were no significant differences present.

In high age, disease including disability is frequent, which was one reason why many of the selected and contacted women were excluded or declined to participate in the MENEW project. The explanations for declining participation ”Nothing to contribute” and ”Unwillingness to report eating” indicate that many of the invited women found it difficult to report eating habits. Perhaps their dietary intake was not in accordance with recommendations, explaining why some women were unwilling to report their own intake (Isaksson, 1998). This is much discussed in the sociological and gender literature (Counihan, 1999). This implies that the women actually participating might be healthier and/or might have different food habits than those who declined participation or were excluded. Consequently, health-conscious persons interested in their diet may be over-represented in the study sample, as has been discussed in other studies (Berglund, 1998; Harris et al., 1989; Holcomb, 1995; Pedersen, 2001; Rothenberg, 1997; Schroll et al., 1996). Thus, we have probably not been able to reach the most active or the least active groups of retired women. The

participating group of women probably represents a specific group, perhaps a ”middle-group” of Swedish women. However, characteristics such as attitudes to food, education, economic situation, types of housing etc., factors that vary in the community, should be covered as stratified random sampling was used.

Rothenberg et al. (1993) had a fairly good participation rate in a study performed among older women. (Isaksson, 1998) points out that dietary assessment performed at home-visits gives an optimal result. However, the in-home 24-h recall method was chosen to obtain valid data, which is possible when the participants are able to show portion sizes, household equipment, specific food items and labelling of certain food items.

However, it has been shown that participation rates are low in dietary studies, especially among elderly women (Becker and Pearson, In press; Harris et al., 1989; Johansson et al., 1997; van't Hof et al., 1991; Wright et al., 1995). The participation rate in the group of self-managing women (Studies I, V and III) was 40%, whereas dietary data were used for 34% and 35%, respectively. Compared with other food surveys in the older generation, the present results are fairly good also among the women in their 80s. Compared to a British study, where the response rate was 20% of those aged over 85 years, the present rate for those in their 80s (37%) was positive (Wright et al., 1995). However, the fact that participation rates did not differ significantly among the three municipalities, the three age groups or between single-living and cohabiting women indicates that the sample was adequately representative of the population.

Since the rate of exclusion and declining of women with disease and illness among possible self-managing women was high, the participation rate was expected to be low also in the study of disabled women (Studies II, III). However, in this group the participation rate was fairly good, as 49% of the women were visited in their homes. Because 10 of the women failed to fill in the food diary, the final participation rate was thus 42% (Studies II, III). Just as among possible self-managing women, the main reasons for not participating in the three groups of disabled women (Study II) were tiredness and problems related to illness. Regarding women with PD and stroke, inclusion was based on consecutive selection from lists of patients enrolled in hospital. Due to hospital obligations to observe professional secrecy, random selection from a list of all patients was impossible, making it difficult to evaluate how selection methods might have affected the results. The women with RA were selected by a research nurse, who was not part of the project and who called potential participants and invited them to take part. This might, however, have contributed to the high number of refusals in the RA group, because of priority reasons. This suggests that women with these diagnoses living at home may have more problems than documented in the present sample. A wide range of symptoms of the disease among the women was stated in the personal records at the hospital and was also shown in the qualitative interviews (Gustafsson et

al., In press). However, it might be that the women declining to participate were more affected by their disease and therefore declined participation.
In Study IV, all women were selected primarily to take part in the qualitative study and this may have diminished the external validity, i.e. generalisability of the results, since those willing to talk about food dominated the sample.

Studies have shown that social class affects the dietary intake, for example the general trend is that the higher the social class, the more the diet corresponds to healthy eating guidelines (Mennell et al., 1992; Cass Ryan and Bower, 1989). One shortcoming of this study is that we have no data on social class, educational level or occupation. However, among the self-managing women, the selection was performed randomly. The disabled women were selected from a patient register; however there is no reason to believe that there is a distorted distribution of women regarding social class. However, we do not know whether specific groups of older women might decline or accept to participate in dietary studies.

Unfortunately, the two selection methods for the self-managing and disabled women, i.e. random and consecutive, respectively, made it impossible to compare the two groups statistically. However, it is difficult to perform random sampling on persons with diseases, due to hospital secrecy.

Table 9. Explanations for declining participation according to age groups and living status among elderly women.

| Categories | 64-68 (n=64) | 74-70 (n=82) | 84-88 (n=94) | Total (n=240) | Single (n=128) | Cohabiting (n=112) | Total (n=240) |
|---|---|---|---|---|---|---|---|
| 1. Lack of time | 22 | 15 | 11 | 48 | 21 | 27 | 48 |
| 2. Tired, fragile, ill or having bad memory | 5 | 9 | 31 | 45 | 20 | 25 | 45 |
| 3. Unwillingness to participate in scientific studies | 15 | 16 | 13 | 44 | 28 | 16 | 44 |
| 4. Too old and nothing to contribute | 7 | 11 | 16 | 34 | 19 | 15 | 34 |
| 5. Declining participation without explanation | 6 | 12 | 12 | 30 | 20 | 10 | 30 |
| 6. Unwillingness to report eating | 3 | 7 | 2 | 12 | 8 | 4 | 12 |
| 7. Lost interest in food and cooking | 3 | 2 | 2 | 7 | 2 | 5 | 7 |
| 8. Unwillingness to invite researchers to her home | 4 | 2 | 1 | 7 | 5 | 2 | 7 |
| 9. Just became a widow or in mourning | 2 | 3 | 1 | 6 | 4 | 2 | 6 |
| 10. Husband objects to wife's participation | 0 | 0 | 5 | 5 | - | 5 | 5 |
| 11. Not old | 2 | 0 | 0 | 2 | 1 | 1 | 2 |

**SUMMARY**

To study elderly women's dietary intake and meals, as well as energy and nutrient intake in relation to age, household structure, disease and cooking ability, both quantitative and qualitative methods have been used in the present thesis. The women participating were self-managing and disabled with Parkinson's disease (PD), rheumatoid arthritis (RA) or stroke.

The participating women reported a low energy intake. This was present in all groups investigated, i.e. self-managing women, disabled women and women classified according to cooking ability. The low energy intake can be explained by an actual low intake and/or under-reporting. Even though there may be underreporting, it is likely that suffering from diseases such as stroke, PD and RA contributed to the low energy intakes as well as to declining cooking ability. The intake of nutrients was mostly adequate according to nutrient density. This might be explained by the varied food intake. Food intakes among both the self-managing and the disabled women were dominated by non-energy drinks, (coffee, tea and water), milk products, fruit, berries and juice, and potatoes and vegetables.

Intake of energy and selected nutrients was compared between age groups and household structure for self-managing women. Between the age groups few differences were seen regarding intake of nutrients. However, overall the lowest intake was obtained in the highest age group. When comparing women regarding household structure the only difference was that single-living women had a significantly higher intake of selenium. When comparing women with a disability no differences were seen. Also, when comparing women classified according to cooking ability, no differences were seen regarding intake of energy and selected nutrients.

The eating events among self-managing and disabled women were spread during day and night, which means that the women's meal patterns can be characterised by individuality and flexibility. For example dinner, i.e. the most energy dense meal, was spread between 11 am and 20 pm. Among women classified according to cooking ability, it was shown that the reported mean energy in a hot meal differed significantly between all groups, with the highest content in the cooking group and the lowest in the part-cooking group. This indicates that when disability in the meal situation is present, it may have consequences for the dietary intake.

The women's own definitions of their eating events and subsequent categorisation of their definition into meals (breakfast, lunch and dinner) and snacks (all other eating events) were used to study the meal pattern. The meals contributing to most energy reported and defined by the women themselves were dinner, lunch and breakfast, in that order. These meals contributed 74 percent of the total daily energy intake. The most important meal from an

energy perspective was meals classified as prepared or hot, or defined as dinner by the women. Dinner was eaten by 90 % of the women and these meals consisted mostly of potatoes, meat and gravy. Eating events defined as morning, evening, tea or coffee, by the women, contributed 22-23 percent of the total daily energy intake. In terms of frequency, meals were 38 percent of the total eating events reported, whereas snacks amounted to 62 percent. Of the snacks, 30-33 percent were eating events not defined by the women, and these contributed only 3-4 percent of the total daily energy intake. These snacks could be characterised as ”grazing”.

The qualitative dietary assessment method FBCE, which is said to be useful for screening of dietary intake among elderly living at home, in geriatric care or have home care services, was shown to be useful on an group level, however not on an individual level. Looking at separate meals as described in the FBCE model, some of them had low energy content, which depended on small portion sizes. In several cases, the women consuming meals with a low energy content also had a low total daily energy intake.

To evaluate the dietary data collected and to gain an understanding of the generality of these results, a drop-out analysis among the self-managing women was performed. Participation rate ranged from 34 to 42 percent, and compared with other food surveys among the older generation, was relatively good especially among women in their 80s. The content analysis of women's stated reasons for declining participation indicates that active younger old people, on the one hand, and tired, fragile, ill or frail older old people as well as those with bad memories, on the other hand, declined participation. Furthermore, those with illnesses, disabilities or dementia were excluded.

## CONCLUSIONS

The results of this thesis indicate that elderly women still living in their homes seem to manage a sufficient dietary intake despite disability and high age. However, when looking at individuals, this age group of older women might be at risk for inadequate dietary intake, and especially in relation to energy intake.

The low energy intake in this group of elderly women should thus receive attention, especially among the eldest, i.e. those >80 years. The portion sizes seemed to be smaller in the highest age group, leading to lower intakes of some nutrients. Thus also the nutrient density of the food should be given greater consideration. Education regarding this issue, i.e. practical guidelines for how to obtain nutrient-dense food, should be of priority and directed towards the elderly themselves as well as those responsible for the care of elderly persons still living at home. Many elderly have to manage on their own without help from the society. Therefore individual dietary advice should be given according to the woman's specific needs at different ages, and with regard to household structure and disability. Dietary advice should also take the women's meal definitions and meal pattern into consideration, since it was shown to be regular and the distribution of main meals and snacks was found to be satisfactory.

Snacks that were defined by the women and frequently and regularly consumed must not be underestimated as important energy sources for old women. "Grazing", that is irregular eating events (snacks) that were undefined by the women, however, had a negligible effect on the energy intake. Meals and snacks that are defined by the women themselves thus seem to be more significant from a nutritional perspective than are meals theoretically classified in scientific models.

Another conclusion of this study was that the qualitative dietary assessment method, FBCE, must be supplemented with a dietary assessment method giving the energy intake to ensure that it is sufficient, especially when studying groups at risk for malnutrition. The FBCE method can, however, as it seems, be used to evaluate the diet among a group of elderly women.

When studying older women and food, a low participation rate might be expected as the most active and the very ill and disabled will decline participation, but also because food is a gender issue. Women, in all age groups, are still responsible for food in the household. Food could, especially for women, be a sensitive area of discussion, even though older women seem to choose "healthy foods" and eat "proper meals". Still, dietary studies involving older women should be further developed.

## ACKNOWLEDGEMENTS

These studies were carried out at the Department of Domestic Sciences at Uppsala University. I would like to express my sincerest gratitude to all those who, in different ways, have contributed to this work. I particularly wish to thank the following persons:

First of all, I would like to thank all the women who kindly gave of their time and participated in the studies. Without their effort and generosity this work would not have been possible.

I wish to thank Professor Christina Fjellström, my supervisor, for introducing me to the MENEW project and directing my work, for inspiring and encouraging me with her enthusiasm during good times and bad. I am also grateful to her for excellent scientific guidance, stimulating creative discussions, and for coaching me especially through the final stages of this thesis.

Dr Margaretha Nydahl, a skilled dietician and my co-supervisor, contributed her invaluable knowledge of nutrition and provided constructive criticism on all parts of the MENEW project and on all parts of this thesis – for this I wish to thank her. I am also grateful to her for supporting and encouraging me during these years, for her never-ending patience and for always having time for my questions and me.

I wish to thank Associate Professor Birgitta Sidenvall, Department of Public Health and Caring Sciences, my supportive co-author in the MENEW project, for generously sharing her knowledge, particularly with regard to Paper VI. She also provided constructive discussions on all parts of this thesis for which I am very grateful.

Kerstin Gustafsson, Department of Public Health and Caring Sciences, my co-author, was involved in fruitful discussions on all parts of the MENEW project, papers and theses, and assisted me with her invaluable knowledge of nursing – for all of these things I am very thankful. I have especially appreciated our frequent lunches with talk about work, science and life.

In addition I wish to thank:

Katarina Virhammar for coding and entering data in the MENEW project and for her good friendship and frequent chats throughout the years. She also deserves special thanks for lending me her bicycle every now and then.

Karin Nordhamn for coding and entering data in the MENEW project and for many good laughs during the time we worked together.

Ingegerd Andersson for data collection in the MENEW project and for her kindness.

Helen Göranzon, head of the Department of Domestic Sciences, for enabling me to be surrounded by an inspiring group of co-workers and friends and for her interest in my work.

Lillemor Abrahamsson, director of doctoral studies at the Department of Domestic Sciences, for working towards developing research at the department and for her interest in my work.

Agneta Andersson for critical and constructive help in the final stage of this thesis, and helping me to think the ”right” way.

Iwona Kihlberg, my roommate, for putting up with me during the final stages of this thesis and for good friendship during the years.

All other friends and colleagues at the Department of Domestic Sciences for being friendly and helpful, and for creating a warm working atmosphere. Special thanks are due the ”FoU group” for constructive help and stimulating discussions during the years.

Gunnar Johansson for a valuable and stimulating discussion in the final stage of this thesis.

Karen Williams for critical review of the English language in my work and for improving my English.

Lars Berglund and Roland Pettersson, for statistical advice, and to Eric Poortvliet, for advice and practical help with statistical analysis.

Staff at the Akademiska Hospital, Uppsala, for help with inclusion procedures for outpatient women.

And last, but not least, I wish to thank all my family and all friends, especially:

My grandmother, Maj, for her never-ending support and kindness.

My parents, Ingela and Christer, for always supporting me, believing in me and being there for me whenever I have needed them. Also for lending me their car during a period of data collection.

Henrik’s family, foremost Rose-Marie and Lennart, for their patient understanding and for spending time together on Orust.

My fiancé Henrik for being supportive, understanding and patient during this demanding period in my life, and for helping me to experience other important things in life. Also for his invaluable computer assistance, which has helped me greatly in my work.

This work was supported by grants from the Swedish Council for Working life and Social Research, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, Stiftelsen Uppsala Hushållsskolas fond, Stiftelsen Uppsala Hemsysterskolas fond, Stiftelsen Engelbrekts Barnavård och Husmodersskola, Svenska Livsmedelstekniska föreningen, Lundellska fondstiftelsen and KP fonden.

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