Pre-school Children’s Food Habits and Meal Situation

Factors Influencing the Dietary Intake at Pre-school in a Swedish Municipality

BY

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ABSTRACT


A pre-school-based dietary survey, using seven-day records, focus group interviews and semi-structured interviews, was carried out in a suburban area of Stockholm. The overall objective was to investigate the individual food and nutrient intake of pre-school children at all meals during the day, as well as factors that might influence children’s intake.

The average energy and nutrient intake per day for the whole week was satisfactory for the 109 pre-school children, but the temporal distribution throughout the day was skewed. The energy and nutrient intakes of food at the pre-school were lower than recommended. This was, however, compensated for by meals eaten at home. The children had a more varied food intake during weekdays than weekend days. This study has not provided any evidence to support the selection of water versus milk as a preferable lunch beverage in terms of pre-school children's total milk consumption and general dietary quality. However, the dietary analyses showed that there could be a reason to limit pre-school children’s daily milk and fermented milk intake to half a litre, according to the existing guidelines.

The children associated food and eating with rules and norms. They did not categorise food as good or bad, as adults often do, but as “food” and “non-food”; for example, sweets were not food. The method used in this study, the focus group interview, was judged to be a useful tool for exploring how children think about and jointly reflect upon food. The role of the teacher had changed over the past years and they had not yet found a solid ground for integrating food and meals into their everyday work.

Key words: children, food, meals, nutrient, pre-school, teachers

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"Att forska om barn behöver mjölk är som att forska om båtar behöver vatten..."

Granne från Nossebro
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ABBREVIATIONS
BMI Body Mass Index
BMR Basal Metabolic Rate
EI Energy Intake
EU European Union
E% Energy percentage
HS Hanna Sepp
M-children Children at pre-schools where milk was served as a meal beverage at pre-school lunch
MJ Energy, Mega Joule
g/MJ Nutrient density, gram/Mega Joule
NFA Swedish National Food Administration
NNR Nordic Nutrition Recommendations
PAL Physical Activity Level
PCA Principal Component Analysis
RDA Recommended Dietary Allowances
REE Resting Energy Expenditure
SD Standard Deviation
SNR Swedish Nutrition Recommendations
W-children Children at pre-schools where water was served as a meal beverage at pre-school lunch
WHO World Health Organization
BACKGROUND

Introduction

The roots of the Swedish childcare system can be traced back to the second half of the 19th century. The first infant crèche was opened in 1854 in Stockholm for children of single mothers who were forced to work for a living (Tallberg Broman, 1995). In a regulation from 1891 at a pre-school in Lund, food is mentioned as an important issue “Children from one to six years of age may be admitted at the crèche. Children at the crèche receive nourishing food” (Tallberg, Broman, 1995, p.11). However, it took 90 years before the pre-schools received governmental financial support, meaning they also became controlled by the state.

In the 1960s, female labour was in demand and calls for a major expansion of childcare facilities intensified. In 1968, the government appointed a special commission, the National Commission on Childcare (Government Report, 1972), which presented a proposition on how a childcare system that met social, educational and supervisory requirements might be developed in Sweden. In 1985, the Swedish Parliament decided that all children from the age of 18 months until school age were to have access to the municipal childcare system (Government Report, 1985). In 1998, the pre-schools received their first curriculum (Government Report, 1998) and were thereby under the control of the National Agency of Education, meaning that what had once been a municipal affair was now a national one.

The public meal for children

In Sweden, three of every four children 1-5 years of age (National Agency for Education, 2000) are enrolled in the municipal childcare system. Consequently, more than 360,000 children are served one to three meals a day (breakfast, lunch, afternoon snack) at pre-school (Sundström, 2000). Thus, for a majority of children, the childcare system is responsible for their dietary intake during most of the weekdays. Yet the public meal in pre-schools has not been regulated in any law, guidelines or curriculum, nor in any other documents from specifically departments of state. This is the case despite the fact that, since 1968, the National Commission on Childcare has characterised the food and meal situation as a pedagogic activity, later defining it as the pedagogic meal. It has, thus, been up to each municipality to set its own quality standards for the pre-school food system. The meal situation had been entirely a municipal affair until 1996, when the National Food Administration in collaboration with the Centre for Applied Nutrition within the Stockholm County Council and the Swedish Association of Local Authorities developed a guideline for pre-school meals including energy and nutrient recommendations as well as recommendations for what kind of foods should be served, how much and when (Wållberg et al., 1996). How these guidelines, aims and recommendations are received and followed is of great interest to parents, personnel responsible for childcare as well as public authorities, in the latter case given the extensive use of childcare in Sweden. This is particularly important when financial cutbacks are increasing in this as in all public services. The
tightening of the childcare sector during the nineties was mainly caused by an increasing birth rate in the absence of corresponding funding increases. The parents pay a fee, which in most areas is linked to the family’s income and/or the child’s total hours of attendance. However, this fees only cover on average 17% of the actual costs (Nilsson & Pettersson, 2000).

Studying children’s food habits
Few studies investigating the diet of pre-school children in Sweden have been performed. These studies are mainly focused on children’s energy and nutrient intake, and in some cases food intake (Hagman et al., 1986; Jacobson & Nordlund, 1994; Koivisto et al., 1994b). In none of the studies do the meal environment at the pre-school, the behaviour of the pre-school staff or the children’s perception of food and eating seem to have been covered, although there are many reasons why research on pre-school children's food habits in a broader perspective is of interest. First of all, food habits determine nutritional intake, which promotes growth, development and health. Second, food choice is important in the establishment of eating habits (Casey & Rozin, 1989; Kelder et al., 1994; Birch, 1999; Koivisto Hursti, 1999; Rolls et al., 2000). Third, obesity and diabetes as well other eating disturbances are increasing among young people in Western society (World Health Organization, 1997; International Life Sciences Institute, 2000). An understanding of the early development and interaction of different factors that influence the food choice with regard to nutritional intakes is therefore of importance. Studying pre-school children’s food habits, however, is complex and many parameters should be taken into consideration. In every culture there are, for example, rules and norms about which foods are edible, how they should be prepared and served and when and how they should be eaten; these rules also depend on age, sex, residential and social status. Therefore, in studies of food habits in general, it is important to look not only at the energy and nutrient intake, but also at the meal, table manners among children among pre-school staff, as well as other behaviours and interactions at the table.

The aim of the following presentation is to give an overall picture both of the research on pre-school children’s food habits and of the complexity of studying these phenomena.

The socialisation and acquisition of food preferences in pre-school children
Since most children in Sweden between the ages of one and five are enrolled in the municipal childcare system, parents share responsibility for their children’s socialisation and acquisition of food habits with personnel responsible for the pre-school meals. Socialisation is the process whereby a culturally valued behavioural norm is passed on from generation to generation (Mennell et al., 1992); as shown in Figure 1, this process can be divided into primary, secondary and re-socialisation (Fieldhouse, 1996). The acquisition of food habits through primary socialisation during
infancy and childhood is primarily accomplished through interaction with family and later also with friends.

Figure 1. Socialisation and the acquisition of food habits (Reproduced with the permission of Nelson Thornes Ltd from Food and Nutrition: Customs and Culture 2e, Fieldhouse, 1995)

The foundations of food choice are laid down in childhood and dietary habits learned in childhood may persist into adult life (Birch, 1999; Koivisto Hursti, 1999; Rolls et al., 2000). Rozin and colleagues have suggested that in the development of food selection, one of the things that children must learn between infancy and early school age is not only what to eat, but they must also acquire a more or less adult attitude regarding what is and is not food within their culture (Rozin et al., 1986).

The dietary awareness of children is subject to a range of complex interactive forces. The development of food preferences has been shown to be a function of social rather than genetic factors (Rozin & Millman, 1987; Rozin, 1990). It has been suggested that there is a critical period, ages 2-5 years, for the formation of food preferences (Birch, 1980). During these formative years, parents largely influence the food choice, which also is shown in the Fieldhouse model in Figure 1. Parents’ beliefs are primarily influenced by culture, dietary awareness, food preferences and socio-economic status. Numerous studies, including observational laboratory studies (Birch et al., 1984; Birch et al., 1987; Klesges et al., 1991) and field surveys (Constanzo & Woody, 1984; Constanzo & Woody, 1985; Patterson et al., 1986; Seagren & Terry, 1991; Koivisto et al., 1994b), indicate that parents shape not only their children’s food preferences, but also where, with whom, when, and how food is eaten as well as the amount eaten. Restricting access to palatable food is not an effective means of inducing a dislike or reducing intake of such foods (Fisher & Birch, 1999b), contrary to parents' beliefs
(Casey & Rozin, 1989). Parental control might even negatively affect children’s eating behaviour (Fisher & Birch, 1999b), which may lead to a higher risk of adiposity (Johnson & Birch, 1994). Generally, approaches to controlling eating in children are thought to undermine their ability to develop self-control of eating behaviour (Johnson & Birch, 1994; Birch & Ficher, 1998).

Children and new food
Taste and familiarity are two major motives for food choice among children and adolescents. Children do not readily accept, and even tend to be afraid of, new foods. This neophobia is normal in children. Children consume foods they like and are familiar with, and many highly preferred foods are energy-dense foods, often high in fat or sugar content (Ross, 1995; Koivisto & Sjödén, 1996; Koivisto Hursti, 1999; Koivisto Hursti & Sjödén, 1999). In addition, children have an inborn preference for sweets and aversion to bitter tastes (Rozin et al., 1986), and they seem to develop dislikes or bad tastes more easily than likes or good tastes (Koivisto Hursti, 1999). Neophobia is reduced by repeated consumption of new foods that is not followed by any unpleasant experiences (Birch & Marlin, 1982; Pliner, 1982; Sullivan & Birch, 1990; Pliner et al., 1993).

Influences on food preferences
As childhood progresses, parental influence decreases in strength and additional forces begin to compete, for example peer pressure (Yperman & Vermeersch, 1979; Birch, 1980; Greer et al., 1991; Fergus et al., 1998; Hendy & Raudenbush, 2000) and the media (American Dietetic Association, 1997). The effectiveness of marketing campaigns targeted to younger age groups is well known as regards the marketing of beer (Grube, 1994) and tobacco (Pierce, 1991). Increasing children’s knowledge of brand names, fostering more positive attitudes towards consumption of snacks, encouraging demands that cause parents to purchase advertised foods, and stimulating direct sales of advertised foods to children are also a well known phenomena in marketing, according to a review by Nestle and colleagues (1998). In Sweden, specific laws regulate advertisement aimed at children (Swedish Statute-book, 1996). In the EU, however, there are no regulations, which means that in the future Sweden must adopt EU laws, provided that the EU does not come over to the Swedish point of view on this issue.

Cultural norms regarding body weight
Concerns about weight problems, such as obesity and anorexia nervosa, have grown in recent years, and this focus might influence food habits even among children (Edlund, 1997). In Western society, looking good, especially for woman, has become associated with a pre-occupation with weight and shape (White, 1992). A slender physique is now seen not only as a standard of physical attractiveness, but also as a public statement about health and self-control in a culture of ambiguities and temptations (Lupton, 1996). Unrealistic ideals for shape and weight are found everywhere, for example in
the dolls Barbie and Ken with their very unrealistic body size proportions (Brownell & Napolitino, 1995). Dyrenfoth et al. (1980) found that children rated obese children as less attractive and associated round fleshy bodies with laziness, meanness and dirtiness. In a Swedish study by Edlund et al. (1996), 28% of the 7-year-old girls studied stated that they wished to be thinner and 22% that they had made attempts to lose weight. Furthermore, it has been estimated that more than one-fourth of American children have overweight or eating problems that began before adolescence (Satter, 1987; Feldman et al., 1988). Similar results are also found in Sweden (Larsson, 2001).

### Methods in assessing food habits

There is no clear definition of the term “food habits”. Mead (1943) defined food habits as “the culturally standardised set of behaviours in regard to food manifested by individuals who have been reared within a given cultural tradition. These behaviours are seen as systematically interrelated with other standardised behaviours in the same culture”. Food habits are not defined in the “manual of methodology for food consumption” by Cameron and van Staveren (1988). However, food habits could probably be the comprehensive and overall term for the defining factors, such as food-related patterns, food patterns, meal patterns and eating patterns. Food is studied within many disciplines. One main line of scholarly activity is centred on the science of nutrition. However, food items become meals and meals are essentially social affairs (Murcott, 1986). Therefore a broad perspective is needed when food habits are studied. According to Prättälä (1989), previous research paid less attention to the cultural aspects of food habits, but the influence of psychological or individual approaches has later come to emphasise Mead's definition. In 1990, Ekström reviewed research on food and culture parallel to that on food and health in Sweden (Ekström, 1990). None of the research reports mentioned included children. Since 1990, Sjödén and colleagues seem to be the only research group in Sweden taking a socio-cultural approach to pre-school children’s food habits. In order to study food habits in an interdisciplinary way, many different methods are necessary, quantitative as well as qualitative. Choice of methods depends on the research question and the objective of the study, as well as on making reasonable demands on participants.

### Quantitative methods

There are several internationally established methods used in dietary studies, the most common being described in the textbooks by Cameron & van Staveren and Gibson (1988;1990). The following short presentation of dietary methods is based on these textbooks. More precise dietary intake must be assessed by quantitative methods, i.e. to describe what has been eaten either in a retrospective or prospective way. Retrospective dietary assessment methods can be difficult for respondents since they must memorise and estimate what they have been eating and drinking. Prospective dietary recording methods, on the other hand, may have the effect of respondents
changing their food habits to facilitate registration of food intake or to conceal their actual intake.

The most common retrospective methods for assessing individual intake are dietary history, 24-hour recall and use of a food frequency questionnaire. The interview method for obtaining dietary history has been developed and used with the purpose of assessing an individual’s total food intake and meal pattern over a certain period of time, usually the past month, six months or past year. This means that information on meal composition, meal frequency and food intake is needed as well as that concerning usual portion sizes. Twenty-four-hour recall involves remembering, in an interview situation, one's food intake over the previous 24-hour period. The food frequency questionnaire is a list of specific food items on which frequencies of intakes are registered over a given time. The record is obtained through interviews or self-administrated questionnaires. The questionnaires can be semi-quantitative when subjects are asked to quantify usual portion sizes of food items.

Using the prospective method, study participants record the intake of all beverages and foods consumed during a certain period of days. The quantities of food are usually estimated with the help of household measurements, food models or using pictures of food and food items; alternatively, all foods and beverages can be weighed. Depending on the number of registration days, the estimation method can be used to assess the actual or usual intakes of individuals. These methods are time-consuming and the burden on the respondent is rather high. The validity of the results depends on the conscientiousness of the respondent and his/her ability to estimate quantities. The respondent, the caretaker or the assistant must be literate. If all the conditions are fulfilled, using a weighed record is considered an accurate dietary assessment method for studying actual intake in groups of healthy people. This is particularly true for young children's intake, assessment of which is done by the caretaker and not the children themselves (Torun et al., 1996).

Some studies have shown that parental involvement has a marked effect on food selection; when parents monitored children’s food intake, the number of non-nutritious foods was lower (Klesges et al., 1991) or certain foods were under- or over-estimated (Eck et al., 1989). When children have reported their own intake, the accuracy of the estimated dietary intake has depended on their preference for different foods (Lytle et al., 1998; Baxter et al., 1999). Some studies have compared parents' estimation of children’s food intake with the children’s own estimation and a fairly good correlation has been found, indicating that involving children is appropriate (Sobo & Rock, 2001). However, more research is needed to address possible psychological and social factors that might introduce bias into reporting on children's diets (Fisher et al., 2000).

In the case of all dietary assessment methods it is important to validate the results. The most accurate method for validating energy intake is the double label water technique.
Background

(Torun et al., 1996). However, this method is time-consuming and expensive. Biological markers can also be used as an independent validity test for food or nutrient intake, but the complexities of nutrient metabolism and environmental factors may affect the usefulness of these methods (Johansson, 1990). This is also true of using physical activity measurements as an independent validity check. A commonly used and cheap validity check is, however, comparison of the reported energy intake and estimated basal metabolic rate based on weight, height, age and sex.

Qualitative methods
Food habits cannot always be adequately analysed in terms of energy, nutrient and food intake in different proportions and combinations as studied by quantitative methods. Other factors of interest are behaviours, perceptions and attitudes as regards food. Qualitative methods such as focus group interviews, interviews or observations may in this case be appropriate. Focus group interviews involve a group assembled to answer questions on a specific topic (Krueger, 1994; Morgan & Krueger, 1998). Interviews can be conducted in many ways, structured or unstructured, face-to-face or by telephone. The objective of the study, money and time determine which interview technique will be chosen. Interviews are particularly valuable in meal research to help researchers understand and describe the respondent’s underlying attitudes and beliefs about food (Lupton, 1996). Experiences from interviews with pre-school children about food are reported by Counihan (1999). Observations based on video recordings allow researchers to document visual perceptions of behaviours as they occur, rather than relying on self-reports of behaviour in tests, questionnaires and interviews (Polit & Hungler, 1995). Ethical considerations are of great importance when using observational methods, especially when such methods are concealed.

Nutrition policies
According to Douglas, food is an encoded social event (Mennell et al., 1992); it expresses hierarchy, inclusion and exclusion, boundaries and transactions across boundaries. In her study, drinks were shared with strangers, acquaintances and workmen, but meals were shared only with family, close friends and honoured guests. However, today in Sweden a major part of the population eat at least one meal a day outside the home, and in the public care sector more than one meal, for example the children at pre-school or the elderly at institutions. The meal is no longer only a family matter, but also a matter of public concern, which is highlighted by the NFA in the nutrition policy (The Swedish National Institute of Public Health & The Swedish National Food Administration, 2000) and NFA guidelines for pre-school children (Wållberg et al., 1996) as well as for school children (The Swedish National Food Administration, 2001).

The focus of Swedish nutrition policy is specified within four areas containing eleven national aims. The four areas are education, support for local and regional nutrition programmes, consumer support and participation, mass catering and restaurants. Four
of the eleven aims are of special interest to food and meal service in public care in general and childcare in particular; these four are:

**Aim 1** The development of school settings for food-health-environmental issues should be supported.

**Aim 9** Guidelines should be established for nutritional quality and meal organisation in private and public mass catering. The guidelines should be made available to the relevant parties in each target group.

**Aim 10** The level of knowledge among production and meal staff involved in private and public mass catering should be increased.

**Aim 11** The authorities should have continuous dialogue with representatives from the mass catering sector.

In 1995, the Swedish Government appointed a National Committee in Public Health to develop national goals for public health work (The Swedish National Committee in Public Health, 1999). The goals should constitute guidance for the community in its work to promote public health and prevent ill health. In the strategies and future goals for pre-school and pre-school children the following is stated: “Pre-school with mealtime activities. Children's attitudes towards food and various food-stuffs are established early in life. It is important that pre-school personnel take advantage of the mealtime's educational possibilities.” (p 26). The report emphasises the importance of epidemiological monitoring of different health risk factors. Few studies about food habits and food-related health risks in the Swedish population have been performed. Research on food habits should consequently be performed in a national perspective and on an individual level, with complete surveys targeting vulnerable groups. Present knowledge about energy and nutrient intake, food intake and food habits in Sweden today is primarily obtained from two national surveys, one from 1989 (The Swedish National Food Administration, 1989) and a follow-up study from 1997 (The Swedish National Food Administration, 1997c). In the follow-up study, children are not included despite the fact that several governmental departments have emphasised the importance of children’s food habits in the promotion of public health.

**Energy and nutrition recommendations**

The Swedish Nutrition Recommendations (SNR) (The Swedish National Food Administration, 1997d) are mainly based upon the Nordic Nutrition Recommendations (NNR) (The Nordic Nutrition Recommendations, 1996) and Recommended Dietary Allowances (RDA) (Food and Nutrition Board, 1989). According to SNR and NNR, energy and nutrient requirements can be met by eating a variety of foods from different food groups. Thus, a balanced diet is the foundation of SNR and NNR. SNR’s main aim is to support the planning of diets for different groups, mainly healthy individuals with a low or medium level of physical activity. Given this purpose, the recommended figures for intake of nutrients are set to cover the requirements of almost all individuals. For infants and children, the recommended amounts are set to maintain a satisfactory rate of growth and development. In cases of sickness or for groups with
special needs, composition of the diet must be developed for that group’s specific requirements. Diet composition varies from meal to meal; thus SNR's daily values are meant to be means of one week's consumption. The values represent the levels of essential nutrients and adequate energy that should be consumed on average. Loss of nutrients due to cooking should therefore be taken in consideration when planning diets on the bases of recommendations (Bergström, 1998).

When results from dietary studies are to be evaluated, it is appropriate to use lower levels of nutrient intakes than used for planning diets. Such data are presented in SNR. There is also a level for lowest acceptable intake. As there is no value representing the lowest acceptable intake or average requirement for children, as there is in the case of adults, it is difficult to evaluate findings from dietary studies.

The energy figures in SNR, NNR and RDA are reference values and represent the estimated mean requirements for the specific age groups. The resting energy expenditure (REE) is the largest component of the total energy expenditure, unless the physical activity level is very high. REE is commonly estimated from several empirically derived equations. For children less than 10 years of age, the energy requirement is estimated from intakes associated with normal growth. The second largest component of total energy expenditure is the energy expended in physical activity. The different types of activity undertaken by an individual can be identified and the time spent in each activity measured. Few studies have been performed on young children and therefore the given energy reference value does not take different physical activity levels into account.

Guidelines for pre-school
The NFA has developed a guideline with dietary recommendations for pre-school children, including recommendations regarding nutritional intake as well as composition of pre-school meals (Wållberg et al., 1996). The NFA guideline aims to cover children’s daily needs of energy, some key nutrients and dietary fibre at preschool. The intention is that all children, independent of age, should be served the same food and slowly, step by step, learn to eat a variety of foods. In Sweden two different kinds of meals are typical at pre-school. One (breakfast and snack) is based upon bread, breakfast cereals and milk products, while the other (lunch) is based upon potatoes/rice/pasta, vegetables/root vegetables and meat/fish/eggs. Lunch is the meal that should meet most of the iron, zinc and vitamin C requirement, while breakfast and snack should meet most of the calcium requirement. In this connection, children’s milk intake has been of special interest, both the amount and distribution over different meals. Since 1973 there has been a recommendation to limit pre-school children’s intake of milk to half a litre per day (including fermented milk), since this is a sufficient amount to cover 75% of the calcium and protein requirements (The Swedish National Board of Health and Welfare, 1973; 1980; 1990; Expertgruppen, 1990). NFA recommends that milk and milk products should be served at breakfast and at snack
meals. Consequently, it is recommended that water be served at lunch and dinner, although milk has traditionally been served in most homes and at school lunch.

The NFA guideline on serving water as a meal drink instead of milk has been debated. The argument has focused on three themes: milk as energy source, milk and iron absorption, and milk versus soft drinks. Milk may be considered a competitor to other food items, and if milk intake is high, there is a risk that especially iron and fibre intake will be low and protein intake too high (The Swedish National Board of Health and Welfare, 1973; 1980; 1990; Wållberg et al., 1996). Scientific opinion as to the association between iron status and milk consumption is divided: one side argues that milk consumption in a single meal has an effect on iron absorption (Cook et al., 1991; Hallberg et al., 1991; Hallberg et al., 1992; Gleerup et al., 1995; Hallberg, 1998; Hallberg, 2000), the other side argues that, in the long run, it does not have such an effect, since the body has mechanisms to regulate absorption and is able, within certain limits, to fill the iron stores if necessary (Tidehag et al., 1995; Reddy & Cook, 1997; Minihane & Fairweather-Tait, 1998; Ames et al., 1999; Lönnerdal, 1999). In Western society, consumption of milk is decreasing, and that of soft drinks and juices increasing, which has the effect that less nutrient rich beverages are replacing the nutrient-rich milk (Thomas et al., 1996; Dennison et al., 1997; Hammers, 1999; Harnack et al., 1999; Watt et al., 2000a; Watt et al., 2000b).

To conclude, in Sweden most children are enrolled in the municipal childcare system owing to the high employment rate for men and woman and political intentions. Consequently, the pre-school and the parents share responsibility for children's dietary intake as well as their socialisation and acquisition of food habits. There are official policies, recommendations and guidelines about the public meal in pre-school. It is important to study, in an interdisciplinary way, how these official documents are followed.
GENERAL AIMS OF THE THESIS
The overall objective was to investigate the individual food and nutrient intake of pre-school children at all meals during the day at the pre-school and at home, as well as to study factors that may influence children’s intake. One specific aim was to compare food and nutrient intake at pre-schools where milk was served at lunch with that at pre-schools serving water.

The thesis comprises five reports with the following aims:

I to describe and analyse the energy and nutrient intake of the children and to evaluate the intake in relation to the Swedish Nutrition Recommendations (SNR) and the Swedish National Food Administration guideline, as well as to compare the nutritional intakes for groups of children with different socio-economic backgrounds.

II to describe weekday and weekend food patterns, i.e., the frequency of consumption of food items and the contribution of energy and nutrient intake from different food groups, and to explore how foods are related in pre-school children’s diet.

III to compare the respective effects of two serving systems at pre-school (one offering milk as lunch beverage, the other offering water) as regards children’s food and nutrient intake. A further aim was to analyse the energy and nutrient intake of low and high consumers of milk.

IV to identify pre-school children’s perception and experiences of food with focus on what they consider to be good, bad and favourite foods as well as their overall experiences of food in everyday life. One specific aim was to explore the appropriateness of focus group interviews with children aged 3-5 years.

V to identify how pre-school staff experience the role of food and meals as part of the pre-school daily activity and if the pedagogic meal was an established phenomenon, and in that case, what it meant to the staff.
SUBJECTS, METHODS AND DISCUSSION

Selection of pre-schools

The pre-schools were selected in a suburb of Stockholm with a population of about 60,000. The suburb was selected partly because of the availability of a dietician who was both responsible for menus and supported the cooks as well as the principals of the pre-schools regarding food issues. Thus, all pre-schools had the same opportunities for support and information to provide an optimal diet, but it was the principal who decided whether they would follow the diet service menu, which used the NFA guideline (Wållberg et al., 1996) and SNR (The Swedish National Food Administration, 1997d) for the planning of the menus.

The director of the municipal childcare programme gave formal permission to engage pre-schools in her area, informing the principals of this. To be included, several criteria had to be fulfilled by the selected pre-schools. Firstly, they had to prepare the meals in their own kitchen. Secondly, three meals per day were to be served, i.e. breakfast, lunch and afternoon snack. Twenty-nine of the 36 pre-schools fulfilled the criteria. Thirdly, all 29 pre-schools also fulfilled the criterion of having “full-time children” (normally present at the day-care centre at least 35 hours per week) aged 3-5 years. Among these 29 schools, a random selection was made of six that offered water, and another six milk, as lunchtime drink. The personnel at all 12 schools accepted the selection of their school and were willing to take part in the investigation.

The author (HS) was responsible for all data collection in Studies I-V. The titles of the papers, methods used, design of the studies and subjects included are presented in Table 1.

Table 1. Data collection methods, design of study and subjects participating in Studies I-V.

All studies were conducted on the same population, included 12 pre-schools.

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Studies I, II and III
A quantitative approach, using an estimated and weighed dietary record, was used to describe, compare and explore the dietary intake among pre-school children. The pre-school staff were asked to select a department with a maximum of 14 non lactose intolerant/milk allergic children 3-5 years of age, i.e. 36-71 months, with parents who were able to read and write Swedish. All parents were given oral and written information in person at the school so that they could give informed consent for their child to participate in the study. In all 136 children and parents were invited to take part in the study and 131 of these participated. There were complete food registrations during 7 days for 109 children. In Study III, 44 children were excluded according to certain criteria.

The participating children spent, on average, 7.7 hours at pre-school per day. The parents’ occupations were divided into three categories according to a scheme used by Statistics Sweden (1995): blue-collar, lower white-collar and middle/upper white-collar. Twenty-three percent of mothers and 23% of fathers were blue-collar, 26% of mothers and 14% of fathers were lower white-collar, and 51% of mothers and 63% of fathers were middle/upper white-collar. Fourteen families were one-parent households. No data were collected on the parents’ education, as this parameter is a basis for the occupation categories mentioned above.

Measuring and recording food intakes
Each pre-school participated in the study for three weeks. The first week the parents were informed and asked to give their consent, and the research staff adjusted to the situation, which meant getting to know the children, staff and routines at the pre-school. During the second week, the children got accustomed to eating according to the new routines and serving procedures, which were to be used during the third week. Every child had its own tray with different pots for every component in the meal. All foods and drinks at pre-school were weighed before and after the meals on a standard electronic scale and recorded individually during a 5-day period (Monday-Friday).

According to validation studies, there is a better agreement between energy intake (EI) and weighed dietary record in young children as compared with adults (Livingstone et al., 1992; Torun et al., 1996; Sichert-Hellert et al., 1998). According to Torun et al., this could be because, for younger children, parents and other adults have overall control of food intake and responsibility for dietary reporting. Younger children also have less unsupervised access to food. In the case of our study, we believe that the weighed dietary record is valid owing to the fact that the week before the actual recording the children had the opportunity to adapt to new serving and meal procedures. According to the pre-school staff, the children were adjusted to the situation after 3 days and ate and drank the same amounts as they normally did. The pre-school staff reported that, during the week of registration, the children behaved as if this were the normal meal situation.
Parallel with recording at the pre-school, the parents recorded foods eaten at home during the 7-day period (Monday-Sunday). All parents were given oral and written information in person at the school as how to record the food intake. They also had daily opportunity during the three-week period to put questions to the research staff. At home the portion sizes were estimated by household measures or with the aid of a booklet, the Meal Model, with illustrations and photographs of typical Swedish dishes and food items (The Swedish National Food Administration, 1997a). When tested on adults at the group level, the Meal Model proved to be an acceptable tool for assessing portion sizes (Håglin et al., 1995). The Meal Model has not been validated specifically for use when estimating children’s intake. However, in this study, adults were estimating the children’s food portions by comparing these to the pictures in the booklet. Assessing food intake through estimated measures is associated with underestimation. A mentioned above, Klesges et al. have shown that parental influences have a marked effect on food selection when parents monitor children’s food intake (Klesges et al., 1991). However, in our study the estimated records are considered valid owing to the fact that there was no significant difference in energy intake between weekdays and weekends, although the consumption pattern was different. The low-nutrient foods contributed more energy on weekend days than on weekdays, which indicates that parents were careful when monitoring their children’s food intake. According to previous studies (Birch et al., 1991; Nicklas et al., 1997), although children’s food consumption is highly varied from meal to meal, the daily energy intake is relatively constant. Since all parents were promised a personal report of the energy and nutrient intake of their child, we believe they were motivated to be extra careful when estimating food intake.

An important factor is the participants’ confidence: children, parents and pre-school staff felt comfortable with the project staff and free to ask questions about the study before deciding on participation. To avoid jealousy between participating and non-participating children, all children were treated equally with regard to the meal situation, i.e. all children at the same department had their own tray with their own pots irrespective of whether they were included in the study. The fact that there were few dropouts may have resulted from a combination of the above factors.

The children also had their weight measured, undressed, to the nearest 0.1 kg. Height was measured to the nearest 5 mm. Basal Metabolic Rate (BMR) was calculated taking into account age, sex, body weight and height according to Schofield’s equation (World Health Organization, 1985). The age of the children varied from 36 to 71 months, with a mean of 56.6 months. Their weights (mean 18.9 kg), and heights (mean 1.08 m), were all plotted and were within ± 3 standard deviations of the weight-for-age curves of Swedish children (Niklasson & Karlberg, 1999), with the exception of one child who was overweight. The mean of predicted BMR was 3.8 MJ/day. There were
no significant differences between the included and excluded children as regards anthropometrical measurements (Study I).

.Validation principles
Two dietary assessment methods were used, the direct measuring (weighing) by the research team of the children’s intake at the pre-school and, for practical reasons, the parents' estimated recording at home. The energy intake as reported by each of the two methods for every child has been analysed. To check for underreporting, the ratio of reported energy intake (EI) and estimated BMR was used, as described by Goldberg et al. (1991). When physical activity level (PAL) is not measured, which is the case in most dietary studies, EI/BMR is used as an estimation of PAL and a guide for validating the dietary assessment (Torun et al., 1996). A cut-off value of 1.2 of EI/BMR was used for validating energy intake at the individual level, as suggested by Goldberg and Black (1998). None of the individual 7-day EI/BMR means were below the cut-off figure 1.2. However, this cut-off value is designed for adults. Children generally have a higher PAL than adults and therefore the validation cut-off should probably be raised. In our study, the mean value for EI/BMR was 1.7 and the EI/BMR value for seven days ranged from 1.27 to 2.25. Thus it appears the data are reliable. However, the variation of energy intake during weekends was great for two reasons. Food habits during Saturdays and Sundays are more flexible owing to more flexible activities on such days, and the mean represents only two days. For some children, the means of the weekend energy intake were very low as compared with the estimated energy requirements of these children. However, the low figures for some children were not primarily due to underestimation of their intake. The principal author (HS) was responsible for the data collection and became well acquainted with children and their parents. Against the background of the validation studies on children mentioned above and the detailed knowledge of the families, no children were excluded because of a low EI/BMR value.

.Data processing, statistics and presentation
There is no sex difference in SNR for children except for energy reference values, thus the data were presented as one group, in absolute amounts (MJ and g) and relative amounts as energy percentage (E%) and nutrient density (g/MJ), separate for home, pre-school, weekdays and weekend. The individual energy intake was compared with SNR (The Swedish National Food Administration, 1997d) and NNR (The Nordic Nutrition Recommendations, 1996). Since SNR does not have recommendations for evaluating dietary assessment in children, the levels used were those for planning meals for children aged 4-6; furthermore, there is no protein recommendation for children, which is why the RDA (Food and Nutrition Board, 1989) was used.

The food intake data were processed by the computer program MATs the flexible (Nordin, 1997) including the NFA food database (The Swedish National Food Administration, 1997b). Recipes from the pre-schools and some new products were
added to the database. The nutrients presented in the results are the same as the key nutrients in the NFA guideline. The statistical software Minitab (MINITAB, 1998) was used for data analysis. T-tests were used to analyse differences between groups, and a t-test of the mean was used to compare the recorded energy intake with recommended intake. One-way ANOVA was used to compare socio-economic groups (three groups) and low and high milk consumers (four groups). In Study III, the data are presented and divided according to the two different serving systems, six offering milk and water (M), and another six offering water (W) as beverage at lunch. In the results and discussion, the children are referred to as M- or W-children. A regression analysis was used to compare the two different groups, age was used as a covariate. Principal Component Analyses (PCA) were performed on 16 aggregated food groups (Figure 4) using the software The Unscrambler (CAMO, 1986-1999). All variables were scaled to unit variance before conducting the PCA (Study II). As older children might eat more food and in different proportions than do younger children, this could influence the statistical analysis of food pattern, thus statistical analyses were based upon nutrient density (g/MJ) in Study II. Results are presented as mean, standard deviation and p-values, and the differences were considered significant at p<0.05. As a large number of statistical analyses were performed, some of the significant differences found might be caused by erroneously rejecting a true null hypothesis (type I error) and some of the non-significant results might be caused by not rejecting a false hypothesis (type II error).

The relationship between the great number of dietary parameters generable from dietary studies – such as nutrient density, frequency and amounts of consumption of individual foods, meal patterns and background factors – can be difficult to describe and analyse in an economical way using traditional statistics. PCA was considered an appropriate multivariate method. PCA is a data reduction method whereby correlated variables can be grouped together, identifying underlying dimensions of the data. A number of studies on diet and eating patterns illustrate the value of PCA as a tool for identifying eating habits (Barker et al., 1990; Whichelow & Prevost, 1996; North & Emmett, 2000). If these structures support emerging knowledge, there are reasons to believe that the described phenomena are of a reproducible nature. During cross-validation of the model, any deviant structure in these subsets would be detected and/or removed. No such anomaly was detected in the present data. There are therefore reasons to believe that repeated studies would not add to the reproducibility of the data. It is interesting to note that all patterns shown were identical for both weekdays and weekend days; however, the patterns for the weekdays were slightly stronger. Shifts away from certain foods often enhance the consumption or combination of others. Visual representation is therefore necessary in interpreting the multidimensional picture. Traditional statistics more often treat variables one at a time, which does not favour complex interpretations of changes in eating behaviours.
Study IV
A qualitative approach – focus group interviews – was used to explore pre-school children's attitudes, perception and experience with regard to food. Twenty-two focus group interviews were conducted during pre-school hours, with the permission of the parents, and held in rooms at the 12 pre-schools.

A total of 131 children were willing to participate in the project. Randomised sampling is not used in qualitative studies, but rather selective sampling, i.e. informants are selected who are willing to talk about specific topics or verbal enough to express themselves. After excluding the shy, non-informative children (on staff recommendation), children at home with a cold, and children occupied with other activities at pre-school, we were left with 103 (56 boys and 47 girls) children participating in the focus groups. The moderator was trained in focus group methodology, as described by Morgan and Krueger (Krueger, 1994; Morgan & Krueger, 1998). An interview guide was developed containing questions about the meal situation, food attitudes and food perceptions and experiences. For the youngest children, a food collage was used to help the conversation. The food collage contained all kinds of different foods from all food groups and different types of dishes, vegetables, fruits, snacks, soft drinks, coffee, ice cream and so on. The interviews ranged from approximately 20 to 35 minutes in length, and were observed and documented by the assistant moderator (HS). The average size of the groups was four participants. All interviews were videotaped. After each focus group, the moderator and assistant moderator reviewed the notes, making general frequency notes, i.e. field notes about the most frequent categories or phenomena that occurred during the interviews. A systematic independent coding and categorising of the material by the moderator and assistant moderator – several times by viewing and carefully listening to the video recordings – followed the preliminary analysis. The moderator and assistant moderator discussed similarities and differences in their respective coding. Main themes and patterns that occurred in most focus groups, or that were deemed important to a significant number of children, were identified and organised into three main themes. Using a form with a column for each preliminary theme that occurred, the coded interview material was divided into these components, allowing the content to be systematically verified. The three main themes were consistent throughout the work.

The method used in this study, focus group interviews, was a successful way to learn about how children think about and jointly reflect upon food. This is also seen by other scholars (Östberg & Thorsen, 1981). We seem to have had more success with this method than indicated by Counihans' (1999) experiences of interviewing pre-school children individually with non-specific abstract questions. This may be explained by the fact that 1) all the children already knew one another, 2) the assistant moderator was well known to the children, 3) a food collage with pictures was used during the focus group interview, and finally, 4) the children were inspired by one another in the group discussion. The reason why 22 focus groups were conducted was that the twelve
pre-schools were participating in a larger study and all had been informed that focus group interviews were going to take place. Most focus group studies consist of three to six group interviews and it was not necessary to conduct such a large number. However, this was a very special opportunity to conduct interviews with more than a handful of groups. It was valuable for us from a practical point of view, as we got a broad experience how to conduct focus groups with small children. The children who took part in this study found it fun and exciting to be interviewed, and we did not believe that they gave answers just to satisfy us. However, it seems to be very important that the focus groups take place in a special room where the children are able to concentrate and not see their friends playing. Furthermore, when conducting focus groups with children, it is vital to gain their confidence through knowing their environment. The children were already used to the video camera, mainly because it had been used in the dietary study, but also because the teachers sometimes used the camera in teaching. Therefore the video recording did not affect the children’s spontaneity, which it often does in encounters with adults (Krueger, 1994).

Four children seemed to be a manageable group size, which is also found by Østberg (1981). The reason why all children spoke easily about the topic is probably because food consumption is a concrete experience to reflect upon. Even so, the children sometimes talked about things that did not have any relevance to the study, as Counihan (1999) also expressed and group moderators must therefore be aware that there are great variations within the same age group.

The food collage was brought to all the interviews. In half of the interviews we did not use it since the children were very talkative without it. However, when the children were a little tense we began to show the collage and when they were comfortable in the interview situation we took it away. Since the food collage covered all sorts of foods of different brands, such as soft drinks, confectionery, ice cream as well as potatoes, milk, fruits, vegetables and ready prepared dishes, for example fish fingers, boiled cod and hamburgers, it is assumed that the collage did not lead to bias.

The participating children had varying abilities of self-expression. The most talkative and articulate were, of course, easier to conduct a focus group interview with, but we observed that the shyer children, though less talkative, did express the same ideas. Therefore we have no reason to believe that staff selection of non-participating children has led to bias, mostly because they were less than a dozen children out of 131, but also because the results were so homogenous among the participating children. Moreover, we have no reason to believe that the non-participating children differ from the others in any respect other than shyness and fear of strangers, since the assistant moderator already knew the children.
Study V
The design of this study was explorative, and the aim was to study how the phenomenon of the pedagogic meal was expressed and applied within the pre-school. In this specific part of the study, a qualitative approach, with semi-structured interviews, was chosen. Thirty-four interviews with pre-school staff were conducted during pre-school hours and held in 12 different pre-schools.

The staff from three groups (11 principals, 15 pre-school teachers and 8 child minders) was recruited through staff participating in the dietary study. They were mostly women who had worked in the municipal care system for 12-36 years. Only one informant was a man and he had worked for 2 years. His responses did not differ from those of the rest of the groups, thus he was not treated separately in the analyses.

The interviewer was trained in interview technique, as described by Kvale (1997). An interview guide was developed to cover questions about the meal situation at the pre-school, intentions and aims of the pre-school meal, food attitudes and food perceptions and experiences in relation to their work at the pre-schools. Each staff member was interviewed on one occasion, the interviews lasting from 45 minutes up to one hour each. The interviews were tape-recorded and transcribed verbatim.

The preliminary analysis began during the fieldwork, during the interviews as described by Kvale (1997). After the fieldwork period, all transcripts were analysed in a first step by the authors, discussing preliminary findings and themes. Since we found that there were similar beliefs and attitudes among the whole group of informants, it was decided to further analyse, on a deeper level, a smaller sample. From the 34 interviews, six interviews from each group of staff members were selected by drawing of lots, leaving a total of 18 interviews in the final analyses. This selection method is not a practice associated with qualitative analyses, though in this case it was the easiest way to decide which of the interviews to use. The transcripts were then further systematically analysed by the interviewer, who used the interviews to confirm preliminary findings or to break them down and re-analyse them to discover new coherence (Kvale, 1997). Using one form for each theme, the interview material was divided into these components, allowing the contents to be systematically verified. The content of each component was compared between the three groups to check for similarities and differences. The main findings were consistent throughout the analyses, but also deepened.

All informants in this study were involved in the dietary study and were already familiar with the interviewer in the pre-school environment. The interviews took place at the pre-schools, which was a familiar place for both the informants and the interviewer. This probably had a positive influence when starting up and conducting the interviews. The informants gave the impression that they were comfortable and able to speak freely. There was no problem recording the interviews, which was
probably due to the fact that they were used to being video recorded during the meal situation with the children. One negative factor might be that informants knew that the interviewer’s special interest was pre-school children’s food habits. The responses might have been different if another interviewer from another discipline had interviewed the informants or if the interviews had been conducted with another group that had not be exposed to dietary studies.

All informants, with the exception of the male one, had worked in the municipal care system for a long period of time (>12 years). The informant’s age was not asked, but the range was approximately between 30-60 years. It would have been interesting to look at possible age differences between the generations, since the majority of the staff spoke about how things used to be.

In addition
At every pre-school, some meals during the three-week period were video recorded. To accustom the children and staff to the video camera standing in front of their dinner table, recordings were made on two separate days, three meals per day (breakfast, lunch, snack). The aim was to observe social exchange and the role of the pre-school teacher during the pre-school meals. The results from this study have been published as a bachelor’s thesis at the Department of Domestic Sciences¹. The results will be mentioned briefly in the discussion.

All children participating in the dietary study received an individual written report of their energy and nutrient intake on weekdays and weekend days. They also got a lot (€3). All participating pre-schools received a financial contribution (€1000), with which they could buy toys or make an excursion, and all children at the participating department received a small present (a rubber ball).

The Ethical Committee of the Faculty of Medicine, Uppsala University, approved the project protocol.

¹ S Lind, T Kaarlejärvi, Bachelor thesis, Department of Domestic Sciences 2000
RESULTS AND DISCUSSION

Dietary intake

Socio-economic background

Socio-economic differences in the diet of children and adolescents have been shown in some Swedish and Finnish studies (Hagman et al., 1986; Laitinen et al., 1995; Höglund et al., 1998). In this study, there were no significant differences between the children’s energy and nutrient intake attributable to the parents’ occupations (Study I). Nor were there any differences in children’s food intake as a function of parental occupation (Study II). The children were spending, on average, almost 8 hours a day at pre-school, i.e., the pre-school was responsible for the major part of the intake during weekdays, which might obscure possible effects of socio-economic background.

Energy

The reported mean energy intakes were 6.2 and 6.7 MJ/day for girls and boys, respectively, the same as or slightly lower than levels found in previous Swedish and Finnish studies of children aged 4-6 years (Samuelson, 1971; Räsänen et al., 1985; Hagman et al., 1986; Jacobson & Nordlund, 1994; Koivisto et al., 1994b; Lagström et al., 1999). It is problematic to compare the present results with SNR as a reference, because the SNR age interval does not correspond to the interval of 36-71 months in this study. The mean reference values for energy intake in NNR and SNR for children aged 4-6 years are 6.8 and 7.1 MJ/day for girls and boys, respectively. The mean of the individual energy requirement calculated according to the NNR as energy per kg body weight of the children in our study was 6.5 MJ/day for girls and 6.4 MJ/day for boys, this on the basis of the age intervals 37-48, 49-60, 61-72 months. According to RDA, the mean energy requirement is 6.1 MJ for children aged 4-6 years old, the same value for both girls and boys in this age group. According to these comparisons, the reported energy intake seems acceptable (Study I). However, the estimations of the energy requirement in RDA and NNR are based upon data collected 20 or more years ago and published in a WHO report from 1985 (World Health Organization, 1985). NNR (The Nordic Nutrition Recommendations, 1996) discusses the apparent tendency that physical activity among young children is decreasing and therefore the reference values might be too high. The rise in obesity has also come to be seen as a problem of low energy expenditure, and the result of a sedentary lifestyle (Gibson, 1997). Children today are more likely to be driven to school than walk, and spend more time watching television than in previous generations (Prentice & Jebb, 1995). One of the factors found to lead to obesity in 3-year-old Japanese children was limited playtime outdoors (1 hour or less) (Takahashi et al., 1999).

However, the energy intake at the pre-schools in the present study fell short of the NFA guideline, i.e. 65% from three meals and 45% from two. Only one fourth of the children who had their meals at pre-school reached the 65% level, and one third of those who had two meals per day reached the 45% level. Thus the temporal distribution of energy and nutrients during the day was skewed for most of the
Results and Discussion

children. Previous Swedish studies (Öhlin et al., 1993; Jacobson & Nordlund, 1994; Hägg et al., 1998) show the same results: as compared with the NFA guideline, children had inadequate energy and nutrient intake during school meals, but this was compensated for by the intake of food at home. It is important to consider, however, whether the recommendations – to cover 65% of the daily intake at pre-school – are adequate and realistic for children who are away from home more than 8 hours a day. One proposal might be that the major part of children’s intake should occur during the active part of day. However, the scientific basis for such a suggestion must be established in future research. (Study I)

The main sources of energy were milk and cheese (17% of the total energy), meat products (17%) and bread and breakfast cereals (15%) (Study II). There were no significant differences between the children’s nutrient and energy intake that were attributable to the serving system, i.e. water or milk as lunchtime beverage at the pre-school. The average intake of milk and flavoured milk at pre-school was about 1.75 dl for both M- and W-children. The W-children consumed, on average, larger amounts of milk at breakfast and afternoon snack than did the M-children. When the children were divided into four groups according to milk consumption, it was notable that the low milk consumers had a more even distribution of energy intake from different food groups than did the high milk consumers (Study III). For the purpose of the present study, the foods were categorised as “high-nutrient foods” and “low-nutrient foods”. Vegetables, fruits, juice, potatoes and root vegetables, milk and cheese products, cereal products and fats were classified as “high-nutrient foods”, and confectionery, soft drinks, etc., as “low-nutrient foods”. The basis for distinguishing between “high-nutrient foods” and “low-nutrient foods” was a traditional Swedish food model, “the food circle”. The food groups categorised here as “high-nutrient foods” were included in the food circle, whereas the “low-nutrient foods” were not. In total, the “high-nutrient foods” contributed relatively more nutrients and less energy on weekdays (80%) than at weekends (68%) (Study II).

The respective mean intakes of protein, fat, carbohydrates and sucrose, expressed as a percentage of the total energy intake, were at pre-school 14, 38, 50 and 9, and at home 14, 36, 52 and 12 weekdays, 14, 34, 55 and 16 weekend days, respectively (Table 2). There were no differences between the amounts of protein and fat consumed during weekends as compared with weekdays, though there was a difference in energy percentage distribution. There was a high carbohydrate intake during the weekends, i.e. high intake of sucrose. The increased sugar intake may be due to either different meal habits during weekends as compared with weekdays or to the consumption of “Saturday sweets”, an established habit among Swedish children. In most Western countries, the increasing risk for cardiovascular disease has led to a major public health campaign to reduce fat consumption (Keys et al., 1984). Compared to the SNR the fat content of pre-school children’s diet in this study was to high. However, according to a review by Michaelsen and Jorgensen (1995) there is no evidence to suggest any
advantages associated with a diet including less than 30% of energy from fat for children and adolescents.

Table 2. Mean and standard deviation of energy (MJ) and macro nutrient (amount, g; energy percentage, E%) intakes of pre-school children (n=109); weekdays and weekend days, compared with SNR. Paired t-test p-values.

<table>
<thead>
<tr>
<th></th>
<th>Weekdays Total</th>
<th>Weekend Home</th>
<th>p&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy, MJ</td>
<td>6.4 ± 1.2</td>
<td>6.5 ± 1.5</td>
<td>ns</td>
<td>6.8&lt;sup&gt;a&lt;/sup&gt; 7.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>EI/BMR</td>
<td>1.7 ± 0.2</td>
<td>1.7 ± 0.4</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Protein, g</td>
<td>53.1 ± 11.5</td>
<td>51.0 ± 13.6</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Protein, E%</td>
<td>14 ± 1.7</td>
<td>14 ± 2.6</td>
<td>*</td>
<td>10-15</td>
</tr>
<tr>
<td>Fat, g</td>
<td>60.8 ± 12.0</td>
<td>57.3 ± 16.7</td>
<td>*</td>
<td></td>
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<tr>
<td>Fat, E%</td>
<td>37 ± 3.8</td>
<td>34 ± 5.7</td>
<td>***</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Carbohydrate, g</td>
<td>193.3 ± 40.7</td>
<td>208.8 ± 54.7</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate, E%</td>
<td>51 ± 4.3</td>
<td>55 ± 6.7</td>
<td>***</td>
<td>55-60</td>
</tr>
<tr>
<td>Sucrose, g</td>
<td>41.1 ± 15.5</td>
<td>61.3 ± 29.1</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Sucrose, E%</td>
<td>11 ± 3.4</td>
<td>16 ± 6.2</td>
<td>***</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>

<sup>a</sup> girls  <sup>b</sup> boys

**Industrial and Nutritional Science**

Minerals, vitamins, sucrose and dietary fibre
To eliminate the differences caused by age variation, the results were recalculated into nutrient density, despite the fact that SNR and NNR do not have any nutrient density recommendations for young children, but only for children >7 years of age. However, it is only vitamin D density that is higher for children 1-6 years when calculating the density from the energy reference values and the recommended intakes for nutrients. The mean total intake per day and nutrient density were in line with SNR, with the exception of selenium and dietary fibre (Table 3 and Figure 2). This has also been found in previous Swedish studies on adolescents (Bergström et al., 1993; Samuelson et al., 1996; Samuelson, 2000). The recommended intake of selenium for children is 25 mg in SNR and NNR, as compared to the 21 mg found in this study. The recommended levels in SNR and NNR are set to cover the requirement of almost all individuals. As there is no value representing the lowest acceptable intake or average requirement for children, it is difficult to evaluate the result. However, the average requirement for adults is about 25% less than the recommended intake, and the level representing the lowest acceptable intake for adults is about 50% below the recommended level in NNR. When the recommended values for children are reduced by 25% and 50%, they amount to 18.7 mg and 12.5 mg, respectively. Twenty-eight percent of the children reached the recommended intake of 25 mg, and 62% reached 18.7 mg. Three of 109 children had an intake below 12 mg. It should be noted that selenium values from food databases are specifically uncertain due to the variation in selenium contents in the soil in different areas.
SNR recommends 3 g/MJ of dietary fibre for adults and children. However, in NNR the authors suggest that 2 g/MJ is more reasonable for pre-schoolers, since otherwise the food will be too voluminous. Eighty-three children had fibre intakes below 2 g/MJ and none had intakes exceeding 3 g/MJ (Study I). The low intake of dietary fibre was caused by a low intake of cereal products, vegetables and fruits (Study II). Dwyer (1995) suggests that “age plus 5 g” is a reasonable recommendation for dietary fibre intakes for children older than 3 years of age, which is almost in line with the results in Study I (11.0±2.5 g).

Table 3. Mean and standard deviation for mineral, vitamin and dietary fibre daily intakes of pre-school children (n=109); weekdays and weekend days, compared with SNR recommendations. Paired t-test p-values.

<table>
<thead>
<tr>
<th></th>
<th>Weekdays</th>
<th>Weekend days</th>
<th>p</th>
<th>SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium, mg</td>
<td>831 ± 229</td>
<td>768 ± 288</td>
<td>**</td>
<td>600</td>
</tr>
<tr>
<td>Iron, mg</td>
<td>8.1 ± 3.0</td>
<td>7.7 ± 3.2</td>
<td>ns</td>
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</tr>
<tr>
<td>Zinc, mg</td>
<td>7.2 ± 1.6</td>
<td>6.8 ± 2.2</td>
<td>ns</td>
<td>6</td>
</tr>
<tr>
<td>Selenium, µg</td>
<td>22.1 ± 7.0</td>
<td>19.0 ± 7.2</td>
<td>***</td>
<td>25</td>
</tr>
<tr>
<td>Retinol equivalents, µg</td>
<td>841 ± 348</td>
<td>674 ± 484</td>
<td>**</td>
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<tr>
<td>Riboflavin, mg</td>
<td>1.3 ± 0.3</td>
<td>1.2 ± 0.4</td>
<td>**</td>
<td>1</td>
</tr>
<tr>
<td>Vitamin C, mg</td>
<td>76 ± 32</td>
<td>58 ± 35</td>
<td>***</td>
<td>45</td>
</tr>
<tr>
<td>Dietary fibre, g</td>
<td>11.5± 2.8</td>
<td>9.8 ± 3.7</td>
<td>***</td>
<td>a</td>
</tr>
</tbody>
</table>

* SNR no recommendation
1 ***=p<0.001, **=p<0.01, *=p<0.05, ns= not significant
Results and Discussion

Figure 2. Histogram with normal distribution curve of mineral, vitamin and dietary fibre daily intakes of pre-school children (n=109) during a seven-day period.
Our study, along with a few others, has looked at the “low-nutrient foods” (Leung et al., 1984; Campbell, 1993). These foods have often been viewed as non-nutritious and, therefore, unimportant. The “low-nutrient foods” in our study accounted for one third of the energy intake during the weekend days and approximately one fifth of the intake of dietary fibre, calcium and vitamin C. Contrary to common assumptions, these foods contributed more than sugar and fat. Our findings (Study II) are similar to those of Leaman et al. (1997) as well as Hagman (1986).

In Western societies, there is great concern about the effects of carbonated beverages in terms of obesity, tooth decay, osteoporosis and other health problems (Harnack et al., 1999; Watt et al., 2000a; Watt et al., 2000b; Wyshak, 2000). In the SNR, it is recommended to limit the intake of refined sugars to achieve a sufficient intake of nutrients and dietary fibre. In our study, the children drank on average more soft drinks and less milk during the weekend days than during the weekdays. There was a tendency for low milk consumers to receive a greater part of their energy from soft drinks than was the case for high milk consumers. Several studies have shown that beverage choice can have a significant effect on the nutrient adequacy of the diets of children and adolescents (Subar et al., 1998; Harnack et al., 1999; Ballew et al., 2000). In a British study, 72.5% of the pre-school children never drank plain water. Squash was the most frequently consumed drink, and 15% consumed almost 50% of the recommended daily energy intakes from drinks (Petter et al., 1995). The consumption of soft drinks in Sweden has increased rapidly (Swedbrewers, 1984-2000), while the milk consumption has decreased (Swedish Dairy Association, 1950-2000).

Dental experts have recommended that sugary foods and drinks be limited to meal times and that drinks such as milk and water be consumed between meals (Holm, 1990). In today’s Sweden, most parents are well informed and know that sweets are bad for teeth, but this does not prevent them from giving sweets to their children (Holm, 1990). Study II shows that the main sources of sucrose were soft drinks and desserts on weekdays, and soft drinks and confectionery at weekends. It seems as though consumption of “Saturday sweets” is still an established habit among Swedish children, whereas soft drinks have become an everyday beverage.

Wilson and co-workers studied types of milk beverages served and found that these had no significant effect on consumption of other food items offered at the meal. Her conclusion is that children do not reduce the intake of other food items at a meal to compensate for the increased energy intake from sucrose-sweetened milk, i.e. young children cannot regulate their energy intake in a specific meal (Wilson, 1991; Wilson, 2000). Wilson’s findings, however, are inconsistent with those of Birch and co-workers (Birch & Deyser, 1986; Birch et al., 1989). In Study III there were no significant differences in energy intake depending on whether milk or water was
served, nor was energy intake affected at the afternoon snack. Similar findings were revealed in an earlier study by Jacobson and Nordlund (1994). The results indicate that there is some reason to believe that children are able to regulate their energy intake in a specific meal.

Food pattern
One interesting finding of the present dietary study was that almost all children had eaten the variety of foods offered at pre-school. This means that they had good opportunities to experience unfamiliar foods, which is necessary for acquiring preferences (Birch, 1999). This is important, since many children have their meals five days a week at pre-school, since the children spend, on average, 8 hours a day at pre-school, and NFA guidelines (Wållberg et al., 1996) recommend that 65% of the daily energy intake of children enrolled full-time be covered at pre-school. Understanding how temporal distribution of food intake affects health will require further investigation.

The children consumed fruits in greater quantities than vegetables (Figure 3), which is comparable with other studies on pre-school children and adolescents (Campbell, 1993; Frost Andersen et al., 1995; Krebs-Smith et al., 1996; McKenzie et al., 1996; Samuelson et al., 1996; Gibson et al., 1998; Briley et al., 1999; Gibson, 2000). The Principal Component Analyses (PCA) revealed four food clusters, i.e., warm food with meat, potatoes and cooked cereals (cluster 3), and three different kinds of snacks, bread and breakfast cereals (cluster 1), milk and cheese products (cluster 2), and confectionery, soft drinks and buns (cluster 4), see Figure 4. The variation within the clusters describing bread and breakfast cereals not only showed a negative correlation to milk and cheese products, but also a positive correlation to meat, potatoes and cooked cereals, thus revealing that bread is utilised for several purposes.

Principal Component 1 (PC1) was, on the one hand, closely related to milk and cheese consumption and negatively associated with the consumption of bread, buns and soft drinks. PC3, on the other hand, explained that the consumption of milk and cheese products was positively related to that of bread and breakfast cereals, but this was of less importance when explaining variation in the material than were the phenomena described by PC1. Milk and cheese products must, therefore, be assumed to have a greater role as between-meal snacks (PC1), and also a lesser role as an accompaniment to bread and breakfast cereals. However, when bread and milk/cheese products were correlated (PC3), there was a negative correlation between these foods and meat and potatoes, which indicates that bread and milk/cheese products were an alternative meal to meat and potatoes (PC3 and PC4). Meat, potatoes and cooked cereals were also negatively correlated (PC2) to confectionery, buns and soft drinks, which indicate that these food groups were replacing each other. It is interesting to note that all patterns shown were the same for both weekdays and weekend days; however, the patterns for the weekdays were slightly stronger.
Results and Discussion

Figure 3. Consumption of different food groups (g) during weekdays and weekend days by 109 children. Paired t-test p-values. ***=p<0.001, **=p<0.01, *=p<0.05, ns= not significant
Figure 4. Relationship between food groups on weekdays (WD) and weekend days (WE) and explained variance (%).
Socialisation and acquisition of food habits in pre-school

Normative influences

The design of Studies IV and V was explorative and qualitative, and was intended to elucidate if and how the phenomenon of the pedagogic meal was expressed and applied within the pre-school. In my analysis of the interview material I have been inspired by Fieldhouse's model of the socialisation of food (Figure 1).

During the interviews (Study IV), it was clear that the pre-school children associated food and eating with rules and norms, i.e. children described what they were and were not allowed to do in this context. Most children also knew what was acceptable and non-acceptable mealtime behaviour. For example, they said: “Everyone has to try at least a little bit of all the food that is served”; “It is not allowed to spit food out of your mouth”. Some of them believed they were expected to eat everything on their plates, while others said, “You can eat as much as you please and leave the rest”. Rules associated with social aspects of meals were: “shouting is not allowed”, “you can speak to the children at your table, but not to the other children in the room”, “we can not leave the table until all of us have finished the meal”. Even the youngest children knew what were considered acceptable table manners. However, when they talked about behaviours at the table at pre-school, the majority of them began with affirmations such as “do sit still on your chair”, “do try a little bit of everything” or “do not play at the dinner table”, “do not shout” and so on.

The present results, thus, indicate that children associate the meal situation at the pre-school with many rules and norms, where “good” table manners seem to be implanted in the children's minds early in life, leaving them with less power – compared to the adults, i.e. staff and parents – to influence their own food choice and behaviour in the meal situation. Perhaps the stories in which young children frequently refer to food as a symbol of power (Counihan, 1999) illustrate their everyday situation, one in which adults make the food decisions, thus demonstrating their power over children. According to terminology in Fieldhouse's model of the socialisation of food, these rules could be seen as early cultural restrictions on children’s food experiences. Rozin also discusses the socialisation of food and the importance of children developing an adult attitude towards food and eating in their culture during the stage of primary socialisation (Rozin et al., 1986).

The majority of children were, however, positive when talking about actual food and it was interesting that they described foods in terms of “likes” and did not think about them in terms of “dislikes”. When asked to rate foods they “disliked”, they almost always started to talk about their favourite foods. Thus, they had no problems talking about food they liked and preferred to eat. However, talking about food they did not
like was, for some reason, more difficult (Study IV). It is, however, interesting to note that Koivisto et al. found that the youngest children in their study had difficulties expressing what food they liked and disliked (Koivisto & Sjödén, 1996). Children, according to these authors, seem to develop dislikes easier than preferences for good taste, which could be interpreted as contradictory to our findings. The contradiction between our results and those of Kovisto et al. could be explained by the different methods chosen. In Koivisto’s study, the parents were present during the child interviews, while only children took part in the focus groups in our study, as well as in Counihan’s interviews (Counihan, 1999). The type of questions posed might also affect how children choose to respond.

In Study IV, the children also expressed cultural knowledge about what food is considered appropriate to eat and what is not, thus demonstrating another example of Fieldhouse's definition of cultural restrictions and an overall example of normative influences. For instance, a number of children said that sweets, ice cream and cakes are not food. It is also interesting to note that the children said that sweets were supposed to be consumed only on Fridays or Saturdays, i.e. they associated sweets with weekends and holidays and not with pre-school. This finding indicates that young children are learning early in life to associate particular foods with certain situations, and these children knew that different foods are consumed at pre-school and at home (Study IV). The children were, during this primary socialisation, influenced by local as well as national norms. According to the Fieldhouse model, the Swedish tradition of “Saturday sweets” is an example of a national societal norm, while the above-mentioned rules and norms at table could be seen both as local (the norms set up within pre-school settings) and as national (norms developed in a societal context). On the other hand, allowing children to drink soft drinks on any weekday, as the parents apparently did (Study II), could be interpreted as indicating that national nutritional-dental norms are changing. The traditional cultural norms in Sweden, that food high in sucrose and especially sweets should be restricted to weekends, were still vital at the pre-school. The parents' acceptance of soft drink consumption all weekdays could be interpreted in two ways: 1) soft drinks are no longer seen as food rich in sucrose or 2) the cultural norm of restricting such food to certain situations is fading. One might ask why, in Swedish homes, sweets and soft drinks are not seen as belonging to one category of foods rich in sucrose?

Rozin also highlights that children's perceptions of foods tend to follow what adults categorise as “good” or “bad” for children (Hammond et al., 1999). However, the children in our study did not use this categorisation, but instead “food” and “non-food”. The idea that “food is good for you” and makes you grow and therefore you should eat it was a strategy with which a number of the children were familiar. Some children recalled that their parents and pre-school teachers used to tell them that they had to eat what was served in order to become big and strong (Study IV). In a recent French study, children aged 9-11 years old, view food primarily as a necessity of life,
whereas mothers viewed food primarily as a pleasure for their child, with necessity and nutrition given a lower importance (Le Bigot Macaux, 2001). However, despite adults' beliefs in telling children that “food is good for you”, studies have shown that encouraging children to eat a specific food is not a good method. This is particularly true when children are told “this is bad for you”. In such cases, the advice has very little effect (Casey & Rozin, 1989; Fisher & Birch, 1999b). Children may not fully understand the reason underlying which foods are good for them, but nonetheless there is reason to believe they have some ability to group foods from a nutritional point of view, as was also shown by Anliker et al. (1990). In this sense, the children in our study had not yet applied the traditional definitions of food, i.e. categorising it by the cultural restrictions or rather normative influences of good or bad, yet they did, at this early age, see food as either food or non-food.

Owen et al. (1997) state that descriptions of foods as “good” or “bad”, “healthy” or “unhealthy” should be avoided. This was expressed by Margaret Mead back in the 1960s (Mead, 1980). In Western societies, however, we still tend to categorise food as bad or good, i.e. it is not preliminary children who do this, but adults who generate these cultural norms in the society. Counihan discusses at what age children in Western societies adopt this vocabulary. I mean that during primary socialisation, which takes place already in pre-school in Sweden, children are learning what is prescribed by the culinary culture (Fieldhouse, 1996), i.e. they eat what is served and have little influence on food choices. Yet they still have not adopted the more normative vocabulary of “good” or “bad” foods.

Since many studies show that food is the woman’s responsibility (Ekström, 1990; De Vault, 1991; Mennell et al., 1992; Wesslén, 2000), and since most of the staff in pre-school are woman, it is essential that they – as an important influential factor during this early socialisation – are aware of the subtle messages they give about body size, weight and dieting, as Lytle et al. have also pointed out (Lytle et al., 1997). Several studies have shown that dieting daughters have mothers who tend to be dieters (Hill et al., 1990; Pike & Rodin, 1991; Ruther & Richman, 1993). According to Hendy and Raudenbusch (2000), girls respond more to peer models of food behaviour than do boys, and even at three to five years of age, eating behaviour has more social relevance for girls, especially when peers play an active role. Similarly, research has found that, even as children, females more often than males use eating behaviour to imitate, impress, or resist others (Mori et al., 1987; Cutting et al., 1999; Fisher & Birch, 1999a). Because girls are at greater risk for developing eating disorders later in life, future research should examine early gender differences and effects of peers at pre-school, but also of other adults, i.e. pre-school staff. For instance, staff with problems regulating their own eating and/or weight could influence the children, both girls and boys, in a negative way.
The pedagogic meal
In Fieldhouse's model (Figure 1), secondary socialisation starts in school, meaning that children in Sweden, already at the age of 1 to 5, are subject to secondary socialisation since they are enrolled in pre-school. An important part of this process is the so-called pedagogic meal. When encouraged to talk about the specific phenomenon of food and meals at pre-school, the informants in Study V began by comparing the present situation with an earlier period, since most of them had worked for more than 12 years within this organisation. In doing so, they revealed strong attitudes as well as ambivalence towards how food-related activities should best be integrated into their daily pedagogic work. In the National Commission on Childcare in 1968 (Government Report, 1972) pre-schools teachers were considered as role models for children at table. However, during the interviews, the informants declared that in the past they did not eat with the children and therefore they had difficulties acting as role models. At the present time, however, the situation was different, i.e. they socialised with the children at table even though there were no official documents or recommendations clearly describing that this should be done and how. At the time of the interviews, the pre-school staff were not actually officially considered as mealtime role models, but were acting as such.

Still, most of the staff in Study V had a clear perception of what it meant to practice and carry out a pedagogic meal. This involved helping and encouraging the children to help themselves and serving as an adult model for the children at table, showing, for example, how to handle cutlery, pass food to each other, sit on a chair, have a conversation without screaming as well as eat together. They also believed that they were expected as pre-school teachers to show children that all foods served are edible and tasteful by encouraging the children to taste and hopefully eat the foods served. The problem, as the staff expressed it, was that the daily meal, the routine meals that had to be eaten every day, several times a day, so were not considered a pedagogic activity. Instead the meals were experienced as something that disturbed other daily work. In other words, the meal was not actually seen and accepted by the staff as a pedagogic activity, whereas all other activities during the day were.

“People think it takes too much time away from other activities. But really it's an activity too, though myself I can think it's just a detail.” Study V

The informants in Study V believed there had been a change in attitudes towards how to teach children good food habits. Nagging and forcing children to taste all foods served at lunch was considered common behaviour among the staff ten to fifteen years ago. Especially the principals viewed this as unsatisfactory behaviour, whereas the childminders and pre-school teachers believed tasting the foods served was still important and should be pointed out to the children (Study V).
There are reasons to believe that children at pre-school accept more new foods because the foods are presented to them repeatedly (Birch & Marlin, 1982) and because they are eating with other children who can serve as models (Yperman & Vermeersch, 1979; Birch, 1980; Greer et al., 1991; Hendy & Raudenbush, 2000). Perhaps earlier research could provide some explanations. Pliner et al. found that younger children often rejected food primarily because it was unknown and secondly because they did not like it (Pliner, 1994). However, Koivisto et al. found that the main reason for rejection was distaste (Koivisto & Sjöden, 1996). The majority of the children in Study IV understood they were expected to taste all foods served, even if they had tried them at home “If you’ve tried it at home, well then you can try again ... and then if you think it’s good you can eat it” (Study IV). Our results parallel those from recent studies in the US conducted by Gittelsohn et al. (2000) and Hertzler et al. (1999). Gittelsohn et al. found that the three most commonly reported food rules practised by 24 interviewed teachers were to encourage the children to finish their foods during the school meal, to wash hands and to taste all foods. Hertzler et al. found that children’s food problems, according to the staff, were that they liked fast food and did not taste new foods. As Koivisto Hursti has pointed out, it is essential that adults be made aware that food neophobia is very common among children (Koivisto Hursti & Sjödén, 1999). In Swedish literature from the seventies and onwards it has been stated that tasting new foods is not important since this may lead to decreased preferences, that is children should not be forced to taste new foods (Virgin, 1970). Research would seem to indicate that it is important for children to be exposed to a variety of foods. However, it is up to the children to choose to taste or not taste new foods. Tasting all foods served seems to be a deeply rooted norm in Western societies, and as shown in Study II, all children had actually eaten or tried a variety of foods served at the pre-school meals.

Gillis and Sabrez (1980) noted that pre-school teachers are in a position to directly influence the quality and type of food available to the children as well as the development of food preferences. Nahikian-Nelms (1997) found a positive correlation between nutrition knowledge and behaviour at mealtime, nutrition knowledge and attitudes, and attitudes and caregiver behaviour. For example, if caregivers fail to sit with children, consume the same foods, and create a positive pleasant environment, positive role modelling may not occur. Sjödén et al. (1985) found a positive correlation between children’s preferences for certain foods and positive behaviour/stimulation from adults in the meal situation. A negative correlation for preference was found if a certain food was followed by a reward, for example, “eat your porridge than you can watch TV”. In a study by Fergus and co-workers (1998), it was found that combined video-modelling and reward intervention resulted in major increases in consumption of fruit and vegetables that children previously had consistently refused to eat. Almost all of the previously refused foods were eaten and the effect was largely maintained after six months. They conclude that eating practices of children are “extremely malleable and subject to strong influence by sociocultural factors” (p.76). According to Hendy and Raudenbusch (2000), teacher modelling is one of the most effective methods to
Results and Discussion

courage food acceptance by pre-school children. They showed that modelling by silent teachers was ineffective in encouraging food acceptance, while enthusiastic teachers (“Mmm! I love mango!”) were effective. However, with edition of a competing peer model, even enthusiastic teacher modelling was no longer effective in encouraging new food acceptance. Koivisto and co-workers showed that most parental behaviour was verbal, including negative statements to the child about non-eating (Koivisto et al., 1994a). These findings are similar to what the children expressed in Study IV; they associated food and eating with rules and norms, i.e. children described what they were and were not allowed to do in this context. Some of the meals during the first week at the pre-schools were even video recorded. The preliminary findings from the video-recordings confirm that, between the children and the staff, the social verbal exchange at the mealtime was insignificant. The children’s practical skills seemed to be more important to the staff than creating meaningful conversations ².

The respondents in Study V expressed the clear opinion that pre-school as an organisation in Sweden looked after and took good care of the children involved in this educational care sector of society. While the staff was satisfied with the pre-school's role of feeding the children, they expressed a concern, or even mistrust regarding the children’s parents. The general picture of the food served at home was that it was unbalanced and that parents mostly served food their children liked to eat, for example pizza, hamburgers and spaghetti. The majority of the staff did not believe that traditional Swedish dishes were commonly served at home. They also believed that if the parents served breakfast at home, it was not a proper one, as opposed to those served at pre-school (porridge or yoghurt, bread, milk, juice, cheese and some other spread). In most cases, the staff thought that children should eat breakfast either at home or at pre-school. The vision of the children’s situation at home in the early mornings was that parents are very stressed, and therefore it must be better for children to have breakfast at pre-school. One pre-school teacher even thought it might be difficult for children to assimilate the energy and nutrients in the breakfast at home because it was too stressful. Overall, the staff thought that the children ate much better at pre-school than at home and that food served at pre-school was more balanced and healthier (Study V). This was, however, not shown to be the case among the children in this study. There were no significant differences in energy intake or food intake between the breakfasts consumed at home compared to those consumed at pre-school.³ However, “high-nutrient foods” contributed relatively more energy and nutrients on weekdays than on weekend days (Study II).

“At home they don’t get... I mean regular home-style meals have disappeared. Not just at pre-school but even for the families I think you hear it from the children, it's MacDonald's and pizza and macaroni and meatballs .... Spaghetti too. So they have an

² S Lind, T Kaarlejärvi, Bachelor thesis, Department of Domestic Sciences 2000
³ H Pernler, M Lennernäs Junberger, H Sepp, M Gillberg; manuscript
unbalanced diet at home but they do have a balanced diet at day-care at least, at pre-
school ... I think.” Study V

Thus the staff saw meals at pre-school as more balanced and as a better guarantee for
good food habits than private meals at home. Yet, as discussed above, they also felt
that mealtime at pre-school was time consuming and a problematic situation during the
day. The results can be interpreted in two ways: 1) that parents and pre-school staff
have shared responsibility for primary socialisation since children begin pre-school so
early in Sweden and spend long hours there every day, or 2) that secondary
socialisation begins earlier in Sweden than elsewhere.

Ideal meal situation - the utopian meal

However, the staff expressed a vision of an ideal meal situation. It was “nice and
cosy”, and a situation in which they could carry on a conversation with the children
around the table, which was seen as one important activity (Study V). The food was to
be nicely presented, tasteful and a delightful scent of freshly prepared food should
meet the children at lunchtime. However, according to the pre-school teachers and
child minders, this was not always the reality. They experienced that meals were often
time-consuming due to their pedagogic profile, and also that they were stressful. All
children wanted to be heard and seen during the meals, i.e. they were talking and
interrupting each other resulting in a far too high sound level. The principals, on the
other hand, did not express any negative experiences of the actual everyday meal;
instead they described it more or less in the same way as the ideal meal situation. One
could discuss whether the principals’ responses expressed their true beliefs about the
meal situation or the wish to give a politically correct answer.

The public-pedagogic meal in the future

The focus of Swedish nutrition policy is specified within four areas: education, support
for local and regional nutrition programmes, consumer support and participation, mass
catering and restaurants. Four of the eleven aims are of special interest for the food and
meal service in public care in general and childcare in particular.

Aim 1  The development of school settings for food-health-environmental issues should be
supported.

Aim 9  Guidelines should be established for nutritional quality and meal organisation in
private and public mass catering. The guidelines should be made available to the
relevant parties in each target group.

Aim 10 The level of knowledge among production and meal staff involved in private and public
mass catering should be increased.

Aim 11 The authorities should have continuous dialogue with representatives from the mass
catering sector.

The importance of a supportive environment for health will benefit everyone, but
especially vulnerable children (Aim 1). In the schools, home economic teachers,
physical training teachers and the school meal staff have a central role as regards integrating food-health-environmental issues. There is no clear specification as to who is responsible for food-health-environmental questions in pre-school. In the curriculum for pre-school, the environmental issues only reflect an ecological aspect: “The pre-schools shall place great emphasis on environmental and conservation issues” (p.10). Many factors probably underlie the fact that food-health-environmental issues are not on the agenda. However, when they are not highlighted, nor included in the curriculum and teaching, the signals given are that they do not have a high priority.

One way to establish the goals of nutritional quality and a positive meal situation is to develop guidelines (Aim 9); this has been done for pre-schools (Wållberg et al., 1996). However, an evaluation of the acceptance of and adherence to these guidelines showed that few people involved in the pre-schools activities had failed to take note of the guidelines (The Swedish National Food Administration, 1998). As a goal, the Nutrition Policy suggested establishment of a position for a dietary expert in each municipality who would be responsible for menus supporting the cooks as well as the principals of the pre-schools regarding food-health-environmental issues. If there is no one responsible in the municipality, it will be difficult to achieve aim 11, i.e. the authorities must have a continuous dialogue with representatives from the mass catering sector.

The pre-schools are often small units, some of them have their own kitchen with a cook, while others receive food from a mass catering kitchen or a pre-school close by. Aim 10 highlights the notion that education is important for the production as well as the meal staff, but if there is no cook at the pre-school, it is even more important to educate the meal staff, i.e. the pre-school teachers.

To conclude, the messages provided by the authorities are not consistent. The Swedish National Food Administration and The Swedish National Institute of Public Health highlight the importance of development of school settings for food-health-environmental issues, while such questions are not mentioned in the curriculum for pre-school or in the education of pre-school teachers. The fact that children consume a large portion of their daily diet on school grounds highlights the importance of supporting food-health-environment and education.
SUMMARY AND CONCLUSIONS

In order to study food habits in an interdisciplinary manner, many different methods are necessary, both quantitative and qualitative. Such a twofold approach has been taken in the present thesis. A pre-school-based dietary survey, using seven-day records, focus group interviews and semi-structured interviews, was carried out in a suburban area of Stockholm. The overall objective was to investigate the individual food and nutrient intake of pre-school children at all meals during the day at the pre-school and at home, as well as to elucidate factors that might influence children’s intake. One specific aim was to compare food and nutrient intake at pre-schools serving milk at lunch with that at pre-schools serving water.

The average energy and nutrient intake per day for the whole week was satisfactory for the 109 pre-school children, but the temporal distribution throughout the day was skewed. The energy and nutrient intakes of food at the pre-school were lower than recommended. That, however, was compensated for the meals served at home. The relative amount of carbohydrates was higher for weekends than for weekdays, owing to a higher sucrose intake. There were no significant differences between the children’s energy and nutrient intake attributable to the parents’ occupations. Understanding how the temporal distribution of food intake affects health calls for further investigation. (Study I)

Almost all children had eaten the variety of foods offered at pre-school, thereby giving them a chance to taste and become accustomed to new foods. The intake of fruits and vegetables seems to have increased during the past decades in Sweden. Still consumption of fruits and vegetables needs to be increased to meet the recommended five servings per day. The children's food intake was more varied during weekdays than weekend days. It seems to be a trend that “low-nutrient foods” have a greater role to play in terms of energy as well as nutrient intake, especially in weekend days. The utilisation of PCA showed that milk and cheese consumption has changed from what was previously assumed; dairy products now have a greater role as between-meal snacks. (Study II)

Serving milk or water for pre-school lunch did not affect the total milk intake at pre-school as the children compensated at other meals for the absence of milk at lunch. The low milk consumers had a more even distribution of energy intake from different food groups than did the high milk consumers. This comparative study has not provided any evidence to support the selection of water versus milk as a preferable lunch beverage in terms of pre-school children's total milk consumption and general dietary quality. The dietary analyses showed that there could be a reason to limit pre-school children’s daily milk and fermented milk intake to half a litre. (Study III)

The children associated food and eating with rules and norms. Most children described these rules and norms as well as what they were and were not allowed to do. They
knew very well the difference between acceptable and non-acceptable mealtime behaviour, and were especially aware of what they were not allowed to do. When children were asked to rate foods they “disliked”, they spoke instead about their favourite foods. They did not categorise food as good or bad, as adults often do, but as “food” and “non-food”; for example, sweets were not food. The method used in this study, the focus group interview, was judged to be a useful tool for exploring how children think about and jointly reflect upon food. (Study IV)

The role of the teachers had changed over the past years and they had not yet found a solid ground for integrating food and meals into their everyday work as pre-school teachers and childminders. Their role as teachers at present could be regarded more as guides, or mentors, serving as mealtime role models. (Study V)

To conclude, ¾ of children in Sweden are enrolled in the Swedish tax-financed pre-school system. Thus, a majority has a great proportion of their meals and food intake at the school facility. According to the study, although the pre-school diet was adequate for most children, more could be done to fulfil the aim of the Swedish nutrition policy, i.e. to develop school settings for food-health-environmental issues. One important step is to include various items concerning food and meals in the pre-school curriculum, thereby sanctioning responsibly for these issues and consequently demanding formal competence among pre-school staff.
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REFERENCES


References


Ekström M (1990) Kost, klass och kön (Food class and gender), Umeå University. [In Swedish, abstract in English]


References


References


Larsson M (2001) Allt fler överviktiga barn och ungdomar. In Vår Föda 4-6. [In Swedish]


Nordin M (1997) MATs. A nutrient calculation system designed for research and education. Västerås: Rudans Lättdata.[In Swedish]


The Swedish National Board of Health and Welfare (1973) *Kost och fysisk aktivitet i barnaåldern.* Vällingby: Socialstyrelsen. [In Swedish]


The Swedish National Food Administration (1989) Hulk.Uppsala. [In Swedish]

The Swedish National Food Administration (1997a) The Meal Model: The Swedish National Food Administration NFA. Uppsala. [In Swedish]


The Swedish National Food Administration (1997c) Riksmaten. Uppsala. [In Swedish]
References

The Swedish National Food Administration (1997d) SNR Tredje upplagan av de svenska näringsrekommendationerna. Vår Föda, 7-14. [In Swedish]


The Swedish National Food Administration (2001) Riktlinjer för grundskolan. Uppsala. [In Swedish]


Det övergripande syftet med studien var att empiriskt kartlägga förskolebarns energi-, närings- och livsmedelsintag. Ett delsyfte var att jämföra barnens dagliga energi- och näringsintag beroende på om mjölk respektive vatten serverades som måltidsdryck till lunch på förskolan. Ett annat delsyfte var att studera värderingar och beteenden beträffande barnens mat och måltider som förskolepersonal visar under sitt arbete och som kan influera på barnens matvanor samt att beskriva barnens egna erfarenheter av mat och måltider på förskolan.

Totalt har tolv förskolor i en kringkommun till Stockholm studerats. Urvalet var att alla förskolor hade ett eget tillagningskök och att de serverade tre måltider om dagen, att hälften av dem serverade vatten och hälften av dem serverade mjölk som måltidsdryck till lunch. Etthundranio barn i åldern 3-5 år kostregistrerades under 7 dagar, all mat på förskolan vägdes individuellt, varje barn fick sin egen bricka med sina egna små uppläggningskärl så att den serverade maten och även resterna kunde vägas. Av praktiska skäl skattades intaget hemma med hjälp av hushållsmått och/eller Livsmedelsverkets bilderbok Matmallen.

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SAMMANFATTNING
Barnens och personalens attityder och värderingar samt kommentarer och beteenden kring kostfrågor beskrevs genom fokusgruppsintervjuer med barnen och halvstrukturerade intervjuer med personalen.

Resultaten visar att barnen hade ett tillfredsställande energi- och näringsintag totalt sett under dagen jämfört med nordiska näringsrekommendationer. Däremot var det genomsnittliga energiintaget på förskolan lågt jämfört med riktlinjerna för barnomsorgen. Detta kompenserades dock genom måltiderna hemma, vilket resulterade i att barnens genomsnittliga intag per dag låg i nivå med referensvärdet för åldersgruppen.

Med tanke på att många barn vistas många timmar på förskolan, i den här studien var snittet knappt 8 timmar, så kan man anta att rekommendationerna för barnomsorgen är satta på en rimlig nivå, dvs. 65% av sitt energiintag bör de få på förskolan om de vistas där full tid. Barnen i den här studien har inte riktigt nått upp till dessa nivåer. Med hänsyn till resultaten bör inte antalet måltider på förskolan minskas, utan att det bör serveras åtminstone frukost, lunch och eftermiddagsmål.

Maten som serverades på förskolorna var variationsrik och av god kvalité med hänsyn till näringstäthet. I stort sett åt alla barnen all mat som serverades på förskolan, vilket innebar att de fick en god chans att smaka och bekanta sig med eventuella nya maträtter och livsmedel. Livsmedelsintaget var mer varierat på vardagen än helgen. Mat med låg näringstäthet och/eller högt energiinnehåll, t ex läsk, saft, bullar och godis, bidrog med 20% av energin på vardagen och 33% under helgen. Principal Component Analys visade ett motsatsförhållande mellan på ena sidan mejeriprodukter å andra sidan bröd och frukostcerealier. Resultaten kan tolkas som att dessa mejeriprodukter intogs i huvudsak utan bröd och frukostcerealier och främst som mellanmål.


I fokusgruppsintervjuerna framkom det att barnen förknippade mat och ätande med regler och normer. De flesta barnen beskrev dessa regler och normer i form av man inte får göra. De visste mycket väl vad som var accepterat och icke accepterat beteende kring matbordet, i synnerhet vad man inte fick göra. Barnen blev tillfrågade att berätta om vilken mat som de inte tyckte om, men de pratade de istället om vilken mat de
Sammanfattning

tyckte om. Vuxna kategoriserar ofta mat som bra och dålig, medan barnen i vår studie pratade om mat och inte mat. Till exempel är godis inte mat. Fokusgruppsintervjuer bedömdes som en bra metod att undersöka barns tankar och reflektioner om mat.

Personalens brist på utbildning och kunskap om mat och måltidens betydelse resulterade i en ambivalens och osäkerhet om deras roll som vägledare i måltidssituationen. Trots detta hade de flesta en klar bild över vad som menas med en pedagogisk måltid. Det var att hjälpa och stödja barnen att klara sig själva samt att vara en förebild vid måltiden. Till skillnad mot förr, var det inte vanligt förekommande att mat användes i den pedagogiska verksamheten. Samtidigt som personalen var nöjd med förskolans roll att tillfredsställa barnens kostbehov uttryckte de en oro eller t.o.m. misstro mot föräldrarna. Trots, eller kanske p.g.a. brist på kunskap om mat och nutrition och bristen på specifika mål med den pedagogiska måltiden, trodde de att de i förskolan var bättre rustade än föräldrarna för att utbilda barn om mat och en bättre garant för barnens kostintag och matvanor. Sammanfattningsvis, förskolepersonalens roll har förändrats de senaste åren och de saknar en solid grund att integrera mat och måltider i det dagliga arbetet som förskolelärare och barnskötare.