# FAMILY RESEMBLANCE IN FAT INTAKE, NUTRITION ATTITUDES AND BELIEFS: A STUDY AMONG THREE GENERATIONS OF WOMEN

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# FAMILY RESEMBLANCE IN FAT INTAKE, NUTRITION ATTITUDES AND BELIEFS: A STUDY AMONG THREE GENERATIONS OF WOMEN

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# STELLINGEN

1. Het spreekwoord "De appel valt niet ver van de boom" gaat slechts in beperkte mate op voor vetinneming binnen families
*dit proefschrift*

2. Bij voorspelling van voedselkeuze spelen consequenties van deze keuze op korte termijn een grotere rol dan consequenties op langere termijn.
*dit proefschrift*

3. Children tend to see parents as more influential than the parents see themselves.
*Hagestad, 1984; dit proefschrift*

4. De toename in de gemiddelde leeftijd waarop Nederlandse vrouwen hun eerste kind krijgen, bemoeilijkt het drie-generatie-onderzoek.

5. Een hoge vetconsumptie onderscheidt zich van andere risicogedragingen in dat men zich niet bewust is van het vertonen van het risicogedrag *(Van Assema et al., Health Education Research, 1993;8:461-472).* Dit betekent dat onderzoek naar determinanten van een hoge vetconsumptie gericht moet zijn op gedragingen die leiden tot een hoge vetconsumptie in plaats van op de vetconsumptie zelf.

6. Analoog aan de bevinding van *Prättälä et al. (Appetite, 1992;18:185-191)* "it seems that exclusive butter users eat what they like whereas margarine users like what they eat", kan men uit onderzoek van *Van Otterloo en Van Ogtrop (1989)* afleiden dat moeders uit de lagere sociaal-economische klasse eten wat ze lekker vinden, terwijl moeders uit de professionele middenklasse lekker vinden wat ze eten.

7. "...modeling of behavior is the strongest socialization technique in developing healthy lifestyles, and therefore is the most promising route for public health officials hoping to change those lifestyles".
*Lau et al., Journal of Health and Social Behavior 1990;31:240-259*

8. Het hardnekkige geloof dat consumptie van voedingsmiddelen met zoetstoffen of kleurstoffen hyperactiviteit bij kinderen tot gevolg heeft, wordt mede veroorzaakt doordat het ouders een strategie biedt om met gevoelens van onmacht bij de opvoeding om te gaan.

9. Door recente ontwikkelingen in de medische wetenschap is de uitdrukking 'women of child-bearing age' minder onderscheidend dan de uitdrukking 'vrouwen van vruchtbare leeftijd'.

10. Het bepalen van consumentengedrag is gokken in de chaos geworden.
*Volkskrant, 6 september 1993*

Stellingen behorend bij het proefschrift

Family resemblance in fat intake, nutrition attitudes and beliefs:
a study among three generations of women

Annette Stafleu
Wageningen 29 juni 1994.

## ABSTRACT

### FAMILY RESEMBLANCE IN FAT INTAKE, NUTRITION ATTITUDES AND BELIEFS: A STUDY AMONG THREE GENERATIONS OF WOMEN

*Thesis by Annette Stafleu, Department of Human Nutrition, Wageningen Agricultural University, The Netherlands, 29th June 1994*

In this thesis nutrition attitudes, beliefs, and fat intake in three generations of women are described. The aim of the study was twofold: the development of methods, and to study family resemblance in food habits. Based on literature study and qualitative pilot studies a questionnaire on beliefs and attitudes towards the consumption of 20 foods was developed for which Fishbein and Ajzen's theory of reasoned action was used as a framework. In addition, an attitude scale was developed towards high-fat foods and their low-fat alternatives. The instruments developed were pretested in 419 adult men and women, 49 elderly women, and 45 students in Human Nutrition. The main study took place among 97 young women, their mothers, and their grandmothers.

Attitudes towards 20 foods showed that liking attitudes had more impact on intention to consume the foods than good/bad attitudes. For all 20 foods the belief about the tastiness of the food was a more important determinant of intention than the belief about whether the food is good for one's figure or increases the chance of getting heart disease. This suggests that short-term rewards (tastiness) are more important than rewards on the middle time (figure) and long term (heart disease).

The scale of attitudes towards high-fat foods and low-fat alternatives can be considered as an important predictor of fat intake. The subscale consisting of liking attitudes had more impact on fat intake than the subscale consisting of good/bad attitudes.

The three-generation study showed that there are small, but many significant, correlations in nutrition knowledge, beliefs, attitudes, intentions, and intake of fats between mothers and daughters.

CONTENTS

*Aan mijn moeder*
*Ter nagedachtenis van Oma Toet*

# CHAPTER 1

## INTRODUCTION

In the Netherlands, as in other western countries, coronary heart disease is the most important cause of death (Centraal Bureau voor de Statistiek, 1992). One of the risk factors associated with coronary heart disease is a diet high in saturated fat (Gordon *et al.*, 1981; Keys, 1980; Kushi *et al.* 1985; Shekelle *et al.*, 1981). The Netherlands Nutrition Council (1991) advises to reduce the fat intake to 30-35 % of energy intake, with a maximum of 10 energy percentage derived from saturated fatty acids. In the Dutch Food Consumption Survey of 1987/1988 the mean percentage of energy derived from fat was 40% (Hulshof & Van Staveren, 1991). This value was slightly decreased in the Dutch Food Consumption Survey of 1992 (Löwik *et al.*, 1993), although still above recommendations.

In recent years several health education campaigns in the Netherlands focused on the reduction of total fat intake. Both community based approaches (Hardeman *et al*, 1993; Van Assema, 1993; Van Assema & Cremers, 1993), and annual national campaigns were performed (Brug *et al.*, 1993; Riedstra *et al.*, 1993). For the development of effective nutrition education campaigns insight into factors which determine a high fat diet is necessary. In addition, identification of factors involved in food choice stimulates the food industry and the government to come to an optimal development of new products and services. Several social-psychological theories are available to study determinants of food choice. Both personal factors and environmental factors are included in these theories (for overviews see e.g. Axelson and Brinberg 1989; Glanz *et al.*, 1990; Krondl, 1990; Shepherd, 1990).

Several researchers (Casey & Rozin, 1989; Contento, 1993) suggested that early food choices may establish habitual patterns, which might influence food choice in adolescence or adulthood. This socialization of food habits might happen within the family and therefore the family unit may be an important target for nutrition education, rather than the individual. Family resemblance in food habits studies might give an indication whether social influences within the family unit takes place. If family resemblance in food habits occurs this might be due to several factors, such as shared

genes, environmental influences like modelling, reinforcement, restriction of available foods, and social or cultural influences (Logue *et al.*, 1988). In a qualitative study in the Netherlands (Van Otterloo & Van Ogtrop, 1989) the role of mother's influence on what children should eat is stressed. From several international studies it appeared that there is a weak to moderate correlation in nutrient intake between parents and children (Garn *et al.*, 1979; Laskarzewski *et al.*, 1980; Oliveria *et al.*, 1992; Pérusse *et al.*, 1988). In addition it was found that there are small but significant correlations in food preferences between parents and children (Borah-Giddens & Falciglia, 1993).

Studies so far indicate that transfer of beliefs, attitudes, and fat intake within families might be an important issue for health education. However, as most studies took place among young children and their parents it is not known whether family resemblance in fat intake and food perceptions persist to adult age. It was decided to study both fat intake and social-psychological determinants of high-fat food choices in adult family members. Further, it was the intention to determine resemblance and differences in beliefs, attitudes, and fat intake in grandparents, their children, and their grandchildren from different socio-economic classes.

This chapter gives an overview of the different research phases. First, several pilot studies are described briefly. The perceptions that emerged from these pilot studies were used to develop a beliefs and attitudes questionnaire, which was pilot tested in several reliability studies. Next, several considerations with respect to the design of the three-generation studies are discussed. This chapter ends with a short description of the three-generation study.

## PILOT STUDIES

In order to assess possible motivations to eat fat foods three pilot studies were performed. Twelve women participated in depth interviews about attitudes towards fat and cholesterol. Six focus group interviews were organized about the same topics. In addition a content analysis of advertisements in a women's magazine and a magazine of

a supermarket chain was performed.

*Depth interviews*

The purpose of this study was to establish the nature of attitudes and beliefs towards fat and cholesterol. A second aim was to develop a qualitative method to study nutrition attitudes and beliefs. Interviews were performed in two stages. Five women were interviewed using direct questions, and seven women were interviewed using indirect questions. In the direct method women were asked *what* they ate during a day and *why*. The indirect method was topic oriented. The themes used in the indirect method were derived from the direct method mainly. Interviews were tape-recorded, and transcribed afterwards. Texts were ordered and analyzed using the qualitative computer programme Kwalitan (Peters *et al.*, 1989).

Results from the direct method were used for generating themes for the interviews using the indirect method. These themes were (i) weight watching; (ii) health, for example healthy eating in general, healthy meal, consequences of an unhealthy eating pattern, relationship between nutrition and coronary heart disease; (iii) tradition and transfer of nutrition habits, for example nutrition habits in parental home, regimes with respect to foods; (iv) purchase behaviour such as meal planning, cutting down expenses, influence of family members on food purchases; and (v) opinions about light-food products and cholesterol-free products. Results from the indirect method showed that important points of attention were weight watching and contrast between tastiness and health. Enjoyment, taste, and liking were often mentioned as reasons for food choice, although it was not a special theme of the interview.

From the direct method it appeared that it is very difficult to obtain motivations why people eat fat foods by asking the question *why?*. Subjects became irritated and annoyed. They felt that they needed to have a reason for eating a certain food. Often they said that they ate the food because they liked it, or because they were used to eat it. Therefore it was concluded that the direct method is not a useful way to obtain the nature of motivations to eat fat foods or a diet high in fat. The indirect method was

much more effective in assessing beliefs about the consumption of fat foods. Unfortunately, only seven women participated in this second phase. Therefore, the results can only be viewed as an indication of the nature of attitudes and points of attention for further research.

*Focus group interviews*

Focus group interviews were evaluated as a useful method to identify concerns and opinions about nutrition and related topics (e.g. Crockett *et al.*, 1990; Lewis & Yetley, 1992; Shepherd *et al.*, 1989). Aim of the focus group interviews was to identify determinants of consumption of high-fat foods in Dutch women from different generations, and to get insight into transfer of nutrition habits from one generation to the other. Six focus group interviews were performed. Recruitment of participants for focus groups with the younger generation took place at primary schools, for the middle generation at a women's organization and a working place, and for the older participants at service centres for the elderly. In total 37 subjects participated in six focus groups. During the interview the following topics were discussed: (i) beliefs towards fat and cholesterol, and nutrition in general; (ii) social influence, for example consideration of other people's preferences, influence others on own dietary behaviour; (iii) problems with respect to following a dietary treatment, healthy food choices; (iv) transfer of nutrition habits from one generation to another. During each group interview a moderator asked questions and an assistant made notes and took care of the tape recorder. For the analysis the phases described by Krueger (1988) were followed: The tape was checked for completeness, the course of the group interview was discussed, and a report of impressions concerning topics and atmosphere was made. The tapes were typed out, and the material was analyzed according to the strategies described by Wester (1987). In this analytical phase the computer programme Kwalitan was used (Peters *et al.*, 1989).

Several foods were recognized as high-fat foods, however it was also clear that there were many misconceptions about fat and cholesterol. As in the other qualitative interviews it appeared that taste, heart disease, and slimming were important topics.

Especially in the elderly groups prevention of bone demineralization was mentioned in relation to milk products. In the two groups with elderly women more health beliefs emerged than in the other groups. From all groups it was clear that women often bought foods which were liked by their husband or children.

*Content analysis of advertisements*

Food advertisements give an impression of attributes that are important in food choice. A content analysis of two widely circulated magazines was performed to examine the frequency of claims used in advertisements for foods that contribute to the dietary fat intake in the Netherlands. The selected magazines were a women's magazine (Libelle) and a magazine that is distributed free of charge by a supermarket chain in the Netherlands (Allerhande). In 1989, circulation rate was 730.000 for Libelle and 1,8 million for Allerhande. A sample was taken of the Libelles and Allerhandes that appeared between 1985 and 1989. In total 411 advertisements were analyzed. A coding form was developed, and all advertisements were characterized with regard to the type of food represented and the type of promotional claims.

The majority of the selected advertisements were for meat and meat products (18%), milk and milk products (16%), cheese (16%), fats (12%), and cake and biscuits (10%). In 81% of the advertisements flavour or taste of the food was referred to. Other important appeals to consumer concerns were packing and assortment (49%), use (43%), quality (38%), profit (29%), convenience (24%). Health and nutrition claims were mentioned in 25% of the advertisements, while 12% of the advertisements referred to body weight, calories or slimming. The finding that the claims most frequently used were not related to nutrition, but to taste and other non-nutritional appeals is in agreement with the findings of Barr (1989), Den Hartog *et al.* (1989), and Wallace Hickman *et al.* (1993).

## QUESTIONNAIRES

### *Beliefs and attitudes questionnaire*

Based on literature and the pilot studies it appeared that taste, slimming, and heart disease are motivations involved in high-fat food choices. In addition, for several foods different beliefs emerged. Several approaches are possible to assess the importance of beliefs and attitudes in a quantitative study. Based on a study of the literature (Stafleu *et al*, 1991/2) it was decided to use the Fishbein and Ajzen theory of reasoned action with two additional variables: self-efficacy and habits.

Further, it was considered whether the study should be on aggregate level (fat intake) or food level (selected high-fat foods). From literature (Lloyd *et al.*, 1993; Van Assema *et al.*, 1993) it appeared that consumers misjudge the fat content of their diet as low in fat. This implies that it makes no sense to ask beliefs and attitudes towards a high fat diet, as most consumers will perceive the risk behaviour under study as the diet of somebody else. Therefore it was decided to ask beliefs and attitudes towards the consumption of foods rather than towards fat intake. This means that, in order to be able to analyze data on aggregate level, one attitude scale should be developed based on attitudes towards several foods.

### *Other questionnaires*

Two other questionnaires were used for analyses on aggregate level. A nutrition knowledge questionnaire based on the Dutch dietary guidelines was developed in cooperation with TNO-Nutrition (Schneijder *et al.*, 1991). From this questionnaire the two subscales related to fat and to cholesterol were used.

Food consumption was assessed by means of a food frequency questionnaire developed and validated by Feunekes *et al* (1993).

## RELIABILITY STUDIES

Several studies were performed to pretest the questionnaires and to assess the reliability of the questionnaires. In Utrecht, a city in the middle of the Netherlands with about 230,000 inhabitants, 419 men and women completed the above mentioned questionnaires. In order to assess test-retest reliability 33 women completed the questionnaires twice, with 12-14 weeks between test and retest. This study was part of a health education programme in a low-income area in Utrecht.

As it was expected that elderly women would have difficulty in answering the beliefs and attitudes questionnaire, and the nutrition knowledge questionnaire it was decided to perform a separate reliability study among elderly women. In total 49 women between 63 and 84 years old participated in this study. Of these women 39 completed the questionnaire twice, on average nine weeks later.

With respect to the nutrition knowledge questionnaire discriminate validity was measured by comparing knowledge score of students in Human Nutrition with results from the subjects who participated in the study in Utrecht. In total 45 students completed the questionnaire.

Based on the above mentioned studies the beliefs and attitudes questionnaire, and the nutrition knowledge questionnaire were adjusted. Questions about normative beliefs, and subjective norm were deleted, as were the self-efficacy questions.

## THREE-GENERATION STUDY

### *Design*

A study among three-generation families faces several practical problems, which are outlined in this section. The final design of the study was based on suggestions of informants mainly.

First, it was decided to perform the study on maternally related family members only. Family resemblance in beliefs, attitudes, and fat intake might be different for same-

sex grandparent-parent-child combinations than for opposite sex grandparent-parent-child combinations (Logue *et al.*, 1988). When both sexes are included in a three-generation study eight possible combinations of sexes could be made. This would have made the study design and the analyses very complicate. The reason why women were studied rather than men is that women traditionally prepare the meals.

The second decision was related to socio-economic class. As there is intergenerational class mobility (Ganzeboom *et al.*, 1987), grandmother, daughter, and granddaughter might belong to different socio-economic classes. This makes it difficult to study differences in socio-economic classes in a three-generation study. In addition, women from the lower socio-economic class in generally have their children at an earlier age (Centraal Bureau voor de Statistiek, 1982, 1990). This means that it is difficult to separate a difference in socio-economic class from a difference in age. Therefore it was decided to perform the study in a homogeneous population, preferable among women from lower socio-economic classes, because death from ischaemic heart disease is higher among lower socio-economic classes (Kunst *et al.*, 1990).

Third, the recruitment was considered. In a three-generation study one of the subjects is asked to provide the addresses of the other two generations. Which generation should be the starting point is subject to several advantages and disadvantages. In the present study it was decided to ask the younger generation first. This decision was based on the following four considerations:

(1) It is possible to select one age range. This is not true for the middle and older generation. For example, a 40 year old women might have a daughter of 20, but it also possible that her daughter is only 5 years old;

(2) Every young adult women has or had per definition a mother and a grandmother. On the contrary, not every middle aged women has an adult daughter, and not every older women has a middle aged daughter, and an adult granddaughter;

(3) Every young adult women has or had only one mother and only one maternally related grandmother. Women from the middle or older generation might have more than one daughter. Selection of favourite daughter should be prevented;

(4) It could be expected that if the younger generation is from the lower socio-economic class, the chance that the other family members are from the lower socio-economic class as well, is higher than when the study started with a grandmother from the lower socio-economic class, because class mobility is in upward direction predominately (Ganzeboom *et al.*, 1987).

As a result it was decided to select young adult women from lower socio-economic classes, and to ask them the addresses of their mothers and grandmothers in maternally line.

*Pilot study*

A pilot study was performed among 19 young women, their mothers, and their grandmothers. The aim of the pilot study was to get insight into the logistics of a three-generation study. Recruitment took place at schools for higher vocational training (PABO's) and aerobic classes. Based on this pilot study the questionnaires were adjusted again. Further, it appeared that it was very difficult to get complete three-generation families, and it became clear that at least ten times the desired study population size should be approached in order to have a large enough study population.

*Main study*

A sample of 2052 women between 20 and 30 years old was taken from the municipality of Helmond, a town in the southern part of the Netherlands with about 71,000 inhabitants. This town was selected because death rates from ischaemic heart disease are higher in this part of the Netherlands (4% and 16% higher than the average in the country, for men and women, respectively) (Van Vlerken, 1989). The sample consisted of women living in low-income areas (based on prosperity indices related to postal codes). Data were collected on socio-demographic characteristics, nutrition knowledge, beliefs, attitudes, and fat intake. Ninety-seven adult women, their mothers, and their grandmothers participated in the study.

## OUTLINE OF THE THESIS

Chapter 2 gives a review of research on social-psychological determinants of nutrition behaviour. The study in Utrecht on reliability assessment of questionnaires could be used to study intercorrelations between beliefs, attitudes, social norms, and intentions with respect to Fishbein and Ajzen's theory of reasoned action (chapter 3). The results of the relative importance of health and sensory related beliefs and attitudes on intentions to consume 20 foods are described in chapter 3 as well. Further, an attitude scale towards high-fat foods and their low-fat alternatives was developed. The reliability of this attitude scale and its relationship with fat intake is reported in chapter 4. Results of the three-generation study are described in chapter 5, 6, and 7. Chapter 5 describes family resemblance in energy and fat intake, and discusses the possibility of a cohabitional effect. Chapter 6 shows results on nutrition knowledge, and attitudes on aggregate level, and refers to the question whether a family based approach in nutrition education is indicated, while results on food level are described in chapter 7. Finally, main findings, additional considerations, and possible implications of this research project for nutrition education, health policy, and further nutrition research are formulated in chapter 8.

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## CHAPTER 2

# A REVIEW OF SELECTED STUDIES ASSESSING SOCIAL-PSYCHOLOGICAL DETERMINANTS OF FAT AND CHOLESTEROL INTAKE[1]

*Annette Stafleu , Cees de Graaf, Wija A. van Staveren, Johannes J.F. Schroots*

## ABSTRACT

Twenty-eight social-psychological studies focused on behaviour associated with the consumption of foods high in fat and cholesterol are reviewed. The different social-psychological models that have been used to explain food choice are described. Factors affecting food choice and empirical results are discussed. Attitudes, especially preferences, seem to be important determinants of a high-fat diet.

## INTRODUCTION

Coronary heart disease is a major cause of death in Western countries. One of the risk factors of coronary heart disease is the proportion of (saturated) fat and cholesterol in the diet (Kris-Etherton *et al.*, 1988). In the Netherlands, as in other countries, the average total intake of dietary fat is about 5 energy percent above the recommended upper limit of 35 energy percent (Hulshof & Van Staveren, 1991).

Health education is one of the tools available to influence dietary behaviour. In nutrition counselling, emphasis is mostly on the health-related effects of foods. However, before nutrition education can be effective it must be known which factors determine nutrition behaviour and which factors are liable to be affected by nutrition education.

A review of selected literature regarding the relationship between social-psychological variables and dietary behaviour has been carried out with special emphasis on the following points:

(1) which theoretical models have been applied to study social-psychological

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[1] *Food Quality and Preference*, 1991/2;3:183-200

determinants of dietary behaviour associated with fat and cholesterol consumption in Western Societies ?

(2) which social-psychological variables are associated with fat and cholesterol consumption ?

For a study to be included in this review, it had to meet the following criteria:

(1) articles were published between 1980 and 1992;

(2) social-psychological variables were measured towards fat, cholesterol, or products that have a high contribution to the dietary fat or cholesterol intake;

(3) the measurements were made independently of an experimental design (for example, a nutrition education programme); and

(4) the subjects were not a special group, like pregnant women or athletes.

Frameworks for understanding food choice or food-related behaviour were reviewed by Glanz *et al.* (1990), Krondl (1990), and Shepherd (1990). A useful theoretical framework that interrelates social-psychological factors with other factors that influence dietary behaviour is shown in Figure 1 (Shepherd, 1985). This scheme includes factors related to food, to the person, and to his social-economic environment, e.g. attitudes to sensory properties, attitudes to health. Social-psychological factors refer to factors related to persons and factors related to the social-economic environment. Not all factors are liable to be influenced by health education. For example: social-economic status may be a good predictor of fat consumption, but cannot be influenced by health counselling. In this review we concentrate on selected factors related to the person and to social factors affecting food behaviour.

First, we describe the different theoretical frameworks used in 28 studies focused on behaviour associated with the consumption of foods high in fat and cholesterol. Some of these models were developed to predict behaviour while other models were developed

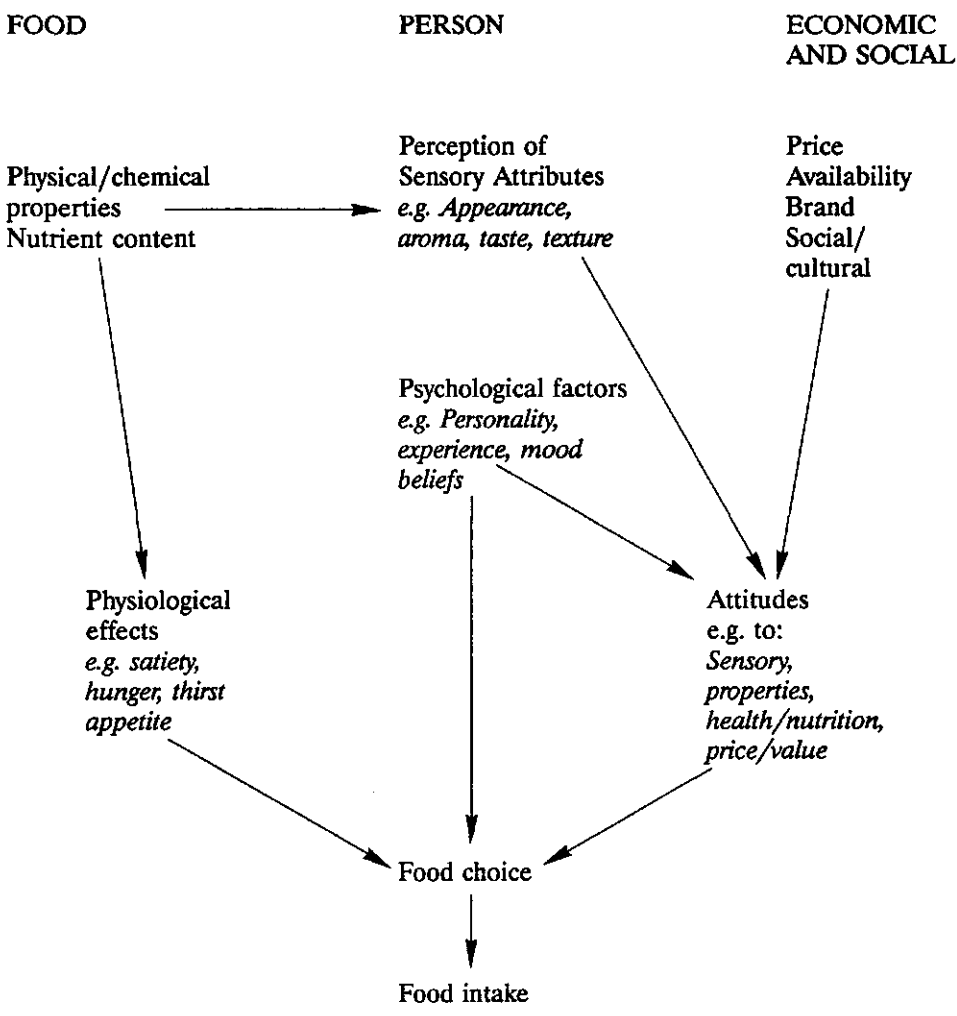



Figure 1. Factors influencing food choice. (From Shepherd (1985), reproduced by permission of MCB University Press Limited).

to gain an insight into variables that may lead to change of behaviour. Secondly, the determinants incorporated in these models are discussed. These two sections form the theoretical part of this article. The empirical results of the studies are discussed in the final part.

## SOCIAL-PSYCHOLOGICAL MODELS USED IN NUTRITION RESEARCH

Most of the social-psychological models used to explain and predict dietary behaviour, were not developed specifically for that purpose. Table 1 shows selected models and theories used in research to explain dietary behaviour associated with fat and cholesterol intake. This table shows that the Fishbein and Ajzen (1975) model was used most often. The Health Belief Model and the locus of control theory were applied in four and five studies, respectively. Other theories were used only once or twice. In five studies a combination of models and theories was used and in four studies a model was not specified.

## PRINCIPLES OF THE MODELS USED

### *Fishbein and Ajzen Model*

According to the theory of reasoned action of Fishbein and Ajzen (1975), behavioral intention is the best predictor of behaviour. Behavioral intention (I) can be predicted from a person's attitude towards behaviour (A) and from his subjective norms (SN) (Figure 2):

$$(I = A + SN) \qquad (1)$$

The term attitude is defined as the individual's positive or negative evaluation of performing a certain behaviour. The subjective norm reflects the social pressure to perform a certain behaviour. A person's attitude is predicted by cognitive beliefs ($B_i$)

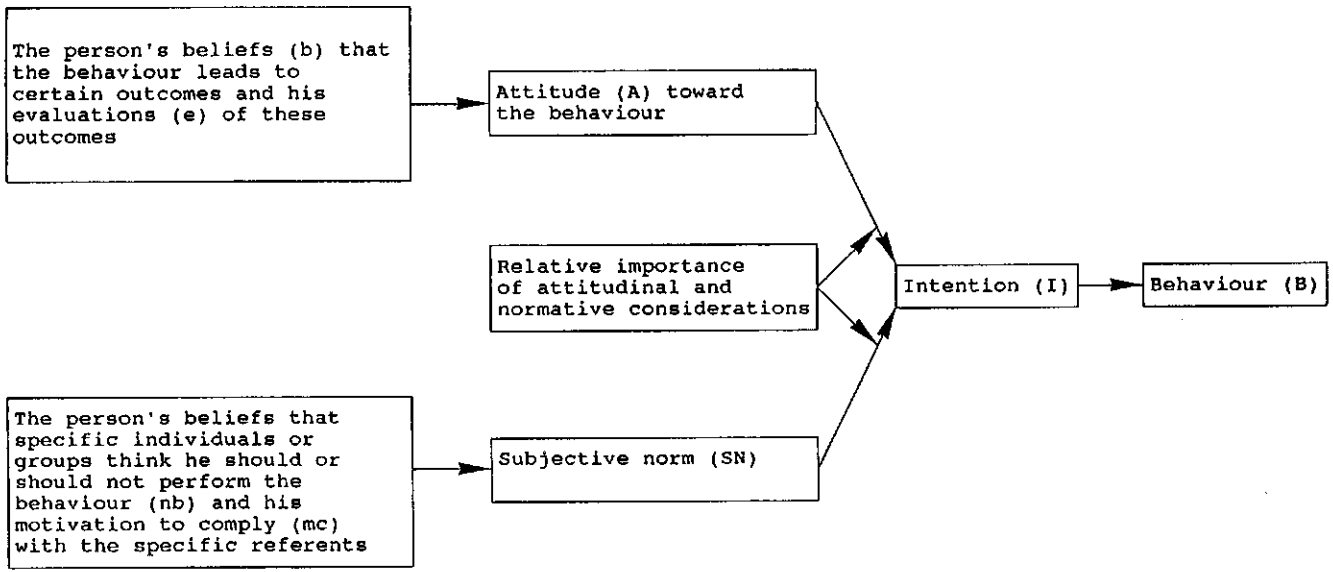



Figure 2. Representation of the components of the theory of reasoned action. (From Ajzen & Fishbein (1980), reproduced by permission of Prentice Hall, Englewood Cliffs, NJ, USA).

about the expected outcome of such behaviour. The outcome beliefs are modified by the individual's evaluation of the expected outcome ($E_i$). Each belief score is multiplied by the appropriate evaluation score and an overall belief-value measure is derived from the sum of these scores:

$$(A = \Sigma B_i E_i) \tag{2}$$

The subjective norm is predicted from a set of normative beliefs ($NB_j$) related to reference groups multiplied by a motivation to comply ($MC_j$) with these groups:

$$(SN = \Sigma NB_j MC_j) \tag{3}$$

Both attitude and subjective norm have to be weighted for their relative importance. Generally speaking, individuals will intend to perform a certain behaviour if they evaluate it as positive and if they believe that important others to them think they should perform it.

Demographic variables and a person's characteristics are considered to be external variables. External variables may influence the beliefs a person holds or the relative importance he attaches to attitudinal and normative considerations (Azjen & Fishbein, 1980; Shepherd, 1989).

*Health Belief Model*

As stated by the Health Belief Model (Figure 3) the likelihood of taking a preventive health action is determined by its perceived benefits minus its perceived barriers, and the perceived threat of disease X. This perceived threat is determined by both the individual's perceived susceptibility to the particular illness and the perceived seriousness of the consequences of the disease. Further, to trigger appropriate health behaviour a cue to action must occur. Demographic and social-psychological variables might affect an individual's health motivations and perceptions, but are not considered

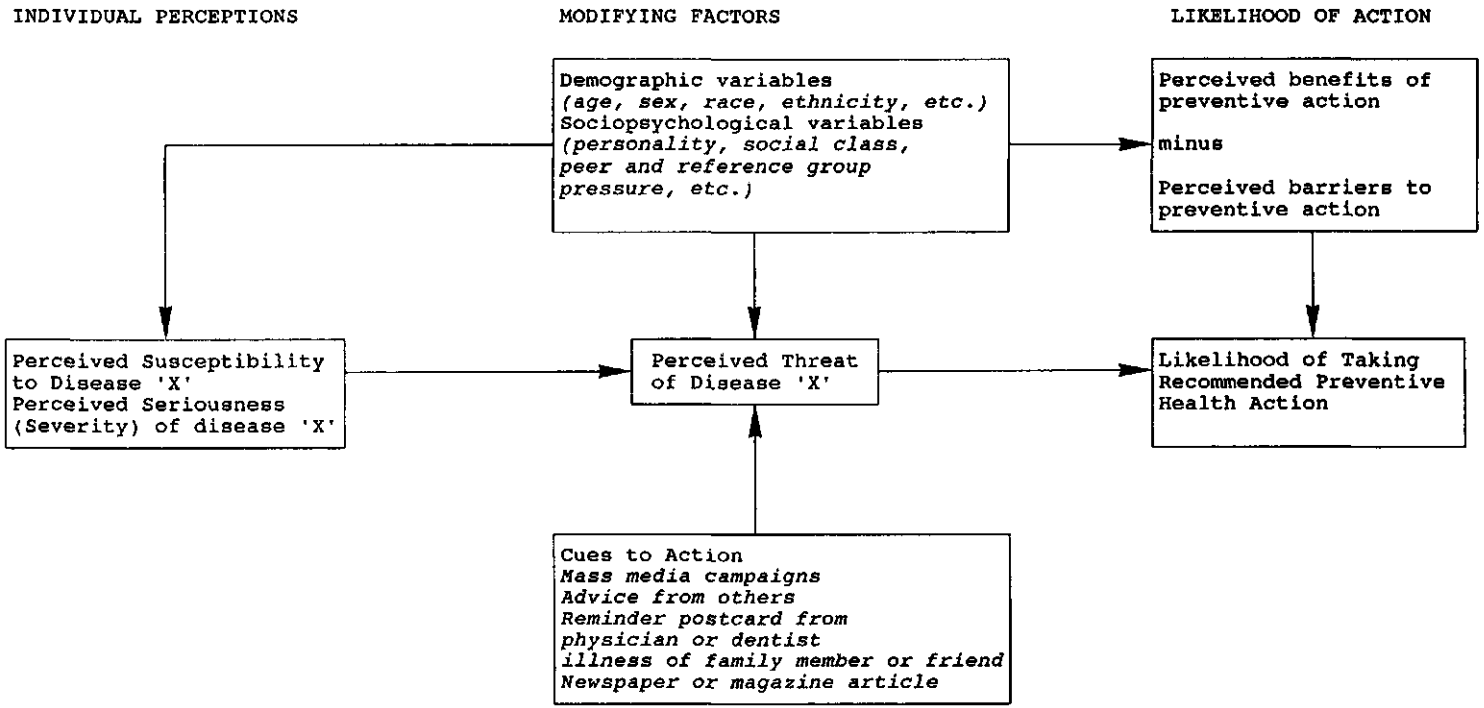



Figure 3. Variables and relationships in the health belief model. (From Becker *et al.* (1977), reproduced by permission of J.B. Lippincott Company, Philadelphia, PA, USA).

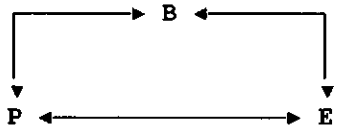
as direct causes of health action (Rosenstock, 1974; Becker *et al.*, 1977; Janz & Becker, 1984).

*Social learning theory*

The four basic components of the social learning theory utilised in the prediction of behaviour are behavioral potential, expectancy, reinforcement value and psychological situation (Rotter *et al.*, 1972). Following Wallston and Wallston (1984), the basic equation of the social learning theory states that the potential of a specific behaviour (BP) occurring in a given situation is a function of the expectancy (E) that the behaviour will lead to a particular reinforcement in that situation and the value of the reinforcement (RV) to the individual in that situation:

$$BP = f(E, RV) \tag{4}$$

In 1986, Bandura renamed the social learning theory a social cognitive theory. In a model of triadic reciprocality a subject's cognitions and other personal factors (P), environmental events (E), and behaviour (B) operate as interacting determinants of each other (Bandura, 1986):




(5)

Lewis *et al.* (1989) applied a social cognitive model for frequency of food consumption. Within this model the interaction and identity with different groups (differential association) are considered as the initial source of all factors affecting nutrition behaviour. Differential association gives rise to social reinforcement, the opportunity to model behaviours and evaluative definitions. Evaluative definitions are individual norms, attitudes and orientations. These factors, in turn, influence behaviour. Physiological need

(taste) -a non-social reinforcement- acts directly on behaviour.

*Locus of control*

Locus of control is an important aspect in Rotter's social learning theory. The health locus of control theory suggests that some people tend to place the primary responsibility or locus of control of the health outcomes of their behaviour within themselves, while other people tend to believe that their health is caused primarily by external circumstances or people outside their own control (Contento & Murphy, 1990). Three loci of control orientations have been identified (Wallston *et al.*, 1978) and described clearly by Eden *et al.* (1984):

(1) internal locus of control – the belief that attainment of a goal, reward or outcome is within one's own control, a result of one's own actions and behaviour;

(2) external locus of control by powerful others – the belief that attainment of a goal, reward or outcome is in the control of other persons or things more powerful or significant than oneself;

(3) external locus of control by chance – the belief that attainment of a goal, reward, or outcome is outside of one's own control and is a result of chance, fate or luck.

With a high belief in internal health locus of control and a high valuing of health a person is most likely to engage in health behaviour (Wallston & Wallston, 1984). A high belief in powerful others locus of control will facilitate health behaviour that is recommended by health professionals. For people with a high belief in locus of control by chance, there seems no reason to take health action.

*Triandis' model*

The model of Triandis has the same principle as that of Fishbein and Ajzen (1975). The most striking difference is the inclusion of habit and facilitating conditions. According to Triandis (1977), the probability of a behaviour (B) is determined by an individual's intention (I) to perform the behaviour and by an individual's previously established habits (H) (Brinberg & Durand, 1983). Facilitating conditions (Fc) regulate

the impact of habit and intention (Tuorila & Pangborn, 1988b). This may be expressed as:

$$(B = Fc \times H + Fc \times I) \quad (6)$$

In its turn, behavioral intention is determined by affect associated with the behaviour (A), by perceived consequences of the behaviour (C) and by social factors (S) (Tuorila & Pangborn, 1988b):

$$(I = A + C + S) \quad (7)$$

The variables in both equations have to be weighted for their relative importance.

*Combinations of different models*

Contento and Murphy (1990) used factors from different models in their study. In addition to the health locus of control theory, variables from the Health Belief Model and the Fishbein and Ajzen model, they measured self-efficacy, a variable that is derived from Bandura's social cognitive theory (Bandura, 1986).

Feldman and Mayhew (1984) utilised the model suggested by Wallston and Wallston (1984). This model integrates elements from the Health Belief Model, the model of Fishbein and Ajzen and Triandis's theory of social behaviour. The fundamental equation of the model of Wallston and Wallston is that behaviour (B) is the sum of behavioral intent (BI), previous behaviour or habit (H), and facilitating conditions (Fc):

$$(B = BI + H + Fc) \quad (8)$$

## VARIABLES INCLUDED IN THE DIFFERENT MODELS

From the described models used in the 28 studies it appears that many variables are

## TABLE 1

*Social-psychological models and variables used in nutrition research.*

| Authors | Model/ theory | Beliefs | Attitudes | Social influence | Locus of control | Other variables | Intention | Behaviour |
|---|---|---|---|---|---|---|---|---|
| Ajzen and Timko (1986) | F[a] | | -good | | | -perceived behaviour control | | -among others: avoid cholesterol |
| Axelson et al. (1983) | F | -quality<br>-nutritious<br>-calories<br>-taste<br>-greasy<br>-selection<br>-no cooking<br>-location<br>-quick<br>-price | -good | -parents<br>-friends<br>-boy or girlfriend<br>-important people | | | -next 2 weeks | -eating at a fast food restaurant |
| Dalton (1987) | F | -healthy<br>-expediency<br>-tasty | -good | -friends<br>-others | | | -lunch | -food choices at lunch |
| Rutter and Bunce (1989) | F | -fattening<br>-cheap<br>-nutritious and healthy<br>-taste<br>-texture<br>-convenient | -good<br>-beneficial<br>-wise<br>-pleasant<br>-healthy<br>-economic | -family members<br>-close friends<br>-Milk Marketing Board<br>-nutritionists<br>-doctors | | -past behaviour<br>-follow-up behaviour | -in future | -milk consumption (six items) |
| Sapp (1991) | F | -food safety<br>-control fat<br>-additives | -good<br>-wise<br>-rewarding<br>-beneficial | -important people<br>-parents<br>-friends<br>-children<br>-spouse | | -knowledge<br>-social acceptability | -next year (compared with current consumption) | -frequency of beef consumption |

*continued*

TABLE 1, continued.

| Authors | Model/ theory | Beliefs | Attitudes | Social influence | Locus of control | Other variables | Intention | Behaviour |
|---|---|---|---|---|---|---|---|---|
| Sapp and Harrod (1989) | F | -safety<br>-limiting fat<br>-additives | -good<br>-wise<br>-rewarding<br>-beneficial | -important people<br>-parents<br>-friends | | -social acceptability | -next year (compared with current consumption) | -beef consumption compared with one year ago |
| Saunders and Rahilly (1990) | F | -health<br>-feeling good<br>-failure<br>-personality or mood changes | | -parents<br>-partner<br>-children<br>-doctor<br>-friends<br>-teacher<br>-roommate | | | -next 2 weeks | -currently modifying dietary intake of fat and sugar |
| Shepherd and Stockley (1985) | F | | -beneficial<br>-pleasant | -important people | | | | -frequency of consumption of six high-fat foods |
| Shepherd and Stockley (1987) | F | | -beneficial<br>-pleasant | -important people | | -knowledge | | -frequency of consumption of four high-fat foods |
| Shepherd (1988) | F | -sensory attributes<br>-nutritional properties<br>-functional properties<br>-price/value | -good<br>-pleasant<br>-beneficial<br>-desirable | | | | -shopping next time | -frequency of consumption three milk types |
| Towler and Shepherd (1992) | F | -healthy<br>-high in fat<br>-tasty<br>-price<br>-protein<br>-vitamins<br>-convenience<br>-additives<br>-calories<br>-greasy<br>-smell | -good<br>-beneficial<br>-pleasant | | | | -next week | -frequency of consumption of four food groups high in fat |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tuorila (1987) | F | -sensory<br>-nutritional<br>-health<br>-price<br>-suitability | -good<br>-pleasant | -family<br>-nutritional experts<br>-dairy industry<br>-farm producers<br>-important people | | | -shopping next time | -selection of milk type in supermarket |
| Tuorila and Pangborn (1988a) | F | -weight concern<br>-functionality<br>-nutrients<br>-benefits<br>-treat<br>-bad feelings<br>-pleasure<br>-costs<br>-undesirable consequences | -good<br>-liking | -nutritionists<br>-food manufactures<br>-food advertisers<br>-parents<br>-friends<br>-important people | | | -next opportunity | -consumption frequency of four high-fat foods<br>-consumption compared to others |
| Becker and Levin (1987) | HBM[b] | -perceived risk | | | | -knowledge | | -dietary salt and saturated fat intake |
| Pierce et al. (1984) | HBM | -costs<br>-time<br>-favourite foods<br>-heart disease | | | | -knowledge | | |
| Eden et al. (1984) | LC[c] | | | | -internal<br>-powerful others<br>-chance | -value of diet and health | | |
| Houts and Warland (1989) | S[d] | | | -household members (social context) | -internal<br>-external | -reinforcement values | | -selection and avoidance of specific foods (nine items) |
| Lewis et al. (1989) | S | | -important | -family<br>-friends<br>-health experts<br>-media<br>-modelling | | -knowledge<br>-social reinforcement<br>-non-social reinforcement (taste)<br>-commitment | | -consumption on frequency of milk and soda |

*continued*

TABLE 1, continued.

| Authors | Model/ theory | Beliefs | Attitudes | Social influence | Locus of control | Other variables | Intention | Behaviour |
|---|---|---|---|---|---|---|---|---|
| Feldman and Mayhew (1984) | W[e] | -convenience<br>-other ? | -moral<br>-pleasant<br>-good<br>-other ? | -mother<br>-other ?<br>-role belief | | -facilitating conditions<br>-self concept<br>-personal normative belief<br>-habit (previous behaviour) | -during next week<br>-near future | -use of meat and sodium (six items) |
| Franssen and Knipscheer (1990) | F<br>LC | | | -intimate network | -internal<br>-powerful others<br>-chance | | | -preventive nutrition (limit salt, limit fat weight control) |
| Hayes and Ross (1987) | HBM<br>LC | | | | -internal<br>-external | -concern with health<br>-concern with appearance | | -consumption frequency (two items)<br>-perceived importance (three items) |
| Brinberg and Durand (1983) | F<br>T[f]<br>SPM[g] | -see Axelson et al. (1983) | -good | -parents<br>-friends<br>-boy or girlfriend<br>-important people | | -facilitating conditions<br>-perceived probability of performing the behaviour<br>-habit (frequency) | -next 2 weeks | -eating at a fast food restaurant |
| Tuorila and Pangborn (1988b) | F<br>LC<br>T | | -liking | -nutritionists<br>-important people | -powerful others<br>-chance | -facilitating conditions<br>-habit (out of)<br>-consequences (good) | -next opportunity | -mean of frequency consumption<br>-consumption compared to others |
| Contento and Murphy (1990) | F<br>HBM<br>LC<br>S | -cancer<br>-heart disease<br>-perceived susceptibility, severity, benefits, barriers, | | -family<br>-friends<br>-physicians<br>-important people | -internal<br>-powerful others<br>-chance | -cues to action<br>-overall health concern<br>-self efficacy | | -change in consumption (29 items) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Cumming et al. (1989) | - | -heart disease | -heart disease | | -knowledge | -fat intake (eight items) |
| Hollis et al. (1986) | - | | -helpless and unhealthy<br>-food exploration<br>-meat preference<br>-consciousness | -family | | -routine use (32 items) |
| Schucker et al. (1987) | - | -health<br>-cholesterol<br>-heart disease | | | -knowledge | |
| Sullivan and Schwartz (1981a,b) | - | | -role diet<br>-changing diet<br>-responsibility | | -knowledge | -usual intake of nutrients and energy |

[a] F, model of Fishbein and Ajzen
[b] HBM, health belief model
[c] LC, locus of control
[d] S, social cognitive theory/social learning theory
[e] W, model of Wallston and Wallston
[f] T, model of Triandis
[g] SPM, subjective probability model

potential social-psychological predictors of dietary behaviour. Table 1 shows an overview of variables which will be discussed below.

*Beliefs and attitudes*

In Figure 4 attitudes and beliefs are placed on a scale with at one end the affective component of behaviour and at the other end the cognitive component (Sims, 1981). Beliefs should be placed towards the fact or cognition side, while attitudes are nearer to the affective side. For example the pleasantness of a food is an attitude, and the expensiveness of a food is a belief. According to Sims (1981), when clear distinctions can be made between right-wrong, correct-incorrect, probable-improbable, the investigator is dealing with beliefs. However, there is not always a clear distinction between beliefs and attitudes. For example, in some studies 'taste' is defined as an attitude, in other studies it is a belief statement.

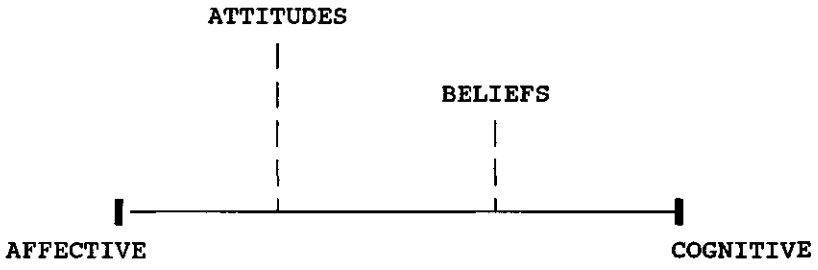



Figure 4. Theoretical distinction between attitudes and beliefs. (From Sims (1981), reproduced by permission of the *Journal of the American Dietetic Association*).

*Beliefs*. In most of the theories and models beliefs are included (see Table 1). In Fishbein and Ajzen's theory of reasoned action, beliefs refer to the perceived likelihood that the behaviour will lead to certain outcomes, e.g. the belief that the consumption of eggs will increase the risk of heart disease. The nature and numbers of beliefs in nutrition

research may vary from food product to food product. For example, in the study of Tuorila and Pangborn (1988a) there were seven beliefs for milk and 16 for ice-cream. In most studies the beliefs were selected in pretests by asking the advantages/disadvantages of the behaviour under investigation.

While belief statements in the Fishbein approach are behaviour-oriented, beliefs in the Health Belief Model are mainly directed to disease.

*Attitudes.* According to Ajzen and Fishbein (1980) attitude towards behaviour is the individual's positive or negative evaluation of performing a certain behaviour. In research using the Fishbein and Ajzen model the attitude of a person can be measured by asking attitudes directly, or a belief-based estimate of attitude can be used by means of the sum of the beliefs multiplied by their evaluation. In most studies attitudes are conceptualised as health consequences and preference aspects of eating the food (see Table 1).

Sullivan and Schwartz (1981a) developed an attitude instrument consisting of 26 statements distributed among three sub-tests: (i) attitudes towards the general role of diet in cardiovascular disease; (ii) attitudes towards changing or manipulating the diet; and (iii) attitudes towards self-responsibility for heart health. Cumming *et al.* (1989) asked their subjects their attitude towards dietary change. Pierce *et al.* (1984) asked questions on both the attitude towards dietary change and the role of diet in heart disease. In these three studies a disease related approach was used.

### *Social influence*

The influence of social environment on fat and cholesterol consumption has been measured in various ways, like perceived norms, modelling, and attitudes of important others.

In most studies the influence of social environment was established according to the subjective norm of the Fishbein and Ajzen model. It is important to know who the important others are who influence the behaviour in question before assessing the normative beliefs in the research population. In addition, the investigator should know

what these important others expect from the subject and if the subject is willing to comply with these important others (Oostveen & Kok, 1987).

Most studies ignore a careful selection of the important others. Sometimes only a direct measure of the subjective norm is obtained.

In other studies a set of normative beliefs derived from reference groups and the motivation to comply was measured. Reference groups were family members, friends, nutritionists/dietitians, physicians, roommate, dairy industry, farm producers (see Table 1). The sources of norms used by Axelson *et al.* (1983), Tuorila (1987), and Saunders and Rahilly (1990) were identified in pilot studies. In the study of Tuorila and Pangborn (1988a) the subjects were not able to indicate groups or individuals who would approve/disapprove of their consumption of fat-containing foods. Therefore, they used a standard approach, asking the subjects in all cases about the same reference groups.

Franssen and Knipscheer (1990) selected the 'important others' very carefully. To measure the influence of the intimate network on one's preventive health behaviour (preventive nutrition) they identified three members of the intimate network. The three persons were selected with the help of a funnel method in three steps.

Lewis *et al.* (1989) assessed the environmental factors in their model by means of four scales for milk. The scales dealt with family, friends, health experts, and media and consisted of statements reflecting: (i) family members' use of the beverage and perception of their feelings about it; (ii) friends' use of the beverage and perception of their feelings about it; (iii) perception of health experts' recommendations concerning the beverage; and (iv) perception of entertainment/persuasive quality of television advertising for the beverage. Besides, social reinforcement was measured by statements reflecting positive feelings, a sense of belonging to a group, and pleasing others as a function of consuming the beverage.

*Locus of control*

Contento and Murphy (1990) used the Wallston and Wallston's Multidimensional Health Locus of Control Scale. In this scale the internal as well as the external locus of

control by powerful others and/or chance are included. Franssen and Knipscheer (1990) also used an existing health locus of control scale, including the above-mentioned three orientations. These scales are not focused on nutrition, but on health in general.

The Multidimensional Health Locus of Control Scale served as a major basis for formulating items for a nutrition-related scale in the study of Eden *et al.* (1984). Tuorila and Pangborn (1988b) only measured the scales 'powerful others' and 'chance' of a nutrition locus of control scale.

### *Self-efficacy*

According to Bandura (1977) self-efficacy is the conviction that one can successfully execute the behaviour required to produce the outcomes desired. Expectations of self-efficacy are based on four major sources of information: performance accomplishments, vicarious experience, verbal persuasion and emotional arousal (Bandura, 1977).

To estimate self-efficacy Contento and Murphy (1990) asked subjects, amongst other things, how confident they were as to being able to change their diet in favour of the recommendations and how important it would be for them to make the change.

### *Habit*

Ronis *et al.* (1989) mentioned that habit may be considered as frequently repeated behaviour or alternatively as behaviour that is in some sense automatic or out of the subject's awareness.

In the study of Feldman and Mayhew (1984) habit was measured as previous behaviour. The measurement of habit (behaviour in the past) and behavioral intent (behaviour in the future) were similar in format; they differed mainly in terms of time frame. Also in the study of Brinberg and Durand (1983) habit was considered as frequently repeated behaviour. Tuorila and Pangborn (1988b) worked the other way round; they asked if the subjects consumed their food from habit.

*Knowledge*

Nutrition knowledge is measured in a few studies. Early work has established only a weak link between knowledge and behaviour (Axelson *et al.*, 1985; Johnson & Johnson, 1985).

In the Fishbein and Ajzen model knowledge is considered as an external variable and in Triandis' model as a facilitating condition. In Bandura's social cognitive theory knowledge is part of the concept of behavioral capability (Perry *et al.*, 1990).

*Facilitating conditions*

According to Triandis (1977) facilitating conditions are indexed by arousal, ability relevant to the task and/or knowledge about the behaviour.

Feldman and Mayhew (1984) conceptualised arousal as one's level of concern about the amount of meat one eats; ability was measured as the possibility to prepare well-balanced meals without meat for oneself. Brinberg and Durand (1983) and Tuorila and Pangborn (1988b) asked, in this context, the ease or difficulty in obtaining the food.

*Social acceptability*

Sapp and Harrod (1989) and Sapp (1991) included a construct measuring social acceptability in the Fishbein and Ajzen model. As the authors mentioned this construct refers to the prestige that the consumption of a food holds among consumers. It measures the extent to which a subject's food choices are influenced by opinions, fads, and fashions of the larger society.

*Behavioral intention*

Behavioral intention is a very important variable in the Fishbein and Ajzen model. However, few studies measured this variable. In Tuorila's milk study (1987) behavioral intentions were assessed as the likeliness of buying each milk type when shopping next time. Tuorila and Pangborn (1988a) specified the intention to consume as 'whenever I get the next opportunity to consume, either as part of a meal or as a snack'. Dalton

(1987) asked people their intended main food choice for lunch. Axelson *et al.* (1983) asked people whether they intended to eat at a fast-food restaurant in the next two weeks. Sometimes the time frame is specified (lunch; next 2 weeks) and sometimes not (whenever I get the next opportunity). Somewhat different approaches were used by Sapp (1991) and Shepherd (1988). Sapp (1991) measured intention to vary beef consumption, the reason being that most people already eat beef, and Shepherd (1988) used a relative intention score by summing the scores for skimmed and semi-skimmed milk and subtracting the score for whole-fat milk.

### *Dietary behaviour*

In studies about social-psychological determinants of dietary behaviour various methods to assess this behaviour are used. Table 1 indicates the dietary assessment method and the amount of items and the foods included in the questionnaire. The questionnaires varied from very simple ones (Feldman & Mayhew, 1984) to a complete dietary history (Sullivan & Schwartz, 1981b). Depending on the purpose of the study, behaviour might vary from shopping foods to intake of nutrients.

## PREDICTIVE POWER OF MODELS AND INDIVIDUAL VARIABLES

### *Variance explained*

Table 2 shows the variance, explained in behaviour or intention for different models. The variance explained varied from very low values, for example, behaviour explained by external locus of control (Tuorila & Pangborn, 1988b), to very high figures, for example in the LISREL models of Sapp and Harrod (1989) and Sapp (1991). For most equations the variance explained was between 20% and 50%. The $\beta$-coefficients are low for social influence variables and high for attitudes and liking. For locus of control, and self efficacy or perceived control the pattern is less clear. Generally speaking, equations in which attitudes are included explained the most variance in predicting behaviour or intention.

## TABLE 2

*Variance explained by the models used to explain dietary[a] behaviour associated with fat and cholesterol intake*

| Authors | Equation[b] | Variance explained (%) |
|---|---|---|
| Ajzen and Timko (1986) | Behaviour = 0.04 attitude + 0.63 perceived control | 41% |
| Axelson et al. (1983) & Brinberg and Durand (1983) | Behaviour = 0.41 intention | 17% |
| | Intention = 0.64 attitude + 0.03 subjective norm | 42% |
| | Behaviour = 0.33 intention + 0.05 habit | 15% |
| | Behaviour = 0.15 facilitating conditions×habit - 0.28 facilitating conditions×intention | 6% |
| | Behaviour = 0.43 intention + 0.13 habit -0.11 facilitating conditions×habit + 0.14 facilitating conditions×intention | 14% |
| Becker and Levine (1987) | Lifestyle risk index (included a measure of fat intake) = 0.36 perceived risk | |
| Contento and Murphy (1990) | Behaviour = 0.54 perceived benefits + 0.47 normative beliefs + 0.32 perceived susceptibility + 0.25 overall health concern + 0.24 chance locus of control + 0.05 cues to action | 29% |
| Cumming et al. (1989) | - | |
| Dalton (1987) | - | |
| Eden et al. (1984) | - | |
| Feldman and Mayhew (1984) | Behaviour = behavioral intent + habit + facilitating conditions | 57-71% |
| | Intention = affect + personal norms + social norms + perceived consequences | 27,41% |
| Franssen and Knipscheer (1990) | Behaviour = -0.24 normative beliefs (x motivation to comply) | 6% |
| | Behaviour = -0.30 actual preventive health behaviour of others (x motivation to comply) | 8-9% |
| Hayes and Ross (1987) | Behaviour = several social-demographic characteristics - 0.42 health locus of control - 0.34 concern with health + 0.76 Health locus of control×health concern + 0.12 concern with appearance | 17% |
| Hollis et al. (1986) | Behaviour = (-0.25-0.08) helpless and unhealthy | < 6% |
| | Behaviour = (-0.15-0.23) food exploration | < 5% |
| | Behaviour = (-0.47-0.05) meat preference | <22% |
| | Behaviour = (0.01-0.27) health consciousness | < 7% |
| Houts and Warland (1989) | Behaviour = locus of control + reinforcement values + social context[c] | 21% |
| Lewis et al. (1989) | Behaviour = differential association + behavioral modelling + evaluative definitions + social reinforcement + non-social reinforcement[d] | 35-48% |
| Pierce et al. (1984) | - | |
| Rutter and Bunce (1989) | Intention = (0.12, 0.40) attitude + (0.29, 0.21) subjective norm | 12,28% |
| | Behaviour = (0.11, 0.42) attitude + (0.30, 0.24) subjective norm | 12,33% |
| | Follow-up behaviour = (0.43, 0.02) attitude + (0.30, -0.05) subjective norm | 28, 0% |

*continued*

TABLE 2, *continued*

| Authors | Equation[b] | Variance explained (%) |
|---|---|---|
| Sapp (1991) | Behaviour = knowledge + beliefs + opinions significant others + social acceptability + attitudes + subjective norms (LISREL-model) | 77%[c] |
| Sapp and Harrod (1989) | Intention = 0.43 attitude + 0.11 subjective norm - 0.03 beliefs + 0.04 normative beliefs + 0.28 social acceptability | 39% |
| | Behaviour = 0.31 intention + 0.08 attitude - 0.02 subjective norm - 0.01 beliefs - 0.06 normative beliefs + 0.21 social acceptability | 29% |
| | Intention = beliefs + subjective norm + social acceptability + attitudes (LISREL-model) | 80%[c] |
| Saunders and Rahilly (1990) | Intention = attitude + subjective norm | 41% |
| | Intention = 0.67 attitude + 0.07 subjective norm (health majors) | 45% |
| | Intention = -0.35 attitude - 0.45 subjective norm (non-health majors) | 47% |
| Schucker et al. (1987) | - | |
| Shepherd (1988) | Behaviour = 0.68 intention | 46% |
| | Intention = 0.70 attitude | 49% |
| Shepherd and Stockley (1985) | Behaviour = (0.33-0.58) attitude + (0.04-0.19) subjective norm | 16-48% |
| Shepherd and Stockley (1987) | Behaviour = (0.30-0.59) attitude + (0.12-0.22) subjective norm | 20-48% |
| Sullivan and Schwartz (1981b) | Behaviour = attitude or knowledge | < 6% |
| Towler and Shepherd (1992) | Behaviour = (0.17-0.68) intention | |
| | Intention = (0.15-0.56) attitude | |
| Tuorila (1987) | Intention/behaviour = (0.38-0.60) attitude + (0.09-0.28) subjective norm | 18-47% |
| Tuorila and Pangborn (1988a) | Intention/behaviour = (0.25-0.74) liking + other variables that entered the model by stepwise regression | 24-55% |
| Tuorila and Pangborn (1988b) | Intention = (0.33-0.64) attitude + (0.06-0.35) subjective norm | 20-42% |
| | Intention = (0.30-0.65) attitude + (0.09-0.36) consequences + (-0.12-0.15) social norm | 22-46% |
| | Behaviour = (0.07-0.20) facilitating conditions×habit + (0.43-0.70) facilitating conditions×intention | 28-56% |
| | Behaviour = (0.11-0.28) habit + (0.47-0.75) intention | 40-67% |
| | Intention = (-0.23-0.16) external locus of control | 0.2-5% |
| | Behaviour = (-0.28-0.24) external locus of control | 0.2-8% |

[a] Only results of behaviour associated with fat and cholesterol intake are mentioned.
[b] All figures are standardized beta coefficients. The figures in the equation of Contento and Murphy (1990) are standardized discriminant functions coefficients: their interpretation is similar to beta weights. The figures in the equations of Towler and Shepherd (1992) and Becker and Levine (1987) are Spearman rank correlations.
[c] Three way analysis of variance.
[d] Path analysis.
[e] Coefficient of determination.

*Differences between groups of subjects*

*Stable versus changed diet.* Contento and Murphy (1990) compared adult shoppers who reported having voluntarily made positive changes in their diets with those who had not. The changers had a higher perception of personal susceptibility to diet-related disease, a higher perception of benefits and a lower perception of barriers as a result of taking preventive health actions; their overall health concern was higher, and they had a higher score on cues to action. According to Contento and Murphy (1990) these results show that the variables of the Health Belief Model largely explain dietary change. The subjects who made desirable changes also differed from those who did not change as regards normative beliefs and motivation to comply. Changers had also a lower score on chance locus of control. The difference in self-efficacy was less important.

Saunders and Rahilly (1990) also compared people with and without recent modifications of fat and sugar intake. The group that modified their diet reported a greater intention to reduce the intake of fat and sugar; had a more supportive attitude as to dietary restriction, and more positive beliefs about perceived consequences of dietary restriction. In addition, they reported a significantly greater perception that parents, spouse/partner, teacher/instructor and roommate would approve of the fat and sugar reduction in their diets. There were no differences between the two groups regarding motivation to comply with any of the seven references.

*Hedonic responses.* In the study of Tuorila (1987) hedonic responses to the three types of milk varied according to the principal user group: the subjects strongly preferred their own milk type. This confirms the relative importance of sensory aspects of foods on food choice.

*Cue to action.* Becker and Levine (1987) compared a group with a high 'cue to action' with a control group. The authors considered a coronary heart disease event experienced by a younger brother or sister as a cue to action. The unaffected siblings in the aggregate

did not make changes in lifestyles in the four months following the event in a younger brother or sister. This implies that a strong 'cue to action' is not that important.

*Locus of control.* In the study of Houts and Warland (1989) people with an internal locus of control were found to assume more responsibility for their diets and they score higher on reported nutritious food behaviour than people with an external locus of control.

## RELIABILITY AND VALIDITY

Reliability can be distinguished in stability (test-retest reliability) and equivalence. With equivalence there is the approach of the equivalence of each item (split half, Spearman-Brown) and the internal consistency approach (Kuder-Richardson, Cronbach's $\alpha$) (Carmines & Zeller, 1979; Sims, 1981).

Three types of test validity can be distinguished (Carmines & Zeller, 1979):

(1) content validity;
(2) criterion-related validity;
(3) construct validity.

According to Sims (1981) the first two types are seldom used in attitude research. She considers factor analysis as a statistical tool which is useful in establishing the construct validity of an attitude measurement instrument because with this technique the researcher is able to identify the basic dimensions underlying a domain of responses.

Different methods were used to study the validity and/or reliability of the questionnaires used in the reviewed studies (Table 3).

### *Reliability*

In most studies Cronbach's $\alpha$ was used to measure reliability (see Table 3). In two studies the test-retest procedure was used (Feldman & Mayhew, 1984; Hollis *et al.*, 1986).

Cronbach's $\alpha$ varied between 0.33 (perceived susceptibility scale in the study of Contento and Murphy, 1990) and 0.94 (attitudes instrument in the study of Sapp, 1991)

TABLE 3.

*Review of validity and reliability of social-psychological variables in studies concerning dietary behaviour*

| Authors | Validity | Reliability | |
|---|---|---|---|
| | | Cronbach's α | Other |
| Ajzen and Timko (1986) | - | - | - |
| Axelson et al. (1983) | Factor analysis | - | - |
| Becker and Levine (1987) | - | 0.80 | - |
| Brinberg and Durand (1983) | See Axelson et al. (1983) | - | - |
| Contento and Murphy (1990) | Construct[a] | 0.33, 0.59-0.82 | - |
| Cumming et al. (1989)[b] | - | - | - |
| Dalton (1987) | - | - | - |
| Eden et al. (1984) | Factor analysis | - | cross tabulations |
| Feldman and Mayhew (1984) | - | - | test-retest 0.59-0.85 |
| Franssen and Knipscheer (1990)[c] | - | - | - |
| Hayes and Ross (1987) | - | 0.59-0.82 | - |
| Hollis et al. (1986) | Factor analysis | - | test-retest 0.58-0.89 |
| Houts and Warland (1989) | Factor analysis | 0.59, 0.76 | - |
| Lewis et al. (1989) | Factor analyses | 0.61-0.90 | KR-20 0.57 |
| Pierce et al. (1984) | - | - | - |
| Rutter and Bunce (1989) | - | - | - |
| Sapp (1991) | Factor analysis | 0.68-0.94 | KR-20 0.61 |
| Sapp and Harrod (1989) | Factor analysis | - | - |
| Saunders and Rahilly (1990) | Construct[d] | 0.80 | - |
| Schucker et al. (1987) | - | - | - |
| Shepherd (1988) | Factor analysis | 0.85 | - |
| Shepherd and Stockley (1985) | - | 0.63-0.80 | - |
| Shepherd and Stockley (1987) | - | - | - |
| Sullivan and Schwartz (1981a) | Content[a]<br>Construct[e] | 0.70,0.79 | Hoyt's r<br>0.00-0.79 |
| Sullivan and Schwartz (1981b) | - | 0.45-0.82 | - |
| Towler and Shepherd (1992) | - | 0.55-0.89 | - |
| Tuorila (1987) | - | - | - |
| Tuorila and Pangborn (1988a) | Factor analysis | 0.39-0.65 | - |
| Tuorila and Pangborn (1988b) | - | 0.72 | - |

[a] Panel of experts.
[b] Half of the questions obtained from previously developed questionnaires.
[c] Use of existing locus of control scale.
[d] Following procedures for questionnaire construction using the Ajzen and Fishbein protocol.
[e] By measuring significant differences in the mean attitude and knowledge scores among groups.

(see Table 3). Generally speaking, the value of Cronbach's α was not very high. However, according to Shepherd (1989) it is not clear whether, in the case of food choice, an unitary belief structure would be expected. Although most studies used Cronbach's α to assess the reliability of scales, the way in which they used it is very different. For example, in the study of Saunders and Rahilly (1990) Cronbach's α is given for the whole questionnaire, Contento and Murphy (1990) and Shepherd and Stockley (1985) computed Cronbach's α for each scale, and Lewis *et al.* (1989) assessed Cronbach's α for each scale for each product separately.

The most interesting part of the reliability studies are the test-retest results. These give an impression of the stability of the variables. In the study of Feldman and Mayhew (1984) the test-retest correlations ranged from 0.59-0.85. In the study Hollis *et al.* (1986) these figures varied from 0.58 (health consciousness) to 0.89 (helpless and unhealthy).

*Validity*

Sullivan and Schwartz (1981a) submitted their attitude instrument to an independent expert panel of five nutritionists for validation by logical analysis. The attitude items were considered to represent an adequate variety of topics on diet and cardiovascular disease. Also in the study of Contento and Murphy (1990) a panel of experts reviewed and edited the questions for construct validity.

*Factor analysis*. Factor analysis was used in nine studies (see Table 3). Axelson *et al.* (1983) found two factors: an organoleptic-nutritious factor and an economic factor which accounted for 24.8% and 15.8% of the variance respectively. Eden *et al.* (1984) found eight factors which accounted for 65% of the variance. The first four factors could be identified as (i) willingness to change one's eating habits; (ii) inability to change or affect one's own eating habits or health; (iii) low control of personal eating habits; (iv) 'trying' to eat, or choose, healthful foods and feeling responsible to do so. After factor analysis the factors in the nutrition attitude survey of Hollis *et al.* (1986) could be identified as (i) helpless and unhealthy; (ii) food exploration; (iii) meat preferences; (iv) health

consciousness. They accounted for 35% of the variance. The locus of control items in the study of Houts and Warland (1989) loaded on one factor, as did the items of the reported nutritious behaviour scale. Principal component analysis on the belief-evaluation scores in Shepherd's study (1988) yielded two components accounting for 52% of the variance. Sapp and Harrod (1989) and Sapp (1991) used the confirmatory factor analysis procedure within LISREL. Tuorila and Pangborn (1988a) performed factor analysis for the beliefs of each product, for the evaluations, and the sum of the products of normative beliefs with motivation to comply, and obtained the following factors for milk: weight concern (31.0%), functionality (22.8%), and nutrients (15.6%).

## DISCUSSION

Predictors of dietary behaviour are important factors to be used in the design of nutrition education programmes. What kind of information can be derived from the above-mentioned studies ?

From both the variance in behaviour explained by different variables and the differences between groups of subjects it appears that attitudes, beliefs and habit are the most important predictors of nutrition behaviour associated with fat intake. Changing these factors may serve as a goal in nutrition education. The influence of social environment, measured by means of the subjective norm or normative beliefs, is a less important predictor of food choice. However, most studies were cross-sectional, and strictly speaking no conclusions with respect to prediction could be drawn.

Reliability and validity have an impact on later analyses. Low, or unknown reliability and validity of scales may have caused the occasional low amount of variance explained by the models. Although Cronbach's $\alpha$ was assessed in most studies, few investigators used factor analysis. Shepherd (1989) questioned whether in the case of food choice an unitary belief structure would be expected. As Axelson *et al.* (1985) mentioned, the identification of different dimensions of a variable by means of factor analysis, and keeping these dimensions separate in analysis may improve the

correspondence between the predictor and dietary intake.

Attitudes towards health and taste are the aspects most frequently examined in studies focused on the prediction of dietary behaviour. In the study of Tuorila and Pangborn (1988a) concerning fat-containing foods liking was the predominant predictor of reported consumption for all foods examined. According to Tuorila (1987) the high correlations between attitude and "overall liking" imply that simply rating overall liking may predict selection of a food approximately as well as assessing an attitude variable by the technique of Fishbein and Ajzen (1975). This is a pragmatic approach, which does not reveal why some people like a product and others do not. It stresses the point mentioned by Lewin (1943): do people like what the eat or eat what they like ? In the case that liking is the only variable measured to predict food selection, a shift is made from the Fishbein model to an application of the sensory model, the application being that a subject indicates on basis of experience whether he or she likes or dislikes a food item rather than he or she tastes the food in an experimental setting. As Krondl (1990) indicates a sensory model is not designed to identify an individual's attitude to food.

In studies using the Fishbein and Ajzen model the belief structure was not always assessed. Often only the overall attitude (health and liking) was asked. In such studies it is not possible to know why people think a product is bad. For example, do subjects evaluate the product as 'bad' because of the increased risk of coronary heart disease, caries, overweight and/or cancer? Rutter and Bunce (1989) used an approach suggested by Towriss (1984) to measure beliefs: subjects were asked about their own beliefs instead of modal beliefs. Their finding that with the Towriss method intentions were better predicted than with the Fishbein and Ajzen method indicates that this approach needs further investigation.

In general the predictive power of the attitudinal component is greater than that of the norm component. It is likely that perceived social pressure affects some types of behaviour more than others (Shepherd & Stockley, 1987). It may be that for some subjects the consumption of foods is a mainly non-social behaviour, and that the invisibility of the behaviour for others is one of the reasons why the predictive power of

the subjective norm is low. This might be especially the case when foods are eaten outside the family context.

If the influence of social environment is subconscious, it is impossible to evaluate the subjective norm by questionnaire. Also, when subjects do not want to admit that they are affected, a questionnaire is not an appropriate instrument. Further, the subjective norm does not act independently from attitudes. There is a continuous exchange between the attitudes of a person and those of his or her social environment. This leads to the process of internalisation, which means that a person thinks that he gives his own opinion, but in fact reports the opinion of other people. These factors make the subjective norm as a predictor of dietary behaviour hard to examine.

An illustration of the unawareness of the influence of social environment comes from the study by Dalton (1987) in worksite cafeterias. She asked employees before lunch their intended, and after lunch their actual, food choice. Their attitude towards food choice was also measured before and after lunch. The rating for 'influence of others' was higher on the actual selections compared to the intended food choice selections. The rating on the actual situation is probably more realistic.

Further, the assessment of social influence by means of preferences and attitudes of important others, social support, and/or modelling needs further investigation. Bandura's social cognitive theory could be used to study this, as Lewis *et al.* (1989) did for milk and soda consumption. Other approaches used in nutrition research might help to unravel the influence of social environment on fat intake. For example, studies of de Castro and coworkers (De Castro & De Castro, 1989; Redd & De Castro, 1992) showed that the number of people eating with the subject influenced meal size.

Contento and Murphy (1990) measured the concept of self-efficacy. Recently, it has been assumed that self-efficacy increases the prediction of behavioral intention. Some researchers (De Vries *et al.*, 1988) have integrated this factor from Bandura's social cognitive theory (Bandura, 1977) with the two factors of the model of Fishbein and Ajzen into one model to explain behavioral intention. In order to extend the theory of reasoned action to predict the performance of behaviours that are not completely under control,

Ajzen and Madden (1986) proposed a theory of planned behaviour. The theory of planned behaviour adds the construct of perceived behavioral control to the theory of reasoned action.

Including the concept self-efficacy in studies using the theory of reasoned action leads for example to the following set of questions: what is my opinion concerning this behaviour ? (beliefs and attitudes), what is the opinion of other people concerning this behaviour ? (normative beliefs and subjective norms) and am I able to perform this behaviour ? (self-efficacy) (De Vries *et al.*, 1988). According to De Vries *et al.* (1988) the advantage of incorporating the concept self-efficacy in the theory of reasoned action is that a more clear description of the process relevant to explain behavioral intention can be established. However, from the only study (Contento & Murphy, 1990) in this review that used the concept self-efficacy it appeared that the difference in self-efficacy between subjects who changed their diet and subjects who did not was less important than the differences in other determinants. On the contrary, the correlation coefficient between perceived control and the behaviour of avoiding high cholesterol foods was 0.64 in the study of Ajzen and Timko (1986). The concept self-efficacy or perceived control needs further investigation. There are currently too little empirical data to draw any conclusions.

Habit proved to be an important predictor of meat consumption in the study of Feldman and Mayhew (1984). Triandis (1977) postulated that behavioral intention is relevant for a new action, but repeated activity becomes increasingly controlled by habit. If this is what happens in practice, the analysis of the predictors of habit would be a valuable approach in food selection studies (Tuorila and Pangborn, 1988a). Another reason to incorporate measures of past behaviour in a model is mentioned by Ajzen and Madden (1986). They argued that perceived behavioral control is likely to reflect, among other factors, past performance of the target behaviour. Therefore, measures of prior behaviour should be included to rule out the possibility that the effect of perceived behavioral control is 'nothing but' a self-prediction of future behaviour.

The operationalization of the concept habit is somewhat trivial: the best predictor

of behaviour is past behaviour. As mentioned by Kahle and Beatty (1987), habit is a type of behaviour or action. Although not a reasoned action, it may be derived from an action that was reasoned in the past. According to Ronis *et al.* (1989) repeated behaviours are characterised by at least two stages: initiation and persistence. They argued that factors that influence initiation of behaviour may be different from factors that determine persistence of behaviour. As food choice is a repeated behaviour that seems to be habitual it is necessary to pay more attention to this variable, and the operationalization of habit in food choice.

One of the reasons why intention is not always included in the questionnaire is probably that in most studies all questions were asked at the same time. In that case it is not useful to predict behaviour from intention because intention refers to future behaviour while current behaviour is asked.

The best way to study the relationship between social-psychological variables and fat and cholesterol consumption seems the inclusion of components of different models in one framework. The theory of reasoned action of Fishbein and Ajzen may serve as a basic framework, because so far most studies have used this model. Other variables may be a valuable addition to this model, for example habit, self-efficacy. As fat and cholesterol consumption is a health-related behaviour, variables from the Health Belief Model should be included. Some of the elements of the Health Belief Model may be part of the salient beliefs. LISREL procedures, as used by Sapp and Harrod (1989) and Sapp (1991), can be used to evaluate the model.

This review is on quantitative data about social-psychological determinants of fat intake. It may be useful to integrate qualitative and quantitative methods. Steckler *et al.* (1992) mentioned four ways in which qualitative and quantitative methods might be combined. Two of them might be of use in studies as reviewed in this paper: (1) qualitative methods used in the initial phase to help developing quantitative methods; (2) qualitative studies used to help interpret and explain predominantly quantitative results.

So far, most attention has been paid to theory testing. In future more attention

should be placed to theory building. Both theory testing and theory building at food level are useful for the understanding of mechanisms involved in food choice, but it should be kept in mind that a product-based approach is a simplification of the complexity of dietary behaviour. Fat intake is an outcome of many behaviours. Foods are eaten in combination, which may cause an interaction of taste, attitudes, etc., when foods are eaten at the same time.

Therefore, it is necessary to pay more attention to the behavioral part of the models. A more precise measure of food consumption may give a better insight into the complexity of behaviour associated with fat and cholesterol intake and the relationship between social-psychological variables and fat and cholesterol consumption. However, people do not eat fat and cholesterol, they eat foods. Thus the questions should be related to foods ready to eat. For a practical implication of the results in nutrition education programmes conclusions should also be related to foods as well as nutrients.

## CONCLUSIONS

Social-psychological models were used to explain nutrition behaviour associated with fat and cholesterol intake. Attitudes, especially preferences, seem to be important determinants of a high-fat diet. According to the literature the influence of social environment is less important, although the possibility of methodological inadequacies cannot be excluded.

The high intake of dietary fat is one of the major nutritional concerns in developed countries. When this and the complexity of dietary behaviour are taken into account, very little research has been done to gain an insight into the social-psychological variables of behaviour associated with fat intake.

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## CHAPTER 3

# AFFECTIVE AND COGNITIVE DETERMINANTS OF INTENTION TO CONSUME TWENTY FOODS THAT CONTRIBUTE TO THE FAT INTAKE

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## ABSTRACT

Fishbein and Ajzen's theory of reasoned action was used as a framework to study beliefs and attitudes towards twenty foods that contribute to the fat intake. Subjects between 18 and 75 years old (n=419) filled out a self-administered questionnaire. The coefficient of determination varied from 0.35 for cheese to 0.69 for smoked beef. Beta weights for attitudes were higher than for subjective norms. Additional analyses on beliefs and attitudes showed that the liking attitude was a more important predictor of intention ($\beta$: .38 – .66) than the good/bad attitude ($\beta$: -.01 – .25). Total effect of the belief about tastiness of the food on intention to consume (.32 – .71) was higher than the total effect of the belief good/bad for figure (.00 – .32) and the belief about prevention of heart disease (-.00 – .12). This suggests that short-term rewards (taste) are more important than rewards on middle term (figure) and long term (heart disease).

## INTRODUCTION

In the Netherlands, as in other western countries, the fat intake is higher than recommended (Erkelens, 1989; Hulshof & Van Staveren, 1991). For prevention-oriented nutritional programmes it is necessary to know why people eat too much fat. Fat intake is not a behaviour itself, but it is an outcome of several behaviours, namely the consumption of foods. Therefore, in order to understand fat intake, insight is needed into the motivations to eat foods that contribute to the fat intake.

Several investigators used the Fishbein and Ajzen (Fishbein & Ajzen, 1975) model to understand high-fat food choices (Rutter & Bunce, 1989; Sapp, 1991; Sapp & Harrod, 1989; Shepherd, 1988; Shepherd & Stockley, 1985, 1987; Towler & Shepherd, 1991/2,

1992; Tuorila, 1987; Tuorila & Pangborn, 1988). In these previous studies only a small amount of foods was investigated at the same time. In the present study the Fishbein and Ajzen model is presented for 20 products that contribute to the dietary fat intake in the Netherlands. In almost all studies that used the theory of reasoned action, attitudes were a better predictor of food choice than subjective norms (Stafleu *et al.*, 1991/2). The purpose of the present study was to investigate whether the dominant role of attitudes as predictor of food choice could be replicated for a wide range of foods. An additional aim was to test the reliability and validity of the concepts in the Fishbein and Ajzen model for these foods.

As it was expected that beliefs and attitudes were the most important predictors, additional analyses were focused on beliefs and attitudes. In food choice literature the operationalization of attitudes varied: wordings like 'pleasant', 'liking', 'beneficial', 'good', 'healthy', and 'wise' were used (Stafleu *et al.*, 1991/2). In most studies sensory related attitudes (pleasant, liking) were combined with health oriented attitudes (good, healthy, beneficial) in one attitude score. However, these attitudes are very different from each other. From Tuorila and Pangborn (1988) it appeared that like/dislike had the strongest relation with food choice. The same problem of multidimensionality is apparent for beliefs (Shepherd, 1989). Therefore, the second purpose of this study was to investigate the possibility of a separate sensory pathway and health pathway on intention to eat 20 foods.

This study was part of a health education programme. As heart disease is more common among people from the lower socio-economic class (Kunst *et al.*, 1990), it was decided to perform the study in neighbourhoods that were considered to be low-income areas predominately.

## METHODS

### *Subjects*

A sample of 1854 subjects living in low-income areas in Utrecht, a city in the

middle of the Netherlands, was sent a self-administered questionnaire by mail. Subsequently, they were contacted by telephone, and an appointment was made for an interview at the subject's home. The response-rate was 23%. In total 419 subjects between 18 and 75 years old participated in this study. Characteristics of the participants are depicted in Table 1. In order to assess test-retest reliability 33 women completed the questionnaires twice. Time span between test and retest was 12-14 weeks. This study describes results from the self-administered questionnaire.

TABLE 1

*Social-demographic characteristics of 419 Dutch adult subjects*

| | Men (n=192) | Women (n=227) |
|---|---|---|
| Characteristics | Frequency (%) | Frequency (%) |
| Age (in years) | | |
| 18-34 | 70 (37) | 94 (41) |
| 35-54 | 73 (38) | 65 (29) |
| 55+ | 49 (26) | 68 (30) |
| Education level[a] | | |
| low | 75 (39) | 111 (50) |
| intermediate | 58 (30) | 56 (25) |
| high | 59 (31) | 57 (25) |
| Occupation level[b] | | |
| low | 64 (36) | 51 (26) |
| intermediate | 65 (37) | 104 (53) |
| high | 48 (27) | 41 (21) |
| Body mass index ($kg/m^2$)[c] | | |
| <20 | 23 (12) | 33 (15) |
| 20-25 | 102 (53) | 122 (54) |
| 25-30 | 54 (28) | 56 (25) |
| ≥30 | 13 ( 7) | 16 ( 7) |
| Household size | | |
| 1 | 31 (16) | 41 (18) |
| 2 | 70 (37) | 79 (35) |
| ≥3 | 91 (47) | 107 (47) |

[a] Low: primary school, lower level of secondary school, lower vocational training. Intermediate: higher level of secondary school, intermediate vocational training. High: higher vocational training, university.
[b] Low: unskilled and skilled workers. Intermediate: lower managerial and minor self-reliant (e.g. shopkeeper). High: intermediate and higher managerial, professionals. Never worked is not included in these figures.
[c] Height and weight were self-reported.

*Questionnaire design*

Food groups that have the highest contribution to the fat intake in the Netherlands are oils and fats (29%), meat and meat products (20%), milk (products) and cheese (20%), and products mainly eaten between meals, such as nuts, savory snacks, pastries, biscuits (8%) (Hulshof & Van Staveren, 1991). The following twenty foods were selected from these food groups: butter, margarine, margarine high in polyunsaturated fatty acids (PUFA-margarine), low-fat margarine, oil, pork, beef, chicken, fish, smoked beef, raw ham, liver sausage, egg, cheese, semi-skimmed milk, whole milk, skimmed yoghurt, whole yoghurt, custard, cake and biscuits. Some of these products are low-fat alternatives of high-fat foods in a food group. Eggs were included because of their cholesterol content, and fish because it was recommended to consume fish once or twice a week (Erkelens, 1989).

The theory of reasoned action of Fishbein and Ajzen (1975) was used to develop the questionnaire. According to the theory of reasoned action behavioral intention is the best predictor of behaviour. Behavioral intention can be predicted from a person's attitude towards behaviour, and from his subjective norms. A person's attitude is predicted by cognitive beliefs about the expected outcome of the behaviour. The outcome beliefs are modified by the individual's evaluation of the expected outcome. Each belief score is multiplied by the appropriate evaluation score and an overall belief-value measure is derived from the sum of these scores. The subjective norm is predicted from a set of normative beliefs related to reference groups multiplied by a motivation to comply with these groups.

For each of the twenty foods there were one intention to consume question, two attitudes questions, one subjective norm question, two normative belief questions, two motivation to comply questions, and several beliefs and evaluation questions. The time frame for the intention question depended on the expected consumption frequency. For example for milk it was the next day, and for beef it was within the next three days. The two attitude questions were: 'I like eating the food', and 'eating the food is very good to very bad'. These attitude questions are referred to as liking attitude and good/bad

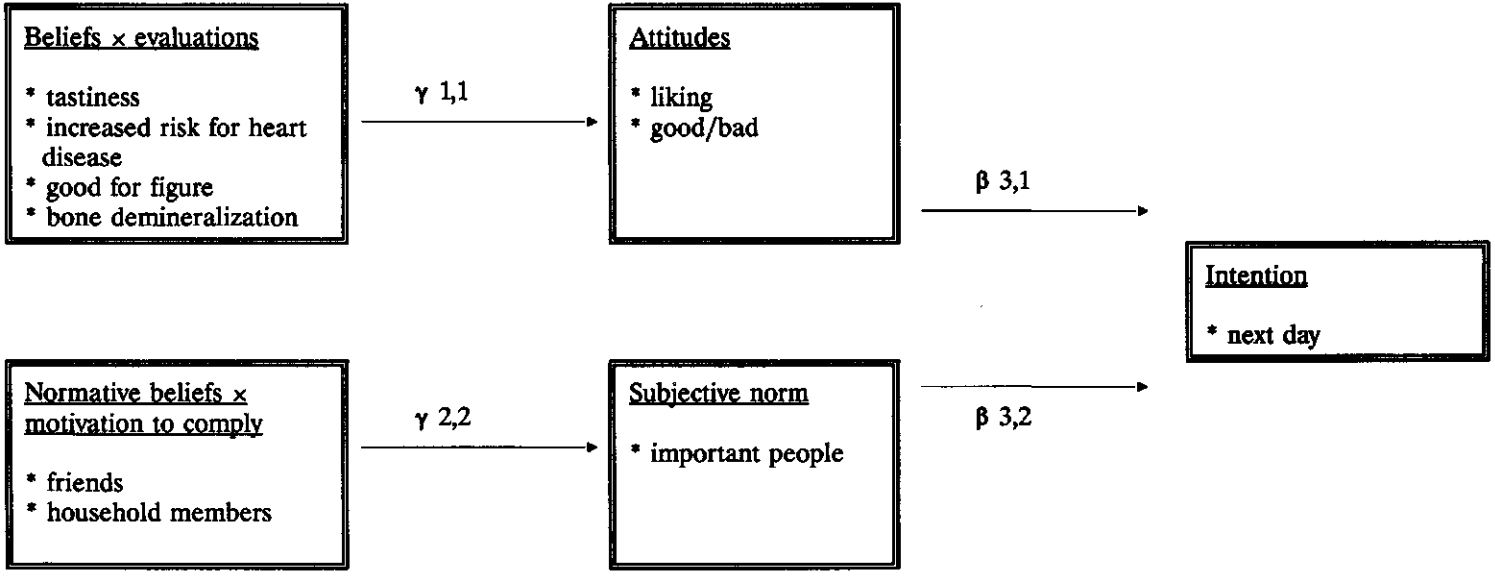


Figure 1. Example of Fishbein and Ajzen model for whole milk

attitude, respectively. The subjective norm was asked as 'People who are important to me think I should eat the food'. The normative belief questions and motivation to comply questions were related to friends and household members.

In order to obtain salient beliefs towards the consumption of the above mentioned foods we performed qualitative interviews (n=12), and focus group interviews (6 focus groups, 37 participants). In addition we asked 11 subjects whether they ate the selected foods and why. The nature and number of beliefs that emerged from the qualitative studies varied for the different foods. As slimming, tastiness, and heart disease were topics often mentioned in the qualitative studies, we decided to include statements about these topics for all foods. Therefore all foods had three beliefs in common: 'eating the food is very tasty/not tasty at all'; 'increases my risk for heart disease'; 'is good for my figure' (with respect to body fatness). Other beliefs differed for different foods. 'Eating the food will prevent bone demineralization' was asked for all milk products, and eggs. 'Eating the food is expensive' was a belief question for fats, meat and meat products, chicken, fish, and cheese. Beliefs with respect to convenience were asked for the several fats, beef, pork, chicken, fish, and eggs. For biscuits and cakes beliefs were asked with respect to guests, treats, and sociability.

All questions were scored on 5 points Likert scales with verbally labelled answering categories. Every question was coded from -2 to +2, except for the intention questions and the motivation to comply questions, which were coded from 1 to 5. Responses were converted to make a positive score correspond to a positive attitude towards consumption of the food. In Figure 1 an example of the Fishbein and Ajzen model for whole milk consumption is shown.

### *Statistical methods*

*Fishbein and Ajzen model.* Sum scores were computed for attitudes, beliefs×evaluations, and normative beliefs×motivation to comply. In order to test the reliability of the scales Cronbach's $\alpha$ and test-retest correlations were computed for each scale. In addition, to

assess construct validity, principal component analyses with varimax rotation were conducted on beliefs and evaluations structures for the 20 foods.

For each food Pearson correlation coefficients were calculated between the elements of the Fishbein and Ajzen model. The correlation matrix was used as data input for path analyses using LISREL VII within the SPSS-X program (Jöreskog & Sörbom, 1988/9). Path analyses were used to test the Fishbein and Ajzen model for the twenty foods, and to evaluate the importance of attitudes and subjective norm as predictors of intention.

*Sensory and Health Pathway.* For each food we used the intention question, both attitude questions, and the beliefs all foods had in common (taste, good for figure, and heart disease) to evaluate the importance of a sensory and health pathway. The sensory pathway was conceptualised as tastiness -> liking -> intention, and the health pathway as good for figure, heart disease -> good/bad -> intention (see Figure 2). Pearson correlation coefficients were computed between the six variables, and the correlation matrix was used as data input for path analyses within the LISREL VII package (Jöreskog & Sörbom, 1988/9). The analyses started with the just-identified model (see Figure 3). A path from liking to good/bad was suggested rather than a path from good/bad to liking. By doing this a justification of liking is assumed.

The gamma matrix shows relationships between the independent (beliefs), and the intervening (attitudes), and the dependent construct (intention). The beta matrix reflects the relationships among the intervening constructs (attitudes) and between the intervening constructs and intention (see Figure 3).

To evaluate the models, chi-square statistics, adjusted goodness of fit indices, Q-plot, and normalized residuals were used. Low chi-square values ($\chi^2/df < 1.00$), and an adjusted goodness of fit index higher than 0.95 were considered to indicate a good fit, while standardized residuals higher than 1.96 were considered to indicate a specification error in the model (Verschuren, 1992). T-values were used to decide which path could be deleted: t-values lower than 2 were considered as not significantly different from zero.

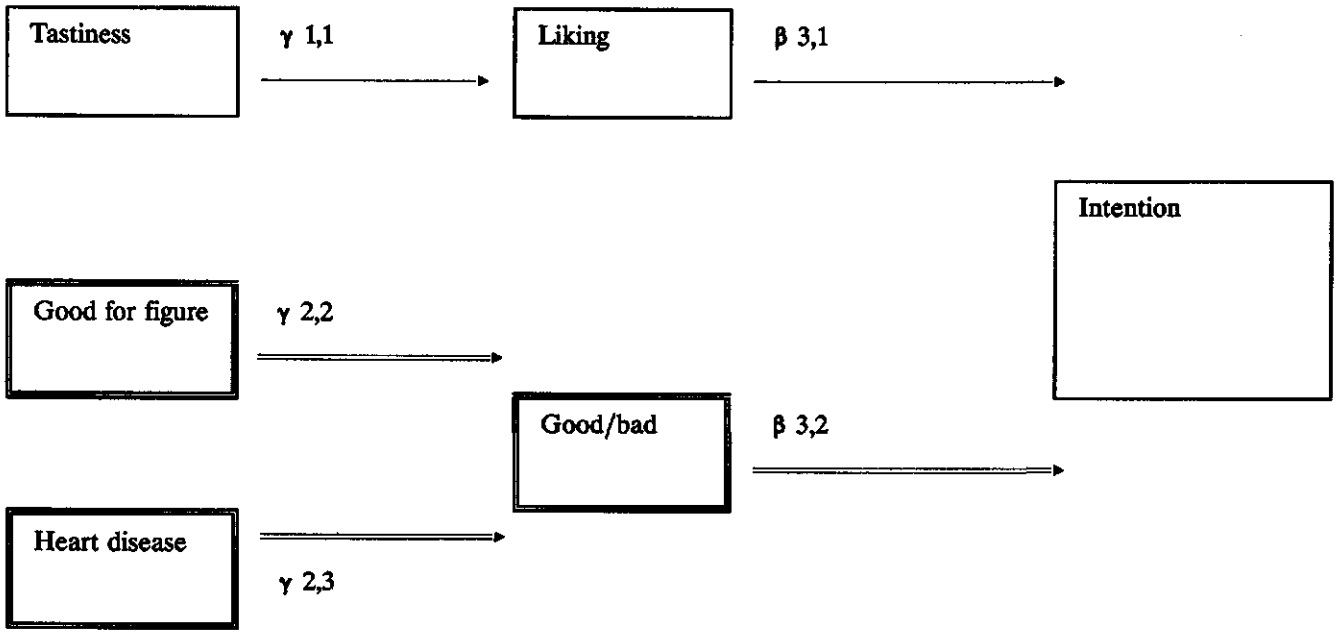


Figure 2. Cognitive and affective determinants of the intention to consume 20 products that contribute to the dietary fat intake. Sensory pathway ( ——— ) and health pathway ( ═══ ).

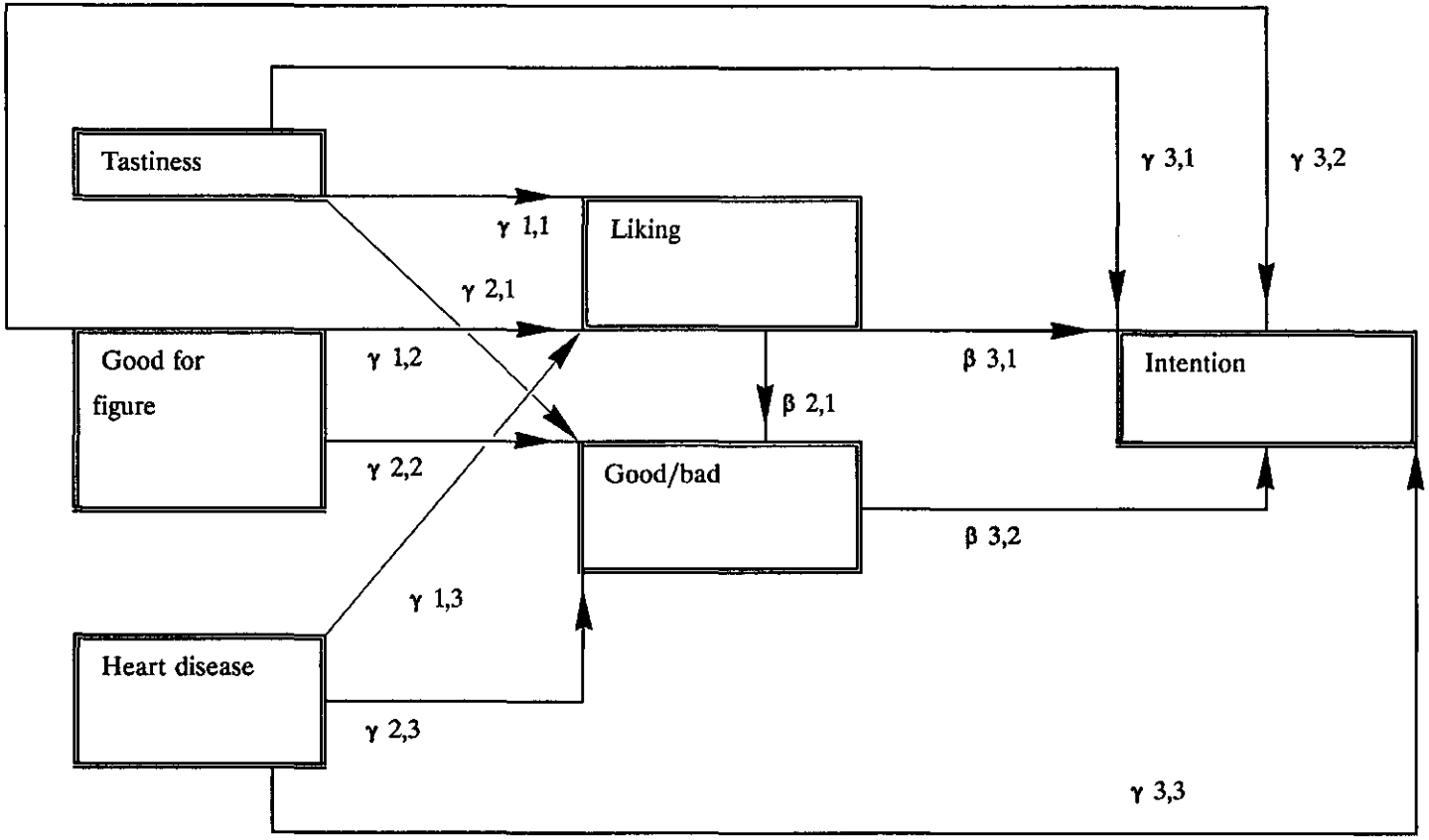


Figure 3. Possible correlations in the model of affective and cognitive determinants of intention to consume a food item

## TABLE 2

*Model fit of the Fishbein and Ajzen model for 20 products that contribute to the dietary fat intake, n = 419 Dutch adults*[a]

| | Coef.d.[b] | $\chi^2_5$ | AGFI | $\beta_{3,1}$ Attitudes-> Intention | $\beta_{3,2}$ Subj.norm-> Intention | $\gamma_{1,1}$ ΣB×E-> Attitudes | $\gamma_{2,2}$ ΣNB×MC-> Subj.norm | Max mod ind |
|---|---|---|---|---|---|---|---|---|
| Butter | .65 | 57.47 | .84 | .70 | .11 | .60 | .68 | 41.12 for β 1,2 |
| Margarine | .54 | 17.45 | .95 | .62 | -.02 | .54 | .59 | 6.77 for γ 2,1 |
| PUFA-margarine | .43 | 129.14 | .68 | .71 | .11 | .45 | .54 | 84.87 for β 1,2 |
| Low-fat margarine | .58 | 64.57 | .82 | .68 | -.01 | .52 | .65 | 47.90 for γ 1,2 |
| Oil | .52 | 69.44 | .81 | .68 | .10 | .63 | .46 | 45.85 for γ 1,2 |
| Pork | .45 | 23.65 | .93 | .61 | -.02 | .43 | .58 | 19.68 for γ 1,2 |
| Beef | .65 | 30.90 | .91 | .47 | .14 | .48 | .74 | 19.87 for γ 1,2 |
| Chicken | .60 | 35.96 | .90 | .55 | -.04 | .47 | .70 | 18.72 for γ 1,2 |
| Fish | .60 | 16.99 | .95 | .55 | .07 | .52 | .67 | 10.21 for γ 1,2 |
| Smoked beef | .69 | 29.29 | .91 | .67 | .09 | .52 | .76 | 22.74 for β 1,2 |
| Raw ham | .53 | 18.24 | .95 | .57 | .13 | .48 | .63 | 12.06 for γ 1,2 |
| Liver sausage | .53 | 29.35 | .91 | .66 | .04 | .61 | .50 | 20.31 for β 1,2 |
| Egg | .57 | 23.21 | .93 | .58 | -.00 | .43 | .68 | 10.32 for γ 2,1 |
| Cheese | .35 | 9.68 | .97 | .67 | .04 | .40 | .47 | 7.41 for γ 3,2 |
| Semi-skimmed milk | .64 | 18.69 | .95 | .79 | .08 | .59 | .67 | 11.68 for γ 1,2 |
| Whole milk | .57 | 37.29 | .89 | .70 | .16 | .57 | .60 | 24.23 for γ 1,2 |
| Skimmed yoghurt | .66 | 33.97 | .90 | .74 | .07 | .61 | .68 | 24.09 for β 1,2 |
| Whole yoghurt | .56 | 26.18 | .92 | .59 | .21 | .54 | .61 | 18.31 for β 1,2 |
| Custard | .59 | 15.42 | .95 | .64 | .14 | .58 | .62 | 10.16 for β 1,2 |
| Cake and biscuits | .45 | 25.28 | .93 | .58 | .06 | .42 | .58 | 14.89 for β 1,2 |

[a] Due to missing values some figures are based on less subjects.

[b] Coef. d. = coefficient of determination, AGFI = Adjusted Goodness of Fit Index

Max mod ind = maximum modification index, ΣB×E = sumscore beliefs×evaluations, ΣNB×MC = sumscore normative beliefs×motivation to comply.

Paths depicted in Figure 2 were not deleted when the t-value was lower than 2, and had to remain in the model. A p-value $<0.05$ was considered as being statistically significant.

## RESULTS

### *Fishbein and Ajzen model*

From the path coefficients depicted in Table 2 it appeared that attitudes had more impact on intention than subjective norm. $\beta$ 3,1 (attitudes -> intention) was very high for all foods and varied from 0.47 for beef to 0.79 for semi-skimmed milk, while $\beta$ 3,2 (subjective norm -> intention) was very low for all foods and varied from -0.04 for chicken to 0.21 for whole yoghurt. Path coefficients between $\Sigma$(beliefs×evaluations) and attitudes, and between $\Sigma$(normative beliefs×motivation to comply) and subjective norm were high: $\gamma$ 1,1 (sum beliefs×evaluations -> attitudes) varied from 0.40 for cheese to 0.63 for oil, and $\gamma$ 2,2 (sum normative beliefs×motivation to comply -> subjective norm) varied from 0.46 for oil to 0.76 for smoked beef.

The model fit of the Fishbein and Ajzen model is also shown in Table 2. The coefficient of determination varied from 0.35 for cheese to 0.69 for smoked beef. Chi-square (5 df) varied from 9.68 for cheese to 129.14 for margarine high in polyunsaturated fat, and showed an overall lack of fit. The adjusted goodness of fit index (AGFI) varied from 0.68 for PUFA-margarine to 0.97 for cheese, indicating a good fit (AGFI $\geq$ 0.95) for margarine, fish, raw ham, cheese, semi-skimmed milk, and custard. For all products normalized residuals were above within one standard deviation from zero residuals. Also the Q-plot showed a lack of fit. From the maximum modification indices it appeared that the influence of significant others on intention is probably mediated by attitudes as for most foods a path between subjective norm and attitudes, or between normative beliefs and attitudes was suggested.

In Table 3 the reliability of the variables used in the Fishbein and Ajzen model is shown. It appeared that Cronbach's $\alpha$ was very low for beliefs×evaluations, somewhat higher for attitudes, and satisfactory for normative beliefs×motivation to comply. Test-

## TABLE 3

*Reliability of elements of the Fishbein and Ajzen model for 20 products that contribute to the dietary fat intake, n=419 Dutch adults*[a]

| Food | ΣB×E[b] | | Attitude | | ΣNB×MC | | Subj.norm | Intention |
|---|---|---|---|---|---|---|---|---|
| | α | test-retest | α | test-retest | α | test-retest | test-retest | test-retest |
| Butter | .30 | .75 | .44 | .90 | .78 | .61 | .44 | .87 |
| Margarine | .25 | .49 | .49 | .72 | .54 | .48 | .34 | .65 |
| PUFA-margarine | .00 | .56 | .47 | .85 | .68 | .58 | .52 | .89 |
| Low-fat margarine | .17 | .38 | .56 | .84 | .68 | .81 | .72 | .79 |
| Oil | .37 | .47 | .62 | .62 | .71 | .41 | .32 | .32 |
| Pork | .17 | .71 | .61 | .86 | .69 | .42 | .49 | .50 |
| Beef | .03 | .43 | .52 | .62 | .73 | .49 | .60 | .54 |
| Chicken | .38 | .35 | .59 | .62 | .73 | .59 | .51 | .52 |
| Fish | .28 | .31 | .54 | .72 | .76 | .71 | .52 | .67 |
| Smoked beef | .14 | .55 | .52 | .76 | .83 | .57 | .54 | .85 |
| Raw ham | .12 | .62 | .53 | .62 | .76 | .52 | .41 | .59 |
| Liver sausage | .03 | .58 | .52 | .69 | .70 | .45 | .30 | .50 |
| Egg | .19 | .43 | .37 | .72 | .71 | .55 | .58 | .72 |
| Cheese | .17 | .50 | .37 | .60 | .60 | .40 | .52 | .45 |
| Semi-skimmed milk | .28 | .72 | .44 | .77 | .73 | .71 | .74 | .80 |
| Whole milk | .12 | .72 | .46 | .81 | .69 | .56 | .46 | .82 |
| Skimmed yoghurt | .39 | .59 | .53 | .79 | .78 | .59 | .70 | .74 |
| Whole yoghurt | .15 | .51 | .50 | .54 | .74 | .61 | .60 | .74 |
| Custard | .16 | .29 | .42 | .55 | .64 | .54 | .53 | .56 |
| Cake and biscuits | .47 | .70 | .02 | .83 | .66 | .45 | .55 | .72 |

[a] Due to missing values some figures are based on less subjects. Test-retest correlations are based on 33 women.
[b] ΣB×E = sumscore beliefs×evaluations, ΣNB×MC = sumscore normative beliefs×motivation to comply.

retest results varied from 0.29 for beliefs×evaluations towards eating custard to 0.90 for attitudes towards butter consumption.

Principal component analyses on beliefs×evaluations retained two factors for most foods. For skimmed yoghurt and smoked beef one factor was obtained, while a solution with three factors was given for cheese, low-fat spread, pork, and fish. There was not a consistent picture of same beliefs loading high on the same factor for the different foods.

*Sensory and Health Pathway*

Table 4 and 5 show that different models were suggested for the 20 foods, although for all foods the beta weight for the path between the liking attitude and intention ($\beta$ 3,1) is higher than the beta weight for the path between the good/bad attitude and intention ($\beta$ 3,2) (Table 4). The path from good/bad to intention is not even statistically significantly different from zero for margarine, low-fat margarine, chicken, fish, skimmed yoghurt, and whole yoghurt. The path from liking to good/bad ($\beta$ 2,1) was not different from zero for beef, fish, smoked beef, raw ham, semi-skimmed milk, custard, and cake and biscuits.

For all foods the path coefficient between tastiness and liking ($\gamma$ 1,1) was very high. In addition for most foods the path between good for figure and liking ($\gamma$ 1,2) was different from zero, except for beef, fish, smoked beef, liver sausage, and cake and biscuits. The path between heart disease and liking ($\gamma$ 1,3) was not significantly different from zero.

Path coefficients between good for figure and good/bad ($\gamma$ 2,2) were in general higher than between heart disease and good/bad ($\gamma$ 2,3). Path coefficients higher than 0.40 were found between good for figure and good/bad for beef, smoked beef, and raw ham. For most foods the path coefficient between tastiness and good/bad ($\gamma$ 2,1) was statistically different from zero.

Direct effects of beliefs on intention were observed for some foods. For 12 foods there was a direct effect of perceived tastiness on intention ($\gamma$ 3,1). For butter, whole yoghurt, and custard a direct path between the belief about good for figure and intention

## TABLE 4

*Standardized solution of the cognitive and affective determinants of the intention to consume 20 products that contribute to the dietary fat intake, n = 419 Dutch adults*[a]

| | Attitudes-> intention | | Liking-> good/bad | Beliefs-> liking | | | Beliefs-> good/bad | | | Beliefs-> intention | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | β3,1 | β3,2 | β2,1 | γ1,1 | γ1,2 | γ1,3 | γ2,1 | γ2,2 | γ2,3 | γ3,1 | γ3,2 | γ3,3 |
| Butter | .63 | .16 | .11 | .56 | .25 | - | .11 | .28 | .37 | - | .10 | - |
| Margarine | .56 | .08[b] | .19 | .38 | .19 | - | .17 | .16 | .33 | .09 | - | .09 |
| PUFA-margarine | .66 | .10 | .17 | .54 | .18 | - | .15 | .30 | .21 | .09 | - | .10 |
| Low-fat margarine | .63 | -.01[b] | .20 | .57 | .23 | - | .17 | .33 | .18 | .17 | - | - |
| Oil | .59 | .13 | .12 | .57 | .19 | - | .29 | .35 | .23 | .11 | - | - |
| Pork | .51 | .19 | .37 | .69 | .13 | - | - | .27 | .16 | - | - | - |
| Beef | .44 | .12 | - | .76 | - | - | .31 | .42 | .07[b] | - | - | - |
| Chicken | .42 | .06[b] | .19 | .78 | .08 | - | .20 | .31 | .16 | .16 | - | - |
| Fish | .62 | .00[b] | - | .85 | - | - | .32 | .36 | .12 | - | - | - |
| Smoked beef | .56 | .25 | - | .83 | - | - | .29 | .42 | .20 | - | - | - |
| Raw ham | .55 | .13 | - | .75 | .12 | - | .23 | .42 | .27 | - | - | - |
| Liver sausage | .45 | .12 | .17 | .83 | - | - | .15 | .29 | .35 | .23 | - | - |
| Egg | .38 | .15 | .25 | .61 | .11 | - | - | .22 | .21 | .27 | - | - |
| Cheese | .53 | .17 | .22 | .70 | .09 | - | - | .17 | .29 | .16 | - | - |
| Semi-skimmed milk | .54 | .15 | - | .76 | .11 | - | .32 | .30 | .26 | .25 | - | - |
| Whole milk | .60 | .13 | .28 | .64 | .23 | - | - | .13 | .26 | .15 | - | - |
| Skimmed yoghurt | .60 | .04[b] | .29 | .80 | .08 | - | - | .39 | .19 | .20 | - | - |
| Whole yoghurt | .57 | .06[b] | .29 | .69 | .14 | - | - | .31 | .22 | - | .22 | - |
| Custard | .61 | .12 | - | .73 | .17 | - | .19 | .31 | .31 | - | .12 | - |
| Cake and biscuits | .56 | .08 | - | .69 | - | - | - | .30 | .30 | .13 | - | - |

[a] Due to missing values some figures are based on less subjects.
[b] parameter not different from zero

TABLE 5

*Model fit of the cognitive and affective determinants of the intention to consume 20 products that contribute to the fat intake, n=419 Dutch adults*[a]

| | Coef.d.[b] | $\chi^2$ (df) | P | AGFI | Max mod ind |
|---|---|---|---|---|---|
| Butter | .59 | 3.60 (3) | .31 | .98 | 3.37 for γ 1,3 |
| Margarine | .39 | 2.09 (2) | .35 | .98 | 2.08 for γ 1,3 |
| PUFA-margarine | .50 | 3.26 (2) | .20 | .97 | 2.86 for β 2,3 |
| Low-fat margarine | .56 | 1.24 (3) | .74 | .99 | 0.95 for γ 3,3 |
| Oil | .62 | 4.01 (3) | .26 | .98 | 2.47 for β 1,2 |
| Pork | .60 | 2.99 (5) | .70 | .99 | 1.23 for γ 2,1 |
| Beef | .70 | 4.76 (6) | .58 | .99 | 2.94 for β 1,2 |
| Chicken | .72 | 3.96 (3) | .27 | .98 | 3.40 for γ 3,3 |
| Fish | .78 | 11.08 (6) | .09 | .97 | 3.97 for γ 3,3 |
| Smoked beef | .80 | 8.93 (6) | .18 | .98 | 2.67 for γ 3,1 |
| Raw ham | .76 | 8.83 (5) | .12 | .97 | 3.46 for β 2,1 |
| Liver sausage | .80 | 5.27 (4) | .26 | .98 | 3.47 for γ 1,2 |
| Egg | .49 | 6.60 (4) | .16 | .97 | 3.92 for β 1,2 |
| Cheese | .57 | 1.95 (4) | .75 | .99 | 1.35 for γ 3,2 |
| Semi-skimmed milk | .73 | 2.79 (4) | .59 | .99 | 2.39 for β 1,2 |
| Whole milk | .57 | 5.46 (4) | .24 | .98 | 2.36 for β 1,3 |
| Skimmed yoghurt | .76 | 5.64 (4) | .23 | .98 | 3.18 for β 1,3 |
| Whole yoghurt | .64 | 4.48 (4) | .35 | .98 | 3.54 for β 2,3 |
| Custard | .68 | 3.77 (4) | .44 | .98 | 2.94 for β 1,2 |
| Cake and biscuits | .60 | 4.78 (6) | .57 | .99 | 3.11 for β 1,2 |

[a] Due to missing values some figures are based on less subjects.
[b] Coef. d. = coefficient of determination, AGFI = Adjusted Goodness of Fit Index, Max mod ind = maximum modification index

was found (γ 3,2), while the path coefficient between belief about heart disease and intention (γ 3,3) was only significant for margarine and PUFA-margarine.

With respect to the quality of the models it is apparent that the fit of the models was good for all foods on almost all indicators (Table 5). For eight foods $\chi^2$/df was lower than 1.00, while for the other twelve foods $\chi^2$/df was satisfactory (between 1.00 and 3.00) (Verschuren, 1992). Adjusted goodness of fit index was ≥ 0.95 for all foods. Standardized residuals were below 1.96 for all foods, and most Q-plots were within the tolerance area. However, there was a high correlation between some estimates. Correlations of estimates higher than 0.50 were found between γ 2,1 (tastiness -> good/bad) and β 2,1 (liking -> good/bad), and between γ 3,1 (tastiness -> intention) and β 3,1 (liking -> intention) for many foods.

## DISCUSSION

Due to the low response rate this sample must be considered as a convenient sample. However, the subjects formed a heterogeneous population with respect to sex, education level, body mass index, and household size. Thus, the influence of social-psychological determinants, so far as included in the Fishbein and Ajzen model, on intention to consume foods could be studied adequately in this group.

The Fishbein and Ajzen model was used several times for understanding food choice associated with fat intake (e.g. Rutter & Bunce, 1989; Sapp, 1991; Sapp & Harrod, 1989; Shepherd, 1988; Shepherd & Stockley, 1985, 1987; Towler & Shepherd, 1991/2, 1992; Tuorila, 1987, Tuorila & Pangborn, 1988). Results from the present study are comparable to these studies. The surplus value of this study is that many foods were investigated at the same time. The coefficient of determination was in general somewhat higher than the explained variance reported in the other studies. This can be explained by the fact that in the present study path analysis was used compared to regression analysis in most other studies. Using path analyses the indirect effect of beliefs×evaluations, and normative beliefs×motivation to comply on intention were included in the explained variance.

The low Cronbach's $\alpha$ for the beliefs×evaluations reinforces the suggestion of Shepherd (1989) that beliefs are not unidimensionally. This was confirmed by principal component analysis. For most foods 2 or 3 factors were retained. Only for skimmed yoghurt and smoked beef the beliefs×evaluations formed one factor.

Internal consistencies of beliefs×evaluations were in our study even lower than reported by Tuorila and Pangborn (1988). One of the reasons could be that in the present study the protocol suggested by Fishbein and Ajzen (1980) for assessing salient beliefs was not strictly followed. Beliefs were mainly obtained in focus group interviews. As tastiness, body fatness, and heart disease were important topics in the focus group interviews it was decided to ask beliefs about these topics for all foods. But, it is possible that for example prevention of heart disease is not a salient belief for the consumption

of some of the foods in our questionnaire. However, in contrast with Cronbach's α, test-retest correlations showed a reasonable reliability for the concepts of the Fishbein models, and showed that measures were stable over time.

As reported in food-choice literature (Stafleu *et al.*, 1991/2) the attitudinal component of the Fishbein and Ajzen model was by far more important than the subjective norm component. However, maximum modification indices indicated that the influence of significant others might be mediated by attitudes. This implicates a process of internalisation of beliefs and attitudes. Ryan (1982) proposed a structural model in which normative beliefs influenced attitudes, but according to him there is no reason to expect that attitudes would have an effect on subjective norms. An important point mentioned by Ryan (1982) is that a small beta weight for subjective norm might be interpreted as a weak effect of social influence on intention, while in fact the effect of the social influence is through the mediating effect of attitudes.

The low path coefficients between subjective norm and intention justified our decision to pay more attention to the beliefs and attitudes part of the Fishbein model. In addition, the low internal consistencies for beliefs×evaluations indicated that another approach examining beliefs might give a better understanding of motivations involved in food choice. This was done by the introduction of a model in which a sensory and health pathway was studied.

With respect to the sensory and health pathway it was clear that the effect of the sensory related concepts (tastiness and liking) on intention were dominant. There was not one model for all foods under investigation, as different paths were significantly different from zero. The path from good for figure to liking ($\gamma$ 1,2) remained in the model for almost all foods, as did the path between tastiness and good/bad ($\gamma$ 2,1). This means that there is no evidence for a separate health pathway and a separate sensory pathway: there seems to be a correlation between the belief of impact of eating the product on body fatness and the degree of liking the product, as well as a correlation between tastiness and good/bad. In addition, for most foods there was a correlation between liking the food and believed good/bad ($\beta$ 2,1). By including the path from liking

to good/bad instead of from good/bad to liking a justification of liking was assumed. However, it is impossible to distinguish between justification and determination of food choice or preferences in a non experimental setting. In this context it is necessary to say that good/bad is a general evaluation, and is not related to health perse.

The direct path from tastiness to intention for some foods implicate that taste might be very important for these products. The direct path from belief that eating PUFA-margarine will decrease the risk for heart disease to intention ($\gamma$ 3,3) is probably due to advertisements of a brand of PUFA-margarine in the Netherlands that is focused on this relationship. In line with this, Tuorila and Pangborn (1988) mentioned that some beliefs are echoes of current mass media topics.

A disadvantage of the model with the sensory and health pathway is that some correlations of estimates are very high. The higher correlations between estimates, the more difficult it is for the programme to distinguish parameters from each other. This means that the reliability of the estimates decreases (Verschuren, 1991). High correlations of estimates were found between $\gamma$ 2,1 (tastiness -> good/bad) and $\beta$ 2,1 (liking -> good/bad), and between $\gamma$ 3,1 (tastiness -> intention) and $\beta$ 3,1 (liking -> intention) for models in which these paths were included. This is not surprising, because the distinction between the belief tastiness and the attitude liking is very minimal, or maybe even absent. One alternative is to remove one of the paths from the model. However, this will result in a bad fit. Another possibility is to include more sensory-related items which measure the latent variable sensory-related affect, a term described by Axelson and Brinberg (1989).

This brings us to another methodological point: there was only one indicator for each concept. This is a disadvantage because multi-item indicators reduce random error (Verschuren, 1991). Therefore, it will be interesting to study the possibility of a separate sensory and health pathway in a study in which concepts are measured by more than one item.

Slimming, and beliefs towards the influence of eating behaviour on body fatness might have to do more with appearance than with health. Hayes and Ross (1987) found

that both appearance and concern with health were motivations for eating habits. In a study of Neale *et al.* (1992) 61% of the women who ever dieted to lose weight gave appearance as reason for weight reduction. Therefore, it might be even more interesting to study the relative importance of beliefs concerning sensory properties, health aspects, and appearance in food choice. This proposed model should include more than one item for each concept. In that case it is also possible to evaluate the relative important of sensory properties, health aspects and appearance by means of a structural model in which the three concept are included as theoretical variables in the model.

Notwithstanding methodological shortcomings, it is clear from the analyses that the liking attitude has more impact on intention to consume than the good/bad attitude. The path between good/bad and intention is not even significant for some foods. This reinforces the importance of liking in food choice, as reported by Tuorila and Pangborn (1988).

In addition it can be concluded that with respect to the beliefs the total effect on intention is largest for tastiness, followed by impact of eating the food on body fatness, and risk for heart disease (see Table 6). This implies that short time rewarding (good taste) is more important than a reward on medium time (good figure), and long term reward (prevention of heart disease).

There is no discussion about whether subjects can report if they like a food or not, but from a nutritional point of view it is not possible to say whether a food is good or bad, increases the chance of getting heart disease, or is good or bad for figure (Whelan & Stare, 1990). If subjects experienced this difficulty in answering their questions, this might be another reason why liking is a more important predictor of intention than good/bad. However, as Rozin (1980) mentioned, people have the tendency to classify foods as good or bad, and healthy or poisonous. Therefore, we think that the above mentioned problem has, if any, only a small influence on the relative importance of sensory and health issues on food choice.

TABLE 6

*Total effects of beliefs about taste, good for figure, and heart disease on intention to consume a food, n = 419 Dutch adults*[a]

| | Taste | Good for figure | Heart disease |
|---|---|---|---|
| Butter | .38 | .30 | .06 |
| Margarine | .32 | .12 | .11 |
| PUFA-margarine | .46 | .15 | .12 |
| Low-fat margarine | .52 | .14 | -.00 |
| Oil | .50 | .16 | .03 |
| Pork | .40 | .13 | .03 |
| Beef | .37 | .05 | .01 |
| Chicken | .51 | .05 | .01 |
| Fish | .52 | .00 | .00 |
| Smoked beef | .53 | .10 | .05 |
| Raw ham | .44 | .12 | .03 |
| Liver sausage | .64 | .04 | .04 |
| Egg | .53 | .08 | .03 |
| Cheese | .56 | .08 | .05 |
| Semi-skimmed milk | .71 | .11 | .04 |
| Whole milk | .55 | .17 | .03 |
| Skimmed yoghurt | .69 | .06 | .01 |
| Whole yoghurt | .40 | .32 | .01 |
| Custard | .47 | .26 | .04 |
| Cake and biscuits | .51 | .02 | .02 |

[a] Due to missing values some figures are based on less subjects.

For health education the importance of liking and tastiness in food choice means that special attention is needed for the tastiness of a healthy diet and 'good' food choices. Illustrative in this perspective is the study of Rappoport *et al.* (1992) in which only two out of 27 foods had positive ratings for both pleasure and health. Another possibility is to try to change preferences. Whether changing preferences can occur by emotional or cognitive means depends on how preferences are formed and the stages of preference formation a person is in (Zajonc & Markus, 1982). In the theory of reasoned action it is assumed that cognitive beliefs have an effect on attitudes. Zajonc (1980) and Zajonc and Markus (1982) question whether cognition precedes preferences. Therefore, health education research should pay more attention to the determinants of preferences as suggested by Tuorila (1990) and Tuorila and Pangborn (1988). A lot of work has been done in this field, see for example Logue and Smith (1986), Rappoport *et al.* (1993), and

reviews of Rozin (1989), Rozin and Vollmecke (1986), and Shepherd (1989). However, the way in which preferences and determinants of preferences can be influenced by health education needs more investigation.

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## CHAPTER 4

# ATTITUDES TOWARDS HIGH-FAT FOODS AND THEIR LOW-FAT ALTERNATIVES; RELIABILITY AND RELATIONSHIP WITH FAT INTAKE[1]

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## ABSTRACT

Score on a scale of attitude towards the consumption of five high-fat foods and their low-fat alternatives was correlated with the energy percentage of fat in the diet across 419 subjects. Attitudes towards low-fat alternatives were more positive than towards high-fat foods. Mean energy percentage of fat in the diet was 38.8% (SD 7.1). The attitude scale explained 25% of the variance in percentage energy as fat. Test-retest reliability of the attitude scale (n=25) was 0.92 [95% confidence limits 0.82 and 0.97]. The reproducibility of energy percentage fat in the diet (n=33) was 0.64 [95% confidence limits 0.38 and 0.81]. Differences in attitude score were found between men and women, subjects following a dietary treatment and those who did not, and subjects with a fat intake according to the Dutch dietary guidelines and those who had not ($p<0.001$). Fat intake (expressed as percentage of energy intake) differed between age groups ($p<0.05$), and between subjects following a special diet and those who did not ($p<0.001$). No difference in attitude score or energy percentage of fat was found for education level, occupation level, body mass index or household size. It is concluded that attitudes towards high-fat foods and their low-fat alternatives are useful in understanding fat intake.

## INTRODUCTION

Dietary fat comprises about 40% of the energy content of the Dutch diet (Hulshof & Van Staveren, 1991). This is considered to be higher than would be good from a

[1] *Appetite*, 1994;22:183-196

health-perspective. According to the Dutch dietary guidelines 30-35% of energy should be derived from fat (Netherlands Nutrition Council, 1991). Therefore, an important question for health educators is: why do people eat too much fat? One way in which this question may be answered is by studying the relationship between social-psychological variables and food intake.

Previous studies on the relationship between beliefs, attitudes and dietary behaviour have focused on specific foods. Shepherd and Stockley (1985, 1987) found that attitudes were good predictors of the consumption of foods with a high fat content. In the study of Tuorila and Pangborn (1988a) food preference was the predominant predictor of consumption of selected fat-containing foods, but several belief factors were also important predictors. In those studies consumption was measured as the frequency of consumption of the foods under investigation.

Attitudes towards single food items may give a good understanding of factors that play a role in food selection, but it does not reflect the quality of the diet. On the one hand, people do not eat just single foods, on the other hand, people do not eat nutrients. People consume a diet that consists of a combination of foods. Thus, with respect to the subjects, attitude questions should be related to foods ready to eat as in the studies of Shepherd and Stockley (1985, 1987) and Tuorila and Pangborn (1988a), and not related to nutrients as fats, or a healthy diet. But, from both a nutritional and health educational point of view the total diet is more interesting than the frequency of consumption of single foods.

A precise measure of food consumption may result in a better insight into both the dietary behaviour of the individual, and the relationship between attitudes and dietary behaviour. In this way it may be possible to conclude that people with positive attitudes towards high-fat foods indeed have a high-fat diet. An indication of the quality of the total diet is the energy percentage of fat in the diet. Little is known about the relationship between attitudes towards foods and the energy percentage of fat in the diet.

The fat content of the diet depends on the choices an individual makes between foods available. People are constantly faced with choices among foods. The choice

between high-fat and lower-fat foods is one of the choice processes a consumer may be involved in. Therefore, attitudes towards high-fat foods and low-fat alternatives may play an important role in making these choices. Especially since in nutrition education emphasis is placed on reducing fat intake by making other food choices (e.g. choose semi-skimmed milk instead of whole milk). Sheppard *et al.* (1988) conducted a meta-analysis on research with the Fishbein and Ajzen model. They found that the model performed well in prediction of activities involving a choice among alternatives. They argued that the attitude comparison choice process appears to underlie the formation of a subject's estimates whether he or she will perform various activities.

The aim of the present study is to determine the relationship between a composite food-related attitude measure based on attitudes towards comparable foods, and the intake of fat. In order to test the stability of the measures test-retest reliability was assessed.

The study was part of a health education programme in a city in the Netherlands. The study took place in low income areas, because heart disease is more common among people from the lower socio-economic classes (Kraus *et al.*, 1980), and fat intake is one of the risk factors associated with coronary heart disease (Kris-Etherton *et al.*, 1988). Therefore, another purpose of this study is to obtain insight into the distribution of attitudes among socio-demographic characteristics.

## METHODS

### *Subjects*

From the municipal register of Utrecht, a city with about 230,000 inhabitants, a sample was taken of 1854 subjects aged 18 years and over, living in low-income areas. Response rate was 23%. Participants were 192 men and 227 women (Table 1). They were almost entirely caucasians, as only persons with Dutch nationality were included in this study. Mean age was 42 years for men (SD 16) and 44 for women (SD 17). Mean

## TABLE 1

*Social-demographic characteristics of 419 adult subjects in the attitude study in Utrecht*

| Characteristics | Men (n = 192) Frequency (%) | Women (N = 227) Frequency (%) |
|---|---|---|
| Age (in years) | | |
| 18-34 | 70 (37) | 94 (41) |
| 35-54 | 73 (38) | 65 (29) |
| 55+ | 49 (26) | 68 (30) |
| Education level[a] | | |
| Low | 75 (39) | 111 (50) |
| Intermediate | 58 (30) | 56 (25) |
| High | 59 (31) | 57 (25) |
| Occupation level[b] | | |
| Low | 64 (36) | 51 (26) |
| Intermediate | 65 (37) | 104 (53) |
| High | 48 (27) | 41 (21) |
| Body mass index ($kg/m^2$)[c] | | |
| <20 | 23 (12) | 33 (15) |
| 20-25 | 102 (53) | 122 (54) |
| 25-30 | 54 (28) | 56 (25) |
| ≥30 | 13 ( 7) | 16 ( 7) |
| Household size | | |
| 1 | 31 (16) | 41 (18) |
| 2 | 70 (37) | 79 (35) |
| ≥3 | 91 (47) | 107 (47) |
| Dietary treatment | | |
| Yes | 50 (27) | 62 (27) |
| No | 138 (73) | 164 (73) |

[a] Low: primary school, lower level of secondary school, lower vocational training. Intermediate: higher level of secondary school, intermediate vocational training. High: higher vocational training, university.

[b] Low: unskilled and skilled workers. Intermediate: lower managerial and minor self-reliant (e.g. shopkeeper). High: intermediate and higher managerial, professionals. Never worked not included in figures.

[c] Height and weight were self-reported.

body mass index was 24.1 kg/m$^2$ (SD 3.7) and 23.6 kg/m$^2$ ( SD 3.9) for men and women respectively.

### *Procedure*

Each of the sample of 1854 received a letter and a questionnaire by mail and was contacted by telephone subsequently. Subjects willing to participate were asked to fill out the questionnaire and an appointment was made for an interview at the respondent's home. In order to assess the test-retest reliability 33 women completed the questionnaires twice. The time span between the test and retest was 12-14 weeks.

### *Questionnaires*

*Attitude Questionnaire.* Using the Fishbein and Ajzen framework (Ajzen and Fishbein, 1980) a questionnaire was developed towards the consumption of 20 foods that contribute to the fat intake in the Netherlands. Among others, this self-administered questionnaire contained questions on attitudes towards the consumption of these foods. For each food two attitude statements were formulated:

(1) I like eating product X: fully agree to fully disagree;

(2) Eating product X is: very good to very bad.

As Ajzen and Fishbein (1980) suggested, attitudes were elicited towards the behaviour (eating the food) instead of towards the object (the food). Answers were given on 5-point Likert scales with fixed answering categories. Answers were coded from 1 (fully disagree, very bad) to 5 (fully agree, very good). The attitude statements are comparable with food-related attitude statements in other studies (e.g. Shepherd & Stockley, 1985, 1987; Towler & Shepherd, 1992; Tuorila & Pangborn, 1988a). Attitudes were elicited towards 20 foods: cheese, eggs, margarine, low-fat margarine, butter, margarine high in polyunsaturated fatty acids, oil, semi-skimmed milk, whole milk, low-fat yoghurt, whole yoghurt, custard, beef, pork, chicken, fish, smoked beef, liver sausage, raw ham, cakes and biscuits.

The foods were divided in products that are lower in fat and products that are higher in fat. Five high-fat foods which have low-fat alternatives were selected. The five high-fat foods were margarine, whole milk, whole yoghurt, pork, and liver sausage; their low-fat alternatives were low-fat margarine, semi-skimmed milk, low-fat yoghurt, beef, and smoked beef. These foods (Table 2) covered 37% of the fat intake in the Dutch diet (Hulshof & Van Staveren, 1991).

Sum scores on attitude questions were calculated for the five high-fat foods and the five low-fat foods separately, adding up the codes for both attitude statements. The score on the low-fat foods was subtracted from the score on the high-fat products.

TABLE 2

*Fat content of the food products included in the attitude scale and their contribution to fat intake in the Dutch diet*

| Food | Fat content grams per 100 grams[a] | Contribution to fat intake in the Dutch diet[b] |
|---|---|---|
| Margarine | 83 | 15.4% |
| Low-fat margarine | 40 | 3.3% |
| Whole milk | 4 | 1.8% |
| Semi-skimmed milk | 2 | 1.7% |
| Whole yoghurt | 4 | 0.7% |
| Low-fat yoghurt | 0 | 0.0% |
| Liver sausage | 28 | 0.6% |
| Smoked beef | 6 | <0.1% |
| Pork[c] | 21 | 9.7% |
| Beef[c] | 15 | 3.8% |
| Total | | 37.0% |

[a] NEVO-tabel (1986)

[b] Only those products that contributed more than 0.1% to the fat intake were included in the computation. Consumption data were based on subjects 30-50 years old (n=1807) in the Dutch Food Consumption Survey 1987-1988 (Hulshof & Van Staveren, 1991)

[c] As different cuts of meat contain different amounts of fat weighted fat contents were computed (Σ (fat content×consumption in grams)/consumption in grams).

In this way a total attitude scale was constructed which reflects the choices between high-fat foods and their low-fat alternatives. The attitude instrument consisted of 20 items (10 foods, two questions per product). The possible range for the total score was -40 to +40.

A high score on the attitude scale means a positive attitude towards the high-fat foods and a negative attitude towards the low-fat alternatives. A low score means a negative attitude towards the high-fat foods and a positive attitude towards the low-fat alternatives.

*Food consumption questionnaire.* The food consumption questionnaire was interviewer administered. The interviews were conducted by trained interviewers. A short food-frequency questionnaire was used to assess the intake of fat, fatty acids, cholesterol, and energy. This questionnaire consisted of 104 items which were selected from the Dutch Food Consumption Survey 1987-1988 (Hulshof & Van Staveren, 1991). The questionnaire is semi-quantitative and is structured according to a meal pattern. Frequency of consumption was recorded per day, per week or per month with a reference period of the past four weeks. Portion size was expressed relative to the standard portion size. Nutrient intake was calculated with the extended version of the Dutch nutrient data base 1986 (NEVO-tabel, 1986). The development and validation of the questionnaire is described elsewhere (Feunekes *et al.*, 1993).

*Questionnaire on demographic characteristics.* Demographic characteristics were asked during the interview at the subject's home. Questions were asked on age, weight, height, education level, occupation and household size.

### *Statistics*

Neither attitude score nor energy percentage fat in the diet showed major departures from normal distribution. In order to test differences in mean attitude score and mean energy percentage fat in the diet Student's t-tests were performed for gender

and dietary treatment. Analyses of variance were conducted for age, education, occupation, body mass index and household size. If analysis of variance showed a statistical significant effect Tukey's studentized range test was used to compare pairs.

Pearson product-moment correlation coefficients were computed to assess the test-retest reliability of the attitude scale and the reproducibility of the food frequency questionnaire. In addition Cronbach's $\alpha$ was computed to measure the internal consistency of the attitude scale. The Pearson correlation coefficient was also computed between the attitude scores and energy percentage fat in the diet. In order to evaluate the association of liking and goodness of foods with energy percentage of fat in the diet standardized beta-coefficients were computed using a multiple regression.

As both the attitude score and the energy percentage of fat are subject to random error, the attenuation of the correlation coefficient was calculated according to the formula described by Liu *et al.* (1978), and used by Van Staveren *et al.* (1986):

$$\rho_{xy} = \rho/((1 + Q^2_1)^{0.5} (1 + Q^2_2)^{0.5})$$

where $\rho_{xy}$ = observed correlation coefficient, $\rho$ = unattenuated correlation coefficient, $Q^2_1$ = ratio of intra-individual variance over inter-individual variance of the attitude score, $Q^2_2$ = ratio of intra-individual variance over inter-individual variance of the energy percentage fat in the diet. The intra-individual variance was derived from the reliability study. As the study population of the reliability study consisted of women only, this population was more homogeneous than the whole study population. Therefore, the inter-individual variance was computed as the total variance of the whole study population minus the intra-individual variance derived from the reliability study. The observed correlation coefficient was also derived from the whole study population.

Data were analyzed using SAS (1989, 1990).

## RESULTS

The mean score on the attitude scale for the whole population (Table 3) was -6.0 (SD 6.8). This means that on average, subjects had a more positive attitude towards low-fat foods than towards high-fat foods. Mean energy intake was 10.4 MJ/day (SD 4.0). Mean energy percentage of fat in the diet was 38.8% (SD 7.1). The mean intakes of energy, fat, fatty acids and cholesterol for men and women separately (Table 4), were comparable with the Dutch Food Consumption Survey 1987-1988 (Hulshof & Van Staveren, 1991).

### TABLE 3

*Attitudes towards five high-fat foods and their low-fat alternatives. Construction of the attitude scale, n=419*[a]

| Food | Attitude question (mean score) | | |
|---|---|---|---|
| | Liking | Good | Liking + good |
| HIGH-FAT FOODS | | | |
| Margarine | 3.0 | 3.0 | |
| Whole milk | 2.6 | 3.1 | |
| Whole yoghurt | 3.2 | 3.0 | |
| Pork | 3.5 | 2.7 | |
| Liver sausage | 3.2 | 2.7 | |
| Sum score | 15.5 | 14.5 | 30.0 |
| LOW-FAT ALTERNATIVES | | | |
| Low-fat margarine | 3.0 | 3.6 | |
| Semi-skimmed milk | 3.4 | 3.9 | |
| Low-fat yoghurt | 3.3 | 3.9 | |
| Beef | 4.0 | 3.6 | |
| Smoked beef | 3.5 | 3.6 | |
| Sum score | 17.2 | 18.7 | 36.0 |

Total attitude score = -6.0 (SD 6.8)

total attitude score = Σ (liking+good high-fat foods) - Σ (liking+good low-fat foods)

[a] For some values the number of subjects was lower because of missing values

TABLE 4

*Intake of fat, fatty acids, cholesterol and energy per day (mean, SD) of 190 men and 225 women in the attitude study in Utrecht*[a]

| Food component | Men | | Women | |
|---|---|---|---|---|
| | mean | SD | mean | SD |
| Energy (MJ) | 12.3 | 4.6 | 8.8 | 2.6 |
| Fat (g) | | | | |
| Total | 131.6 | 66.1 | 91.8 | 37.6 |
| Saturated | 50.9 | 26.0 | 35.6 | 14.4 |
| Monounsaturated | 46.7 | 25.0 | 32.5 | 14.0 |
| Polyunsaturated | 25.6 | 14.1 | 17.9 | 9.3 |
| Cholesterol (mg) | 340 | 166 | 249 | 89 |
| Fat (En %) | | | | |
| Total | 39.3 | 7.1 | 38.4 | 7.0 |
| Saturated | 15.2 | 3.1 | 15.0 | 3.0 |
| Monounsaturated | 13.9 | 3.2 | 13.6 | 3.0 |
| Polyunsaturated | 7.7 | 2.5 | 7.4 | 2.5 |

[a] For four subjects it was not possible to compute intake data because of missing values.

Women had a lower score on the attitude scale than men (Table 5), $t=3.63$, $p=0.0003$, and respondents following a dietary treatment had a lower attitude score than subjects who did not [$t=-3.76$, $p=0.0002$]. The same was true for subjects with a fat intake according to the Dutch dietary guidelines and those who had not [$t=4.62$, $p<0.0001$]. The mean attitude score did not vary among age groups [$F(2,366)=1.78$, $p=0.17$], education levels [$F(2,363)=0.67$, $p=0.51$], occupation levels [$F(2,325)=1.87$, $p=0.16$], body mass index [$F(3,365)=0.67$, $p=0.57$] and household size [$F(2,366)=1.52$, $p=0.22$].

The energy percentage fat in the diet differed significantly between subjects following a special diet and those who did not [$t=-3.42$, $p=0.0007$]. Fat intake differed between age groups [$F(2,412)=3.95$, $p=0.02$]: subjects aged 18-34 had a significantly higher fat intake (expressed as percentage of energy intake) than the 35-54 year olds. There was no difference in energy percentage fat in the diet for gender [$t=1.17$, $p=0.24$], education level [$F(2,409)=0.22$, $p=0.80$], occupation level [$F(2,367)=0.16$, $p=0.85$], body mass index [$F(3,411)=0.62$, $p=0.60$) and household size [$F(2,412)=1.26$, $p=0.29$].

## TABLE 5

*Mean attitude score and energy percentage fat of 419[a] adult subjects in the attitude study in Utrecht*

| | Attitude score | | Energy % fat in diet | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Whole group | -6.0 | 6.8 | 38.8 | 7.1 |
| Sex | | | | |
| Male | -4.6** | 6.4 | 39.3 | 7.1 |
| Female | -7.1** | 7.0 | 38.4 | 7.0 |
| Age (in years) | | | | |
| 18-34 | -5.2 | 5.9 | 40.0* | 6.4 |
| 35-54 | -6.5 | 6.8 | 37.9* | 6.7 |
| 55+ | -6.6 | 8.0 | 38.3 | 8.2 |
| Education level[b] | | | | |
| Low | -6.3 | 7.4 | 38.5 | 8.1 |
| Intermediate | -6.0 | 6.1 | 39.1 | 6.2 |
| High | -5.3 | 6.2 | 38.8 | 6.2 |
| Occupation level[c] | | | | |
| Low | -4.9 | 7.6 | 39.0 | 7.8 |
| Intermediate | -6.7 | 6.5 | 38.5 | 7.1 |
| High | -6.0 | 6.3 | 38.9 | 6.1 |
| Body mass index ($kg/m^2$)[d] | | | | |
| <20 | -5.1 | 6.9 | 39.6 | 6.4 |
| 20-25 | -5.9 | 6.9 | 38.7 | 6.5 |
| 25-30 | -6.7 | 6.6 | 39.0 | 8.3 |
| ≥30 | -5.8 | 7.1 | 37.6 | 8.1 |
| Household size | | | | |
| 1 | -6.9 | 8.1 | 38.1 | 7.9 |
| 2 | -6.5 | 6.3 | 38.4 | 7.0 |
| ≥3 | -5.3 | 6.7 | 39.4 | 6.8 |
| Dietary treatment | | | | |
| Yes | -8.2** | 7.5 | 36.8** | 7.4 |
| No | -5.1** | 6.3 | 39.5** | 6.8 |
| Dutch guidelines energy % fat | | | | |
| 30-35 (n=74) | -8.5** | 6.4 | 32.8** | 1.3 |
| >35 (n=258) | -4.6** | 6.5 | 42.2** | 5.1 |

* $P < 0.05$, ** $P < 0.001$.

[a] For some values the number of subjects was lower because of missing values.

[b] Low: primary school, lower level of secondary school, lower vocational training. Intermediate: higher level of secondary school, intermediate vocational training. High: higher vocational training, university.

[c] Low: unskilled and skilled workers. Intermediate: lower managerial and minor self-reliant (e.g. shopkeeper). High: intermediate and higher managerial, professionals.

[d] Height and weight were self-reported.

The relationship between the first and second score on the attitude scale (Figure 1) gave a test-retest reliability of 0.92 [95% confidence limits (CL) 0.82 and 0.97 (n=25)]. Cronbach's α of the attitude scale, computed on the first administration, was 0.67.

Figure 2 shows the relationship of energy percentage fat in the diet between first and second administration of the food frequency questionnaire. The reproducibility of energy percentage fat in the diet was 0.64 [95% CL 0.38 and 0.81 (n=33)].

Pearson correlation coefficient between the attitude score and energy percentage of fat (Figure 3) was 0.40 (95% CL 0.31 and 0.49) for the whole group, and 0.43 (95% CL 0.30 and 0.54) and 0.38 (95% CL 0.25 and 0.49) for men and women respectively.

The multiple correlation between the two types of attitudes and the energy percentage of fat in the diet R was 0.40, the liking attitude showing a higher standardized beta weight than the goodness attitude (0.32 versus 0.14). The correlation between liking and goodness of the foods was 0.54 (95% CL 0.46 and 0.61).

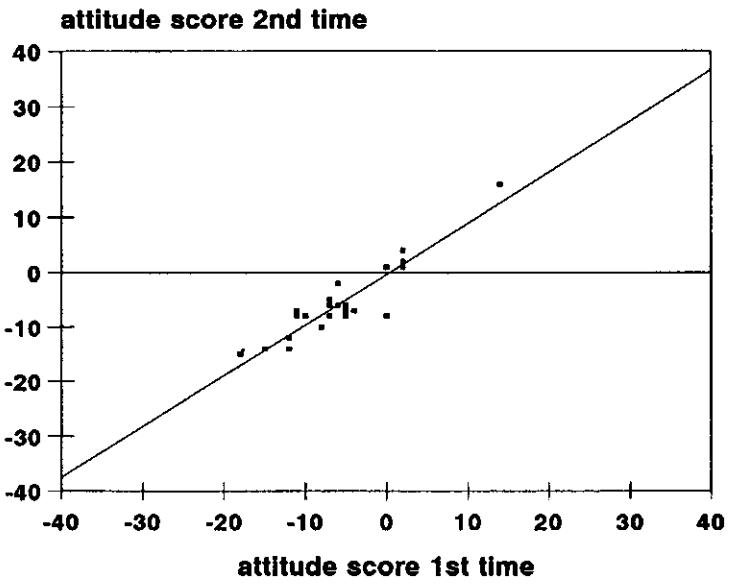


Figure 1. Relationship between the first and second score on the attitude scale [r=0.92 (0.82; 0.97), n=25]

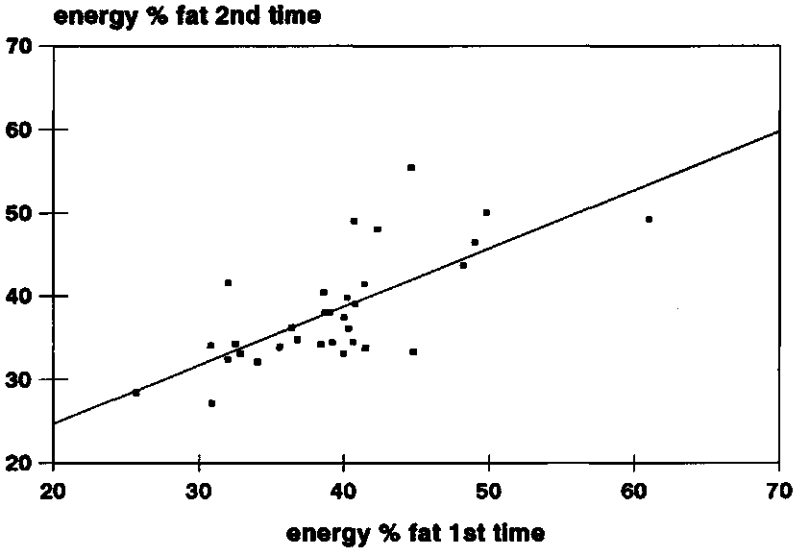


Figure 2. Relationship of energy percentage fat in the diet between first and second administration of the food frequency questionnaire [r=0.64 (0.38; 0.81), n=33]

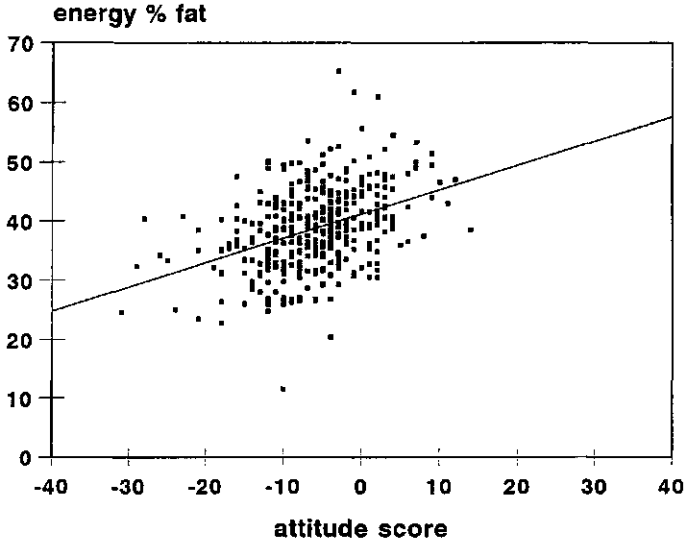


Figure 3. Relationship between attitude score and energy percentage fat in the diet [r=0.40 (0.31; 0.49), n=365]

TABLE 6

*Intra-individual and inter-individual variance in attitude score and energy percentage fat in the diet, and the attenuation coefficient in the attitude study in Utrecht*

| | Variance | | | | |
|---|---|---|---|---|---|
| Variable | Intra individual | n | Inter individual | n | Attenuation coefficient $(1+Q^2)^{-0.5}$ |
| Attitude | 3.3 | 25 | 43.0 | 369 | 0.96 |
| Energy % fat in diet | 15.2 | 33 | 35.7 | 415 | 0.84 |

A high ratio of intra-individual variance over inter-individual variance ($Q^2$) for the attitude score or energy percentage fat in the diet (Table 6) would cause underestimation of the correlation coefficient between attitudes and energy percentage fat. The attenuation factor ($(1 + Q^2)^{-0.5}$) was 0.96 for the attitude score and 0.84 for energy percentage fat in the diet. This resulted in a "true" or unattenuated correlation coefficient of 0.50. This value was only slightly higher than the observed correlation coefficient of 0.40. As the unattenuated correlation coefficient is 0.50 the attitude score explained 25% of the variance in energy percentage fat.

## DISCUSSION

The attitude scores explained 25% of the variance in energy percentage of fat. This result shows, together with the difference in attitude score between subjects with a dietary fat intake in accord with the Dutch dietary guidelines and those having a diet with more dan 35% of energy derived from fat, that the attitude scale is useful in the understanding of total fat intake. An attractive aspect of the attitude scale we used is that it reflects feelings about higher fat and lower fat foods, while the dietary energy percentage from fat is an outcome of choices between high-fat foods and low-fat

alternatives.

A correlation coefficient of 0.50 between attitudes and energy percentage fat is relatively high if it is taken into account that the attitude instrument consists of attitudes towards 10 foods while the food frequency questionnaire is based on 104 items. The 10 products included in the attitude scale covered 37% of the total fat intake of the Dutch National Food Consumption Survey (Hulshof & Van Staveren, 1991). Ideally, attitudes should be elicited towards the 104 items included in the food frequency questionnaire but from a practicable point of view this is impossible. However, other choices can be included in an attitude scale like this, for example full fat cheese and low fat cheese, chicken with and without skin, rolls and croissants. Including other high-fat/lower-fat pairs will increase the amount of fat in the diet that is covered by the items of the attitude scale.

Meat is a difficult item, because different cuts of meat contain different amounts of fat. This means that attitudes towards pork or beef depend on which cut of meat the subject had in mind. To overcome this problem questions could be asked towards a particular meat item instead of the whole product group. For example, tartar versus hamburger, lean versus fat beefsteak, lean versus fat pork chops. However, this approach will decrease the amount of fat covered by the attitude scale, unless the products are evaluated as a representative for the whole food group. Whether this is the case should be studied in pilot studies. Another problem in comparing pork and beef arises when subjects with various ethnic backgrounds (e.g. Moslems, Jewish people) are included in a study. In that case attitudes towards alternatives within one animal species might be a better choice, as in some religions consumption of pork is forbidden.

Another reason why the correlation coefficient of 0.50 should be considered as high is that attitudes are not the only variables that influence food consumption. Food choice is influenced by a large range of factors varying from social-economic factors to physical characteristics of foods. Influence of the social environment, habit and perceived control are examples of other possible social-psychological determinants of dietary intake (Shepherd, 1990). However, in many studies it was found that liking is the predominant

predictor of food choice (Tuorila and Pangborn 1988a, 1988b; Tuorila, 1990). Because liking is one of the attitude questions in our scale it is not expected that the variance explained will increase dramatically when other factors are included in the model. From the multiple regression analysis it appeared that the association between liking of foods and fat intake (expressed as per cent of energy intake) is more important than the association of goodness of foods and fat intake. This result confirms the relative importance of preference in food choice.

The difference in attitude score for gender is in agreement with previous research (e.g. Shepherd, 1988; Towler and Shepherd, 1992). However, this difference in attitude score did not result in a difference in energy percentage of fat. Unexpectedly, the various indicators for social class did not show any differences in attitude score or energy percentage of fat in the diet. Shepherd (1988), Shepherd and Stockley (1985; 1987), and Towler and Shepherd (1992) found that in general the higher social class groups had more negative attitudes towards consumption of high-fat foods, although no significant differences were found. Hulshof *et al.* (1991) found differences in energy percentage of fat between socio-economic classes, with subjects in the low socio-economic class having more energy derived from fat than subjects in the high socio-economic class. However, the differences were rather small. The discrepancy between our results and the results of Hulshof *et al.* (1991) may be caused by using different food consumption methods, as also Bart *et al.* (1993), using the same food frequency questionnaire as we did, did not found a difference in energy percentage fat for socio-economic classes and gender in a study among the elderly. In addition, as education, occupation, age and sex are associated, confounding effects should be kept in mind.

The quality of research methods is determined by the validity and reproducibility of measures used. In the present study test-retest procedure and Cronbach's $\alpha$ were used to measure the reliability of the attitude scale.

Cronbach's $\alpha$ was used most often to assess reliability of an attitude or belief scale (e.g. Contento and Murphy, 1990; Towler and Shepherd, 1992). Shepherd (1989) argued that it is questionable if in the case of food choice an unitary belief scale would be

expected: "it might be that an individual could consider consuming a particular food gives sensory pleasure whilst still believing that the food is bad for health". The same is true for our composite attitude scale. Although the value of Cronbach's $\alpha$ is borderline (0.67), it is comparable with other attitude and belief scales.

Test-retest reliability has been seldom used in food related attitude research (Stafleu *et al.*, 1991/2). Compared to previous studies (Feldman and Mayhew, 1984; Hollis *et al.*, 1986) the test-retest reliability of our attitude scale is high, but the studies are difficult to compare. A possible explanation for a high test-retest reliability is that the subjects remembered what they filled out the first time (Carmines and Zeller, 1988). However, the amount of items was very high and the time span between the test and retest was 12-14 weeks, so it is unlikely to expect such an effect.

The food frequency questionnaire is valid and reproducible (Feunekes *et al.*, 1993; Feunekes *et al.*, accepted). The value of reproducibility of 0.64 in the present study reinforces the reliability of this questionnaire.

Substantial random error will tend to reduce correlation coefficients (Beaton, 1991; Sempos, 1991). The higher the reliabilities of the variables, the less the corrected correlation differs from the observed correlation (Carmines and Zeller, 1988). The attenuation factor was 0.96 and 0.84 for attitudes and energy percentage of fat in the diet respectively. Therefore the difference between the observed and unattenuated correlation coefficient was very small. This was caused by the high test-retest reliability of the measures used. Given the high test-retest correlations, error components might be correlated between administrations both in the attitude data and food frequency data (Beaton, 1991). This provides a biased estimate of the correlation with true intake, implying that the degree of expected attenuation would probably be underestimated.

The response rate was very low. This was due to several factors. The study took place in low-income areas, and many subjects didn't have a telephone and were therefore difficult to reach. Attitudes towards low-fat foods were more positive than attitudes towards high-fat foods. This is an interesting result for health education and food industry, but it is uncertain whether this can be extrapolated to the whole Dutch

population. However, a low response rate is not a serious problem for the main purpose of our study, which was a methodological question. A selection bias will result in a low variation in the variables measured and therefore in an underestimation of the correlation coefficient.

There are several studies that used an approach that is in some aspect comparable with the present study. Shepherd and Stockley (1985) summed the scores of six high-fat food groups for both the attitudes and the frequency of consumption. Correlation coefficient between the composite attitude measure and composite behaviourial measure was 0.56. Shepherd and Stockley (1987) found a correlation of 0.68 between attitudes and intention (not behaviour itself) for four food types combined. As they mentioned in their discussion section this may have resulted partly from the close correspondence in definitions used for attitudes and behaviourial intention. Shepherd (1988) used the relative intention towards low-fat milk. He subtracted the score for whole fat milk from the sum of low-fat milk and semi-skimmed milk. The correlation between attitudes towards low-fat milk and this relative intention measure was 0.70. However, an attitude scale that weighs the attitudes towards low-fat foods and high-fat foods, and is related to fat intake has, as far as we know, not been published before. Therefore it is necessary to repeat this study in other populations.

The advantage of this attitude scale is that it covers choices between foods that contribute to the fat intake. Further, it is a single measure that can be used to predict fat intake, to compare groups of subjects and to evaluate attitude changes. Taking this into account, it is concluded that attitudes towards high-fat foods and their low-fat alternatives are useful in understanding fat intake. We hope that this study will stimulate research on choice behaviour in nutrition attitude research.

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## CHAPTER 5

# FAMILY RESEMBLANCE IN INTAKE OF ENERGY, FATS, AND CHOLESTEROL; A STUDY AMONG THREE GENERATIONS OF WOMEN[1]

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## ABSTRACT

Transfer of nutrition habits within the family may contribute to the establishment of a high fat diet. Several studies showed a significant correlation in nutrient intake between parents and children living in the same household. This study describes family resemblance in nutrient intake in adult women living apart. Family resemblance in fat intake was assessed in three generations of adult women by means of a short food frequency questionnaire. Data were collected on 291 maternally related family members (97 young adult women, their mothers, and their grandmothers). Weak correlations (0.13-0.27) were found between nutrient intake of the younger and middle generation. Correlations between the middle and older generation (-0.03-0.29), and between the younger and older generation (-0.03-0.33) tended to be lower. This study shows that family resemblance in nutrient intake is weak for adult women living apart. There seems to be more impact of middle aged mother's eating habits on fat intake of their adult daughters, than of elderly women's eating habits on their middle aged daughters.

## INTRODUCTION

Coronary heart disease is the major cause of death in Western countries. A diet high in saturated fat is associated with coronary heart disease (Keys *et al.*, 1980; Gordon *et al.*, 1981; Shekelle *et al.*, 1981; Kushi *et al.*, 1985). One factor that may contribute to the establishment of a high fat diet is the transfer of nutrition habits within families. It is suggested that diet, and other cardiovascular risk factors, are established in early

[1] *Preventive Medicine*, accepted

childhood and persist to adult age (Khoury *et al.*, 1980; Oliveria *et al.*, 1992; Williams *et al.*, 1979), while others found that shared familial environment had no significant impact on the diet in adulthood (De Castro, 1993). Several studies showed a significant association between nutrient intake of parents and children (Garn *et al.*, 1979; Laskarzewski *et al.*, 1980; Oliveria *et al.*, 1992, Pérusse *et al.*, 1988). These studies have one thing in common: family members were living in the same household. As a consequence family members share their meals, often one person in the family buys food, and therefore food choice for the other members is limited. This "cohabitional effect" (Garn *et al.*, 1979) may have resulted in an overestimation of nutrient aggregation within the family. As there was no influence of familial environment on daily intake and meal patterns in a study of De Castro (1993) among adult twins not living together, family resemblance between parents and children living apart needs investigation.

The purpose of this paper is to assess family aggregation of nutrient intake among adult family members. As transfer of food habits was expected to take place in female line predominately (Litman, 1974), the study took place among three generations of women. In addition, as there are indications that heart disease is more common in the lower socio-economic classes (Kraus *et al.*, 1980), and fat intake seems to be higher in the lower socio-economic classes (Bolton-Smith *et al.*, 1991; Hulshof *et al.*, 1991), the recruitment took place in low-income areas.

As in the present study the younger generation lived not with their mother any more, our hypothesis was that in adult family members associations in nutrient intake between generations would be lower than in previous studies. We expected that correlations were higher between younger and middle generation than between middle and older generation, as the younger generation lived on their own for a shorter period. No association in nutrient intake was expected between the older and younger generation.

## METHODS

### *Sample*

A sample was taken from the municipality of Helmond, a town in the southern part of the Netherlands with about 71,000 inhabitants. This town was selected because death rates from ischaemic heart disease are higher in this part of the Netherlands (4% and 16% higher than the average in the country, for men and women, respectively) (Van Vlerken, 1989). A letter was sent to 2052 women between 20 and 30 years old living in low-income areas. Subsequently, the women were contacted by telephone, up to eight attempts. Subjects with no telephone, or a secret number were visited at home, up to three attempts. In order to compose three-generation families for the study, all subjects contacted were asked some questions to ascertain eligibility. The major criteria were:

(1) the woman of the younger generation had to live on her own;

(2) her mother, and grandmother (mother's mother) must be alive;

(3) all generations must be able to speak Dutch, and had to live in the Netherlands.

Of the 1846 subjects contacted, main reasons for not participating were: grandmother or mother not alive (46% and 5% respectively), still living with mother (16%), mother or grandmother not living in the Netherlands (5%).

### *Data collection*

If subjects met all eligibility criteria, and if the women of all generations were able and willing to participate, a self-administered questionnaire was sent, and an appointment was made for an interview at the subject's home. Each family member was interviewed apart. Data were collected on social-psychological determinants of fat intake (self-administered), socio-demographic characteristics, and food intake (interviewer-administered). Participants were 97 adult women, their mothers, and their grandmothers. In this paper the dietary intake data will be presented.

*Food frequency questionnaire*

Intake of fat, fatty acids, cholesterol, and energy was assessed by means of a validated food frequency questionnaire developed by Feunekes *et al.* (1993). The food frequency questionnaire consisted of 104 items which were selected from the Dutch Food Consumption Survey 1987-1988 (Hulshof & Van Staveren, 1991). The questionnaire is semi-quantitative and is structured according to the Dutch meal pattern. Frequency of consumption was recorded per day, per week, or per month with a reference period of four weeks preceding the interview. Subjects were asked to express their regular portion size relative to the standard portion size. Half portions were possible. For many items a choice between several common serving sizes could be made. Nutrient intake was calculated with the extended version of the Dutch Nutrient data base 1986 (Nevo-tabel, 1986).

The relative validity of this questionnaire was tested against the dietary history (Feunekes *et al.*, 1993). In addition biological markers were used to compare both the results of the food frequency questionnaire and the dietary history with an independent measure of fat intake. As the results from the food frequency questionnaire and from the dietary history were closely associated, the food frequency questionnaire was considered appropriate for classifying subjects according to their fat intake.

The interviews were conducted by trained interviewers and took place at the subject's home.

*Analysis*

Mean intakes were calculated for all generations separately. In order to correct fat and cholesterol intakes for energy intake nutrient densities were computed. For fat and fatty acids energy percentages were used, while cholesterol intake was divided by energy intake. Pearson product moment correlations between the different generations were computed. First these analyses were done by leaving out all families of which one generation had a diet prescribed by a practitioner. These analyses were based on 58 families. As the results were comparable to the results for the whole group, it was

decided to present only the results for the whole group (n=97 families). To evaluate differences between generations we performed analyses of variance with family and generation as main effects. When weight or height was not reported by one of the family members the whole family was excluded from analyses involving weight or height. In addition pregnant women were excluded from analyses on family resemblance in body weight and body mass index. In order to evaluate family resemblance in food choice Spearman correlation coefficients between the different generations were computed for several food groups. Spearman correlations rather than Pearson correlations were used, because intake on food level was not normally distributed.

## RESULTS

### *Population*

In Table 1 some sample characteristics are given. Mean age was 25, 49, and 76 years for the younger, middle, and older generation respectively. Weight [$F(2,176)=10.61$, $P<0.001$], and body-mass index [$F(2,162)=32.15$, $P<0.0001$] were increasing with age, whereas daughters were taller than their mothers for all generations [$F(2,178)=31.07$,

TABLE 1

*Some characteristics of 97 young adult women, their mothers, and their grandmothers in the three generation study on food habits*

| | Younger generation | | | Mothers | | | Grandmothers | | |
|---|---|---|---|---|---|---|---|---|---|
| | mean | SD | n | mean | SD | n | mean | SD | n |
| Age (years) | 24.9 | 2.8 | 97 | 49.2 | 5.1 | 97 | 76.2 | 5.9 | 97 |
| Height (cm)[a] | 168.5 | 6.3 | 97 | 165.0 | 6.0 | 97 | 162.6 | 6.5 | 90 |
| Weight (kg)[a] | 64.2 | 10.6 | 90 | 67.8 | 11.9 | 97 | 70.5 | 10.7 | 95 |
| BMI ($kg/m^2$)[a] | 22.5 | 3.5 | 90 | 24.9 | 4.2 | 97 | 26.8 | 4.1 | 88 |

[a] Height and weight were self-reported. Seven pregnant women of the younger generation were not included in the calculation of weight and body mass index (BMI). In the older generation 7 values for height and 2 for weight were missing.

$P<0.0001$]. Pearson correlation coefficients between family members ranged from 0.34 to 0.41, 0.13 to 0.30, and 0.10 to 0.31 for height, weight, and body-mass index, respectively (Table 3).

Seven women of the younger generation were pregnant, 1 was lactating, and 11 were on a special diet. Seventeen women of the middle generation, and 34 women of the older generation had dietary restrictions. Not all of these diets were prescribed by a practitioner. For a diet prescribed by a practitioner these figures were 3, 12, and 29 for the younger, middle and older generation respectively.

A low education, not higher than primary school or low vocational training, was reported by 23%, 59%, and 92% of the younger, middle, and older generation, respectively, while higher vocational training or university degree was reported by 10%, 5%, and 0% of the younger, middle, and older generation, respectively. Mean contact frequency per month, either by telephone or visit, was 17 (SD 9) between younger and middle generation, 14 (SD 10) between middle and older generation, and 6 (SD 7) between younger and older generation.

*Dietary Intake*

Mean intakes per generation are depicted in Table 2. Younger generations had higher energy intake than older, both when expressed in kJ [$F(2,192)=5.19$, $P<0.01$] or as energy per kg body weight [$F(2,188)=11.39$, $P<0.0001$]. Also the intake of saturated fatty acids in grams [$F(2,192)=3.56$, $P<0.05$], and cholesterol both in mg [$F(2,192)=4.28$, $P<0.05$] and mg/MJ [$F(2,192)=4.81$, $P<0.01$] were statistically different between generations.

As expected, the correlations in nutrient intake, though generally low, tended to be higher between the younger and middle generation than for other combinations (Table 3). Unexpectedly, a moderate correlation coefficient was found between the younger and the older generation for polyunsaturated fatty acids expressed as percentage of energy, and low, but significant correlations for energy per kg body weight, and saturated fatty acids intake.

TABLE 2

*Nutrient intakes of 97 young adult women, their mothers, and their grandmothers in the three generations study on food habits (mean, SD). Data are based on a food frequency questionnaire*

| | Younger generation | | Mothers | | Grandmothers | |
|---|---|---|---|---|---|---|
| Food component | mean | SD | mean | SD | mean | SD |
| Energy | | | | | | |
| (kJ) | 9513 | 3225 | 9054 | 2740 | 8271 | 2831 |
| (kilocalories) | 2274 | 771 | 2164 | 655 | 1977 | 677 |
| (kJ/kg body weight[a]) | 152 | 55 | 139 | 54 | 119 | 48 |
| (kcal/kg body weight[a]) | 36 | 13 | 33 | 13 | 28 | 11 |
| Total fat | | | | | | |
| (g) | 102 | 50 | 97 | 38 | 90 | 48 |
| (% energy[b]) | 39 | 7 | 40 | 7 | 40 | 9 |
| Saturated fatty acid | | | | | | |
| (g) | 40 | 18 | 37 | 14 | 34 | 16 |
| (% energy) | 15 | 3 | 15 | 3 | 15 | 4 |
| Monounsaturated fatty acid | | | | | | |
| (g) | 37 | 18 | 34 | 15 | 31 | 19 |
| (% energy) | 14 | 3 | 14 | 3 | 14 | 3 |
| Polyunsaturated fatty acid | | | | | | |
| (g) | 20 | 13 | 20 | 9 | 19 | 13 |
| (% energy) | 8 | 3 | 8 | 2 | 8 | 4 |
| Cholesterol | | | | | | |
| (mg) | 266 | 88 | 282 | 89 | 249 | 87 |
| (mg/MJ) | 29 | 7 | 32 | 8 | 31 | 10 |
| (mg/1000 kilocalories) | 121 | 29 | 134 | 33 | 130 | 42 |

[a] weight was self-reported. In the older generation 2 values for weight were missing, therefore energy per kg body weight was in the older generation based on 95 women.

[b] % energy, per cent of total energy intake

Correlations between generations in energy intake from different foods and food groups were weak to moderate (Table 4). Again the highest correlations were found for the younger-middle generation pairs, with 12 out of 22 correlations being statistically significant ($P<0.05$). For the middle-older pairs 9 out of 22 correlations were significant, while for the younger-older pairs only energy from cheese and milk showed significant correlations. These last two significant correlations could be ascribed to chance.

TABLE 3

*Pearson correlations between family members for nutrient intake and body composition in a study among three generations of adult women. Data are based on a food frequency questionnaire*

| | Younger-middle generation | | Middle-older generation | | Younger-older generation | |
|---|---|---|---|---|---|---|
| | r | n | r | n | r | n |
| Height (cm)[a] | 0.35*** | 97 | 0.41*** | 90 | 0.34** | 90 |
| Weight (kg)[a] | 0.30** | 90 | 0.24* | 95 | 0.13 | 89 |
| Body-mass index (kg/m$^2$)[a] | 0.27** | 90 | 0.31** | 88 | 0.10 | 82 |
| Energy | | | | | | |
| (kJ) | 0.22* | 97 | 0.08 | 97 | 0.14 | 97 |
| (kJ/kg body weight)[a] | 0.27** | 97 | 0.15 | 95 | 0.22* | 95 |
| Total fat | | | | | | |
| (g) | 0.19 | 97 | 0.02 | 97 | 0.19 | 97 |
| (% energy[b]) | 0.19 | 97 | -0.02 | 97 | 0.12 | 97 |
| Saturated fatty acid | | | | | | |
| (g) | 0.23* | 97 | 0.12 | 97 | 0.23* | 97 |
| (% energy) | 0.26* | 97 | 0.09 | 97 | 0.05 | 97 |
| Monounsaturated fatty acid | | | | | | |
| (g) | 0.19 | 97 | 0.02 | 97 | 0.16 | 97 |
| (% energy) | 0.22* | 97 | 0.04 | 97 | -0.00 | 97 |
| Polyunsaturated fatty acid | | | | | | |
| (g) | 0.13 | 97 | -0.03 | 97 | 0.19 | 97 |
| (% energy) | 0.20 | 97 | 0.10 | 97 | 0.33*** | 97 |
| Cholesterol | | | | | | |
| (mg) | 0.21* | 97 | 0.29** | 97 | 0.05 | 97 |
| (mg/MJ) | 0.21* | 97 | 0.24* | 97 | -0.03 | 97 |

[a] height and weight were self-reported. In the older generation 7 values for height and 2 for weight were missing. Seven pregnant women of the younger generation were not included in the calculation of weight and body mass index (BMI).
[b] % energy, per cent of total energy intake
* P< 0.05
** P< 0.01
*** P< 0.001

## DISCUSSION

This paper deals with family resemblance in nutrient intake in three generations of Dutch women. The results imply that family resemblance in nutrient intake is not very apparent in adult women living apart. Correlation coefficients in intake data between younger en middle generation were weak and significant for most nutrients. Correlations

## TABLE 4

*Correlations in energy intake from different food items between younger-middle, middle-older, and younger-older generation in a study among three generations of adult women. Data are based on a food frequency questionnaire*

| Food item or food group | Number of items per group[a] | Spearman correlation coefficients between generations | | |
|---|---|---|---|---|
| | | Younger-middle generation (n=97) | Middle-older generation (n=97) | Younger-older generation (n=97) |
| Bread | 7 | 0.13 | 0.27** | 0.01 |
| Oils and fats[b] | 16 | 0.19 | 0.20* | 0.09 |
| Sandwich filling | | | | |
| Cheese[c] | 11 | 0.27** | 0.25* | 0.28** |
| Meat products[c] | 9 | 0.18 | 0.25* | -0.12 |
| Other | 8 | 0.18 | 0.03 | -0.02 |
| Milk | 4 | 0.19 | 0.18 | 0.22* |
| Milk (in coffee) | 10 | 0.31** | 0.29** | 0.07 |
| Yogurt,custard,ice(cream) | 15 | 0.08 | 0.17 | 0.10 |
| Rice, pasta | 2 | 0.29** | 0.19 | 0.18 |
| Chinese food, pizza | 2 | 0.29** | 0.06 | 0.08 |
| Potatoes | 1 | 0.23* | 0.09 | 0.19 |
| Vegetables, fruit | 2 | 0.12 | 0.15 | -0.05 |
| Fish | 7 | 0.41*** | 0.25* | -0.01 |
| Meat | 15 | 0.16 | 0.13 | -0.00 |
| Egg | 1 | 0.27** | 0.35*** | 0.20 |
| Cookies, cakes, pastry | 8 | 0.32** | 0.02 | 0.04 |
| Chocolate snacks | 6 | 0.20* | -0.06 | 0.17 |
| Sugar | 1 | 0.24* | 0.16 | -0.08 |
| Savory snacks | 11 | 0.30** | 0.35*** | 0.08 |
| Peanuts, 'chips' | 6 | 0.30** | 0.13 | 0.09 |
| Sauces | 12 | 0.14 | 0.42*** | 0.07 |
| Alcoholic beverages | 5 | 0.15 | -0.08 | -0.11 |

[a] Total number of items mentioned is more than the 104 items included in the questionnaire. This is due to the fact that for some items a choice from different fat levels, or a choice from different serving sizes could be made. For example milk is one item, but a choice *from different fat levels could be made.*

[b] For all 16 items for added fat and oils a choice from 16 types could be made

[c] Also cheese and meat products eaten without bread

* P< 0.05

** P< 0.01

*** P< 0.001

between middle and older generation were only significant for cholesterol intake. There were moderate correlations in energy intake from different sources between the younger and middle generation. Again, correlations between younger and middle generation were higher than between middle and older generation. Energy from milk in coffee, fish, eggs, and savory snacks showed a significant correlation both for younger and middle, and middle and older generation. Energy from cheese has a moderate correlation between all pairs. Correlations between younger and middle generation were weak to moderate for all food groups, and not just for some specific food items.

The significant correlations in nutrient intake between the younger and older generation were not reflected in food items. As there is no explanation for the correlations found in nutrient intake between younger and older generation, these findings may be due to chance alone.

In family studies results may be biased by family members influencing each other in responding to questionnaires. Food consumption was assessed using an interviewer administered food frequency questionnaire. Therefore, the chance that family members influenced each other in reporting their intake was very small. The food frequency questionnaire proved to be a valid method in subjects aged 30-50 (Feunekes *et al.*, 1993), and in a separate study among the elderly (Van Staveren *et al.*, 1992). Mean intake was somewhat higher than the average in the Netherlands (Ministerie van WVC & Ministerie van LNV, 1988). This is consistent with the finding that the food frequency questionnaire overestimated intake in the validation studies of Feunekes *et al.* (1993) and Van Staveren *et al.* (1992).

Although not directly comparable with respect to food consumption method, age of children, and living together, our findings are consistent with other studies. Garn *et al.* (1979) reported a correlation of 0.22 between white pregnant mothers and children aged 10-16 y for energy intake. Laskarzewski *et al.* (1980) found significant correlations between parents and children for saturated fat ($r = 0.15$), polyunsaturated fatty acids ($r = 0.19$) and energy intake ($r = 0.24$), but not for cholesterol intake. Pérusse *et al.* (1988) found intraclass correlation coefficients for nuclear families between 0.27 (energy and

fat) and 0.42 (ratio of linoleic acid to saturated fatty acids). Correlation coefficients of 0.22-0.56 between the nutrient intake of mothers and daughters reported by Oliveria *et al.* (1992) were much higher than we found for the younger and middle generation (0.13-0.27), and middle and older generation (-0.03-0.29).

In these previous studies the children were younger, they lived at home, and therefore parents and children shared meals. In addition, it was sometimes necessary that the mother completed the diaries (Oliveria *et al.*, 1992). The lower correlation coefficients in the present study therefore confirm the existence of a cohabitional effect as reported by Garn *et al.* (1979). In addition, as the correlations between middle and older generation were lower than the correlation coefficients between younger and middle generation, the period of living apart seems to be an important factor in family resemblance in nutrient intake. Several factors might explain poorer resemblance after longer periods of living apart. The participation criteria used in the present study did not exclude elderly women who lived in a sedentary home. The fact that these women did not prepare their own main meal any more could have attenuated the correlations in which the older generation was involved. As mean contact frequency is higher between younger and middle generations it might be that the younger and middle generation shared more meals together than the middle and older generations. Information about duration of living together, and number of meals shared would have given helpful information and should be asked in next studies.

There are other factors that could have caused lower correlations than reported in literature. As the three generations reflect different stages of family life cycle, low correlation coefficients could have been biased by the influence of family life cycle on dietary intake (Cross *et al.*, 1975; Schafer & Keith, 1981). Factors, like pregnancy, lactation, and dieting, that go with life cycle could have attenuated the correlation coefficients. Birch (1980) suggested that low correlations between preferences of family members may be a reflection of a commonality of preferences within a subcultural group. As the women in our study were predominantly caucasian, and from the middle and lower socio-economic classes, the sample was probably too homogeneous to find high

correlations in nutrient intake.

From Garn *et al.* (1979) it appeared that genetic influences on nutrient intake are small compared to environmental influences, while the study of De Castro (1993) showed that the diet is influenced by the immediate environment and heredity, but not by the familial environment. In the present study it was impossible to separate genetic influences from environmental influences. Correlation coefficients were higher between younger and middle generation than between middle and older generation. This argues against a strong impact of heredity on dietary habits. On the other hand it can be argued that the significant correlations in intake between the younger and middle generation reflect the influence of the immediate environment rather than familial environment, as the mean contact frequency of 17 times a month was very high.

The present study shows family resemblance in height, weight, and body mass index. Our results were in agreement with Tiret *et al.* (1991) who found a correlation coefficient of 0.29 between weight of mothers and daughters. Family resemblance in body composition was also reported in twin studies (De Castro, 1993; Stunkard *et al.*, 1990), and adoption studies (Garn *et al.*, 1979). Self-reported weight and height could have caused some problems. Subjects aged 65-74 y in the study of Rowland (1990) overreported their height by an average of 2.4 cm. This implies that the older generation possibly reported their height as they had before the shrinkage caused by osteoporosis. Whether this caused an under- or overestimating of family resemblance in height and body mass index is not clear. Among obese subjects, underreporting of both weight and dietary intake tend to occur (Rowland, 1990; Lichtman *et al.*, 1992). As there is family resemblance in height, weight, and body fatness this could have biased the results in nutrient intake.

In the present study only families of which all members were willing to participate were included in the study. Selection bias due to families that get on together could have occurred. Further research is necessary to show whether correlations between intake data will be lower in families with a lower contact frequency. The criterium of grandmother being alive has probably resulted in a selection of healthy families (survival of the fittest),

and of families that got their children at an early age.

From the significant, but weak correlations between the dietary intake of young adult women and their mothers it appeared that family resemblance in nutrient intake persists to adult age. This implies a possible transfer of nutrition habits within the family. However, as the correlations between the older and middle generation are lower, there seems to be poor resemblance after longer periods of living apart.

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## CHAPTER 6

# NUTRITION KNOWLEDGE AND ATTITUDES TOWARDS HIGH-FAT FOODS AND THEIR LOW-FAT ALTERNATIVES IN THREE GENERATIONS OF WOMEN

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## ABSTRACT

If family members influence each other in food habits nutrition education should be focused on the family as a unit, rather than on separate family members. In this study it is investigated whether adult family members resemble each other in food habits. Ninety-seven adult women, their mothers and grandmothers were asked about nutrition knowledge, attitudes, and fat intake. Mean percentage energy derived from fat was 39% for the younger generation, and 40% for their mothers and grandmothers. Correlations of nutrition knowledge scores were 0.30 ($p<0.05$) between the younger and middle generation, 0.35 ($p<0.05$) between the middle and older generation, and 0.14 ($p>0.05$) between the younger generation and their grandmothers. For attitudes towards high-fat foods and their low-fat alternatives these figures were 0.27, 0.22 (p's$<0.05$), and 0.17 ($p>0.05$), respectively, while for energy percentage of fat intake the correlations were only 0.19, -0.02, and 0.12 (p's$>0.05$), respectively. Within generations the correlations between attitudes and nutrition knowledge or percentage energy derived from fat were found to be higher in the middle generation than in other generations. No statistically significant correlations were found between nutrition knowledge and percentage energy derived from fat. From this study it can be concluded that mothers and their adult daughters resemble each other in nutrition knowledge and attitudes.

## INTRODUCTION

In the cholesterol consensus in the Netherlands, as in other Western countries, it was decided that a reduction of fat intake is indicated for the whole population (Erkelens, 1989). Several social-psychological theories and models are available that can

be used in nutrition education programmes aimed at reducing fat intake (Stafleu *et al.*, 1991/2). Both personal factors and environmental factors are included in these theories. In the Social Learning Theory it is postulated that many types of behaviour can be learned through observational learning (Perry *et al.*, 1990). As socialization of food habits takes place in the nuclear family, children might have similar nutrition habits as their parents. Family resemblance in food habits could be a reason to focus nutrition education within the family unit.

Several family-based nutritional programmes are reported in literature (Carmody *et al.*, 1986; McMurry *et al.*, 1991; Nicklas *et al.*, 1988). In addition some literature is available about family resemblance in nutrition habits. Nutrition knowledge of mothers and daughters was studied by Moxley (1981). Although there was a zero order correlation of 0.22 between mothers' nutritional knowledge score and their nine years old daughters' nutrition knowledge score, in a multiple regression with other family characteristics the beta-coefficient of mothers' knowledge on daughters' nutrition knowledge was only 0.02. Several investigators studied family resemblance in food preferences (Birch, 1980; Bryan & Lowenberg, 1958; Burt & Hertzler, 1978; Logue *et al.*, 1988; Pliner, 1983; Pliner & Pelchat, 1986; Rozin, 1991; Rozin *et al.*, 1984; Weidner *et al.*, 1985). From a meta-analysis on five studies it appeared that there was a small, statistically significant correlation in food preferences between parents and children (Borah-Giddens & Falciglia, 1993). Also for nutrient intake resemblance between parents and children was reported (Garn *et al.*, 1979; Laskarzewski *et al.*, 1980; Oliveria *et al.*, 1992; Pérusse *et al.*, 1988).

As suggested by several investigators early food choices may establish habitual patterns, which might influence food choice in adolescence or adulthood (Casey & Rozin, 1989; Contento *et al.*, 1993). As most studies took place among young children and their parents, it is not known whether family resemblance in nutrition habits persist to adult age.

Therefore, in the present study it is investigated whether adult family members resemble each other in nutrition knowledge, attitudes, and fat intake. In order to get

information about resemblance in food habits over the life-span it was considered that both middle aged parents and their adult children, and older parents and their middle aged children should be included in the study. As grandparents might have a role in transfer of food habits, it was decided to perform a three-generation study. In order to make the design not too complicated the study was performed among three generations of women, as transfer of nutrition habits was expected to take place in female line predominately (Litman, 1974). In order to investigate how nutrition knowledge, attitudes and behaviour interrelate in different stages of adult life, an additional aim was to investigate these interrelationships within each generation.

## METHODS

### *Subjects*

A sample of women between 20 and 30 years old was taken from the municipality of Helmond, a town in the southern part of the Netherlands with about 71,000 inhabitants. This town was selected because death rates from ischaemic heart disease are higher in this part of the Netherlands (Van Vlerken, 1989). The sample consisted of women living in low-income areas, as there are indications that heart disease is more common in the lower socio-economic classes (Duijkers *et al.*, 1989; Kraus *et al.*, 1980; Kunst *et al.*, 1990), and fat intake seems to be higher in the lower socio-economic classes (Bolton-Smith *et al.*, 1991), although the differences in the Netherlands are rather small (Hulshof *et al.*, 1991).

A letter was sent to 2052 women. Subsequently, the women were contacted by telephone, up to eight attempts. Subjects with no telephone, or a secret number were visited at home, up to three attempts. In order to compose three-generation families for the study, all subjects contacted were asked some questions to ascertain eligibility. The major criteria were:

(1) the woman of the younger generation should live on her own;

(2) her mother, and grandmother (mother's mother) should be alive;

(3) all generations must be able to speak Dutch, and should live in the Netherlands. In order to reach the third criterium a first selection was made on family names: married women of whom both maiden name and husband's name were not Dutch were not included in the sample. Of the 2052 women who were sent a letter, 1846 subjects were reached by telephone or visit. Main reasons for not participating were: grandmother or mother not alive (46% and 5% respectively), still living with mother (16%), mother or grandmother not living in the Netherlands (5%).

If subjects met all eligibility criteria, and if the women of all generations were able and willing to participate, a self-administered questionnaire was sent, and an appointment was made for an interview at the subject's home. Each family member was interviewed apart. Data were collected on socio-demographic characteristics, nutrition knowledge, beliefs, attitudes, and fat intake. The interviews were conducted by trained interviewers. Ninety-seven adult women, their mothers, and their grandmothers participated in the study.

*Nutrition knowledge questionnaire*

A nutrition knowledge questionnaire based on the Dutch Dietary Guidelines (Voedingsraad, 1986) was developed by Schneijder *et al.* (1991). Content validity of this questionnaire was assessed by 10 nutritionists and dieticians. Answers which nutritionists and dieticians did not agree upon were not included in the final questionnaire. Questions were addressed to the several dietary guidelines, but for the present study only 22 questions with respect to fat and cholesterol were asked. This part of the questionnaire consisted of 12 multiple choice questions with four possible answers for each question, and 10 true-false questions. Questions were asked about definition, content in foods, preparation, and function of fat and cholesterol in the body. For each correctly answered question one point was obtained. No points were given for wrong answers and skipped questions. Nutrition knowledge was measured by summing the correct answers. The maximum possible score was 22.

Reliability of the questionnaire was assessed in a study among 419 men and

women between 18 and 75 years old. Cronbach's $\alpha$ for the 22 questions was 0.74. Test-retest reliability was 0.68 ($p<0.01$) in a subsample of 31 women, with a time span of 12-14 weeks between test and retest. In a separate study among 39 elderly women test-retest reliability was 0.65 ($p<0.01$) with 9 weeks between test and retest.

Discriminate validity was assessed by comparing nutrition knowledge scores of lay people with nutrition knowledge scores of MSc-students in human nutrition. It was expected that students in human nutrition would have a higher nutrition knowledge score than lay people. Mean score of 45 students was 19.6 (SD 2.2), while the mean score of 419 lay people was 12.9 (SD 3.9) ($t=17.7$, $p<0.01$).

Based on these reliability and validity studies two questions were reformulated, as subjects had difficulty in understanding these questions.

*Attitudes questionnaire*

An attitude scale towards high-fat foods and low-fat alternatives was developed in order to have one measure for attitudes that could be related to fat intake. This overall measure included attitudes towards the consumption of five high-fat foods (whole milk, whole yoghurt, margarine, pork, liver sausage) and five lower fat alternatives (semi-skimmed milk, skimmed yoghurt, low-fat margarine, beef, smoked beef). For each food two attitude questions were formulated: 'I like eating the food', and 'eating the food is very good/very bad'. These attitude statements are referred to as liking and good/bad.

Answers were given on 5-point Likert-scale with verbally labelled answering categories, and were coded from 1 (which indicates a negative attitude towards consuming the food) to 5 (which indicates a positive attitude towards consuming the food). Sum scores on attitude questions were calculated for the five high-fat foods and the five low-fat foods separately, adding up the codes for both attitude statements. Attitude scores on low-fat alternatives were subtracted from scores of high-fat foods. The attitude scale consisted of 20 items (10 foods, two questions per food). The possible range for the total score was -40 to +40. In this way a total attitude scale was constructed which reflects the choices between high-fat foods and their low-fat

alternatives. The attitude scale is described in detail by Stafleu *et al.* (1994), and it appeared that Cronbach's α of the scale was 0.67 (n=365), and test-retest reliability was 0.92 ($p<0.01$) (n=25). In a separate study among elderly women the test-retest reliability was 0.83 ($p<0.01$) (n=36) with 9 weeks between test and retest.

*Food frequency questionnaire*

Intake of fats, cholesterol, and energy was assessed by means of a food frequency questionnaire developed by Feunekes *et al.* (1993). The food frequency questionnaire consisted of 104 items which were selected from the Dutch Food Consumption Survey 1987-1988 (Hulshof & Van Staveren, 1991). The questionnaire is semi-quantitative and is structured according to the Dutch meal pattern. Frequency of consumption was recorded per day, per week, or per month with a reference period of four weeks preceding the interview. Portion size was expressed relative to the standard portion size. Fat intake was calculated with the extended version of the Dutch Nutrient data base 1986 (NEVO-tabel, 1986). The questionnaire appeared to be a valid measure both in men and women between 30 and 50 years old (Feunekes *et al.*, 1993) and in the elderly (Van Staveren *et al.*, 1992). Test-retest reliability of the questionnaire was 0.77 ($p<0.01$) for percentage energy derived from fat (n=93) (Feunekes *et al.*, accepted).

*Statistics*

Mean scores for nutrition knowledge, attitudes, and energy percentage of fat in the diet were calculated for all generations separately. To evaluate differences between generations we performed mixed-model analyses of variance with family as random effect and generation as main effect. Pearson product-moment correlations were calculated between family members for nutrition knowledge, attitudes and percentage energy derived from fat.

Within each generation coefficients of correlation were calculated between nutrition knowledge and attitudes, attitudes and percentage energy derived from fat, and nutrition knowledge and percentage energy derived from fat. In order to evaluate the

relative importance of liking and good/bad attitudes a standardized regression analysis was performed with liking and good/bad attitudes as independent variables, and energy percentage of fat in the diet as dependent variable:

$$\text{total fat intake (en\%)} = w_1 \text{ liking} + w_2 \text{ good/bad}$$

In the same way the relative importance of the attitudes towards the high-fat foods and low-fat foods on energy percentage of fat was evaluated:

$$\text{total fat intake (en\%)} = w_1 \text{ high-fat} + w_2 \text{ low-fat}$$

Due to missing values analyses on nutrition knowledge and attitudes were performed on 94 and 93 families, respectively. For all analyses a p-value of $<0.05$ was considered as being statistically significant.

## RESULTS

Mean age of the younger generation was 25 (SD 2.8), of their mothers 49 (SD 5.1), and of their grandmothers 76 (SD 5.9). Data in Table 1 show that education level was higher for the younger generation than for the other generations. Most women of the middle generation were married, while 68% of the older generation were widowed. Self-reported occurrence of heart disease in the near family was 11% for the younger generation, while more than 50% of the middle and older generation reported heart disease in father, mother, children, brothers, or sisters.

Subjects were asked whether and in which direction they thought transfer of nutrition habits occurred. The majority of the sample (69%) reported that they adopted nutrition habits from their mother, and 49% thought that their daughter adopted nutrition habits from them. With respect to transfer of nutrition habits in the other direction a much lower percentage thought that their mother adopted nutrition habits

TABLE 1

*Characteristics of 97 young adult women, their mothers, and their grandmothers in a three-generation study on food habits.*

| | Generation | | | | | |
|---|---|---|---|---|---|---|
| | Younger Freq. (%) | | Middle Freq. (%) | | Older Freq. (%) | |
| Educational level[a] | | | | | | |
| Low | 33 | (34) | 82 | (85) | 94 | (97) |
| Intermediate | 54 | (56) | 10 | (10) | 3 | ( 3) |
| High | 10 | (10) | 5 | ( 5) | - | |
| Marital status | | | | | | |
| Married | 41 | (42) | 75 | (77) | 27 | (28) |
| Never married | 54 | (56) | - | | - | |
| Divorced | 2 | ( 2) | 17 | (18) | 4 | ( 4) |
| Widowed | - | | 5 | ( 5) | 66 | (68) |
| Household size | | | | | | |
| 1 | 10 | (10) | 17 | (18) | 65 | (67) |
| 2 | 57 | (59) | 42 | (43) | 29 | (30) |
| ≥3 | 30 | (31) | 38 | (39) | 3 | ( 3) |
| Family history of heart disease[b] | | | | | | |
| Yes | 11 | (11) | 54 | (56) | 56 | (58) |
| No | 86 | (89) | 43 | (44) | 41 | (42) |

[a] Educational level: low: primary school, lower level of secondary school, lower vocational training. Intermediate: higher level of secondary school, intermediate vocational training. High: higher vocational training, university.
[b] Reported heart disease in father, mother, children, brothers and sisters.

from them (20%), while 26% reported to have adopted nutrition habits from their daughter.

In Table 2 the mean nutrition knowledge score, attitude score and fat intake (expressed as % of energy intake) is shown for the three generations. Mixed-model analyses of variance with generation as main effect showed that nutrition knowledge was significantly different between generations [$F(2, 186) = 37.08$, $p < 0.01$]. Mean total attitude score was negative for all generations. A negative score means that on the average the women had a more positive attitude towards low-fat alternatives than towards high-fat foods. This was true both for the liking and the good/bad attitudes scales. Only the good/bad attitudes showed a significant generation effect [$F(2, 184) = 4.04$, $p < 0.05$]. Mean percentage energy derived from fat was 39.3 for the young women, 39.6 for their mothers, and 39.9 for their grandmothers, which was not statistically significant [F(2,

TABLE 2

*Nutrition knowledge, attitudes, and fat intake (% of energy) of young women, their mothers and grandmothers (n = 97 families)*[a].

| | Generation | | | | | | |
|---|---|---|---|---|---|---|---|
| | Younger | | Middle | | Older | | |
| | Mean | SD | Mean | SD | Mean | SD | |
| Knowledge[b] | 14.0 | 2.9 | 13.7 | 2.9 | 11.2 | 3.0 | ** |
| Attitudes[c] | -8.1 | 6.0 | -8.6 | 7.4 | -7.8 | 7.9 | |
| Liking[d] | -3.5 | 4.2 | -2.8 | 4.5 | -2.4 | 5.4 | |
| Good/Bad[e] | -4.6 | 2.8 | -5.8 | 3.9 | -5.4 | 3.7 | * |
| High-fat[f] | 28.6 | 4.9 | 28.9 | 5.1 | 29.8 | 6.4 | |
| Low-fat[g] | 36.7 | 4.7 | 37.5 | 4.5 | 37.6 | 5.3 | |
| Energy % fat | 39.3 | 7.2 | 39.6 | 6.9 | 39.9 | 8.5 | |

[a] Due to missing values attitudes and nutrition knowledge scores are based on 93 and 94 families respectively.
[b] Sumscore of correctly answered questions. Maximum score: 22.
[c] Liking attitudes and good/bad attitudes towards five high-fat foods and their low-fat alternatives. Possible range -40 to +40.
[d] Liking attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[e] Good/bad attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[f] Liking attitudes and good/bad attitudes towards five high-fat foods. Possible range 10 to 50.
[g] Liking attitudes and good/bad attitudes towards five low-fat foods. Possible range 10 to 50.
* Significant generation effect, $p<0.05$.
** Significant generation effect, $p<0.01$.

192) = 0.18, $p > 0.05$].

From Table 3 it can be seen that the correlation of nutrition knowledge score was 0.30 between younger and middle generation, 0.35 between middle and older generation, and 0.14 between the younger generation and grandmothers, while partial correlations with difference in educational level as partial variable were 0.32, 0.26, and 0.11, respectively. For the total attitude score correlations between generations were 0.27, 0.22, and 0.17, respectively. It is striking that the correlations were higher for the attitudes towards the high-fat foods than towards the low-fat foods. For fat intake (% of energy intake) the correlations were 0.19 between younger and middle generation, -0.02 between middle and older generation, and 0.12 between younger and older generation.

In Table 4 correlations between concepts are depicted within generations.

## TABLE 3

*Correlations of nutrition knowledge, attitudes, and fat intake (% of energy) between young women, their mothers, and their grandmothers (n = 97 families)*[a]

| | Correlations between generations | | |
|---|---|---|---|
| | Younger-Middle | Middle-Older | Younger-Older |
| Knowledge[b] | 0.30** | 0.35** | 0.14 |
| Attitudes[c] | 0.27** | 0.22* | 0.17 |
| Liking[d] | 0.20 | 0.08 | 0.11 |
| Good/Bad[e] | 0.24* | 0.33** | 0.21* |
| High-fat[f] | 0.21* | 0.30** | 0.05 |
| Low-fat[g] | -0.00 | 0.13 | 0.03 |
| Energy % fat | 0.19 | -0.02 | 0.12 |

[a] Due to missing values attitudes and nutrition knowledge scores are based on 93 and 94 families respectively.
[b] Sumscore of correctly answered questions. Maximum score: 22.
[c] Liking attitudes and good/bad attitudes towards five high-fat foods and their low-fat alternatives. Possible range -40 to +40.
[d] Liking attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[e] Good/bad attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[f] Liking attitudes and good/bad attitudes towards five high-fat foods. Possible range 10 to 50.
[g] Liking attitudes and good/bad attitudes towards five low-fat foods. Possible range 10 to 50.
* $p<0.05$, ** $p<0.01$.

## TABLE 4

*Pearson correlations between nutrition knowledge, attitudes, and fat intake (% of energy) per generation (n=93 families)*

| | Generation | | |
|---|---|---|---|
| | Younger | Middle | Older |
| Knowledge-attitude | -0.00 | -0.29** | -0.05 |
| Attitude-energy % fat | 0.28** | 0.49** | 0.30** |
| Knowledge-energy % fat | -0.07 | -0.08 | 0.13 |

* $p<0.05$
** $p<0.01$

TABLE 5

*Effect of subscales of the attitude scale towards high-fat foods and their low-fat alternatives on percentage energy derived from fat per generation: standardized multiple regression analysis (n=93 families)*

| | | Standardized beta weights per generation | | |
|---|---|---|---|---|
| | | Younger | Middle | Older |
| Attitudes | | | | |
| | liking[a] | 0.28* | 0.40** | 0.24* |
| | good/bad[b] | 0.02 | 0.15 | 0.10 |
| $R^2$ | | 0.09 | 0.25 | 0.09 |
| Attitudes | | | | |
| | high-fat[c] | 0.38** | 0.37** | 0.47** |
| | low-fat[d] | -0.06 | -0.26** | 0.08 |
| $R^2$ | | 0.14 | 0.24 | 0.24 |

[a] Liking attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[b] Good/bad attitudes towards five high-fat foods and their low-fat alternatives. Possible range -20 to +20.
[c] Liking attitudes and good/bad attitudes towards five high-fat foods. Possible range 10 to 50.
[d] Liking attitudes and good/bad attitudes towards five low-fat foods. Possible range 10 to 50.
*$p<0.05$.
**$p<0.01$.

Pearson's correlation coefficient between nutrition knowledge and attitudes was -0.29 for the middle generation, while no statistically significant correlations were found for younger and older generations. A negative correlation between nutrition knowledge and attitudes means that women with a higher nutrition knowledge score tended to have more favourable attitudes. Correlation between attitude score and percentage of energy derived from fat was 0.28 for the younger generation, 0.49 for the middle generation, and 0.30 for the older generation. A positive score between attitudes and fat intake (% of energy intake) means that women with less favourable attitudes tend to have a diet higher in fat. The correlation between nutrition knowledge score and fat intake (% of energy intake) was -0.07, -0.08, and 0.13 for the younger, middle and older generation, respectively.

As appeared from the regression analysis (Table 5) the relative importance of the

liking attitudes was larger than the relative importance of the good/bad attitudes for all generations. The good/bad attitudes were statistically significant for none of the generations. Attitudes towards high-fat foods were a more important contributor to the variance in percentage energy derived from fat than the attitudes towards low-fat foods. Only for the middle generation the standardized estimate for attitudes towards low-fat foods was statistically significant.

## DISCUSSION

This study demonstrates that mothers and their adult daughters resemble each other in nutrition knowledge and attitudes. This was true both for middle aged mothers and their daughters, and for elderly women and their middle aged daughters. Grandmothers' nutrition knowledge and attitudes seemed to have no impact on nutrition knowledge and attitudes of their granddaughters. No family resemblance was found for percentage energy derived from fat.

These results indicate that nutrition knowledge and attitudes pass on from mother to daughter. However, in a cross-sectional study like the present one it is impossible to conclude whether there is a transfer from mother to daughter, or from daughter to mother. Therefore we asked the subjects their own opinion. According to the subjects transfer of nutrition habits is predominantly in the direction from mother to daughter.

This indicates that it might be interesting to use a family-based approach in nutrition education. But, whereas family resemblance was most apparent for nutrition knowledge, good/bad attitudes and attitudes towards the high-fat products, it should be kept in mind that nutrition knowledge and good/bad attitudes had little or no impact on fat intake.

A reason why family resemblance existed for attitudes towards high-fat foods, and not for the low-fat subscale, might be that mothers teach their children what is bad for them, but not what is good for them. This is in agreement with a study of Rozin *et al.* (1986) from which it was suggested that children learn what not to eat.

Nutrition knowledge showed the highest family resemblance. The reason that Moxley (1981) found a lower correlation might be that the daughters in his study were only nine years old. As nutrition knowledge is associated with educational level (Levy *et al.*, 1993), family resemblance in nutrition knowledge can be caused by family resemblance in educational level. However, partial correlation coefficients accounting for difference in educational level did not support this hypothesis. Therefore, resemblance in nutrition knowledge between mothers and daughters seemed to be independent of difference in educational level. A problem in comparing educational levels between generations is that almost all grandmothers had a low educational level. This also explains the lower mean nutrition knowledge levels of the grandmothers in the present study.

Correlations between nutrition knowledge and fat intake within each generation were low. In a meta-analysis Axelson *et al.* (1985) reported a correlation of 0.10 between nutrition knowledge and dietary behaviour. Except for a lack of correspondence between nutrition knowledge and dietary behaviour, low correlations might be caused by lack of reliability and validity, or a lack of consideration for the dimensionality of the variables being measured (Axelson *et al.*, 1985; Axelson & Brinberg, 1992). Both nutrition knowledge and percentage energy derived from fat were reliable and valid as reported in the methods section. However, in this study we neither investigated different dimensions of nutrition knowledge, nor of attitudes, because it was the intention to have one measure for each concept that could be related to percentage energy derived from fat. Therefore, as mentioned by Axelson and Brinberg (1992) the use of one score for a multidimensional construct could have resulted in smaller correlations than expected. In this perspective, it should also be kept in mind that fat intake is not a behaviour, but an outcome of several behaviours, which means that variables were measured on different levels.

Correlation between attitudes and percentage energy derived from fat in the middle generation were similar to results in a previous study (Stafleu *et al.*, 1994), while the correlations in the other two generations were somewhat lower. As to the

effect of the liking and good/bad attitudes on fat intake (expressed as percentage of energy) the multiple regression showed a replication of the importance of liking (Tuorila & Pangborn, 1988). One would expect that good/bad attitudes become more important when somebody is older, but the reason that such an effect was not found may be that this effect is only apparent on product level and not on aggregate level.

Correlations between nutrition knowledge, attitudes and fat intake were highest for the middle generation. A possible explanation for a more consistent pattern of correlations in the middle generation might be that the middle generation is more sensitive for nutrition information about fat than younger and older generations. Reported heart disease in the near family was higher in middle and older generations than in the younger generation, as expected. The fact that people in somebody's direct environment have heart disease might act as a cue to action, as postulated in the Health Belief Model (Becker *et al.*, 1977). However, Becker and Levine (1987) reported that on average siblings did not make changes in lifestyles in the months following a heart disease event in a younger brother or sister. Also, Tate and Cade (1990) did not found that subjects with a positive family history of coronary heart disease (in themselves, parents, or sibling) had higher nutrition knowledge levels than those without a positive family history.

## CONCLUSIONS

From the present study it can be concluded that mothers and daughters resemble each other in nutrition knowledge and attitudes. When somebody becomes older, other important people than mother will serve as a model for nutrition behaviour, e.g. husband, other household members, parents-in-law, or friends. The correlations found in this study must be evaluated in this perspective. Therefore, this study implies that a family based approach might be effective in reducing fat intake. Whether a family based nutrition education programme is indeed a useful approach in obtaining this goal needs further investigation, in which a nutrition intervention should take place.

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## APPENDIX

*Examples of questionnaire items*

*Nutrition knowledge*

Linoleic acid is:
a. the same as cholesterol
b. a polyunsaturated fatty acid
c. a hormone
d. a special kind of saturated fat

Salad oil contains more fat than sunflower oil
a. true
b. false

Frying in vegetable oil, adds more cholesterol to a food item than baking in butter.
a. true
b. false

Saturated fat decreases risk for heart diseases
a. true
b. false

*Attitudes*

| | fully agree | agree | not agree/ not disagree | disagree | fully disagree |
|---|---|---|---|---|---|
| I like drinking whole milk | O | O | O | O | O |
| | very good | good | not good/ not bad | bad | very bad |
| Drinking whole milk is: | O | O | O | O | O |

## CHAPTER 7

# FAMILY RESEMBLANCE IN BELIEFS, ATTITUDES, AND INTENTIONS TOWARDS CONSUMPTION OF 20 FOODS; A STUDY AMONG THREE GENERATIONS OF WOMEN

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## ABSTRACT

Family resemblance in beliefs, attitudes and intentions towards the consumption of 20 foods that contribute to the fat intake was investigated in 97 adult women, their mothers, and their grandmothers. Elements from the Fishbein and Ajzen theory of reasoned action were correlated between family members. Mean correlations between younger and middle generation were 0.09 (range -0.13 to 0.28) for sum beliefs×evaluations, 0.17 (range -0.08 to 0.32) for liking attitudes, 0.14 (range -0.06 to 0.30) for good/bad attitudes, and 0.17 (range -0.09 to 0.32) for intentions. Between middle and older generation these figures were 0.13 (range -0.01 to 0.33) for sum beliefs×evaluations, 0.12 (range -0.07 to 0.30) for liking attitudes, 0.14 (-0.07 to 0.31) for good/bad attitudes, and 0.17 (range -0.06 to 0.32) for intentions. More statistically significant correlations were found for liking attitudes between younger and middle generation ($p<0.05$ for 10 out of 20 correlations) than for other pairs. All significant correlations were positive. Between the older and younger generation the number of significant correlations could be due to chance alone. From the relative importance of liking and good/bad attitude on intention it appeared that liking contributed the most to the variance in intention scores. Health related beliefs and attitudes became of increasing importance in the older generations. The results indicate that mothers have an influence on food habits of their daughters, although resemblance is poor.

## INTRODUCTION

In the Netherlands, as in other western countries, the fat intake is higher than recommended (Erkelens, 1989; Hulshof & Van Staveren, 1991). In the development of health prevention and education programmes insight into factors which contribute to a high fat diet is necessary. One important factor might be the process of socialization within the family. Resemblance in beliefs, attitudes, and behaviour between parents and children might give an indication whether such influences take place. According to Logue *et al.* (1988) biologically related relatives could resemble each other due to shared genes, environmental influences like modelling, reinforcement, restriction of available foods, and social or cultural influences.

Several studies have been performed on the relationship of food preferences between parents and children. Birch (1980), Bryan and Lowenberg (1958), and Pliner and Pelchat (1986) compared preferences of preschool children and their parents. Studies among schoolchildren and their parents were described by Burt and Hertzler (1978), Logue *et al.* (1988), and Weidner *et al.* (1985). Pliner (1983), Rozin (1991), and Rozin *et al.* (1984) performed studies among college students and parents. Surprisingly low correlations were found between preferences of parents and children. Borah-Giddens and Falciglia (1993) did a meta-analysis on five of these studies and found a correlation of 0.17 between food preferences of children and their parents.

Although several studies were performed on food preferences, little information is available on the relationships of beliefs or attitudes between parents and children. Rozin *et al.* (1984) performed a study on family resemblance in attitudes to foods. They found that disgust-contamination attitudes showed higher child-parent correlations than preferences. However, sensitivity to cleanliness and contamination of foods are very specific attitudes.

In the present study we used elements from the Fishbein and Ajzen model (1975) to investigate whether beliefs, attitudes, and intentions to consume 20 foods that contribute to the fat intake are related between parents and children. The Fishbein and

Ajzen theory of reasoned action has been applied several times to study beliefs and attitudes towards foods, and appeared to be useful in predicting intentions or consumption frequencies of several high-fat foods (Shepherd & Stockley, 1985, 1987; Shepherd *et al.*, 1991/2; Towler & Shepherd, 1992; Tuorila & Pangborn, 1988), meat (Richardson *et al.*, 1993; Sapp, 1991; Sapp & Harrod, 1989), chips (Towler & Shepherd 1991/2), and milk- and milk products (Rutter & Bunce, 1989; Shepherd, 1988, Tuorila, 1987).

In order to investigate whether socialization might have an impact on beliefs, attitudes and intentions in later life, it was decided to perform the study among adult children and their parents. In order to get information about resemblance in attitudes and beliefs over the life-span it was considered that both middle-aged parents and their adult children, and older parents and their middle aged children should be included in the study. Therefore, a three-generation study was performed. To make the design not too complicated only maternally related generations were studied. We expected that the eldest generation served as a model for their daughters, while the middle generation in turn served as a model for their daughters.

This design enabled us to investigate both family resemblance and differences between generations at the same time. Thus, apart from family resemblance, differences between generations in beliefs, attitudes, and intentions were investigated.

## METHODS AND MATERIALS

### *Subjects*

A sample of women between 20 and 30 years old was taken from the municipality of Helmond, a town in the southern part of the Netherlands with about 71,000 inhabitants. This town was selected because death rates from ischaemic heart disease are higher in this part of the Netherlands (4% and 16% higher than the average in the country, for men and women, respectively) (Van Vlerken, 1989). The sample consisted of women living in low-income areas, as there are indications that heart disease is more

common in the lower socio-economic classes (Kraus *et al.*, 1980), and fat intake seems to be higher in the lower socio-economic classes (Bolton-Smith *et al.*, 1991; Hulshof *et al.*, 1991).

A letter was sent to 2052 women. Subsequently, the women were contacted by telephone, up to eight attempts. Subjects with no telephone, or a secret number were visited at home, up to three attempts. In order to compose three-generation families for the study, all subjects contacted were asked some questions to ascertain eligibility. The major criteria were:

(1) the woman of the younger generation should live on her own;

(2) her mother, and grandmother (mother's mother) should be alive;

(3) all generations must be able to speak Dutch, and should live in the Netherlands.

In order to reach the third criterium a first selection was made on family names: married women of whom both maiden name and husband's name were not Dutch were not included in the sample. Of the 2052 women who were sent a letter, 1846 subjects were reached by telephone or visit. Main reasons for not participating were: grandmother or mother not alive (46% and 5% respectively), still living with mother (16%), mother or grandmother not living in the Netherlands (5%).

If subjects met all eligibility criteria, and if the women of all generations were able and willing to participate, a self-administered questionnaire was sent, and an appointment was made for an interview at the subject's home. Ninety-seven adult women, their mothers, and their grandmothers participated in the study. In this paper results of beliefs, attitudes, and intentions to consume 20 foods are reported.

### *Questionnaire design*

In the Netherlands oils and fats (29%), meat and meat products (20%), milk (products) and cheese (20%), and products mainly eaten between meals, such as nuts, savory snacks, pastries, biscuits (8%) have the highest contribution to the fat intake (Hulshof & Van Staveren, 1991). The following twenty foods were selected from these food groups: butter, margarine, margarine high in polyunsaturated fatty acids (PUFA-

margarine), low-fat margarine, oil, pork, beef, chicken, fish, smoked beef, raw ham, liver sausage, egg, cheese, semi-skimmed milk, whole milk, skimmed yoghurt, whole yoghurt, custard, cake and biscuits. Some of these products are low-fat alternatives of high-fat foods in a food group. Eggs were included because of their cholesterol content, and fish because it was recommended to consume fish once or twice a week (Erkelens, 1989).

The Fishbein and Ajzen model (Fishbein & Ajzen, 1975) was used to develop the questionnaire. For each of the twenty foods there were: one intention to consume question; two attitudes questions; and several belief questions. In total 10 different evaluation questions were asked. As foods had some beliefs in common some of the evaluation questions were used several times for the computation of sum of beliefs×evaluations. Normative beliefs and subjective norms were not included in the questionnaire, because subjective norms showed a lower prediction of intention to consume foods than attitudes (Shepherd & Stockley 1985, 1987; Tuorila & Pangborn, 1988). The time frame for the intention question depended on the expected consumption frequency. For example for milk it was the next day, and for beef it was within the next three days. The two attitude questions were: 'I like eating the food', and 'eating the food is very good to very bad'. These attitude statements are referred to as liking attitude and good/bad attitude.

In order to obtain salient beliefs towards the consumption of the above mentioned foods we performed qualitative interviews (n=12), and focus group interviews with women of different age groups (in total 6 focus groups, 37 participants). In addition we asked 11 subjects whether they ate the selected foods and why. The nature and number of beliefs that emerged from the qualitative studies varied for the different foods. As slimming, tastiness, and heart disease were topics often mentioned in the qualitative studies, we decided to include statements about these topics for all foods. Therefore all foods had three beliefs in common: 'eating the food is tasty'; 'eating the food increases my risk for heart disease'; 'eating this food is good for my figure' (with respect to body fatness). Other beliefs differed for different foods. 'Eating the food will prevent bone demineralization' was asked for all milk products. 'Eating the food is expensive' was a

belief question for fats, meat and meat products, chicken, fish, and cheese. Beliefs with respect to convenience were asked for the several fats, beef, pork, chicken, fish, and eggs. For biscuits and cakes beliefs were asked with respect to guests, treats, and sociability.

All questions were scored on 5 point Likert scales with verbally labelled answering categories. Every question was coded from -2 to +2, except for the intention questions, which were coded from 1 to 5. Responses were converted to make a positive score correspond to a positive predisposition towards consumption of the food.

The questionnaire was self-administered. At a home visit the questionnaire was checked for completeness and understanding. Some subjects needed assistance in answering the questions because of illness or illiterateness.

### *Statistics*

Mean scores for sum scores of beliefs×evaluations, attitudes, and intentions were calculated for all generations separately. In order to compare the results with the literature separate analyses were performed on liking and good/bad attitude. To evaluate differences between generations a mixed-model analysis of variance was conducted with family as random effect and generation as main effect. In order to assess family resemblance Pearson correlations were computed for sum of beliefs×evaluations, attitudes, and intention between family members. Mean correlations were computed by transforming each correlation coefficient to a Fisher's Z and then these scores were averaged and reconverted to a Pearson correlation.

Within each generation Pearson correlations were computed between sum of beliefs×evaluations, attitudes, and intention. Mean correlations were computed as described for correlations between generations. In addition, Pearson correlations were computed between each belief×evaluation and intention. In order to evaluate the relative importance of good/bad and liking attitude we performed standardized regression analysis with good/bad and liking as independent variables, and intention as dependent variable:

$$\text{Intention} = w_1 \text{ liking} + w_2 \text{ good/bad}$$

As three subjects did not complete the self-administered questionnaire, the analyses were performed on 94 families. Due to missing values some analyses were performed on 92, or 93 families. For all analyses a p-value of ≤0.05 was considered as being statistically significant.

## RESULTS

### *Subjects*

Mean age of the younger generation was 25 (SD 2.8), of their mothers 49 (SD 5.1), and of their grandmothers 76 (SD 5.9). Derived from self-reported height and weight the mean body mass index ($kg/m^2$) was 22.5 (SD 3.5), 24.9 (SD 4.2), 26.8 (SD 4.1) for the younger, middle, and older generation respectively. Data in Table 1 show that education level was higher for the younger generation than for the other generations. Of the older generation 79% had no higher education than primary school. Both subjects' own occupation level and the occupation level of their husband or partner is depicted, as husbands' occupation level might give a better indication of social class than women's own occupation level. Although addresses of the younger generation were derived from low-income areas, it is clear from education and occupation levels that not everybody belonged to the lower socio-economic class.

A special diet was adhered by 11% of the younger generation, 18% of the middle generation, and 35% of the older generation. Of the younger generation 55% thought that their body weight was too high or much too high. For the middle and older generation these figures were 61% and 47%, respectively. Based on self-reported weight and height 20% of the younger generation, 43% of the mothers, and 66% of the grandmothers had a body mass index of 25 or higher. Slimming in the past year was reported by 40% of the younger generation, 38% of the middle generation, and 13% of the older generation. Self-reported health was good, or very good for 75%, 69%, and 44% of the younger, middle, and older generation respectively. Seven women of the younger generation were pregnant, while one women was lactating. Currently smoking

## TABLE 1

*Some characteristics of 97 young adult women, their mothers, and their grandmothers in a three-generation study on food habits.*

| | Generation | | | | | |
|---|---|---|---|---|---|---|
| | Younger Freq. (%) | | Middle Freq. (%) | | Older Freq. (%) | |
| Educational level[a] | | | | | | |
| Low | 33 | (34) | 82 | (85) | 94 | (97) |
| Intermediate | 54 | (56) | 10 | ( 9) | 3 | ( 3) |
| High | 10 | (10) | 5 | ( 5) | - | |
| Occupational level[b] | | | | | | |
| Never worked | 20 | (21) | 6 | ( 6) | 26 | (27) |
| Low | 19 | (20) | 39 | (40) | 56 | (58) |
| Intermediate | 47 | (48) | 37 | (38) | 13 | (13) |
| High | 11 | (11) | 15 | (15) | 2 | ( 2) |
| Occupational level partner[b] | | | | | | |
| Not applicable/unknown | 22 | (23) | 15 | (15) | 5 | ( 5) |
| Low | 45 | (46) | 34 | (35) | 61 | (63) |
| Intermediate | 11 | (11) | 18 | (19) | 21 | (22) |
| High | 19 | (20) | 30 | (31) | 10 | (10) |
| Dietary treatment[c] | | | | | | |
| Yes | 11 | (11) | 17 | (18) | 34 | (35) |
| No | 86 | (89) | 80 | (82) | 63 | (65) |
| Evaluation body weight | | | | | | |
| Much too heavy | 8 | ( 8) | 7 | ( 7) | 6 | ( 6) |
| Too heavy | 45 | (46) | 52 | (54) | 40 | (41) |
| Just good | 38 | (39) | 30 | (31) | 47 | (49) |
| Too light | 5 | ( 5) | 8 | ( 8) | 4 | ( 4) |
| Much too light | 1 | ( 1) | - | | - | |
| Self-reported body mass index | | | | | | |
| Pregnant/unknown | 7 | | - | | 9 | |
| <20 | 22 | (24) | 8 | ( 8) | 5 | ( 6) |
| 20-25 | 50 | (56) | 47 | (49) | 25 | (28) |
| 25-30 | 14 | (16) | 32 | (33) | 42 | (48) |
| ≥30 | 4 | ( 4) | 10 | (10) | 16 | (18) |
| Slimming in last year | | | | | | |
| Yes | 39 | (40) | 37 | (38) | 13 | (13) |
| No | 58 | (60) | 60 | (62) | 84 | (87) |
| Self-reported health | | | | | | |
| Very good | 13 | (13) | 12 | (12) | 12 | (12) |
| Good | 60 | (62) | 55 | (57) | 31 | (32) |
| Reasonable | 12 | (12) | 14 | (14) | 27 | (28) |
| Sometimes good/ sometimes bad | 11 | (11) | 11 | (11) | 20 | (21) |
| Bad | 1 | ( 1) | 5 | ( 5) | 7 | ( 7) |
| Current smoking | | | | | | |
| Yes | 46 | (47) | 41 | (42) | 11 | (11) |
| No | 51 | (53) | 56 | (58) | 86 | (89) |

[a] Education level: Low: primary school, lower level of secondary school, lower vocational training. Intermediate: higher level of secondary school, intermediate vocational training. High: higher vocational training, university

[b] Occupation level based on last job: Low: lower-grade technicians, skilled and unskilled manual workers. Intermediate: Routine non-manual employees, small proprietors, farmers. High: professionals, managers

[c] Both prescribed and not prescribed diets

was reported by 47% of the young women, 42% of the mothers, and 11% of the grandmothers.

Subjects were asked whether and in which direction they thought transfer of nutrition habits occurred. The majority of the sample (69%) reported that they adopted nutrition habits from their mother, and 49% thought that their daughter adopted nutrition habits from them. With respect to transfer of nutrition habits in the other direction a much lower percentage thought that their mother adopted nutrition habits from them (20%), while 26% reported to have adopted nutrition habits from their daughter. Mean contact frequency per month, either by telephone or visit, was 17 (SD 9) between younger and middle generation, 14 (SD 10) between middle and older generation, and 6 (SD 7) between younger and older generation.

*Beliefs, attitudes, and intentions*

From mixed model analysis of variance on the sum of beliefs×evaluations, attitudes, and intentions it appeared that there was a difference in score between generations for many foods (Table 2). Most apparent for liking attitudes were the differences in scores for liking butter [$F(2,186)=15.44, p<0.0001$], PUFA-margarine [$F(2,184)=16.28, p<0.0001$], smoked beef [$F(2,186)=10.31, p<0.0001$], and whole milk [$F(2,186)=10.41, p<0.0001$]. For good/bad attitudes highly statistically significant generation effects [$F(2,186)>10, p<0.0001$] were found for PUFA-margarine, low-fat margarine, and smoked beef. For intentions generation effects at $p<0.0001$ were found for PUFA-margarine [$F(2,186)=12.04$], smoked beef [$F(2,186)=10.84$], and whole milk [$F(2,186)=17,29$]. For pork, custard, and cake and biscuits mean scores were positive for liking attitude, and negative for good/bad attitude. In addition, for many foods sum of beliefs×evaluations, attitudes, and intentions were significantly different between families. Family aggregation was reflected in the correlations between generations (Table 2, 3).

Between the younger and middle generation five out of 20 correlations for sum beliefs×evaluations were statistically significant (Table 3). Between the middle and older generation significant correlations were found for oil, pork, beef, raw ham, liver sausage,

## TABLE 2

*Mean score[a] for sum beliefs×evaluations, attitudes, and intentions of three generations of women (n=94 families).*

| | Sum beliefs×evaluations | | | | Liking attitude | | | | Good/Bad attitude | | | | Intention | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Food | Y[b] | M | O | p<0.05 | Y | M | O | p<0.05 | Y | M | O | p<0.05 | Y | M | O | p<0.05 |
| Butter | -2.8 | -2.4 | -1.9 | | -0.7 | -0.1 | 0.2 | * † | -0.5 | -0.1 | -0.2 | * † | 1.7 | 2.0 | 2.3 | * † |
| Margarine | -0.7 | -0.7 | 1.0 | * | 0.0 | -0.0 | 0.1 | † | -0.3 | -0.0 | 0.0 | * † | 2.9 | 3.0 | 3.0 | † |
| PUFA-margarine | 1.4 | 1.8 | 2.5 | | -0.5 | -0.1 | 0.5 | * | 0.6 | 0.9 | 1.1 | * | 2.2 | 2.9 | 3.1 | * |
| Low-fat margarine | 1.9 | 2.7 | 2.9 | | 0.4 | 0.4 | 0.4 | | 0.5 | 0.8 | 0.9 | * | 3.2 | 3.3 | 3.0 | |
| Oil | 1.4 | 2.1 | 1.4 | † | -0.1 | -0.2 | -0.4 | † | 0.2 | 0.4 | 0.2 | | 2.3 | 2.5 | 2.1 | * † |
| Pork | 0.8 | 0.4 | 0.6 | † | 0.6 | 0.6 | 0.5 | † | -0.1 | -0.4 | -0.3 | † | 3.2 | 3.2 | 2.8 | * † |
| Beef | 2.6 | 3.6 | 3.8 | † | 0.9 | 1.0 | 1.0 | † | 0.7 | 1.0 | 1.0 | * † | 3.3 | 3.4 | 3.2 | † |
| Chicken | 4.2 | 6.3 | 6.2 | * | 1.0 | 1.0 | 1.0 | | 0.7 | 1.0 | 1.0 | * † | 3.8 | 3.9 | 3.4 | * † |
| Fish | 3.3 | 5.2 | 4.9 | * | 0.8 | 1.1 | 1.1 | | 1.0 | 1.3 | 1.3 | * † | 3.3 | 3.7 | 3.6 | * † |
| Smoked beef | 2.3 | 3.9 | 2.5 | * | 0.5 | 0.8 | 1.2 | * † | 0.7 | 1.2 | 1.2 | * † | 2.9 | 3.4 | 3.7 | * † |
| Raw ham | 0.7 | 1.3 | -0.1 | * † | 0.2 | 0.6 | 0.8 | * | 0.2 | 0.5 | 0.3 | | 2.8 | 3.4 | 3.1 | * † |
| Liver sausage | -1.1 | -1.3 | -0.5 | † | -0.1 | -0.2 | -0.2 | | -0.5 | -0.6 | -0.4 | † | 2.3 | 2.6 | 2.3 | † |
| Egg | 1.4 | 1.8 | 1.7 | | 0.6 | 0.6 | 0.3 | † | 0.2 | 0.1 | 0.1 | | 3.4 | 3.5 | 3.1 | * † |
| Cheese | 1.6 | 3.2 | 2.5 | * † | 0.8 | 1.2 | 1.0 | * | 0.5 | 0.7 | 0.7 | * | 3.1 | 3.5 | 3.4 | * |
| Semi-skimmed milk | 3.0 | 3.3 | 2.6 | | 0.4 | -0.0 | 0.1 | | 0.9 | 0.9 | 0.9 | | 3.3 | 2.8 | 3.0 | |
| Whole milk | -1.6 | -0.9 | 0.5 | * | -0.9 | -0.7 | -0.0 | * | 0.1 | 0.0 | 0.1 | † | 1.7 | 1.9 | 2.6 | * |
| Skimmed yoghurt | 4.9 | 4.6 | 3.1 | * | 0.7 | 0.3 | 0.0 | * | 1.0 | 1.1 | 1.0 | | 3.6 | 3.3 | 3.0 | * |
| Whole yoghurt | 0.5 | 1.2 | 0.7 | | -0.2 | 0.1 | -0.1 | † | 0.1 | 0.2 | 0.1 | | 2.1 | 2.4 | 2.4 | * † |
| Custard | 0.1 | 0.3 | -0.1 | † | 0.4 | 0.1 | 0.1 | † | -0.1 | -0.1 | -0.1 | † | 2.9 | 2.8 | 2.7 | † |
| Cake and Biscuits | 3.3 | 3.2 | 5.1 | * † | 1.0 | 0.7 | 0.7 | | -0.7 | -0.6 | -0.4 | * † | 3.6 | 3.6 | 3.3 | † |

[a] For sum beliefs×evaluations score range varied according to number of beliefs. Attitudes scores varied from -2 to +2. For both attitudes and beliefs×evaluations a positive score means a positive predisposition towards consumption of the food. Intentions varied from 1 to 5, with a higher score indicating a greater intention to consume the food.

[b] Y, M, O refers to younger, middle, older generation, respectively.

* Significantly different between generations ($p<0.05$).

† Significantly different between families ($p<0.05$).

## TABLE 3

*Correlations between beliefs×evaluations, attitudes, and intentions of three generations of women (n=94 families).*

| | Correlations between generations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beliefs×evaluations | | | Liking attitude | | | Good/Bad attitude | | | Intention | | |
| Food | Y-M[a] | M-O | Y-O | Y-M | M-O | Y-O | Y-M | M-O | Y-O | Y-M | M-O | Y-O |
| Butter | .13 | .02 | -.02 | .23* | .22* | .05 | .12 | .27* | .18 | .27* | .30* | -.00 |
| Margarine | .11 | .04 | .10 | .17 | .20 | .05 | .08 | .31* | .09 | .11 | .13 | .08 |
| PUFA-margarine | -.13 | .17 | -.16 | .22* | -.03 | -.18 | .17 | .07 | .01 | .24* | -.06 | -.08 |
| Low-fat margarine | -.06 | .06 | .03 | -.07 | -.06 | .18 | -.06 | .18 | .12 | -.09 | -.01 | .01 |
| Oil | .16 | .24* | .08 | .25* | .30* | .19 | .01 | .18 | .02 | .18 | .12 | .17 |
| Pork | .18 | .33* | -.02 | .32* | .26* | -.01 | .19 | .21* | .10 | .27* | .32* | .04 |
| Beef | .07 | .21* | .11 | .28* | .23* | .32* | .30* | .05 | .07 | .16 | .12 | .14 |
| Chicken | .07 | .10 | -.06 | .27* | .06 | -.14 | .27* | .06 | .00 | .29* | .27* | .04 |
| Fish | .20 | .08 | .01 | .14 | .18 | -.05 | .23* | .12 | .01 | .18 | .30* | .15 |
| Smoked beef | .06 | .10 | .03 | .12 | .15 | .07 | .23* | .23* | .13 | .16 | .23* | .18 |
| Raw ham | .21* | .27* | -.00 | .13 | .06 | .08 | .01 | .10 | .02 | .17 | .32* | .04 |
| Liver sausage | .21* | .24* | .05 | .13 | .11 | -.01 | .27* | .21* | .15 | .11 | .14 | .12 |
| Egg | .17 | .04 | .09 | .21* | .04 | .21* | .06 | .23* | -.04 | .21* | .07 | .04 |
| Cheese | .16 | .12 | .09 | .00 | .05 | .02 | .10 | .02 | .05 | .03 | .10 | .07 |
| Semi-skimmed milk | -.06 | .04 | -.10 | .08 | .16 | .01 | .16 | -.07 | -.15 | .05 | .08 | -.10 |
| Whole milk | .28* | -.01 | -.09 | .24* | .05 | -.03 | .14 | .24* | -.03 | .12 | .17 | .01 |
| Skimmed yoghurt | .00 | .06 | .14 | -.08 | .07 | .06 | .10 | -.07 | .00 | .03 | .11 | -.04 |
| Whole yoghurt | .27* | .02 | -.01 | .20 | .15 | .03 | .12 | .08 | .09 | .32* | .26* | .07 |
| Custard | .12 | .24* | -.05 | .24* | .15 | .09 | .11 | .22* | .13 | .22* | .20* | .08 |
| Cake and Biscuits | .25* | .26* | .09 | .22* | -.07 | .06 | .16 | .10 | .27* | .23* | .14 | -.06 |
| Mean Correlation | .09 | .13 | .02 | .17 | .12 | .05 | .14 | .14 | .06 | .17 | .17 | .05 |

* Statistically significant ($p<0.05$).

[a] Y, M, O refers to younger, middle, older generation, respectively.

custard, and cake and biscuits. No statistically significant correlations were found between young women and their grandmothers. The mean correlation between liking attitude was 0.17, 0.12, 0.05 for the younger-middle, middle-older, and older-younger pairs, respectively. For the good/bad attitude the mean values were 0.14, 0.14, and 0.06. The number of statistically significant correlations was greater for the liking attitude between the younger and middle generation (10 out of 20) than for attitudes of any other combination. Mean family resemblance in intention to consume was 0.17 between the younger and middle generation, and between the middle and older generation, and 0.05 between the older and younger generation. Both between younger and middle generation, and middle and older generation eight out of 20 foods showed a statistically significant correlation.

High mean correlations were found between the elements of the Fishbein and Ajzen theory of reasoned action (Table 4). Multiple regression analyses of the liking attitude and good/bad attitude on intention yielded R-squares varying from 0.25 to 0.80. Beta weights for liking attitude varied between 0.45 and 0.79, while for good/bad attitudes beta weights varied from -0.08 to 0.34. For all generations the beta weight for liking attitude was statistically significant for all 20 foods. For the younger generation the good/bad attitude reached significance in four out of 20 foods. In the middle generation eight foods showed a statistically significant beta weight for the good/bad attitude, while for 10 foods in the older generation the good/bad attitude had a significant contribution to the explained variance in intention.

In order to get further insight into the possible differences in importance of values between the generations analyses were performed on evaluations. As the same evaluation question could be used in the computation of sum of beliefs×evaluations for several foods, in total 10 evaluation questions were included in the questionnaire. It appeared that mean scores on evaluation questions with respect to heart disease [$F(2,184)=4.37, p=0.01$], osteoporosis [$F(2,186)=6.63, p=0.002$], easy to prepare [$F(2,186)=9.95, p<0.0001$], and easy to fry in [$F(2,186)=10.84, p<0.0001$] were significantly different between generations, with higher scores for the older generations.

It should be mentioned that the range in data was very small for some evaluation questions: for example nobody disagreed with the statement 'I think that it is desirable to prevent heart disease'.

TABLE 4

*Mean correlations between sum beliefs×evaluations (ΣB×E), attitudes, and intentions to consume 20 foods in three generations of women (n=94 families).*

| | Correlations between concepts | | |
|---|---|---|---|
| Generation | ΣB×E vs Attitudes | Attitudes vs Intentions | ΣB×E vs Intentions |
| Younger | 0.61 | 0.65 | 0.46 |
| Middle | 0.60 | 0.69 | 0.47 |
| Older | 0.57 | 0.67 | 0.42 |

Table 5 shows whether the several belief×evaluations showed statistically significant correlations with intention to consume 20 foods. It appeared that tastiness was significantly correlated with intention for all foods, except for margarine in the younger and middle generation. Belief×evaluation with respect to heart disease was in four out of 20 foods significant for the younger generation, and in seven times for the middle and older generations. The belief×evaluation with respect to good for figure showed a significant correlation in 11, 11, and 12 out of 20 foods for the younger, middle, and older generation, respectively. However, in standardized multiple regression analyses the beta weight for tastiness was the only significant beta weight for many foods.

## TABLE 5

*Significant correlations between beliefs xevaluations and intention to consume 20 foods in three generations of women (n=94 families).*

| Foods | Belief xevaluation | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Taste[a] | | | Heart | | | Figure | | | Bone | | | Price | | | Conv. | | | Other | | |
| | Y | M | O[b] | Y | M | O | Y | M | O | Y | M | O | Y | M | O | Y | M | O | Y | M | O |
| Butter | * | * | * | * | | * | * | * | | - | - | - | | | | | | | - | - | - |
| Margarine | | * | | | | | | | * | - | - | - | | | | | * | | - | - | - |
| PUFA-margarine | * | * | * | | | | * | | * | - | - | - | | | | * | | | - | - | - |
| Low-fat margarine | * | * | * | | | | * | * | * | - | - | - | * | | | | | | - | - | - |
| Oil | * | * | * | | * | * | | * | | - | - | - | | | | * | * | * | - | - | - |
| Pork | * | * | * | | * | | * | | * | - | - | - | | | | * | | * | - | - | - |
| Beef | * | * | * | | | | | | | - | - | - | | | | | | * | - | - | - |
| Chicken | * | * | * | | * | | * | | | - | - | - | | | | | | * | - | - | - |
| Fish | * | * | * | | * | | * | | | - | - | - | | | | | * | * | - | - | - |
| Smoked beef | * | * | * | | * | | * | * | * | - | - | - | | | | - | - | - | - | - | - |
| Raw Ham | * | * | * | | | * | | * | * | - | - | - | | | | - | - | - | - | - | - |
| Liver Sausage | * | * | * | * | | * | * | * | * | - | - | - | | | | - | - | - | - | - | - |
| Egg | * | * | * | | | | | | * | - | - | - | - | - | - | | | | - | - | - |
| Cheese | * | * | * | | * | * | | | * | | | * | | * | | - | - | - | - | - | - |
| Semi-skimmed milk | * | * | * | | | | * | * | * | | * | * | - | - | - | - | - | - | - | - | - |
| Whole milk | * | * | * | * | | | | * | | | | * | - | - | - | - | - | - | - | - | - |
| Skimmed yoghurt | * | * | * | * | | | * | * | * | * | * | | - | - | - | - | - | - | - | - | - |
| Whole yoghurt | * | * | * | | | * | * | * | | | | | - | - | - | - | - | - | - | - | - |
| Custard | * | * | * | | * | * | | * | * | * | | * | - | - | - | - | - | - | - | - | - |
| Cake and Biscuits | * | * | * | | | | | | | - | - | - | - | - | - | - | - | - | * | * | *[c] |

* = statistically significant ($p<0.05$): with 94 families a correlation coefficient of >0.20 is statistically significant. - = belief was not asked for that food.

[a] Taste = tastiness, Heart = heart disease, Figure = good for figure, Bone = bone demineralization, Price = expensiveness, Conv. = convenience.

[b] Y = younger generation, M = middle generation, O = older generation.

[c] For cake and biscuits three other beliefs were asked: sociability, treats, quests. Sociability and quests showed significant correlations for all generations.

## DISCUSSION

From this study it appeared that the correlations between mothers' and daughters' sum of beliefs×evaluations, liking attitudes, good/bad attitudes, and intentions were statistically significant for many foods. This was true both for elderly women and their middle aged daughters and middle aged mothers and their adult daughters. Only for liking the correlation between the younger and middle generation seems to be somewhat higher than for the middle and older generation. There were more significant correlations between mother-daughter pairs than would have been expected by chance. All of the significant correlations were positive. One (5%) out of 20 correlations would have been expected to be significant by chance alone. For correlations between the younger and middle generation five of the sum of belief×evaluations, ten of the liking attitudes, five of the good/bad attitudes, and eight of the intentions were significantly different from zero. For middle-older generation pairs seven out of 20 sum of beliefs×evaluations, four of the liking attitudes, eight of the good/bad attitudes, and eight of the intentions were significantly different from zero. The small number of statistically significant correlations between grandmothers and granddaughters could be due to chance alone. There was no pattern of some foods showing resemblance while others did not, although it seems that most significant correlations were found in the group of meat and meat products. The results indicate that mothers might have an influence on food habits of their daughters. As between the older and younger generation correlations were very low, it is not likely that grandmothers influence food habits of their granddaughters.

Although we assume that correlations reflect transmission of food habits from the older generations to the younger generations, it is strictly speaking not possible to make any conclusions with respect to causality from this cross-sectional study. However, according to the subjects themselves transfer of nutrition habits is predominantly in the direction from mother to daughter.

We make no claim for the representativeness of the data. Selection bias could have occurred on families that get on together, and families that got their children at an

early age. In addition a selection of healthy families could have taken place, as grandmother was still alive and able to participate.

As mentioned by Logue *et al.* (1988) parents and children could resemble each other due to genetic factors, environmental influences, and social or cultural influences. Liking might have a genetic component (Logue, 1991), but in the case of beliefs and good/bad attitudes it is more likely that relations between mothers and daughters were caused by environmental influences and social or cultural influences. Most significant correlations were found for liking between the younger and middle generation. Although higher correlations for liking than for good/bad attitude might be due to the fact that preferences are probably influenced by genetics, twin studies showed contradictory results with respect to genetical influences on preferences (Krondl *et al.*, 1983; Rozin & Millman, 1987).

Birch (1980) suggested that low correlations between preferences of parents and children may be a reflection of commonality of preferences within a subcultural group. As the women in our study were predominately caucasian, and from the middle and lower socio-economic classes, the sample was probably too homogeneous to find correlations due to social or cultural influences. Therefore it is likely that the relationships in the present study were caused by environmental influences like modelling and reinforcement, predominately. From a study of Lau *et al.* (1990) among young adults and their parents it appeared that modelling had a stronger influence on eating behaviour than transmission of beliefs, and explicit training efforts. In the present study it is not possible to distinguish between the effect of modelling, transmission of beliefs, explicit training, or exposure frequency. Modelling is probably reflected in resemblance in liking and intentions, while transmission of beliefs is more apparent from resemblance in sum of beliefs×evaluations and good/bad attitude. Indications of the effect of explicit training efforts can not be derived from this study.

For somebody becoming older other persons than parents might serve as a model, or influence the subject in another way. Therefore it is surprising that the correlations found for liking between younger and middle generation are similar to the correlations

found in literature. The high contact frequency of 17 times a month between middle aged mothers and their daughters might have had an impact on this.

In our study preference was operationalized as liking the food. As pointed out by Rozin and Vollmecke (1986) there is a distinction between preference and liking. With preference the availability of at least two foods is assumed and refers to the choice of one rather than the other, while liking refers to affective reactions to a food. However, most researchers used these terms interchangeable, which makes our liking questions comparable to other preference literature. Mean correlation in liking between the younger and middle generation was 0.17. This figure is similar to the value of 0.17 found in a meta-analysis of the relationship in food preferences between parents and children (Borah-Giddens & Falciglia, 1993).

Logue *et al.* (1988) mentioned several necessary characteristics of studies on food preferences in families: there should be sufficient range in data, a large variety of types of foods, a large enough sample size, analyses separate for the different sexes, each subject should report his or her own food preferences, a distinction should be made between adopted and biological children, and children should be young enough to be living with their parents. Some of these criteria were met by our study, while others were not.

According to Logue *et al.* (1988) preferences should be measured on at least a seven-point scale. We used five-point scales, the reason being that our experience was that elderly had difficulty in answering questions on large scales. So it should be kept in mind that there was probably an insufficient range in data in our sample. However, range in data of sum of beliefs×evaluations should have been large enough. Another way in which sufficient range in data could be met is by choosing other foods than those foods that everybody likes or dislikes (Logue *et al.*, 1988). In our study we used foods that contributed most to the dietary fat intake in the Netherlands. This means that these foods are consumed and liked by a majority of the Dutch population. Although this may lead to an insufficient range in data we think that for the relevance of research outcomes for health education and health policy foods consumed frequently are more interesting

than foods consumed only by a minority of the Dutch population, like caviar and olives.

Although it is more likely to show an existence of resemblance in beliefs, attitudes, and intentions between family members living in the same household, it was decided to perform the present study in three generations of women of whom the youngest generation did not live with their mother any more. The reason was that we were especially interested in the effect of early shared nutrition environment on beliefs, attitudes and intentions in later life. If children and parents do not resemble each other in beliefs, attitudes, and intentions when the children are not living with their parents any more, one could wonder whether it is useful to change these factors in young children.

For all generations correlations between the elements of the Fishbein and Ajzen model were comparable to figures found in other studies (Shepherd & Stockley, 1985, 1987; Shepherd, 1988; Shepherd *et al.*, 1991/2; Towler & Shepherd, 1992; Tuorila & Pangborn, 1988). Cross *et al.* (1975) found that food selection practices differed between stages of family life cycle. As the generations in our study reflected different family life cycles, beliefs important for the younger generation might be less important for their grandmothers. The study design made it possible to study these generation effects as well. For many foods a difference in mean score for sum of beliefs×evaluations, attitudes, and intentions between generations was found. Results with respect to the evaluations give an indication of the relative importance of the different beliefs for the three generations. Significant differences in evaluations between generations were found for heart disease, convenience, and osteoporosis, with higher scores for the older generation. The older generation might be more health oriented. Less women of the older generation evaluated their health as good. For the older generation the good/bad attitude was somewhat more important than for the other generations, although one should keep in mind that good/bad is a general evaluation, and is not related to health perse.

In conclusion, from the present study it appeared that family resemblance exists for beliefs, attitudes, and intentions. However, resemblance is low, as was reported for preferences (Borah-Giddens & Falciglia, 1993). More statistically significant correlations

were found for liking attitude between the younger and middle generation than for any other comparison between attitudes. From the relative importance of liking and good/bad attitude on intention it appeared that liking contributed the most to the variance in intention scores. However, it seems that health related beliefs and attitudes become of increasing importance when women become older. Therefore this study indicates that more research is necessary to study the development of beliefs and attitudes within the family, and in later life. Depending on the life cycle stage the person is in, other peoples' beliefs and attitudes could be related to the ones of the subject under study. For young children parents and peers might be important, while in adult age partners, parents-in-law, and colleagues might be important as well.

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# CHAPTER 8

## GENERAL DISCUSSION

In the present study beliefs, attitudes, and fat intake were investigated in three generations of women. This unique study design made it possible to investigate both family resemblance and differences between generations in food habits. Before this study could take place it was necessary to develop and pretest questionnaires. Therefore the aim of this project was twofold: the development of methods (chapter 3 and 4), and to study family resemblance in foods habits (chapter 5, 6, and 7). This chapter starts with a brief overview of the main findings. Next, methodological considerations with respect to the developed questionnaires, and study population are discussed. Finally, implications for nutrition education, policy, and marketing are given, and recommendations for further research are made.

## MAIN FINDINGS

From the three-generation study it appeared that there are small, but significant correlations in food habits between mothers and daughters (chapter 5, 6, 7). In addition it seemed that family resemblance was somewhat more apparent in younger-middle generation pairs than in middle-older generation pairs for intake of fats, and liking attitudes. Granddaughters did not resemble their grandmothers in food habits. From the results it can be concluded that food habits might pass on from mother to daughter. Although, a longitudinal study would give stronger evidence whether and in which direction such a transfer takes place.

It seemed that short-term rewards (tastiness) are more important determinants in food choice than rewards on the middle-term (good figure) and long-term (prevention of heart disease) (chapter 3). From chapter 7 it appeared that good/bad attitudes became of increasing importance in the older generations. It might be that health becomes a middle-term or short-term reward in the older generation.

In addition, several findings reported in literature were replicated. Attitudes had more impact on intentions to consume than subjective norms (chapter 3), as was reported

by *e.g.* Shepherd and Stockley (1985, 1987), Tuorila and Pangborn (1988a). Two attitude statements were elicited: liking attitude and good/bad attitude. Both from the study in Utrecht on reliability assessment of questionnaires (chapter 3 and 4) and the study among three generation of women (chapter 6 and 7) it appeared that liking attitude had a higher correlation with intention and fat intake than good/bad attitude. This is a replication of the importance of liking attitude in food choice (Tuorila and Pangborn, 1988a).

## QUESTIONNAIRES

### *Theory of reasoned action*

It was decided to use the Fishbein and Ajzen theory of reasoned action as a framework, because this theory was used most often in studies in which attitudes and beliefs towards foods were assessed (Chapter 2). Chapter 3 showed that the results obtained with the Fishbein and Ajzen theory in literature could be replicated for the 20 foods under study. From this chapter it also emerged that beliefs towards a particular food could not be evaluated as a unidimensional scale. Multidimensionality of beliefs was also mentioned by Shepherd (1989) and reported by Tuorila and Pangborn (1988a).

Based on the reliability studies the beliefs and attitudes questionnaire was adjusted. The subjective norm questions were eliminated from the questionnaire. This decision was based on several considerations. Attitudes were more important in predicting intentions or behaviour than subjective norms (chapter 2, 3). Further, in the three-generation study emphasis is placed on the social influence by mothers, so social influence was measured as family resemblance instead of subjective norms. Some practical problems supported the decision to eliminate normative beliefs and subjective norms. Subjects in the reliability studies did not like the questions and complained about them. In addition, the normative belief questions concerning household members were difficult to answer for subjects living alone, and it was expected that a lot of the women from the older generation in the three-generation study would live alone.

*Additional variables*

Self-efficacy questions were included in the questionnaire that was used in the study in Utrecht, but were not included in the questionnaire used in the three-generation study. The elimination of the concept self-efficacy was based on two considerations. First, the self-efficacy questions were the only questions related to behavioral change. All other questions were related to current consumption of the foods. Therefore it was not possible to relate the self-efficacy question with the other variables within one model. Second, one could wonder whether assessing self-efficacy on food level is useful. People might be very confident that they are able to change the consumption of a single food item if they wanted to. But, the important question is whether they are confident or not that they are able to change their diet. Some studies were reported in which perceived control, a variable that is very closely related to self-efficacy, was incorporated in a model towards the consumption of a single food. It appeared that perceived control did not increase the prediction of chip consumption (Towler and Shepherd, 1991/2), consumption of semi-skimmed milk and whole milk (Raats *et al.*, 1993), or the intention to consume whole meal bread (Sparks *et al.*, 1992), but it did for the consumption of skimmed milk (Raats *et al.*, 1993) and biscuits (Sparks *et al.*, 1992). These findings indicate that the importance of self-efficacy on food level is food specific.

Habits, the other modification of the Fishbein and Ajzen model, remained in the questionnaire, but was not used in the analysis. Habit was operationalized as "I eat the food out of habit" (derived from Tuorila and Pangborn 1988b). By means of this operationalization it is assumed that the consumption of the food is seen as an action outside the person's control. In that case it does not belong in a model of reasoned action. The operationalization of habits needs further investigation, as well as the relation of habits with other social-psychological variables.

*Food level*

Some problems emerge when beliefs and attitudes are asked on food level. Undoubtedly people can indicate whether they like a food or not. But, with respect to

some other questions there might be a problem. Strictly speaking it is not possible to indicate whether the consumption of a food is good or bad, or increases the chance of getting heart disease. However, our experience was that most subjects did not encounter this problem. According to Rozin (1980) people have the tendency to classify foods as for example good or bad.

The reason for asking beliefs and attitudes on food level rather than on aggregate level was based on the expectation that subjects are unaware of their own high fat intake (Lloyd *et al.*, 1993; Van Assema *et al.*, 1993). This is illustrated in the study of Tuorila and Pangborn (1988a). Subjects indicated that they liked milk, cheese, ice cream and chocolate, but they disliked "high-fat" foods. We think that the disadvantages of asking questions towards the consumption of 20 foods far outweighs the disadvantages of asking questions towards a high-fat diet, or high-fat foods in general.

*Attitude scale*

In addition to the Fishbein and Ajzen model on food level, an attitude scale was developed towards high-fat foods and low-fat alternatives. Test-retest reliability appeared to be very good for this scale ($r=0.92$). In addition it was related to fat intake. Correlations between the attitude scale and percentage of energy derived from fat was 0.40 (0.50 after correction for attenuation) in the study in Utrecht (chapter 4), and 0.28, 0.49, and 0.30 for the younger, middle, and older generation respectively (chapter 6).

Modifications of this scale were mentioned with respect to choice of foods incorporated in the scale and amount of items (chapter 4). Preferable, a high-fat food and a low-fat alternative should differ in fat content only. This was the case for milk, yoghurt, and margarine, but not for meat and meat products. In addition, subjects should experience the consumption of the low-fat foods as alternative behaviours. Whether people experience eating low-fat foods as alternative behaviours for consuming high-fat foods needs further investigation.

Another methodological point is that it was the investigator who subtracted the low-fat foods from the high-fat foods. Another approach would be that the subjects

themselves indicate whether they like the high-fat food better than the low-fat alternative, and whether they evaluate the high-fat food as better or worse than the low-fat food. A comparison of both methods will give additional insight into the usefulness of the attitude scale, and the formation of attitudes.

However, for the time being it seems to be a promising approach to ask attitudes towards high-fat foods and their low-fat alternatives. The advantage of the attitude scale is that it can be used to compare subjects, to evaluate attitude changes, and to correlate attitudes with fat intake. This makes the scale applicable in effect-evaluations of nutrition education programmes, which is difficult to establish with the Fishbein and Ajzen model on food level, because of the large amount of items needed. The disadvantage of correlating the attitude scale towards high-fat foods and their low-fat alternatives against fat intake is that the level of measurement of independent and dependent variable is not the same. In addition fat intake is an outcome of behaviours rather than a behaviour itself. Therefore for some specific scientific applications it might be useful to use both analysis on aggregate level and on food level.

*Fat intake*

In this thesis emphasis is placed on total fat intake. From a health point of view saturated fat is more important than total fat intake. Fat campaigns focused on reduction of total fat intake assume that a reduction in total fat intake will cause a reduction in saturated fat intake as well. In addition, with respect to the prevalence of obesity a reduction in total fat intake is indicated (Voedingsraad, 1986).

A short food frequency questionnaire was used to assess fat intake (Feunekes *et al.*, 1993). This questionnaire proved to be reliable (Feunekes *et al.*, accepted), and was considered appropriate for classifying subjects according to their fat intake (Feunekes, 1993). Although the questionnaire overestimated absolute fat intake compared to the dietary history method, this was not a problem for the purposes of the present study.

## THREE-GENERATION STUDY

### *Study population*

Some considerations with respect to the study population of the three-generation study should be made. Not in every family three generations are available. It is more likely to have a complete three-generation family in families who got their children at an early age. In the case of large families it is more likely that grandmother is still alive when one of her older daughters or granddaughters was included in the sample. In addition, selection bias could have occurred of healthy families. Families of whom grandparents died already might have different beliefs and attitudes. It might be that they have a higher perceived susceptibility of getting a disease like heart disease or cancer if one of their grandparents died from these diseases. In the Health Belief Model death or illness of a family member is seen as a possible cue to action (Becker & Maiman, 1975). However, as 68% of the women from the older generation were widowed, most subjects included in the three-generation study experienced death of a (grand)parent as well. Finally, taking into account the high contact frequencies in the present study, it is likely that selection bias occurred on families that get on together.

Due to the above mentioned sources of selection bias it should be kept in mind that results from a three-generation study could not be extrapolated to the general population. Selection bias in a three-generation study can be prevented by linking a three-generation study to a cross-sectional study as described by Jackson and Hatchett (1986). However, due to resources and time available such a design was not possible in the present study.

Other considerations with respect to the study population involve socio-economic class. The study took place among young women living in low socio-economic neighbourhoods, their mothers, and their grandmothers. The selection of neighbourhoods was based on prosperity indices related to postal codes. It was assumed that such a selection would result in families that were from the lower socio-economic class predominately. From education and occupation levels it appeared that not everybody

belonged to the lower socio-economic class. This could have happened due to several causes. First, the prosperity indices related to postal codes result in a very crude classification of socio-economic classes (Van Berkel-van Schaik & Tax, 1990). Second, women between 20 and 30 years old are at the beginning of their career and might have relatively low incomes, which implies that for young people a selection on postal code might be even worse. Third, when one family member belongs to the lower socio-economic class, the other two generations do not necessarily belong to the same socio-economic class. Fourth, response rate is generally lower in the lower socio-economic class (Kanuk & Berenson, 1975), which means that women who were willing to participate might belong to higher socio-economic classes than the sample as a whole.

Further, only maternally related family members were studied. Of course fathers might be important as well. In a study of Weidner *et al.* (1985) about food preferences of mothers and their 8 to 11 year old children the best predictor of what was being served to the family was what the father (husband) liked to eat. In addition, depending on the stage of life a person is in, other persons might be important as well, for example brothers, sisters, friends, parents-in-law. Social network studies might give an insight into the influence of several important people on food habits.

Family resemblance in food habits exists, although correlations were low. This means that a large sample size is necessary to be able to find statistically significant correlations. Therefore, a study population of about 100 families is not large enough to evaluate influences of education level, dieting, pregnancy, or contact frequency on family resemblance.

*Contact frequency*

Influence of living together and contact frequency might be important aspects in family resemblance in food habits. In the present study contact frequency was very high: 17, 14, and 6 times a month between younger-middle, middle-older, and younger-older generations, respectively. The only question asked about contact frequency was "How many times a week/month/year do you have contact with your daughter, mother,

grandmother, or granddaughter, either by telephone or by visit?". In further research more attention should be placed on contact frequency and contact intensity, age that the child left parental home, number of meals shared, whether parent and children talk about nutrition, etcetera. These variables may have an impact on the strength of family resemblance in food habits. However, in order to be able to account for these variables in the analyses, a larger study population is necessary.

## IMPLICATIONS FOR NUTRITION EDUCATION AND POLICY

Because of the selection bias in the three-generation study and the low response rate in the study in Utrecht, it is not possible to make any claim for the representativeness of the data. However, two main findings emerged from this thesis that might have implications for nutrition education, policy, or marketing.

From both studies it appeared that liking was the most important predictor of intention and fat intake. This finding is in agreement with literature (Tuorila, 1988a), and emerged also from depth interviews, focus group interviews, and content analysis of food advertisements. Therefore, nutrition education and policy should be focused on preferences and change of preferences. Zajonc and Markus (1982) mentioned that it depends on how preferences are formed and the stages of preference formation a person is in whether emotional or cognitive means should be applied in order to change preferences.

From the three-generation study it appeared that daughters and mothers resemble each other in food habits. Although correlations were low, these results might encourage decision-makers to use a family based approach in efforts to reduce fat intake.

## RECOMMENDATIONS FOR FURTHER RESEARCH

In the preceding chapters and paragraphs some modifications and suggestions for further research were made. Major recommendations that emerged from this thesis are

reported in this section.

A main finding of this study was the importance of liking in food selection. Therefore, more research on preference formation in indicated. According to Zajonc and Markus (1982) preferences acquired in infancy and childhood are formed primarily on affective basis, while some later preferences have as their basis a rich cognitive structure. Generation studies might play an important role in exploring this phenomenon of preference formation.

As mentioned by Jackson and Hatchett (1986) a three-generation research design has the potential of contributing greater knowledge to an understanding of cohort, aging and period effects. Although, in order to study changes over time and to be able to conclude in which direction influences take place a longitudinal design is necessary. As socialization of food habits takes place in the nuclear family such a longitudinal study should start when the younger generation is at preschool age and prolong until the younger generation reaches adult age and is living on her own. Processes involved in socialization should be the focus of study, like modelling, communication of beliefs, explicit training. Such a design makes it possible to study the development of food habits and to investigate the influence of living together on family resemblance in food habits.

With respect to family resemblance in food habits behavioral approaches related to fat intake might be an interesting addition to food consumption methods. Kristal *et al.* (1990) developed a questionnaire to assess four dimensions of dietary behaviour associated with fat intake: excluding high-fat ingredients and preparation techniques; modifying high-fat foods; substituting specially manufactured low-fat foods for their higher-fat counterparts; and replacing high-fat foods with low-fat alternatives. In the present study an attitude scale based on the last mentioned dimension was applied. In further research attitude scales towards the other dimensions could be developed and related to subsequent behaviours.

From chapter 3 it appeared that terms of reward might play a role in nutrition behaviour. Three major rewards were mentioned: 1. short-term rewards related to taste; 2. middle-term rewards related to appearance; 3. long-term rewards related to chronical

diseases. Taking these terms into account a beliefs and attitudes questionnaire could be developed.

In general, more advanced statistics should be used in this research field. In literature on determinants of food habits correlation coefficients and regression analyses were the most applied statistical analyses . Only recently LISREL analyses on data about food habits were reported (Sapp, 1991; Sapp & Harrod, 1989). Both the behavioral approach and the approach based on terms of reward offer possibilities for advanced statistical techniques.

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## SUMMARY

In this thesis nutrition attitudes, beliefs, and fat intake in three generations of women are described. The aim of the study was twofold: the development of methods, and the study of family resemblance in food habits.

Most nutritional health recommendations are aimed to reduce the energy percentage derived from fat in the diet. In order to achieve a reduction in fat intake, insight into factors involved in high-fat food choices is necessary. Several social-psychological theories and models are available that can be used to explain and predict nutrition behaviour. Both personal factors and environmental factors are included in these theories. As socialization of food habits takes place in the nuclear family, children might have similar food habits as their parents.

Based on literature study and qualitative pilot studies a questionnaire on beliefs and attitudes towards the consumption of 20 foods was developed for which Fishbein and Ajzen's theory of reasoned action was used as a framework. The questionnaire was pretested in 419 adult men and women, 49 elderly women, and 45 students in Human Nutrition at the Wageningen Agricultural University. The main study took place among 97 young women, their mothers, and their grandmothers.

In chapter 2 twenty-eight social-psychological studies focused on behaviour associated with the consumption of foods high in fat and cholesterol are reviewed. Several social-psychological models were used to explain nutrition behaviour associated with fat and cholesterol intake, of which the Fishbein and Ajzen theory of reasoned action was used most often. Attitudes, especially preferences, appeared to be important determinants of consumption of high-fat foods. Social influence seemed to be less important, although the possibility of methodological inadequacies cannot be excluded.

The next two chapters are based on data of a study on beliefs, attitudes and fat intake carried out in Utrecht. In total 419 subjects between 18 and 75 years old participated in this study. The dominant role of attitudes as predictor of food choice in research with the theory of reasoned action could be replicated for 20 foods (chapter 3). Additional analyses on beliefs and attitudes showed that the liking attitude ($\beta$: 0.38 – 0.66) had more impact on intention than good/bad attitude ($\beta$: -0.01 – 0.25) for all 20 foods. Total effects of beliefs on intention suggested that short-term rewards (tastiness)

are more important than rewards on middle-term (figure) and long-term (heart disease).

An attitude scale towards high-fat foods and their low-fat alternatives is described in chapter 4. The study among 419 men and women showed that attitudes towards low-fat alternatives were more positive than towards high-fat foods. Mean energy percentage of fat in the diet was 38.8% (SD 7.1) in this population. The attitude scale explained 25% of the variance in percentage energy as fat. Test-retest reliability of the attitude scale was 0.92 [95% confidence limits 0.82 and 0.97]. The attitude scale consists of two subscales: liking attitudes and good/bad attitudes. A multiple regression of the two subscales on energy percentage of fat in the diet showed a higher standardized beta weight for liking attitudes (0.32) than for good/bad attitudes (0.14). It was concluded that attitudes towards high-fat foods and their low-fat foods could be used to predict fat intake, to compare groups of people, and to evaluate attitude changes.

The three-generation study took place among 291 maternally related family members (97 young adult women, their mothers, and their grandmothers). Mean percentage energy derived from fat was 39.3 (SD 7.2), 39.6 (SD 6.9), and 39.9 (SD 8.5) for the younger, middle, and older generation, respectively. Intake of energy, fats, and cholesterol was correlated between daughters and mothers, and granddaughters and grandmothers. Correlations between younger and middle generation varied from 0.13 to 0.27, while correlations between middle and older (r: -0.03 – 0.29), and younger and older generation (-0.03 – 0.33) tended to be lower (chapter 5).

Resemblance in nutrition knowledge and attitudes between the three generations is described in chapter 6. Correlations of nutrition knowledge scores were 0.30 ($p<0.05$) between the younger and middle generation, 0.35 ($p<0.05$) between the middle and older generation, and 0.14 ($p>0.05$) between the younger generation and their grandmothers. For the attitude scale towards high-fat foods and their low-fat alternatives, these figures were 0.27, 0.22 (p's$<0.05$), and 0.17 ($p>0.05$), respectively. From multiple regression analysis of the liking attitudes and good/bad attitudes on fat intake it appeared that the relative importance of the liking attitudes was larger than the relative importance of the good/bad attitudes for all generations.

Chapter 7 describes family resemblance in beliefs, attitudes and intentions towards

each of the 20 foods separately. For many foods significant correlations were found between younger and middle generation, and middle and older generation for elements of the Fishbein and Ajzen model. More statistically significant correlations were found for liking attitudes between younger and middle generation ($p<0.05$ for 10 out of 20 correlations) than for any other pair. From the relative importance of liking and good/bad attitude on intention it appeared that liking contributed most to the variance in intention scores. Health related beliefs and attitudes became of increasing importance in the older generations.

From the three-generation study it appeared that there are small, but many significant, correlations in nutrition knowledge, beliefs, attitudes, intentions, and intake of fats between mothers and daughters. For liking attitudes and intake of fats resemblance seemed to be somewhat higher between young women and their mothers than between the elderly women and their daughters. The results indicate that food habits might pass on from mothers to daughters. In addition, as liking attitudes were the most important predictors of intention and fat intake, development and change of preferences needs further investigation.

## SAMENVATTING

In dit proefschrift worden opvattingen en houdingen ten aanzien van 20 voedingsmiddelen, en de vetinneming beschreven van drie generaties vrouwen. Het doel van de studie was tweeledig: de ontwikkeling van methoden en het bestuderen van overeenkomsten in voedingsgewoonten binnen families.

De meeste aanbevelingen op het gebied van voeding en gezondheid betreffen een verlaging van het energie percentage vet in de voeding. Om een reductie in vetinneming te bereiken, is inzicht nodig in de factoren die invloed hebben op voedselkeuze. Er zijn verscheidene sociaal-psychologisch theorieën en modellen beschikbaar, die aangewend kunnen worden om voedingsgedrag te voorspellen en te verklaren. In deze theorieën zijn zowel factoren gerelateerd aan de persoon als aan de omgeving van het individu opgenomen. Omdat socialisatie van voedingsgewoonten binnen het gezin plaatsvindt, is het mogelijk dat kinderen dezelfde voedingsgewoonten hebben als hun ouders.

Op basis van literatuurstudie en kwalitatieve voorstudies is een vragenlijst ontwikkeld, waarvoor de theorie van beredeneerd gedrag van Fishbein en Ajzen als uitgangspunt diende. De vragenlijst werd uitgetest bij 419 volwassen vrouwen en mannen, 49 oudere vrouwen en 45 studenten van de studierichting Voeding van de Mens van de Landbouwuniversiteit Wageningen. De hoofdstudie werd uitgevoerd bij 97 jonge vrouwen, hun moeders en hun grootmoeders.

In hoofdstuk 2 wordt een overzicht gegeven van 28 sociaal-psychologische studies over gedrag dat geassocieerd is met de consumptie van voedingsmiddelen hoog in vet of cholesterol. Verscheidene sociaal-psychologische modellen zijn gebruikt om voedingsgedrag geassocieerd met vet en cholesterol inneming te verklaren. Hiervan werd het Fishbein en Ajzen model het meest gebruikt. Attitudes, met name preferenties, bleken belangrijke determinanten te zijn van de consumptie van vetrijke voedingsmiddelen. Sociale invloed leek minder belangrijk te zijn, hoewel een methodologisch probleem niet uitgesloten kan worden.

De twee volgende hoofdstukken zijn gebaseerd op data van een onderzoek naar opvattingen, houdingen en vetinneming dat werd uitgevoerd in Utrecht. In totaal participeerden 419 personen tussen 18 en 75 jaar oud in dit onderzoek. In onderzoek naar voedselkeuze waarbij gebruik gemaakt wordt van het Fishbein en Ajzen model zijn

attitudes de belangrijkste voorspeller. Dit werd eveneens gevonden voor de 20 voedingsmiddelen beschreven in hoofdstuk 3. Nadere analyses op opvattingen en houdingen lieten zien dat voor alle 20 voedingsmiddelen de attitudes met betrekking tot het graag eten van een produkt ($\beta$: 0.38 – 0.66) meer effect hadden op de intenties dan de 'goed/slecht' attitudes ($\beta$: -0.01 – 0.25). Totale effecten van opvattingen op intenties suggereerden dat beloningen op korte termijn (lekker) belangrijker zijn dan beloningen op middellange termijn (lijn) en lange termijn (hartziekte).

In hoofdstuk 4 wordt een attitudeschaal ten aanzien van vetrijke voedingsmiddelen en minder vette alternatieven beschreven. Uit de studie onder 419 mannen en vrouwen bleek dat attitudes ten aanzien van de minder vette alternatieven meer positief waren dan attitudes ten aanzien van de vetrijke voedingsmiddelen. Het gemiddelde energiepercentage vet in de voeding was 38.8% (SD 7.1) in deze populatie. De attitude schaal verklaarde 25% van de variantie in energie percentage vet. Test-hertest correlatie van de attitude schaal was 0.92 [95% betrouwbaarheidsgrenzen 0.82 en 0.97]. De attitudeschaal bestaat uit twee subschalen: attitudes ten aanzien van het graag eten van de voedingsmiddelen en attitudes gerelateerd aan het goed dan wel slecht beoordelen van de voedingsmiddelen. Multiple regressie van de twee subschalen op het energie percentage vet in de voeding gaf een hogere gestandaardiseerde bèta voor de attitudes met betrekking tot het graag eten (0.32) dan voor 'goed/slecht' attitudes (0.14). De conclusie was dat attitudes ten aanzien van vetrijke voedingsmiddelen en hun minder vette alternatieven bruikbaar zijn om de vetinneming te voorspellen, om groepen respondenten te vergelijken en om veranderingen in attitudes te evalueren.

De drie-generatie studie vond plaats onder 97 jonge vrouwen, hun moeders en hun grootmoeders. Het energie percentage vet in de voeding was gemiddeld 39.3 (SD 7.2), 39.6 (SD 6.9) en 39.9 (SD 8.5) voor respectievelijk de jongste, middelste en oudste generatie. De inneming van energie, vetten en cholesterol werd gecorreleerd tussen dochters en moeders en kleindochters en grootmoeders. Tussen de jongste en middelste generatie werden correlaties gevonden tussen 0.13 en 0.27, terwijl de correlaties tussen de middelste en oudste generatie (r: -0.03 – 0.29) en jongste en oudste generatie (r: -0.03 – 0.33) lager leken te zijn (hoofdstuk 5).

De overeenkomsten in voedingskennis en houdingen tussen de drie generaties zijn beschreven in hoofdstuk 6. Correlaties in score op een voedingskennis vragenlijst waren 0.30 ($p<0.05$) tussen de jongste en middelste generatie, 0.35 ($p<0.05$) tussen de middelste en oudste generatie en 0.14 ($p>0.05$) tussen de jongste generatie en hun grootmoeders. Voor de attitudeschaal ten aanzien van vetrijke voedingsmiddelen en minder vette alternatieven waren de correlaties respectievelijk 0.27, 0.22 (p's$<0.05$) en 0.17 ($p>0.05$). Uit multiple regressie bleek dat het relatieve belang van de attitude subschaal met betrekking tot het graag eten groter was dan de 'goed/slecht' subschaal op vetinneming. Dit gold voor alle generaties.

Hoofdstuk 7 beschrijft de overeenkomst tussen familieleden voor elementen van het Fishbein en Ajzen model voor de 20 voedingsmiddelen apart. Voor veel voedingsmiddelen werden significante correlaties gevonden tussen de jongste en middelste generatie en de middelste en oudste generatie. Er werden meer statistisch significante correlaties gevonden tussen de jongste en middelste generatie voor het graag eten van het produkt ($p<0.05$ voor 10 van de 20 produkten) dan voor elk ander paar. Uit het relatieve belang van de attitudes met betrekking tot het graag eten en 'goed/slecht' attitudes op de intenties bleek dat 'graag' het meest bijdroeg aan de variantie in scores op de intentie vragen. Daarnaast bleek dat de aan gezondheid gerelateerde opvattingen en houdingen meer van belang waren in de oudere generaties dan in de jongste generatie.

Uit de drie-generatie studie kan geconcludeerd worden dat er zwakke, maar veelal statistisch significante, correlaties zijn tussen moeders en dochters voor voedingskennis, opvattingen, houdingen, intenties en inneming van vetten en cholesterol. Voor het graag eten van een voedingsmiddel en de inneming van vetten leek de overeenkomst wat groter tussen de jongste generatie en hun moeders dan tussen de oudste generatie en hun dochters. De resultaten geven aan dat voedingsgewoonten mogelijk overgedragen worden van moeder op dochter. Daarnaast kan geconcludeerd worden dat ontwikkeling en verandering van preferenties meer onderzoek behoeft, omdat preferenties de beste voorspeller zijn van intenties en vetinneming.

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Annette Stafleu
Heelsum, mei 1994

## CURRICULUM VITAE

Annette Stafleu werd geboren op 8 november 1964 te Nijmegen. Van 1977 tot 1984 volgde zij haar middelbare school opleiding (Atheneum B) aan het Christelijk Lyceum te Zeist. In augustus 1984 begon zij met de studie Voeding van de Mens aan de toenmalige Landbouwhogeschool te Wageningen. Van mei tot oktober 1989 liep zij stage bij het Nederlands Kanker Instituut te Amsterdam. In januari 1990 behaalde zij de titel van landbouwkundig ingenieur in de afstudeerrichting Voeding van de Mens met als afstudeervakken Voedingsleer, Gezondheidsleer en Voorlichtingskunde.

Het in dit proefschrift beschreven onderzoek werd uitgevoerd van december 1989 tot december 1993 aan de vakgroep Humane Voeding van de Landbouwuniversiteit Wageningen, waar zij als Assistent in Opleiding was aangesteld. Zij maakte deel uit van het Postgraduate Programme in Human Nutrition. Zij trainde zich verder in Methoden en technieken van sociaal-wetenschappelijk onderzoek (LUW) en volgde een cursus Strukturele modellen (Katholieke Universiteit Nijmegen). In juli 1990 participeerde zij in de Postgraduate Summer Course in Public Health and Nutritional Epidemiology, in Southampton, UK. In de zomer van 1993 bracht zij enige weken door op het Department of Family and Consumer Studies van de University of Guelph, Canada, waar zij ook in de zomer van 1994 drie maanden zal zijn. In maart 1994 was zij deelnemer van het eerste European Nutrition Leadership Programme in Echternach, Luxemburg. Vanaf 15 juli 1994 is zij aangesteld als postdoc bij de onderzoeksschool VLAG (LUW).

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