Direction for nutrition education determined by target group segmentation[1]

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The usual diet in The Netherlands seems to be less than desirable for optimal health. Per capita consumption data (1,2) and dietary surveys (3,4) demonstrate that in the Dutch diet the average daily intake of fats is 130 gm.; of sugar, 140 gm.; of cholesterol, 420 mg.; and of salt, 8 to 15 gm. International studies reveal similar food intake patterns (5). In view of what is probably an important role for nutrition in the prevention of coronary heart disease (CHD) (6), nutrition education appears to be a necessity. Usually health and/or nutrition education is addressed to the public at large. However, health and/or nutrition education may be more effective when it is directed toward specific groups that particularly need nutritional guidance.

In The Netherlands to date, only two examples of nutrition counseling for such specific target groups are known: (a) in the field of secondary prevention in hospital settings for post-myocardial infarction patients and (b) in the area of primary prevention, where elevated risk of cardiovascular problems is detected via screening (7).

However, there is still a segment of the Dutch population for which nutrition education is important. The assumption is that less desirable dietary habits may lead to increased levels of low-density-lipoprotein (LDL) cholesterol (8) and therefore to a higher probability of developing coronary heart disease. More healthful dietary behavior should be recommended in preventive nutrition education.

Segmentation of the Dutch population into target groups—on the basis of behavior regarding cardiovascular risk factors like smoking, nutrition habits, obesity, and physical activity—was carried out on the data reported in a national survey. The objective of the study was to characterize the target group with less than desirable food consumption patterns and to identify approaches for nutrition education acceptable to that group. In a random sample of the Dutch adult population, nutrition knowledge, attitude, and practices were assessed, together with demographic and socioeconomic characteristics.

Methods

The data on nutrition were collected in 1978, through a national survey among the Dutch adult population. A stratified random sample of 2,562 men and women, between the ages of 18 and 64 and representative of the Dutch adult population, was drawn in three stages. First, communities within each province representing various levels of urbanization were selected. Second, addresses within each community representing the various neighborhoods were selected. Third, a member of each household who satisfied the study criterion of being between 18 and 64 years of age was chosen. The response rate was 77 percent; 14 percent refused to take part in the survey, and 9 percent could not be reached. All subjects participating in the survey were personally interviewed, according to a partially structured questionnaire, by a team of 174 trained interviewers. Of the 1,973 subjects in the survey, 889 men and 1,062 women provided complete information on relevant variables.

The study provided information about knowledge, attitude, and behavior concerning factors with a supposed relationship to coronary heart disease: nutrition habits, smoking, obesity, and physical activity. In addition, questions concerning health education were included to determine to what extent health education was needed and how individuals wished to be informed.

Food consumption patterns were qualitatively measured by a dietary history via recall, an interviewing method relying on a subject's memory to discover his/her "usual" diet. In the questionnaire, focus was on those nutrients considered important in a diet aiming at prevention of cardiovascular disease (9)—i.e., fats, polyunsaturated fats, simple carbohydrates, cholesterol, dietary fiber, and alcohol. Data were gathered on the average weekly consumption of 17 food items that are the main sources of the nutrients mentioned. Quantitative food intake data were not emphasized. The assumption was that the selection and consumption frequency of certain food items is indicative of the participant's intake of related nutrients. An example is frequency of egg and liver consumption for the cholesterol intake or of bread and fruit consumption for the dietary fiber intake.

With the criteria of a prudent diet (10) used as the standard, a "nutrition score" was computed for each individual, indicating the preventive value of his/her usual diet. The rationale for the scoring procedure was that frequent use of certain food items which, from a preventive point of view, are optimal or less optimal

choices would lead to a higher or a lower score. All foods included in the questionnaire were given a score between 1 and 5, depending on the individual's consumption frequency. The scores for all food items were summarized to give each participant a nutrition score, illustrating his/her type of diet. Since the questionnaire included 17 food items, an individual nutrition score could range between 17 and 85 points.[6]

By means of quantitative data on nutrient intake, gathered in a rural population by seven-day recording (11), the assumption that our method could adequately classify individuals on the basis of their dietary habits was tested. Rough estimates of the nutrient intake reflected by various values of the nutrition score were calculated (9).

The population for the study discussed in this article was divided into three categories of dietary patterns. We labeled those patterns *desirable* (upper 30 percent of the nutrition score, scoring values of 58 or more, n = 568); *less desirable* (lower 30 percent of the nutrition score, scoring values of 48 or less, n = 578); and *intermediate* (middle 40 percent of the nutrition score, scoring values from 48 to 58, n = 805). The average nutrient composition estimated on the basis of the nutrition score for desirable and less desirable food consumption patterns is given in Table 1. The group with less desirable consumption patterns was identified as the target group, most in need of nutrition education.

Knowledge about nutrition was assessed by questions concerning the cholesterol content of bread, eggs, water, liverwurst, lettuce, blood, and diet margarine and the nutritive value of soft drinks, bacon, milk, brown beans, potato chips, and cabbage. The answers were added up to produce a knowledge score, a higher score being indicative of greater nutrition knowledge. Each correct answer received 1 point, no answer, 0 point, and an incorrect answer, minus 1 point. For further analysis, the range of the score was divided into three equal classes.

Attitude items were tested in a pilot study with 150 individuals. The answers, ranging from "strongly agree" to "strongly disagree," were scored in a 5-point Likert-type scale. To test unidimensionality, correlation coefficients between the separate items and the total score were computed. Attitude items with a correlation coefficient of *r* of less than 0.40 were eliminated, leading to a reduction from 18 to 7 items. The reliability of the scale (Cronbach's alpha) was 0.73.

Interrelationships among participants' knowledge, attitudes, and behavior were expressed by Pearson correlation coefficients (12), calculated from the original continuous variables.

Target group segmentation on less desirable food practices was performed by using Fisher's linear discriminant function (12) to examine which of a series of characteristics, such as demographic and socioeconomic determinants, discriminated between two groups. The function compared the target group members with less desirable eating behavior and individuals with desirable

[6]Information on the scoring system used may be obtained on request from the senior author.

Table 1. Average nutrient composition estimated on the basis of the nutrition score for desirable and less desirable food consumption patterns, in comparison with the criteria for a prudent diet.

nutrient	prudent diet	less desirable	desirable
fat (energy percent)	30-35	40-46	35-40
polyunsaturated fat (energy percent)	10-12	5-8	8-10
carbohydrates (energy percent)	53-60	40-47	53-60
cholesterol (mg. per day)	250	350-450	250-300
dietary fiber (gm. per 4.2 kJoules*)	11-15	7-8	9-11
alcohol (energy percent)	†	≥7	≤5
salt (gm. per day)	3-5	—‡	—

*4.2 kJoules is equivalent to 1,000 kcal.
†No recommendation: four or more consumptions per day (more than 7 percent of total energy) endangers health.
‡No information available.

food practices in an additive linear model of the various determinants:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n$$

For the analysis the determinants x_1, x_2, ..., x_n were arranged in categories. The coefficient β indicated whether a variable could be used to distinguish between the two groups. In this way the independent contribution of a determinant could be estimated, and the effects of interrelationships between determinants were eliminated. In this form, the technique yielded results similar to those of a binary regression analysis. By taking the antilogarithm of a coefficient, one could also obtain a more quantitative idea of the importance of a determinant. The antilogarithm of β, exp β, is an estimate of an odds ratio (OR). This measure is the ratio of the relative frequency of that determinant in the two groups (13).

The discriminant analysis was applied twice, with the target group as an index group compared with the group with desirable eating habits. In the first analysis, demographic and socioeconomic determinants were included; in the second, intervening variables of nutritional behavior were used. The coding system used in the discriminant analysis (see Tables 2 and 3) can be illustrated by the following example: For civil status, the occurrence of unmarried, divorced, and widowed people, respectively, is related to the occurrence of married people in both of the two groups.

Results

DESCRIPTION
Knowledge and behavior. In this sample of adults, knowledge of the cholesterol content and nutritive value of food was satisfactory. The majority of participants knew that there is no cholesterol in bread, water, lettuce, and diet margarine and also recognized eggs and liverwurst as prime sources of cholesterol. Nineteen percent of the respondents gave correct answers to all nutrition knowledge questions. Ten or more items were answered correctly by half of the study population. The knowledge level was age independent; women rated higher than men.

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A higher level of education was accompanied by better knowledge of nutrition in both sexes. The relationship between knowledge and education was not influenced by age.

Compared to men, women had better food consumption patterns. For both sexes, a better food consumption pattern accompanied increasing age (Figure 1). In higher socioeconomic classes, we identified more desirable dietary practices. With the exception of the oldest persons, age had no influence on this finding.

Self-perception and attitude. The majority (82 percent) of the subjects believed that they had healthy food habits. On the basis of our criteria for a prudent diet, the respondents' perception of the healthfulness of their diet was not supported, especially among women in the younger age groups. Information on these young women's perception of good dietary practices was not requested in our study. The perception that their diet was healthful was correct only for those belonging to the desirable nutrition group (31 percent).

Nearly one-quarter (23 percent) of those interviewed believed that they did not have sufficient knowledge to determine what kind of diet was healthy. Individuals with scanty knowledge thought this significantly more often (32 percent) than those with a high degree of nutrition knowledge (21 percent). Men more often than women believed that they did not know enough about healthful nutrition. Women with this belief were found in the youngest age categories. In all age groups, women were more positive toward healthful nutrition than men, but this effect was strongest in the younger age groups (18 to 34 years).

Interrelationships between knowledge, attitude and behavior. The Pearson correlation coefficients (knowledge-attitude $r = 0.19$, knowledge-behavior $r = 0.12$, and attitude-behavior $r = 0.20$) pointed to a significant relationship (p of less than 0.001) within the knowledge-attitude-behavior triad. The strength of the association, however, was not impressive.

TARGET GROUP SEGMENTATION.   In order to characterize those individuals with inadequate dietary habits and to seek clues for directing nutrition education toward them, a linear discriminant analysis was applied. The results of

FIG. 1. *Prevalence of desirable and less desirable food consumption patterns in the Dutch adult population by sex and age.*

this analysis are presented in Tables 2 and 3. By means of the discriminant function coefficients, odds ratios (OR) were derived. An OR (exp β) of 1 means that the relative

Table 2. Results of the target group segmentation on less desirable food consumption pattern by linear discriminant analysis—demographic and socioeconomic determinants

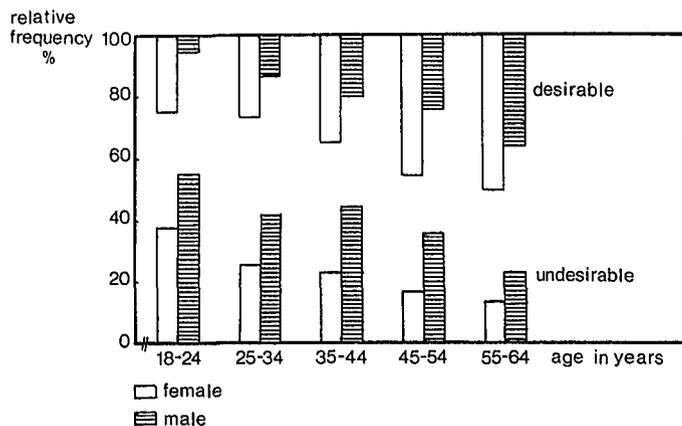| determinant	discriminant coefficient β	odds ratio exp β
demographic		
sex		
female		
male	1.1100*	3.0
age		
55-64 years		
45-54	0.3046	1.4
35-44	0.7576*	2.1
25-34	1.3145*	3.7
18-24	2.2985*	10.0
civil status		
married		
unmarried	−0.2606	0.8
divorced	0.1236	1.1
widowed	−0.3007	0.7
family size		
1		
2	0.3531	1.4
3 or 4	0.7905*	2.2
5 or more	0.8668*	2.4
degree of urbanization†		
low		
middle	−0.1025	0.9
high	−0.3771	0.7
socioeconomic		
education‡		
low		
middle	−0.4046*	0.7
high	−0.7908*	0.5
occupation#		
low		
middle	−1.3163*	0.3
high	−0.6369	0.5
familial social class¶		
low		
middle	−0.0244	1.0
high	−0.2287	0.8

*Significant at 0.05 level.
†Degree of urbanization: low, rural communities with an agricultural population of more than 20 percent; middle, urbanized rural communities with an agricultural population between 10 and 20 percent; high, communities with an agricultural population of less than 10 percent.
‡Respondent's education: low, primary school and lower vocational training; middle, secondary school and middle vocational training; high, university and high vocational training.
#Respondent's occupation: low, unskilled and skilled workers; middle, middle and lower employees; high, high employees.
¶Familial social class is determined by the occupation and education of the wage earner of the family to which the respondent belongs.

Table 3. Results of the target group segmentation on less desirable food consumption pattern by linear discriminant analysis—intervening determinants

determinant	subsection*	discriminant coefficient β	odds ratio exp β
knowledge	Little nutrition knowledge.	0.0303	1.0
	A diet rich in fat is mentioned as one of the three most important risk factors for coronary heart disease.	0.0725	1.1
attitude	Negative attitude toward nutrition.	1.1240†	3.1
self-perception	Knowledge of healthy nutrition is considered deficient.	0.5022†	1.7
	Dietary habits are considered unhealthy.	0.6093†	1.8
	Dietary habits are considered difficult to change.	0.2348	1.3
nutrition education	The opinion is that education does not pay enough attention to healthful nutrition.	−0.0143	1.0
	No effort to get informed about healthful nutrition is made.	0.9473†	2.6
influence of environment	Remarks to stimulate a more prudent dietary pattern are often heard.	−0.1886	0.8

*Effect of the described category in comparison with the other categories.
†Significant at 0.01 level.

occurrence (odds) of a determinant is similar in the two groups. An odds ratio greater than 1 indicates that the determinant proportionally occurs more often in the index group (target group with less desirable food habits). Determinants with an OR value between 0 and 1 are relatively more frequent in the reference group.

The complete demographic and socioeconomic profile of the target group is shown in Table 2. For example, the OR for men was 3.0, and for higher education it was 0.5. This means that the man-woman ratio of the target group was three times as high as that of the group with desirable nutrition, and the high to low level of education ratio was half as high. Thus characteristics of the target group were: male sex, age 18 to 44 years, belonging to families with three or more members, with low level of education, and working in the lowest occupational categories. Civil status, degree of urbanization, and familial socioeconomic position did not discriminate.

IMPLICATIONS FOR NUTRITION EDUCATION. The results of the second analysis (Table 3), in which intervening determinants of nutritional behavior were included, led to guidelines for content and choice of method for nutrition education.

To reach the target group described, we should take into account:

● _The existing attitude toward nutrition._ This attitude was demonstrated in respondents' indifferent to negative opinion concerning the desirability of reducing one's fat, cholesterol, and sugar consumption and of increasing polyunsaturated fat intake. Also, taste prevailed over health-related aspects of nutrition as the reason for the food choices of one-third of those who

were members of the target group (Table 4).

● _Self-perception of knowledge regarding nutrition and dietary habits._ The target group members thought twice as often that they were insufficiently informed about healthy nutrition, even though their level of nutrition knowledge did not differ from that of the group with desirable dietary habits. (Odds ratios for knowledge items are 1.0 and 1.1, respectively.) Although the odds for expressing the opinion that one had poor dietary habits was higher in the target group than in the reference group, the actual frequency of this opinion was very low (6 and 3 percent, respectively) in both groups. Only 13 percent of the target group members reported that they made an effort to become informed about nutrition. Articles in magazines were the most important source of information for them.

Also important for nutrition education, but not different in the two groups (see Table 3), were the following:

● _The existing knowledge about the relationship between the degree of fat intake and the risk of coronary heart disease (CHD)._ About half of the study population (46 percent) mentioned a diet rich in fat as one of the 3 most important causes of myocardial infarction, out of a list of 10 possible risk indicators. Stress (70 percent) was regarded as the most important risk factor; hypertension (40 percent) was in third position.

● _The problems involved in modifying nutritional patterns._ Nearly one-third (30 percent) of the respondents mentioned that it would be difficult to change their dietary behavior. Both sexes struggled with this problem. Among men there was no age difference, while young women were said to have more difficulty in changing their habits than older women.

Table 4. Distribution of opinions concerning attitude toward nutrition in the target group and the desirable dietary pattern group

Talking about eating, everyone has his own views. What is your opinion on the following statements?

statement	group*	agree†	no opinion	disagree‡
		←———%———→		
We should consume substantially				
less fat	T	72	14	14
	D	87	5	8
less cholesterol	T	61	33	6
	D	76	19	5
more polyunsaturated fats	T	39	44	17
	D	62	28	10
less sugar	T	53	21	26
	D	80	11	9
If you wish to stay healthy you have to pay special attention to your diet.	T	83	6	11
	D	92	4	4
The taste of a meal is of more importance to me than health-related aspects.	T	33	13	54
	D	17	11	72
Well-balanced meals are often too expensive.	T	21	11	68
	D	14	15	71

*T = target group; D = desirable dietary pattern group.
†Strongly agree and agree combined.
‡Strongly disagree and disagree combined.

● *The influence of "significant others" in the direct environment.* In both groups, 12 percent of the interviewed reported that significant others (predominantly members of the family) made remarks to stimulate a more prudent dietary pattern. These comments, however, were perceived as having little influence on subjects' food behavior.

In addition to these objective parameters, the subjective need for information was also probed. Thirty-six percent of the target group believed that in health education too little attention was paid to healthy diets.

EDUCATION METHODS. Data on the target group's preference for the various methods of receiving health education are given in Table 5. For their personal education, the respondents were interested mainly in audiovisual mass media. In contrast, the subjects believed that health education policy in general should focus, on the one hand, on school education and, on the other, on face-to-face instruction from public health workers and, in particular, audiovisual programs.

Discussion
In this project we studied the profile of a target group which, because of its less desirable food consumption patterns, especially required nutrition education for the primary prevention of coronary heart disease. Preferences for content of and methods for nutrition education of this target group were also assessed. Our main conclusion was that nutrition education should be directed through audiovisual mass media, and, above all, to young men with a low level of education, employed in the lower occupational categories, and belonging to families consisting of three or more members.

Target group segmentation is based on the concept of market segmentation for nonprofit organizations (14). In

health education, segmentation has the objective of identifying, out of an heterogeneous population, one or more subgroups that are more or less homogeneous in one or more characteristics. Possible points of similarity can be the same type of help, obtainable through the same communication channels, or the same health education message (15,16). The aim of this type of segmentation is to arrive at a more favorable cost-effective type of educational effort. Here the well-being and the interest of the subjects come first. Segmentation does not necessarily lead to selection—education can be transmitted to the entire population—but it can promote a more target group-directed approach in health education.

In this study, segmentation was achieved on the basis of the characteristic of *less desirable food consumption pattern.* It would perhaps have been more self-evident from a health education point of view to carry out segmentation on the basis of *insufficient knowledge.* However, a topic of discussion in health education is whether health education should impart knowledge only where it is lacking or should aim at behavior modification (17). We favored the latter point of view.

The findings of the target group segmentation were important for two reasons:

● The category of men between the ages of 18 and 44 constituted the group in which primary prevention might have much impact in preventing future cardiovascular risk.

● Through this group we would cover at the same time young families with children whose dietary habits are still being formed. Thus, health education of men in the younger age group would result in a double effect, contributing to primary prevention of CHD risk for both young men and their children (18).

Our results regarding the demographic and socioeco-

Table 5. Preference for educational methods and outlook on health education policy of the target group

What way do you prefer to learn about a healthy way of life?
(open-ended question)

	%		%		%
no preference	17				
school education	3				
other ways	11				
health education	69 :	individually by a general practitioner	11		
		group counseling	6		
		mass communication	52 :	audiovisual media	34
				television	33
				radio	1
				printed media	18
				leaflets	7
				newspapers	6
				magazines	5

There are different ways to deliver health education. Which three of the methods on this list do you prefer, i.e, do you think are most important?
(pre-structured question)

			%
school education			50
health education : individually by a			
general practitioner			49
group counseling			24
mass communication :	audiovisual media :	television	77
		radio	14
	printed media :	newspapers	34
		magazines	33
		leaflets	16

nomic determinants of a less desirable food consumption pattern are partially consistent with those in other studies. Poor nutritional behavior in young Dutch male adults has already been reported (4). A recent paper on diets in the United States (5) showed that the category of men between the ages of 18 and 44 had the highest mean intakes of saturated fat, cholesterol, and sodium.

Budget studies of the Dutch Central Bureau of Statistics (2) indicated that, with increased family income, there was a gradual shift to a more favorable selection of food products. In a Dutch national survey on meal planning (3), a similar trend was found with regard to families' socioeconomic status (SES). In our study, a relationship between the social class of families and the quality of the diet was established through univariate analysis. In the multivariate analysis, however, the individual respondent's own education and occupation level were both independent discriminators, while the family's social class was not. We did not introduce family income to establish SES because there were missing data—24 percent of participants did not tell their income level, and those who did may not have given correct information. So there is still a possibility that family income affected dietary practices. But the predictive value of the respondent's own education suggests that money did not play such a critical role in the determination of dietary patterns in The Netherlands.

The inverse relationship of family size and quality of the diet is in agreement with other findings (3).

As opposed to other reports (19), our study hardly confirmed an association among the knowledge-attitude-behavior triad. Some further comments are called for.

First, self-reported behavior can be expected to be closer to knowledge and attitude. This means that the relationship would have been even weaker had data on actual behavior been available.

Second, in our study, measurement of participants' knowledge was restricted to general facts and concepts about nutrition. One may doubt whether such general knowledge enabled the subject to choose well-balanced meals. In addition, the items mainly concerned knowledge about the cholesterol and nutrient content of food, while for the food consumption pattern we inquired primarily about the intake of fat and carbohydrate.

Third, with respect to attitude toward nutrition, one may doubt whether this was truly measured (20). "Attitude" refers to a frame of mind that is hard to capture in objective terms. Therefore, the validity and reliability of any attitude scale remain a problem.

In health education, the knowledge-attitude-practices triad, or KAP model, is often applied to explain and to modify health behavior (21). A criticism of this approach is the predisposition to overemphasize the influence of personal characteristics on health behavior. Determinants from the social environment and broader influences—e.g., from legislation, advertising, and price policy—are not discussed (22). So the model leads to an "individual-blame" approach to health problems (23,24). The design of our study exhibited this shortcoming; also, structural determinants were not included, e.g., availability of good food in markets, places where food is eaten, and who prepares it.

To modify nutritional behavior, a strategy in which education and policy are combined seems to be more effective (25). This concept of health promotion was formulated by Green (26) as "any combination of health education and related organizational, political and economic interventions designed to facilitate behavioral and environmental adaptations that will improve or protect health." This view points more to a "system-blame" approach to health problems (23,24).

In developing nutrition education programs, one should first of all be guided by the need of the target group members for more information about the nutrient composition of food products so that they can plan healthful diets. There is a need for legislation for adequate food labeling, complemented by a comprehensive education program to teach consumers to use those labels (27). Equally important is information on how to prepare, in an economical way, wholesome meals that are appetizing (28,29).

Nutrition education requires translation of scientific findings into practical dietary advice. To induce gradual shifts in food selection and consumption frequency, a "more-less" line of approach would be appropriate: Eat more complex carbohydrates, vegetable oils, and dietary fiber, together with less animal fat and cholesterol. Moreover, individuals need help in identifying sources of these nutrients in the diet.

It is also essential that the message should fit in with the receiver's attitude and self-perception. (See Tables 3 and 4.) In our study, personal preference, as expressed in taste, seemed to be an important indicator of attitude toward nutrition (Table 4). Much can be learned from the findings of Schafer (30) and Reaburn (31) concerning the effects of family influences, cost of food, and convenience on food selection.

In our study, respondents had mistaken beliefs about the healthfulness of their own dietary habits. Together with the perceived difficulty of modifying eating behavior, this should be kept in mind in program planning. Communication that does not deviate from existing attitudes is better able to achieve attitude change (15,16).

With regard to educational methods, target group members preferred mass media, especially television programs, and face-to-face instruction (Table 5). However, the effectiveness of mass media in changing behavior is limited. A combination of mass media and other educational methods seems to be most effective (32).

Nutrition education by special television programs directed at young families in the lower social classes could be combined with primary prevention programs in occupational settings, for instance, face-to-face instruction and/or group counseling. Intervention programs in communities and industries have demonstrated that a multimedia strategy for primary prevention of coronary heart disease can give good results (33).

Summary

This study identified those individuals in the Dutch population with food consumption patterns that were thought to increase risk of coronary heart disease. Target group segmentation provided a description of this population which then could be used to design nutrition education materials for this specific group. Nutrition knowledge, attitude, and behavior of 1,951 adults 18 to 64 years of age were determined in 1978. Using discriminant analysis techniques, we found significant independent demographic and socioeconomic predictors of less desirable eating behavior. These were: age 18 to 44 years, male sex, family size of three or more members, low level of education, and lowest categories of occupation. A second analysis, which considered personal and environmental determinants affecting the less desirable dietary pattern group, demonstrated that: (a) target group members believed that they were consuming healthful diets; (b) they had a negative attitude toward nutrition; and (c) they did not intend to actively seek information about nutrition.

Like the remainder of the study population, the target group showed a satisfactory level of knowledge about the cholesterol content and nutritive value of food, had insufficient awareness of diet as a possible coronary risk indicator, and had a strong preference for receiving health education via audiovisual mass media.

Nutrition education emphasis, therefore, should be directed toward men 18 to 44 years of age, with large families, in the lower socioeconomic strata, and with practices that are least in accord with the dietary recommendations. The education methods should include television programs as well as group counseling or face-to-face instruction directed at young families.

References

(1) Bosman, W.: Nutrition in the Netherlands in 1976. Neth. J. Nutr. 40:351, 1979.

(2) Central Bureau of Statistics (CBS): Workmen's Budget Survey 1974-75, Part 4. Foodstuffs Bought: Quantity and Price. The Hague: The Netherlands State Press, 1979.

(3) Menu Census. Yearly Report 1980. Part I. Voorburg: Netherlands Institute for Agricultural Market Research, 1981.

(4) Nutrition and nutritional status of 19 year old students in comparison to their working contemporaries. Report No. R5504. Zeist, The Netherlands: Central Institute for Nutrition Research, 1977.

(5) Abraham, S., and Carrol, M.D.: Fats, cholesterol, and sodium intake in the diet of persons 1-74 years: United States. Vital and Health Statistics of the National Center for Health Statistics. Advancedata 54:1, 1981.

(6) Keys, A., ed.: Coronary heart disease in seven countries. Circulation 41 (Suppl. 1), 1970.

(7) Styblo, K., Meyer, J., Arntzenius, A.C., de Haas, J.H., van Geuns, H.A., Mellema, T.L., and Sluyter, D.P.: CB heart project in the Netherlands. Results of intervention in high risk individuals. Heart Bull. 8:47, 1977.

(8) Grundy, S.M.: Dietary fats and sterols. In Levy, R., Rifkind, B., Dennis, B., and Ernst, N., eds.: Nutrition, Lipids and Coronary Heart Disease. New York: Raven Press, 1979.

(9) Kok, F.J., Matroos, A.W., Hautvast, J.G.A.J., and van den Ban, A.W.: Food consumption pattern of the Dutch population in 1978. Neth. J. Nutr. 43:14, 1982.

(10) Select Committee on Nutrition and Human Needs, U.S. Senate: Dietary Goals for the United States. Rev. Washington, DC: Government Printing Office, 1977.

(11) Van Staveren, W.A.: Can dietary fiber be determined for a category of Dutch adults? Neth. J. Nutr. 40:113, 1979.

(12) Snedecor, G.W., and Cochran, W.G.: Statistical Methods. 6th ed. Ames: Iowa State University Press, 1967.

(13) Mantel, N., and Haenszel, W.: Statistical aspects of the analysis of

data from retrospective studies of disease. J. Natl. Cancer Instit. 22:719, 1959.

(14) Kottler, P.: Marketing for Non-profit Organizations. Englewood Cliffs, NJ: Prentice Hall, 1975.

(15) Van den Ban, A.W.: Introduction to Extension Education. 4th ed. Meppel, The Netherlands: Boom, 1979.

(16) Zaltman, G., and Duncan, R.: Strategies for planned change. New York: John Wiley & Sons, 1977.

(17) Committee for a National Plan for Health Education: Design and Development of Health Education in the Netherlands, First Recommendation. The Hague: Netherlands State Press, 1978.

(18) Stamler, J.: Improved life styles: Their potential for the primary prevention of atherosclerosis and hypertension in childhood. In Lauer, R.M., and Shekelle, R.B., eds.: Childhood Prevention of Atherosclerosis and Hypertension. New York: Raven Press, 1980.

(19) Grotkowski, M.L., and Sims, L.S.: Nutritional knowledge, attitudes, and dietary practices of the elderly. J. Am. Dietet. A. 72:499, 1978.

(20) Foley, C., Hertzler, A.A., and Anderson, H.L.: Attitudes and food habits—a review. J. Am. Dietet. A. 75:13, 1979.

(21) Fishbein, M., and Ajzen, I.: Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Reading, MA: Addison-Wesley Publishing Co., 1975.

(22) Henderson, J.B., and Enelow, A.J.: The coronary risk factor problem—a behavioral perspective. Prev. Med. 5:128, 1976.

(23) Rogers, E.M.: Where are we in understanding innovation? In Schramm, W., and Lerner, D., eds.: Communication and Change:

The Last Ten Years—and the Next. Honolulu: University Press of Hawaii, 1976.

(24) Lalonde, M.: A New Perspective on the Health of Canadians. Ottawa: Government of Canada, 1975.

(25) Hautvast, J.G.A.J., and Hermus, R.J.J.: Food and nutrition policy in the Netherlands; combatting consequences of prosperity. I and II. Ned. Tijdschr. Geneeskd. 123:939 and 975, 1979.

(26) Green, L.W.: New definitions of health education and health promotion. Int. J. Health Educ. 13:161, 1980.

(27) McNutt, K.W.: Nutrition labeling—a tool for diet planning. In Levy, R., Rifkind, B., Dennis, B., and Ernst, N., eds.: Nutrition, Lipids and Coronary Heart Disease. New York: Raven Press, 1979.

(28) Peterkin, B.B., Kerr, R.L., and Shore, C.J.: Diets that meet the Dietary Goals. J. Nutr. Educ. 10:15, 1978.

(29) Scott, L.W., Foreyt, J.P., Young, J., Reeves, R.S., O'Malley, M.P., and Gotto, A.M., Jr.: Are low-cholesterol diets expensive? J. Am. Dietet. A. 74:558, 1979.

(30) Schafer, R.B.: Factors affecting food behavior and the quality of husbands' and wives' diets. J. Am. Dietet. A. 72:138, 1978.

(31) Reaburn, J.A., Krondl, M., and Lau, D.: Social determinants in food selection. J. Am. Dietet. A. 74:637, 1979.

(32) Rogers, E., and Shoemaker, F.: Communication of Innovations. 2nd ed. New York: Free Press, 1971.

(33) Maccoby, N., Farquhar, J.W., Wood, P.D., and Alexander, J.: Reducing the risk of cardiovascular disease—effects of a community-based campaign on knowledge and behavior. J. Community Health 3:100, 1977.