

## Self-Rated Dietary Fat Intake: Association with Objective Assessment of Fat, Psychosocial Factors, and Intention to Change

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**ABSTRACT** In order to study the role of awareness of dietary fat intake as a possible factor in the process of dietary behavior change, data on 1507 adult subjects gathered in The Netherlands were analyzed. Objective assessments of dietary fat intake were compared to self-rated, or subjective, dietary fat intake among a Dutch study population. A majority of the respondents had an unrealistic view of their own fat intake. Men were more often unrealistic than women. Underestimation of fat intake was especially prevalent. Self-rated dietary fat intake, and not objectively assessed fat intake, proved to be a significant correlate of intention to reduce fat consumption in the near future among women. Psychosocial determinants of fat intake were stronger correlates of self-rated fat intake than of objectively assessed fat intake. It was concluded that underestimation of one's own dietary fat intake could be a major barrier in healthy diet promotion aimed at reducing fat consumption in The Netherlands. Therefore, improving dietary fat intake awareness should be given priority as a first step in healthy diet promotion strategies. Personal feedback and advice could be a means to improving the realistic estimation of dietary fat intake.

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The growing body of epidemiologic evidence of a relationship between dietary patterns and the etiology of various chronic diseases, such as cardiovascular diseases and some cancers, has led governments and public health organizations to promote certain preventive dietary recommendations.<sup>1,2</sup> In The Netherlands, the guidelines for a prudent diet from the Dutch Nutrition Council were published in 1986.<sup>3</sup> The Dutch Nutrition Council recommended eating a variety of foods, eating ample amounts of complex carbo-

hydrates, and reducing dietary fat intake, especially by reducing intake of saturated fat, to 35% or less of total calories. Further recommendations were to increase dietary fiber intake to at least 3 g per MJ energy intake, to restrict consumption of mono- and disaccharides to less than 25% of total calories, and to limit the intake of cholesterol to less than 33 mg/MJ energy intake. These recommendations are in accordance with dietary guidelines in other European and North American countries,<sup>1,2</sup> although the US guidelines recommend reducing fat intake to less than 30% of total calories, and the importance of consuming five or more servings of fruits and vegetables per day is stressed.

Major discrepancies have been found between these guidelines and actual dietary behavior as measured through food consumption research in The Netherlands.<sup>4</sup> The Dutch Nutrition Council advised that healthy diet promotion activities should focus on a reduction in total fat intake with special attention to a reduction in saturated fat, because the largest public health gain was expected from such a reduction.<sup>3</sup> This advice resulted in a nationwide campaign aimed at reducing fat intake among the general Dutch population, called "Fat Watch."<sup>5,6</sup>

A major difference between dietary fat intake and other behaviors associated with chronic disease, such as smoking, is that individuals are often unaware of their dietary risk behavior. Dietary behavior is very complex. It involves, for example, choosing a variety of food items in different quantities and combinations that can be prepared in various ways. Dietary fat intake cannot be avoided completely and dietary fat is often hard to recognize in food items.<sup>7</sup> Dutch research revealed that less than 20% of the Dutch population rate their own diet as high in fat and less than 10% rate their own dietary fat consumption as *too* high.<sup>4,8,9</sup> This is in sharp contrast to results of nationwide food consumption research in The Netherlands.<sup>4</sup>

The primary purpose of this study was to estimate the strength of the association of awareness of one's own dietary fat intake with the intention to reduce dietary intake of fat. It was hypothesized that a majority of the study population

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would be unrealistic about their dietary fat intake. Frequent underestimation of dietary fat intake was expected. Furthermore, it was expected that unrealistic self-rating of fat intake would be more prevalent among men than among women, because in The Netherlands women are most often responsible for purchasing food items and preparing meals and have shown more interest in nutrition education activities in the past.<sup>8</sup>

Lack of awareness could be a major barrier to changing dietary behavior through healthy diet promotion interventions. Awareness of the relationship between behavior (diet) and outcome (health) may also be important, especially in earlier stages of (dietary) behavior change.<sup>7,9</sup> But awareness of performing the risk behavior itself could also be important in a complex behavior such as dietary behavior. Subjects who underestimate their dietary risk behavior, that is, who mistakenly rate their personal diet as low in fat, are not likely to intend to change their diet towards less fat. Therefore, the second hypothesis in this study was that self-rated dietary fat intake is more likely to be associated with intention to change than is objectively assessed dietary fat intake.

Furthermore, it is proposed that for subjects who have a biased image of their own dietary intake, psychosocial factors that may be related to dietary behavior are in fact associated with self-rated dietary behavior. Therefore, the third hypothesis was that correlations of selected psychosocial factors with self-rated dietary fat intake will be stronger than correlations with objectively assessed dietary intake. It was expected that these hypothesized differences in associations would be strongest among subjects who are unaware of their dietary fat intake.

## METHODS

**Subjects.** In order to test these hypotheses, data collected for the baseline measurement of the Healthy Bergeyk Project were analyzed. The Healthy Bergeyk Project was a community-based cancer prevention intervention project. The project aimed to reduce the prevalence of four cancer-related risk behaviors (high fat consumption, smoking, high alcohol intake, use of solarium) among the population of Bergeyk, a small municipality in the south of The Netherlands. More information on the intervention and the evaluation study has been reported elsewhere.<sup>10</sup> For the evaluation study, an experimental and a control community were randomly selected from municipalities in the south of The Netherlands with approximately 10,000 inhabitants. From both communities, a random sample of 1000 adults was selected. Response to the baseline survey was 75.3% ( $n = 1507$ ).

**Theoretically based concepts.** The Healthy Bergeyk Project was based on a number of theoretical models, such

as the theory of planned behavior<sup>11,12</sup> and social learning theory.<sup>13</sup> According to these models, three determinants of dietary behavior can be distinguished: attitude, social influence, and self-efficacy.<sup>11,14</sup> These determinants are expected to have a direct influence on behavioral intention. External variables, such as sociodemographic factors, are expected to influence behavior through the behavioral determinants and intention. A person's attitude towards a specific dietary behavior is determined by comparing relevant pros and cons of the expected consequences of the specific behavior. Social influence consists of two components: direct and indirect social influence. Direct influence is the perceived expectations of others. Indirect social influence, or modeling, appears when the behavior of others is taken as an example.<sup>13</sup> Self-efficacy refers to a person's expectations regarding his or her capability to realize a (desired) behavior. Self-efficacy is partly dependent on a person's abilities to perform a behavior and on barriers that stand in the way of performing the behavior.<sup>13,14</sup> Finally, the behavior, or trying to perform the behavior, will lead to feedback that may, in turn, influence the determinants.<sup>15</sup>

**Measures.** Data for the evaluation study of the Healthy Bergeyk Project were collected by means of telephone interviews. The study population consisted of 1507 subjects, 751 women and 756 men. For the present analysis, self-reported fat intake (objectively assessed fat intake), self-rated fat intake, intention to reduce dietary fat intake, and psychosocial determinants of dietary fat intake were analyzed.

Objectively assessed fat intake was assessed by means of a validated 25-item food-frequency questionnaire.<sup>16</sup> The validity of this questionnaire, assessed in relation to 7-day diet records, was considered sufficient and comparable to the validity of other often-used food-frequency questionnaires.<sup>16</sup> With a short food-frequency questionnaire, or with any other kind of self-report, it is impossible to measure "true" dietary fat intake. Nevertheless, measuring fat consumption with a short food-frequency questionnaire is generally recognized as a practical and acceptable way to assess food consumption in large population studies.<sup>17</sup> The food frequency used in the present study permits a fat consumption score to be calculated, ranging from 12 to 60. Based on this score, subjects can be ranked according to dietary fat intake and changes in fat intake can be measured; however, it is not possible to express dietary fat intake in grams of fat or in percentage of total calories. Therefore, no absolute comparisons between fat scores and dietary recommendations can be made. For the first and second hypotheses of the present study, subjects were divided in tertiles for objectively assessed dietary fat intake. The tertiles were defined as low-, intermediate-, or high-fat diets. Self-rated dietary fat intake (subjective fat intake) was measured by asking respondents to evaluate their fat intake on a bipolar five-point scale (very low in fat to very high in fat). For studying the first and second hypotheses, the subjective fat

intake variable was recoded into three categories (high, intermediate, and low fat). For the present study, an awareness variable was created as follows (Fig. 1): Subjects were classified as realistic when their subjective dietary fat intake was in the same tertile as their objectively assessed fat intake. Subjects were classified as optimistic when they underestimated dietary fat intake as compared to objectively assessed fat intake and as pessimistic when subjective intake was higher than objectively assessed intake.

Psychosocial determinants of dietary fat consumption were measured by means of a questionnaire specially developed for the Healthy Bergeyk study using a combination of qualitative and quantitative techniques. Information on the development of the psychosocial determinants questionnaire has been reported elsewhere.<sup>10,18,19</sup> Two attitude constructs were measured. First, "sum of beliefs" was measured by means of five items based on the expectancy-value model of attitude.<sup>11</sup> Respondents were asked to evaluate the five most salient beliefs (taste, skin problems, growing fat, digestive problems, heart disease risk) in relation to choosing high-fat diets on a bipolar five-point scale (-2/+2, 3 items) or on a unipolar three-point scale (0/2, 2 items). Further, "direct attitude" was measured by means of two items in which respondents were asked to rate high-fat diets on a bipolar, five-point (-2/2), good-bad scale and a pleasant-unpleasant scale. Direct social influence was measured by means of four items asking the respondents to indicate to what extent important others (partner, close relatives, colleagues, and friends) encourage them to use low-fat diets, on unipolar four-point scales (-3/0). Indirect social influence (modeling) was measured by asking the respondents to assess the level of fat consumption of the same significant others, on unipolar, five-point scales (0/4). Self-efficacy was measured by two items asking the respondents to indicate, on a bipolar, five-point scale, how difficult they think they would find refusing high-fat food items in certain "high-risk" situations (during weekends, at parties). All variables were coded so that high positive scores indicated positive

determinants of high-fat diets. Intention was measured by asking respondents to what extent they intended to reduce their fat intake in the next month, on a unipolar, four-point scale.

**Statistical analysis.** Chi-square tests were performed to test for differences in proportions between men and women having the intention to reduce dietary fat intake and being optimistic, realistic, or pessimistic in relation to dietary fat intake. Analysis of variance was used to detect differences between men and women in objective and subjective dietary behavior and psychosocial determinants.

Univariate and multiple logistic regression were used, with intention to reduce dietary fat consumption as the dependent variable and self-rated dietary intake and objectively assessed fat intake as independent variables, in order to identify the strongest correlates of intention to reduce dietary fat intake. Subjects were divided in tertiles for the independent variables for the logistic regression analyses. Finally, univariate and multivariate regression analysis was used to study correlations of behavioral determinants related to fat intake with objectively assessed fat intake and with subjective dietary fat intake.

Regression and logistic regression analyses were done separately for men and women. All analyses were performed using the SPSSx statistical package.<sup>20</sup>

## RESULTS

**Hypothesis 1.** A majority (55%) of the respondents proved to be unrealistic about their dietary fat intake. A large proportion (76%) of these unrealistic subjects underestimated their dietary fat intake.

Results on mean objectively assessed fat intake scores and psychosocial determinants of dietary fat intake are presented in Table 1. Mean fat score was 29.3 and 25.7 among men and women, respectively. Men had a higher mean dietary

		Objectively assessed fat intake			
		Low	Intermediate	High	
Subjective dietary fat intake	Realistic	Realistic	Optimistic	Optimistic	Low
	Pessimistic	Pessimistic	Realistic	Optimistic	Intermediate
	Pessimistic	Pessimistic	Pessimistic	Realistic	High

Figure 1. Different categories of awareness of dietary fat intake.

**Table 1.** Range and means (SD) for objective dietary fat intake and psychosocial determinants of dietary fat intake among men and women.

Variable	Range	Mean	
		Men (n = 756)	Women (n = 751)
Objective fat intake	(12 to 60)	29.3 (5.9)	25.7 (5.4)*
Sum of beliefs	(-10 to 4)	-0.68 (3.4)	-2.8 (3.5)*
Direct attitude	(-4 to 4)	-0.82 (2.5)	-2.01 (2.2)*
Self-efficacy	(-4 to 4)	-1.5 (2.7)	-1.8 (2.6)*
Social influence	(-12 to 0)	-1.6 (2.1)	-1.4 (2.2)*
Modeling	(0 to 16)	5.1 (3.4)	4.7 (3.5)

\*Significant difference between men and women ( $p < .05$ ).

fat intake and, in general, reported more positive determinants toward high-fat diets compared to women.

Proportions of men and women who rated their dietary fat intake as high and in the different awareness categories and the proportions of men and women who had the intention to reduce dietary fat intake are presented in Table 2.

The percentage of subjects who rated their own dietary fat intake as high was 21.4% among men and 10.1% among women, with the difference being statistically significant. A significantly larger proportion of men were optimistic regarding dietary fat intake than were women, 47% vs 37%, respectively. Women were significantly more often realistic about their dietary fat intake. No significant difference between men and women was found in the proportion of pessimistic subjects. Among men, 9.7% had the intention to reduce their dietary fat intake, and significantly more women (16.1%) had this intention. Pearson correlation between objectively assessed fat intake and self-rated dietary intake was 0.30 and 0.37 among men and women, respectively, both correlations being statistically significant.

**Table 2.** Proportions of men and women with high, self-rated dietary fat intake, intention to reduce fat intake, and with optimistic, pessimistic, and realistic self-rated dietary fat intake.

	(%) Men (n = 756)	(%) Women (n = 751)
High subjective fat intake	21.4	10.1*
Intention to reduce fat intake	9.7	16.1*
Optimistic	46.6	36.5*
Realistic	41.0	49.5*
Pessimistic	12.4	14.0

\*Significant difference between men and women ( $p < 0.05$ ).

**Hypothesis 2.** Results of univariate and multiple logistic regression analyses are presented in Table 3. Because of the differences between men and women in objectively assessed dietary fat intake and subjective dietary fat intake (both were higher for men), and in intention to reduce fat intake (higher for women), these analyses were done separately for men and women. For women, self-rated dietary fat intake was a relatively strong predictor of intention to reduce dietary fat intake (OR = 2.4). Objectively assessed fat intake was inversely associated with intention (OR = 0.7) among women, but this association was not statistically significant. In the multiple logistic regression with subjective and objectively assessed fat intake as independent variables, the association of subjective fat intake with intention was somewhat stronger among women (OR = 3.0). Among men, neither self-rated dietary fat intake (OR = 0.8) nor objectively assessed fat intake (OR = 0.7) was significantly associated with intention to reduce dietary fat intake.

**Hypothesis 3.** In Table 4, correlations between determinants and both objectively assessed and subjective dietary behavior are presented. All correlations are statistically significant. The dietary behavior determinant model explained 34% of the variance in self-rated dietary fat intake. The explained variance in objectively assessed dietary fat intake was 15%. The correlations of psychosocial determinants, except for self-efficacy, are significantly stronger with subjective fat intake than with objectively assessed fat intake.

In Table 5, Pearson correlations between determinants and both objectively assessed and subjective dietary fat intake are presented for subjects who are unrealistic about their fat intake. The correlations with subjective dietary fat intake are still highly significant. For objectively assessed intake, only the correlations with self-efficacy and direct

**Table 3.** Odds ratios and confidence intervals for subjective and objectively assessed fat intake as predictors of intention to reduce dietary fat intake within the next month, among women and men, in univariate and multiple logistic regression analysis.

	Univariate		Multiple	
	OR	95% CI	OR	95% CI
Women (n = 751)				
Subjective fat intake	2.4	1.4-4.8	3.0	1.6-5.3
Objectively assessed fat intake	0.7	0.4-4.2	0.7	0.5-1.0
Men (n = 756)				
Subjective fat intake	0.8	0.4-1.6	0.9	0.4-1.7
Objectively assessed fat intake	0.7	0.4-1.2	0.9	0.6-1.2

OR = odds ratios; CI = confidence intervals.

**Table 4.** Pearson correlations between psychosocial determinants and objectively assessed and subjective fat intake (n = 1507).

Variable (Range)	Fat Intake	
	Objectively Assessed (12 to 60)	Subjective (-2 to 2)
Sum of beliefs (-10 to 4)	.31**	.47**†
Direct attitude (-4 to 4)	.33**	.47**†
Self-efficacy (-4 to 4)	.22**	.24**
Social influence (-12 to 0)	.06*	.14**†
Modeling (0 to 16)	.21**	.40**†

\*Significant correlation;  $p < .05$ .\*\*Significant correlation;  $p < .01$ .†Significant difference between correlation with objectively assessed fat intake and subjective fat intake;  $p < .001$ .

attitude are statistically significant at the .05 level. The model explained 22% of variance in subjective dietary fat intake and only 2% of variance in objectively assessed intake of fat.

## DISCUSSION

Although food consumption research has shown that approximately 80% of the Dutch adult population has a diet that is too high in fat compared to dietary recommendations, only a relatively small percentage of the respondents in this study rated their own diets as high in fat. These data indicate that underestimation of dietary fat intake is highly prevalent in The Netherlands. Indications that Dutch subjects underestimate their fat intake have been found before.<sup>5,6,8</sup> Correlations between actual dietary fat intake and self-rated dietary fat intake were rather low and comparable to those found in US research.<sup>21</sup> The biased self-rating of dietary fat intake among the Dutch population could be caused by lack of knowledge about fat contents of food items. In particular, the so-called "hidden fats" in foods such as pastries, snacks, and fast food are often hard to recognize for subjects without extensive nutrition education.

We hypothesized that the lack of awareness could be a major barrier in interventions aimed at reducing dietary fat intake. This study supports that hypothesis, but only among women. Female subjects who rate their personal fat intake as high were more likely to intend to reduce their fat intake than female subjects who thought their fat intake was low.

Providing objective information about individual dietary fat intake might bring about a more realistic estimation of dietary fat intake among Dutch subjects. Based on results presented in this paper, it can be argued that this kind of individualized dietary feedback might result in a larger

proportion of female subjects with a high fat intake being motivated to reduce their dietary fat intake. General information about high fat consumption is not likely to be effective. Previous research showed that a large majority of the Dutch population is convinced that the general Dutch diet is too high in fat;<sup>8</sup> however, they do not think that they are eating too much fat themselves.

In this study, male subjects who rate their fat intake as high are not more likely to intend to reduce their fat intake. Male subjects have more positive feelings toward high-fat diets than women. For men, nutrition education should be focused on changing these determinants first. However, men are even more unrealistic about their dietary fat intake than women. Therefore, personalized feedback on dietary fat intake might be an additional healthy nutrition education strategy for men.

In the study described here, psychosocial determinants of dietary fat intake were measured, and associations between these determinants and objectively assessed behavior and self-rated behavior were assessed. The associations with self-rated behavior were quite strong and always significant. Associations of behavioral determinants with actual behavior were much weaker. Among the group of unrealistic subjects, determinants of high fat intake explained only 2% of actual dietary fat intake. Should this finding be reproduced in other studies, it will have serious consequences for psychosocial nutrition research. In nutrition education evaluation studies, positive intervention effects on attitudes and other psychosocial determinants of nutrition behavior are often found. This is seen as a successful outcome, or at least as a first step toward dietary behavior change. However, the present study suggests that only determinants of *subjective* dietary behavior might be changed. When, as in the Dutch situation, a large proportion of subjects tend to

**Table 5.** Pearson correlations between psychosocial determinants and objectively assessed and subjective fat intake among subjects who are unrealistic about their dietary fat intake (n = 802).

Variable (Range)	Fat Intake	
	Objectively Assessed (12 to 60)	Subjective (-2 to 2)
Sum beliefs (-10 to 4)	.04	.38**†
Direct attitude (-4 to 4)	.08*	.37**†
Self-efficacy (-4 to 4)	.09*	.12**
Social influence (-12 to 0)	-.03	.13**†
Modeling (0 to 16)	.001	.34**†

\*Significant correlation;  $p < .05$ .\*\*Significant correlation;  $p < .01$ .†Significant difference between correlation with objectively assessed fat intake and subjective fat intake;  $p < .001$ .

underestimate their personal fat intake, positive views toward low-fat diets will not imply a positive prerequisite for a reduction in dietary fat consumption.

This study is based on data gathered in The Netherlands. Because associations between objective and subjective dietary intake in the US are likely to be of the same magnitude as found in this study, there are indications that the awareness problem might be apparent in the US as well.<sup>21</sup> Further, Dutch-US collaborative analyses will be conducted in order to study whether the situation in the US is similar to that in The Netherlands.

## CONCLUSIONS

It can be concluded that only a minority of the study population has a realistic view of their own dietary fat intake. This result is confirmed by previous studies in The Netherlands.<sup>8</sup> Improving dietary fat intake awareness should be given priority as a first step in nutrition education interventions in The Netherlands. This could improve the effectiveness of nutrition education aimed at reducing dietary fat consumption, because subjects who are aware of their high fat intake might be more likely to be willing to pay attention to information on reducing fat intake.

The lack of association found between psychosocial determinants of fat intake and objectively assessed fat intake shows that what are normally considered as psychosocial determinants of dietary behavior are more likely determinants of what subjects think that their dietary behavior is like.

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