

# An Epidemiologic Study of Food Consumption Habits in Germany

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Food consumption habits were studied in subgroups of subjects in the German Nutrition Survey (Nationale Verzehrstudie [NVS]) on the basis of body weight. Our study was performed in an 18- to 88-year-old representative subgroup of 2,006 noninstitutionalized volunteers with no significant pathology (known as the Verbundstudie, Ernährungserhebung, und Risikofaktorenanalytik [VERA] subgroup). Using the German Food Code, food and nutrient intakes were calculated from 7-day dietary records. A stratification analysis was used to determine significant differences in food consumption habits of overweight subjects in comparison to normal-weight subjects. The results showed an increase in the prevalence of overweight (body mass index [BMI], 25 to 30) with age, from 15% in the group aged 18 to 24 years to 50% in the group aged more than 55 years. The prevalence of severe overweight (BMI, 30 to 40) increased from 3% to 17% in the same age groups, whereas morbid obesity (BMI, >40) was found in only 0.4% of the study population. The calculated daily energy intake showed only a very weak correlation with BMI, probably because individual energy requirements and expenditures were not taken into account. However, differences were found between BMI subgroups in terms of the types of food consumed: a high BMI was associated with a higher consumption of meat and meat products but a lower consumption of milk and dairy products and bread and other cereal-based foods. In terms of nutrients, a high BMI was associated with a higher intake of fat and protein and a lower intake of carbohydrates. Snack consumption was observed in 78% of the study population. On average, 8.7% of consumed calories originated from snacks, and 5.5% of the study population derived more than 20% of their total energy intake from snacks. Obese subjects with a high fat intake consumed more sugar than lean subjects with a similar high fat intake.

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**O**VERWEIGHT is one of the main health and nutrition concerns in industrialized countries. Obesity results from a chronic pattern of energy intake that exceeds energy requirements. Food eaten between meals (snacks) also contributes to caloric overnutrition. The prevalence of overweight increases dramatically with age. It would seem that weight gain in adult life is more a result of a decrease in energy expenditure than an increase in food intake, since food intake and consequently energy intake have usually been shown to decline with age.<sup>1</sup> This report focuses on some nutritional aspects of overweight in Germany. Epidemiologic data from the German Nutrition Survey (Nationale Verzehrstudie [NVS]) were used to determine characteristic differences in food consumption habits of obese and lean subjects, taking into account the limitations inherent in dietary recording.

## MATERIALS AND METHODS

The NVS<sup>2</sup> was a cross-sectional descriptive survey conducted before the reunification of Germany from 1985 to 1988, among a population of nearly 25,000 subjects with no significant pathology, of all age groups, and from all regions of West Germany. This random sample was representative of the noninstitutionalized population in West Germany. All participants had to answer a questionnaire about diet, medical history, and life-style characteristics.<sup>3</sup> Subjects with acute or chronic diseases were excluded from the study. Food and nutrient intakes were calculated on the basis of the German Food Code as mean values from 7-day dietary records.

From 1987 to 1989, additional anthropometric and clinical parameters were obtained in a subgroup—called the VERA (Verbundstudie, Ernährungserhebung, und Risikofaktorenanaly-

tik) subgroup—of the overall NVS sample.<sup>4</sup> The VERA subgroup of 2,006 subjects was likewise representative of the whole West German adult population. The field work was planned and performed by the GfK in Nürnberg.

Evaluation of food consumption habits was based on data from 7-day dietary records of the VERA subgroup. As opposed to the investigator-measured anthropometric data of the VERA study, the NVS survey was based on self-measured anthropometric data, which have been shown to be a source of substantial bias in the calculation of body mass index (BMI) values.<sup>5</sup> For this reason, conclusions in this report are based exclusively on the more reliable data from the much smaller VERA subgroup. A stratification analysis was used to determine significant differences in food consumption habits of overweight subjects in comparison to normal-weight subjects.

## RESULTS AND DISCUSSION

Obesity is one of the main health concerns in Germany, as in other industrialized countries. The prevalence of overweight (BMI, 25 to 30) increased from 15% in the youngest age group (18 to 24 years) to 50% in the over-55 age group. The prevalence of severe overweight (BMI, 30 to 40) increased from 3% to 17%, respectively, in the same age groups, and morbid obesity was found in 0.4% of the study population. The proportion of overweight subjects was lower for smokers than for nonsmokers or former smokers.

A median energy intake of 2,787 kcal/d for men and 2,120 for women was calculated from 7-day dietary records. The frequency distribution showed that a substantial proportion of subjects reported an energy intake that was less than their basal metabolic rate. However, it must be remembered that dietary records are often unreliable as a tool for estimating food and nutrient intake.<sup>6</sup> Thus, underreporting and underrating often occur during cross-sectional studies, which results in underestimation of true energy and nutrient intake.<sup>7</sup> Moreover, data from short-term nutritional records always have flatter and wider frequency distributions than would be shown with the true intake.<sup>8</sup>

Therefore, absolute food and nutrient intake data require careful interpretation and discussion. Besides, the

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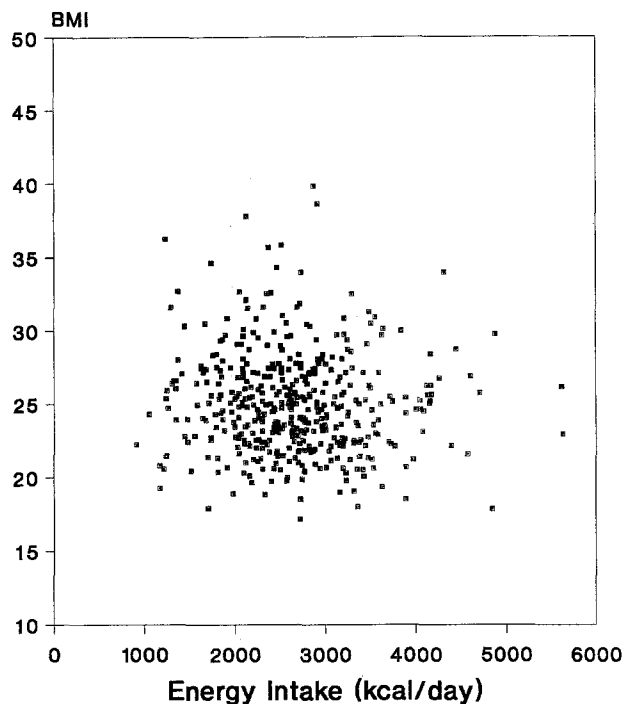


Fig 1. Energy intake and BMI (men aged 25 to 50 years). VERA study (1987/88).

present study design has only allowed the description of associations that exist between two or more parameters, which excludes any causal interpretation of such associations. Comparisons of relative data (eg, percentage of energy from different nutrients) seem to be less influenced by confounding factors or biases.

Calculated daily energy intakes showed only a weak correlation with BMI values (Fig 1), probably because

individual energy requirements and expenditures were not taken into account, and it is difficult to estimate the true and long-term individual energy intake. Age, body weight, cigarette smoking, genetic predisposition, and previous illness showed significant interactions. Figure 1 shows that obese subjects did not appear to have a higher energy intake as compared with lean subjects. Evidence from numerous studies overwhelmingly suggests that obesity is the consequence of a chronic pattern of long-term energy intake that exceeds the individual's energy requirements. Obesity is therefore a problem of energy imbalance.

A solely bivariate analysis of food consumption data might result in an insufficient interpretation of the data. A stratification analysis of energy intake by sex, age, and smoking status indicated a lower energy intake in nonsmoking obese subjects than in nonsmoking lean subjects (Fig 2). This observation is consistent with many reports in the literature.<sup>1</sup> However, in cross-sectional studies, the accuracy of energy estimates may be lower in obese individuals. In this study, an overall decrease in energy intake with increasing age, more notable in men than in women, was observed. Since there is a parallel decrease in basal metabolic rate with increasing age, the increase in body weight and body fat mass with age observed in our study should not be attributed to an increase in food intake, but rather to a relative increase in energy balance that results from a reduction in energy expenditure. However, direct observation tends to support the hypothesis that obese subjects do eat more food and eat more rapidly than normal-weight subjects.

Despite the reduced caloric intake in overweight subjects, a positive association between BMI and fat intake was observed in male and female smokers and nonsmokers in most age groups (Fig 3). In addition, a positive association seems to exist between BMI and energy intake from

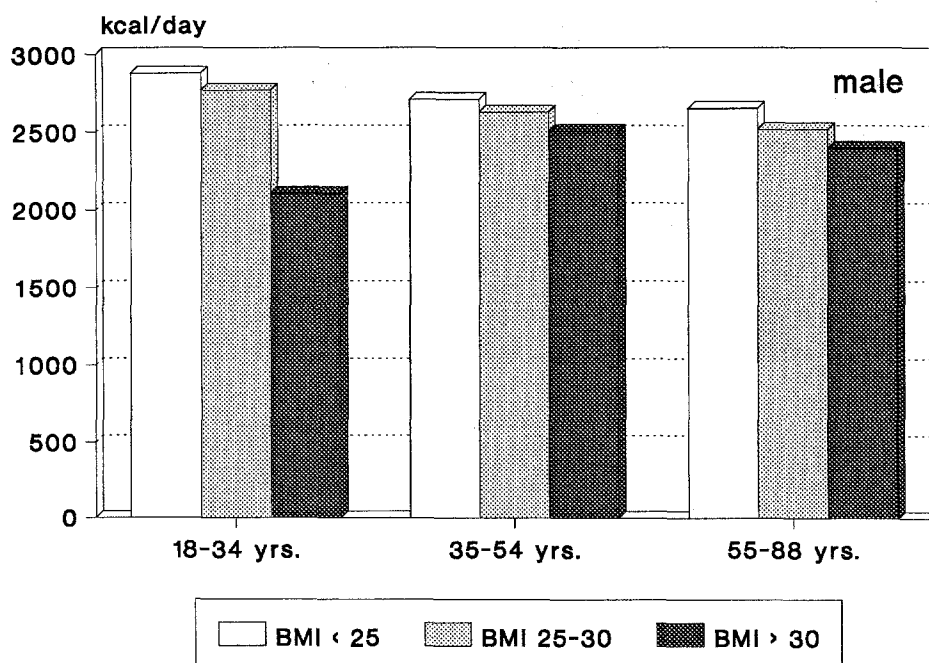


Fig 2. Energy intake by sex, age, and BMI (men, nonsmokers). VERA study (1987/88). (□) BMI < 25; (▨) BMI 25 to 30; (■) BMI > 30.

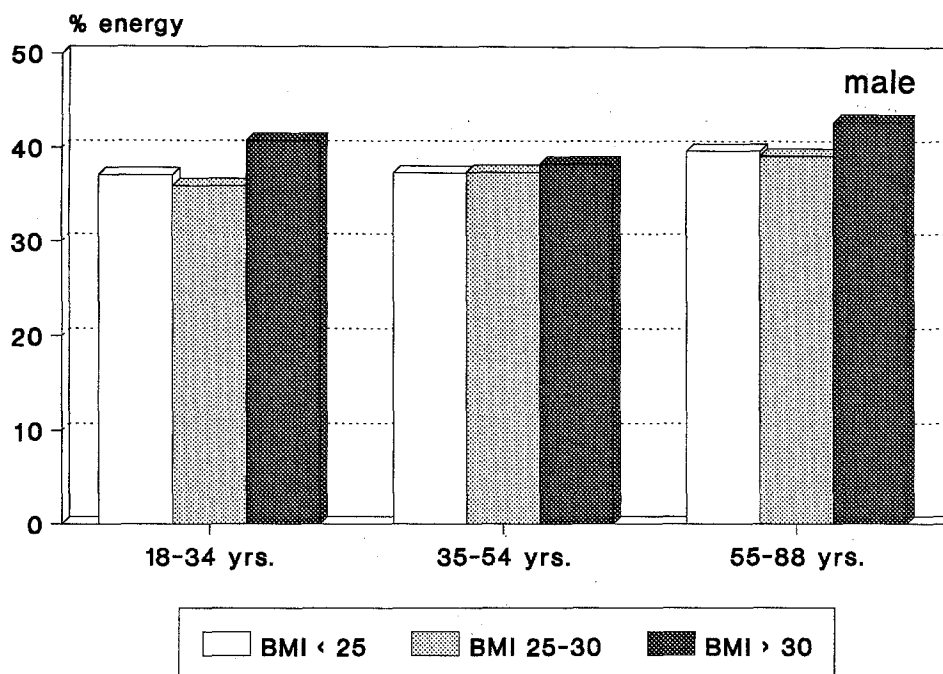


Fig 3. Fat intake by sex, age, and BMI (men, nonsmokers). VERA study (1987/88).

protein. A negative association was observed between BMI and energy intake from carbohydrates (Fig 4), as opposed to fat and protein.

Regarding the types of food consumed, substantial differences were demonstrated between lean and obese subjects: the higher the BMI, the higher the consumption of meat products and the lower the consumption of milk and dairy products, sugar, bread, and other starchy foods such as pasta (Fig 5).

However, no further conclusions can be drawn from total

food, nutrient, and energy intake alone, which makes it difficult to recognize significant associations. Therefore, more detailed analyses were performed on the basis of several classic hypotheses. One such hypothesis states that snack consumption might play an important role in the development of obesity. To see whether this was true in our study population, energy intake from snacks was estimated from 7-day dietary records. Seventy-eight percent of the study population was found to have consumed snacks (defined as sweet and savory foods eaten between main

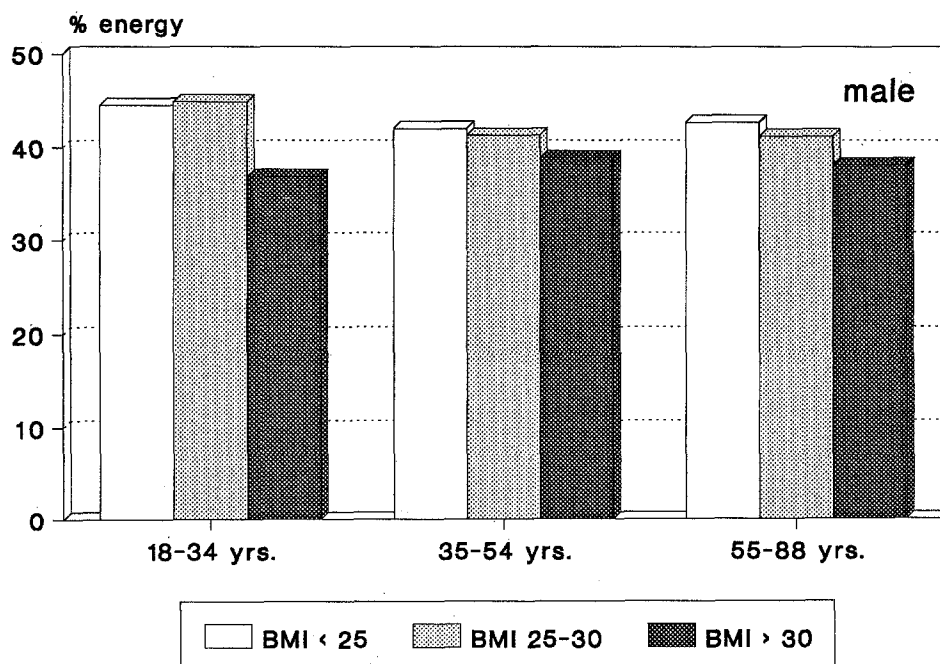


Fig 4. Carbohydrate intake by sex, age, and BMI (men, nonsmokers). VERA study (1987/88).

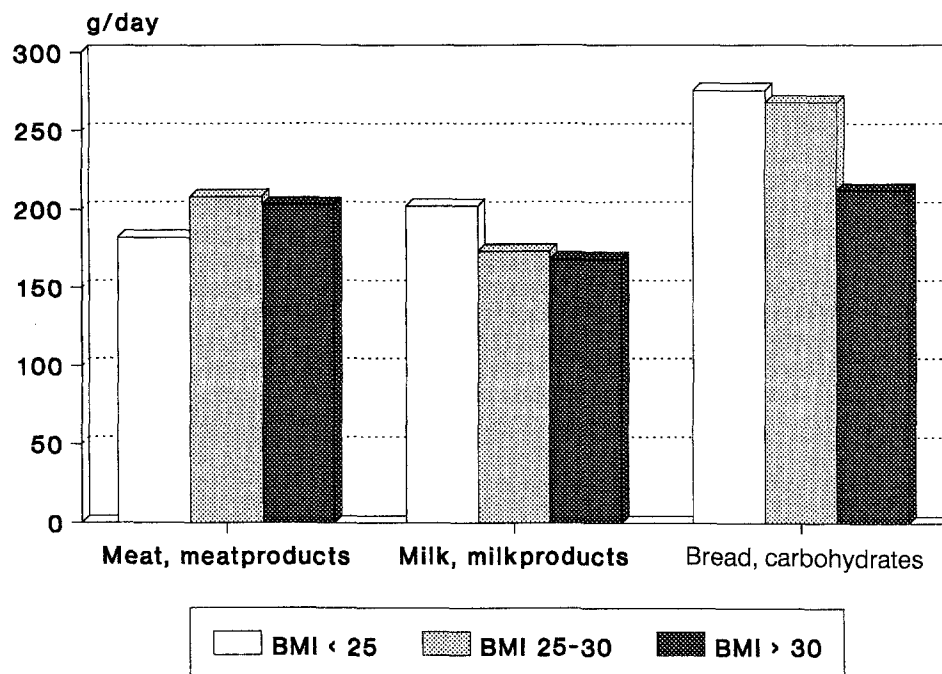


Fig 5. Intake of selected food groups by sex, age, and BMI (men, nonsmokers). VERA study (1987/88).

meals) during the 1-week observation period. Snacks contributed to 8.7% of total calories consumed, and 5.5% of snackers derived more than 20% of their total energy intake from snacks. Most snackers showed a marked preference for sweet snacks. However, since consumption of snacks was greatest in younger subjects, ie, those in whom the prevalence of overweight was still relatively low, it was impossible on the basis of this purely descriptive study to

confirm the postulated relationship between snack intake and overweight.

According to another hypothesis, obese people consume too much fat and sugar. To test this hypothesis, total daily intakes of fat, monosaccharides, and disaccharides were calculated and dichotomized (to show above- and below-mean intakes). This calculation showed that in both sexes the proportion of subjects with above-the-mean fat and sugar intakes was higher in high-BMI subgroups (80% in men, 78% in women) than in low-BMI subgroups (65% in men, 68% in women) (Table 1).

Table 1. Proportion of Subjects With a Fat and Sugar Intake Above Average Values for the Population: Stratification Analysis by Sex and BMI

	BMI		
	≤ 25	25-30	> 30
Men (%)	65	67	80
Women (%)	68	66	78

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