Commentary

Nutrition and Health in France: Dissecting a Paradox

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For many decades now, scientists have wondered about the "French paradox." Despite a high intake of dietary fats (35% to 40% of daily energy), cardiovascular mortality in France appears surprisingly low compared with the other developed countries of Europe and the United States. Many hypotheses have been proposed to account for this phenomenon (see Czernichow and colleagues [1] in this issue for a partial review). A popular theory involves one important aspect of the traditional diet in France (ie, the daily intake of red wine in a large proportion of French adults). More generally, what has been described as the "Mediterranean diet" (some wine, plenty of vegetable oils, fruits, vegetables, fish, and relatively little saturated fat) has been presented as one crucial factor contributing to cardiovascular health not only in France, but also in other Southern European areas, such as Crete. Such hypotheses have generated a host of excellent research, leading to the notion that the type of fat in the diet is just as important as the total amount of fat (1), and that moderate intake of wine does have beneficial health effects (2), even though the definition of "moderate" is subject to debate.

In addition to the generally favorable rate of cardiovascular diseases, other interesting aspects of public health in France merit attention. France has the longest life expectancy in the Western world (second only to Japan among developed countries). Prevalence of obesity and overweight is relatively low. In French adults, the frequency of obesity (body mass index >30 [calculated as kg/m^2]) in adults was 11.3% in 2003 (3). Overweight (body mass index between 25 and 30) was present in 41.6% of adults (3). These figures are lower than those of many developed countries, particularly those of the United States. A popular best-selling book in America holds that French women do not get fat. Unfortunately, this assertion is not entirely true, but it is worthwhile to investigate why the French are not as fat as you might expect them to be, given the culturally transmitted inclination for rich eating and drinking.

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One important aspect to understand is that nutrition and health risks are not the same across all of France. Although France is a small geographical area, there is great variability between different regions. Traditional diets are extremely different between the North and the South (the actual Mediterranean region), and between the East and the West. Tourists know well that a trip to Alsace is completely different, gastronomically speaking, from a trip to Brittany or Provence. The contrast between Normandy and Corsica is immense, certainly much greater than that between New Jersey and California. Local food and drink specialties are endless, even today, after a few decades of globalization have started to spread more uniform eating choices and habits. Local differences remain in the diet content, in parallel with gradients of health risk (1). France appears to replicate Europe on a smaller scale, with people who love butter and beer in the North, and people who prefer olive oil and wine in the South. These local dietary habits translate, in a very logical fashion, to higher cardiovascular risk in the North and lower risk in the South. So, within France, there really is not as much of a paradox between diet and cardiovascular risk as there may seem to be.

WHAT DO THE FRENCH EAT? DO THEY REALLY FOLLOW RECOMMENDATIONS?

Several large-scale epidemiological studies have examined the content of the habitual diet in several regions of France. Czernichow and colleagues (1) present some of the results of the Suppléments en Vitamines et Minéraux Antioxydants (SUVIMAX) longitudinal study. Its dietary results are derived from repeated 24-hour recalls over a period of 18 months. This repeated-measures design, including reports for every day of the week and every season of the year by the same individuals, provides very complete information about food choices in various regions of the country, but in a limited age range. Other national studies have used 1-day or 1-week recalls in representative populations of children, adolescents, and adults (4-6).

The SUVIMAX study started in 1995 and followed a cohort of 12,741 middle-aged men and women (35 to 60 years old) over 8 years (7). The main objective of the study was to establish whether a daily supplement of antioxidant vitamins and minerals, randomly administered to half of the population, would exert any impact on the incidence of cancer and coronary heart disease mortality. Numerous anthropometric, biochemical, and other parameters were followed in the cohort. In particular, the participants reported their 24-hour intake of foods and drinks once every other month. The very sophisticated

method for obtaining valid self-reports has been described in earlier publications, and several articles have presented the dietary data and their changes over time (8,9). The SUVIMAX population is composed of mature individuals who volunteered for long-term participation in a very demanding study about health and nutrition. In addition, the participants have a higher level of education than the general population. For all these reasons, the SUVIMAX respondents might have a greater awareness of the importance of good nutrition, and their diet might be better than that of less-educated, less-motivated groups.

In the SUVIMAX population, the daily energy intake observed in 1995 was about 1,900 kcal in women and 2,500 kcal in men (8). Total daily energy intake has decreased linearly since the beginning of the study, not only when considering the same subjects longitudinally, but also when comparing same-age groups over time. This decrease in energy intake parallels a decrease in total fat. In 2001-2002, the percentage of participants who ingested <35% of their daily energy as fat had increased dramatically, in comparison with 1995-1996 (52.1% of women and 69.2% of men in 2001-2002, vs 19.4% and 34.1%, respectively, in 1995-1996). However, the nature of fats did not change over the study period and saturated fats represented 40% to 41% of total fats in both men and women (8). The intake of carbohydrates increased over time, particularly intake of simple carbohydrates (8). Fiber (about 22 g/day in men and 18 g in women), protein (16% to 18% of total energy), and alcohol (about 9% of daily energy in men, and 4% to 5% in women) intake appeared constant between 1995 and 2002 (8).

In terms of micronutrients, while the majority of participants had adequate dietary inputs, the percentages of individuals whose intake was below two thirds of the recommended values increased for vitamins A, B-6, B-9, and E in both men and women and for iron in women (8). Although low levels of intake do not demonstrate actual deficiencies, participants with low intakes could be encouraged to consume the food sources of these crucial nutrients (eg, dairy products, eggs, fruits, vegetables, and legumes) in greater amounts.

Intake of fruits increased regularly over the course of the SUVIMAX study in both men (from 235 to about 250 g/day in 2001-2002) and women (from 217 to about 230 g/day in 2001-2002) (9). While intake of vegetables did increase over time in longitudinal comparisons of the same individuals, the comparison of same-age groups at different moments of the study indicated a decrease in vegetable intake. Over the time of the study, the percentage of participants ingesting the recommended five fruits or vegetables a day increased from 1995-1996 to 2001-2002 (14.6% to 22.5% in men; 17% to 27.5% in women) (9). Over time, the intake of cereal products, legumes, milk and dairy products, and alcohol remained stable (9). In contrast, intake of animal products (meats, fish, and eggs) decreased in both men and women, while consumption of added fats was dramatically reduced (25.6 g to 15.2 g/day in men and 20.3 to 12.8 g/day in women) (9). The article by Czernichow and colleagues (1) shows that the average national data actually mask large regional differences in the nature of added fats. In addition, it reveals that the level of education is critically associated with choice of added fats: more-educated people tended to use more fats of vegetable origin and less fat of animal origin. It should not be concluded from these two observations that, in France, educated people principally live on the warm and sunny Mediterranean border while the people of Normandy have low education levels and console themselves by eating the best butter and cream in the world (or maybe these are to be found in the province of Charente, which is on the Atlantic coast: the debate is still raging). Although many wealthy retirees in France do tend to move to the Mediterranean coast to enjoy the climate, it is obvious that the SUVIMAX population did include highly educated participants from all areas of the country. The SUVIMAX investigators should now tell us how independent or additive education level and area of residence are as factors determining food choices and health risks.

The striking dietary changes over time reported in the SUVIMAX participants were the large decrease in dietary fats and the increased proportions of people ingesting five fruits/vegetables a day. These changes clearly reflect nutritional recommendations made to the French public, suggesting that the efforts made by public health authorities had the desired impact in this rather well-educated, well-motivated, mature population. More remains to be done, as vegetable intake could be increased and the proportion of saturated fats could be decreased in this same population. As proposed by Darmon and colleagues (10), emphasizing the good nutrient density of vegetables per 100 kcal, or the good nutrient value for the money, could represent an interesting strategy to increase consumption.

Other national intake surveys provide complementary data about the French population. The Enquête Individuelle et Nationale sur les Consommations Alimentaires (INCA) study (4) was carried out in 1998-1999 and included 2,439 participants between 3 and 75 years of age. The survey method was a weekly food diary. The *Baromètre Santé Nutrition 2002* survey was realized in February-March 2002 in 3,153 people aged 12 to 75 years (5). Participants were asked by professional interviewers about their intake over the last 24 hours and their habitual intake over the last 15 days. Both surveys were carried out in representative national samples. The data provided by these surveys differ from those of SUVIMAX for many obvious methodological reasons (including selection of participants). They tend to indicate less-favorable intake patterns. For example, the *Baromètre Santé Nutrition 2002* (5) reported that only 10% of the population consumed at least five fruits/vegetables a day. They also confirmed regional variations, such as the INCA study's report of higher intake of fruits and vegetables, fiber, folates, and beta carotene in the South than in other regions.

The INCA study revealed that children (3 to 14 years old) ingested about 1,973 kcal/day in 1999, which represented a 7% increase as compared with the results of a comparable survey carried out in 1994 (6). The increase in energy intake was not associated with changes in the nutrient composition of the diet. In 1999, French children's daily energy was 15.5% protein, 47% carbohydrate, and 37.5% fat. The INCA data also revealed that 93% of