# Monitoring the obesity epidemic in France: the Obepi surveys 1997-2006

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## Abstract

The objective of the study is to describe the prevalences of obesity in French adults over a 9 year period. Mailed questionnaire surveys, in 1997, 2000, 2003 and 2006, sampled 20,000 representative French households by the method of quotas Weight, height and waist circumference were reported by all members of the selected households 18 years and older. Obesity was defined according to WHO criteria, BMI < 25 kg/m$^2$.

The prevalence of adult obesity increased progressively from 8.6 % (95% confidence interval: 8.2–8.8) in 1997 to 13.1 % (12.7–13.5) in 2006. The increase affected all ages, socio economic strata and regions. While the prevalence of obesity increased in parallel in men and women from 1997 to 2003, the rate of increase was lower in men between 2003 and 2006.

These surveys showed a sharp increase in the prevalence of obesity in France in recent years contrasting with a stable prevalence in the 1980s. The results of the first Obepi surveys prompted the French government to implement a Nutrition and Health National Plan in 2001. Regular monitoring of obesity prevalence in France and neighboring countries is needed to compare future trends.

**MESH Keywords** Adolescent ; Adult ; Aged ; Aged, 80 and over ; Body Height ; Body Mass Index ; Body Weight ; Disease Outbreaks ; Female ; France ; epidemiology ; Humans ; Male ; Middle Aged ; Obesity ; epidemiology ; Overweight ; epidemiology ; Prevalence ; Socioeconomic Factors ; Waist Circumference ; Young Adult

**Author Keywords** adults ; epidemiology ; prevalence ; socioeconomics ; obesity

## Introduction

Between 1980 and 1991(1), there was only a modest increase in the prevalence of obesity in French adults at the national level, which remained around 6.5 %. This contrasted with the trends documented in neighbouring countries such as the United Kingdom (2). A protective effect of the French lifestyle was hypothesised, with the pleasurable and social aspects of eating and the importance of food quality (3). Four surveys with the same methodology. in 1997, 2000, 2003, 2006, document the prevalences of obesity in France, on national representative samples.

## Research Methods and Procedures

### Subjects

At the four three yearly surveys, mailed questionnaires were sent by a polling institute, TNS-SOFRES, to a sample of 20,000 households. This sample is a permanent sample constituted on a voluntary basis to answer various questions. It is selected to be representative of the French population by quotas, based on the distributions of the closest national INSEE reference for age class, sex, occupational class, region and size of city of residence. Five hundred and fifty new households are incorporated each month into this permanent sample replacing 550 households withdrawn because of repeated non answers (75%), willingness of the participants (17%) or exceeding the 10-year lifetime limit in the sample (8%).

### Measures and definitions

All members of the households aged 15 years and older, were asked to measure their weight, height and waist circumference with the help of another household member whenever possible, before writing the measures on the questionnaire. Detailed illustrated instructions were provided to explain how to measure waist circumference and height. Height was measured against a wall, and the waist circumference, at the level of the umbilicus, both with a tape measure.

Weight and height were used to calculate the body mass index (BMI). Overweight and obesity were defined according to the WHO definitions (4) as, respectively, $25 \leq BMI < 30$ kg/m$^2$ and $BMI \geq 30$ kg/m$^2$. Obesity was further categorized into moderate ($30 \leq BMI < 35$ kg/m$^2$), severe ($35 \leq BMI < 40$ kg/m$^2$) and morbid ($BMI \geq 40$ kg/m$^2$). Net monthly household income per capita was computed as the net household income (reported data) divided by the weighted number of subjects in the household with weights of 1 for adults $\geq$ 18 years, 0.75 for adolescents (15–17 years) and 0.5 for children (< 15 years).

### Response rates

Of the 20,000 questionnaires sent, 73.4 %, 71.4 %, 69.6 % and 66.6 % were returned in 1997, 2000, 2003 and 2006 respectively. After exclusion of pregnant women, those aged under 18 years and people with outlying and missing data, BMI was available for respectively 26,595, 25,659, 24,402 and 22,374 individuals and waist circumference for 24,988, 22,990, 21,083 and 18,896 individuals.

### Statistics

Comparing subjects included in the analysis (responders with BMI available) with those not included (non-responders or responders but BMI not available) by Chi-square tests showed similar biases for each survey: a significant under-representation of subjects under 55 years, of farmers and of inhabitants of the Paris region and a significant overrepresentation of retired subjects (results not shown). To correct for these differences induced by non response, each sample was weighted using the Raking Adjusted Statistics method (5). Standard deviations took into account the increase in variance resulting from the weighting as proposed by Kish (6). Prevalences of overweight and obesity are given for each survey with 95 % confidence intervals.

# Results

### Prevalences of overweight and obesity

There was a progressive increase in the prevalence of obesity between 1997 and 2006 (Table 1). To analyse whether the changes in the structure of the French population over the 9 years could account for all or part of the observed increased in the prevalence of overweight and obesity, the 2000, 2003, and 2006 data were standardized to the 1997 population age-distribution. The results showed only minor changes, between the original prevalences and those standardized on the 1997 distribution: 10.0 % (95% CI: 9.6–10.4), 11.7 % (11.2–12.2), 12.9 % (12.4–13.4) in respectively 2000, 2003 and 2006.

### Changes in waist circumference

Parallel to the increase in obesity prevalence, there was an increase in the mean waist circumference. In the 1997, 2000, 2003 and 2006 surveys, the weighted means (95 % CIs) were for men: 91.2 (91.0–91.4), 92.4 (92.2–92.6), 93.3 (93.1–93.5) and 93.8 (93.5–94.1) cm, and for women 79.7 (79.5–79.9), 81.6 (81.4–81.8), 82.8 (82.6–83.0) and 84.2 (83.1–84.5) cm.

### Relationship between socio demographic factors and obesity

The prevalence of obesity was similar in men and women between 1997 and 2003, and increased between 1997 and 2003 in both sexes ( Table 1). Between 2003 and 2006, the prevalence of obesity continued to rise in women from 11.9 to 13.6 % (p < 0.05) but the increase was more modest in men from 12.0 % to 12.5 % which were not significantly different..

From 1997 to 2006, the prevalence of obesity increased in almost all age classes in both men and women (Table 1). The prevalence of overweight remained stable in most age-classes. An increase in the prevalence of obesity was observed even in households with high monthly incomes (Figure 1). The same conclusion was reached when the relationship was examined as income per capita (for example in the highest income per capita category, the prevalence increased from 7.6 % in 1997 to 11.4 % in 2006). An increase in the prevalence of obesity between 1997 and 2006 was also noted in all regions. For example, in the regions with the two extreme prevalences in 1997: in the Paris region it increased from 7.0 to 12.1 %, in the north of France from 13.7 to 19.1 %.

# Discussion

Previous estimates of the prevalence of obesity in France dated from the 1980s and showed stable prevalence of obesity in French adults aged 20 years and over: 6.4 % in men with a slight increase in women, from 6.3 to 7.0 % (1). The results of the Obepi surveys suggest a sharp acceleration of obesity prevalences in the 1990s in France. The increase seems to be slowing down, at least in men since 2003, but this trend awaits confirmation.

Some methodological limitations of the Obepi studies have to be acknowledged. The surveys were not based on random samples but on the permanent panel of a poll institute. There was a declining response rate from the first to the fourth survey. However, as the demographic characteristics of non responders remained similar over time, it should not affect our results on obesity prevalence. A second limitation arises from the fact that weight, height and waist circumference were reported and not measured by an investigator. To limit the reporting bias in the Obepi surveys, subjects were asked whereever possible to measure themselves with the aid of another household member, before reporting the anthropometric data. It is likely that this added constraint explains part of the non response. However, the underreporting bias may less affect the interpretation of the changes in the prevalence of obesity over time. Two other estimates of the prevalence of obesity in France come from the three regional French MONICA centers and were based on measured height and weight in 35–64 year-old subjects in 1985–88 and 1995–97 (7) and in French men (17–25 year-old) drafted for military service between 1985 and 1996 (8). These studies confirm the upward trends found in the Obepi studies in the 1990s. The pitfalls of the methodology of the Obepi surveys have to be weighted against its main advantages. The quota method often achieves actually a better representativity of the national population than random procedure. The low cost and simplicity of the procedure allow the study of large samples and therefore to closely follow rapidly changing situations.

The increase in the prevalence of obesity in France is close to that described recently in other western European countries. In most of these countries (7,9–13), an increase in the prevalence of obesity was documented in the past decade(s) with rates ranging from 0.2 % (Netherlands) to 0.9 % (UK) per year in recent years, in comparison to 0.6 % in France. The rate in the UK is similar to that in the USA, as estimated from the NHANES 1988–94 and 1999–2000 data (14).

The increase in obesity prevalence found in the Obepi studies was uniform over the country and across ages, regions and occupational classes. The prevalence of overweight, an intermediate category, was more stable because the percentage of subjects with BMI $<25$ kg/m$^2$ decreased over time in parallel with the increase in obesity prevalence. In Sweden, the increase in obesity prevalence between 1996/97 and 2000/01 was also noted whatever the age, educational level, smoking status, size of the city of residence, country of birth (12). The recent changes in our environment and way of life appear to outweigh the classical cultural and socioeconomic differences in obesity prevalence but do not erase them. The results according to socioeconomic status are however not consistent across countries. In the MONICA studies, between 1979–89 and 1989–96, an increase in the difference in mean BMI between subjects with the lowest and the highest educational level was documented in most centers, especially in women (15). In Switzerland, the increase was higher in men in the high occupational level group and in women in the low occupational level group (16). In the United States however, the disparity in the prevalence of obesity across socioeconomic classes has decreased over the period 1971–2000 (17).

Obesity prevalences in the elderly are reaching high levels. This may in part be due to a better survival of obese subjects as recently suggested (18). Obesity may no longer be associated with increased mortality rates in elderly obese subjects (19) and there is a debate on the risk and benefit of intentional weight loss in the elderly (18).

France and many other countries in the world have to face the increasing number of obese subjects, and an increasing number of subjects with obesity related medical complications. The results of the first Obepi surveys were one of the arguments that prompted the French government to implement a Nutrition and Health National Plans for the period 2001–2005 and 2006–2008 ( http://www.sante.gouv.fr/htm/pointsur/nutrition/rapport_pnns2.pdf), with specific goals: to inform the population on healthy food choices and the benefit of physical activity, to develop the nutritional monitoring of the population, to screen and treat obesity and its related complications, and to encourage research in human nutrition.

In that context, we hope to confirm a slowing down in the increase of obesity prevalence in the next Obepi survey in 2009.

## Ackowledgements:

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**Figure 1**

Prevalence of obesity (with the upper 95 % confidence interval) by monthly net household income in 1997 (white bar), 2000 (light grey bar), 2003 (dark grey bar) and 2006 (black bar): the French Obepi surveys.
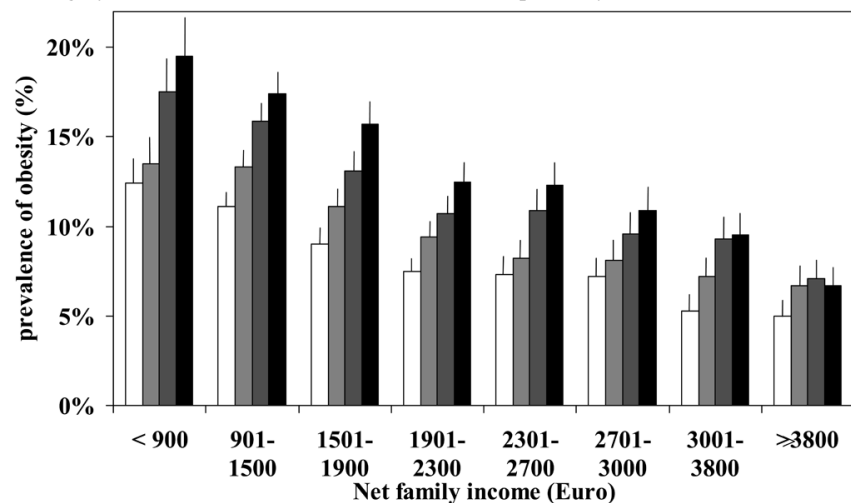
**Table 1**

Prevalences (95 % confidence intervals) of overweight (excluding obesity) and obesity by age-class in subjects 18 years and older in the French 1997, 2000, 2003 and 2006 Obepi surveys

| Prevalences | 1997 | 2000 | 2003 | 2006 |
|---|---|---|---|---|
| N | 26,595 | 25,659 | 24,402 | 22,374 |
| All Overweight | 29.8 (29.3–30.3) | 30.6 (30.0–31.2) | 31.5 (30.9–32.1) | 30.6 (30.3–31.2) |
| Obesity | 8.6 (8.2–8.8) | 10.1 (9.7–10.5) | 11.9 (11.5–12.3) | 13.1 (12.7–13.5) |
|   Moderate | 7.1 (5.7–8.4) | 8.1 (6.8–9.3) | 9.2 (7.9–10.5) | 9.9 (8.6–11.3) |
|   Severe | 1.2 (0.0–2.6) | 1.6 (0.3–2.9) | 2.0 (0.7–3.4) | 2.3 (1.0–3.7) |
|   Morbid | 0.4 (0.0–1.9) | 0.4 (0.0–1.6) | 0.7 (0.0–2.0) | 0.8 (0.0–2.3) |
| **Men** | | | | |
| All Overweight | 37.2 (36.1–38.2) | 38.2 (37.3–39.2) | 39.7 (38.1–40.1) | 37.6 (36.5–38.6) |
| Obesity | 8.9 (8.3–9.6) | 10.2 (9.7–10.8) | 12.0 (11.3–12.6) | 12.5 (11.8–13.2) |
|   Moderate | 7.7 (7.1–8.3) | 8.6 (8.1–9.2) | 9.9 (9.3–10.5) | 10.2 (9.6–10.9) |
|   Severe | 1.1 (0.8–1.3) | 1.4 (1.1–1.6) | 1.7 (1.4–2.0) | 1.7 (1.5–2.0) |
|   Morbid | 0.2 (0.1–0.3) | 0.2 (0.2–0.3) | 0.4 (0.3–0.5) | 0.5 (0.3–0.7) |
| **18–19 years** | | | | |
| Overweight | 4.9 (2.4–7.4) | 5.7 (3.3–8.1) | 7.9 (4.8–11.0) | 8.1 (4.7–11.4) |
| Obesity | 2.1 (0.5–3.8) | 1.5 (0.2–2.8) | 0.7 (0.0–1.7) | 1.9 (0.3–3.6) |
| **20–29 years** | | | | |
| Overweight | 17.7 (15.4–20.0) | 20.1 (18.0–22.2) | 17.6 (15.4–19.9) | 19.7 (17.3–22.1) |
| Obesity | 3.9 (2.8–5.1) | 4.3 (3.3–5.4) | 5.3 (4.0–6.6) | 5.2 (3.8–6.5) |
| **30–39 years** | | | | |
| Overweight | 33.1 (30.9–35.4) | 34.5 (32.4–36.5) | 33.8 (31.7–35.9) | 33.9 (31.8–36.1) |
| Obesity | 5.7 (4.6–6.8) | 7.0 (5.9–8.1) | 9.9 (8.6–11.2) | 9.3 (8.0–10.7) |
| **40–49 years** | | | | |
| Overweight | 42.5 (40.1–45.0) | 42.0 (39.8–44.3) | 42.9 (40.5–45.3) | 40.6 (38.1–43.0) |
| Obesity | 10.2 (8.7–11.7) | 10.4 (9.0–11.8) | 11.3 (9.8–12.9) | 13.4 (11.7–15.1) |
| **50–59 years** | | | | |
| Overweight | 47.9 (45.1–50.8) | 46.2 (43.6–48.7) | 48.4 (45.9–51.0) | 45.1 (42.4–47.8) |
| Obesity | 13.4 (11.4–15.3) | 13.3 (11.6–15.1) | 17.3 (15.4–19.3) | 15.6 (13.6–17.5) |
| **60–69 years** | | | | |
| Overweight | 50.5 (48.1–53.0) | 50.6 (48.4–52.9) | 50.6 (48.4–52.8) | 47.5 (45.0–50.1) |
| Obesity | 14.7 (13.0–16.4) | 16.0 (14.4–17.7) | 17.8 (16.1–19.5) | 20.9 (18.8–22.9) |
| **70–79 years** | | | | |
| Overweight | 49.4 (46.5–52.3) | 50.4 (47.9–52.9) | 52.1 (49.7–54.6) | 50.0 (47.4–52.6) |
| Obesity | 11.9 (10.0–13.8) | 15.8 (14.0–17.6) | 14.7 (13.0–16.5) | 17.1 (15.2–19.1) |
| **≥ 80 years** | | | | |
| Overweight | 42.9 (35.2–50.7) | 42.4 (36.5–48.3) | 44.2 (39.1–49.4) | 43.2 (38.4–47.9) |
| Obesity | 4.3 (1.1–7.5) | 8.4 (5.1–11.7) | 11.0 (7.7–14.2) | 11.8 (8.7–14.9) |
| **Women** | | | | |

| | | | |
|---|---|---|---|
| All Overweight | 23.4 (22.6–24.2) | 23.5 (22.7–24.3) | 24.4 (23.7–25.3) | 24.3 (23.4–25.1) |
| Obesity | 8.3 (7.8–8.9) | 10.0 (9.4–10.5) | 12.0 (11.3–12.5) | 13.6 (13.0–14.3) |
| Moderate | 6.5 (6.1–7.0) | 7.6 (7.1–8.0) | 8.6 (8.1–9.1) | 9.6 (9.1–10.2) |
| Severe | 1.3 (1.1–1.5) | 1.8 (1.5–2.0) | 2.3 (2.1–2.6) | 2.9 (2.5–3.2) |
| Morbid | 0.5 (0.4–0.6) | 0.6 (0.5–0.8) | 0.9 (0.7–1.1) | 1.1 (0.9–1.3) |
| **18–19 years** | | | | |
| Overweight | 6.9 (4.0–9.9) | 8.0 (5.3–10.7) | 8.8 (5.7–12.0) | 6.0 (3.3–8.7) |
| Obesity | 1.5 (0.1–2.9) | 1.4 (0.2–2.5) | 2.9 (1.0–4.8) | 3.8 (1.6–5.9) |
| **20–29 years** | | | | |
| Overweight | 11.1 (9.7–12.6) | 11.9 (10.4–13.5) | 14.6 (12.7–16.4) | 13.6 (11.7–15.4) |
| Obesity | 3.6 (2.8–4.5) | 4.4 (3.4–5.4) | 4.9 (3.8–6.0) | 7.2 (5.8–8.6) |
| **30–39 years** | | | | |
| Overweight | 15.0 (13.5–16.5) | 17.2 (15.6–18.8) | 19.4 (17.7–21.0) | 20.2 (18.5–21.8) |
| Obesity | 6.5 (5.4–7.5) | 8.5 (7.3–9.7) | 10.8 (9.5–12.2) | 13.7 (12.2–15.1) |
| **40–49 years** | | | | |
| Overweight | 22.0 (20.1–24.0) | 22.6 (20.7–24.6) | 22.8 (20.9–24.8) | 22.1 (20.1–24.2) |
| Obesity | 9.1 (7.8–10.4) | 10.0 (8.6–11.4) | 12.2 (10.7–13.8) | 13.7 (12.0–15.3) |
| **50–59 years** | | | | |
| Overweight | 30.0 (27.7–32.3) | 26.7 (24.7–28.8) | 28.0 (26.0–30.0) | 29.2 (27.0–31.4) |
| Obesity | 11.2 (9.6–12.8) | 12.9 (11.4–14.5) | 15.2 (13.6–16.8) | 16.6 (14.8–18.4) |
| **60–69 years** | | | | |
| Overweight | 35.0 (33.0–37.1) | 34.7 (32.7–36.6) | 34.0 (32.0–36.0) | 33.6 (31.2–35.9) |
| Obesity | 12.1 (10.7–13.5) | 14.8 (13.3–16.2) | 15.4 (13.9–16.9) | 17.7 (15.8–19.6) |
| **70–79 years** | | | | |
| Overweight | 35.0 (32.2–37.7) | 35.3 (33.0–37.6) | 35.3 (33.0–37.6) | 35.2 (32.6–37.7) |
| Obesity | 9.2 (7.5–10.8) | 12.5 (10.9–14.1) | 15.0 (13.4–16.8) | 16.8 (15.8–19.6) |
| **≥ 80 years** | | | | |
| Overweight | 27.6 (21.0–34.1) | 31.6 (25.8–37.3) | 28.6 (24.0–33.1) | 30.3 (25.4–35.2) |
| Obesity | 10.4 (5.9–14.9) | 9.0 (5.5–12.5) | 12.4 (9.1–15.7) | 11.5 (8.1–14.9) |