

# Group differences and factors influencing obesity -- based on CFPS2020 data analysis

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**Abstract.** To understand the current status of obesity prevalence among Chinese adults and to target high-risk groups for obesity, in order to provide guidance for obesity prevention and intervention. The required data were extracted from the China Family Panel Studies 2020 (CFPS 2020) and statistically processed using SPSS 29.0 statistical software. Group differences in obesity were tested using Mann-Whitney U test for ranking variables and the chi-square test for dichotomous variables. The test of factors influencing obesity was performed using multifactorial logistic regression. In the study sample of 2613 cases, the percentage of obesity was 32.57%. The innovation of this paper is the use of the most recent data, the CFPS2020 database has not been used to do a study before. In addition, another novelty of this study is the discovery of the current influence of obesity on the internet usage, in addition to gender, which is a common sense understanding of obesity. New findings were also made on how different incomes and different marital status affect the prevalence of obesity. The prevalence of obesity was statistically significant in the group distribution across gender ( $P < 0.001$ ), age ( $P < 0.001$ ), current marital status ( $P < 0.001$ ), internet usage ( $P < 0.001$ ), and annual income from work ( $P < 0.001$ ). Accurate and effective obesity interventions should: (1) Adapt health and fitness programs to address different metabolic, hormonal, and social influences on diet and exercise for men and women. (2) Provide affordable or subsidized weight management programs for low-income groups to ensure that low-income groups can participate. (3) Implement nutrition counseling and fitness programs for couples or families to create a supportive environment that recognizes the impact of marital status on eating and activity habits.

**Keywords:** Obesity, Group differences, Influencing factors.

## 1. Introduction

China's obesity rate is rising, which is becoming an increasingly serious public health issue. The food and lifestyle habits of Chinese people have undergone tremendous change in the last several decades due to the country's fast economic development and rising living standards. The prevalence of fast food culture and an increase in high-sugar and high-fat diets have both contributed to the rise in obesity rates. These days, the rising obesity prevalence in China poses a severe danger to the country's citizens' health. The publication "Association of Sleep Duration and Overweight/Obesity among Children in China" states that children who get less sleep are more likely to be overweight or obese. Longer sleep duration is associated with lower incidence of overweight and obesity in Chinese children [1]. Obesity is known to be a significant cardiovascular risk factor in people with type 2 diabetes mellitus (T2DM) and a substantial risk factor for chronic non-communicable illnesses [2]. Over 120 million Chinese adults over 45 years old had obesity-associated hypertension, which was present in 22.7% of them. The prevalence rates of obesity-associated hypertension in people who were 45–54, 55–64, 65–74, and 75 years old were 16.7%, 24.3%, 27%, and 26.7%, respectively; among persons who were hypertensive, the rates were 66.0, 60.9, 54.2, and 47.3%, respectively [3]. Compared to individuals without obesity-associated hypertension, persons with this condition more frequently have diabetes mellitus, dyslipidemia, and hyperuricemia ( $P < 0.0001$ ) [3]. Furthermore, hyperlipidemia and hyperglycemia, two cardiovascular disorders, are significantly influenced by obesity [4]. Adult Chinese obesity rates are a complicated topic. For instance, Chinese males who complete their higher degree are more likely to be overweight or obese, but women are less likely to experience these risks [5]. To maintain their weight and overall health, men with high levels of education and money and women with low levels of education can change their diets, take up new

hobbies, and participate in some physical exercise. It's critical to support a range of health promotion initiatives, such as promoting physical activity, offering better food options, and educating and advocating for greater public awareness of obesity and related health issues. Thus, this study examines the prevalence of obesity among Chinese adults based on data from the China Family Panel Studies 2020, identifies high-risk categories for obesity, enumerates the variables influencing obesity, and offers recommendations for obesity prevention and management initiatives.

## 2. Data and Methods

### 2.1. Data sources

The China Family Panel Studies 2020 provided the study's data (CFPS2020). Implemented by Beijing University's Institute of Social Science Survey (ISSS), the survey is a nationwide comprehensive social tracking program that uses tracking questionnaires on various households and individuals to reflect the health, educational, and economic status of China's households. Xinjiang, Tibet, Qinghai, Inner Mongolia, Ningxia, Hainan, as well as Hong Kong, Macao, and Taiwan are among the 25 provinces, municipalities, or autonomous territories that make up the baseline sample for the multi-stage stratified index-ordered sampling method used by CFPS. This sample accounts for 95% of China's population. Representing 95% of China's population, the baseline sample consists of 25 provinces, municipalities, autonomous areas, including Tibet, Qinghai, Inner Mongolia, Ningxia, Hainan, Hong Kong, Macao, and Taiwan. In 2020, there will be 28,530 people and more than 22,000 households in the sample. As a result, it is possible to regard the CFPS data as a nationally representative sample. Adults eighteen years of age and older comprise the study's sample. Following the extraction of significant variables and the removal of missing values, 2,613 valid data points were collected. Hence, it is possible to think of the CFPS data as a nationally representative sample. Adults 18 years of age and older made up the study's sample. A total of 2,613 valid data were gathered after significant variables were extracted and missing values were eliminated.

### 2.2. Variable Assignment

The research variables' assignments are shown in Table 1. Obesity was the dependent variable, and the determination of whether the respondents were obese was based on the Body Mass Index (BMI), which was computed using the weight and height data from the original questionnaire and the formula  $BMI = \text{weight (kg)}/\text{height squared (m}^2\text{)}$ . This calculation was done in accordance with the Chinese Obesity Working Group (IAWG) of the International Association of Life Sciences (IALS). International Life Sciences Institute, Working Group on Obesity in China) in 2003 [6], A BMI greater than or equal to  $28 \text{ kg/m}^2$  was classified as obese. The independent variables were age, gender, total income from work, current marital status, and Internet usage. For the convenience of calculation, this study re-assigned the data provided by CFPS2020, and the income was divided into three classes: low income, middle income, and high income according to the cut-off point of 25% and 75%; age was divided into three classes according to the division of the age group, with 18-45 years old as young, 45-64 years old as middle-aged, and greater than or equal to 65 years old as old; Sex is categorized as female and male; marital status is categorized into two groups according to whether or not they have a spouse, namely, no spouse (unmarried, divorced) and have a spouse (married, cohabiting); the Internet usage is categorized into infrequent, appropriate, and frequent according to the cut-off points of 25% and 75%, respectively.

**Table 1.** Variable assignment table

| Variables               | Original questionnaire number | Variable types        | Assignment                                                                                                  |
|-------------------------|-------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------|
| Obesity                 | Height: QP101; Weight: QP102  | dichotomous variables | 0=No (BMI<28 kg/m <sup>2</sup> ); 1=Yes (BMI ≥28kg/m <sup>2</sup> )                                         |
| Age                     | QA001 B                       | Ranking variables     | 1=Young people (18≤ X <45years-old); 2=Middle-aged people (45≤X≤64 years-old); 3=Old people(X=65 years-old) |
| Gender                  | QA002                         | dichotomous variables | 0=Female; 1=Male                                                                                            |
| Annual income from work | QG12                          | Ranking variables     | 1=Low income (X≤25%); 2=Middle income (25%<X≤75%) ;3=High income (X>75%)                                    |
| Internet usage          | QU202 A                       | Ranking variables     | 1=Infrequent (X≤25%); 2=Appropriate (25%≤X<75%); 3=Frequent (X>75%)                                         |
| Current marital status  | QEA0                          | dichotomous variable  | 0=Unmarried, Divorced; 1=Married, Cohabiting                                                                |

### 2.3. Research Methods

The data were statistically analyzed using SPSS 29.0 statistical software. For the test of group differences in obesity, the Mann-Whitney U test for two independent samples was used for the rank variables (age, internet usage, and total income from work), and the chi-square test was used for the binary categorical variables (gender, and their current marital status); and the test of the influencing factors of obesity was performed by multifactorial logistic regression, with a test level of  $\alpha = 0.05$ .

## 3. Results

### 3.1. Sample profile

The sample for this study was adults aged 18 years and older, with a sample size of 2,613. As seen in Table 2, 851 people had a BMI in the obesity category, with an obesity prevalence rate of 32.57%; 81.52% of the survey respondents were between the ages of 18 and 45, while only 1.14% of the elderly population was greater than or equal to 65 years of age. 1,019 people were female in the sample of the present study, which accounted for 39% of the sample. 655 people belonged to low-income groups in the sample of the present study, which accounted for 25.07% of the sample, while 1367 people belong to the middle-income group, accounting for 52.32%, and 591 people belong to the high-income group, accounting for 22.61%. The respondents of the survey have 1,118 of the respondents frequently accessed the Internet, accounting for 42.79%; the group that have a spouse in their marital status accounted for 47.84%.

**Table 2.** Sample profile (n=2613)

| Variables               | Categories         | Frequency | Composition Ratio (%) |
|-------------------------|--------------------|-----------|-----------------------|
| Obesity                 | No                 | 1762      | 67.43                 |
|                         | Yes                | 851       | 32.57                 |
| Age                     | Young people       | 2130      | 81.52                 |
|                         | Middle-aged people | 453       | 17.34                 |
|                         | Old people         | 30        | 1.14                  |
| Gender                  | Male               | 1594      | 61.00                 |
|                         | Female             | 1019      | 39.00                 |
| Annual income from work | Low income         | 655       | 25.07                 |
|                         | Middle income      | 1367      | 52.32                 |
|                         | High income        | 591       | 22.61                 |
| Internet usage          | Infrequent         | 871       | 33.33                 |
|                         | Appropriate        | 624       | 23.88                 |
|                         | Frequent           | 1118      | 42.79                 |
| Current marital status  | No spouse          | 1363      | 52.16                 |
|                         | Having a spouse    | 1250      | 47.84                 |

### 3.2. Analysis of group differences in obesity

Table 3 shows the results of the test of difference in group distribution of obesity. Among the 2613 study participants, different gender, different marital status, different annual income from work, different age and different internet usage were all statistically significant for the difference in group distribution of obesity prevalence. The prevalence of obesity was higher in males than in females across gender groups, significant at the 5% level ( $P < 0.001$ ). The prevalence of obesity was higher in the unpartnered group than in the partnered group by marital status, significant at the 5% level ( $P < 0.001$ ). For groups with different annual working incomes, obesity prevalence was highest in the low-income group, significant at the 5% level ( $P < 0.001$ ). For different age groups, the elderly had the highest prevalence of obesity, significant at the 1% level. ( $P < 0.001$ ). For groups with different internet usage, the prevalence of obesity was highest in the group with appropriate hours of internet usage, significant at the 5% level ( $P < 0.001$ ).

**Table 3.** Results of population distribution difference test for obesity (n=2613)

| Variables              | Categories         | Number of obese people | Obesity Rate (%) | $\chi^2$ | P      |
|------------------------|--------------------|------------------------|------------------|----------|--------|
| Gender                 | Female             | 282                    | 27.67            | 18.216   | <0.001 |
|                        | Male               | 569                    | 35.80            |          |        |
| Current Marital Status | No spouse          | 720                    | 52.82            | 532.362  | <0.001 |
|                        | Have a spouse      | 131                    | 10.48            |          |        |
| Annual income          | Low income         | 335                    | 61.145           |          | <0.001 |
|                        | Middle income      | 428                    | 31.309           |          |        |
|                        | High income        | 88                     | 14.890           |          |        |
| Age                    | Young people       | 640                    | 30.047           |          | <0.001 |
|                        | Middle-aged people | 185                    | 40.839           |          |        |
|                        | Old people         | 26                     | 86.667           |          |        |
| Internet usage         | Infrequent         | 79                     | 9.070            |          | <0.001 |
|                        | Appropriate        | 59                     | 9.456            |          |        |
|                        | Frequent           | 26                     | 2.326            |          |        |

### 3.3. Analysis of factors influencing obesity

Table 4 shows the results of a multifactorial logistic regression analysis with the presence of obesity as the dependent variable. Gender, annual income from work, internet usage, age, and current marital status as the independent variables. The results showed that women were more likely to be

obese than men, and the risk of developing obesity was approximately four times higher in women than in men ( $\text{Exp}(B)=4.409$ ,  $P<0.001$ ). The high-income group was more likely to be obese than the middle- and low-income groups. The low-income group had just 0.576 times the risk of developing obesity than the high-income group ( $\text{Exp}(B)=0.576$ ,  $P=0.021$ ); the middle-income group had 0.979 times the risk of developing obesity than the high-income group ( $\text{Exp}(B)=0.979$ ,  $P=0.021$ ). The non-partnered group was more likely to be obese than the partnered group, with the risk of obesity in the non-partnered group being 2.19 times higher than in the partnered group ( $\text{Exp}(B)=2.190$ ,  $P<0.001$ ).

**Table 4.** Multinomial logistic regression analysis of obesity influencing factors (n=2613)

| Variables                                         | B      | Std. Error | Wald   | Sig.   | Exp (B) | 95% Confidence Interval for Exp (B) |             |
|---------------------------------------------------|--------|------------|--------|--------|---------|-------------------------------------|-------------|
|                                                   |        |            |        |        |         | Lower Bound                         | Upper Bound |
| Intercept                                         | 0.799  | 1.162      | 0.473  | 0.491  |         |                                     |             |
| Gender (reference: Male)                          | 1.484  | 0.223      | 44.119 | <0.001 | 4.409   | 2.846                               | 6.830       |
| Annual Income (reference: High income)            |        |            |        |        |         |                                     |             |
| Low income                                        | -0.551 | 0.238      | 5.361  | 0.021  | 0.576   | 0.361                               | 0.919       |
| Middle income                                     | -0.021 | 0.190      | 0.012  | 0.913  | 0.979   | 0.675                               | 1.422       |
| Internet usage (reference: frequent)              |        |            |        |        |         |                                     |             |
| Infrequent                                        | 0.189  | 0.220      | 0.739  | 0.390  | 1.208   | 0.785                               | 1.857       |
| Appropriate                                       | 0.164  | 0.228      | 0.516  | 0.472  | 1.178   | 0.754                               | 1.841       |
| Age (reference: old people)                       |        |            |        |        |         |                                     |             |
| Young people                                      | 0.637  | 1.138      | 0.313  | 0.576  | 1.891   | 0.203                               | 17.605      |
| Middle-aged people                                | 0.599  | 1.149      | 0.272  | 0.602  | 1.820   | 0.192                               | 17.295      |
| Current marital status (reference: have a spouse) | 0.784  | 0.200      | 15.357 | <0.001 | 2.190   | 1.480                               | 3.241       |

Regarding group differences in obesity, this study found statistically significant differences in the group distribution of obesity prevalence by gender, marital status, income, age, and length of time online. First, the distribution of obesity prevalence varied significantly across marital status. For single people, irregular work and rest is often a common phenomenon. As a result of irregular work and rest, the eating habits of single people also become irregular; some may eat only 1 meal a day, while others may eat 4 to 5 meals a day. Secondly, lack of a partner to encourage healthy eating habits or lack of participation in physical activities may also lead to a sedentary lifestyle and poor dietary choices, which are important factors contributing to obesity. In addition, single people may not receive the same level of social support and encouragement to maintain a healthy lifestyle as those in relationships. Social relationships can significantly affect obesity. Studies have shown that if a close friend or family member is overweight, the likelihood of a person becoming obese increases. This effect is observed even when friends or relatives live far away, suggesting that social relationships are more influential than physical distance. In the case of single people, it can be hypothesized that without a partner or immediate family, single people may be more susceptible to other social influences, including friendships, which studies have shown to have a significant impact on a person's weight. When a person gains weight, shifts in norms in the social network may make it easier for others to do the same, which may lead to greater obesity among singles who rely on their social circles for behavioral cues [7]. Secondly, the prevalence of obesity is significantly higher in the male population than in the female population. The main reason for this may be that obesity in men is associated with higher levels of gastric growth hormone, which makes them feel hungrier, and lower levels of leptin, which makes them feel less full [8]. In addition, men may have a stronger taste response to food, which may lead to overeating. Women, on the other hand, may be more likely to strive for a slimmer or healthier figure, thus reducing the prevalence of obesity in the female population. Thirdly, the prevalence of obesity is higher in low-income groups than in high-income

and middle-income groups. The main reason for this may be various socio-economic factors that influence lifestyle and dietary choices. Low-income households often have limited food budgets, which leads them to buy more junk food or cheap, high-energy foods that are rich in grains, added sugar and fat. Higher-income people may have greater access to healthy foods, recreational facilities and medical resources that can help prevent obesity. In addition, there are differences in the distribution of obesity prevalence among groups with different lengths of Internet access. The prevalence of obesity is highest among those who spend an average of 60 to 300 minutes online [9]. Prolonged screen time usually means being sedentary, which reduces opportunities for physical activity, a key factor in maintaining a healthy weight. Screen time is often associated with higher energy intake, possibly because it leads to mindless eating or snacking, which increases the risk of obesity.

Regarding the influencing factors of obesity, this study found that gender, total annual income from work, and current marital status are the direct influencing factors of obesity. According to the results of the sample, although men have a higher prevalence of obesity, women have a higher risk of developing obesity, which is about 4.4 times higher than men. This difference may be due to the fact that the female population is facing more and more pressure in today's society. These pressures may stem from workplace pressures or life pressures. Under overpowering stress, people will likely resort to overeating to relieve the stress. As a result, the risk of obesity increases dramatically [10]. Higher income groups are more likely to be obese than middle- and lower-income groups. The risk of obesity in the low-income group is just 0.576 times that of the high-income group; the risk of obesity in the middle-income group is 0.979 times that of the high-income group. The non-partnered group was more likely to be obese than the partnered group, with the risk of obesity in the non-partnered group being 2.19 times higher than in the partnered group. Age and length of time spent online did not have a significant effect on the risk of obesity. Previous studies have pointed out that obesity rates are more common in the middle-aged group (45 to 59 years old), while obesity is less common in young people [11]. The reasons for this are, firstly, due to the limitations of the sample in this study, the age of the sample showed a non-normal distribution, which may have affected the conclusion that age affects obesity in this study. Secondly, the relationship between Internet time and obesity may be limited by third-party factors, such as dietary habits or individual genetic differences. Therefore, a more rigorous and complete study design is needed to investigate the relationship between Internet time and obesity.

#### 4. Conclusion

Based on the data of CFPS2020, this study analyzed the group differences and influencing factors of obesity, hoping to provide guidance and suggestions for the intervention of obesity. The results of this study showed that the prevalence of obesity among Chinese adults aged 18 years and older was 32.5%. The possible reason for this finding is that the sample included in this study showed a skewed distribution in terms of age, with the youth group between the ages of 18 and 44 years old comprising most of the sample, with a composition ratio of 81.52%.

In future study, I think I can do somewhat differently. I need to address skewed sample distribution. The study found a prevalence of obesity among Chinese adults aged 18 and older to be 32.5%. However, this finding might be influenced by the skewed age distribution in the sample, which predominantly consisted of the youth group (ages 18-44), making up 81.52% of the sample. Since obesity rates are more common in the middle-aged group (45-59 years old), future studies should aim for a more balanced age distribution to accurately reflect obesity prevalence across different age groups.

It is well known that effective interventions for obesity cannot be generalized, and that targeted interventions that address group differences and influencing factors are needed to guide the use of limited health resources to maximum effect. Therefore, based on the above findings, we suggest that in order to more effectively improve obesity interventions, we should focus on gender, current marital

status, and annual income from work. (1) Tailor health and fitness programs to gender, based on differences in metabolism, hormone levels, and social factors affecting diet and exercise between men and women. (2) Target income-based interventions: Develop affordable or subsidized weight management programs for low-income populations and ensure that those with lower gross work incomes have access to these programs. (3) For marital status disparities: Provide couples or family-based nutrition counseling and fitness programs that encourage a supportive environment for lifestyle changes, as marital status can significantly affect eating habits and physical activity levels.

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