



The growing burden of overweight and obesity in contemporary China

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Summary Once considered to have one of the leanest populations, China is fast catching up with the West. Recent estimates from the 2002 China Health and Nutrition Survey indicate that nearly 215 million Chinese are affected, about 22% of adults, 5% of children ages 0–6 years and 7% of those ages 7–17 years. Although the prevalence of overweight and obesity in China is relatively low compared with countries in the West, it is the rate of increase that gives the greatest cause for concern. From 1992 to 2002 the prevalence of adult overweight increased by nearly 40% and that of obesity doubled. Particularly among rural Chinese who account for more than 60% of the country's total population, the prevalence, although significantly lower than that found in urban areas, has increased two to three-fold over the 10 year time period. Studies suggest that changes to the traditional diet, reduced levels of physical activity, increased sedentary lifestyles, lack of health knowledge on obesity, and traditional social attitudes towards body fatness are major drivers of the increasing trend. Improving the level of awareness about the hazards associated with excess weight through wide-reaching health education campaigns is a fundamental first step in combating the epidemic. Actions have been undertaken by the government, some academic societies and experts. National and regional programs focusing on health education and school children have been initiated, However, potential solutions to China's obesity crisis are still for the most part theoretical, and it will be many years before the efficacy of the current strategies that have been initiated can be evaluated. Crown Copyright © 2008 World Heart Federation. Published by Elsevier Ltd. All rights reserved.

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Introduction

According to recent estimates from the International Obesity Task Force, one in every four individuals, worldwide, is either overweight or obese [1]. Only countries of sub-Saharan Africa remain relatively unaffected by the epidemic of excess weight. Although the burden of overweight and obesity continues to be highest among the most economically developed countries such as the United States, the United Kingdom and countries of Western Europe, where up to two-thirds of the adult population are affected and up to one in five children are considered to be overweight, lower- and middle-income countries are no longer immune to the encroaching epidemic [2,3].

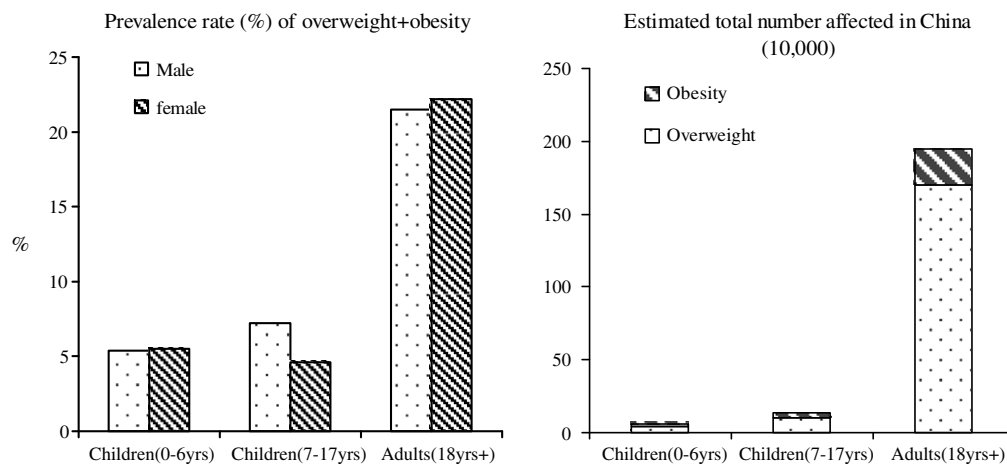
Prevalence of overweight and obesity in China

Once considered to have one of the leanest populations [4], China is fast catching up with the West [5]. Recent estimates from the 2002 China National Nutrition and Health Survey (CNNHS) which was a cross-sectional survey based on a random sample of nearly 210,000 individuals, indicate that one in six of the Chinese population are overweight or

obese which is the equivalent to nearly 215 million affected individuals, the majority (90%) being adults (Fig. 1). According to these data, the overall prevalence of overweight and obesity in adults was approximately 22%, and, as might be expected, there were large differences in the prevalence of overweight and obesity between urban and rural areas (Fig. 2) [6,7]. In the larger cities of China such as Beijing and Shanghai, the prevalence of overweight and obesity among older adults was over 50%, which was double that found in the most rural areas of the country [8].

For a large, but economically unevenly developed country like China, an appreciation of the regional distribution of obesity would be informative with respect to understanding the obesity-related health issues in China. Our previous reports on 15,000 middle-aged men and women from fifteen populations in China with different geographical, economical (urban/rural) and occupational status showed that the prevalence of obesity varied considerably among populations, and in general, was higher in the northern areas, in urban areas and in women [8].

In children, the prevalence of overweight and obesity was approximately 5% in those aged 0–6 years and 7% in those aged 7–17 years. As in adults, the prevalence of overweight and obesity was higher in urban areas than in rural areas in those aged



Note:

- 1) Rate was standardized by age and social economic status according to the national census in year 2000
- 2) Estimated number is the total population taken from the 2000 National Census multiplied by the prevalence of the condition
- 3) WHO Criteria for classification were used.

Figure 1 Rate and estimated number of overweight and obese in China by age group. Data from the National Nutrition and Health Survey 2002.

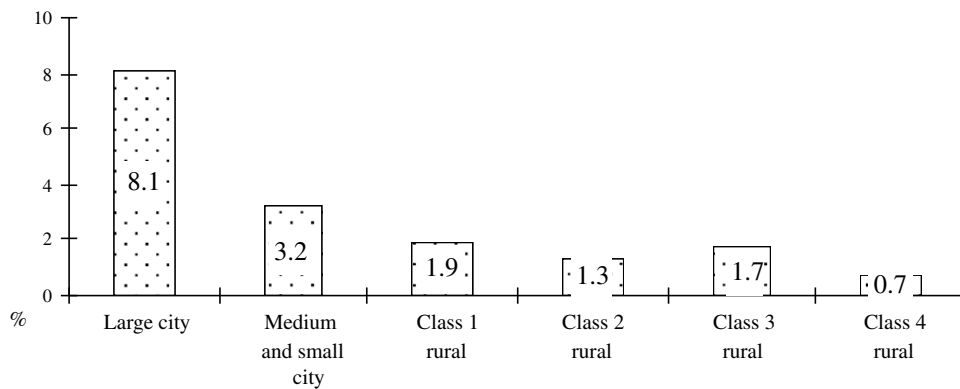


Figure 2 Prevalence of obesity among urban and rural (Class 1 as the most developed, and class 4 as the most undeveloped) Chinese Children, aged 7–17. Data from the 2002 National Nutrition and Health Survey. Obesity is defined by criteria from the Chinese Guidelines on Prevention and Control of Obesity in Children.

7–17 years (13.9% in urban compared with 4.6% in rural areas) but the prevalence was the same between urban and rural areas for children less than 7 years of age. A sex difference in the prevalence of overweight and obesity was apparent among both age-groups with more boys than girls being affected: 2.3% versus 1.6% in children aged 0–6 years and 5.2% versus 3.4% in the 7–17 year age group [9].

Under-or overestimating the obesity epidemic?

However, these figures may underestimate the true extent of the problem since the current World Health Organisation's (WHO) definitions of adult overweight ($BMI > 25 \text{ kg/m}^2$) and obesity ($BMI > 30 \text{ kg/m}^2$) are largely derived from European populations [10], and hence, may not be applicable to Asians. On the basis of a meta-analysis of cross-sectional associations of BMI with cardiovascular disease (CVD) risk factors, among 240,000 Chinese adults, and of the longitudinal relationships of BMI to CVD risk, the Working Group on Obesity in China (WGOC) has recommended that a BMI of 18.5–23.9 kg/m^2 should be considered as "optimal", that a BMI between 24.0 and 27.9 kg/m^2 as "overweight", and a BMI of $\geq 28.0 \text{ kg/m}^2$ as "obese" [11,12]. These recommendations have since been adopted, and used, in the Guidelines for Prevention and Control of Overweight and Obesity in Chinese Adults [13]. Using these "cut-points", as opposed to the WHO definitions, increases the prevalence of overweight and obesity in China by a further 66 million, to over a quarter of a billion people [5].

Data from the Obesity in Asia Collaboration, a large-scale individual participant data meta-analysis of nearly 200,000 individuals, suggest that, compared with Europeans, the association between BMI and blood pressure, one of the most important cardiovascular risk factors, is significantly stronger in Asians, which would provide further support for a lowering of the cut-point for overweight in these populations [14].

The emerging epidemic of overweight and obesity

Although the prevalence of overweight and obesity in China is relatively low compared with countries in the West, it is the rate of increase that gives the greatest cause for concern. Data from the CNNHS 2002 survey indicate that from 1992 to 2002 the prevalence of adult overweight increased by nearly 40% and that of obesity doubled (Fig. 3). Typically, the age-group that was most affected pertained to middle-aged individuals in whom the prevalence of overweight and obesity increased by about 50% (from 15% to 23%) and about 150% (from 2.6% to 6.4%), respectively. Of particular significance is the rise in the prevalence of the condition among rural Chinese, which although significantly lower than that found in urban areas has increased two to three-fold over the 10 year time period. By contrast, urban women were relatively resistant to the increasing trend; the prevalence of overweight and obesity increased by only 10% and 20%, respectively [7]. This pattern is similar to recent findings reported by NHANES which showed that from 1999 to 2004, there was no increase in the prevalence of overall obesity among US women [15].

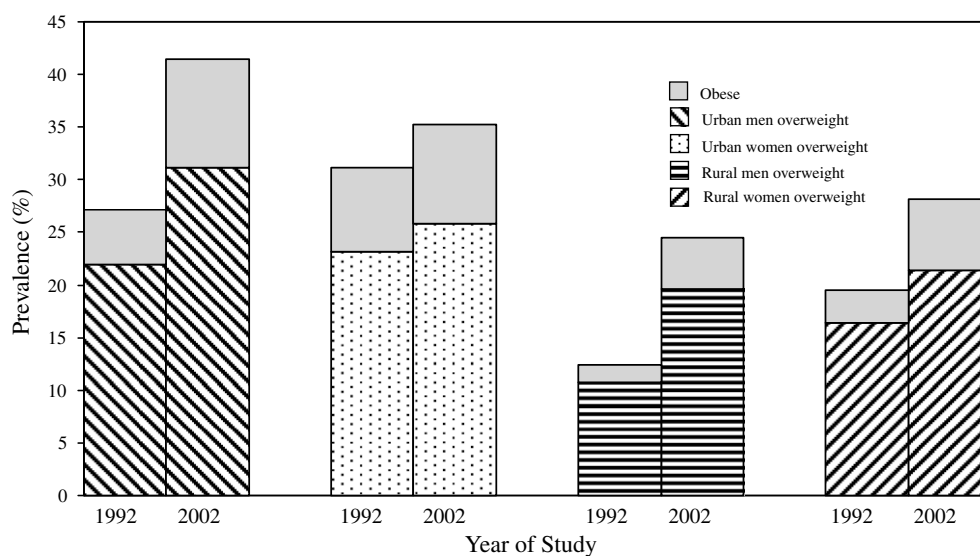


Figure 3 Change in the prevalence of overweight (BMI 24–28 kg/m²) and obesity (BMI > 28 kg/m²) among Chinese adults (>18 years) by urban/rural region from 1992 to 2002.

Moreover, the observed rate of increase in the prevalence of overweight and obesity in China is considerably higher than in most other parts of the world, a trend that is predicted to continue in the coming years. For example, according to recent data from the WHO, the projected rate of increase in the prevalence of overweight and obesity for women, aged 30 years or more, from 2005 to 2015 will be higher for China, compared with lower- and middle-income countries, such as Brazil and India [3].

Even more alarming is the significant increase in the prevalence of overweight and obesity among children in the past decades (Fig. 4). Studies have shown that the increase in childhood overweight and obesity occurred in all age groups and in both boys and girls [7]. However, adolescent females tended to be fairly resilient to the increasing trend as the prevalence within this group has remained relatively low, and stable, at around 3–4% since 1992. In contrast to adults where the greatest proportional increase in the prevalence of overweight and obesity since 1992 occurred in rural areas, the greatest change in the prevalence of childhood overweight and obesity has occurred in urban areas: 45% in boys and 25% in girls from urban areas compared with 14% and –5%, respectively, in rural areas. In urban areas, the prevalence of childhood overweight and obesity (particularly in boys) is now on par with those reported in developed countries [9].

Some insight into the origins of the epidemic of childhood overweight and obesity in China can be gleaned from another nationally representative sample of the population namely the

National Survey on Physical Fitness and Health of Chinese Students which commenced in 1985 and which is repeated every five years. Data from the 1995 survey indicated a marked increase in the prevalence of childhood overweight and obesity in major coastal cities whilst other areas of the country remained relatively unaffected. After 2000, the prevalence began to increase in all age groups and in both urban and rural areas [16].

What's driving China's epidemic of overweight and obesity?

Many explanations have been proposed to explain China's recent epidemic of overweight and obesity including changes to the traditional diet, reduced levels of physical activity (including both work-related and leisure-time) and increased sedentary lifestyles. A comprehensive review of studies published between 1989 and 2003 in adult populations of developing countries by Monteiro and colleagues [17] that examined the links between socioeconomic status and obesity concluded the following; first, in these populations, obesity is not restricted to the most affluent sectors of society; second, the distribution of obesity shifts towards groups of lower socioeconomic status as the country's GNP increases. And third, the reasons for why lower socioeconomic groups were considered to be 'protected' against obesity were thought to be due to food scarcity and patterns of high energy expenditure in the poorer groups of society.

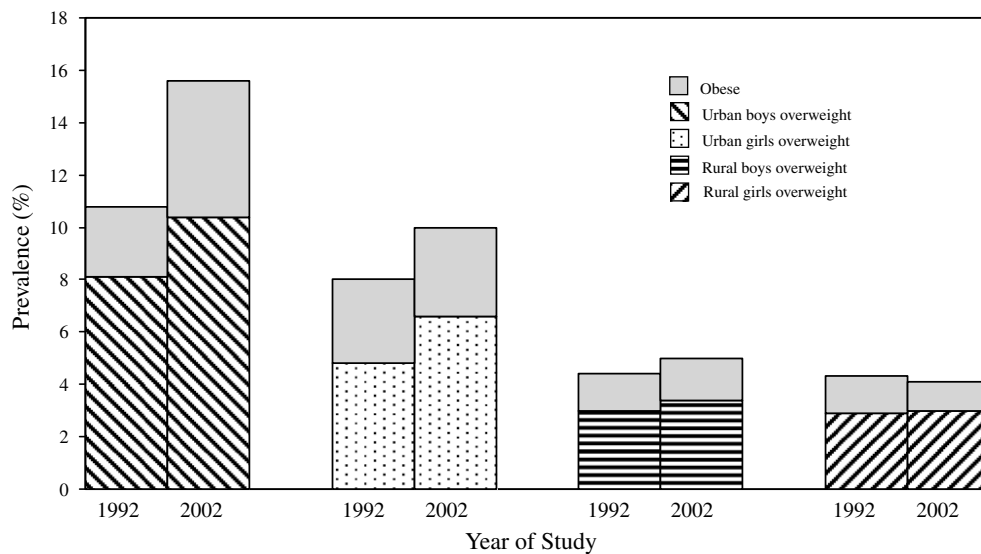


Figure 4 Change in the prevalence of overweight and obesity among Chinese children and adolescents (7–17 years) by urban/rural region from 1992 to 2002. Note: (1) Rate was standardized by age and social economic status according to the national census in year 2000. (2) Estimated number is the total population taken from the 2000 National Census multiplied by the prevalence of the condition. (3) WHO Criteria for classification were used.

The situation in China fits well with this model. The country has undergone rapid economic and industrial growth in the past couple of decades and there has been a substantial shift in the population away from rural subsistence into urban environments. Concomitant with increased economic growth has been a relative reduction in food prices and an increased availability of a much wider variety of foods (particularly those that are more commonly seen in the West) to a greater proportion of the population. Recent data from the National Surveys of Nutrition indicate that there have been noticeable changes in the proportions, and sources, of dietary macronutrients over the last twenty years; energy intake from animal sources has increased more than three-fold from 8% in 1982 to 25.3% in 2002 [6]. Moreover, the average energy intake from dietary fat among urban Chinese is approximately 35%, which is comparable to the level of dietary fat consumption observed in Western populations, and which is significantly greater than the upper limit of 30% recommended by the WHO [18]. Several cross-sectional studies have shown that the dietary patterns of children and adolescents are associated with the risk of being overweight or obese [19–21]. Particularly hazardous behaviour patterns include not eating breakfast, the consumption of Western-type “fast food” and the frequent consumption of soft drinks [19–21].

Part of the explanation for the obesity epidemic in China may also have its roots in the social attitudes towards body fatness. In Chinese culture,

there is still a widespread belief that excess body fat represents health and prosperity. This is perhaps a consequence of China’s recent history where exposure to famine and chronic malnutrition were responsible for the deaths of millions of individuals in the older generations. It is also conceivable that China’s one-child policy may have contributed to the growing problem of overweight and obesity in children. A possible consequence of one-child families is that the child is the sole beneficiary of attention not only from the parents but also from the two sets of grandparents. This in itself is not necessarily harmful but when combined with increased household wealth it may stimulate environments that encourage obesogenic behaviours among children and the immediate family such as over-feeding and reduced physical activity. An excellent discussion of the implications of China’s economic and social development on children’s health is given by Jing in “Feeding China’s Little Emperors” [22]. Moreover, as in other parts of the world (particularly in developed countries) there is the prevailing belief in China that women should be slim and petite, which may explain the sex differences in the prevalence of overweight and obesity, particularly among adolescents.

Coinciding with China’s continuing modernization are the reductions in physical activity and labour intensity in both urban and rural areas. People are expending less energy on traditional forms of transportation, such as walking and cycling, whilst the popularity of motorized forms

of transport such as cars, buses and motorcycles, is increasing. Car ownership for example has increased more than ten-fold from 0.34 cars/100 household in 1999 to 3.4 cars/100 households in 2005 [23]. Furthermore, the lack of consideration towards constructing environments in inner cities that promote physical activity has meant that it has become increasingly more difficult to find safe places in residential areas to exercise, or even walk. In addition, the increasing popularity and accessibility to televisions and the internet at home is likely to have further exacerbated the imbalance between energy intake and expenditure. For example, television ownership among urban residents has increased from 59 sets/100 household in 1990 to 130 sets/100 households in 2003 [23]. Similarly, the number of Chinese households with access to a computer has increased several-fold from 6 sets/100 household in 1999 to 42 sets/100 households in 2005 [23].

An increasing sedentary lifestyle in the population is also likely to be a major contributing factor to the epidemic of overweight and obesity. Findings from a meta-analysis demonstrated a positive association between the duration of television watching and the risk of becoming overweight or obese in Chinese children [24]. Low levels of physical activity have also been reported to be associated with adolescent overweight and obesity [21].

In a recent report, several factors were suggested to be associated with overweight or obesity in Chinese children, including limited access and use of sports facilities in schools and regular consumption of soft drinks [21]. Interestingly, some of the risk factors such as household income and parental education were positively associated with childhood overweight and obesity in China, whereas in high-income countries they tend to exert a protective effect against childhood obesity. The study suggested that risk factors operating at the household, school and community level have an important role to play in the development of childhood and adolescent obesity. Furthermore, childhood dietary and exercise patterns are most likely influenced by parent's knowledge and their own behaviour [21].

Prevention and control of overweight and obesity in China

The increasing prevalence of overweight and obesity in China is likely to be largely attributable to detrimental changes in lifestyle behaviours such as reductions in overall physical activity levels

combined with increased energy intake (particularly from animal fats and proteins). Moreover, the rapidity at which the obesity epidemic has taken hold in China is likely to have been facilitated in part by the widespread belief among the general population that being overweight is a sign of prosperity and success. Hence, changing attitudes and personal beliefs about obesity is a necessary first step in combating the growing epidemic.

Since 2005, a program called "Happy 10" has been conducted in schools in Beijing and other cities. The program is derived from the "Take 10" program in the US and includes 45 types of activities in 16 classes, such as skipping rope, and triathlon [25]. From September 2007, the Ministry of Education has recommended that group dancing be incorporated into the Chinese national curriculum with the aim of increasing the level of physical activity among primary, secondary and high schools students [26]. In May 2007, China's first week-long campaign against obesity was launched in Beijing, Shanghai, Guangzhou and Shenzhen by the Chinese Preventive Medical Association. In this campaign, experts gave lectures and provided free examinations to help increase the level of awareness of the health hazards associated with excess weight [27].

A national plan on the prevention and control of chronic diseases in China has been in development by the Ministry of Health in which obesity was identified as one of the key risk factors for ill-health [28]. Accordingly, a national education program on healthy lifestyle was initiated in May 2007, which included information on what constitutes a healthy diet and a suitable level of physical activity. However, it will be several years before the efficacy of this program on modifying people's attitudes and behaviors towards obesity can be evaluated.

As in the West, among certain groups of the Chinese population, namely young urban women, weight loss has become increasingly fashionable and has given rise to a previously unknown but highly lucrative weight loss industry. A recent survey in Shanghai showed that individuals aged 20–30 years were those most likely to want to lose weight [29]. Also rare in China up until relatively recently weight loss camps for overweight children have become an increasingly popular place to spend the summer school break in Beijing, Shanghai and other major cities.

Since the 1990's many interventional studies for the prevention and treatment of overweight and obesity among Chinese children and adolescents have been published. Most of these studies included interventions that were based on the

delivery of health education via class-room sessions, meetings or expert lectures and modification of physical activity and dietary behaviours. Overall, none of the studies proved successful and all shared major methodological limitations around study design and analysis [30]. Future directions for interventional strategies could focus on changing policy on food pricing, influencing school policy on matters relating to health, and physical education, the content of school canteens, and modifying the environment at both the school and community level to support healthy lifestyle behaviours in children and adolescents. A vital element to any obesity intervention targeting children is the concurrent education of parents and other care-givers so as to reinforce the key messages in the non-school environment.

In summary, the prevention and control of overweight and obesity among the Chinese population is still in its infancy. Improving the level of awareness about the hazards associated with excess weight through wide-reaching health education campaigns is a fundamental first step in combating the epidemic. However, potential solutions to China's obesity crisis are still theoretical, rather than evidence-based, and it will be many years before the efficacy of the current strategies that have been initiated can be evaluated.

Conflict of interest statement

None declared.

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