



Eating out and getting fat? A comparative study between urban and rural China



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ABSTRACT

In parallel with the increased prevalence of overweight and obesity, the rate of food away from home (FAFH) consumption in China has increased notably in recent years. Under the long-term urban–rural dual structure in China, the purpose of this study was to investigate the impact of FAFH consumption on body mass index (BMI) by a comparative study between rural and urban areas, using 26,244 subjects from the 2004–2011 China Health and Nutrition Survey. The results indicated that urban residents have a higher rate of FAFH consumption than rural residents with the difference narrowing over time. The empirical results illustrated that the frequency of meals consumed away from home had a significantly positive effect on BMI in urban China, whereas no significant association was observed in rural China. The urban–rural difference resulted from different levels of surplus energy, which was mainly due to the different labor intensity among rural and urban residents.

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1. Introduction

The rate of overweight and obesity is a rapidly growing threat reaching epidemic proportions worldwide. China, the largest developing country, is no exception. The Chinese Residents Nutrition and Chronic Disease Status Report (2015) revealed that the rate of overweight adults aged 18 or older throughout the country was 30.15%, and the obesity rate was 11.9%, an increase of 7.3% and 4.8%, respectively from 2002. The prevalence of overweight and obesity has become not only a public health threat but also an economic problem in China. The direct economic burden attributable to overweight and obesity was estimated to be 90.77 billion Yuan (RMB) (~\$12.97 billion), accounting for 42.9% of the total medical costs for major chronic diseases, or 4.5% of the national health expenditure in 2010 (Zhang, Shi, & Liang, 2013).

One factor that is largely held responsible for overweight and obesity is the transition in dietary intake and eating behaviors, especially when consumption of food away from home (FAFH) is concerned (Binkley, Eales, & Jekanowski, 2000). A large body of literature has shown that FAFH consumption is associated with higher intakes of energy and saturated fat, and low micronutrient

intakes (Lachat et al., 2012; Lin, Guthrie, & Frazão, 1999; Nordström & Thunström, 2015), thus it may result in the energy imbalance that causes weight gain. In China, consumption of FAFH has become a continuously growing part of the Chinese dietary pattern and is expected to increase for the next couple of decades in both urban and rural areas (Gale, 2005; Ma, Huang, Fuller, & Rozelle, 2006). The share of urban food expenditure on FAFH raised from 7.9% in 1992 to 21.2% in 2010 (Zheng, Gao & Zhao, 2015; Zheng, Henneberry, Zhao, & Gao, 2015), and similarly the share of rural food expenditure on FAFH raised from 2.3% in 1990 to 13.3% in 2010 (Xu, 2011).

A number of studies have already reported a positive relationship between FAFH consumption and body mass index (BMI) or risk of obesity, mainly because of the substantial contribution of FAFH to increased energy intake (Ayala et al., 2008; Bes-Rastrollo et al., 2010; Cai, Alviola, Nayga, & Wu, 2008; Ko et al., 2007; Kyureghian, Nayga, Davis, & Lin, 2007; Ma et al., 2003; Mccrory et al., 1999). However, it is far from conclusive. Some studies have discovered no association between increased FAFH consumption and obesity risk (Burns, Jackson, Gibbons, & Stoney, 2002; Marínguerro, Gutiérrezfisac, Gualarcastillón, Banegas, & Rodríguezartalejo, 2008; Orfanos et al., 2007; Simmons et al., 2005), whereas others have discovered an association that is gender specific, significant only to men or only to women (Bezerra & Sichieri, 2009; Bezerra, Junior, Pereira, & Sichieri, 2014; Drichoutis, Nayga, & Lazaridis, 2012; Du et al., 2016; Kant & Graubard, 2004). Possible reasons for these various results are differences in energy intake due to the

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type of food facilities frequented or customer characteristics (Bezerra & Sichieri, 2009; Bezerra et al., 2014; Du et al., 2016; Marínguerrero et al., 2008). For example, women usually prefer to control weight and choose relatively healthy foods when dining out, thus FAFH consumption shows no effect on weight gain in women (Bezerra & Sichieri, 2009; Du et al., 2016).

In conclusion, noticeable differences in the relationship between FAFH consumption and risk of overweight and obesity exist, and it is widely discussed that the difference in energy intake away from home is a major factor for the inconsistent results (Bezerra & Sichieri, 2009; Du et al., 2016; Marínguerrero et al., 2008). However, it should be noted that the fundamental crux of the obesity framework centers on the classic energy balance approach, where calorie intake exceeds calorie expenditure (Chou, Grossman, & Saffer, 2004; Philipson & Posner, 2003; Rashad, 2006). Hence, high-calorie FAFH consumption could result in overweight and obesity only if total energy intake exceeds consumption; that is, the prerequisite for the effect of FAFH consumption on weight gain is that surplus energy reaches a certain level. Although differences in calorie intake are fully emphasized to explain the various results in the existing literature, calorie expenditure, another important part of energy balance, is often ignored. This can also help to explain disparities in the relationship between FAFH consumption and weight gain, especially in regions with significantly different levels of physical activity.

In China, the urban–rural disparities in the relationship between FAFH consumption and risk of overweight and obesity are expected to be notable, especially when both energy intake and expenditure are taken into consideration. Due to the long-term urban-biased developing strategy towards industry and the Hukou system of household registration in China, there is an enormous urban–rural gap in economic and social development (Kanbur & Zhang, 2010; Yang, 1999). According to the National Bureau of Statistics of China, the per capita disposable income of urban residents reached 31,790 RMB in 2015, which is almost three times that of rural residents (10,772 RMB). Under the long-term urban–rural dual structure, urban–rural disparities in energy expenditure are considerable. Urban residents have a relatively low level of physical activity due to the increasingly sedentary nature of work and recreation. However, traditional agricultural production is still a basic part of most rural residents, and heavy physical activities, such as farm work, are universal. Also, studies have found that rural residents differ substantially from urban residents in food consumption structure (Meng, Xu, & Zhang, 2010; Zheng, Gao et al., 2015; Zheng, Henneberry et al., 2015). Urban residents' consumption on animal products is significantly larger than that of rural residents, while their grain consumption is smaller than that of rural residents (Meng et al., 2010). The urban–rural disparities in food consumption structure at home are expected to reflect that of FAFH consumption, which may contribute to differences in energy intake.

Differences in energy intake and expenditure may lead to the urban–rural disparities in the effects of growing FAFH consumption on overweight and obesity. Unfortunately, these disparities have been neglected in the several studies that have analyzed these effects in China (Cao, He, & Yang, 2014; Du et al., 2016). In this paper, we first explored the possible urban–rural disparities in associations between FAFH consumption and risks of overweight and obesity in China. We then analyzed the difference in the perspective of surplus energy, including both energy intake and energy expenditure.

The rest of the paper is organized as follows: Section 2 introduces the method and data; Section 3 presents the results of the association between FAFH and BMI; Section 4 discusses the mechanism of the empirical results; finally, the paper is concluded

in Section 5.

2. Methods and data

2.1. Data

The data were drawn from the China Health and Nutrition Survey (CHNS), which is a longitudinal, household-based study that began in 1989. There have been nine surveys to-date, of which the latest was in 2011. The CHNS includes eight or nine diverse provinces that vary substantially in geography, economic development, public resources and health indicators; three additional megacities (Beijing, Shanghai and Chongqing) were added in the latest 2011 survey. A multistage cluster random sampling method was used to derive the original sample, and the related information was collected by questionnaire survey on the individual, household and community levels (Du et al., 2016). Therefore, demographics, socio-economics, physical activity and health data were collected in the CHNS. It also provides detailed individual food intake information during the surveyed 3 days, which fully supports our analysis.

Given the drastic growth of the China's catering industry since the beginning of the 21st century, our estimation was conducted for the latest four surveys (2004, 2006, 2009 and 2011). The analysis included non-pregnant individuals aged 18–60 years. Furthermore, given that the BMI factor of overweight malnourished populations is remarkably different from the general population (as a result of disease, excessive weight loss, etc.) and that the disabled and participants who report to have been diagnosed with non-communicable chronic diseases may have strict limitations on eating behaviors, they were excluded from the sample. A final sample size of 26,244 adults (9148 in urban and 17,096 in rural China) were included.

2.2. Methods

According to previous studies, the prevalence of overweight and obesity is a result of multiple factors, including demographic, socio-economic and lifestyle variables, among which FAFH consumption is being paid more and more attention because of its high energy and fat content (Lachat et al., 2012; Lin et al., 1999). To formalize these interrelationships and to take into account the urban–rural difference, we set the multivariate linear model of the influence of FAFH consumption on overweight and obesity as follows:

$$BMI_{ij} = \beta_{0j} + \beta_{1j}FAFH_{ij} + \beta_{2j}X_{ij} + \mu_{ij}$$

where i indicates different individuals; j represents the urban and rural difference; j equals 1 if the respondent is in urban China and 2 if in rural China. The dependent variable BMI_{ij} is the body mass index of individual i in region j . $FAFH_{ij}$ is the key variable, representing the consumption of food away from home of individual i in region j , and β_{1j} shows the influence of $FAFH_{ij}$ on BMI_{ij} . X_{ij} are controlled variables, and include demographic characteristics, socio-economic variables, lifestyle variables, year dummies and province dummies. β_{0j} is the intercept term and μ_{ij} is the error term.

2.2.1. Definition of overweight and obesity

BMI is defined as weight (kg) divided by the square of height (m^2). Weight was measured to the nearest 0.1 kg using an electronic scale, and height was measured to the nearest 0.1 cm using a stadiometer (Du et al., 2016). The cut-offs established by the Working Group On Obesity In China were used to classify the respondents: $24 \text{ kg/m}^2 \leq BMI < 28 \text{ kg/m}^2$ for overweight and $BMI \geq 28 \text{ kg/m}^2$ for obesity.

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