THE EFFECT OF DIETARY KNOWLEDGE ON CHINESE ADULTS' BODY MASS INDEX

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ABSTRACT

Publishing dietary guideline and conveying dietary knowledge to the public through mass education are world wide used to alleviate overweight and obese problem. However, previous researches in developed countries have showed that dietary knowledge has limited effect on preventing obesity. This study uses China as an example, aims to examine whether dietary knowledge can prevent overweight and obese problem in developing countries.

An ordinary least squares econometric regression model is used to invest demographic, socioeconomic, dietary knowledge, life styles, and food and physical activity preferences predictors of BMI in Chinese adults from the 2004 Chinese Health Nutrition Survey.

The result shows that dietary knowledge does not associate with BMI, whereas demographic factors, occupation, income, lifestyles of being a smoker, drinking alcohol and preferring in watching T.V. are highly associated with BMI. The impacts of preference in salty snacks, sugared beverage and light activity although statistically significant, are not going to the direction we expect.

This study presents that the overweight and obese problem will get worse in the future. Chinese government should pay more attention on this issue. Preventive education of delivering dietary knowledge to public although not effective is still a channel worth to use if we think education as a long term shifting in attitude development and adjustment about dietary.

This thesis is dedicated to all who played a part in its creation –
My advisor David Newman, GPPI faculty and staffs, my friends and family.

Special thanks to my parents!

Thank you so much.

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Introduction

Overweight[1] and obesity pertain to the abnormal or excessive accumulation of fat, which creates risks for a person's health. Overweight and obesity are major factors for chronic disease such as diabetes, cardiovascular diseases, and cancer (WHO: 2008). They not only reduce one's health-related quality of life but also drive the rapid growth of health care and medication spending (Sturm: 2007). Not all countries assess the actual cost of obesity and its co-morbidities; however, in the United States, obesity causes at least 300,000 excess deaths every year. In 2002, the health care cost for American adults with obesity was estimated to be $93 billion (Food Assistance and Nutrition Research Program: 2007)

Once considered a problem only in high-income countries, overweight and obesity are now a worldwide phenomenon affecting even low- and middle-income countries, particularly in urban settings (WHO 2008; Popkin: 1995, 1997). China is one of the developing countries now facing the problem of the widespread of overweight and obesity. Since the economic reforms in 1979 and the increase in per capita income, the traditional Chinese diet, including cereals and vegetables with some meat has been transformed to a larger quantity of animal products and higher fat intake (Du et al.: 2002). At the same time, occupational patterns have shifted from physically

[1] Overweight is generally known as an adjective but used as a noun in most of obesity related researches. In this paper, like those academicals papers, overweight is used as a noun.

intensive work to light activity, thus reducing energy expenditure; urbanization (associated with wide-ranging factors, which, in turn, affect diet), physical activity, and body composition also cause people to become overweight and obese.

The China Health Nutrition Survey (CHNS) reveals that from 1989 to 2000 the number of overweight and obese (BMI>=25) of Chinese adults (20-45 years old) increased from 9.1% to 19.7% (Wang et al.: 2007). A 2004 survey by the CHNS showed that more than 30% of the sample was overweight. This shows that overweight and obese population in China has dramatically increased and is likely to increase health care problems and medical spending.

In the 1990s, the Chinese government recognized the prevalence of overweight and obesity in the population as growing health problem. To alleviate this problem, the government has crafted a policy, to distribute health knowledge through public education, hoping that citizens will eventually learn about obesity and maintain their body conditions through better eating habits and lifestyles (Zhai et al.: 2002). Accordingly, the Institute of Nutrition and Food Hygiene at the Chinese Academy of Preventive Medicine and the Chinese Nutrition Society designed the Dietary Guidelines for Chinese Residents. These guidelines contain eight principles focused on under- and over-nutrition and relate food behaviors. The principles are:

1. Eat a variety of foods, with cereals as the staple.
2. Consume plenty of vegetables, fruits and tubers.

3. Consume milk, beans or diary or bean products daily.
4. Consume appropriate amounts of fish, poultry, eggs and lean meat. Reduce fatty meat and animal fat in the diet.
5. Balance food intake with physical activity to maintain a healthy body weight.
6. Choose a light diet that is also low in salt.
7. Drink alcoholic beverages in limited amounts, if at all.
8. Avoid unsanitary and spoiled foods. (Zhai et al. 2002; the Dietary Guidelines for Chinese Residents, 2005).

This paper examines whether distributing dietary knowledge is effective by examining whether knowledge is related to weight using the Chinese Adults' BMI distribution from the 2004 CHNS.

Literature Review

Body Mass Index Cutoff Points

Defined as a person's weight in kilograms divided by the square of their height in meters (kg/m^2), body mass index (BMI) classifies underweight, overweight, and obese adults of both sexes, for all ages (WHO: 2006).

The World Health Organization (WHO) defines an overweight individual as someone with a BMI greater than 25, and an obese Caucasian individual as someone with a BMI of 30 and above (Table 1).

However, these cutoffs should be considered only as a rough guide, because they do not correspond to the same degree of fatness in different ethnic groups. For instance, Asians have a higher body fat content and greater risk for diabetes, higher blood pressure, and heart diseases than Caucasians do. Therefore, judging Asians by Western standards of obesity can be problematic; an overweight and obese Asian may have a normal BMI. Because the BMI thresholds are based on Caucasians pattern, Asians would not receive the proper screening, prevention, or treatment if they were applied without modification (Nature Medicine 2004). Based on cross-sectional data from various national surveys, a WHO panel recommended different cutoff points for Asians. These cutoff points define an overweight Asian as someone with a BMI

greater than 23, and an obese Asian as someone with a BMI of 25 and above (see Table 1) (Nature Medicine: 2004; WHO: 2004, 2007).

Table 1: International and Recommended Asia Classification of Adult Underweight, Overweight and Obesity According to Body Mass Index (BMI**)**

Classification	BMI (kg/m^2) Cut-off Points for Caucasians	BMI (kg/m^2) Recommended Cut-off Points for Asian Countries
Underweight	**<18.50**	**<18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00-16.99	16.00-16.99
Mild thinness	17.00-18.49	17.00-18.49
Normal range	**18.50-24.99**	**18.50-22.99**
Overweight	**≥25.00**	**≥23.00**
Pre-obese	25.00-29.99	23.00-24.99
Obese	**≥30.00**	**≥25.00**
Obese Class I	30.00-34.99	25.00-29.99
Obese Class II	35.00-39.99	30-39.99
Obese Class III	≥40	≥40

Source: World Health Organization (WHO)

Chinese officials argue that this definition does not include data from China and Taiwan. Consequently, based on a survey of 21 provinces and 239,972 adults in the 1990s, China set its own standard, defining a BMI of 24 as the cutoff point for overweight and a BMI of 28 as the cutoff point for obesity (Zhou: 2002). Hence, by definition, the Chinese standard is less strict than the WHO standard.

Taiwan has it own standard that defines a BMI of 24 as the cutoff point for overweight and a BMI of 27 for obesity (Department of Health: 2002). Therefore, applying Chinese standards to the Taiwanese is unnecessary. In addition, because the

risk is a continuum, the Japanese researcher Mitsuo Fukushima argues that "anything above a BMI of 22 would show risk for Asians" (Nature Medicine: 2004).

While there are significant differences in the BMI-body fat relationship among Asian countries and ethnicities (Deurenberg-Yap M et. al.), I have adopted the WHO's recommended cutoff points for Asian countries in this study. I believe that the WHO standard is more inclusive; apart from this, it is better to include more people in the target population while planning a health policy aimed at preventing diseases. Table 2 presents the difference in sample distribution by using three cutoff points standard mentioned above. Using the Chinese standard is used rather than WHO-recommended cutoff points for Asian countries, an additional 13 percent of Chinese adults have normal BMI, and another 10 percent of overweight and obese population is excluded.

Table 2: BMI Distribution among Chinese Adults by Different Cut-off Points

WHO Cut-off Points for Caucasians		Chinese Cut-off Points		WHO-recommend Cut-off Points for Asian Countries	
Thin (BMI<18.5)	6	Thin (BMI<18)	3.74	Thin BMI(<18.5)	6
Normal (BMI=18.5-24.99)	66.80	Normal (BMI=18-24)	59.53	Normal (BMI=18.5-22.99)	46.54
Above normal (BMI=25-29.99)	22.72	Above normal (BMI=24-28)	27.61	Above normal (BMI=23-24.99)	20.26
Obese I (BMI=30-35)	3.37	Obese (BMI>=28)	9.12	Obese I (BMI=25-29.99)	22.72
Obese II (BMI=35-39.99)	0.36			Obese II (BMI=30-39.99)	3.73
Obese III (BMI>=40)	0.76			Obese III (BMI>=40)	0.76
Total (Percent)	100	Total (Percent)	100	Total (Percent)	100

Source: WHO

What affects BMI?

BMI is affected in part by demographic factors. A survey shows that in the United States (US), the average BMI across gender is fairly similar (CDC: 2003). However, it does not mean that the proportions of overweight and obesity of men and women are similar. Reports from the WHO show that women have higher rates of obesity than men although men may have higher rate of overweight (WHO: 2000).

BMI is positively related with age—as age increases, BMI increases (Van Lenthe et al.X: 2000). Hall (2003) argues that there is a BMI naturally gain curve, that is, men's body mass index gradually increases with age, until after age 50 to 60, when a gradual decline occurs. Each percentile line has a curved shape, even for skinny people at 25^{th} and 10^{th} percentiles. Hall believes that it is "natural" for some weight gain to occur during adult life. Moreover, he argues that adult BMI gain changes with age, assuming that about 1.1 kg/m^2 between age 20 to 30, 0.6 kg/m^2 between age 30 to 40, 0.4 kg/m^2 between age 40 to 50, and so on. However, a BMI increase with age does not necessarily mean that older cohort has higher BMI than younger cohort, in developing countries; dietary patterns even play a more important role than physical reasons. In China, dietary transition only happened in these two decades; elder adults who still maintain traditional dietary patterns currently may have lower BMIs than younger people who consume more high-fat foods. Yet if comparing same age group

people in different years, we will find the mean BMI in that age group is increasing across years.

There have been studies that show that marital status especially marital change is also related to BMI. Sobal (2003) points out that unmarried people usually weigh less than married people do. The reasons for this are not clear yet, but unmarried people need to attract mates so that they may keep their figure in a good shape (Waldron, Lye: 1989). In addition, urban residents have higher BMIs than their rural counterparts. This phenomenon is particularly obvious in less developed countries and is intertwined with many socioeconomic conditions such as access to better education and health facilities ,professional profiles, and less physical activities (WHO: 2000), which are discussed below.

Overweight is also associated with the income and level of education of a person (Cornelisse: 2006). Therefore, it is important to consider education, income, and occupation when explaining differences in BMI. However, whether socio-economic variables are positively or negatively related to BMI depends on a country's level of development. Sobal's review of socioeconomic status and obesity found the same consistency, which is that among adults in developing countries, SES was positively associated with obesity as opposed to relationship in developed societies (Sobal: 1989). In developing countries, increase in income means adequate food supplies; people

therefore can consume more animal-protein, high-fat food. Moreover, a traditional culture value from the time when food supplies are not adequate regarding "fat" as a symbol of wealth and good life also encourage people consume more food as their income increases. For example, in many Asian countries, people use food as a reward for events and regard larger bodies as a sign of prosperity (Nature Medicine: 2004). In Nigeria, young women are isolated in "fattening huts" and are fed high qualities of food in order to find a high-status spouse. A woman's figure represents a family's wealth. Being relatively fat would help the daughter to marry up in their society and expand the family network at a higher social level (Sobal: 1997).

What is more interesting is the relation between gender and SES. If consider gender only, mean BMI across gender is similar. However, in developed country, while considering gender and SES together, education attainment and higher SES were associated with a lower risk of obesity in both men and women, whereas higher occupational status was associated with a lower risk only for women. Yet whether these phenomena also appear in developing countries is still unknown. (Wardle et al.: 2002).

Physical activities also impact BMI. Professional workers, who usually have higher SES, tend to have higher BMI than manual workers because professionals are less physically active during the course of their work. Sedentary behaviors such as

reading, working at a computer, driving a car may contribute to weight gain through means other than a reduction in energy expenditure (WHO:2000). Yet professional workers usually have time and opportunities for leisure (Sobal: 1989).

Life style choices such as smoking and alcohol consumption also affect BMI. Smoking and body weight are inversely related; smokers tend to have increased metabolic rate and to reduce food intake compared with non-smokers (WHO: 2000). Conversely, alcohol is associated with an increased risk of abdominal fat. The human body is unable to store alcohol, and oxidation of ingested alcohol is prioritized over that of other macronutrients. Therefore, alcohol consumption meets some of the body's energy needs, allowing a greater proportion of energy from other foods to be stored as fat (WHO: 2000).

Health Knowledge and BMI

Although overweight and obesity appear in different subgroups in developing and developed economies, countries around the world (Japan, Netherlands, Thailand, U.S., U.K.… etc.) use similar methods to alleviate the problem-conveying nutritional knowledge to the public, for the reason that it is believed that health knowledge education will lead to long term changes in attitude development and adjustment about dietary fat, thus influencing food choices and dietary quality (Kenkel 1991). Since the early 1990s, the U.S. Department of Agriculture (USDA) has published food guides to

teach the public healthy eating habits. The 1990 Dietary Guideline imposed by the USDA stressed body weight and the intake of fat and saturated fat. In 1993, the USDA created the Food Guide Pyramid to suggest the elements of a healthy diet. The food pyramid was taught in schools and disseminated through the media and brochures.

In 1999, the British Broadcast Company launched the "Fighting Fat, Fighting Fit" (FFFF) campaign, designed to inform people of the need for active obesity prevention, and to educate and encourage them to eat more healthily and become more physically active; the deliver channels include book, video, and boarded programs (Wardle et al.: 2001). However, the benefit of health knowledge appears to be limited. Research indicates that dietary prevention education is not as successful as education on smoking cessation because smoking requires only a single change in behavior (which is to stop smoking); in contrast, dietary improvement is much more complicated (Atkins and Bowler: 2001). Although some people know what constitutes a healthy diet, they prefer practicing a relatively unhealthy one (WHO: 2000). There is always a gap between what individuals think they "should" do, what they "actually" do, and what they "say" they do to whoever is interested in knowing always exists (Backett: 992).

Health Knowledge, BMI, and China

As mentioned in background, China designed its own Dietary Guidelines for Chinese and the "Chinese Pagoda," (similar to USDA's Food Pyramid) as tools for passing on dietary knowledge to mitigate obesity. However, to date research has focused only on the distribution of Chinese adult BMI and the trend in this distribution (Ge at al, 1992; Popkin et al, 1995; Bell et al, 2001; Y. Wang et al, 2007; H. Wang et al, 2007), not on regress statistical analysis of the relation between dietary knowledge and BMI, or the relation between demographic factors, SES and BMI. Accordingly, this paper used a regression model to discuss whether dietary knowledge performs better in China than it does in other countries in terms of mass education on overweight and obesity.

Conceptual Model

This section explains the reasoning behind the relationship posited between BMI and demographic factors, socio-economic conditions, dietary knowledge, food preference, and physical activity preference.

Demographic factors

Demographic factors include gender, age, and location.

Gender: As mentioned, gender itself does not affect BMI a lot. However, since gender is correlated with some socioeconomic status, it is important to take gender into account while analyzing BMI distribution among Chinese adults.

Age: Studies show that BMI is positively associated with age. However, since China's economic reform and rapid economic growth beginning 1987, it is likely that only the young and middle-aged populations have shifted their dietary habits from healthy diet to processed food. Therefore, more attention should be paid to the relationship between age and BMI.

Location: In China, people's educational attainment, income, activity level, and food consumption patterns vary geographically between urban and rural settings. Urban residents are more likely to have higher educational attainment, income, lower activity level, and high animal protein, more oil and less vegetables food consumption

patterns, because they have more change to eat out and access to fast food (Wang et al.: 2007).

Rural residents are more likely to be engaged in manual work. Therefore, it is likely that people who live in urban areas will have higher BMI compared to people who live in other.

Socioeconomic Factors

Socio-economic factors include education, occupation and income.

Education: Education and income are usually considered socioeconomic indicators and are generally negatively associated with the BMI in developed countries but positively associated with the BMI in developing countries. However, taking these factor separately, little is known about the relationship between education level and obesity in developing countries except that urban adults are more highly educated than those from rural areas (WHO: 2000).

Occupation: People with less physical activities at work are likely to have higher BMI than those who have more physical activities.

Income: In a developing country like China, processed foods commonly have high fat, salt, and sugar content, and are usually more costly. People with higher socioeconomic status tend to consume more processed food; only those in low socioeconomic status groups maintain traditional healthy diet habits and lifestyles

(Kim et al: 2003). Socioeconomic variables, in this case, are likely to be positively related to weight.

Dietary knowledge, lifestyle, food, and physical activity preference

Dietary knowledge: Ideally, the better the dietary knowledge a person has, the more likely that he or she will have a normal weight. In 2002, Nestle pointed out the disparities in diet and health between rich and poor people in the United States. Usually, wealthier people are healthier because they choose better diets; in addition, they are better educated and more physically active. Consequently, it is difficult to separate the effects of diet from those of any other behavioral factor. However, in China, it might be a different case; people who are better educated may have greater dietary knowledge, yet socioeconomic reasons might affect their BMIs more than dietary knowledge.

Lifestyle: Habits of smoking and drinking alcohol and drinking sugared beverage will be examined in the model. It is generally believed that smokers have lower BMI than non-smokers, while people who drink alcohol and sugared beverage frequently have higher BMI than those who rarely drink.

Food preference: In this aspect, it was assumed that people who like to eat fast food, salty snacks, and sugared beverages have a higher BMI than those who do not

prefer these food items. In addition, it was assumed that people who prefer healthful food (fruits and vegetables) will have lower BMI than those who do not eat like them.

Activity preference: I assume that activities such as light exercise (activity), sports, and body building are negatively associated with BMI and that sedentary activities, like watching T.V, watching video, playing computer, surfing the Internet, or reading, are positively related with BMI.

Data Source

The principle sources of data for this study are the 2004 Chinese Adults and Household Income data from the China Health and Nutrition Survey (CHNS), which is a longitudinal (1989, 1991, 1993, 1997, 2000, and 2004) cross-sectional (nine provinces) survey conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill, the National Institute of Nutrition and Food Safety in China, and the Chinese Center for Disease Control and Prevention. One goal of the project is to examine how the social and economic transformation of Chinese society affects the health behavior, health, and nutritional status of China's population.

The CHNS survey was conducted over a three-day period in nine provinces: Heilongjiang, Liaoning, Shandong, Jiangsu, Henan, Hubei, Hunan, Guangxi, and Guizhou. These provinces have differences in geography, economic development, public resources, and health indicators. A multistage, random cluster process was used to draw the survey sample. Counties in each of the nine provinces were stratified by income level and were randomly selected based on a weighted sampling scheme. In addition, the provincial capital and a lower-income city in each province were selected when feasible, except that other large cities other than the provincial capitals were selected in two provinces. Villages and towns within the counties and urban and

suburban neighborhoods within the cities were selected randomly. Beginning in 2000, the primary sampling units were increased to 216, including 36 urban neighborhoods, 36 suburban neighborhoods, 36 towns, and 108 villages.

The 2004 Adult Survey questionnaire was organized into 10 sections, which included the following: demographics, work activities, household chores and child care, tobacco, caffeine, alcohol, and sugar consumption, current functioning, use of health services, health status, diet and activity knowledge, questions for married women under age 52, and physical measurements. This study used information from the demographic, work activities, tobacco, caffeine, alcohol and sugar consumption, diet and activity knowledge and physical measurements sections.

Among the 9,856 people originally sampled in the survey, 736 observations were removed. The data cleaning process was of two stages. First, 596 observations were removed because of missing information on height and weight. Second, while calculating the BMI, the researcher found extreme values (BMI<10 or BMI>100) which appeared to because of errors in coding height and weight. Those extreme values could lead the analysis lose its validity. Therefore, the researcher decided to eliminate outliners at both ends of the distribution (69 or 1.5% of all observations). Consequently, this study considered only the BMI of 98.5% of the respondents ranging from 15.84 to 60.89.

Descriptive Statistics

Before moving onto the econometric model, it is important to review descriptive statistics and regarding the relation between BMI and the variables of interest. One way Anova was used to compare the mean BMI by variables among different populations in the following tables**.**

Figure 1 show the BMI distribution for Chinese Adults. Forty-six and fifty-four hundredths percent of observations had normal BMI (18.5-22.99 kg/m^2). An additional 6% of the samples had BMIs below the normal range, and another 47.5% of them had a BMI above normal in the obese range. As we see in the figure, the distribution of BMI is right-skewed, which means that in China the obesity problem is now more serious than malnutrition.

Figure 1: Histogram of BMI distribution among Chinese Adult

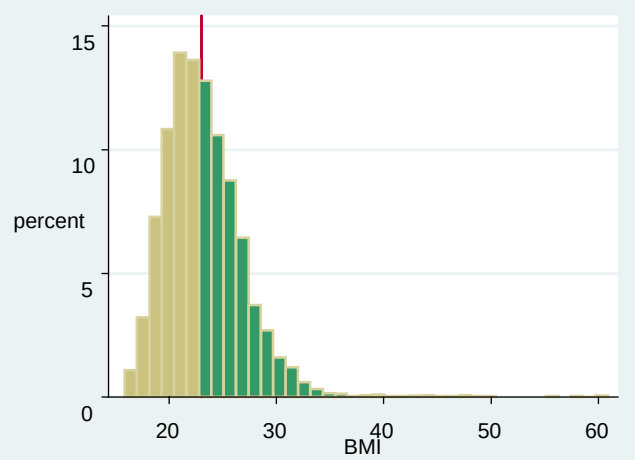

Table 3 analyzes BMI and demographic characteristics. A stringent P value of 0.05 or smaller was used to denote "statistically significant". The mean BMI of females (23.37) was slightly higher than that of males (23.27), and was similar to a U.S. survey which showed that the average BMI of men and women were fairly similar (26.6, 26.5 respectively) (CDC: 2003). BMI is the product of height and weight, so despite men weighing more than women in the sample; women have a higher BMI than men because the latter are typically taller than the former.

The mean BMI across age increases up to a point as age increases. The peak BMI occurs at 50 years old; however, for people beyond 50 years old, the mean BMI decreases as age increases. This confirms the need to put both age and age squared variables in the model

Table 3 also shows that urban residents, people with higher educational attainment and incomes, have higher mean BMIs than others. Working people have lower mean BMIs than non-working people. Meanwhile, within the group of working people, professional and skilled workers have higher mean BMIs than farmers, fishermen, and hunters. Values are generally consistent with what one would expect.

Table 3: Descriptive Statistics on BMI and Demographic Characteristics

	Mean BMI	Standard Deviation	N	Percent
Total	23.32	4.08	9,120	100
Age** (N=9,120)				
18-24	21.51	4.28	551	6.04
25-34	22.77	4.18	1,389	15.23
35-44	23.67	4.17	1,996	21.89
45-54	23.70	3.71	2,225	24.4
55-64	23.56	4.07	1,539	16.88
65-74	23.36	4.07	971	10.65
>=75	22.59	4.07	449	4.92
Gender (N=9,120)				
Male	23.27	4.10	4,342	47.61
Female	23.37	4.07	4,778	52.39
Location** (N=9,109)				
Urban	23.90	4.05	3,954	43.41
Rural	22.88	4.05	5,155	56.59
Martial status** (N=9,080)				
Married	23.49	3.98	7,492	17.49
Not married	22.51	4.47	1,588	82.51
Education (N=9,103)				
Don't know	24.95	4.57	16	0.18
Never went to school	23.14	4.01	1,352	14.85
Elementary school	23.27	4.04	2,569	28.22
Middle school	23.32	4.18	3,024	33.22
High school	23.46	4.01	1,678	18.43
College or higher	23.71	4.08	464	5.1
Income** (N=9,037)				
Low	22.83	4.16	2,881	31.88
Middle	23.34	4.04	3,052	33.77
High	23.78	4	3,104	34.35
Working Status** (N=9,095)				
Working	23.13	3.97	5,370	59.04
Non-working	23.62	4.23	3,725	40.96
Occupation** (N=4,997)				
Professional	24.03	3.96	925	18.51
Farmer, fisherman, hunter	22.58	3.85	2,422	48.47
Skill/non-skill workers	23.34	3.95	1,431	28.64
Don't know	23.25	3.83	219	4.38

**Statistically significant, $p<0.05$

Table 4 presents the relationship between BMI and dietary knowledge. There were 12 dietary knowledge questions in the survey (questions and descriptive statistics are listed in the Appendix, see Table 10.). The dietary knowledge index variable is defined as the ratio of correctly answered questions to all answered questions in order to evaluate how much Chinese adults know about dietary knowledge. Approximately 82% of the observations answered more than half of the answered to questions correctly; 16.24% of the sample population answered more than three-fourths of the responded questions correctly. The mean BMI across dietary knowledge index shows that as people have more correct knowledge, the mean BMI increases up to a point, however, the mean BMI decreases as the correct answer rate increases.

Table 4: Descriptive Statistics on BMI and the Dietary Knowledge Index

	Mean BMI	Standard Deviation	N	Percent
Dietary Knowledge Index (N=9,082)				
<25%	22.38	4.13	252	2.77
25-49.9%	23.13	3.98	1,403	15.45
50-74.9%	23.47	4.02	5,952	65.54
75-100%	23.09	4.41	1,475	16.24

The following section divided the sample by attitudes toward fast food, salty snacks, sugared drink, fruits, and vegetables. Table 5 analyzes Chinese adults' BMI and their dietary characteristics. In fact, most observations do not eat fast food, salty snacks, or drink sugared drink (61.24%, 49.66%, and 36.2 %, respectively). As for the

rest of the sample, one can note that people who dislike these foods have higher mean BMIs than people who like those foods. With respect to healthy foods, 86% and 94% of people who like fruit and vegetable. Within those populations, the more they like fruits, the lower the mean BMI they have. However, whether people like vegetables or not does not show any relation with BMI.

Table 5: Descriptive Statistics on BMI and Dietary Characteristics

	Mean BMI	Standard Deviation	N	Percent
Fast food (N=9,069)				
Dislikes very much	23.91	4.34	917	10.11
Dislikes somewhat	23.52	3.73	1,726	19.03
Likes somewhat	22.91	4.19	665	7.33
Likes very much	22.82	5.13	207	2.28
Doesn't eat this food	23.24	4.06	5,554	61.24
Salty snack (N=9,070)				
Dislikes very much	24	4.22	709	7.82
Dislikes somewhat	23.56	3.8	2,254	24.85
Likes somewhat	22.77	3.76	1,249	13.77
Likes very much	22.47	4.16	354	3.9
Doesn't eat this food	23.33	4.25	4,504	49.66
Sugared beverage (N=9,072)				
Dislikes very much	23.72	4.08	628	6.92
Dislikes somewhat	23.5	3.97	2,982	32.87
Likes somewhat	22.93	3.94	1,701	18.75
Likes very much	22.56	3.96	477	5.26
Doesn't eat this food	23.41	4.25	3,284	36.2
Fruit (N=9,075)				
Dislikes very much	23.53	3.24	126	1.39
Dislikes somewhat	23.46	4.02	853	9.4
Likes somewhat	23.33	4.1	3,990	43.97
Likes very much	23.32	4.06	3,865	42.59
Doesn't eat this food	22.77	4.73	241	2.66
Vegetable (N=9,076)				
Dislikes very much	23.92	3.58	91	1
Dislikes somewhat	22.74	3.49	263	2.9
Likes somewhat	23.2	4	3,724	41.03
Likes very much	23.44	4.13	4,900	53.99
Doesn't eat this food	23.33	6.1	98	1.08
**Statistically significant, $p<0.05$				

Table 6 shows Chinese adults' BMI and their lifestyle. It is obvious that smokers have lower mean BMIs than non-smokers. In addition, people who ever drink alcohol last year have higher mean BMIs than people who do not. However, at the same time, the numbers do not show any relationship between the frequencies of drinking alcohol and mean BMIs. The relation between sugared beverage and BMI is opposed to we expect. People who never drink sugared beverage last year have higher mean BMIs than other people. Moreover, the relation between the frequency of drinking beverages and BMI is not clear.

Table 6: Descriptive Statistics on BMI and Lifestyle

	Mean BMI	Standard Deviation	N	Percent
Smoking (N=9,109)				
Never	23.43	4.09	6,155	67.57
Ever smoked	23.08	4.00	2,948	32.36
(Current smoking situation, N=2,959)				
Doesn't smoke anymore	23.66	3.97	333	11.25
Still smoking	23.02	4.00	2,623	88.64
Doesn't know	20.94	0.83	3	0.1
Doesn't know	28.16	13.77	6	0.07
Alcohol (N=9,103)				
Never drink alcohol last year	23.26	4.09	6,110	67.12
Ever Drink alcohol last year	23.45	4.00	2,989	32.84
(Drinking Frequency, N=2,984)				
Drinks every day	23.34	4.08	968	32.44
3-4 times/per week	23.61	3.82	395	13.24
1-2 times/per week	23.82	3.88	745	24.97
1-2 times/per month	23.27	3.98	536	17.96
No more than once time/per month	23.17	4.51	272	9.12
Doesn't know	22.46	2.60	68	2.28

Doesn’t know	32.52	17.09	4	0.04
Sugared beverage (N=9,111)				
Never drink sugared beverage last year	23.43	4.04	6,743	74.01
Ever Drink sugared beverage last year	23.01	4.13	2,353	25.83
(Drinking Frequency, N=2,353)				
Drinks every day	22.38	3.17	106	4.5
3-4 times/per week	22.97	3.79	162	6.88
1-2 times/per week	23.04	4.34	559	23.76
1-2 times/per month	23.24	4.49	740	31.45
Not more than once time/per month	23.06	3.81	633	26.9
Doesn't know	22.13	3.65	153	6.5
Doesn’t know	25.12	9.46	15	0.16

**Statistically significant, $p<0.05$

Table 7 provides an analysis of Chinese adults’ BMI and their activity preference. Except for watching TV, less than 50% of the sample respondents join in other activities. The analysis show that for light physical activities (i.q., walking, tai-chi), people who participate them have higher BMI mean than those who do not. As for sports and body building, people who like these activities have lower mean BMIs than people who dislike them; this is consistent with the expected result—that people who do more exercise have lower mean BMIs (Bell et al). The BMI distribution for watching TV and reading shows that the more a person likes to watch TV and read, the higher mean BMI he or she has. However, there is no relationship between watching videos, computer use, and surfing on the Internet, and BMI.

Table 7: Descriptive Statistics on BMI and Activity Characteristics

	Mean BMI	Standard Deviation	N	Percent
Light physical activity** (N=9,062)				
Dislikes very much	23.58	3.92	329	3.63
Dislikes somewhat	23.37	4.15	1,181	13.03
Likes somewhat	23.70	4.11	1,695	18.70
Likes very much	24.25	4.02	944	10.42
Doesn't participate	23.00	4.05	4,913	54.22
Sport** (N=9,053)				
Dislikes very much	23.78	3.98	339	3.74
Dislikes somewhat	23.78	4.20	1,204	13.3
Likes somewhat	23.46	3.74	696	7.69
Likes very much	23.38	3.97	323	3.57
Doesn't participate	23.21	4.10	6,491	71.7
Body building** (N=9,053)				
Dislikes very much	23.84	4.19	268	2.96
Dislikes somewhat	23.73	4.35	1,018	11.24
Likes somewhat	23.71	3.75	590	6.52
Likes very much	23.58	3.33	272	3
Doesn't participate	23.21	4.09	6,905	76.27
Watching TV** (N=9,074)				
Dislikes very much	22.89	3.51	263	2.9
Dislikes somewhat	23.24	3.73	737	8.12
Likes somewhat	23.34	4.00	4,374	48.2
Likes very much	23.50	4.24	3094	34.1
Doesn't participate	22.65	4.43	606	6.68
Watching Videos, computer and surfing on the Internet (N=9,043)				
Dislikes very much	23.97	3.83	577	6.38
Dislikes somewhat	23.49	3.78	865	9.57
Likes somewhat	23.2	3.98	457	5
Likes very much	22.98	5.01	330	3.65
Doesn't do participate	23.28	4.10	6,814	75.35
Reading (N=9,060)				
Dislikes very much	23.93	4.36	297	3.28
Dislikes somewhat	23.42	4.03	1,177	12.99
Likes somewhat	23.47	3.97	2,182	24.08
Likes very much	23.85	4.35	840	9.27
Doesn't do participate	23.10	4.07	4,564	50.38
** Statistically significant, $p<0.05$				

Analysis Plans

This section describes the researcher's plan for the analysis of the relationship between Chinese adults' BMIs and their dietary knowledge, food and physically activity preferences, and socioeconomic level. An ordinary least squares (OLS) econometric regression model was used to measure the impact of socioeconomic levels, dietary knowledge, and food and activity preferences on BMI. The model reports the partial effect of each factor on BMI. The effect of each variable helps one to know what affects Chinese people's BMIs most and how mass education strategies in reducing obesity could be improved.

Hypothesis: H_0: Dietary knowledge is not associated with Chinese adults' BMI

H_1: Dietary knowledge is associated with Chinese adults' BMI

*Model: BMI=f_1 (*socioeconomic variables, demographic variables, dietary knowledge, food, and physical activity preferences)

The variables used to estimate BMI are presented in Table 8. More details about all variables in the model and how they are defined are shown in Table 11 in the Appendix.

Table 8: Variables of Interest

Demographic	Socio-economic	Dietary knowledge, Lifestyle choices, food and physical activity preferences
Age	Education	Dietary Knowledge Index
Age squared	Occupation	Food preference (fast food, sugared beverage, salty snack, fruit, vegetable)
Gender	Income	Smoker
Location		Drink alcohol more than one time last year
Marital Status		Drink sugared beverage more than one time last year
Marital*gender		Activity preference (light activity, sport, body building, watching TV, playing computer, video, and internet, reading)

This model contains many dummy variables. The reference group for the model has the following characteristics:

- Female, Rural residents, Currently not married
- Never go to school, Have lower income, Currently not working
- Dislike or do not eat fast food, salty snacks, sugared beverage, fruit, and vegetable
- Non-smoker, Have never drunk alcohol and sugared beverage last year
- Dislike or do not participate in light activities, sport, body building, watching TV, playing computer, video and Internet, reading.

Regression results

Table 9 presents the regression results for Chinese adult BMI. The results based on the data from the 2004 CHNS show that Chinese adults' BMI pattern in the demographic part, is consistent with what is expected. Demographic characteristics are strong predictors of BMI. Age has a positive effect on BMI up to a point with older Chinese adults with higher BMI. The age squared variable means that people who are over 50 years old, their BMIs decrease as their age increases. Males have higher BMIs than females. Urban residents have higher BMIs in contrast to rural residents. Married people have positive effects on BMI while married males have less BMI than all others. Amongst these variables, being an urban resident has greatest effects on BMI, followed by, whose marital status is currently married, being a man and the increase of age.

Among the socioeconomic variables, education is not an important indicator, only high school education level has statistically significant effects on BMI. On the other hand, occupation is a strong predictor of BMIs. Farmers, fishermen, hunters and skilled/non-skilled workers have less BMI than people who are currently not working. Being a farmer, fishermen or hunter even has less BMI than being a skilled/non-skilled worker because people who expend more energy at work have lower BMIs. Income has a strong positive effect on BMI compared with the samples of lower incomes. The higher income they have, the higher BMIs they have as well. It is because higher

income people are more likely to access to high-fat and high-energy food such as meats and processed foods and can eat out in restaurants. In general, socioeconomic characteristics' effects on BMI go to the directions as what is generally expected although not all of them are statistically significant.

The knowledge index variable is not an important indicator of BMI. This finding is consistent with previous research, which points that changes in people's health-and nutrition-related knowledge, attitude, and belief, lag behind the economic and social developments in China (Wang et al.: 2007) and also substantiated by the previous discussion that the benefit of nutritional knowledge is limited and that mass education will only raise awareness although it is hard to encourage active utilization this knowledge in a manner that reduce BMI. In addition, higher knowledge may only reflect respondents answering what they thought they should be doing rather than what they actually are doing (Mills et al.: 2001).

As for lifestyles, the influences of smoking and alcohol consumption are as what we expect. Smoking has negative effects on BMI. People who drunken alcohol more than once per week during last year has higher BMIs than other people do.

In food and activity preference, one can note that people who like salty snack and sugared beverage are likely to have less BMI than people who do not like or do not eat them. This could be that people who like salty snack (potato chips, pretzels, French

fries, etc) and sugared beverage are relatively young; therefore their BMI is relatively lower than that of other people who are older and who have a higher BMI.

As for activity preference, light activity is positively associated with BMI; however, little information is known about the relation. Watch TV has a positive effect on BMI; in fact, it is a good indicator of the more sedentary lifestyle. Other sportive activity preferences do not have strong effects on Chinese adults' BMI; this could be that the idea of leisure time activity is not yet common for the Chinese (Monda et al.: 2006). Recent survey shows that only 28.6% of Beijing residents aged 25-69 years were engaged in regular exercise, which might compensate for a less physically demanding lifestyle (Pang et al, 2005).

Table 9: Estimated Coefficient from the OLS Model of BMI by Demographic, Socioeconomic, Dietary Knowledge, and Lifestyle Characteristics

Dependent variable: BMI		
Variable	Coefficient	Standard Error
Intercept	17.59*	0.53
Age	0.20*	0.02
Age squared	-0.002*	0.00
Male	0.47*	0.22
Location	0.52*	0.11
Marital Status	0.50*	0.17
Marital Status*Gender	-0.45	0.24
Education		
Elementary School	-0.02	0.18
Middle School	-0.08	0.17
High School	-0.40*	0.19
College or higher	-0.43	0.28
Occupation		
Professional	0.02	0.18
Farmers, fishermen, hunters	-0.84*	0.12

Skilled/non-skilled workers	-0.32*	0.14
Income		
Middle income	0.30*	0.11
Higher income	0.45*	0.12
Knowledge index	0.33	0.27
Current Smoker	-0.70*	0.12
Drinks alcohol more than once/week last year	0.34*	0.11
Drinks sugared beverage more than once time/week last year	-0.19	0.12
Food preference		
Fast food	0.06	0.17
Salty snack	-0.54*	0.13
Sugared beverage	-0.29*	0.12
Fruit	-0.09	0.14
Vegetable	0.21	0.21
Activity preference		
Light activity	0.23*	0.11
Sport	0.08	0.18
Body building	0.13	0.18
Watching T.V	0.28*	0.12
Video, computer, Internet	0.03	0.18
Reading	-0.0001	0.12
F-statistics (df): 17.39 (30)		
Adjusted R-squared: 0.0546		
N=8,508		
Note: * p<=0.05		

Discussion

This study presents that age has the greatest impacts on BMI. The magnitude of increasing BMI of people who are younger than 50 years old is almost the same as the magnitude of decreasing BMI of people who are older than 50 years old (beta coefficient are 0.75 for age and -0.73 for age squared respectively.) This is consistent with the fact we know that elder cohorts do not have higher BMIs than younger cohorts in today's' China. Living in urban area also has great impacts on increasing BMI, followed by being a man and being in higher income group. Being a farmer, fisherman or hunter play an vital role in reducing one's BMI , followed by being a smoker. These characteristics show that living in urban area, gender and income are highly associated with BMI increase whereas intensive physical activity at work is highly associated with lower BMI.

Although there are many other reasons affecting BMI can not be explained by the variables in the model, all the results suggest that overweight and obesity problems will get worse in the future. First, as China develops further, few people will engage in manual work; in contrast, more people will be in the service sector, where people eat up less energy. This trend will lead more people to have higher BMIs. Second, as China moves forward the way other developed countries did or have done, the smoking

population may decline because the government has started to promote tobacco cessation. However, as what this paper shows, smoking causes lower BMIs, and smokers frequently gain weight when they give up the habit (WHO, 2000). This means that overweight and obesity will be a more serious problem in the future. Similarly, as China develops, more people will consume alcohol, which will cause them to have higher BMIs.

As a result, although the effects of dietary knowledge on maintaining BMI is not obvious, conveying dietary knowledge through public education is still encouraged to use. It is because dietary knowledge is a preventive health education, according to the experience from developed countries (WHO: 2000), the prevalence of obesity might have been much higher if not for the widespread knowledge. Thus, from a long-term perspective to cultivate citizens' dietary habits and behavior, Chinese government should still keep current policy-distributing dietary knowledge to public for alleviating the overweight and obesity problem in China.

Reference

Atkins Peter and Bowler Ian. *Food in Society: Economy Culture, Geography.* New York: Oxford University Press, 2001

Backett Kathryn "The Construction of Health Knowledge in Middle Class Families" *Health Education Research: Theory and Practice Vol.7 No.4* (1992)*:* 497-507

Bell, AC., Ge K, and Popkin, BM. "Weight Gain and Its Predictors in Chinese adults" *International Journal of Obesity* 25 (2001): 1079-1086

Center for Disease Control. "Healthy weight, overweight, and obesity among U.S. adults" National Health and Nutrition Examine Survey (2003) http://www.cdc.gov/nchs/data/nhanes/databriefs/adultweight.pdf (accessed at March 28)

China Health and Nutrition Survey. http://www.cpc.unc.edu/projects/china (accessed September 28, 2007)

Chinese Nutrition Society. "The Dietary Guidelines for Chinese Residents" (2005) (in Chinese)

Cornelisse-Vermaat, J.R. and H. Maassen van den Brink "The effects of food habits and socioeconomic status on overweight. Differences between the native Dutch and immigrants in the Netherlands" Working Paper Mansholt Graduate School, MWP-05, (2003): 1-27.

Department of Health, Executive Yuan, Taiwan "National Definition of Obesity and Treatment Principle" (2002) http://www.doh.gov.tw/CHT2006/DM/SEARCH_MAIN.aspx?keyword=bmi (accessed March 28, 2008)

Deurenberg-Yap M., Schmidt G, van Staveren WA,. Deurenberg P. "The Paradox of Low Body Mass Index and High Body Fat Percentage among Chinese, Malaysian, Indians in Singapore" *International Journal of Obesity Vol.24 No.8* (2000): 1011-1017

Du Shufa., Lu Bing Lu., Zhai Fengying and Popkin, Barry M. "A new stage of the nutrition transition in China." *Public Health Nutrition, Vol.* 5 (1A) (2002): 169-174

Food Assistance & Nutrition Research Program. "The Economics of Obesity: A Report on the Workshop Held at USDA's Economic Research Service" (2004)

Ge, K., Weisell,R., Guol. X, Cheng, L., Mal, H., Zhai, F. Popkin, BM. "The Body Mass Index of Chinese Adults in the 1980s" http://www.unu.edu/unupress/food2/uid10e/uid10e15.htm (accessed at September 24, 2007)

Halls, Steven B. "Body Mass Index Chart of Men" (2003) http://www.halls.md/body-mass-index/mens.htm (accessed at March 28)

Kenkel, Donald S. “Health Behavior, Health Knowledge, and Schooling” *The Journal of Political Economy Vol.99, No.2* (1991): 287-205

Kim, Soowon., Symons. Michael, Popkin, BM. “Contrasting Socioeconomic Profiles Related to Healthier Lifestyles in China and in the United States” *American Journal of Epidemiology Vol.159, No.2* (2004): 184-191

Monda, Keri. L., Penny Gordon-Larsen, Stevens, June. Popkin, Barry M. “China’s Transition: The Effect of Rapid Urbanization on Adults Occupation Physical Avticity” *Social Science and Medicine, No.64* (2007): 858-870

Natural Medicine “Asia’s Big Problem” *Vol.10, No.4* (2004): 325-327

Nestle Marion. *Safe Food.* Berkeley: University of California Press, 2003

Pang X, Jian S, Huang L, Duan J, Ren G, Liu Z. “Nutrition and Health Status of the Beijing Residents” *Chin J Prev Med, Vol. 39* (2005) 272-275 (in Chinese)

Popkin, Barry M. “The Nutrition Transition and its Health Implication in Lowe-Income Countries” *Public Health Nutrition Vol.1 No.1* (1997): 5-21

Popkin,Barry M., Paeratakul Sahaspirn., Ge Keyou., Zhai Fengying. “Body Weight Patterns among the Chinese: Results from the 1989 and 1991 China Health and Nutrition Survey” *American Journal of Public Health, Vol.85 No.5* (1995): 690-694

Sobal, Jeffery., Rauschenbach, Barbara., Frongillo, Edward A. "Marital status changes and body weight changes: a US longitudinal analysis" *Social Science & Medicine Vol.56, No.7 (2003)*:1543-1555

Sobal, J., Stunkard, A.J. "Socioeconomic Status and Obesity: A Review of the Literature" *Psychological Bulletin Vol.105 No.2* (1989): 260-75.

Walderon I., Lye D. "Family Roles and Smoking" *American Journal of Preventive Medicine Vol.5, No.3* (1989): 136-41

Wardle Jane, Waller Jo, Jarvis Martin J."Sex differences in the association of socioeconomic status with obesity" *American Journal of Public Health Vol.92 No.8* (2002): 1299-1304

Wang H., Du S., Zhai F. and Popkin BM. "Trends in the distribution of Body Mass Index among Chinese Adults, aged 20-45 years (1989-2000)" *International Journal of Obesity 31* (2007): 272-278

Wang Y., Mi J., Shan X-y., Wang QJ and Ge K-y. "Is China facing an obesity epidemic and he consequence? The trend in obesity and chronic disease in china" *Internationa Journal of Obesity 31* (2007): 177-188

Wardle J., Rapoport L., Miles A., Afuape T., and Duman M. "Mass Education for Obesity Prevention: the penetration of the BBC's 'Fighting Fat, Fighting Fit' campaign *Health Education Research Vol.16 No.3* (2001): 343-355

Welsh, Susan O., Davis Carole, Shaw Anne, "USDA's Food Guide: Background and Development" (1993) http://www.cnpp.usda.gov/Publications/MyPyramid/OriginalFoodGuidePyramids/FGP/FGPBackgroundAndDevelopment.pdf(accessed at March 28)

WHO, "The Asia-Pacific Perspective: Redefining obesity and its treatment" (2000)

WHO, "Obesity: Preventing and Managing the Global Epidemic" (2000)

WHO, "Obesity" http://www.who.int/topics/obesity/en/ (accessed March 28, 2008)

WHO, "BMI Classification" http://www.who.int/bmi/index.jsp?introPage=intro_3.html (accessed March 28, 2008)

Zhou, Bei Fan. "Predictive values of Body Mass Index and Waist Circumference for Risk Factors of Certain Related Diseases in Chinese Adults-Study on optimal cut-off points of Body-Mass Index and waist circumference in Chinese adults" *Biomedical And Environmental Sciences* 15 (2002): 83-96

Zhai Fengying., Fu Dawei., Du Shufa., Ge Keyou,. Chen Chunming and Popkin, Barry M. "What is China Doing in Policy-making to Push Back the Negative Aspects of the Nutrition Transition?" *Public Health Nutrition Vol.5* (1A) (2002): 269-273

Appendix

Table 10: Descriptive Statistics on BMI and Dietary Knowledge

	Mean BMI	Standard Deviation	N	Percent
1. Choosing a diet with a lot fruit and vegetables is good for one's health (N=9,080)				
Correct	23.33	4.09	7,102	78.22
Incorrect	23.33	4.07	1,978	21.78
2. Eating a lot of sugar is good for one's health (N=9,079)				
Correct	23.48	4.03	7,162	78.89
Incorrect	22.78	4.23	1,917	21.11
3. Eating a variety of foods is good for one's health (N=9,079)				
Correct	23.41	4.06	7,523	82.86
Incorrect	22.96	4.17	1,556	17.14
4. Choosing a diet high in fat is good for one's health (N=9,079)				
Correct	23.49	4.01	6,993	77.02
Incorrect	22.78	4.28	2,086	22.98
5. Choosing a diet with a lot of Staple foods (rice products and wheat and wheat product) is not goof for one's health (N=9,077)				
Correct	23.30	4.02	4,251	46.83
Incorrect	23.35	4.14	4,826	53.17
6. Consuming a lot of animal product daily(fish, poultry, eggs, and lean meant) is good for one's health (N=9,080)				
Correct	23.55	4.00	5,166	56.89
Incorrect	23.03	4.18	3,914	43.11
7. Reducing the amount of fatty meat and Animal fat in the diet is good for one's health (N=9,080)				
Correct	23.47	4.08	7,052	77.67
Incorrect	22.85	4.07	2,028	23.33
8. Consuming milk and dairy products is good for one's health (N=9,078)				
Correct	23.39	4.08	8,306	91.50
Incorrect	22.62	4.13	772	8.50
9. Consuming beans and bean products is good for one's health (N=9,080)				
Correct	23.38	4.07	8,495	93.45
Incorrect	23.61	4.22	595	6.55
10. Physical activities are good for one's health (N=9,079)				
Correct	23.38	4.08	8,302	91.44
Incorrect	23.81	4.07	777	8.56
11.Sweaty sports or other intense physical activities are not good for one's health (N=9,079)				
Correct	23.38	4.04	5,085	56.01
Incorrect	23.26	4.15	3,994	43.99
12. The heavier one's body is the healthier he or she is (N=9,081)				
Correct	23.41	3.95	7,847	86.41
Incorrect	22.84	4.84	1,234	13.59

Table 11: Variables of interests and definition

Variable Name	Variable Value
Age	18-107
Agesq	Age squared
Gender	1=Male; 0=Female
hhrt	1=Urban; 0=Rural
Marital	1=Currently married; 0=All others
Margen	1=Currently married * male; 0=All others
Education	
edu2	1=Elementary school; 0=All others
edu3	1=Middle school; 0=All others
edu4	1=High school; 0=All others
edu5	1=College or higher; 0=All others
Occupation	
occupation2	1=Professional; 0=All others
occupation3	1=Farmers, fishermen, hunters; 0=All others
occupation4	1=Skilled/non-skilled workers; 0=All others
Income	
Income2	1=Middle income; 0=All others
Income3	1=Lowe income; 0=All others
dkindex	0-1
Life style	
smoker	1=current smoking; 0=All others
alf	1=Drink alcohol more than once time per week last year; 0=All others
sugaredf	1=Drink sugared beverage more than once per week last year; 0=All others
Food preference	
ffL	1=Like fast food somewhat or very much; 0=All others
ssL	1=Like salty snack somewhat or very much; 0=All others
sgL	1=Like sugared beverage somewhat or very much; 0=All others
ftL	1=Like fruit somewhat or very much; 0=All others
vgL	1=Like vegetable somewhat or very much; 0=All others
Activity preference	
laL	1=Like light activity somewhat or very much; 0=All others
stL	1=Like sport somewhat or very much; 0=All others
bbL	1=Like body building somewhat or very much; 0=All others
wtL	1=Like watching TV somewhat or very much; 0=All others
vciL	1=Like watching Video, playing computer, surfing on the Internet somewhat or very much; 0=All others
rdL	1=Like reading somewhat or very much; 0=All others