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ORIGINAL ARTICLE

Dietary diversity and adiposity in Chinese men and women: an analysis of four waves of cross-sectional survey data

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BACKGROUND/OBJECTIVE: Increasing dietary diversity is concurrent with an increasing prevalence of adiposity in China, but the association between these variables remains ambiguous. This study reveals an association between dietary diversity and body mass (underweight, overweight and obesity) in Chinese adults.
SUBJECTS/METHODS: Data from 17 825 participants (age, 18–65 years) were pooled from four survey waves (2004, 2006, 2009 and 2011) of the Chinese Health and Nutrition Survey. Anthropometric data and dietary intake information obtained through a 24-h dietary recall for 3 consecutive days were collected. Information on covariates, namely those regarding the socioeconomic status and lifestyle of each participant, were collected. The dietary diversity score (DDS) and entropy were used to represent dietary diversity. The association between dietary diversity and adiposity was analyzed by using multivariable-adjusted multinomial logistic regression.
RESULTS: A positive association between dietary diversity and overweight was detected only in men (DDS: OR = 1.09 (1.03–1.17); entropy: OR = 1.60 (1.24–2.07)). The results were confirmed by analyzing the interaction between sex and diversity (DDS: OR = 1.27 (1.17–1.37); entropy: OR = 2.89 (2.11–3.89)). In contrast, no significant association was detected between dietary diversity and underweight/obesity (all $P > 0.05$). Dietary consumption was compared between sexes to explain the different effects of dietary diversity on body mass in men and women. The results indicated that men typically had a higher consumption of meat ($P < 0.01$).
CONCLUSIONS: Higher dietary diversity is positively associated with overweight in men. Additional preventive strategies that promote a healthy diet should focus on men.

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INTRODUCTION

Several studies have reported that China is undergoing a marked nutritional transition associated with rapid economic development.[1–4] One of the most interesting features of this transition is the increasing dietary diversity that is attributable to innovations in agricultural technology (for example, greenhouses, hybridization techniques and soil-less culture), lifestyle changes and increases in food accessibility because of market development and decreasing transportation costs.[5,6] Furthermore, world market integration has substantially increased, particularly after China joined the World Trade Organization, thereby stimulating food import into China and increasing the diversity of foods available. In addition, the dietary pattern of citizens has shifted from low-fat, traditional food, which is mainly composed of carbohydrates, vegetables and few animal-based foods, to a Western diet, which is high in fats, sugar and refined foods.[3,4,7,8] This shift has improved the nutritional status of undernourished people, but it has also raised concerns about over-nutrition among upper class citizens, given the rapid increase in the prevalence of overweight and obesity during the past several decades.[9–11] It has been established that body adiposity is associated with most chronic diseases, such as diabetes, cardiovascular diseases and certain cancers.[12–14]

Nutritionists typically believe that healthful diets are the most diverse diets because nutrients cannot be obtained from a single type of food, but instead exist in different food sources.[15,16] Studies have reported that diverse diets can confer protection against chronic diseases,[17–19] reduce the risk of having a lack or excess of any single nutrient,[20] and improve utility by allowing consumers to more closely match their tastes with food characteristics or by counteracting diminishing returns in quantity.[21] In contrast, higher food variety might also promote excess energy intake and further increase obesity because it can stimulate appetite and increase food consumption by increasing the enjoyability of meals.[22–24]

Recent studies have reported a positive association between dietary diversity and body adiposity; however, the overall results are inconsistent.[25,26] Moreover, the association might differ between men and women. As described in our review of the relevant literature, few studies have investigated this association in China. Therefore, we extracted and analyzed data from the China Health and Nutrition Survey (CHNS) to determine the association between dietary diversity and body mass.

METHODS

Population description

This survey was approved by the Institutional Review Board of the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Food Safety, China Center for Disease Control and

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Prevention. All participants provided informed consent. We pooled data from adults aged 18–65 years from 4 waves of the CHNS data set (2004, 2006, 2009 and 2011; $n = 26\,255$). Participants aged >65 years ($n = 3737$) or <18 years ($n = 2318$) were excluded because changes in their body weight were likely to be induced by ageing rather than diet. Women who were pregnant or lactating ($n = 144$) were excluded because of their altered body weight. Furthermore, observations with implausible daily energy intake (>7000 kcal or <500 kcal) were excluded to avoid outlier interference ($n = 31$). In addition, participants with an unreliable body mass index (BMI, >70 or <15; $n = 1\,863$) and those with incomplete information ($n = 337$) were excluded to reduce measurement error. In total, 9459 women and 8366 men were included in this analysis, of whom 6382 only had one observation, 3062 had two observations, 2786 had three observations and 855 participated in all four survey waves. Our large sample size ensure adequate power to detect the a pre-specified effect size.

Anthropometric data

The body weight and height of each participant were measured by trained health workers using regularly calibrated equipment according to the manufacturer's instructions (SECA880 scales and SECA 206 wall-mounted metal tape). The BMI was calculated by dividing the weight (kg) by the square of the height (m^2) of each participant. The participants were defined as underweight if their BMIs were below 18.5 kg/m^2 ($n = 900$), normal if their BMIs ranged between 18.5 kg/m^2 and 24 kg/m^2 ($n = 9619$), overweight if their BMIs were $\geqslant 24$ kg/m^2 and <28 kg/m^2 ($n = 5547$) and obese if their BMIs were $\geqslant 28$ kg/m^2 ($n = 1759$); these thresholds were in accordance with those of the National Health and Family Planning Commission of the People's Republic of China.[27]

Diet assessment and dietary diversity computation

Individual food consumption data from all household members were recorded for 3 consecutive days. The participants reported all the food that they consumed at home and away from home in a 24-h period. Trained field interviewers recorded the codes of the food, the amount of the food, the types of meals and the eating locations on the previous day by using food models and pictures. Detailed information about the survey has been previously reported.[28]

Two indicators were used to measure dietary diversity. The first indicator was the dietary diversity score (DDS), developed by Kant *et al.*[29] which represents the number of different food categories consumed daily. To estimate the DDS, we followed the method reported by Liu *et al.*[30] and further combined the original 12 major food categories into 6 broad groups: grains; vegetables; fruits; meat, poultry and seafood; dairy; and beans, eggs and nuts. Relevant details are presented in Table 1 on the basis of similarities in their nutrient composition and their functions in diet. As suggested by Kant *et al.* we excluded foods that were consumed less than a minimum amount (25 g) to avoid bias caused by negligible consumption in a food group. The DDS value ranges from 0 to 6, with higher values representing more diverse diet.

The second indicator was entropy, as suggested by Theil and Finke.[31] We were not interested only in how many different categories of food were consumed; we also sought to measure the distribution of food quantities among the six groups. Hence, the entropy index was introduced into our analysis.[30] The index is illustrated as a function of the consumption share, w_i.

$$\text{Entropy} = \sum\nolimits_{i}^{n} w_i \ln\left(\frac{1}{w_i}\right) \quad (1)$$

As a higher entropy value represents a higher dietary diversity, the diversity [ln(n)] is maximized when consumption shares are equally distributed among different categories, which is ln.[6] The share, w_i, was calculated according to the weight of each food group. Therefore, food groups that were consumed in a greater quantity had a higher weight.

Covariate information collection

We adjusted for the following demographic information: family income (per capita household income), physical activity (according to the occupation type, ranging from 1 to 5; this classification conforms to the original data from the CHNS: 1 = very light physical activity, working in a sitting position [for example, office worker or watch repairer]; 2 = light physical activity, working in a standing position (for example, sales person or teacher); 3 = moderate physical activity (for example, student or driver); 4 = heavy physical activity (for example, farmer or dancer); and 5 = very heavy physical activity (for example, loader, logger or miner); 1 and 2 are classified as light activity, 3 is classified as moderate physical activity, 4 and 5 are classified as heavy activity), marital status (1 = currently married, 0 = other), sex (0 = woman, 1 = man), age (old adult >45 years old and $\leqslant 65$ years old, young adult $\leqslant 45$ years old and $\geqslant 18$ years old), and education level (primary school education, middle school education or above high school education). Total energy intake has been proven to be an important confounder of adiposity,[32,33] which was also controlled for in the regression. Furthermore, smoking cigarettes and consuming alcohol, tea and coffee can also affect body adiposity. Therefore, we added smoking status (0 = currently not smoking, 1 = currently smoking) and drinking status (0 = did not drink in the past year, 1 = drank alcohol in the past year), as well as dummy variables for tea (1 = drank tea, 0 = other) and coffee consumption (1 = drank coffee, 0 = other) as covariates. In addition, urban and northern dummy variables were adopted to control regional heterogeneity (northern provinces: Heilongjiang, Henan, Liaoning and Shandong; southern provinces: Guangxi, Guizhou, Hubei, Hunan and Jiangsu). Finally, a year-specific dummy variable was included to control for annual variations.

Statistical analysis

All statistical analyses were performed using Stata statistical software (Version 14.0, College Station, TX, USA), all codes are available on requirement. The significance level was set at $P < 0.05$ with two-tailed test. In addition to analyses of the complete sample, analyses stratified by sex were also conducted. Finally, a regression model with an interaction term between sex and dietary diversity was used to identify sex-related differences in the association between dietary diversity and BMI.

Descriptive analyses were conducted to illustrate the characteristics of the entire population and two subsamples that were stratified by sex. The data are expressed as the mean and s.d. for continuous variables and as percentages for categorical variables. Moreover, each variable was compared between male and female participants by using Student *t* tests for continuous variables and χ^2 tests for binary variables (allowing for unequal variance between two groups).

Table 1. The discrepancy of daily food consumption by category in overweight women and men

Overweight	*Total* n = *5547*	*Women* n = *2827*	*Men* n = *2720*	P-*value*	*Definition*
Grain (g)	345.1 ± 134.6	347.4 ± 140.3	342.8 ± 128.4[a]	0.21	Cereals and cereal products; tubers, starches and products
Vegetable (g)	279.7 ± 139.8	294.8 ± 147.5	264.0 ± 129.4	< 0.01	Vegetables and vegetable products; fungi and algae
Fruit (g)	45.6 ± 83.5	52.0 ± 90.8	39.0 ± 74.5	< 0.01	Fruit and fruit products
Meat (g)	106.1 ± 88.0	100.8 ± 90.1	111.7 ± 85.5	< 0.01	Meat and meat products; poultry and poultry products; fish, shellfish and mollusc
Dairy (g)	13.7 ± 44.2	14.8 ± 47.5	12.7 ± 40.4	0.07	Milk and products
Bean (g)	77.4 ± 67.6	77.9 ± 70.4	76.9 ± 64.5	0.59	Dried legumes and legume products; nuts and seeds; eggs and egg products

[a]The ratio of average daily energy intake between women and men for each age cohort was used as the weight to adjust the original food consumption of men.

To investigate the association between dietary diversity and body shape status (underweight, overweight and obesity), multivariable-adjusted multinomial logistic regressions were used and odds ratios (ORs) and 95% confidence intervals are reported. In addition, some observations were drawn from the same participant indifferent years. Their error terms would correlate and cause inefficient estimation. Therefore, the standard errors and the variance–covariance matrix of the estimators were modified by controlling for cluster effects to increase estimation efficiency.

RESULTS

Supplementary Figure 1 indicates that the BMI of both men and women increased steadily over the years. Supplementary Figure 2 illustrates a clear increasing prevalence rate of overweight and obesity that was concurrent with a declining trend of underweight and normal weight. Supplementary Figure 3 presents a clear increasing trend of diversity indicators.

The descriptive data on the socioeconomic status and body mass of all participants are presented in Table 2. The mean age of the total population was 45.4 ± 11.9 years, and no difference was detected between women and men ($P = 0.68$). Men had a higher average annual income and obtained a higher education level ($P < 0.01$). No significant differences were detected in average BMI between men and women ($P = 0.57$). However, the prevalence of overweight was significantly higher in men than in women ($P < 0.01$), whereas the prevalences of underweight and obesity were significantly higher in women than in men ($P = 0.03$ and

Table 2. Characteristics of participants

	Total population[a] (n = *17 825*)	*Women* (n = *9459*)	*Men* (n = *8366*)	P-*value*
Income (RMB/year)	32 811 ± 42 497[b]	32 023 ± 40 363	33 701 ± 44 773	< 0.01
Male (%)	46.9[c]			
Age[d]	45.4 ± 11.9	45.4 ± 11.7	45.3 ± 12.1	0.68
Young adults	34.0	33.9	34.0	0.94
Old adults	66.0	66.1	66.0	0.94
Marriage status (%)	88.1	88.7	87.4	< 0.01
Education level[e]	8.3 ± 4.0	7.6 ± 4.2	9.1 ± 3.5	< 0.01
Primary (%)	32.9	40.2	24.7	< 0.01
Middle (%)	59.5	53.3	66.6	< 0.01
High (%)	7.5	6.4	8.7	< 0.01
Urban (%)	32.8	33.2	32.5	0.32
North (%)[f]	40.9	41	40.9	0.85
BMI[g]	23.5 ± 3.6	23.5 ± 3.7	23.5 ± 3.5	0.57
Normal (%)	54.0 (*n* = 9619)	54.2 (*n* = 5543)	53.6 (*n* = 4963)	0.39
Underweight (%)	5.0 (*n* = 900)	5.4 (*n* = 510)	4.7 (*n* = 390)	0.03
Overweight (%)	31.1 (*n* = 5547)	29.9 (*n* = 2417)	32.5 (*n* = 2243)	< 0.01
Obesity (%)	9.9 (*n* = 1759)	10.5 (*n* = 989)	9.2 (*n* = 770)	< 0.01

Abbreviations: BMI, body mass index; RMB, ren min bi. [a]The total population was extracted from four wave of CHNS data (2004, 2006, 2009 and 2011), which had 4046, 3916, 4337 and 5526 observations respectively. [b]Both mean and s.d. were presented for continuous variable. [c]Proportion was shown for categorized variable. [d]Young adults were < 45 years old and ⩾ 18 years old, old adults were ⩾ 45 years old and ⩽ 65 years old. [e]Educational level was dissected into three part: only obtained primary school education; obtained middle school education and above high school education level (including high school education level). [f]Northern provinces: Heilongjiang, Henan, Liaoning and Shandong; southern provinces: Guangxi, Guizhou, Hubei, Hunan and Jiangsu. [g]Participants were defined as underweight if their BMI is below 18.5, normal if BMI ranged between 18.5 and 24, overweight if their BMI was ⩾ 24 and < 28, and a BMI of ⩾ 28 was defined as obesity according to the National Health and Family Planning Commission of the People's Republic of China.

Table 3. The descriptive data of lifestyle of participants

	Total population[a] (n = *17 825*)	*Women* (n = *9459*)	*Men* (n = *8366*)	P-*value*
Energy intake (kcal/d)	2102.4 ± 655.9[b]	1940.7 ± 595.5	2285.3 ± 672.9	< 0.01
Protein (g/d)	65.6 ± 23.2[c]	60.9 ± 21.4	71.0 ± 24.0	< 0.01
Fat (g/d)	72.0 ± 37.3	67.7 ± 35.2	76.9 ± 38.9	< 0.01
Carbohydrate (g/d)	292.2 ± 108.2	271.1 ± 100.5	316.0 ± 111.6	< 0.01
Smoke (%)[d]	27.6	2.5	56.1	< 0.01
Drink (%)[e]	34.0	9.2	62.0	< 0.01
Tea (%)[f]	34.9	25.4	45.7	< 0.01
Coffee (%)[g]	3.6	3.7	3.4	0.28
Activity[h]	3.6 ± 1.2	3.5 ± 1.2	3.7 ± 1.2	< 0.01
Heavy activity (%)	51.5	45.8	58.0	< 0.01
Middle activity (%)	23.5	27.4	19.1	< 0.01
Light activity (%)	25.0	26.8	22.9	< 0.01
DDS	3.95 ± 0.96	3.97 ± 1.00	3.93 ± 0.92	0.01
Entropy	1.18 ± 0.25	1.19 ± 0.26	1.17 ± 0.24	< 0.01

Abbreviation: DDS, dietary diversity score. [a]The total population was extracted from four wave of CHNS data (2004, 2006, 2009 and 2011), which had 4046, 3916, 4337 and 5526 observations respectively. [b]Both mean and s.d. were presented for continuous variable. [c]Proportion was shown for categorized variable. [d]Smoke was defined as currently smoking. [e]Drink was defined as drinking alcohol in the past year. [f]Drinking tea was defined as drinking tea in the past year. [g]Drinking coffee was defined as drinking coffee in the past year. [h]Physical activity level was classified into three groups: light, middle and heavy physical activity according to their occupation.

Table 4. Multivariable-adjusted results for the association between dietary diversity and BMI[a]

	Total population (OR (95% CI))		Women (OR (95% CI))		Men (OR (95% CI))		Interaction (OR (95% CI))	
	DDS	*Entropy*	*DDS*	*Entropy*	*DDS*	*Entropy*	*DDS*	*Entropy*
Normal (ref. group)								
Underweight								
Diversity	1.04 (0.95, 1.135)	1.17 (0.83, 1.66)	1.01 (0.90, 1.13)	1.21 (0.76, 1.94)	1.08 (0.94, 1.25)	1.10 (0.64, 1.90)	1.00 (0.91, 1.12)	1.17 (0.75, 1.83)
Male	0.93 (0.73, 1.19)	0.93 (0.73, 1.19)	–	–	–	–	0.75 (0.37, 1.52)	0.98 (0.44, 2.18)
Male × diversity	–	–	–	–	–	–	1.06 (0.89, 1.26)	0.96 (0.50, 1.86)
Overweight								
Diversity	1.05 (1.01, 1.10)	1.29 (1.08, 1.53)	1.05 (0.99, 1.11)	1.20 (0.94, 1.53)	1.09 (1.03, 1.17)	1.60 (1.24, 2.07)	0.95 (0.90, 1.00)	0.81 (0.65, 1.01)
Male	1.18 (1.05, 1.31)	1.18 (1.06, 1.32)	–	–	–	–	0.46 (0.33, 0.64)	0.34 (0.23, 0.50)
Male × diversity	–	–	–	–	–	–	1.27 (1.17, 1.37)	2.87 (2.11, 3.89)
Obesity								
Diversity	1.01 (0.94, 1.08)	1.10 (0.84, 1.44)	1.05 (0.96, 1.14)	1.24 (0.88, 1.74)	0.99 (0.89, 1.10)	1.09 (0.72, 1.64)	0.93 (0.86, 1.01)	0.76 (0.55, 1.04)
Male	1.00 (0.84, 1.20)	1.00 (0.84, 1.20)	–	–	–	–	0.45 (0.27, 0.74)	0.35 (0.20, 0.61)
Male × diversity	–	–	–	–	–	–	1.22 (1.09, 1.37)	2.44 (1.57, 3.79)

Abbreviations: BMI, body mass index; CI, confidence interval; DDS, dietary diversity score; OR, odds ratio. [a]The variable categories adjusted in the regression models were: ln (family income); ln (total energy intake); physical activity status: (light activity, moderate activity-reference group and heavy activity); married status (1 = currently married, 0 = other); sex (0 = woman, 1 = man); old adult (1 = 46–65 years old, 0 = 18–45 years old); educational level (primary school education-reference group, middle school education or above high school education); smoking status (0 = currently not smoking, 1 = currently smoking); drinking status (0 = did not drink in the past year, 1 = drank alcohol in the past year), drank tea (1 = drank tea, 0 = other); coffee consumption (1 = drank coffee, 0 = other); urban (1 = urban area, 0 = rural area); north (1 = north China, 0 = south China) and year-specific dummy variable.

$P < 0.01$, respectively). Table 3 lists the descriptive statistics of lifestyle factors, such as dietary intake. Men typically had higher values for all variables except for coffee consumption, for which no significant difference was detected between women and men ($P = 0.28$). Notably, the diversity scores for women were significantly higher according to both the DDS and entropy ($P = 0.01$ and < 0.01, respectively).

The results of multivariable-adjusted multinomial logistic regressions for the entire sample suggested that both indices of dietary diversity were risk factors for overweight (DDS, OR = 1.05 (1.08–1.10); entropy, OR = 1.29 (1.08–1.53); see (Table 4). The association between dietary diversity and overweight was further analyzed by stratifying the data on the basis of sex. Notably, food diversity significantly increased the risk of overweight in men (DDS, OR = 1.09 (1.03–1.17); entropy, OR = 1.60 (1.24–2.07)), whereas no significant association was observed in women (DDS, OR = 1.05 (0.99–1.11); entropy, OR = 1.20 (0.94–1.53)).The different effects of dietary diversity on overweight in men and women were further confirmed by the results obtained from the model with the interaction term. The statistically significant OR of the interaction term between sex and food diversity (DDS, OR = 1.27 (1.17–1.37); entropy, OR = 2.87 (2.11–3.89)) indicated different effects of food diversity on overweight in men and women. The associations between dietary diversity and underweight/obesity were also investigated, but no significant relationships were detected.

To determine why food diversity had harmful effects only on men, food consumption was compared between the sexes in the overweight population. To control for the biological differences between men and women (that is, men typically have a larger body size and are more physically active than women, so they might have a higher consumption of major food items), we adjusted the consumption of men according to the ratio of the average energy intake between women and men for different age cohorts. The results are presented in Table 1. The data showed that overweight men had a markedly higher consumption of meat ($P < 0.01$), with a significantly lower consumption of vegetables and fruit (all $P < 0.01$).

DISCUSSION

Our present study applied a multivariable-adjusted multinomial logistic regressions model with two food diversity indices, DDS and entropy, to clarify the association of dietary diversity with underweight, overweight and obesity. The present findings revealed that a more diverse diet was associated with a higher risk of overweight in the total population. This association was enhanced in men and absent in women, according to the separate regressions for each sex. This result was further confirmed by the significant interaction term between sex and the diversity indicators. A further comparison of food consumption between the sexes suggested that overweight men had a significantly higher intake of high-energy density food, such as meat, and a lower consumption of fruits and vegetables. Notably, most Chinese men were the major earning members of their families and were working even during mealtimes. Thus, such work habits enhanced their variety, eating time and portion size. This observation may also account for the significant positive association between education and overweight in men, because highly educated men had more social activities.

However, our analysis did not indicate any associations between DDS and either obesity or underweight. This result might be attributed to the genetic background of each individual, because here dietary factors play a critical role in whether an individual is obese or underweight.[34–38] Thus, dietary control might help some overweight people lose weight. Nonetheless, for obese people, we speculate that certain genes might play a dominant role in obesity. Hence, improved methods should be generated for the obese population as well as the underweight population, to aid in control of body weight.

Our results differ from those of a study based on the first National Health and Nutrition Examination Survey (NHANES I, USA), which has revealed a significant negative association between the DDS and BMI in women but a non-significant negative association in men after adjustment for age.[29] Moreover, in another study, the same researcher has reported a significant negative association in both men and women by using NHANES III data adjusted for age, race and ethnicity, education, smoking, alcohol consumption, activity, energy intake and the intention to lose weight.[39] In our analysis, we adjusted for different covariants, which might be the reason for the disparity between our results and those of the previous studies. Previous studies conducted in Asia (Qinghai Plateau, China and Taiwan) have not revealed any association between BMI and the DDS, which may be attributed to differences in the enrolled population, particularly with age.[40,41] Our study included people aged 18–65 years, whereas both aforementioned studies have examined older people who were over 65 and 60 years of age, respectively. Another study conducted in 2011 among young Iranian females has suggested a significant negative association between the DDS and either overweight and obesity.[33] The results indicate that a greater amount of healthy dietary advice is sought after by young people, particularly well-educated female medical students, whereas older people follow a traditional dietary pattern because of the lack of information during impoverished periods.

One limitation of our study is that the actual food diversity cannot be precisely captured by using the 24-h recall method over 3 consecutive days, which might reduce the observed risk or protective effect size.[42] In addition, the measurement error caused by discrepancies between the self-reported dietary recall and the actual food consumption might differ among people of different sexes and with different personalities, thus causing bias in our results.[43] Finally, our analysis was a cross-sectional analysis, and a clinical trial or prospective analysis is needed to investigate causality further.

Despite these limitations, our study contributes to the current literature in several ways. First, this study is the first to investigate the effects of dietary diversity on body mass in mainland China by using survey data from a large sample with an adequate number of covariants. Second, the interaction term between sex and food diversity identified the disparity of the effects between men and women. In addition, we compared the food consumption on the basis of sex and observed that men had a higher consumption of energy-dense foods, such as meat.

In conclusion, our analysis revealed that the DDS and entropy are associated with a higher risk of overweight, but the association was significant only in men. Adiposity is an increasing challenge in China because of the increasing prevalence of adiposity-related diseases, thus imposing a massive burden on the health care system. Preventive efforts, such as promoting dietary guidelines and a healthy lifestyle or a personal BMI control plan, are warranted to alleviate this increasing pressure.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

Data extraction, integrity and accuracy by XT, MW and YZ. Data analysis and interpretation by XT, MW and JZ. Manuscript drafting by XT, MW, YZ and HW. Study concept and design, and critical revision of the manuscript by XT, MW, YZ, JZ and HW. Acquirement offunding and study supervision by XT and HW.

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