

Sociodemographic disparity in health-related behaviors and dietary habits among governmental employees in Hunan, China

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Research

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Abstract

Background

Health-related behaviors and dietary habits have played essential roles in shaping population health and are related to morbidity or mortality. We aimed to estimate the distribution of health-related behaviors and dietary habits by socio-demographics among governmental employees in China.

Method

A total of 5029 participants were included in this study. Information on their sociodemographic characteristics, health-related behaviors and dietary habits was collected. Socioeconomic status (SES) scores were calculated by multiplying ordinal numerical values assigned to consecutive categories of education level and annual household income. Adjusted multinomial logistic regression analysis and categorical principal component analysis were used to estimate differences in health-related behaviors and dietary habits by socio-demographics.

Results

The distribution of health-related behaviors and dietary habits varied by sociodemographic groups. Middle-aged males (41–60 years) were more likely to smoke, use alcohol and have short sleep duration. Young participants (≤ 30 years) were more likely to have multiple unhealthy behaviors and dietary habits. Those in high-SES have a lower level of smoking and leisure-time physical inactivity, but a high level of late sleeping than those in low-SES. Notably, older males (≥ 51 y) with low-SES preferred the 'smoked and pickled foods, and dessert' and 'fish and nut' pattern. In high-SES groups, 41–50 y people preferred the 'traditional foods' and 'cereals and dairy product' pattern. No difference in dietary patterns by socio-demographics were found among females.

Conclusions

Our findings of the disparity distribution of health-related behaviors and dietary habits by specific-gender, age and SES among Chinese governmental employees have important policy implications for developing targeted health interventions to facilitate health-related behaviors and dietary habits in this population.

Background

Globally, health-related behaviors and dietary habits play an essential role in shaping population health. Health-related behaviors can be defined as voluntary behaviors that related to health or disease [1], some of which may lead to negative outcomes from a health perspective, such as smoking, alcohol drinking, physical inactivity and sedentary lifestyle. Health-related behaviors have been recognized as major determinants of morbidity and mortality [2, 3], and their role extends to the development and progression of diseases, the effectiveness of treatments and quality of life[4]. The most common diseases can be prevented with the adoption of healthier behaviors[5, 6]. Among various health-related behaviors, smoking

is a chief contributor to morbidity and the leading cause of mortality[6, 7]. Dietary habits are the habitual decisions of individuals or group of people regarding what foods they eat[8]. Some unhealthy dietary habits (e.g., eating midnight snack and consuming pickled foods) have been shown to be associated with a higher risk of cancer[9–11]. The importance of healthy behaviors and dietary habits is underscored by the US Affordable Health Care Act, which provides unprecedented universal coverage for preventive behavioral and dietary health services[12].

The distributions of health-related behaviors and dietary habits usually differ by sociodemographic characteristics, such as gender, age and social class,[13–15]. Men (including male adolescents), for instance, are more likely than women to smoke, binge drink[16, 17]; women (including female adolescents), by contrast, are less likely to engage in physical activity[18]. Younger people were more likely to get involved in risk behaviors and unhealthy dietary habits than older people[19, 20]. Those with high socioeconomic status (SES) were less likely to smoke, and have a low level of physical inactivity, but more likely to have high nutritional eating patterns [21–25]. These sociodemographic factors shape social context and day-to-day routines, which in turn influence health behaviors and dietary habits, as well as people's ability to change. Knowledge of sociodemographic-specific behavioral characteristics and their interrelationships can help pinpoint intervention targets and guide for development of efficacious interventions.

Although health-related behaviors and dietary habits have been found to be associated with socio-demographics such as gender, age and SES, these factors are usually studied separately. There is a lack of comprehensive study on health-related behaviors and dietary habits by taking account of all socio-demographic factors together, for instance, by combining age and gender. Also, most of the study were conducted in developed countries, it is also important to learn about the situation in developing countries such as China. The current study was conducted to understand the distribution of health-related behaviors and dietary habits by socio-demographics among governmental employees in urban area of China.

Methods

Study design and participants

This retrospective study was conducted between January 2018 and December 2018 in Changsha city, Hunan province of China. Briefly, a multistage sampling design was carried out to obtain a representative sample. Firstly, 10 institutions were randomly sampled from the government-run institutions that volunteered to participate in the study in Changsha city. Secondly, in each sampled institution, all the staff were selected to take part in our study using cluster sampling. In China, governmental employees are the workers in the national legislative branch, judicial branch, administrative organs, the Party organs of the Communist Party of China and the democratic parties, people's organizations and public institutions, who perform public duties according to law, such as civil servants, regular employee at university or hospital, etc. After obtaining informed consent, eligible participants were asked to complete

a digital self-reported questionnaire. The eligibility criteria for participants included: (1) being able to speak and understand Chinese, (2) being 18–60 years old, (3) working at the selected institution, and (4) having no serious limb diseases. Finally, a total of 5029 governmental employees were include in this study.

Sociodemographic characteristics

The collected sociodemographic data included information on demographic (age, gender, marital status) and socioeconomic characteristics (education and annual household income). SES scores were calculated by multiplying ordinal numerical values assigned to consecutive categories of education level and annual household income[26]. Educational attainment was divided into six groups, and annual household income was divided into seven groups. The SES score ranged from 1 to 42. According to the tertile values of the SES score distribution, study participants were further divided into three groups: low SES (L-SES, 1–12 points), medium SES (M-SES, 13–18 points), and high SES (H-SES, 19–42 points).

Health-related behaviors

Data on health-related behaviors was collected using standardized questionnaires, which included smoking, alcohol drinking, leisure-time physical inactivity, sedentary behavior, late sleeping, and short sleep duration. Smoking was defined as smoking at least one cigarette a day for more than half a year, which can be further classified into three status: never, former, or current smoking. Alcohol drinking was defined as dinking at least once a week for more than half a year, and can be further classified into three status: never, former, or current smoking. Leisure-time physical inactivity was defined as 30 min/day of physical activity at a frequency of once per week or less. Sedentary behavior was defined as more than 2 hours/day sitting (such as watching TV, surfing the Internet, etc.) apart from work and study. Late sleeping was defined as sleeping after midnight, and short sleep duration was defined as sleeping time less than 7 hours per night.

Dietary habits

Dietary habits included four eating behavior habits and 15 kinds of food consumption. Eating behavior habits included irregularly meals habit (yes or no), eating midnight snack habit (yes or no), eating gluttony habit (yes or no), and salty taste habit (yes or no). Food consumption was assessed by asking whether consuming each of the following food groups for more than 3 times/week: (i) rice; (ii) wheat; (iii) grains; (iv) fish; (v) vegetables; (vi) poultry meat; (vii) livestock meat (pork, beef/lamb); (viii) Soybean and products; (ix) fruits; (x) eggs; (xi) dairy products; (xii) nuts, (xiii) desserts (xiv) pickle food, and (xv) smoked fish or meat.

Data Analysis

Crude frequencies and weighted percentages were calculated for distribution of socio-demographic characteristics. Among these socio-demographic variables, gender, age and SES were considered as important factors for health-related behaviors and dietary habits. Thus, analyses of health-related

behaviors and dietary habits were stratified by these three variables. Participants were grouped into 8 categories based on gender (male/female) and four age subgroups (≤ 30 , 31–40, 41–50 and ≥ 51), and 3 categories based on SES. Weighted percentage of the six health-related behaviors and four eating habits were calculated by these categories. Adjusted multinomial logistic regression analysis was used to determine frequencies (health-related behaviors and eating habits) in L-SES and H-SES.

Categorical principal components analysis (CATPCA) was used to examine the different consumption patterns for the 15 food groups mentioned previously (Table 1, see line 541). The analysis allowed for simultaneous evaluation of the relationships between various variables. The analysis was considered reliable for Cronbach's alpha coefficient >0.7 . All the statistical analyses were performed using SPSS version 19.0 software. A two-sided p-value <0.05 was considered as being of statistical significance.

Results

Sample characteristics

A total of 5029 participants were included in the study (3006 for female; 2023 for males), and their characteristics were shown in Table 2 (see line 543). The age distribution of the sample was as follows: 19.6% of participants were ≤ 30 years, 40.1% were 31–40 years, 24.8% were 41–50 years, and 15.6% were ≥ 51 years old. Most participants were married/cohabited (84.8%), with an education level of undergraduate/college or above (94.6%), and with a family income level of 110,000-200,000 (36.2%). According to the definition of SES for the current study, 35.3% were in L-SES group, 36.6% were in M-SES group, and 28.1% were in H-SES group. The prevalence of current smoking, current alcohol drinking, leisure-time physical inactivity, sedentary behavior, late sleeping and short sleep duration among the participants was 12.0%, 6.7%, 54.8%, 74.8%, 16.6% and 34.4%, respectively. Additionally, the prevalence of four eating behavior habits was 38.3% for irregular meals habit, 26.1% for salty taste habit, 4.8% for eating gluttony and 2.0% for eating midnight snack, respectively (Table 2, see line 543).

Distribution of health-related behaviors and eating behavior habits by gender and age

We further examined distribution of health-related behaviors and eating behavior habits by age for men and women separately (Table 3, see line 574). Smoking and alcohol drinking behaviors were observed for males, but hardly for females. For males, the age of ≥ 51 years group had the highest rate of current smoking (36.2%), current alcohol drinking (25.7%) and short sleep duration (39.0%). Younger males (age ≤ 40 y) had a high rate of leisure-time physical inactivity (age ≤ 30 y: 52.8%; age 31-40 y: 59.6%). The youngest age group (age ≤ 30 y) had the highest rate of sedentary behavior (80.4%) and late sleeping (30.1%). As for eating behavior habits, the youngest age group (age ≤ 30 y) had the highest rate of irregular meals habit (50.4%), eating midnight snack habit (3.5%), eating gluttony habit (10.3%) and salty taste habit (35.8%).

For females, the youngest age group (age ≤ 30 y) had the highest rate of sedentary behavior (81.7%), leisure-time physical inactivity (69.4%) and late sleeping (20.7%). The ≥ 51 age group had the highest

rate of short sleep duration (45.4%). As for eating behavior habits, the youngest age group (age ≤ 30 y) had the highest rate of irregular meals habit (61.1%), eating midnight snack habit (3.9%), eating gluttony habit (7.0%) and salty taste habit (25.6%). A negative dose-response trend increasing age was found in irregular meals habit, eating midnight snack habit and salty taste habit

Distribution of health-related behaviors and eating behavior habits by SES

Table 4 (see line 592) presented the distribution of health-related behaviors and eating behavior habits among different SES groups after adjusting for age, gender and marital status. For health-related behaviors, compared to the L-SES group, the H-SES group had lower rate of current smoking (11.4% vs 13.7%, $p = 0.006$) and leisure-time physical inactivity (51.9% vs 54.4%, $p = 0.028$), but higher rate of late sleeping (18.5% vs 15.2%, $p < 0.001$). No significant differences were found in the rate of current alcohol drinking, sedentary behavior and short sleep duration. Additionally, the rates of the four dietary behaviors were similar in the three different SES groups.

Food consumption patterns by gender, age and SES

CATCPA was performed to identify the patterns of food consumption for 15 food groups by gender, age and SES (Figure 1). The Cronbach's alpha was 0.887 and the total eigenvalue was 5.812, indicating good reliability for assessment of simultaneous relationships among the selected variables. Among the 15 food groups, rice consumption habit was located in the centroid. Four food consumption patterns were identified. Pattern 1 named 'traditional foods' pattern was characterized by more consumption of vegetables, livestock and poultry meat, fruits and eggs. Pattern 2 named 'cereals and dairy product' pattern was characterized by more consumption of grain, wheat, soybean and products, and dairy product. Pattern 3 named 'fish and nut' pattern was characterized by more consumption of fish and nut. Pattern 4 named 'smoked and pickled foods, and dessert' pattern was characterized by more consumption of smoked fish or meat, pickle food and dessert. CATCPA indicated the 'traditional foods' and 'cereals and dairy product' patterns were mainly observed in the 41-50 age group with H-SES. "Fish and nut" and "smoked and pickled foods, and dessert" patterns were mainly observed among the ≥ 51 y males in L-SES group. There is an absence of difference in four food consumption patterns among young females (aged ≤ 40 years old) in the M-SES group.

Discussion

This retrospective study showed that the distributions of health-related behaviors and dietary habits varied by gender, age and SES among governmental employees in China. Males in the middle-aged group (41–60) were more likely to smoke, use alcohol and have short sleep duration, but males in the 31–40 age group had the highest rate of leisure-time physical inactivity (59.6%). Young females (age ≤ 30 y) were more likely to have leisure-time physical inactivity, but females aged ≥ 51 y were more likely to have short sleep duration. Sedentary behavior, late sleeping, as well as all four risk eating behavior habits were more prevalent in youngest age group (age ≤ 30 y), regardless of gender. In addition, we found that people in the H-SES group were less likely to be current smoker and have physical inactivity, but were

more likely to have late sleeping. We also identified four food consumption patterns, which varied by gender, age and SES.

We found gender and age differences in the occurrence of health-related behaviors. For instance, the rate of smoking and alcohol drinking were much lower in females than males, which may be explained by socio-cultural factors. The social gender role in culture consider it acceptable, appropriate, or even desirable to engage in certain behaviors such as smoking and drinking for males, but almost not for females [27–29]. In this study, a higher rate of smoking and alcohol drinking was found in middle-aged (41-60y) males than that in younger males (≤ 40 y). In recent years, the Chinese government has been gradually strengthening the policies against tobacco use, and the group intervention on smoking cessation based on social cognitive theory could be effective to reduce smoking[30, 31]. Male smokers in the high age group lacking health knowledgeable and ignoring the proper health behaviors, cannot sufficiently understand the need for preventive measures[32, 33], even reduce the stress of social isolation, economic hardship, prior trauma, and the loss of power and status by smoking [34]. In addition, we found young females and males had a high rate of leisure-time physical inactivity, late sleeping and sedentary behavior, which was consistent with previous research[35]. With the rapid socioeconomic development in China and changes in urbanization, work stress emerged in the urban population, especially among the working young population due to a rise in living costs, which may result in long working time and lacking leisure-time to participant in physical activity. Modern media use has also become intricately connected with our bedtime routine and sleep [36]. Additionally, individuals in the ≥ 51 y age group were more likely to have a high level of short sleep duration. These findings strongly suggest that planning of effective health promotion programs should target health-related behaviors that are modified by gender and age.

The association between SES and various health-related behaviors are multiple and complex[37]. Past studies have consistently shown SES as the strongest predictor of tobacco use [38–40]. In the current study, we found higher rate of smoking and leisure-time physical inactivity in the H-SES group than L-SES group, which were consistent with previous research[41, 42]. Our study, for the first time, found higher rate of late sleeping in H-SES group than L-SES group among governmental employees in China. Tobacco control policies, leisure-time physical inactivity and late sleeping interventions in China should be increasingly focused on populations with low-SES in order to break the link between socioeconomic disadvantage and these unhealthy behaviors. Education, one of the components of SES, remained the strongest predictor of these unhealthy behaviors[38–40, 42], suggesting future intervention programs to take targeted measures to reduce unhealthy behaviors, according to education attainment status. Although no significant differences in short sleep duration and sedentary behaviors were observed by SES in this study, we found much higher rate of short sleep duration and sedentary behaviors in our study population than the general population in southeast of China in other studies [41, 43], drawing our attention to the impact of short sleep duration and sedentary behaviors on health among this special population [9].

We found differences in dietary habits including eating behavior habits and food consumption patterns by gender, age and SES. For eating behavior habits, both females and males in the younger age group (≤ 30 years) have the highest rate of these four unhealthy dietary habits. Younger individuals may get involved easily in unhealthy eating behaviors due to poor control awareness and health literacy [19, 20, 44]. Although there were absent differences in four eating behaviors among three SES groups, combination of some other studies, SES remained an important factor to impact unhealthy eating behaviors [45–47].

We also explored food consumption patterns by socio-demographics using CATCPA analysis, which is the first study of its kind among governmental employees in China. We found the ‘traditional foods’ and ‘cereals and dairy product’ patterns were mainly observed in the 41–50 age group with H-SES. In China, traditional foods such as vegetables, fruits, meats and eggs were considered as healthy food pattern in line with Chinese traditions. Research has consistently shown that high intake of vegetables and fruits, whole grains, and eggs may decrease the risk of chronic diseases, even cancer[48, 49]. In addition, we found ‘fish and nut’ and ‘smoked and pickled foods, and dessert’ patterns were mainly observed among the ≥ 51 y males in L-SES group. High intake of sugars, and pickled or smoked foods may increase such risk [9, 22, 50, 51], but fish consumption was associated with a reduced risk of all-cause mortality[52]. Available study has pointed out that males have a higher liking for sweets than females [53]. Younger age, low education, and low family income were associated with a poor health literacy status, which may result in a low nutrient food consumption[44]. The findings have implications for future intervention programs to take targeted measures to reduce unhealthy food consumption habits, according to specific sociodemographic characteristics.

To the best of our knowledge, this is the first study using a large sample from a representative urban governmental employee population. This is also the first study to use the CATPCA method to study health-related behaviors and dietary habits by socio-demographic characteristics such as gender, age and SES groups. However, some limitations should be considered when interpreting our results. First, many variables were self-reported and the findings may be subject to recall bias. Second, the study participants came from Hunan province and China, and the generalizability of the study findings may not be able to generalize to other parts of China despite its large sample size. Future multiprovince or multinational surveillance studies are needed to further test findings in our study. Third, the retrospective design of the current study may preclude any observation of behaviors and dietary habits changes over time. Future longitudinal studies may overcome such a limitation.

Conclusions

This study confirmed the various distribution of health-related behaviors and dietary habits by sociodemographic characteristics among governmental employees. Notably, this study found that middle-aged group (41–60 years) had the highest rates of smoking and alcohol drinking, and young-aged group (≤ 40 years) with L-SES were more likely to have multiple unhealthy behaviors and dietary habits. We also identified four food consumption patterns, which varied by gender, age and SES. Our findings of

the disparity distribution of health-related behaviors and dietary habits by specific-gender, age and SES among Chinese governmental employees have important policy implications for developing targeted health interventions to facilitate health-related behaviors and dietary habits in this population.

Abbreviations

SES: Socioeconomic status; L-SES: Low socioeconomic status; M-SES: Medium socioeconomic status; H-SES: High socioeconomic status; CATPCA: Categorical principal components analysis.

Declarations

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Authors' contributions

LL: study design, data analyses and interpretation, manuscript writing and revision. HJ, FYOY, DQ and YL: data acquisition, interpretation and manuscript revision. YY and DL: manuscript revision. SX: study conceptualisation, data acquisition and interpretation, and manuscript revision. All of authors approved the final content of this manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Xiangya School of Public Health, Central South University (ethics approval number: XYGW-2016-10). Informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1. Discretization criteria used in the Principal Components Analysis of Categorical Data.

Variable	Property	Criteria for classification	Assumable value
Gender	Dichotomous	Male; female	1,2
Age	Ordinal	≤29; 30-40; 41-64; ≥65	1,2,3,4
SES	Ordinal	SES score: ≤10; 11-16; 17-42	1,2,3
Rice consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Vegetables consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Wheat consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Grain consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Fish consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Livestock meat consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Poultry meat consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Soybean and products	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Fruits consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Egg consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Dairy products consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Nut consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2
Dessert consumption habit	Dichotomous	less than 3 days/week; more than 3 days/week	1,2

Table 2. Characteristics of study participants.

Variable	Frequency	Weighted percentage
Gender		
Male	2023	40.2
Female	3006	59.8
Age		
≤30y	981	19.6
31-40y	2017	40.1
41-50y	1245	24.8
≥51y	786	15.6
Marital status		
Married/cohabited	4265	84.8
Unmarried	619	12.3
Divorced/widowed	145	2.9
Education		
1.Elementary school or below	8	0.2
2.Middle school	40	0.8
3.Vocational Technical School	75	1.5
4.Senior school	149	3.0
5.Undergraduate and college	2677	53.2
6.Postgraduate and above	2080	41.4
Family income (CNY)		
1.<50,000	525	10.4
2.50,000-100,000	1186	23.6
3.110,000-200,000	1893	37.6
4.210,000-300,000	944	18.8
5.310,000-500,000	378	7.5
6.510,000-1000,000	83	1.7
7.>1000,000	20	0.4
SES *		
Low	1777	35.3
Medium	1838	36.6
High	1414	28.1
Smoking (current)	601	12.0
Drinking (current)	338	6.7
Leisure-time physical inactivity ^a	2756	54.8
Sedentary behavior ^b	3761	74.8
Late sleeping ^c	836	16.6
Short sleep duration ^d	1723	34.4
Irregular meals habit ^e	1926	38.3
Eating midnight snack	98	2.0
Eating gluttony habit	242	4.8
Salty taste habit	1404	26.1

* SES: socioeconomic status was calculated as education multiplied by family income.

^a Leisure-time physical inactivity was defined as 30 min/day of physical activity at a frequency of once per week or less.

^b Sedentary behavior was defined as the time spent sitting (such as watching TV, surfing the Internet, etc.) more than 2 hours/day in addition to work and study.

^c Late sleeping was defined as the time to fall asleep after midnight.

^d Short sleep duration was defined as sleep time less than 7 hours per night.

^e Irregular meals habit was defined as not eating three meals on time per day.

Table 3. Distribution of health-related behaviors and eating behavior habits by age and gender.

Characteristics	Gender ^f	Age ≤ 30		Age 31-40		Age 41-50		Age ≥ 51	
		M (n=282)		M (n=705)		M (n=577)		M (n=459)	
		F (n=699)		F (n=1312)		F (n=668)		F (n=327)	
		n	%	n	%	n	%	n	%
Health-related behaviors									
Smoking (current)	M	55	19.5	176	25.0	191	33.1	166	36.2
	F	2	0.3	2	0.2	7	1.0	1	0.3
Alcohol drinking (current)	M	18	6.4	81	11.5	115	19.9	118	25.7
	F	0	0.0	2	0.2	3	0.4	1	0.3
Leisure-time physical inactivity ^a	M	149	52.8	420	59.6	262	45.4	157	34.2
	F	485	69.4	898	68.4	287	43.0	98	30.0
Sedentary behavior ^b	M	227	80.4	521	73.9	442	76.6	351	76.5
	F	571	81.7	921	70.2	491	73.5	237	72.5
Late sleeping ^c	M	85	30.1	136	19.3	79	13.7	64	13.9
	F	145	20.7	192	14.6	99	14.8	36	11.0
Short sleep duration ^d	M	74	26.2	230	32.6	197	34.1	179	39.0
	F	195	27.9	441	33.6	260	38.9	147	45.4
Eating behavior habits									
Irregular meals habit ^e	M	142	50.4	283	40.1	153	26.5	99	21.6
	F	427	61.1	546	41.6	196	29.3	80	24.5
Eating midnight snack	M	10	3.5	17	2.4	3	0.5	5	1.1
	F	27	3.9	29	2.2	5	0.7	2	0.5
Eating gluttony habit	M	29	10.3	37	5.2	25	4.3	22	4.8
	F	49	7.0	58	4.4	12	1.8	10	3.1
Salty taste habit	M	101	35.8	245	34.8	177	30.8	147	32.0
	F	179	25.6	283	21.6	123	18.4	59	18.0

^a Leisure-time physical inactivity was defined as 30 min/day of physical activity at a frequency of once per week or less.

^b Sedentary behavior was defined as the time spent sitting (such as watching TV, surfing the Internet, etc.) more than 2 hours/day in addition to work and study.

^c Late sleeping was defined as the time to fall asleep over 24 o'clock.

^d Short sleep duration was defined as sleep time less than 7 hours per night.

^e Irregular meals habit was defined as being not eat three meals on time per day.

^f M: male; F: female.

Table 4. Distribution of health-related behaviors and eating behavior habits by socioeconomic status.

Characteristics	Low		Intermediate		High		p-value
	N=1605		N=1577		N=2250		
	n	%	n	%	n	%	
Health-related behaviors							
Smoking (current)	244	13.7	196	10.7	161	11.4	0.006
Drinking alcohol(current)	117	6.6	118	6.4	103	7.3	0.739
Leisure-time physical inactivity ^a	966	54.4	1056	57.5	734	51.9	0.028
Sedentary behavior ^b	1324	74.5	1374	74.8	1063	75.2	0.234
Late sleeping ^c	270	15.2	304	16.5	262	18.5	< 0.001
Short sleep duration ^d	623	35.1	634	34.5	466	33.0	0.290
Eating behavior habit							
Irregular meals habit ^e	715	40.2	717	39.0	494	34.9	0.128
Eating midnight snack	34	1.9	40	2.2	24	1.7	0.934
Eating gluttony habit	85	4.8	98	5.3	59	4.2	0.803
Salty taste habit	464	26.1	472	25.7	378	26.7	0.722

^a Leisure-time physical inactivity was defined as 30 min/day of physical activity at a frequency of once per week or less.

^b Sedentary behavior was defined as the time spent sitting (such as watching TV, surfing the Internet, etc.) more than 2 hours/day in addition to work and study.

^c Late sleeping was defined as the time to fall asleep over 24 o'clock.

^d Short sleep duration was defined as sleep time less than 7 hours per night.

^e Irregular meals habit was defined as being not eat three meals on time per day.

Figures

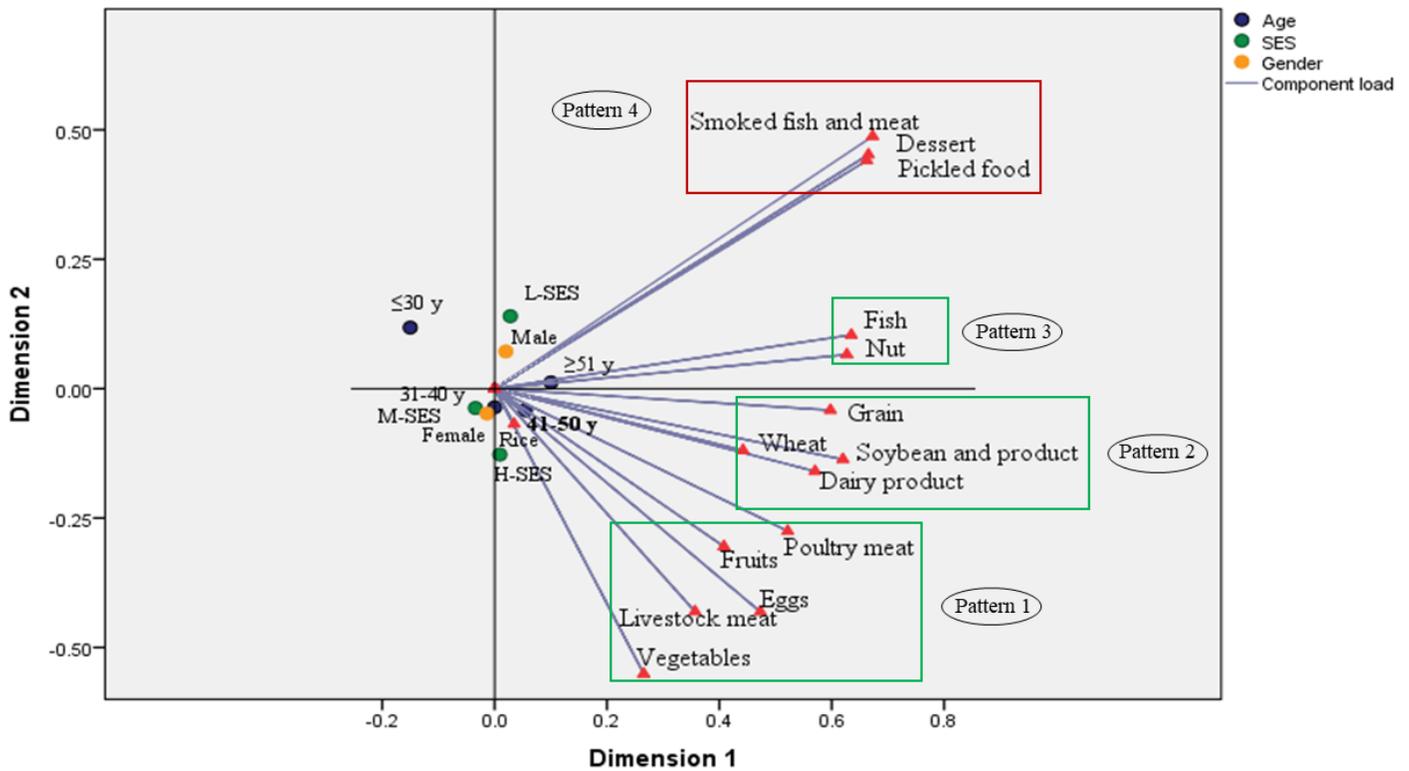


Figure 1

Principal Components Analysis of Categorical Data (Cronbach's alpha=0.887; eigenvalue=5.812). Variables in association: Pattern 1 named 'traditional foods' pattern was characterized by more consumption of vegetables, livestock and poultry meat, fruits and eggs. Pattern 2 named 'cereals and dairy product' pattern was characterized by more consumption of grain, wheat, soybean and products, and dairy product. Pattern 3 named 'fish and nut' pattern was characterized by more consumption of fish and nut. Pattern 4 named 'smoked and pickled foods, and dessert' pattern was characterized by more consumption of smoked fish or meat, pickle food and dessert; SES, socioeconomic status; L-SES: low-socioeconomic status; M-SES, medium- socioeconomic status; H-SES, high- socioeconomic status.