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Trends in incidence of hypertension in Chinese adults, 1991–2009: the China Health and Nutrition Survey

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Abstract

Background/objectives—Previous studies have shown an upward trend in the prevalence of hypertension, but data on trend of incidence of hypertension are lacking. We seek to investigate the trends in incidence of hypertension and control of incident hypertension among Chinese adults during 1991–1997 and 2004–2009.

Methods—Within the China Health and Nutrition Survey (1991–2009), we identified five cohorts of adults (age ≥ 18 years) who were free of hypertension at baseline of each cohort: cohorts 1991–1997 (n=4107), 1993–2000 (n=4068), 1997–2004 (n=4141), 2000–2006 (n=4695), and 2004–2009 (n=4523). Data on demographics, smoking, alcohol intake, physical activity, body mass index (BMI), and blood pressure were collected through interviews and clinical examination. Hypertension was defined as blood pressure ≥ 140/90 mmHg or currently using antihypertensive drugs. Multiple generalized estimation equations and Cox regression models were used to test the trends in blood pressure, incidence of hypertension, use of antihypertensive drugs, and control status of incident hypertension.

Results—After controlling for potential confounders, incidence of hypertension (per 100 person-years) significantly increased from 2.9 in 1991–1997 to 5.3 in 2004–2009 ($p_{\text{trend}}=0.024$); the linear trend was statistically or marginally significant in the age group of 18–39 years, in women, in rural residents, and in adults with normal BMI. The overall rates of antihypertensive treatment and control of incident hypertension increased significantly from 5.7% and 1.7% in 1991–1997 to 19.9% and 7.6% in 2004–2009, respectively ($p_{\text{trend}} < 0.001$).

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Conclusions—The incidence of hypertension has increased in Chinese adults since early 1990s. The treatment and control status of incident hypertension, while improved, remain very poor.

Keywords

Trends; Incidence; Hypertension; Adults; China

1. Introduction

The mortality of coronary heart disease (CHD) and stroke in the United States of America decreased at ~3% per year between 1970 and 1997 [1]. In England, mortality of CHD had fallen ~6% every year during 2000–2007 [2]. The decline in incidence and mortality of major cardiovascular diseases (CVDs) among high-income countries is largely attributable to the implementation of various prevention strategies including control of hypertension, high cholesterol, and smoking [1–5]. By contrast, in low- and middle-income countries, although mortality of stroke decreased, the incidence of stroke increased significantly from 1990 to 2010 [6]. In China, the burden of major CVDs (CHD and stroke), as the leading causes of death and disability, has increased over 1990–2010 [7].

Hypertension, as a major modifiable risk factor for CVDs, is fairly common among adults. The World Health Organization (WHO) Study on Global Aging and Adult Health (SAGE) of middle-income countries showed that the prevalence of hypertension varied from 23% to 52%, with the prevalence among people aged 35 years or older being 39% in China [8]. Several studies from high-income countries have shown an increase in the prevalence of hypertension since the 1990s [9–11]. Previously, data from the China Health and Nutrition Survey (CHNS) have suggested that the prevalence of hypertension in Chinese adults has increased from 14.5% in 1991 to 21.4% in 2009 [12]. However, data on the trend of incidence of hypertension are currently lacking.

In addition, the treatment and control of prevalent hypertension have been improved in many high-income countries. For example, studies from the United States of America showed that the control rate of hypertension had increased from 27.3% in 1988–1994 to 47.2% in 2009–2010 [10,13]. By contrast, although the treatment and control rates of hypertension have increased, it remains unacceptably low in middle-income countries including China [8,12,14]. The WHO SAGE study of middle-income countries suggested that approximately 73% of patients with hypertension were untreated and less than 10% were well controlled during 2007–2010 [8]. Blood pressure (BP) control of patients with hypertension remains a major problem in central and eastern European countries [14]. In China, data from CHNS also show an increase in the control rate of prevalent hypertension from 1991 to 2009, but the rate remained extremely low (6.1% in 2009) [12].

Previous studies from the CHNS have shown an upward trend in the prevalence of hypertension as well as in the treatment and control rates of prevalent hypertension [12]. While the increase in survival of people with hypertension contributes to the increased prevalence, it is plausible to hypothesize that the increased prevalence is partially owing to the increased incidence of hypertension. In the current analysis, using data from CHNS we seek to test this hypothesis by investigating the secular trends in incidence, treatment, and

control status of incident hypertension among Chinese adults from 1991–1997 to 2004–2009.

2. Methods

2.1 Study design and population

CHNS is a nationwide survey aiming to investigate health and nutritional status in Chinese populations (age ≥ 2 years) [15]. The study sample for CHNS was drawn from nine provinces (Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi, and Guizhou) through a multistage, randomized, cluster sampling process, as fully described elsewhere [15]. The CHNS survey was conducted in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, and 2011. Because BP was measured only once in the 1989 survey and data on the 2011 survey had not yet been released at the time when this analysis was completed, we included data from the surveys 1991 through 2009. Eligible subjects for this analysis were adults of people aged ≥ 18 years.

To determine the trend in incidence of hypertension over time, we identified five cohorts that covered five time periods. Each cohort (time period) covered three waves of survey: the first wave was considered as baseline survey, and the two successive waves were considered as follow-up surveys. For each cohort, we excluded (1) subjects who were identified to have hypertension at baseline survey, and (2) subjects who did not participate in either of the two successive follow-up surveys. Therefore, this study was based on the following five cohorts of adults (age ≥ 18 years) who were free of hypertension at baselines and who completed at least one follow-up survey: cohort 1991–1997 (n=4107), cohort 1993–2000 (n=4068), cohort 1997–2004 (n=4141), cohort 2000–2006 (n=4695), and cohort 2004–2009 (n=4523). Of these, 35.6%, 24.0%, 19.2%, 10.2%, and 10.9% subjects were included in 1, 2, 3, 4, and all the 5 cohorts, respectively.

The current study complies with the Declaration of Helsinki. The survey protocols, instruments, and the process for obtaining the informed consent for CHNS participants were approved by the Institutional Review Committees of the University of North Carolina at Chapel Hill, NC, USA, and the China National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention, Beijing, China. All participants provided written informed consents prior to the surveys.

2.2 Data collection and definitions

Data on demographics (age, sex, education, and living area), BP, weight, height, lifestyles (ever smoking, alcohol intake, and physical activity), and use of medications were collected by trained and certified health professionals through interviews and physical examinations. Ever smoking was defined as a positive answer to the question “have you ever smoked cigarettes or pipe?” Alcohol intake was defined as regular drinking alcoholic beverage ≥ 3 times a week. Because data on leisure-time physical activities were not collected in the surveys before 1997, physical activity was defined as the combination of occupational activity and home activity, as previously reported [16]. The total metabolic equivalents (METs) of physical activity were calculated as MET-hrs per week.

After at least a 10-min rest, arterial BP (Korotkoff phase I for systolic and phase V for diastolic pressure) was measured on the right arm in the sitting position using a mercury sphygmomanometer with the cuff maintained at the heart level. BP was measured three times on one visit, and the mean of three readings was used in the analysis. Hypertension was defined as systolic BP (SBP) ≥ 140 mm Hg, diastolic BP (DBP) ≥ 90 mm Hg, or current use of antihypertensive medications [17]. Among participants who were identified to have developed incident hypertension, control of hypertension was defined as SBP <140 mm Hg and DBP <90 mm Hg after receiving antihypertensive medications [17].

Height was measured to the nearest 0.1 cm without shoes using a portable stadiometer, and weight was measured to the nearest 0.1 kg with lightweight clothing on a calibrated digital floor scale. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Overweight or obesity was defined as BMI ≥ 25 kg/m².

2.3 Statistical analysis

Characteristics of participants in each cohort were presented with mean (standard deviation, SD) for normal distributed continuous variables and with frequency (%) for categorical variables. We described the trends in mean baseline BP of participants in each cohort and in the rates of treatment and control of hypertension according to age groups (18–39, 40–59, and ≥ 60 years), sex, region (urban and rural areas), or BMI status (normal weight and overweight or obesity) by plotting linear graphs. The statistical significance of trends in mean BP and in the treatment and control of incident hypertension were assessed by multiple generalized estimation equations (GEE) regression models to address the correlation of repeated measures within individuals. For assessing the trend in mean BP, an identity link and a normal distribution were used in the GEE model, in which SBP or DBP was used as the independent variable. For assessing the trend in the treatment and control rates of incident hypertension, a logit link and a binomial distribution were used in the model, with the treatment or control of hypertension being the dependent variable.

We calculated the incidence of hypertension according to person-years of follow-up (per 100 person-years). For participants who did not develop hypertension at the last contact of follow-up, the follow-up time was calculated from the date of baseline survey to the date of last contact. For those who developed hypertension, date of onset of hypertension was assumed to be in the midpoint between the two surveys because of the insidious onset of hypertension, and thus, the follow-up time was estimated as the full time during which subjects remained free of hypertension plus half of the follow-up time during which hypertension developed. Cox model was employed to assess the trend of incidence of hypertension across five time periods with follow-up time being the time scale.

We controlled for demographic and lifestyle factors to assess their influence on the trend of incidence, treatment, and control rates of hypertension. Because each factor had limited effect on the trend, we reported the results (*p* for trend) from the models that controlled for age, sex, region, ever smoking, alcohol intake, physical activity, and BMI at baseline.

IBM SPSS Statistics 19 for Windows (IBM SPSS Inc., Chicago, Illinois, USA) was used for all analyses. Statistical significance was set at $p = 0.05$, and statistically marginal significance at $0.05 < p < 0.10$.

3. Results

Table 1 presents the baseline characteristics of participants by five cohorts. The mean age of participants increased from 40.6 (SD, 13.3) years in cohort 1991–1997 to 46.6 (13.0) years in cohort 2004–2009 ($p_{\text{trend}} < 0.001$). The proportions of people aged ≥ 60 years increased over time ($p_{\text{trend}} < 0.001$), while the proportion of rural residents decreased significantly across the five cohorts ($p_{\text{trend}} < 0.001$). The proportion of female participants slightly increased over time ($p_{\text{trend}} = 0.05$). After controlling for age, sex, and region, mean BMI and prevalence of overweight or obesity significantly increased across five time periods, while the prevalence of ever smoking decreased significantly from cohort 1991–1997 to cohort 2004–2009 (all $p_{\text{trend}} < 0.001$). There appeared to be a J-shaped trend in physical activity across cohorts ($p_{\text{trend}} < 0.001$). There was no significant linear trend in the prevalence of alcohol intake over time ($p_{\text{trend}} = 0.411$).

Fig. 1 shows the trends in mean baseline SBP and DBP from cohort 1991–1997 to cohort 2004–2009 by age, sex, region, and BMI status. For each cohort, mean levels of baseline SBP and DBP were significantly higher in older than in young adults, in men than in women, and in overweight or obese adults than in those with normal BMI ($p < 0.001$), while there was no significant difference in mean BP between urban and rural residents ($p > 0.05$). Controlling for age, sex, region, ever smoking, alcohol intake, physical activity, and BMI, mean baseline SBP and DBP increased significantly from cohort 1991–1997 to cohort 2004–2009 ($p_{\text{trend}} < 0.001$); the linear trends were statistically significant in all subgroups by age, sex, region, and status of overweight or obesity ($p_{\text{trend}} < 0.05$) (Fig. 1).

Table 2 presents the trends in incidence of hypertension over time from 1991–1997 to 2004–2009 by age, sex, region, and BMI status. Overall, the incidence (per 100 person-years) of hypertension increased from 2.9 in 1991–1997 to 5.3 in 2004–2009 ($p_{\text{trend}} = 0.024$). After controlling for age, sex, region, ever smoking, alcohol intake, physical activity, and BMI, the linear trends of increasing incidence of hypertension were statistically significant in women ($p_{\text{trend}} = 0.050$), in rural residents ($p_{\text{trend}} = 0.009$), and in adults with normal BMI ($p_{\text{trend}} < 0.001$) and marginally significant in the age group of 18–39 years ($p_{\text{trend}} = 0.060$). In each of the five cohorts, the incidence of hypertension was significantly higher in older age groups than in younger ones, in men than in women, and in overweight or obese adults than in those with normal BMI ($p < 0.01$), while there was no significant difference in the incidence of hypertension between urban and rural residents ($p > 0.05$).

The self-reported antihypertensive treatment and control status of incident hypertension in five cohorts by age, sex, region, and BMI status are shown in Fig. 2. First, among people with incident hypertension, the overall rate of self-reported antihypertensive treatment increased from 5.7% in 1997 to 19.9% in 2009 ($p_{\text{trend}} < 0.001$). The rate of antihypertensive treatment increased significantly over time in all subgroups ($p_{\text{trend}} < 0.01$), except for young adults aged 18–39 years ($p_{\text{trend}} = 0.098$). Second, the rate of antihypertensive treatment was

higher in older than in young adults, and in women than in men from 2004 to 2009, whereas the rate of treatment was higher in urban than in rural residents, and in overweight or obese people than in those with normal weight from 1997 to 2009.

Among people with incident hypertension, the overall control rate of incident hypertension increased significantly from 1.7% in 1997 to 7.6% in 2009 ($p_{\text{trend}} < 0.001$). The control rate increased significantly over time in all subgroups ($p_{\text{trend}} < 0.01$), except for people aged 18–39 years ($p_{\text{trend}} = 0.226$). The control rate was higher in older than in young adults, and in women than in men in 2006 and 2009, and in urban than in rural residents across all cohorts, whereas overweight or obese adults had a significantly or marginally higher control rate than those with normal weight only in 2004 ($p = 0.039$) and 2009 ($p = 0.051$).

4. Discussion

This population-based study from CHNS suggested that, among Chinese adults, the incidence of hypertension increased over time from 1991–1997 to 2004–2009, especially in young adults, women, rural residents, and those with normal weight. The incidence of hypertension was higher in older than in young adults, in men than in women, and in overweight or obese adults than in those with normal weight. The rates of self-reported antihypertensive treatment and control among Chinese adults with incident hypertension, although increased over time, remained very low.

We previously reported that prevalence of hypertension in Chinese adults increased during 1991 and 2009 [12]. The current analysis suggested that the increased trend in prevalence of hypertension is at least partly owing to the increased incidence of hypertension because the trend is present independent of major influential factors of BP such as age, BMI, physical activity, and living region. In addition, our data showed that the baseline level of BP in people free of hypertension increased over time, which may contribute to the increased trend in incidence of hypertension. The increased trend in SBP over time among Chinese adults without hypertension is in accordance with the report from the United States national survey of adults who are free of hypertension [10]. Indeed, the reports from the United States survey and the WHO Multinational Monitoring Trends and Determinants in CVD Project suggested a trend of decrease in SBP and DBP from the 1980s to the 2000s in the whole population [10,18], which is largely owing to improvement in therapeutic control of high BP among the general populations.

The incidence of hypertension varied with age, sex, and living area of participants. As expected, BP level and incidence of hypertension were higher in older people than in young adults. However, the increased trend in incidence of hypertension was evident mainly in young adults. This suggests that young Chinese adults increasingly are affected by high BP, which has significant implications for public health. The incidence of hypertension increased over time in women but not in men, although the incidence was higher in men than in women, which are in agreement with the prevalence data [12,19,20]. Moreover, previous studies have indeed revealed a higher prevalence of hypertension in urban than rural residents [19,20], but the rural-urban difference in prevalence of hypertension tended to diminish in the last decade [12]. We found that the incidence of hypertension was

generally comparable between rural and urban residents, but the increased trend in incidence of hypertension was evident only in those living in rural area. This may partly reflect the fact that the considerable urban-rural gap in lifestyles and socioeconomic status existing before the 1990s in China had gradually diminished in the last decade or so; rural areas have acquired certain characteristics of urban environments as a result of quick industrialization and urbanization, which may promote development of chronic diseases such as hypertension [21,22].

Changes in lifestyles and BP-related factors may contribute to the increase in incidence of hypertension. First, overweight or obesity is strongly associated with hypertension [19,23–25]. Data from CHNS showed that during 1993–2009, there was an upward trend in prevalence of obesity in Chinese adults [23,26]. However, this cannot explain the increased trend in incidence of hypertension because the trend was present independent of overweight or obesity, and was evident mainly among people with normal BMI. Second, although physical activity (assessed as the combination of occupational and home physical activities) tended to increase from the survey 1997 onward, the meta-analysis revealed no convincing evidence for the association between occupational physical activity and risk of hypertension [27]. Third, urbanization, which has accelerated in China during the study period, might contribute to the increased trend in incidence of hypertension, because the urbanization and related changes in living conditions are linked to certain risk factors for hypertension, such as increasing intake in dietary fats, stressful life, and sedentary lifestyle among Chinese residents [16,22]. Fourth, the high intake of sodium, along with the increasing prevalence of obesity or overweight and heavy alcohol consumption, might partially explain the increasing incidence of hypertension among Chinese adults [28,29]. Finally, along with rapid urbanization and industrialization in China, the increasing outdoor air pollution might also partly contribute to the increased trend in the incidence of hypertension [22,30].

In the last decade, several studies have consistently shown an increasing trend in the treatment and control rate of prevalent hypertension [10,12,13]. We found a trend towards an overall improvement in the treatment and control rate of incident hypertension over time. However, among persons who were identified to have developed incident hypertension, the proportions of those receiving antihypertensive treatment and of achieving the goal of BP control were very low compared to studies of prevalent hypertension [10–12]. This may not be surprising given that incident hypertension is by definition the newly developed hypertension, and a considerable proportion of people with newly developed hypertension over the 5–7 year period are likely to be unaware of the disease. Nevertheless, the rates of treatment and control of incident hypertension were higher in older people than younger adults, in women than men, in urban residents than rural people, and in obese adults than in those with normal weight, which were consistent with the results of treatment and control of prevalent hypertension from CHNS [12]. These results imply that closely monitoring BP among Chinese adults, especially young adults, may help avoid any delay of antihypertensive treatment.

This study is based on a large-scale nationwide sample in China that covers a wide range of demographics, socioeconomic status, and nutritional and health conditions. Moreover, a standardized approach in BP measurement has been used consistently across the whole

period that comprises multiple assessments over time. However, this study also has limitations. Firstly, given the tremendous diversity of Chinese population across regions, the size and representativeness of the study sample for each cohort remained limited. Secondly, BP was measured at only one occasion without follow-up visits, which might have overestimated the incidence of hypertension [10]. Finally, data on use of antihypertensive medications were self-reported, not verified independently.

In conclusion, the incidence of hypertension has increased steadily over the last two decades among Chinese adults, especially in young adults, women, rural residents, and those with normal BMI. A considerable proportion (>80%) of people with incident hypertension are not timely treated, and even fewer (<10%) achieve the goal of BP control. Given that CVDs are the leading cause of deaths and disability-adjusted life-years in China, and that hypertension, especially when leaving untreated or uncontrolled, is the strongest single risk factor for CVDs, the government-dominated nationwide campaign to improve the management of hypertension is indicated to reduce the tremendous burden of CVDs in China.

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Highlights

- The incidence of hypertension has increased in Chinese adults since early 1990s.
- The trend is obvious in young, women, rural residents, and those with normal BMI.
- The treatment and control status of incident hypertension remain very poor.

Fig. 1. Mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) at baseline of five cohorts of adults who were free of hypertension by sex, age, region, and body mass index (BMI)
Controlling for age, sex, region, ever smoking, alcohol intake, physical activity, and body mass index, $p_{\text{trend}} < 0.05$ for the mean SBP and DBP from 1991 to 2004 in all subgroups.

Fig. 2.

The proportion of self-reported antihypertensive treatment (A) and control (B) of incident hypertension in five cohorts by sex, age, region, and body mass index (BMI)

Controlling for age, sex, region, ever smoking, alcohol intake, physical activity, and body mass index at baseline, $p_{\text{trend}} < 0.01$ for the rates of antihypertensive treatment and effective control of incident hypertension from 1997 to 2009 in all subgroups, except for people aged 18–39 years ($p_{\text{trend}} = 0.098$ for rate of antihypertensive treatment; $p_{\text{trend}} = 0.226$ for control rate of incident hypertension).

Table 1

Baseline characteristics of participants in the five cohorts that were free of hypertension at baseline surveys.

Characteristics	Cohort 1991–1997	Cohort 1993–2000	Cohort 1997–2004	Cohort 2000–2006	Cohort 5 2004–2009	<i>p</i> _{trend} [*]
No. of subjects	4107	4068	4141	4695	4523	
Age (years), mean (SD)	40.6 (13.3)	41.3 (12.7)	42.6 (12.8)	44.1 (12.7)	46.6 (13.0)	<0.001
Age (years), n (%)						
18–39	2217 (54.0)	2043 (50.2)	1828 (44.1)	1911 (40.7)	1484 (32.8)	
40–59	1501 (36.5)	1646 (40.5)	1865 (45.0)	2212 (47.1)	2338 (51.7)	
60	389 (9.5)	379 (9.3)	448 (10.8)	572 (12.2)	701 (15.5)	<0.001
Sex, n (%)						
Men	1908 (46.5)	1858 (45.7)	1910 (46.1)	2101 (44.7)	2017 (44.6)	
Women	2199 (53.5)	2210 (54.3)	2231 (53.9)	2594 (55.3)	2506 (55.4)	0.050
Region, n (%)						
Urban	1113 (27.1)	1114 (27.4)	1296 (31.3)	1455 (31.0)	1362 (30.1)	
Rural	2994 (72.9)	2954 (72.6)	2845 (68.7)	3240 (69.0)	3161 (69.9)	<0.001
BMI (kg/m ²), mean (SD)	21.4 (2.6)	21.7 (2.6)	22.1 (2.8)	22.6 (3.0)	22.7 (3.1)	<0.001
BMI (kg/m ²), n (%)						
<25	3720 (90.6)	3605 (88.6)	3509 (84.7)	3769 (80.3)	3530 (78.0)	
25	387 (9.4)	463 (11.4)	632 (15.3)	926 (19.7)	993 (22.0)	<0.001
Ever smoking, n (%)						
No	2662 (65.1)	2676 (66.3)	2802 (68.1)	3236 (69.5)	3106 (68.8)	
Yes	1428 (34.9)	1361 (33.7)	1315 (31.9)	1421 (30.5)	1410 (31.2)	<0.001
Alcohol intake, n (%)						
No	3526 (86.5)	3400 (84.4)	3397 (84.0)	3826 (84.3)	3859 (85.6)	
Yes	551 (13.5)	627 (15.6)	649 (16.0)	711 (15.7)	650 (14.4)	0.411
Physical activity (MET- hrs/week), mean (SD)	75.9 (94.5)	88.1 (131.3)	59.3 (96.1)	62.5 (100.8)	131.8 (122.4)	<0.001

BMI, body mass index; MET: metabolic equivalents; SD, standard deviation.

* Linear trend was tested using generalized estimation equations regression models, if applicable, controlling for age, sex, and region.

Table 2

Trends in incidence rate of hypertension by age, sex, region, and body mass index from 1991–1997 to 2004–2009.

Characteristics	Cohort 1991–1997			Cohort 1993–2000			Cohort 1997–2004			Cohort 2000–2006			Cohort 2004–2009			<i>p</i> _{trend} [*]
	No. of cases	Person-years	IR	No. of cases	Person-years	IR	No. of cases	Person-years	IR	No. of cases	Person-years	IR	No. of cases	Person-years	IR	
Total	651	22104	2.9	721	24966	2.9	758	24584	3.1	781	24288	3.2	1004	18895	5.3	0.024
Age, years																
18–39	186	12674	1.5	191	13303	1.4	204	11684	1.7	179	10460	1.7	175	6671	2.6	0.060
40–59	312	7737	4.0	381	9738	3.9	381	10771	3.5	424	11209	3.8	557	9740	5.7	0.226
60	153	1693	9.0	149	1926	7.7	173	2130	8.1	178	2619	6.8	272	2484	11.0	0.941
Sex																
Men	341	10100	3.4	362	11205	3.2	393	11170	3.5	402	10606	3.8	500	8275	6.0	0.175
Women	310	12004	2.6	359	13761	2.6	365	13407	2.7	379	13683	2.8	504	10621	4.7	0.050
Region																
Urban	195	5894	3.3	190	6845	2.8	240	7701	3.1	254	7388	3.4	293	5794	5.0	0.812
Rural	456	16211	2.8	531	18121	2.9	518	16884	3.1	527	16901	3.1	711	13101	5.4	0.009
BMI, kg/m ²																
<25	537	20255	2.6	559	22440	2.5	582	21234	2.7	549	19876	2.8	670	14316	4.7	<0.001
25	114	1849	6.2	162	2527	6.4	176	3350	5.2	232	4413	5.2	334	3805	8.8	0.085

BMI, body mass index; IR, incidence rate (per 100 person-years).

^{*} *p* values for linear trend were derived from Cox regression models controlling for baseline age, sex, region, ever smoking, alcohol intake, physical activity, and body mass index.