Obesity Facts

Out-of-Pocket Expenditure Associated with Physical Inactivity, Excessive Weight and Obesity in China: Quantile Regression Approach

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Abstract

Introduction: Previous studies exploring associations of physical inactivity, obesity and out-of-pocket expenditure (OOPE) mainly used traditional linear regression, little is known about the effect of both physical inactivity and obesity on OOPE across the percentile distribution. This study aims to assess the effects of physical inactivity and obesity on OOPE in China using a quantile regression approach. *Methods:* Study participants included 10,687 respondents aged 45 years and older from the recent wave of the China Health and Retirement Longitudinal Study in 2015. Linear regression and quantile regression models were used to examine the association of physical activity, body weight with annual OOPE. *Results:* Overall, the proportion of overweight and obesity was 33.2% and 5.8%, respectively. The proportion of individuals performing high-level, moderate-level and low-level physical activity was 55.2%, 12.7% and 32.1%, respectively. The effects of low-level physical activity on annual OOPE was small at the bottom quantiles but more pronounced at higher quantiles. Respondents with low-level activity had an increased annual OOPE of 26.9 US$, 150.3 US$, 1534.4 US$, at the 10th, 50th, and 90th percentiles, respectively, compared with those with high-level activity. The effects of overweight and obesity on OOPE were also small at the bottom quantiles but more pronounced at higher quantiles. *Conclusion:* Interventions that improve the lifestyles and unhealthy behaviours among people with obesity and physical inactivity are likely to yield substantial financial gains for the individual and health systems in China.

Keywords: out-of-pocket; health care cost; physical activity; overweight; obesity; China

Introduction

Excessive weight and physical inactivity are precursor to a plethora of adverse health outcomes, including diabetes and cardiovascular diseases like hypertension, or coronary artery disease [1-3]. Emerging evidence has found that patients with excessive weight and physical inactive have higher health care utilisation, and medical cost [4-6]. In low- and middle-income countries (LMICs), due to insufficient public spending on health and poor coverage of health services, patients often pay a high proportion of their medical cost out-of-pocket, resulting in medical impoverishment due to illness.

China, home to 1.3 billion population, underwent a rapid epidemiological transition. Compared with 1990, the most common non-communicable diseases (NCDs), including stroke, ischaemic heart disease, lung cancer, chronic obstructive pulmonary disease, and liver cancer contributed much more to mortality and years of life lost in 2017 [7]. Historically a lean population, China has witnessed a concerning rise in overweight, obesity and physical inactivity in recent decades [8]. It is suggested that this trend is due to rapid economic progress accompanied by urbanisation over the last few decades, which has raised the standards of living for its citizens [8]. The average energy density of food has increased, with higher levels of animal fat and simple sugar consumption [8], while a lack of physical activity has resulted from a reduction in labour intensive jobs and an increased use of motorised transport [9].

Findings from four national surveys in 2000, 2005, 2010, and 2014 among Chinese adults aged 20–59 years estimated that the prevalence of obesity increased from 8.6% in 2000, to 10.3% in 2005, 12.2% in 2010, and 12.9% in 2014, and the prevalence rates of overweight were 37.4%, 39.2%, 40.7%, and 41.2% in the year of 2000, 2005, 2010, and 2014 [10]. In addition, referring to the guidelines from the American College of Sports Medicine, Tian et al. defined the recommended minimum levels of leisure-time physical activity as 150 min of moderate-intensity physical activity or 75 min of vigorous-intensity physical activity per week to achieve a total energy expenditure of at least 500–1000 metabolic-equivalent-of-task-min per week [11]. They observed that between 2000 and 2014, although the percentage of Chinese adults who met the recommendation of leisure time physical activity slightly increased from 17.2% to 22.8%, the majority of adults had insufficient physical activity [10]. Furthermore, a number of studies note similar trends in both obesity and physical inactivity in Chinese children and adolescents, suggesting that the trend will continue well into the future [9, 12-14]. Recognising an urgent need to improve population health, the 'Healthy China 2030' plan was proposed by the Chinese government in 2016 [15]. This plan includes a number of specific targets for reducing risk factors associated with chronic disease, and represents a focus on evidence-based practice, as well as a transition from emphasis on treatment to prevention of disease [15]. The plan aimed for a 30% relative reduction in premature mortality related to NCDs by the year 2030 [15]. However, a recent report has suggested that China is not on track to reach this target, especially in their most developed municipalities [16].

In LMICs such as China, there is a heavy reliance on out of pocket expenditure (OOPE) to fund health care [17]. In 2011, 34.8% of total health expenditure in China was paid at the cost of the individual. To address this challenge, the 'Healthy China 2030' plan aims to decrease OOPE to 25% in line with other high-income countries [15]. High OOPE on healthcare is problematic as it has shown to be a barrier for patients in seeking health care, thus leading to worse health outcomes [17]. It is known to be particularly detrimental to those with chronic illness, who are much more likely to suffer from catastrophic health expenditure and impoverishment as a result of these costs [18]. In 2012, the rates of catastrophic health expenditure and impoverishment in China were estimated to be 13% and 7.5% respectively [18]. Similarly, one 2012 study using nationally representative data estimated physical inactivity to be responsible for 15% of total healthcare costs in China [6], while overweight and obesity accounted for 3% of China's total healthcare costs from 2000-2009 [5].

There is evidence that physical inactivity and obesity are risk factors leading to higher OOPE in China [19, 20], but all of these studies have used traditional linear regression, and were limited by a small sample from major cities in China. For example, a study of university retirees from Beijing, China found that overweight and obesity were associated with an increased OOPE of 13% and 33% respectively, compared to healthy weight individuals [19]. Little is known about the effect of both physical inactivity and obesity on OOPE across the percentile distribution. Unlike traditional regression methods, such as the Ordinary Least Squares (OLS) regression or the Generalized Linear Model (GLM), that focus on population average/mean effects, quantile regression models look at the effect of physical inactivity and obesity on health care costs across the outcome distribution. Alternative estimation strategies using quantile regression analysis has been increasingly adopted in health systems research to investigate the associations between outcomes of interest and the explanatory variables across the distribution of a given dependent variable [21].

To fill this important evidence gap, this study will use nationally representative data from the 2015 China Health and Recruitment Longitudinal Study (CHARLS) looking at Chinese adults >45 years. The study will assess the effect of a) physical activity (high/ moderate/ low) and b) body mass index (BMI, normal/ overweight/ obese) on the 10th, 25th, 50th and 90th percentiles of OOPE, after controlling for a number of covariates. To our knowledge, this will be the first study to assess the effects of physical inactivity and obesity on OOPE in China using a quantile regression approach.

Materials and Methods

Materials

This study used the most recent wave of data from the CHARLS conducted in 2015. The study collected high-quality data from a nationally representative sample of Chinese residents aged 45 and older, using multi-stage stratified probability-proportionate-to-size sampling. The total sample size of the CHARLS baseline survey was 17,708 individual respondents. Ongoing follow-up surveys were conducted once every two years. A detailed description of the survey objectives and methods has been reported elsewhere [22]. For this study, we identified 14,576 respondents without loss to follow-up. After removing respondents' BMI <18.5 kg/m^2 and individuals with missing values of dependent variables and covariates, our final sample had 10,687 respondents (73.3% of 14,576). Weight status was analysed using this entire sample, and the level of physical activity was analysed among 5,713 participants who reported their weekly physical exercise time.

Measures

The level of physical activity was measured by a modified version of the International Physical Activity Questionnaire, which assessed total physical activity [23], including the frequency of weekly physical exercise (days of physical activity at least 10 minutes) and physical activity intensity, including walking, moderate, and vigorous physical activity.

Information on physical activity was assessed with two items asking, "Did you walk or perform moderate and vigorous physical activity for 10 minutes or longer during last 7 days?", "How many of the last 7 days did you walk, or perform moderate, and vigorous physical activity for 10 minutes or longer?". A new variable was computed to classify participants into three groups: 1) High-level physical activity (practice of vigorous physical activity for 10 minutes or longer ≥3day/week, or moderate physical activity for 10 minutes or longer≥5 days/week.); 2) Moderate-Level physical activity (practice of vigorous physical activity for 10 minutes or longer 1-2 day/week, or moderate physical activity for 10 minutes or longer 1-4 days/week); and 3) Low-level physical activity /Physical inactivity (none weekly physical exercise and/or only walking during last week).

In terms of overweight and obesity, the CHARLS provided respondents' BMI calculated from measured weight in kilograms and height in meters (kg/m^2). We classified the weight status into three categories according to the

World Health Organisation definition; normal weight (BMI: 18.5-24.9 kg/m^2), overweight (BMI: 25-29.9 kg/m^2), obesity (BMI: ≥30 kg/m^2) [24].

The primary outcome variable was annual OOPE, defined as the sum of direct payments for outpatient and inpatient care provided during the last year, after reimbursement from health insurance. Since the OOPE for outpatient care is measured one month at a time, this study calculated the one-year outpatient care costs by multiplying the one-month measurement by twelve.

We included the following variables as covariates in the regression analyses: age, gender, marital status (married and partnered, unmarried and others), level of education (illiterate, primary school, secondary school, college and above), place of residence (rural, urban), geographical region (east, central and west), household economic status quartiles (yearly per capita household consumption expenditure), and social health insurance (yes, no).

Statistical approach

We summarized the mean of annual OOPE across BMI and physical inactivity groups. This study assessed the effect of physical inactivity and obesity on OOPE using a linear regression and quantile regression model. For individuals with positive OOPE (expenditures>0 US$), linear regression models were used to examine the overall effects of physical inactivity and obesity on OOPE. Quantile regression analysis was also performed to estimate the impact of physical inactivity and obesity on OOPE at the 10th, 25th, 50th, 75th, and 90th percentiles. Analogous to ordinary least squares regression, quantile regression estimates the median or other quantiles of an outcome variable associated with a set of predictors and covariates without the assumptions of normality and homoscedasticity of the underlying distribution [25-27]. Quantile regression is robust to outliers because it allows for studying the full distribution of the outcome variable and is suitable for modelling outcomes that are highly skewed or not normally distributed [28, 29]. The coefficients at lower percentiles (10th, 25th percentile) present the association of physical inactivity and obesity with OOPE in those individuals with low health expenditures, while upper percentiles (75th, 90th percentiles) reflects the association on those with higher health expenditures. We also estimated the effect of physical inactivity and obesity with the individual as a predicting variable in our regression analysis. All statistical analyses were conducted using Stata software 15.0 (Stata Corp., College Station, Texas).

Results

We analysed data from 10,687 respondents. **Table 1** presents the respondents' socioeconomic and demographic characteristics. The median age of participants was 60 years (IQR 52–66) in 2015. There was a slightly higher percentage of female (52.5%) than male respondents. Most of the respondents were married (87.6%) and resided in rural areas (54.9%). Only 33.9% of the respondents had attained a level of education higher than primary school, and 82.9% of the respondents were enrolled in social health insurance in China. Overall, the proportion of overweight and obesity was 33.2% and 5.8%, respectively. The proportion of individuals performing high-level physical activity, moderate-level physical activity and low-level physical activity was 55.2%, 12.7% and 32.1%, respectively.

Table 2 shows the proportion and average annual OOPE across the weight status and physical activity groups. Of the total participants, 27.1% experienced an occurrence of OOPE during the last year. Overall, the mean OOPE was 477 US$ in our total sample and 1759 US$ among participants with positive OOPE. Obesity were associated with a higher incidence of incurring any OOPE last year (30.9%) compared to normal weight persons (26.3%). Low-level physical activity was associated with a higher incidence of incurring any OOPE last year (28.3%) compared to High-level physical activity (26.1%). Among people with positive OOPE, physical inactivity and overweight were associated with a substantially greater OOPE.

Results of quantile regression analysis

The result of quantile regression analysis (among those experiencing a positive OOPE) suggested that physical inactivity was significantly associated with greater OOPE at both higher percentiles and lower percentiles of OOPE spending **(Figure 1)**. The OOPE attributable to overweight (top) and obesity (bottom) over the distribution of the OOPE are depicted in **Figure 2**. Variations in OOPE attributable to overweight and obesity became more pronounced as expenditure approached the upper percentiles.

Table 3 showed that the effects of low-level physical activity on annual OOPE was small at the bottom quantiles but more pronounced at higher quantiles. Respondents with low-level activity had an increased annual OOPE of 26.9 US$, 150.3 US$, 1534.4 US$, at the 10th, 50th, and 90th percentiles, respectively, compared with those with high-level activity. The difference in OOPE is greater at higher percentiles of the OOPE distribution, but with wide CIs. There is no statistically significant association of moderate-level activity with annual OOPE.

Table 4 showed that annual OOPE increased due to obesity at the 10th, 25th, 50th and 75th quantiles, compared with those individuals with normal weight after adjusting for covariates. The annual OOPE attributable to obesity were higher than OOPE attributable to overweight in all quantiles of the distribution except the 90th quantile, while OOPE attributable to overweight and obesity were not significant in most quantiles of the distribution except for the group of overweight at the 50th quantile and the groups of obesity at the 25th and 50th quantiles. The effects of overweight and obesity on OOPE were also small at the bottom quantiles but more pronounced at higher quantiles. The difference in OOPE is greater at higher percentiles of the OOPE distribution, but with wide CIs.

Discussion

The association of obesity and physical activity with OOPE in a large nationally representative sample in China in the present study is similar with that of previous research from the U.S.,   Australia and some European countries [4, 30]. Consistent to previous studies, it highlights the potential economic burden of the growing prevalence of physical inactivity, excessive weight and obesity [31-37]. While only 8.1% of our sample were uninsured, the share of OOPE remained high, with almost 30% of people with low physical activity or obesity still experiencing an occurrence of OOPE. Our results support the evidence that accessibility of health insurance benefits packages for older adults is still relatively low in China [38].

With the present sample of adults aged at 45 years or older, engaging in high-level physical activity [practice of vigorous-intensity physical activity for 10 minutes or longer ≥3day/week, or moderate-intensity physical activity for 10 minutes or longer≥5 days/week frequency of their physical activity] were found to have a decreased annual OOPE, compared with those inactive. This is similar to previous findings. In a study of 94,267 adults from 16 European countries, Dallmeyer et al. found that if a person is physically active once a week, annual OOPE are reduced by 17.7% compared to someone who is never active. For physical activity more than once a week, this effect decreases to 15.3%. For physical activity less than once a week, it is reduced to 12.7% [30]. Likewise, in China, Zhang and Chaaban (2013) estimated the medical cost attributable to physical inactivity reached 24.3 billion Yuan (3.5 billion USD) in 2008 [6]. Similarly, a previous study exploring the association of physical activity and health expenditures among elderly patients with coronary heart diseases in Dongfeng-Tongji, China found that people with no or light physical activity had significantly longer hospital stays and had a greater inpatient and outpatient cost [39].

Moreover, the study by Qin and Pan (2016) found that the annual medical cost attributable to overweight and obesity in China was 24.35 billion Yuan [5]. A reasonable explanation of the higher OOPE increase with physical inactivity and obesity may be that both physical inactivity and obesity are associated with a higher risk of developing five majors NCDs in China, including coronary heart disease, stroke, hypertension, cancer, and type 2 diabetes [6], which consequently impose a substantial financial burden on individuals, family, and society. Therefore, continued nationwide interventions are needed to promote physical activity and decrease the prevalence of overweight and obesity in China so as to decrease the healthcare cost. Given the benefits of moderate to high-intensity physical activity to weight management and reduction, promotion of sufficient physical activity participation is recommended as the first priority. In addition, the government must ensure appropriate financial support to mitigate the economic burden among the older population [40].

There is worldwide acceptance among medical authorities that physical inactivity and excessive weight or obesity are increasingly being viewed as the two of the greatest threats to public health in both developed and developing countries today [41-63]. Key national and global policy initiatives have attempted to address the issues above mentioned, including Healthy China 2030's vision and the World Health Organization's Global NCD Target that calls for a 10% reduction in the prevalence of physical inactivity by 2025 [64, 65]. To achieve this goal, healthcare settings could be used to provide comprehensive assessment and promotion for physical activity among adult patients. Physicians should collaborate with other health care professionals such as physical therapists and nurses and integrate assessment of physical activity into vital sign assessment or general medical check-ups, prescribe exercise for patients especially those with comorbid conditions including overweight/obesity, and monitor the compliance and outcomes of exercise and dietary changes [66]. Certain types of exercise that are popular among middle-aged and older members of the Chinese population, such as tai chi and dancing, have been found to reduce the risk of NCDs [67, 68]. However, lifestyle changes, such as sedentary living conditions and rapid industrialization, have limited the uptake of such traditional exercise [68], and thus, creating conducive social and physical environments for these activities is imperative. Further, to improve the level of physical activity and prevent the onset of chronic diseases, future promotions could be

customized for older adults to encourage sufficient physical activity in an otherwise sedentary population. Finally, as physical inactivity is correlated with additional financial burden, health promotion could stress the potential economic savings of being physically active, which has been shown to be effective among the elderly population [69].

Strengths and Limitations

To our knowledge, this is the first study that examined OOPE in relation to obesity and physical activity using a quantile regression approach that can reflect the variations in the impact of obesity and physical inactivity across the percentile distribution. There is no current study, which confirms that reverse or bidirectional causality between levels of physical activity and obesity. Therefore, we examined the associations of both physical inactivity and obesity with health service expenditures, which let readers compare the results of analyses of two risk factors. However, there are some limitations that should be acknowledged. First, the use of self-reported height and weight to calculate BMI and assess physical activity lacks the accuracy of the measured data. Existing literature suggest that the self-reported BMI is likely underestimated especially amongst obese individuals [70, 71], while self-reporting of physical activity is likely over reported [72]. These reporting bias impedes the precise estimation of outcomes. Second, OOPE might not be attributable to the health conditions associated with obesity or physical inactivity. OOPE includes the costs that are not specific to the health conditions associated with obesity and physical inactivity such as infectious diseases (e.g. pneumonia) and physical injuries. Therefore, our results on the cost burden of obesity and physical inactivity might be overestimated. Third, some covariates, such as social health insurance and marital status, were included as dichotomous variables for performing quantile regressions due to the limited sample in CHARLS. Finally, the cross-sectional nature of study limits the ability to prove the causal relationships. Future study should use longitudinal study design to explore the effect of obesity and physical inactivity on OOPE attributable to diseases associated with these risk factors.

Conclusion

In conclusion, this study provides important evidence from a nationally representative sample that physical inactivity and overweight are associated with a substantially greater OOPE among Chinese adults with positive OOPE. The impact of physical inactivity on treatment cost gradually increases as costs approach the upper quantile of treatment costs. Interventions that improve the lifestyles and unhealthy behaviours among people with obesity and physical inactivity are likely to yield substantial financial gains for the individual and health systems in China.

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Figure legend
Figure 1. Distribution of adjusted OOPE associated with physical inactivity by percentile of OOPE
Figure 2. Distribution of adjusted OOPE associated with overweight (top) and obesity (bottom) by percentile of
OOPE
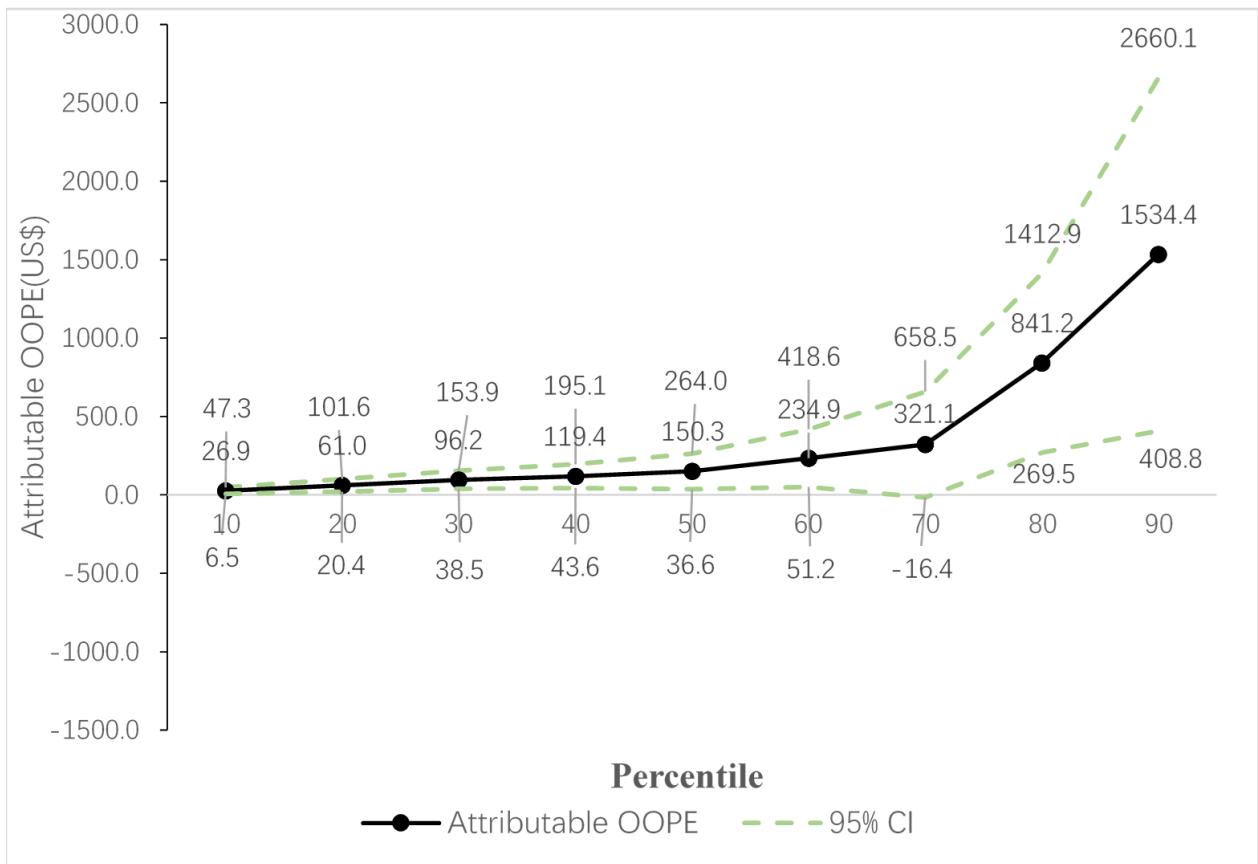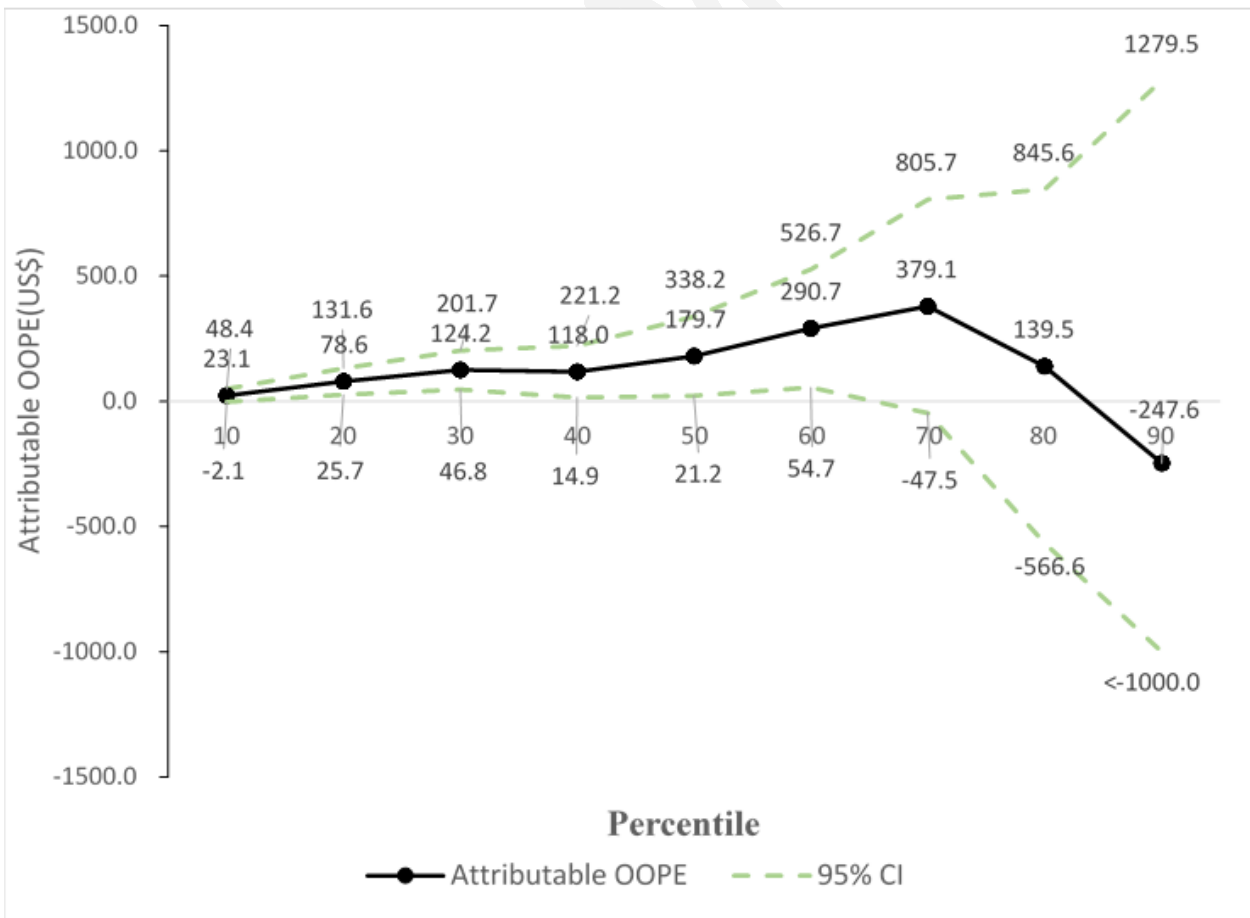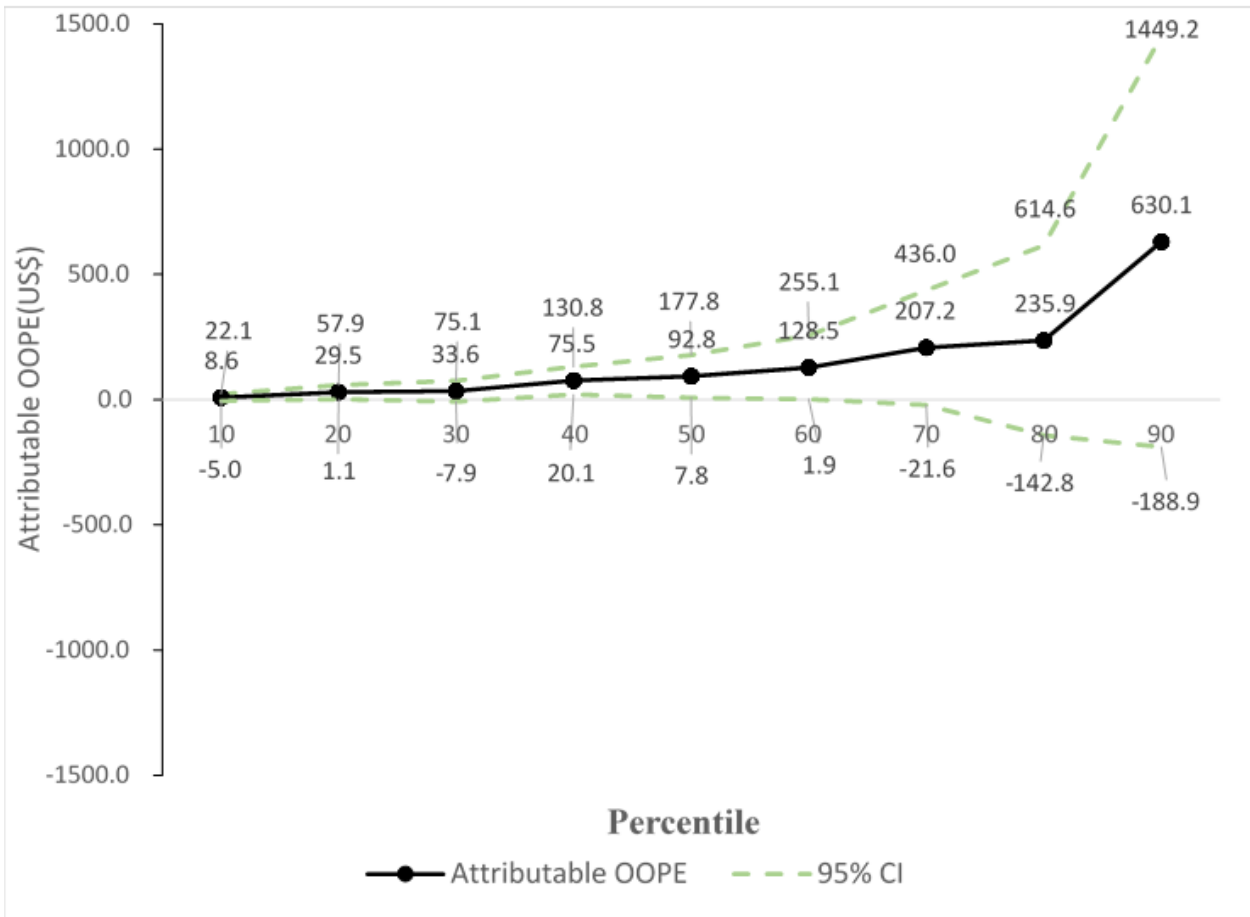
Table 1. Characteristics of sample in 2015

Characteristic	N	Unweighted %	Weighted %
Total	10,687	100.0	100.0
Age (year)			
45-54	3,430	32.1	31.8
55-64	3,930	36.8	37.1
65-74	2,537	23.7	23.1
75 and above	790	7.4	8.0
Gender			
Male	5,036	47.1	47.5
Female	5,651	52.9	52.5
Marital status			
Married and partnered	9,381	87.8	87.6
Unmarried and other	1,306	12.2	12.4
Education status			
Illiterate	4,521	42.3	39.4
Primary school	2,854	26.7	26.7
Secondary school	2,216	20.7	21.7
College & above	1,096	10.3	12.2
Residence place			
Urban	4,014	37.6	45.1
Rural	6,673	62.4	54.9
Region			
East	4,007	37.5	40.6
Central	4,135	38.7	36.8
West	2,545	23.8	22.5
PCE, quartile			
Q1, the lowest	2,674	25.0	22.7
Q2	2,671	25.0	24.4
Q3	2,671	25.0	26.0
Q4 (the highest)	2,671	25.0	26.9
Social health insurance			
No	1,749	16.4	17.1
Yes	8,938	83.6	82.9
BMI			
Normal	6,598	61.7	61.0
Overweight	3,441	32.2	33.2
Obesity	648	6.1	5.8
Physical activity			
High-level PA	2,930	55.6	55.2
Moderate PA	658	12.5	12.7
Low-level PA	1,679	31.9	32.1

Note: BMI, Body Mass Index.

Table 2. Out-of-pocket health expenditure by the weight status and physical activity group

	Any OOPE (%)			Overall OOPE			OOPE >0		
	Proportion	95%CI		Mean	95%CI		Mean	95%CI	
Total participants	27.1%	26.3%	28.0%	477.0	421.7	532.2	1759.0	1562.6	1955.3
Physical activity									
High-level PA	26.1%	24.6%	27.7%	326.3	266.2	386.3	1248.6	1030.5	1466.7
Moderate PA	27.8%	24.5%	31.0%	531.8	185.4	878.3	1916.2	685.7	3146.7
Low-level PA	28.3%	26.2%	30.3%	632.7	473.6	791.7	2238.5	1698.9	2778.1
Excessive weight									
Normal	26.3%	25.3%	27.4%	437.1	370.3	503.9	1659.3	1414.7	1904.0
Overweight	27.9%	26.4%	29.4%	552.8	441.0	664.7	1981.5	1594.7	2368.3
Obesity	30.9%	27.3%	34.4%	480.4	359.2	601.6	1556.5	1206.4	1906.5

Note: BMI, Body Mass Index; OOPE, out-of-pocket expenditure.

Table 3. Quantile regression on OOPE associated with physical inactivity (OOPE>0,n=1417)

	10th percentile			25th percentile			50th percentile			75th percentile			90th percentile		
	Coeff	95% CI		Coeff	95% CI		Coeff	95% CI		Coeff	95% CI		Coeff	95% CI	
Physical activity (High-level)															
Moderate -level	-6.0	-33.9	21.9	14.1	-55.9	84.1	-44.4	-199.6	110.8	-21.3	-589.9	547.3	64.2	-1472.0	1600.5
Low-level/Physical inactivity)	26.9	6.5	47.3	76.6	25.3	127.9	150.3	36.6	264.0	560.9	144.3	977.5	1534.4	408.8	2660.1
Age (per five years)	0.2	-5.5	5.8	-3.6	-17.8	10.6	-28.8	-60.3	2.8	0.0	-115.6	115.6	122.9	-189.4	435.1
Gender (male)															
Female	14.7	-4.5	34.0	12.6	-35.8	61.1	-27.7	-135.0	79.7	-38.5	-432.0	354.9	32.1	-1031.0	1095.2
Marital status (married)															
Unmarried and other	1.8	-27.4	31.0	-51.9	-125.3	21.5	-65.7	-228.3	96.9	-159.9	-755.9	436.0	-61.8	-1671.9	1548.3
Level of education (illiterate)															
Primary school	-9.6	-33.0	13.8	-54.6	-113.3	4.2	-102.4	-232.6	27.8	-26.9	-504.0	450.2	106.0	-1183.0	1395.0
Secondary school	-18.4	-44.5	7.6	-51.5	-117.0	14.1	-79.2	-224.4	66.1	-228.4	-760.7	303.8	470.5	-967.6	1908.7
College & above	17.7	-16.5	51.8	-45.8	-131.6	40.0	-145.3	-335.4	44.8	-234.9	-931.5	461.7	-507.5	-2389.6	1374.7
Residence place (urban)															
Rural	-15.2	-34.6	4.2	-30.5	-79.3	18.3	-15.6	-123.8	92.6	-53.0	-449.4	343.5	65.8	-1005.3	1137.0
Region (east)															
Central	4.3	-16.9	25.5	15.8	-37.5	69.0	-20.8	-138.8	97.3	-211.2	-643.8	221.4	-117.2	-1286.1	1051.6
West	-5.1	-28.7	18.4	-15.4	-74.6	43.8	-133.0	-264.2	-1.8	-421.1	-902.0	59.7	-733.1	-2032.4	566.2
PCE, quartile (Q1, the lowest)															
Q2	6.5	-20.0	33.1	-7.1	-73.8	59.6	-20.9	-168.7	126.9	202.3	-339.2	743.9	691.3	-772.0	2154.7
Q3	16.1	-10.4	42.6	40.6	-25.9	107.1	76.8	-70.6	224.2	233.3	-307.0	773.5	723.5	-736.3	2183.3
Q4 (the highest)	33.7	8.0	59.4	92.8	28.3	157.4	282.3	139.2	425.4	984.8	460.4	1509.3	3869.4	2452.4	5286.5
Social health insurance (no)															
Yes	-9.8	-37.0	17.3	-4.0	-72.2	64.3	-4.7	-156.0	146.6	-488.2	-1042.5	66.1	-1267.9	-2765.5	229.8

Note: Coefficients estimated after adjusting for study variables, including age, gender, and marital status, level of educati on, residence place, region, ho usehold economic level and health insurance status. CI, confidence interval; PCE, Per capita household consumption expenditure.

Table 4. Quantile regression on OOPE associated with overweight and obesity (OOPE>0, n=2898)

	10th percentile			25th percentile			50th percentile			75th percentile			90th percentile		
	Coeff	95% CI		Coeff	95% CI		Coeff	95% CI		Coeff	95% CI		Coeff	95% CI	
BMI (Normal)															
Overweight	8.6	-5.0	22.1	32.5	-3.9	68.9	92.8	7.8	177.8	222.8	-60.9	506.6	630.1	-188.9	1449.2
Obesity	23.1	-2.1	48.4	101.3	33.5	169.2	179.7	21.2	338.2	327.2	-201.9	856.3	-247.6	-1774.7	1279.5
Age (per five years)	3.7	-0.1	7.6	3.5	-6.9	13.9	-6.0	-30.2	18.2	46.2	-34.6	127.0	147.9	-85.3	381.2
Gender (male)															
Female	9.3	-4.1	22.7	12.2	-23.7	48.1	3.8	-80.1	87.6	80.3	-199.7	360.3	319.8	-488.4	1128.1
Marital status (married)															
Unmarried and other	-0.5	-20.1	19.0	-30.8	-83.2	21.6	-54.4	-176.7	68.0	-301.1	-709.7	107.4	-357.8	-1537.1	821.5
Level of education (illiterate)															
Primary school	12.7	-3.6	28.9	-22.1	-65.6	21.5	-51.5	-153.3	50.2	-74.3	-413.9	265.4	-147.9	-1128.4	832.5
Secondary school	-1.8	-19.9	16.4	-36.1	-84.8	12.6	-53.4	-167.2	60.5	-54.2	-434.2	325.8	728.4	-368.6	1825.4
College & above	11.2	-12.1	34.5	-3.8	-66.2	58.6	-53.4	-199.3	92.4	299.1	-187.6	785.8	501.0	-903.9	1906.0
Residence place (urban)															
Rural	-10.9	-24.4	2.6	-15.8	-51.9	20.3	-20.7	-105.1	63.6	104.4	-177.1	385.9	490.9	-321.6	1303.5
Region (east)															
Central	7.7	-7.0	22.4	4.3	-35.1	43.7	-43.8	-135.8	48.3	-46.2	-353.4	261.1	-23.2	-910.1	863.8
West	4.1	-12.0	20.2	-43.0	-86.1	0.2	-144.8	-245.6	-44.0	-273.0	-609.4	63.4	-476.3	-1447.3	494.7
PCE, quartile (Q1, the lowest)															
Q2	2.3	-16.0	20.6	10.7	-38.5	59.8	-32.4	-147.2	82.5	158.6	-224.8	542.0	376.7	-729.9	1483.3
Q3	11.1	-7.2	29.3	60.7	11.7	109.6	139.9	25.5	254.2	365.3	-16.3	747.0	762.9	-338.7	1864.4
Q4 (the highest)	38.0	20.1	55.9	102.0	53.9	150.1	303.2	190.9	415.6	1367.0	992.0	1742.1	3898.2	2815.6	4980.8
Social health insurance (no)															
Yes	3.6	-15.3	22.5	0.7	-50.0	51.4	5.1	-113.3	123.6	-399.5	-794.9	-4.0	-1274.6	-2416.0	-133.2

Note: Coefficients estimated after adjusting for study variables, including age, gender, and marital status, level of educati on, residence place, region, household economic level and health insurance status. PCE, Per capita household consumption expenditure; BMI, Body Mass Index. CI, confidence interval.