

SUPPLEMENTAL MATERIAL

Obesity Prevalence and Risks among Chinese Adults: Findings from China PEACE Million Persons Project, 2014–2018

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Supplement I. Brief State-of-the-Art Review on Obesity Prevalence and Socio-Demographic Risks in China

Objective: We conducted a state-of-the-art review¹ to identify gaps in research knowledge on the current prevalence of obesity and its socio-demographic risks in China.

Methods: The literature search was conducted on March 6, 2020 using Ovid MEDLINE(R) ALL and Embase. We combined medical subject headings (MeSH) terms and keywords for the concepts of China and obesity (see Query below) and limited the results to those on human adults and published in 2011 and after. A final set of 422 de-duplicated publications were returned. We reviewed their abstracts or full-texts and excluded disease-specific and local or regional studies.

Query:

1. China.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
2. Obesity.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
3. General obesity.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
4. Overall obesity.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
5. Abdominal obesity.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
6. Central obesity.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
7. 3 or 4 or 5 or 6
8. body mass index.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
9. waist circumference.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
10. 8 or 9
11. 7 or 10
12. 1 and 11
13. 2 or 10
14. 1 and 13
15. national.mp. [mp=ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, sy, tn, dm, mf, dv, kw, dq]
16. 12 and 15
17. 14 and 15

Synopsis of Results: A total of 48 publications reported at least one national estimate of obesity prevalence based on studies, including China Chronic Disease and Risk Factor Surveillance, China National Nutrition and Health Survey, and China Health and Retirement Longitudinal Study. No study reported national data after 2013–2014. Fewer studies reported on abdominal obesity compared to overall obesity. Reports on socio-demographic risks of obesity were limited because many studies focused on specific population strata and none across broad socio-demographic subgroups.

Reference:

1. Grant MJ and Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Info Libr J* 2009; 26: 91–108.

Supplement II. Members of the Provincial Coordinating Office in the China PEACE Million Persons Project Collaborative Group

Beijing Center for Diseases Prevention and Control: Chun Huang, Zhong Dong, Bo Jiang; Tianjin Chest Hospital: Zhigang Guo, YingYi Zhang; Hebei Center for Diseases Prevention and Control: Jixin Sun, Yuhuan Liu; Shanxi Center for Diseases Prevention and Control: Zeping Ren, Yaqing Meng; Inner Mongolia Center for Diseases Prevention and Control: Zhifen Wang, Yunfeng Xi; Liaoning Center for Diseases Prevention and Control: Liying Xing, Yuanmeng Tian; Jilin Center for Diseases Prevention and Control: Jianwei Liu, Yao Fu, Ting Liu; Heilongjiang Center for Diseases Prevention and Control: Wei Sun, Shichun Yan, Lin Jin; Shanghai Center for Diseases Prevention and Control: Yang Zheng, Jing Wang; Jiangsu Center for Diseases Prevention and Control; Zhejiang Provincial People's Hospital: Jing Yan, Xiaoling Xu; Anhui Center for Diseases Prevention and Control: Yeji Chen, Xiuya Xing, Luan Zhang; Fujian Center for Diseases Prevention and Control: Wenling Zhong, Xin Fang; Jiangxi Center for Diseases Prevention and Control: Liping Zhu, Yan Xu; Shandong Center for Diseases Prevention and Control: Xiaolei Guo, Chunxiao Xu; Henan Center for Diseases Prevention and Control: Gang Zhou, Lei Fan, Minjie Qi; Hubei Center for Diseases Prevention and Control: Shuzhen Zhu, Junfeng Qi, Junlin Li; Hunan Center for Diseases Prevention and Control: Li Yin, Qiong Liu; Guangdong Provincial People's Hospital: Qingshan Geng, Yingqing Feng, Jiabin Wang; The First Affiliated Hospital of Guangxi Medical University: Hong Wen; Health Commission of Hainan: Xuemei Han; Hainan Center for Diseases Prevention and Control: Puyu Liu; Chongqing Center for Diseases Prevention and Control: Xianbin Ding, Jie Xu; Sichuan Center for Diseases Prevention and Control: Ying Deng, Jun He; Guizhou Provincial People's Hospital: Gui'e Liu, Chenxi Jiang; Yunnan Center for Diseases Prevention and Control: Shun Zha, Cangjiang Yang; Tibet Center for Diseases Prevention and Control: Guoxia Bai, Yue Yu, Zongji Tashi; Shaanxi Center for Diseases Prevention and Control: Lin Qiu, Zhiping Hu; Gansu Center for Diseases Prevention and Control: Hupeng He, Jing Zhang; Qinghai Center for Diseases Prevention and Control: Minru Zhou, Xiaoping Li; Ningxia Center for Diseases Prevention and Control: Jianhua Zhao, Shaoning Ma; The First Affiliated Hospital of Xinjiang Medical University: Yitong Ma, Ying Huang, Yuchen Zhang; and Xinjiang Corps Center for Diseases Prevention and Control: Fanka Li, Jiacong Shen.

Supplemental Methods. Construction of Population Subgroups for Prevalence of Obesity Analysis (Figure 3)

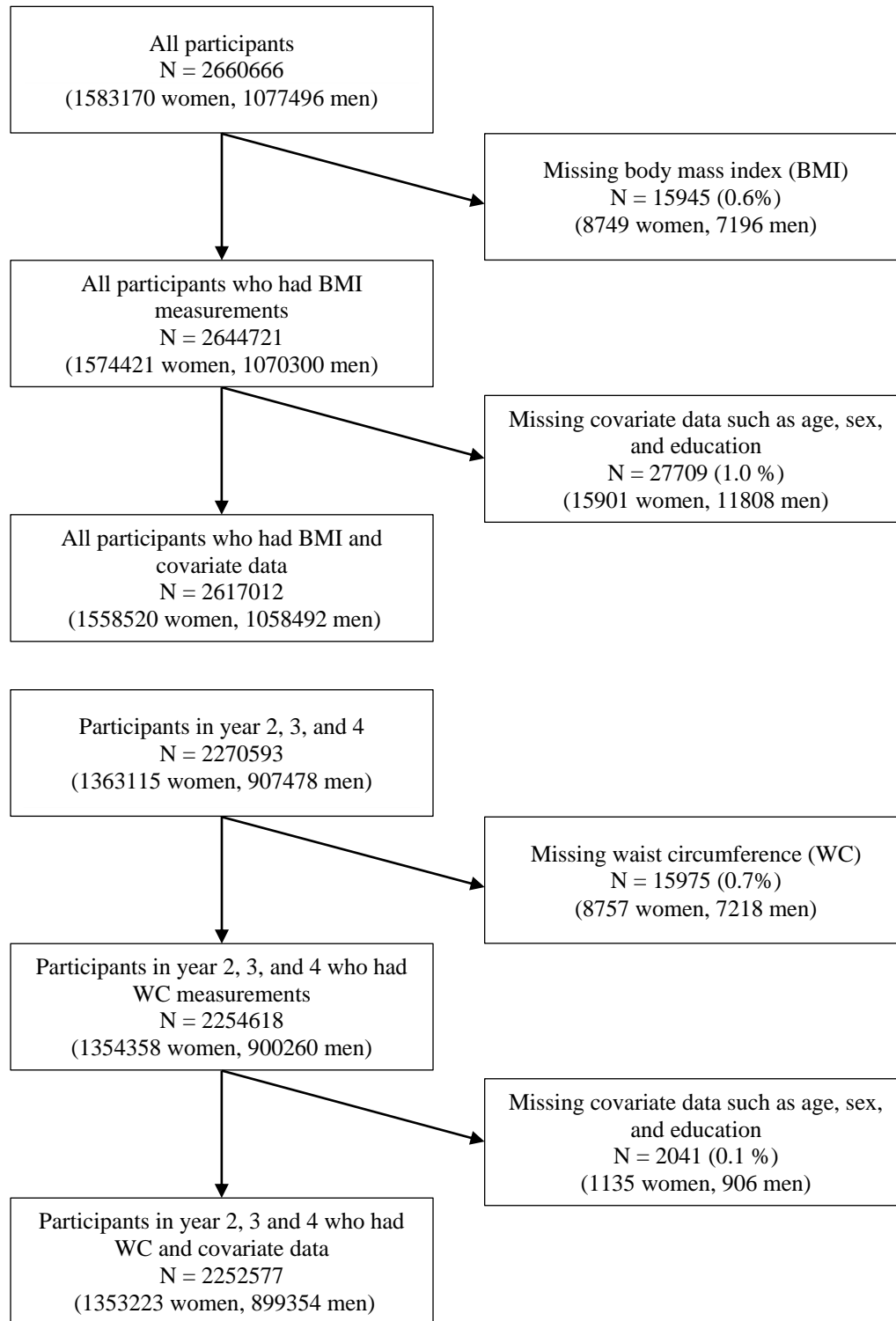
To construct population subgroups for prevalence of obesity analysis (as shown in Figure 3), we first categorized 12 studied socio-demographic factors into the strata below. Then we defined subgroups based on every combination of every k-sized subset of these 12 socio-demographic factors, for k=1, 2, 3, ..., 12. Finally, because many subgroups have very few people, we restricted our analysis to only subgroups with ≥ 500 participants.

1. age (35-44, 45-54, 55-64, 65-75),
2. sex (men, women)
3. ethnicity (Han, non-Han)
4. marital status (married, others)
5. education (primary school and below, middle school, high school, college and above)
6. occupation (farmer, non-farmer)
7. annual household income (<10,000 RMB, 10,000–<50,000 RMB, $\geq 50,000$ RMB)
8. residence urbanity (urban, rural)
9. geographic region (western, central, eastern)
10. health insurance (insured, uninsured, unknown)
11. current smoking status (yes, no)
12. current drinking status (yes, no)

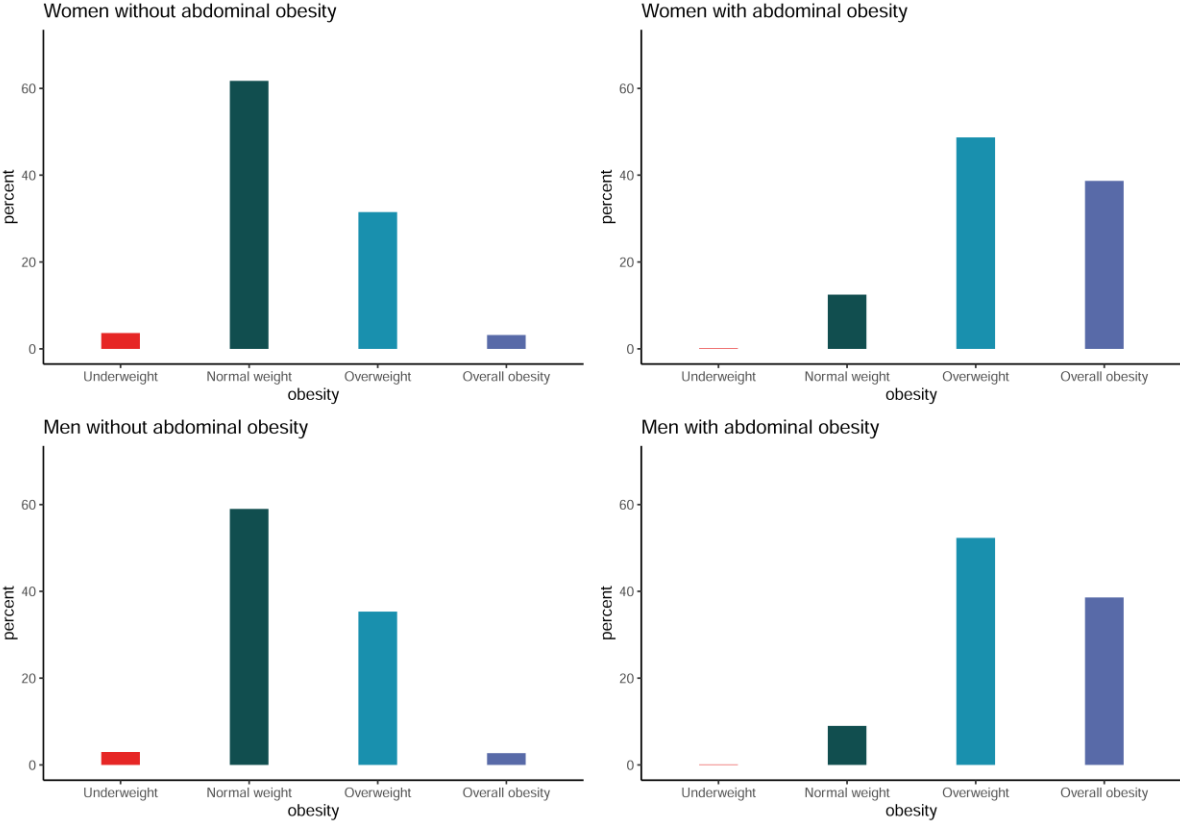
For example, for k=1, we had subgroups: men, women, Han, Non-Han, farmers, current smokers, etc. For k=2, we had subgroups: men who were smokers, women who were smokers, men who were not smokers, women who were not smokers, men who are Han, etc. For k=3, we had subgroups: Han men who were smokers, Han men who were not smokers, non-Han men who were smokers, etc.

Overall, we were able to construct 337,956 subgroups of ≥ 500 participants each for analyzing the prevalence of obesity across population subgroups (as in Figure 3).

Supplemental Figure I. Flowchart of Study Participant Selection in China PEACE Million Persons Project



Supplemental Figure II. Prevalence of Overall Obesity by Abdominal Obesity Status



Supplemental Table. Multivariable-Adjusted Associations of Socio-Demographic Factors with Body Mass Index and Waist Circumference

	Women, BMI	Women, WC	Men, BMI	Men, WC
N	1583170	1363115	1077496	907478
Age, year				
35–44	0 (ref)	0 (ref)	0 (ref)	0 (ref)
45–54	0.59 (0.57; 0.61)	2.34 (2.30; 2.39)	0.08 (0.06; 0.09)	0.60 (0.54; 0.66)
55–64	0.63 (0.62; 0.65)	3.91 (3.86; 3.96)	-0.30 (-0.32; -0.28)	0.05 (-0.01; 0.11)
65–75	0.49 (0.47; 0.51)	4.54 (4.48; 4.59)	-0.59 (-0.61; -0.57)	-0.07 (-0.13; -0.00)
Ethnicity				
Han	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Non-Han	0.14 (0.11; 0.17)	0.71 (0.62; 0.79)	0.14 (0.11; 0.17)	0.68 (0.57; 0.79)
Marital status				
Married	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Others	-0.10 (-0.12; -0.08)	-0.18 (-0.23; -0.12)	-0.20 (-0.23; -0.17)	-0.55 (-0.64; -0.46)
Education				
<Primary school	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Primary school	0.04 (0.03; 0.06)	0.04 (-0.01; 0.09)	0.24 (0.22; 0.26)	0.76 (0.69; 0.83)
Middle school	-0.26 (-0.28; -0.25)	-0.97 (-1.02; -0.92)	0.38 (0.36; 0.40)	1.30 (1.22; 1.37)
High school	-0.71 (-0.74; -0.69)	-2.10 (-2.17; -2.04)	0.37 (0.35; 0.40)	1.48 (1.40; 1.57)
College or university	-1.23 (-1.26; -1.20)	-3.46 (-3.54; -3.37)	0.39 (0.36; 0.42)	1.36 (1.26; 1.46)
Unknown / refused to answer	-0.31 (-0.37; -0.25)	-0.88 (-1.05; -0.71)	0.29 (0.21; 0.36)	0.83 (0.61; 1.04)
Occupation				
Farmer	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Non-farmer	0.07 (0.05; 0.09)	-0.00 (-0.05; 0.05)	0.37 (0.35; 0.39)	1.21 (1.15; 1.27)
Unknown / refused to answer	0.09 (0.03; 0.14)	0.11 (-0.04; 0.27)	0.36 (0.30; 0.42)	1.28 (1.10; 1.46)
Annual household income, RMB				
<10000	0 (ref)	0 (ref)	0 (ref)	0 (ref)
10000–<50000	0.08 (0.06; 0.10)	0.17 (0.12; 0.22)	0.17 (0.15; 0.19)	0.47 (0.41; 0.53)
>=50000	0.01 (-0.01; 0.04)	-0.04 (-0.11; 0.03)	0.30 (0.27; 0.32)	0.82 (0.74; 0.91)
Unknown / refused to answer	0.09 (0.06; 0.11)	-0.07 (-0.15; 0.00)	0.19 (0.16; 0.22)	0.48 (0.38; 0.57)
Residence urbanity				

Urban	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Rural	-0.45 (-0.53; -0.38)	-1.61 (-1.85; -1.36)	-0.27 (-0.34; -0.19)	-1.74 (-2.02; -1.45)
Geographic region				
Western	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Central	0.24 (0.16; 0.32)	-0.51 (-0.77; -0.25)	0.24 (0.16; 0.32)	-0.32 (-0.63; -0.02)
Eastern	0.53 (0.44; 0.61)	0.89 (0.62; 1.16)	0.36 (0.28; 0.45)	0.59 (0.28; 0.91)
Health insurance status				
Insure	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Uninsured	-0.01 (-0.08; 0.06)	-0.22 (-0.41; -0.03)	-0.04 (-0.12; 0.04)	-0.64 (-0.89; -0.39)
Unknown / refused to answer	-0.22 (-0.28; -0.17)	-0.54 (-0.69; -0.39)	-0.11 (-0.18; -0.05)	-0.57 (-0.75; -0.38)
Smoking status				
Not current smoker	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Current smoker	-0.43 (-0.47; -0.39)	-0.25 (-0.36; -0.14)	-0.50 (-0.51; -0.48)	-0.83 (-0.87; -0.79)
Drinking status				
Not current drinker	0 (ref)	0 (ref)	0 (ref)	0 (ref)
Current drinker	0.13 (0.11; 0.15)	0.32 (0.27; 0.38)	0.34 (0.33; 0.36)	1.11 (1.07; 1.15)

Data are adjusted mean differences (95% confidence intervals). All variables are mutually adjusted in linear mixed effects models with community/village-specific random effects. BMI: body mass index in kg/m²; WC: waist circumference in cm.