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Socioeconomic Status, Physical Inactivity, and BMI in Transitional Urban China: Contextualizing the Theory of Fundamental Causes

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Abstract

Drawing insights from the theory of fundamental causes of disease, this study examined the relationships between socioeconomic status (SES) and selected risk factors in transitional urban China. Specifically, under China's distinct institutional and sociocultural environment, we examined how contextualized SES (i.e., party membership, *hukou* status, housing ownership, and subjective social status) and conventional SES indicators (i.e., education, income, and occupation) were associated with physical inactivity and body mass index (BMI). Utilizing the urban subsample of the 2017 Chinese General Social Survey (CGSS), we found that individuals with higher education, income, Communist Party membership, and urban *hukou* status had lower risks of physical inactivity. However, higher SES with Community party membership, urban *hukou*, and government jobs also increased the risks of being overweight, which may be explained by potential countervailing mechanisms. These findings revealed intricate relationships among SES and risk factors in China. Our study helped contextualize the theory of fundamental causes, furnished new empirical evidence, and served as a useful reference for future health inequality research in non-Western societies.

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Introduction

As a result of the Industrial Revolution in the past few centuries, most of the Western world has undergone an epidemiological transition in leading causes of death from primarily infectious diseases to chronic conditions. China, despite having an institutional and sociocultural environment distinct from the West, has experienced a similar transition but at a much faster pace since its reform and opening up in 1978. During the process from an agricultural to an industrialized nation, China's GDP per capita had increased exponentially from $156 in 1978 (National Bureau of Statistics of China, 2018) to $12,514 in 2023 (Textor, 2024). As a result, China has ascended from a poor and famished country to the second-largest economy in the world.

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Along with China's economic development, chronic diseases are rising rapidly. For example, the prevalence of diabetes had surged more than 15 folds from less than 0.67% in 1980 to 10.6% in 2021 (Shen et al., 2016; Zhang, 2022), and hypertension had almost quintupled from 7.73% in 1979 to 37.2% in 2015 (Bao & Wang, 2020). An estimated 87% of total deaths were from chronic illnesses in the Chinese population (Hu et al., 2020).

Two key risk factors associated with such upsurges in chronic conditions are the emerging modern lifestyles with declined physical activity and the trend of heavier body weight. Specifically, overweight and obesity had tripled from 8.2% to 26.5% among men aged 18-39 between 1993 and 2009 (He et al., 2017), and the number continued to rise to more than 50% among Chinese adults, according to a report released in 2020 (Xinhuanet, 2020). The trend of heavier body weight is mainly the result of an improved standard of living and altered lifestyles. On the one hand, there is a higher intake of nutrients and calories among Chinese citizens; on the other hand, physical inactivity becomes more prevalent, particularly among urban residents, ranging from 44% among middle-aged and older adults to

about 80% among adolescents (Chen et al., 2014; Ding et al., 2020).

Theory of Fundamental Causes of Disease

China's transformed socioeconomic environment and its population's fast-changing health profiles provide an intriguing opportunity for researchers to explore the linkage between social factors and health inequality. Prior scholarship in this area has been well-established in the West, especially in light of the theory of fundamental causes of disease (Link & Phelan 1995; Phelan et al., 2010). According to this theory, a fundamental cause has four important features: 1) it embodies access to and mobilization of health-enhancing or risk-minimizing resources, 2) it affects multiple diseases, 3) it influences health and disease outcomes through multiple risk factors, and 4) such effects persist even when intervening mechanisms change (i.e., temporal reproducibility). Given these four features, fundamental causes of disease usually refer to social factors, particularly socioeconomic status (SES; such as education, income, and occupation), which can be either directly translatable into health capital and resources or indirectly utilized to tap into such resources. In essence, this theory underscores social determinants, rather than proximal factors (e.g., risk factors such as diet or cholesterol), as the primary and persistent predictors of health and causes of disease (Link & Phelan, 1995; Phelan et al., 2010). Although the theory has been widely adopted and empirically tested in the United States and other Western countries (Phelan et al., 2010), much less is known about how it holds in non-Western societies and cultures. Existing research has called for contextualizing the theory to consider how resources (and access to resources) might differ in various institutional environments to affect health inequality (Lutfey & Freese, 2005).

This study aimed to advance the literature by applying the fundamental causes perspective to China's distinct context and focusing on the associations between SES and risk factors. Specifically, we addressed a key research question: *what conventional and contextualized SES indicators affect two major risk factors (physical inactivity and BMI) in transitional urban China?* Such a study could contribute to the health literature both theoretically and empirically. Theoretically, it contextualizes the fundamental causes theory, conceptualizes additional SES indicators, and identifies potential intervening or countervailing mechanisms in China's distinct institutional environment, featuring different political and cultural systems, dramatic socioeconomic changes, and fragmented market conditions. Empirically, it furnishes tangible evidence for intricate associations between a wide array of SES indicators and key risk factors associated with lifestyle and cultural changes in China's institutional context.

Conventional SES Indicators

SES (often used interchangeably with social class or socioeconomic position) is a multidimensional construct considered to be a prime example of a fundamental cause of disease (Duncan et al., 2002; Elo, 2009; Link and Phelan, 1995; Nocon, Keil, & Willich, 2007; Phelan et al., 2010). Researchers have proposed and identified multiple dimensions/indicators of SES, most commonly education, income, and occupation, to investigate their associations with health conditions (Adler & Ostrove, 1999; Braveman et al., 2010; Duncan et al., 2002). Although wealth, power, subjective social status, neighborhood conditions, and built environment are sometimes operationalized as various measures of SES to capture nuanced facets of status, they are usually viewed as proxies for or supplementary to one's education, income, and occupation (Adler et al., 2000; McLaughlin et al., 2012; Shavers, 2007).

Multiple causal pathways would presumably link education, income, and occupation to major health outcomes via important risk factors. For example, education can contribute to better health information/knowledge, cognitive ability, personality factors (e.g., agency and a sense of control), and social network, which can help one explore and adjudicate among different lifestyles (e.g., physical activity, diet) and settle on the one commensurate with corresponding resources, thus leading to varying health outcomes (Cutler & Lleras-Muney, 2010; Mirowsky & Ross, 2003; Ross & Wu, 1995). Income usually represents financial resources that one can capitalize on to maximize health-enhancing resources and minimize risks (Phelan et al., 2010). A healthy diet, fitness center membership, outfit/equipment for various types of physical exercise/sports, or simply access to healthcare all require financial resources, all of which contribute to healthy lifestyles and favorable health outcomes (Marmot, 2002; Pampel et al., 2010). One's occupation can also influence health behaviors and outcomes directly or indirectly through the nature of the occupation (e.g., menial or sedentary), workplace physical conditions, occupational prestige, and psychosocial environments (e.g., workload, stress, social support) (Fujishiro et al., 2010; Kelly et al., 2014; Marmot et al., 1991).

Contextualized SES Indicators in Urban China

Given the enduring impact of SES on risk behaviors and health outcomes, scholars recently have become more cognizant of how institutional contexts might influence or modify such effects (Beckfield & Olafsdottir, 2013; Beckfield et al., 2015; Olafsdottir et al., 2013). Adopting this institutional perspective, our study specifically examined how SES was associated with health risk factors in transitional urban China, a field undergoing momentous social experiments and vicissitudes. In the past few decades,

China's economic reforms have resulted in "fragmented" markets, featuring diverse resource allocation mechanisms via both a state-controlled and market-oriented system impacting various institutions and life chances, such as work organizations, housing ownership, and social welfare (Zhao, 2012; Zhao & Zhou, 2017). Under such reshuffled stratification orders, it is crucial to look beyond conventional SES indicators (e.g., education, income, and occupation). Specifically, research in contemporary China has shown that the Chinese Communist Party (CCP) membership, *hukou* status (urban/rural household registration), housing ownership, and subjective social status are all distinctive markers of SES and play important roles in China's stratification system, which cannot be fully captured by those conventional indicators (Xu et al., 2021).

Among contextualized SES indicators in China, CCP membership is a distinct socioeconomic marker. While education mainly embodies human capital, CCP membership, selected primarily based on political allegiance along with educational credentials, is a crucial form of political capital in China (Zhou, 2004). Even during the market transition era, CCP membership often represents an elite status carrying political, economic, and social privileges as well as resources (Bian et al., 2001; Dickson & Rublee, 2000; Li et al., 2007). In addition to bringing tangible socioeconomic rewards (e.g., salaries and promotions), CCP membership transmits health-promoting resources, such as a sense of belonging and security, social prestige, and networking opportunities (Dickson & Rublee, 2000). Thus, CCP membership is a salient indicator of social status that can relate to risk factors and health outcomes in the Chinese context.

Another unique SES indicator in China is the residential *hukou* status, which bears the traditional socialist legacy. First established in 1955, the *hukou* system (household registration) has been a form of social control to distinguish between urban and rural residents and exclude the latter from state-allocated benefits and entitlements (Wu & Treiman, 2004). Although the *hukou* system has relaxed gradually, and there has been a large number of rural peasants migrating to urban areas in recent decades, only those with urban *hukou* have access to comprehensive coverage of social benefits, including education, employment, housing, health insurance, and other welfare programs and services, and those with urban *hukou* enjoy better psychological well-being despite having a higher rate of diabetes (Song & Smith, 2019).

Housing is another important SES indicator in contemporary China. The radical housing reform and privatization since the late 1990s have led to skyrocketing housing prices in 21st-century China. Consequently, housing ownership has become a significant correlate of wealth in China and borne profound consequences for such life outcomes as education, income, and marriage (Meng, 2007). Nevertheless, different from the well-established housing market in Western countries, housing ownership may be acquired from different venues under the fragmented market environment in urban China. In particular, residential house ownership may be procured through housing privatization in an individual's employment organization or purchased from the private market (Zhao & Ge, 2014). In this context, housing ownership cannot be fully captured by household income. Therefore, as the most critical asset to Chinese families, housing ownership can have an independent and enormous impact on individuals' wealth accumulation, self-perceived SES, life satisfaction, quality of work and life, and self-reported depression (Meng, 2007; Xu et al., 2021).

Yet another critical SES indicator in China's institutional environment is subjective social status. While subjective social status can be clearly based on objective SES indicators (e.g., income, education, and occupation) in a developed market economy with an established social hierarchy, China's stratification regime has been reshuffled during the market transition, and the new social hierarchy is still emerging in fragmented markets across multiple domains. Therefore, subjective social status can be loosely connected with objective SES and also exert an independent effect on life outcomes (e.g., happiness) (Zhao, 2012). As inequalities rise in China, subjective status can become an important determinant of health. Research has shown that subjective SES was associated with self-reported health above and beyond other SES indicators among the urban Chinese population (Xu et al., 2021).

With these newly conceptualized measures of SES within a particular context, our study can enrich the theory of fundamental causes in two important ways: 1) it explored the full gamut of major SES measures, especially those contextually distinct from the Western world, which may be associate with resources and thus influence risk factors and health outcomes; and 2) it deepens our understanding of the intricate associations between SES and risk factors, including the unique or even counteracting mechanisms in China's distinct context, which can complement, revise, or even challenge existing theories.

Contextualized Risk Factors in Urban China

Besides SES, it is also important to contextualize risk factors, which can be shaped by the social milieu and can often be directly controlled or modified (Phelan et al., 2010). According to the fundamental causes theory, one of the features of fundamental social conditions is that they affect disease through multiple risk factors (Link & Phelan, 1995; Phelan et al., 2010). A risk factor is commonly defined as "an environmental, behavioral, or biologic factor confirmed by temporal sequence, usually in longitudinal studies, which if present, directly increases the probability of a disease occurring, and if absent or removed, reduces the probability"

(Beck, 1998, p. 221). By comparison, disease refers to structural or functional deviations from a normal state that usually cause harm to an organism (Boorse, 1977). The boundary between a risk factor and a disease, albeit putatively distinct, can be obscure and debatable sometimes (Schwartz, 2008).

To better understand the SES-health relationships in urban China during the modern-day epidemiological transition, we need to consider emerging risk factors within China's institutional and social-cultural environment. In this study, we focused on two prominent ones: physical inactivity and BMI. On the one hand, both of them have long been regarded as major risk factors in biomedical and health literature (Ezzati et al., 2002). On the other hand, they are embedded in China's dramatic changes in socioeconomic conditions, lifestyle, and social culture. In this context, the associations between SES and the risk factors can be intricate and warrant careful examination and broad explorations (Link, 2008).

Whereas physical activity usually refers to any musculoskeletal movement that expends energy (and produces health benefits) and can be attained during leisure time, work, or transportation (Borodulin & Anderssen, 2023), physical inactivity refers to insufficient physical activities below the recommended standards for healthy lifestyle. The latter presents a risk for noncommunicable diseases, disability, and mortality (Bull & Bauman, 2011). Research showed that physical inactivity in China contributed to 12-19% of the risks of five major chronic conditions: coronary heart disease, stroke, hypertension, cancer, and type 2 diabetes, leading to substantial economic and disease burdens (Zhang & Chaaban, 2013). While physical inactivity is deleterious to health, its converse—physical activity—is a remedy and a protective means to improve health and thus considered a protective factor (Vuori, 2004). Among different types of physical activities, physical exercise, a subset of more structured and vigorously intensive activities mainly during leisure time, is a lifestyle choice and behavior particularly beneficial to health conditions, including weight status (Bauman et al., 2006).

Prior scholarship has shown that SES may facilitate disparate opportunities for access to resources enabling physical exercise, such as equipment, facility/space, health information (e.g., awareness and effectiveness), and scheduling (Hankonen et al., 2017; Ke et al., 2022; Yang et al., 2023). Some studies based on regional data in Shanghai and Tianjin documented that education, income, and occupational status were positively associated with exercise (Hu & Pekkarinen, 2002; Lee et al., 2007). But overall, research on physical exercise in China (both as an outcome and a predictor), particularly based on the national representative data, has lagged behind (Chen et al., 2022; Zhou et al., 2018). The relationship between SES, particularly those contextualized SES indicators, and physical exercises, warrants further explorations.

Another important chronic health risk factor is BMI, which is often examined together with physical inactivity (e.g., Ding et al., 2020). Easily calculated and interpreted, BMI is a widely adopted system of weight classifications (underweight, normal, overweight, and obesity) and an established risk factor (especially in the obesity category) for diabetes, hypertension, cardiovascular disease, cancer, and mortality (Pi-Sunyer, 2009). The prevalence of obesity has been steadily increasing in most countries to the extent that the globe is now undergoing an obesity pandemic (Fox et al., 2019; Swinburn et al., 2011). Following this trend, China is also transforming from a "lean giant" that used to have one of the slimmest populations to quickly catching up with the rest of the world (Wu, 2006). According to some studies, the mean BMI among adults increased from 20.9 kg/m^2 in 1982 to 24 kg/m^2 in 2014, overweight prevalence from 1% in 1985 to 14% in 2014, and obesity rate from 0.1% to 6.4% in the same years (Pan et al., 2021).

Among the BMI categories, obesity has been adopted and treated as a "chronic complex disease" by the World Health Organization and most industrialized countries in recent years, and it is believed to increase the risk for an array of serious health conditions, such as type 2 diabetes, cardiovascular diseases (CVDs), and multiple types of cancers (e.g., breast, colon and rectum, and stomach) (Centers for Disease Control and Prevention, 2023; De Lorenzo et al., 2019; World Health Organization, 2024). While the health risks of obesity to other diseases have been long established, overweight also seems to be a significant risk factor in the context of China. Research has shown that overweight is an independent risk factor for hypertension, type 2 diabetes, stroke, and coronary heart disease in Chinese populations (Hou, 2008; Wang et al., 2015; Zhou et al., 2002).

Research has further explored the socioeconomic determinants of BMI in China. Some findings showed a positive association between conventional SES indicators and obesity/overweight (especially among males), contrasting the generally observed inverse SES-obesity association in the United States and Europe (Ma, 2012; Wu, 2006; Xiao et al., 2013; Yang et al., 2023; Zhang et al., 2017). Thus, how body weight type is associated with SES in China can be potentially quite distinct from the well-established patterns in Western industrialized nations.

Using the well-received wisdom from the theory of fundamental causes, we could infer that individuals with higher conventional SES indicators (e.g., education, income, and occupation) and contextualized SES indicators (e.g., CCP membership, *hukou* status, housing ownership, and subjective socioeconomic status) will help them access and mobilize financial, social, and psychological resources to adopt a healthy lifestyle (e.g., regular physical exercise and

healthy diet) and minimize exposure to (physically or psychologically) hazardous environment, thus leading to better health outcomes.

However, as China is quickly transitioning from a low- to middle/upper-income country at an unprecedented speed and scale, there can be anachronisms between the rising economic condition and the entrenched cultural values. For example, consuming refined food and idling around without toiling oneself are usually socially desirable, often signaling socioeconomic privileges and high status. Despite China's fast pace of modernization and urbanization, such traditional cultural values may not easily vanish. In modern times, ironically, these behaviors can result in elevated health risks and poor health outcomes (French & Crabbe, 2010). In this context, the relationships between conventional and contextualized SES indicators and these two risk factors can intricately involve competing mechanisms and thus warrant further explorations.

In sum, physical inactivity and BMI are two pivotal risk factors related to chronic conditions in China's distinct institutional and cultural environment (Gu et al., 2006; Tian et al., 2016; Wang et al., 2012). In this study, we systematically examined the associations between both conventional and contextualized SES and two key risk factors (physical inactivity and BMI) in transitional urban China, through the lens of the fundamental causes theory.

Methods

To address our research question, we used nationally representative data from the 2017 Chinese General Social Survey (CGSS). Data from this survey year can provide one of the most recent health profiles of the Chinese population right before the COVID-19 pandemic, during and after which people's lifestyles could be dramatically changed. The CGSS adopted a stratified sampling design to collect data from individuals residing in both urban and rural areas of 100 city districts and counties, three major municipalities directly administered by the central government (i.e., Beijing, Shanghai, and Tianjin), and two other large metropolitan areas (i.e., Guangzhou and Shenzhen). Under fast urbanization, China's cities have been the center of socioeconomic reforms and market transition in recent decades. To avoid confounding issues due to the sharp urban-rural divide affecting multiple areas of life chances, social norms and behavioral patterns (e.g., physical inactivity), and health outcomes simultaneously, we focused on urban China in this study by utilizing the subsample of the CGSS data drawn from urban areas only (N = 7,571).

Dependent Variables

We included two major risk factors as dependent variables: physical inactivity and BMI. Because physical (in)activity is a multidimensional construct, we specifically focused on one of its dimensions—physical exercise (more structured and vigorously intensive activities)—as a more precise measure of physical (in)activity as it is more directly related to weight status compared to other types of physical activities (e.g., leisure-time or work-related activities) (Bauman et al., 2006; Shaw et al., 2006; Spees et al., 2012). Originally, physical exercise was measured by an ordinal level variable ranging from "never exercising" to "exercising almost every day." We reverse-coded the variable to indicate a degree of lower risk ("exercising almost every day;" coded 1) to higher risk ("never exercising;" coded 5).

The Chinese population-adjusted BMI was used to categorize the sample into several groups: underweighted ($BMI < 18.5\ kg/m^2$), normal ($18.5\ kg/m^2 \leq BMI < 24\ kg/m^2$), over-weighted ($24\ kg/m^2 \leq BMI < 28\ kg/m^2$), and obese ($BMI \geq 28\ kg/m^2$) (Fang et al., 2021). For presentational convenience, this paper treated obesity as a pathologically elevated level of BMI, following the common view of regarding overweight as a risk factor instead of disease. Whether obesity is a risk factor or disease, nevertheless, should not change the substantive causal pathways linking social factors to this condition. While focusing on obesity and overweight, we also included underweight, the lowest ordinal level of BMI, to cover the full range of body weight. Because underweight is not well-regarded as a risk factor and its causes are complicated, we reported this part of the results without delving into details.

Independent Variables

To operationalize SES, we first included traditional markers. Education was measured by a set of dummy variables: elementary education, junior high school, senior high school, and college and above (reference). Family income was operationalized by the log of annual household income. Occupational status was gauged by a series of dummy variables, including those working in the government (reference), enterprises, public services, self-employed, the agriculture sector, other occupations, currently not working, and those who never worked.

Considering China's distinct institutional environment, we highlighted multiple contextualized SES indicators as discussed above. CCP membership was a dichotomized variable, with 1 indicating a member. Urban *hukou* was coded as 1 in contrast to those with rural *hukou*. Housing ownership was assessed by a set of dummy variables: owning no house (reference), one house, two houses, and three or more houses. Subjective social status was scored by the MacArthur Scale of Subjective Social

Status (Adler et al., 2000). Respondents were presented and asked to rate on a ladder where they would rank their social standing from 1 (worst-off) to 10 (best-off) in Chinese society.

Control Variables

Demographic control variables included age group (18-29, 30-39, 40-49, 50-59, 60-69, and 70 and older), gender (female coded as 1), ethnicity (the majority ethnic group *Han* coded as 1), marital status (married, unmarried, widowed, and other), region (east, west, central, and major metropolitan regions), and social health insurance (insured coded as 1).

Analytic Strategies

After univariate analyses, we first conducted the ordered logit model to examine physical inactivity (1-5) as the outcome. Then we included physical inactivity as an additional covariate, along with other independent and control variables, to examine BMI, using both the ordered logit and multinomial logit models. To balance presentational ease and model accuracy, we only displayed results from multinomial logit models for BMI categories using normal weight as the reference (results from ordered logit regressions are available upon request). All analyses were conducted using Stata 17.0 and adjusted for sample weights.

Results

Descriptive Statistics

We reported descriptive statistics in Table 1. Our sample comprised 53% female, 95% *Han* Chinese, 71% married, and 92% with health insurance. Among contextualized SES indicators, only 14% of the sample were CCP members, reflecting the selective nature of the membership. Although all of the participants were residing in urban China, only two-thirds of the sample had urban *hukou* registration status. The majority of the sample (70%) owned one house, while 12% did not own any. The mean score of subjective social status was 4.3 on a 1-10 scale. Among conventional SES indicators, for education, those who had elementary, junior high, senior high, and college or above education were 22%, 27%, 23%, and 29%, respectively. About 23% of the respondents worked in enterprises, and 15% were self-employed.

There was considerable variation in the reported amount of physical exercise: while 33% of the sample almost never exercised, 14% exercised only a couple of times a year, and 22% exercised almost every day. Regarding body weight, the average BMI was 23 kg/m^2, which was near the higher end of the normal range (18.5 $kg/m^2 \leq$ BMI $<$ 24 kg/m^2). Specifically, 57% of the sample was of normal weight, 28% overweight, and nearly 8% obese.

Table 1. Descriptive Statistics: The 2017 Chinese General Social Survey (CGSS), N = 7,571

Variable	Percentage/Mean (s.d.)
Dependent Variables	
Physical inactivity (lack of exercise)	
Mean (1 always – 5 never exercising)	3.1 (1.60)
1 Almost everyday	21.9%
2 A couple of times a week	21.1%
3 A couple of times a month	10.4%
4 A couple of times a year	13.6%
5 Never	33.1%
Chinese-adjusted BMI	
BMI score	23.0 (3.43)
Underweight	7.1%
Normal	56.8%
Overweight	28.2%
Obese	7.6%
Contextualized SES Variables	
Party membership	14.3%
Urban *hukou*	66.7%
Housing ownership	
No house	11.5%
1 house	70.4%
2 houses	14.5%
3 or more	3.6%

Subjective SES (1-10)	4.3 (1.71)
Conventional SES Variables	
Education	
Elementary	22.0%
Junior high	27.1%
Senior high	22.8%
College and above	28.7%
Logged family income	10.3 (2.07)
Occupation	
Government	2.2%
Enterprises	22.7%
Public services	7.9%
Self-employment	14.7%
Agriculture	4.3%
Other occupations	1.1%
Currently not working	41.7%
Never worked	5.4%
Control Variables	
Female	53.3%
Age	
18-29	15.1%
30-39	16.7%
40-49	17.9%
50-59	18.1%
60-69	18.6%
70 and older	13.7%
Han ethnicity	95.3%
Marital status	
Married	71.1%
Unmarried	12.6%
Widowed	8.7%
Other marital status	7.4%
Region	
Major metropolitan regions	29.7%
East	30.0%
Central	23.6%
West	16.7%
Health insurance	91.9%

Note: Standard deviations in parentheses.

Physical Inactivity

Results from the ordered logit model (Model 1 in Table 2) indicated that, among contextualized SES indicators, being a CCP member (odds ratio (OR) = 0.70, p <.001), having urban *hukou* (OR = 0.69, p <.001), and having a higher level of subjective social status (OR = 0.90, p <.001) were negatively associated with physical inactivity (shown as a lower frequency/amount of physical exercise). Housing ownership was not statistically significant in predicting physical inactivity.

Among traditional SES markers, individuals with only an elementary education (OR = 2.66, p <.001) or junior high education (OR = 1.62, p <.001) were more likely to be physically inactive compared to highly educated individuals (college or above). Family income was negatively associated with physical inactivity (OR = 0.94, p <.001). Compared with government employees, those working in the agriculture sector were more likely to report a higher level of physical inactivity probably for not deliberately seeking out physical exercise (OR = 1.87, p <.05). In contrast, those who never worked were less likely to report physical inactivity possibly with more leisure time to partake in exercise (OR = 0.68, p <.01). Of all SES indicators, party membership, urban *hukou*, subjective SES, and especially income and education were significantly associated with physical inactivity, but much less so for occupational types and housing ownership. If one compares standardized coefficients along with effect sizes for binary

indicators, education (the odds comparison between elementary vs. college and beyond) appeared to be the most important predictor.

Among control variables, several age groups above 40 were less likely to be physically inactive. Compared with married people, those unmarried and widowed were negatively (OR = 0.61, p <.001) and positively (OR = 1.41, p <.01) associated with physical inactivity, respectively.

Table 2. Ordered Logit Regression Predicting Physical Inactivity and Multinomial Logit Regression Predicting BMI: The 2017 Chinese General Social Survey (CGSS), N = 7,571

	Physical Inactivity	**BMI**		
	(1 "almost always exercising" – 5 "never exercising")	Underweight vs. normal weight	Overweight vs. normal weight	Obesity vs. normal weight
	Model 1	Model 2a	Model 2b	Model 2c
Contextualized SES Indicators				
Party membership	0.70***	0.93	1.24*	0.95
	(0.05)	(0.19)	(0.11)	(0.17)
Urban *hukou*	0.69***	0.86	1.17*	1.24
	(0.04)	(0.10)	(0.08)	(0.18)
Housing ownership (reference: no house)				
Housing – 1 house	0.97	1.05	0.99	1.07
	(0.08)	(0.18)	(0.11)	(0.14)
Housing – 2 houses	0.93	1.16	1.12	1.28
	(0.10)	(0.21)	(0.12)	(0.22)
Housing – 3 or more	0.88	1.00	0.97	1.13
	(0.15)	(0.39)	(0.15)	(0.32)
Subjective SES	0.90***	1.01	0.99	0.95
	(0.02)	(0.03)	(0.02)	(0.04)
Conventional SES Indicators				
Education (reference: college and above)				
Elementary	2.66***	0.73	1.47**	1.86*
	(0.37)	(0.20)	(0.21)	(0.54)
Junior high	1.62***	0.66**	1.21+	1.35
	(0.17)	(0.09)	(0.12)	(0.38)
Senior high	1.14	0.70*	1.06	1.44
	(0.11)	(0.12)	(0.10)	(0.37)
Family income (logged)	0.94***	1.00	1.03	0.96
	(0.01)	(0.03)	(0.03)	(0.03)
Occupation (reference: government)				
Enterprises	1.10	0.58	0.64**	0.60
	(0.10)	(0.24)	(0.10)	(0.22)
Public services	0.91	0.51+	0.62**	0.46+
	(0.10)	(0.19)	(0.11)	(0.19)
Self-employment	1.04	0.64	0.84	0.68
	(0.13)	(0.25)	(0.12)	(0.24)
Agriculture	1.87*	0.79	0.60**	0.41+
	(0.50)	(0.38)	(0.11)	(0.19)
Other occupations	1.17	1.23	0.89	0.94
	(0.35)	(0.60)	(0.36)	(0.55)
Currently not working	0.98	0.78	0.70*	0.52+
	(0.13)	(0.31)	(0.12)	(0.18)
Never worked	0.68**	0.82	0.42***	0.56
	(0.10)	(0.32)	(0.08)	(0.25)
Control Variables				

Female	1.16*	1.76***	0.52***	0.66**
	(0.08)	(0.15)	(0.04)	(0.08)
Age (reference: 18-29)				
30-39	1.00	0.62*	1.15	0.86
	(0.07)	(0.14)	(0.21)	(0.18)
40-49	0.71***	0.24***	1.49*	1.10
	(0.07)	(0.06)	(0.24)	(0.31)
50-59	0.69***	0.25***	1.72***	1.25
	(0.07)	(0.06)	(0.25)	(0.29)
60-69	0.40***	0.36***	1.35	0.80
	(0.07)	(0.10)	(0.27)	(0.19)
70 and older	0.57***	0.71	1.34+	0.96
	(0.09)	(0.17)	(0.23)	(0.25)
Han ethnicity	0.91	1.27	0.65***	0.66
	(0.11)	(0.30)	(0.08)	(0.19)
Marital status (reference: married)				
Unmarried	0.61***	1.27	0.69*	0.46**
	(0.05)	(0.29)	(0.12)	(0.11)
Widowed	1.41**	1.12	1.14	1.17
	(0.17)	(0.18)	(0.20)	(0.23)
Other marital status	0.91	2.27***	0.94	1.05
	(0.13)	(0.36)	(0.11)	(0.21)
Region (reference: East)				
Major metropolitan	1.01	0.96	1.21	1.96*
	(0.16)	(0.27)	(0.18)	(0.61)
Central	1.46*	0.66+	0.93	0.82
	(0.21)	(0.15)	(0.15)	(0.29)
West	1.23	1.13	0.84	0.80
	(0.21)	(0.23)	(0.11)	(0.22)
Health insurance	1.06	0.75+	1.04	1.04
	(0.13)	(0.13)	(0.13)	(0.19)
Physical inactivity	——	1.12***	0.95***	0.94
	——	(0.03)	(0.02)	(0.04)
Cut point 1	0.05***			
	(0.01)			
Cut point 2	0.17***			
	(0.04)			
Cut point 3	0.30***			
	(0.07)			
Cut point 4	0.62*			
	(0.14)			

Note: odds ratios; standard errors in parentheses.
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

BMI

Results from the multinomial logit models on BMI were reported in Models 2a-2c in Table 2. Across all three models, normal weight was consistently used as the reference category for producing raw regression and odds ratio coefficients. We also included physical inactivity as a covariate in addition to other independent and control variables because of the close correlation between physical exercise and body weight (e.g., Lee et al., 2007; Zhou et al., 2018).

Model 2a showed the odds comparisons between underweight and normal weight (reference). Results indicated that individuals with junior high school (OR = 0.66, $p < .01$) or senior high school (OR = 0.70, $p < .05$) education, as opposed to their college-educated counterparts, had lower odds of being underweight vs. normal weight. Other conventional and contextualized SES indicators could not

distinguish the odds comparison of underweight vs. normal weight at the conventional significance level.

Models 2b and 2c focused on the odds comparisons of overweight and obesity vs. normal weight, respectively. Results in Model 2b suggested that having CCP membership (OR = 1.24, p <.05) and urban *hukou* status (OR = 1.17, p <.05) would increase the odds of overweight vs. normal. Housing ownership, subjective SES, and income were not significantly associated with the odds comparison of overweight vs. normal.

One of the conventional SES indicators, education, was linked to the odds comparisons of both overweight and obesity vs. normal in the expected direction. Specifically, as shown in Model 2b, individuals with elementary schooling (OR = 1.47, p <.01) were more likely than college graduates to be overweight vs. normal. In Model 2c, elementary-educated individuals had higher odds of being obese vs. normal than their college-educated counterparts (OR = 1.86, p < .05). Compared with government employees, individuals in most occupational categories had lower odds of being overweight vs. normal (in Model 2b). The analysis in Model 2c revealed a similar pattern but with fewer and less significant occupational differences. Of all SES indicators, education (especially the odds comparison between elementary education vs. college and beyond), and to a lesser degree, party membership, *hukou*, and occupational, were important predictors of BMI types, but clearly not so for housing ownership, subjective SES, or family income.

When physical inactivity was included as a covariate in Models 2a-c, results indicated somewhat unexpected associations with body weight. In particular, physical inactivity increased the odds of underweight vs. normal weight (Model 2a: OR = 1.12, p <.001), while it decreased the odds of overweight vs. normal weight (Model 2b: OR = 0.95, p <.001). It did not distinguish between obesity and normal weight (Model 2c: OR = 0.94, p = n.s.).

Among other control variables, being females (compared with males) increased the odds of underweight and decreased the odds of both overweight and obese vs. normal weight. Compared with the youngest age group (18-29), all older groups except 70 and above had lower odds of being underweight vs. normal, while most age groups above 40 had higher odds of being overweight vs. normal. *Han* ethnicity, compared with non-*Han* ethnic minorities, was associated with a lower likelihood of being overweight vs. normal (OR = 0.65, p <.05). Compared with their married counterparts, the unmarried were less likely to be overweight or obese vs. normal. Finally, residents in the major metropolitan areas had higher odds of being obese vs. normal (OR = 1.96, p <.05) compared with the reference group (those living in the eastern region of China).

Discussion

To fully understand the SES-health relationship in China, it is important to consider its distinct institutional context. Our study revealed that both conventional and contextualized SES indicators may influence selected risk factors in transitional urban China. A general finding was that conventional SES markers (higher education and income) and contextualized SES indicators (CCP membership, urban *hukou* registration, and high self-perceived status) were associated with physical inactivity: individuals with higher levels of SES were less likely to be physically inactive, as demonstrated in the level of physical exercise. Such SES advantages, however, were not directly translated into a leaner or normal body type, suggesting that SES, physical (in)activity, and BMI were intricately connected in China.

Our study suggested that Chinese urban residents with higher status manifested by contextualized SES markers (being a CCP member and with urban *hukou*) were more likely to be overweight than their counterparts with lower status. Such intriguing findings were actually consistent with previous studies reporting positive associations between SES and body weight in China, especially in urban settings (e.g., Huang & Grol-Prokopczyk, 2022; Song & Smith, 2019). Other findings in our study also pointed in the same direction, such as the higher odds of being obese (vs. normal) among residents in better-developed major metropolitan areas. These patterns may reflect potential "countervailing mechanisms" that would link social determinants to risk factors and disease in China's distinct institutional and sociocultural environment.

Based on the theory of fundamental causes, countervailing mechanisms refer to behaviors and cultural norms that may simultaneously maintain or enhance social status while undermining the prevention and control of health conditions (Lutfey & Freese, 2005). In the Chinese context, several possible countervailing mechanisms may exist. First, traditional cultural values in China tend to connect a heavier body weight with a positive and desirable image and idolize the linkage between corpulence and affluence (Huang & Grol-Prokopczyk, 2022). For example, a Chinese phrase that best captures such a positive connotation is *fu tai*, whose literal translation is "a state of richness" or "wealthy-looking" and whose euphemistic meaning is actually "plump and portly." Although socioeconomic conditions have dramatically transformed during the market transition, such a traditional cultural value might still be deeply entrenched in contemporary China and probably hard to evaporate within a short span, and it can continue shaping people's perceptions and behaviors. Therefore, risk factors often need to be evaluated in specific cultural contexts that can be quite stable or resilient despite drastic socioeconomic changes (Pang, 2012).

Second, related to cultural values, individuals with higher social status in China might have increased opportunities and access to binge drinking and eating, potentially leading to higher BMI. Traditionally, many business transactions and negotiations happen around dinner tables in fancy restaurants that involve a considerable amount of drinking and feasting. Some businessmen and government officials have even developed alcohol addiction or other chronic illnesses due to excessive drinking and eating (Popkin et al., 1995).

Furthermore, higher social status in China is sometimes still linked to some unhealthy lifestyle choices, such as sugary and fatty foods, refined grains, sedentary lifestyles, etc. (Osburg, 2018); these choices are indeed typical around the inception of the "epidemiologic transition" across the world. The results that government employees were more likely to be overweight might be a reflection of these lifestyle factors along with an improved standard of living. As people are eager to pursue other desirable social outcomes related to status, prestige, and power, such pursuits can provide countervailing mechanisms, possibly to the detriment of health (Phelan et al., 2010).

Among other socioeconomic indicators in our study, education was generally associated with BMI in the expected direction. Individuals with only elementary schooling had higher odds of being overweight or obese (vs. normal) than their college-educated counterparts. Such a finding is generally consistent with Western-based studies, further validating education as a universal marker of SES (Elo, 2009). A college or high school degree may help individuals acquire more health information and knowledge about a healthy lifestyle which could lead to more ideal body weight (Cutler & Lleras-Muney, 2010). Of all SES indicators, our results showed the robust effects of education for both risk factors.

Other SES indicators with only one exception (housing ownership) presented somewhat inconsistent patterns, strong for one but weak or nil for the other. Our data analysis also failed to demonstrate significant associations between housing ownership and either risk factor, suggesting that housing ownership may not have a direct effect on these outcomes. More research could be developed to reaffirm or explore such nonsignificant associations by testing indirect effects or including other outcomes.

Limitations and Future Research

We acknowledge that this study had a few limitations—due in part to constraints on sample design and data structure—that warrant future research. First, even though we found that various measures of SES within transitional Chinese society could potentially influence selected risk factors via multiple intervening mechanisms, putatively through the access to and mobilization of resources, the exact mapping of causal pathways and relative magnitudes of effects would require an elaborate sampling design and usually a prodigious amount of data. Thus, this project mainly explored possible associations rather than elaborating on causations. In the future, more longitudinal data can be utilized to parcel out more precise causal pathways.

Second, some measures were not refined in the current data. For example, although physical exercise was based on the most optimal instrument in gauging physical (in)activity in this database and has often been used to explore its effect on different health outcomes (Dong et al., 2023; Gan & Jiang, 2022; Kan & Xie, 2024), this variable was only a self-reported crude measure of frequency. Physical activity could be further operationalized multidimensionally, including dose-response, duration, intensity, and volume (Lee & Skerrett, 2001). Thus, results yielded from such analyses need to be read with caution because of potential measurement errors and simplicity. Despite such limitations, this variable was nonetheless effective in appraising the attitudinal and resources-related domains of physical activity since physical exercise requires planning and various resources for execution. Future studies can explore the multidimensions of physical (in)activity to more fully investigate their associations with various SES indicators.

Third, although the current scholarly focus on BMI was mostly on the high-end types (e.g., overweight and obesity) for obvious reasons in the grand epidemiological transition, additional attempts can be made to explore how SES can be associated with underweight. The causes of underweight are multifaceted, including malnutrition, genetics (e.g., high metabolism), disease (both physical and mental, such as anemia, infectious disease, anorexia, and some chronic conditions), and the pursuit of slimness, some of which could be associated with resources or the lack thereof (Uzogara, 2016). Since the main focus of this paper is on the SES associations with body-weight via the utilization of resources, a caveat about the discussion of underweight needs to be in place that an association does not imply causation (Doak et al., 2002).

Finally, regarding the SES-health linkage, one could also explicitly test countervailing mechanisms, incorporating additional protective/risk factors and health outcomes such as diet and specific chronic conditions, and expanding the research setting from urban to rural China, or other institutional as well as cultural contexts.

Conclusion

Such constraints and limitations notwithstanding, overall, our study contributed to the health inequality literature on multiple fronts. Theoretically, it extended the

scope of the fundamental causes perspective by testing not only well-established SES indicators (i.e., education, income, and occupation) but also conceptualizing additional SES markers in the context of China (i.e., CCP membership, *hukou* status, housing ownership, and subjective socioeconomic status). Besides expanding on the SES measurement, we further highlighted physical inactivity and BMI as two increasingly salient risk factors affected by China's rapid modernization and simultaneously lingering traditional values. Empirically, based on nationally representative data, our study furnished tangible evidence for intricate associations between SES and risk factors and also pinpointed some countervailing mechanisms in China's institutional context. As China's institutional and sociocultural environment continues to evolve, we hope this study can serve as a useful reference for future research on health inequality in non-Western societies.

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