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Original Research

Increased obesity risks for being an only child in China: findings from a nationally representative study of 19,487 children

M. Li [a,b], H. Xue [c], W. Wang [d], M. Wen [e], Y. Wang [f,*]

[a] Systems-oriented Global Childhood Obesity Intervention Program, Department of Epidemiology and Environmental Health, University at Buffalo, State University of New York, Buffalo, NY, USA
[b] Department of Sociology, University of Notre Dame, Notre Dame, IN, USA
[c] Department of Health Behavior and Policy, School of Medicine, Virginia Commonwealth University, USA
[d] Department of Sociology, Renmin University of China, Haidian District, Beijing, China
[e] Department of Sociology, University of Utah, UT, USA
[f] Fisher Institute of Health and Well-being, College of Health, Ball State University, Muncie, IN, USA

ARTICLE INFO

Article history:
Received 20 March 2017
Received in revised form
18 May 2017
Accepted 6 July 2017

Keywords:
Child obesity
China
One child policy
Only child
Physical activity

ABSTRACT

Objectives: Given the rapid demographic transition and obesity growth in China, it is important to study how the large only-child population (≈100 million) might contribute to the obesity epidemic. This study evaluated associations of only-child status with weight and energy expenditure–related behaviors in China and examined how the associations may vary by sex and urbanicity.

Study design: Secondary analyses of nationally representative cross-sectional data from China Education Panel Survey: Junior Cohorts 2013–14, which included 19,487 students from 112 middle schools in 28 regions across China.

Methods: We used propensity-score–weighted multilevel models to test associations between only-child status and weight outcomes.

Results: Compared with sibling-sons, only-sons had higher body mass index (BMI) (Beta = 0.32, $P < 0.05$) and higher risks of overweight (OR = 1.24, 95% CI = [1.07–1.45]) and obesity (OR = 1.29, 95% CI = [1.02–1.64]); and spent less time on TV watching (Incidence rate ratio (IRR) = 0.89, 95% CI = [0.81–0.98]), internet use (IRR = 0.87, 95% CI = [0.79–0.96]), after-school sports (IRR = 0.91, 95% CI = [0.83–0.99]), and household chores (IRR = 0.85, 95% CI = [0.80–0.92]). Overweight/obesity risks for only-sons were particularly pronounced in urban China, where only-sons were 36% more likely to be overweight and 43% more likely to be obese than sibling-sons. Only-daughters had a higher risk of obesity (OR = 1.43, 95% CI = [1.01–2.04]) than sibling-daughters. However, the association was not significant for

* *Corresponding author*. Fisher Institute of Health and Well-being, Systems-Oriented Global Childhood Obesity Intervention Program, College of Health, Ball State University, HP 302E, Muncie, IN 47306, USA. Tel.: +1 765 285 8121.
E-mail address: ywang26@bsu.edu (Y. Wang).

http://dx.doi.org/10.1016/j.puhe.2017.07.002

either urban girls or rural girls examined separately. Only-daughters in rural areas spent less time helping with household chores (IRR = 0.88, 95% CI = [0.80–0.97]) than sibling-daughters. *Conclusions:* Future childhood obesity interventions should pay special attention targeting the large young only-child population in China.

Introduction

As the largest developing country, China has seen a rapid increase in childhood obesity over the past several decades: the combined prevalence of childhood overweight and obesity has increased from 2% in 1981–1985 to 21% in 2006–2010,[1] and in some major cities, it has reached above 30% among boys, which is even higher than that in the US.[2] Effective interventions are urgently needed.

Family is a critical setting for intervention. Family structure was identified as a key factor affecting children's weight status.[3,4] Studies have consistently reported that being the only child in the family is associated with increased risks of overweight or obesity.[5–10] Only-child status seems to have a dose-response effect: longer duration of being the only child in the family is associated with higher overweight risk.[6,7]

Given its large population base, rapid demographic transition, and 30-year one-child policy, China has the largest only-child population in the world (≈100 million).[11] Only children in China were often viewed as overweight 'little emperors' overnourished by doting parents and grandparents.[12–14] Accordingly, the one-child policy was often cited as a leading contributor to the rising child obesity epidemic,[15] although very few studies have evaluated the obesity risk among only children in China and, among two notable exceptions, null findings were reported.[16,17] Neither study, however, used nationally representative data or considered possible gender and urban-rural variations in the association. Moreover, both studies used conventional regression adjustment in dealing with potential confounding effects, which relies on an untestable assumption about correct model specification. To reduce bias due to potential model misspecification, methods with more robust properties should be used to obtain more precise estimates.

Furthermore, to our knowledge, no study has examined how only-child status may affect energy expenditure–related behaviors among Chinese children. Accordingly, little is known about lifestyle factors that may put only children at increased risks of overweight or obesity.

The present study examined the associations of only-child status with weight status and several energy expenditure–related behaviors based on data from the most recent national data. We also examined how such associations may vary by sex and region. To reduce bias due to confounding and/or potential model misspecification, our estimation followed a combined strategy of propensity score weighting and multilevel regression, which provides a doubly robust estimator yielding consistent estimates if only either the outcome regression model or the propensity score model was correctly specified.[18] Findings from this study will inform family-based interventions and projections of future obesity trend in China.

Methods

Data and study population

Analyses were done based on data from the baseline wave (2013–2014) of the China Education Panel Survey-Junior High Cohorts (CEPS-JH). Following a stratified multistage sampling design, CEPS-JH is an ongoing panel study of a nationally representative sample of 10,279 seventh grade and 9208 ninth grade students, from 112 schools located in 28 regions across in China. Separate questionnaires were administered to students, parents, teachers, and school principals to collect multilevel information on school context, family structure, and students' characteristics. The student questionnaire collected information on student height, weight, and daily activities, including several energy expenditure–related activities, and thus provides an ideal data source for examining differences between only children and sibling children in terms of weight status and behavioral outcomes. The data collection of the China Education Panel Survey-Junior High was approved by the Institutional Review Board at the *Renmin* University of China. Detailed information on the CEPS-JH was introduced elsewhere.[19]

Measurements

Weight status outcomes

Body mass index (BMI) was calculated as self-reported body weight (kg) divided by self-reported height (m) squared (kg/m^2). Overweight and obesity were defined based on the International Obesity Task Force recommended age-sex-specific cutoffs (for Asian children) corresponding to BMI $\geq$ 23 and BMI $\geq$ 27 at age 18, respectively.[20]

Behavioral outcomes

Our study examined several physical activity and sedentary behavioral outcomes, including time spent on the following activities per weekday (in hours): after-class sports, doing household chores, and watching TV. All measures were based on students' self-reports and rounded to the nearest integer.

Exposure variable

Siblingship structure was measured as an indicator variable with '1' represents only children in the family and '0' otherwise (i.e., family had $\geq$2 children).

Student-level covariates

The following student-level covariates were adjusted in predicting propensity scores and outcomes: age (in years), sex