Socioeconomic Status and BMI Trajectories during Market Transformation:

A Longitudinal Study of Children and Youth in China

Introduction

Since it fully embraced a market economy in 1992, China has grown mightily in terms of production, foreign exchange reserves, savings and exportation. Whereas it is widely, albeit not unanimously, agreed that the benefits of this reform spread to every corner of social and economic life, the distribution of benefits has been uneven. Social scientists have paid little attention to the long-term influence of this profound and gigantic institutional change on health outcomes. As China has transformed from a scarcity economy to a market economy in the past two decades, we argue that the relationship between parental SES and BMI trajectories of children and youth deserve attention because they can shed light on how weights in the transition to adulthood are influenced by institutional changes in developing countries. Using a nationally representative dataset, we examine whether (and how) household and parental characteristics at the beginning of China's economic reform in 1993 influence the BMI trajectories of children and youth through childhood and adolescence.

Data

This research is based on data from the China Health and Nutrition Survey (CHNS), a nationally representative survey conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill, the National Institute of Nutrition and Food Safety in China and the Chinese Center for Disease Control and Prevention. The study began in 1989 and continues to the present. To examine the effect of China's accelerated economic reform in 1992 on BMI trajectories, the sample includes 1,694 children age 2-11 years (N = 1,694) who were interviewed in 1993. Follow-up interviews were conducted in 1997 when they were age 6-15 (N = 1,222); in 2000 at ages 9-18 (N = 1,075), in 2004 at ages 13-22 (N = 471) and in 2006 at ages 15-24 (N = 278). The total number of observations is 4,741. Thus, each of the 1,694 children first interviewed in 1993 participated in 2.8 waves on average.

Dependent and independent variables

The dependent variable is each participant's body mass index (kg/ m^2). While *sex* is set as a control variable, the independent variables include:

- *Parental state sector* is a dummy variable denoting whether either of parents was employed in a state sector (government department, state service/institute or state-owned enterprise) in 1993. Working in state sectors usually results in political advantages during the reform era (Walder 1996);
- *Economic advantage* is a dummy variable denoting whether the per capita gross income of the respondent's household fell into the top one fourth of per capita household income of the sample as a whole in 1993;
- *Average parental years schooling* is a continuous variable denoting the average years of schooling of parents surveyed in 1993;
- *Urban China* is a dummy variable denoting whether a household lived in an urban area in 1993. Due to China's rural-urban divide, living in urban areas in the pre-reform era defined a person's entitlement to social resources, such as education, health care and housing;
- *Southern China* is a dummy variables denoting whether a household lived in the southern part of China, which benefited first and most from China's economic transformation. It should also be noted that people in the south have different dietary habits from people living in the north.
- *Eastern & Middle China* is a dummy variable denoting whether a household lived in the middle or eastern part of China in 1993. Because China's vast western regions have been underdeveloped during market transformation, this variable, together with *Southern China*, was introduced to account for China's regional disparity during economic transformation.

Methods

Growth curve modeling is employed to examine the relationship between initial SES and BMI trajectories over time. To capture curvilinear BMI growth during childhood and adolescence (Cole et al. 2000), a second order of age (acceleration) also was included. Using a two-stage model formulation of hierarchical linear models (Raudenbush and Bryk 2002), this growth curve model can be expressed as follows:

Level-1 model:

$$BMI_{ij} = \pi_{0i} + \pi_{1i} \times age_{ti} + \pi_{2i} \times age_{ti}^2 + \varepsilon_{ti}$$

Level-2 models:

Intercept

$$\pi_{0i} = \beta_{00} + \sum_{q=1}^{Q_0} \beta_{0q} X_{qi} + r_{0i}$$

Slope

$$\pi_{1i} = \beta_{10} + \sum_{q=1}^{Q_1} \beta_{1q} X_{qi} + r_{1i}$$

Acceleration

$$\pi_{2i} = \beta_{20} + \sum_{q=1}^{Q_1} \beta_{2q} X_{qi} + r_{2i}$$

The variance-covariance matrix for level-2 random effects is given as below, where τ_{ij} ($i \neq j$) is not restricted to be zero in the estimation to account for dependence between random components.

$$T = \begin{bmatrix} \tau_{00} & \cdot & \cdot \\ \tau_{10} & \tau_{11} & \cdot \\ \tau_{20} & \tau_{21} & \tau_{22} \end{bmatrix}$$

Findings

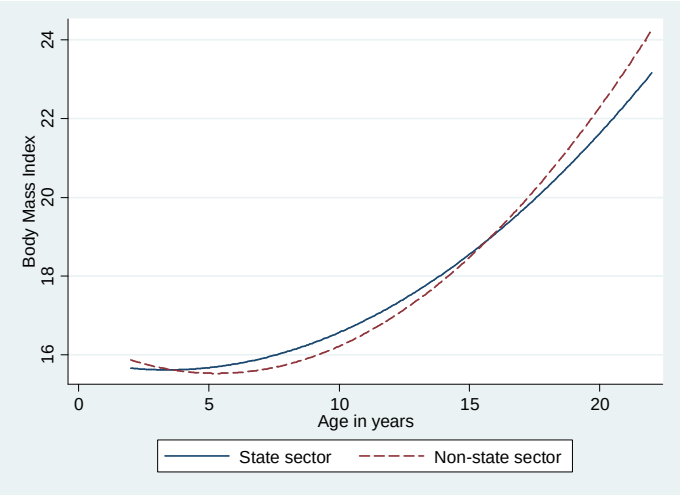
- Most variables representing parental SES in 1993 have significant linear or curvilinear effect on BMI trajectories, although they are not always in the same direction;
- The effect of age and age squared on BMI trajectories has been explained by SES in 1993;
- As suggested by Figure 1, children with a parent working in a state sector show greater BMI increase from age 3 to age 16 but BMI of their counterparts caught up afterwards;
- Children with better-educated parents show lower BMI before age 20 and the trend is reversed after age 20. Children from high-income families show a similar trend but the tipping point is much earlier (around age 8);
- Except for early childhood, children living in the south show lower BMI than their counterparts;
- Net of other effects, the BMI trajectory of urban children is systematically lower than that of rural children, which differs from existing findings based on bivariate analysis. However, this result is in tandem with literature on income inequality in China, which argues that rural-urban disparity can be explained by years of schooling and other SES indicators.
- Children living in non-west China in 1993 show higher BMI except for age 12-17.

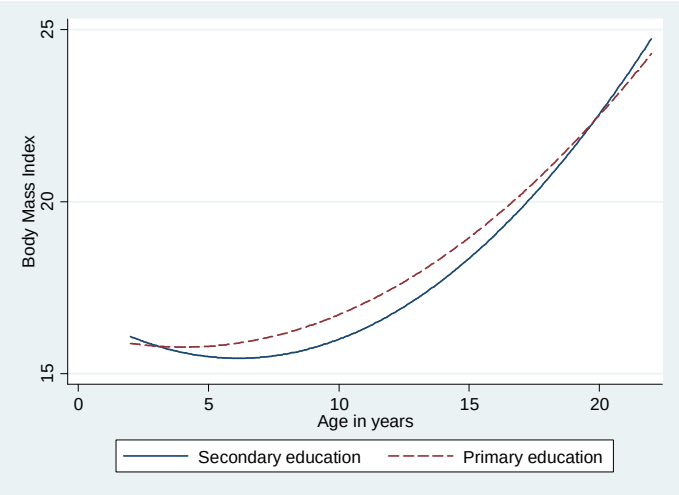
Table 1 Growth curve models on BMI trajectories of children and youth in China: 1993-2006

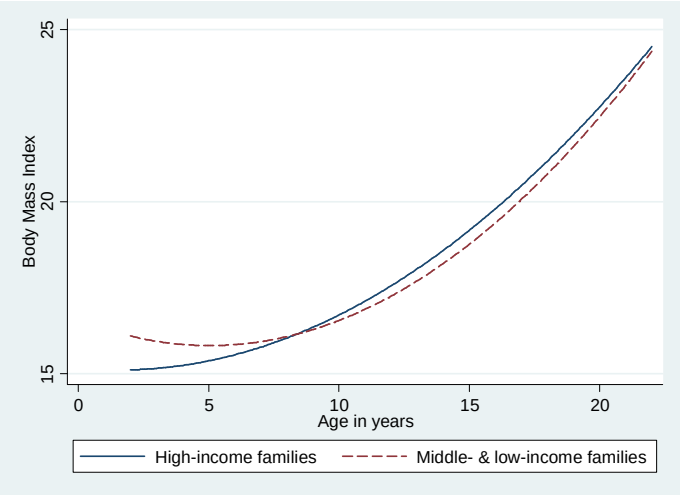
	Model 1		Model 2	
	Coefficients	S.E.	Coefficients	S.E.
Level-1 intercept				
Age	-0.259***	0.052	0.222	0.135
Age square	0.029***	0.002	0.009	0.006
Male	0.831*	0.355	0.805*	0.349
Parental state sector			-0.537	0.545
Economic advantage			-1.409**	0.471
Average years of schooling			0.107†	0.062
Urban China			-0.833	0.524
Southern China			1.483***	0.414
Eastern & Middle China			1.461**	0.439
Intercept	15.953***	0.260	13.609***	0.701
Level-1 slope				
Male	-0.105	0.071	-0.096	0`.069
Parental state sector			0.183†	0.109
Economic advantage			0.281**	0.093
Average years of schooling			-0.032**	0.012
Urban China			0.181†	0.104
Southern China			-0.379***	0.083
Eastern & Middle China			-0.154†	0.086
Level-1 acceleration				
Male	0.003	0.003	0.003	0.003
Parental state sector			-0.009†	0.005
Economic advantage			-0.009*	0.004
Average years of schooling			0.002**	0.001
Urban China			-0.008†	0.005
Southern China			0.014***	0.004
Eastern & Middle China			0.006	0.004
τ_{11} (age)	0.300	0.064	0.232	0.061
τ_{22} (age square)	0.001	0.000	0.001	0.000
τ_{00} (intercept)	4.698	1.489	3.668	1.414
τ_{21} (age, age square)	-0.013	0.003	-0.011	0.003
τ_{10} (age, intercept)	-1.062	0.303	-0.818	0.287
τ_{20} (age square, intercept)	0.046	0.013	0.036	0.013
σ_{ε}^2 (residual)	3.334	0.118	3.361	0.119

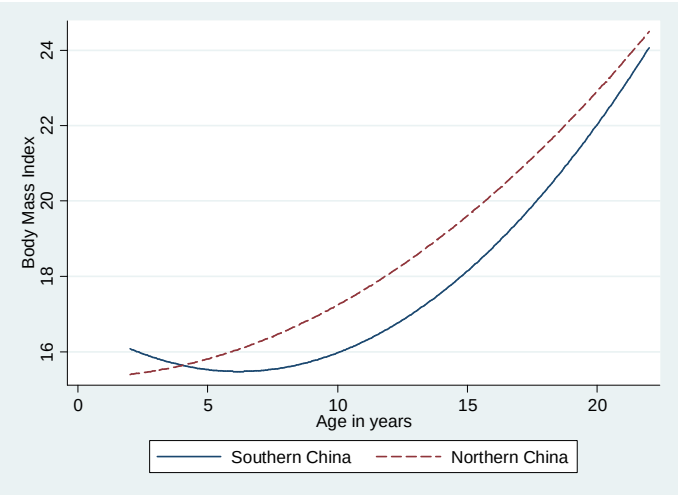
Note: Statistical significance: † p < 0.10; * p < 0.05; ** p<0.01 ; ***P<0.001 (two-tailed tests);

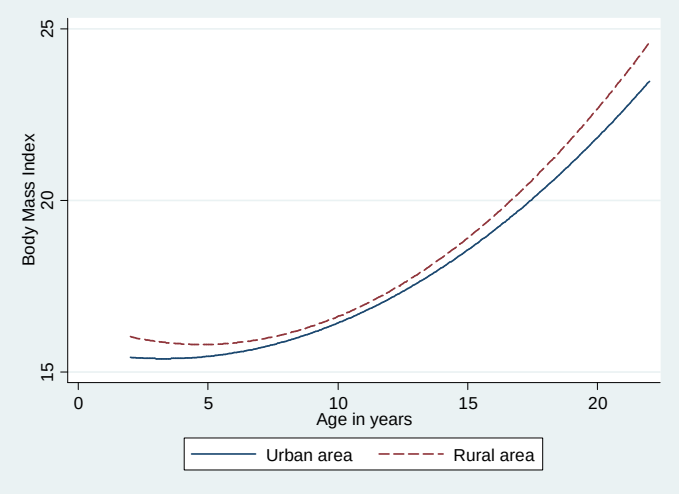
For the Model 1 in Table 1, the unexplained variance σ^2 is 4.418 (.111) in the absence of random effects in slope and acceleration and 6.497 (.133) in the absence of random effects.











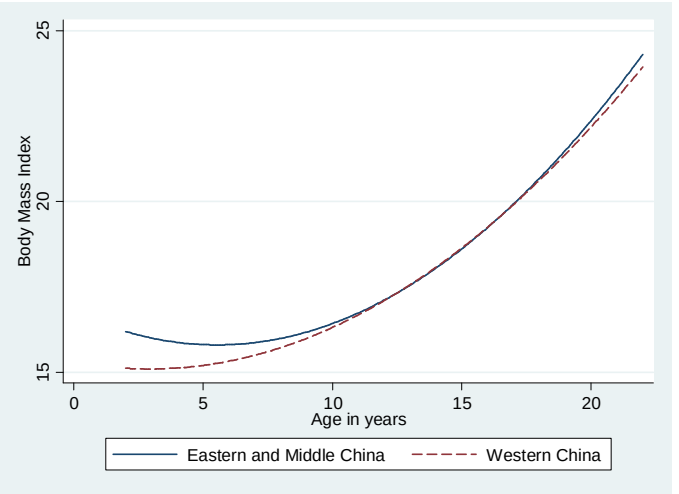


Figure 1 Child and youth BMI trajectories as moderated by household SES (children and youth aged 2- 22)

Note: This figure is based on the Model 2 in Table 1. All other covariates are held as constant (sample mean).