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Short Report

Improving but unequal: Temporal trends in Chinese self-rated health, 1990–2012

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ABSTRACT

This study examines temporal trends in the self-rated health of Chinese adults from 1990 to 2012. Concentration on this particular period in Chinese history provides insights into the health implications of China's massive societal transformation induced by economic reform. A series of cross-classified random effects models were estimated predicting favorable health status across time periods and adjusted for age, cohort effect and individual-level covariates. Results show that more recent birth cohorts exhibit better health conditions than earlier birth cohorts. However, period effects had a more profound effect than that of birth cohort. Net of age, cohort and individual-level covariates, there is a significant and increasing trend in self-rated health since the early 1990s. The period pattern was non-monotonic, with health improvement in the early 1990s, a dip later in that decade, but more evidence of improvement by 2012. We also found that health disparities have widened over the past 20 years, particularly on the basis of income and educational attainment.

Introduction

Chinese economic reform, launched in the late 1970s, brought massive macroeconomic and institutional transformations. Accordingly, a great deal of scholarly attention has been devoted to the consequences of large-scale societal transformations for Chinese lives. Earlier studies have focused on social stratification and social mobility, spawning a large body of market transition literature (Hannum & Xie, 1994; Nee, 1991). Recently, increasing attention has been given to the quality of life, such as physical health and psychological well-being (e.g., Brockmann, Delhey, Welzel, & Yuan, 2009; Chen, Yang, & Liu, 2010; Easterlin, Morgan, Switek, & Wang, 2012; Schafer & Kwon, 2012; Steele & Lynch, 2013; Tang, 2014; Whyte & Sun, 2010). In this paper, we examine health implications of China's social changes from 1990 to 2012. How has self-rated health changed during economic reform? How have socioeconomic inequalities in health changed during this period?

Market reform and health in China

Economic reform has brought pronounced changes to Chinese public health (Zhao, 2006) Specifically, China's market economic reforms dismantled a near-universal health care system established under state-socialism and yielded a decline in the scope and quality of health care services (Yip, 2009). Nevertheless, key indicators of public health point toward improvement, including a decline in all-age mortality rates and an increase in child height (Banister & Hill, 2004; Yip, 2009). This leads to a puzzling conclusion: public health care has deteriorated at the same time as population health has appeared to improve. Whyte and Sun (2010:8) argue that reform strategies led to substantial and sustained economic growth have counteracted the negative consequences of a weakening of socialist health care institution. Such a proposal harkens back to the McKeown thesis which posits that broad economic and social conditions are the most important factor in explaining improvement in health (McKeown, 1976).

Period change in self-rated health—net of age and cohort?

Left unclear from previous research on China is the answer to two important issues. First, have there been improvements in self-rated health net of contemporaneous age and cohort effects? This question first moves us beyond aggregated health outcomes (e.g., mortality rates). Improvements in life expectancy are unmistakable; however it remains uncertain whether these added years are accompanied by good health. Self-rated health (SRH) provides an efficient, reliable, valid, and holistic view of health and well-being (Ferraro & Farmer, 1999; Idler & Benyamini, 1997), and has been

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validated as a predictor of mortality in China (Leung, Tang, & Lue, 1997).

Our primary research question also calls attention to an analytic complication. Coinciding with historical change are two additional temporal phenomena with direct relevance for SRH in reform-era China: *population aging* and *cohort turnover*. First, *age effects* can confound or obfuscate historical change (i.e., period effects). Aging refers to biological, physiological, and developmental changes over the life course (Yang & Land, 2006). Extant research shows that SRH declines with age (Schnittker, 2005; Chen et al., 2010), though the pattern may be non-linear (Zheng, Yang, & Land, 2011). Age effects are relevant because changing levels of SRH in China may owe in some degree to shifting demographic profiles, population aging in particular. Due in large part to the one-child policy enacted in 1980, Chinese population aging is occurring at an unusually rapid pace. Between 1990 and 2005, the country has seen a 35% increase in the share of their population aged 65+; the United States, by contrast, increased by $<1\%$ (the global average, including China, was at 19% (Chen & Liu, 2009). China's aging population could mask the role of period-based change.

Understanding historical dynamics is also complicated by cohort turnover. *Cohort effects* refer to variations across groups of people exposed to an initial event, such as birth in the same year (s), and who therefore experience identical events at the same stage of life course (Yang & Land, 2006). Cohort variation can be attributed to the long-lasting effects of differentials in early life conditions which extend into adult health trajectories (Chen et al., 2010). In the context of China, rapid economic development and industrialization may have different health consequences depending on the life stage in which it was experienced. Various birth cohorts considered in the present study came of age during momentous periods of Chinese political history: the Communist Revolution (late 1940s), The Great Leap Forward (1958–1961), the Cultural Revolution (1966–1976), and the Economic Reform (1978 to present). Likewise, those who experienced the 1955–1966 famine as young children demonstrate serious health consequences on into adulthood (Fan & Qian, 2015; Huang, Li, Wang, & Martorell, 2010). On the other hand, Chinese adults that died off during the period of economic reform would be disproportionately those who came of age prior to massive public health reforms of the 1950s and whose adult health trajectories were shaped by early exposure to infectious disease (Banister & Hill, 2004; Chang, Fleisher, Kim, & Liu, 2014; Chen et al., 2010). Taken together, these considerations reinforce the importance of accounting for both cohort turnover and population aging in the estimation of period effects on health.

Growth in health inequality during the reform era?

The second key question taken up by this article is whether health improvements associated with the reform period have been experienced equally by various sub-groups of the Chinese population. As presented above, the McKeown argument can be summarized by the phrase "wealthier is healthier" (Pritchett & Summers, 1994). Yet the *fundamental cause perspective* draws attention to how the health benefits of economic improvement are most effectively seized by those with the highest levels of knowledge, power, material resources and social capital—by those highest in the status hierarchy (Link & Phelan, 1995). In other words, while the McKeown thesis focuses on explaining absolute level of population health over time, a fundamental cause approach expects to observe class-based health disparities *within* the population (Link & Phelan, 2002). Link and Phelan (2002) proposed that *both* dynamics can operate over historical time, especially during times of massive social change like that of reform-era China.

There are several reasons to expect that class-based health disparities would be preserved—perhaps even magnified—even as mean levels of Chinese population health have recently risen. Underinvestment in public programs has left the planned health system increasingly commercialized and decentralized, meaning that the more advantaged strata of the Chinese populations can access better health care, while the less advantaged have decreased access to quality care (Yip, 2009; Zhao, 2006). Heightened levels of income inequality during market reform may produce a sense of relative deprivation and associated stress for those in the lower social strata, while more advantaged persons obtain the psychosocial boost of comparative success (Marmot & Wilkinson, 2001). Finally, market reform has increased exposure "lifestyle" health risks, including junk food, motorized transport, and sedentary work and leisure; accordingly, the prevalence of obesity and associated disease has increased most markedly in recent cohorts among those with the lowest levels of education (Schafer & Kwon, 2012; Shang et al., 2013; Zhao, 2006). With these mechanisms in mind, we expect that period gains in self-rated health (net of age and cohort) have been disproportionately accrued by Chinese adults with the highest levels of income and education.

Methods

Sample

Data for this study come from five waves of World Value Survey (WVS)-China (1990, 1995, 2001, 2007 and 2012). Each wave of survey was designed to be representative of the Chinese adult population (e.g., 18 years old or older) at the time of survey, with a multistage stratified sampling strategy and face-to-face interviews. The overall response rate exceeds 70% in the China sample of the WVS. Twenty-three cases (0.3%) are missing on self-rated health variable. Among key variables, 724 (9.3%) cases and 4 cases (0.05%) cases are missing on income and education, respectively. Because of small percent of missing data and some methodological concerns associated with multiple imputation in time-series cross-section data structure (Honaker & King, 2010), we deleted cases with missing data, yielding a final sample of 6856.

Measures

Self-rated health is our dependent variable. During each wave, respondents were asked, "All in all, how would you describe your state of health these days?" Response options changed slightly in 2001 onward (1995–1995: 'very good', 'good', 'fair', 'poor', 'very poor'; 2001–2012 removed 'very poor'). For this reason, and because of the variable's positively skewed distribution (more than 60% of respondents report 'very good' and 'good'), responses were dichotomized into very good/good health versus fair/poor/very poor health (reference). We shorten these distinctions by simply referring to "good" vs. "poor" health in the results section.

In analytic models, survey year and birth cohort serve as contextual variables, which will be further discussed below. Each survey year represents the period. Age (survey year minus birth year) and period are measured by single year values, while birth cohorts were grouped into five-year intervals, helping to alleviate the identification problem associated with the *period=age+cohort* equation (Yang & Land, 2006, 2008). Age was centered at the median to enhance interpretability, and also include an age-squared term in the analysis.

Table 1
Sample characteristics: World Value Survey-China 1990–2012 (N=6856).

	Coding description	1990 (N=972)	1995 (N=1500)	2001 (N=895)	2007 (N=1447)	2012 (N=2042)
Self-rated health	Respondent's self-rated health status					
	1=very good/good; 0=very poor/poor/fair	55.9%	68.0%	61.1%	61.2%	67.7%
Level 1-variables						
Age	respondent's age at survey year	39.4	38.7	40.4	44.5	43.7
		(13.9)	(13.9)	(11.3)	(13.2)	(14.8)
Male	1=male ; 0=female	60.0%	53.0%	50.0%	46.0%	50.0%
Marital status	1=married; 0=otherwise	78.0%	81.0%	88.0%	84.0%	82.0%
Education	Respondent's education level					
	1= ≥ high school ; 0= < high school	55.0%	51.0%	58.0%	49.0%	70.0%
Income	Respondent's household income					
	1=the bottom quartile	9.0%	23.0%	16.0%	25.0%	17.0%
	2=the middle two quartiles	60.0%	42.0%	41.0%	33.0%	54.0%
	3=the top quartile	31.0%	34.0%	43.0%	42.0%	29.0%
Work status	Respondent's work status					
	1=full time/self-employed; 0=otherwise	84.0%	65.0%	74.0%	66.0%	54.0%
Level 2 variables		N	Range			
Period	Survey year	5	1990–2012			
Cohorts	Birth year	14	1905–1990			

Note: Mean values reported for continuous measures; standard deviations in parentheses.

Socioeconomic characteristics considered include household income and education. The original WVS income measure is decile of household income arrayed from high (10) to low (1). Income level was created into three dummy variables, low income (the bottom quartile of income), middle income (the middle two quartiles), and high income (the top quartile). Education was measured as the highest degree attained and coded as a dummy variable (high school or greater=1, lower than high school=0). Originally, we created three dummy variables for education (elementary or less, secondary and post-secondary). However, due to the rarity of post-secondary education (less than 1% of the sample), we collapsed the two highest categories. Other individual level covariates include work status and marital status (See Table 1).

Analyses

We carry out cross-classified random effects model (CCREM) in an attempt to untangle age, period, and cohort effects on good health (Yang & Land, 2006, 2008). A Hausman test was used to compare fixed (CCFEM) and random effects models (CCREM). Following the guidelines for large samples guided by Yang and Land (2008), we fail to reject the null hypothesis that there are no systematic difference in coefficients (χ^2 (8)=20.25; p=0.0101), thus favoring the CCREM model over the CCFEM. Further, the CCREM has a better model fit (e.g., BIC of CCFEM= 8659.91; BIC of CCREM=8561.819), smaller standard error of estimated constant (SE of constant in CCFEM=0.480; SE of constant in CCREM=0.172), and is able to handle the unbalanced data from repeated cross-sectional surveys more efficiently. Taken together, then, the CCREM specification is preferred. Recognizing that statistical solutions to the Age-Period-Cohort (APC) confound have received recent critique (e.g., Bell & Jones, 2014), we carried out sensitivity analyses to inspect the robustness of our results. These included CCREM models with different cohort widths (e.g., seven year intervals) and intrinsic estimator (IE) models for age, period, and cohort analysis. Neither set of models changed our substantive findings reported in this paper.

Using the CCREM approach, the individual-level model is specified as follows:

$$Y_{ijk} = \beta_{0jk} + \beta_1(Age)_{ijk} + \beta_2(Age^2)_{ijk} + \sum \beta_p X_{ijk} + \varepsilon_{iik} \quad (1)$$

where Y_{ijk} is the logit of reporting very good health for the ith respondents in the jth period and the kth birth cohort. $\sum\beta_p$ represents coefficient for income and education along with other covariates (e.g., sex, marital status, work status). ε_{iik} is a residual error independent across period and cohorts. The random intercept β_{0jk} varies for each period and birth cohort and is modeled as the following form:

$$\beta_{0jk} = \gamma_{00} + u_{0j} + \nu_{0k,},\ \mu_{0j} \sim N(0, \tau_u),\ \nu_{0k} \sim N(0, \tau_v) \quad (2)$$

where the model intercept γ_{00} represents the average level of good SRH across years and cohorts when the value of level-1 individual covariates is zero. The random effect, survey year (u_{0j}) and birth cohort(ν_{0k}), represents overall period and cohort effect averaged across all cohorts with variance τ_u and across all periods with variance τ_v, respectively. This model allows individuals in any particular survey year to come from multiple birth cohorts, and individuals belonging to any birth cohort can participate in different survey years. That is, individuals born in the same cohort and interviewed in the same year may have similar level of health because they share unique components attributable to period and cohort. In addition, to assess whether health differentials vary by period or birth cohort, we specify a model that includes cross-level interaction terms (e.g., education × year), referring to such terms as random coefficients. Statistical analysis is performed using Stata 14.0 (StataCorp., 2015).

Results

We first use descriptive statistics to examine unadjusted percentages of "good"/"very good" self-rated health (hereafter, good SRH) across time points. As displayed in Fig. 1, the percentage of Chinese adults with good SRH increased from 55% in 1990 to 68% in 1995. This percentage decreased to 61% in 2001, remains nearly unchanged by 2007, and then again increases to 67% in 2012. The percentage in all four time points, with the exception of 2001, is significantly higher than 1990.

Table 2 presents the odds ratios of reporting good SRH obtained from CCREMs. The variance components, showing how much of the variability in good SRH occurs at the cohort and period levels, are reported in the bottom of Table 2. Our analyses begin with a model (Model1) where age, age-squared, period and cohorts are

included without other covariates. Model 2 through Model 5 adds individual-level covariates. Income and education are included separately in the consideration of their positive correlation ($r=0.17$) and because income has been considered a mediating link between education and health (Beckfield, Olafsdottir, & Bakhtiari, 2013; Starfield, 2006). Finally, both factors are included simultaneously (Model 6 and Model 7).

Model 1 shows significant age, period and cohort effects. Fig. 2a shows that the probability of good SRH decreases with age. Fig. 2b displays a general upward trend across time, though the increase is not monotonic. The probability of good SRH underwent a remarkable upward trend from 0.56 in 1990 to 0.69 in 1995, declined in 2001, then rebounded in 2012. Overall, the likelihood of good SRH increased over the past two decades. This contrasts with temporal trends in the U.S where SRH has been quite stable over the last three decades (Beck, Finch, & Lin, 2014), perhaps pointing to the impact of socioeconomic change in reform-era China. Cohort differentials, net of age and period effects, are displayed in Fig. 2c, exhibiting a distinct upward and almost monotonic pattern where the predicted probability of good SRH has increased across subsequent birth cohorts. Although there is a significant cohort effect ($\tau_v=0.011$; $p<0.05$), period effects principally contribute to the upward trends in SRH during the reform era ($\tau_u=0.051$; $p<0.001$).

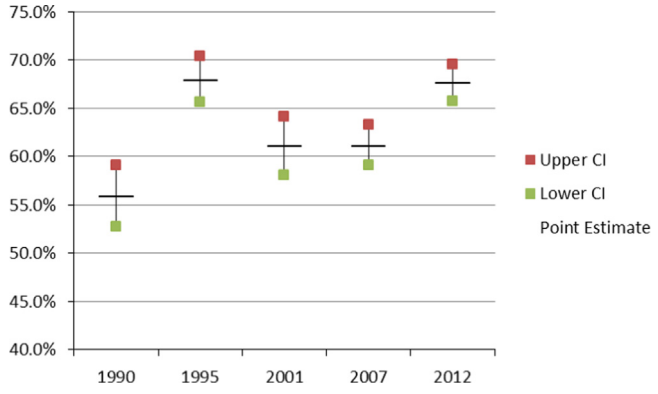

Fig. 1. Descriptive statistics of good/very good health in China, WVS-China 1990-2012. Note: Upper and lower CI indicates 95% confidence interval.

Age and period effect remains significant in Model 2 net of income and all other covariates. Cohort effects, however, become non-significant. Higher income is positively related to good SRH. Random effects of income reported in the bottom of Model 3, estimated with a cross-level interaction at level 1 (e.g., income) and level 2 (e.g., period) shows a significant temporal change in income-based differentials in health. Note that the random effects estimate for middle quartile income was approximately zero, so it was not reported. Fig. 3a estimated from model 3 shows that income gaps in SRH have persisted across the entire period of observations, and have increased over time. The increasing income gap results from those in high income improving SRH, while those with low incomes have remained flat.

Models 4 and 5 focus on educational differentials in health. First, Model 4 shows a positive association between higher education and good SRH. Then, random effect of education, estimated with a cross-level interaction (education × year), is reported in the bottom of Model 5. Random effect of education is statistically significant; however its fixed effect in Model 5 becomes non-significant. As shown in Fig. 3b, there is an insubstantial educational gap in 1991 which has enlarged by the most recent survey year, due, in part, to the better educated group's increasing SRH

Table 2
Cross-classified random effects model of good/very good self-rated health, World Value Survey -China , 1990–2012 (N= 6856).

Fixed effects	Model 1 Odds ratio	Model 2 Odds ratio	Model 3 Odds ratio	Model 4 Odds ratio	Model 5 Odds ratio	Model 6 Odds ratio	Model 7 Odds ratio
Age	0.969***	0.965***	0.966***	0.966***	0.965***	0.966***	0.966***
	(0.963 – 0.976)	(0.959 – 0.972)	(0.959 – 0.972)	(0.959 – 0.972)	(0.959–0.971)	(0.959–0.972)	(0.960–0.972)
Age^2	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	(1.000 – 1.000)	(1.000 – 1.001)	(1.000–1.001)	(1.000–1.001)	(1.000–1.001)	(1.000 - 1.001)	(1.000–1.001)
Male		1.262***	1.267***	1.225***	1.216***	1.252***	1.248***
		(1.137 – 1.401)	(1.141 – 1.407)	(1.103 – 1.360)	(1.095 - 1.350)	(1.126 - 1.391)	(1.122–1.387)
Married		1.284**	1.286**	1.318***	1.330***	1.285**	1.297**
		(1.090 – 1.513)	(1.091 – 1.515)	(1.120 – 1.550)	(1.130 - 1.565)	(1.091 - 1.515)	(1.100 – 1.528)
Full time worker		1.156*	1.156*	1.148*	1.158*	1.159*	1.167*
		(1.025 – 1.303)	(1.025 – 1.304)	(1.019 – 1.293)	(1.027 – 1.305)	(1.028 – 1.307)	(1.034 – 1.317)
Income (ref. bottom quartile income)							
middle quartiles income		1.559***	1.525***			1.546***	1.506***
		(1.358 – 1.788)	(1.328 – 1.751)			(1.347 – 1.775)	(1.311 – 1.730)
top quartile income		2.244***	2.157***			2.215***	2.129***
		(1.940 – 2.597)	(1.682 – 2.766)			(1.911 – 2.568)	(1.678 – 2.702)
Education (Ref. < high school)							
≥ high school				1.169**	1.147	1.070	1.066
				(1.047 – 1.306)	(0.929 – 1.415)	(0.956 – 1.197)	(0.882 – 1.287)
Variance components for random effects							
Cohort effects (τ_v)	0.011*	0.006	0.006	0.006	0.004	0.005	0.004
Period effects (τ_u)	0.051**	0.073**	0.057**	0.058**	0.053**	0.072**	0.055**
top quartile income			0.227**				0.210**
≥ high school					0.203**		0.171**
Goodness of Fit							
BIC	8666.715	8554.365	8555.471	8657.913	8658.515	8561.819	8566.681
Log-likelihood	−4311.275	−4233.018	−4229.155	−4289.209	−4285.093	−4232.328	−4225.927

Note: 95% confidence interval in parentheses;
+ $p<0.1$ (two-tailed test); BIC: Bayesian Information Criterion ; τ_v and τ_u are the variance of cohort and period random effects, respectively.
*** $p<0.001$,
** $p<0.01$,
* $p<0.05$,

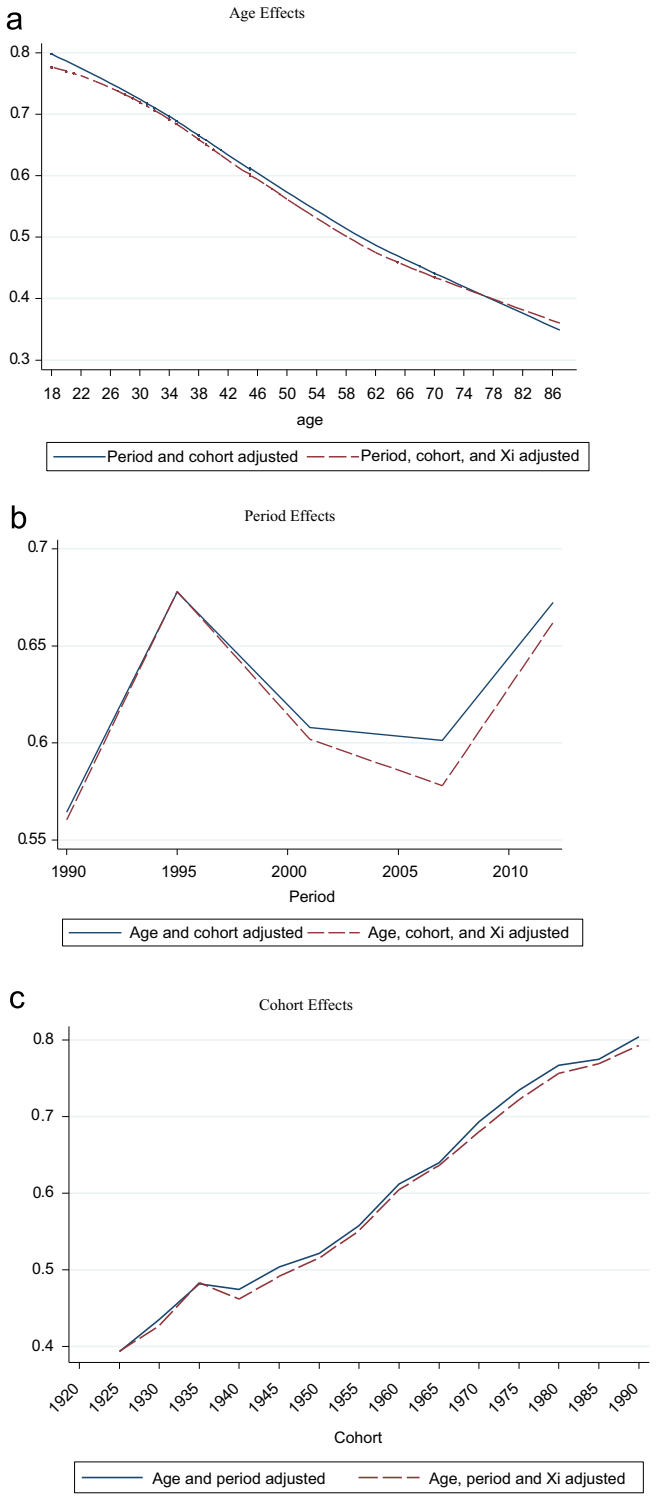

Fig. 2. Predicted probability of good/very good health across age, period, and cohort, WVS-China 1990-2012: Model 1 (age and cohort adjusted model)) vs. Model 6 (fully adjusted model). (a) Age Effects, (b) period effects, (c) cohort effects.

and the less educated group's declines. This finding suggests emerging educational disparities in health.

Model 6 includes income and education simultaneously, along with all other covariates. Results show that the fixed effect of education is non-significant, whereas the income coefficients are essentially unchanged from Models 2 and 3. This may imply that a large part of the link between education and health can be explained by economic resources. The results of the variance

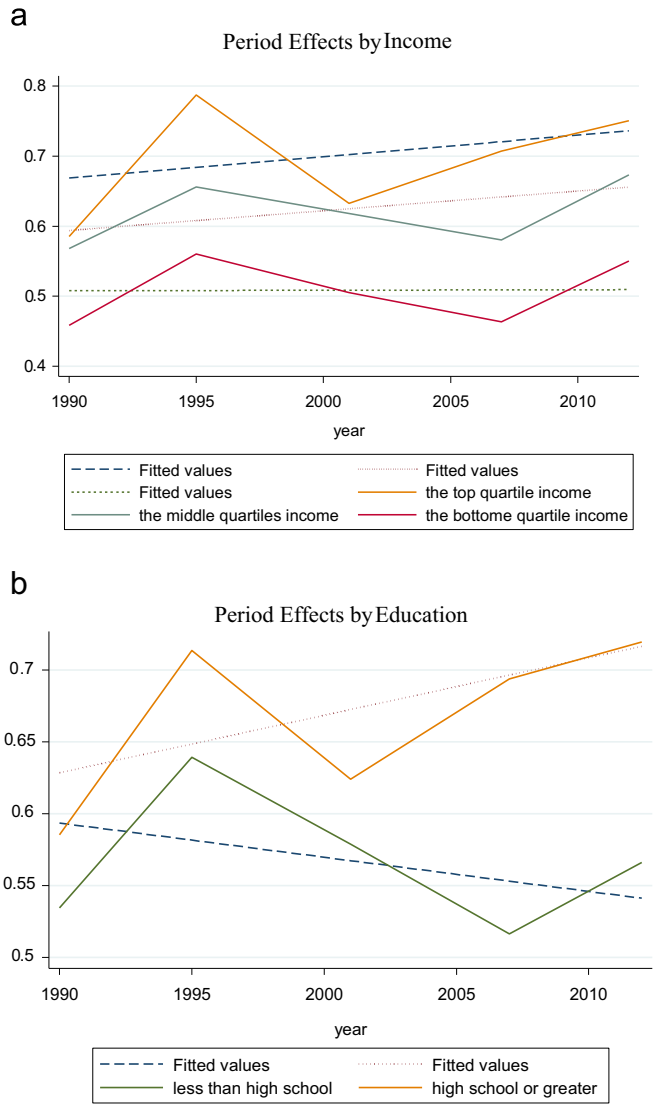

Fig. 3. Predicted period variations in the income and education disparities in good/very good SRH, adjusted for all covariates (a) Period Effects by Income (b) Period Effects by Education. Notes: The dotted line imposed on the period effects by education and income indicate the trends fitted by regression models. The solid line in a and b are random period effects estimated from Models 3 to 5, respectively.

components analysis at the bottom of Model 6 shows that controlling for all covariates, the random period variations are still significant and even become larger than those in Model 1.This suggests that sociodemographic compositional change does not account for estimated period variations. We displayed and compared predicted probability of good SRH generated based on Model 1 versus Model 6. Looking at the dashed line of Fig. 2(b), it is evident that an increase in the period effects seems to derive from substantial decreases in SRH between the early 2000s and mid-2000s in the covariate adjusted model. Finally, Model 7 includes random coefficients of education and income simultaneously, showing that, there are significant temporal variations in income and education inequalities net of age effects, cohort changes, and sociodemographic compositional effect.

Discussion & conclusion

Research on the impact of social change on individual outcomes has been largely conducted in western, developed societies.

Less is known about China's economic reform and temporal trends in self-rated health (SRH), despite the massive social transformations that occurred during economic reform. The present study utilized repeated cross-sectional data in World Values Survey spanning nearly two decades (1990–2012). We assessed period effects, net of age and cohort, and highlighted the emergence of health inequalities associated with social change in reform-era China.

Results reveal that Chinese adults were more likely to report being in good health in 2012 than they were in 1990. Importantly, however, SRH improvement did not undergo a monotonic increase. We speculate that the non-linear patterns may reflect macro socioeconomic changes during the reform era. Nevertheless, the interpretation below rests on major social changes that *coincide* with changes in self-rated health, not events that definitively explain the observed patterns.

We suggest that pronounced health improvement in the early 1990s may reflect economic growth commencing in the prior decade. China experienced a remarkable economic boom consisting of nearly 10% economic growth during early stages of reform, improving the living standards and lifting many out of poverty (Ravallion & Chen, 2007). This may have led to immediate health improvement through better nutrition, preventing infectious disease, and enhanced life satisfaction (Link & Phelan, 2002; Whyte & Sun, 2010). Further, some scholars have argued that health returns to additional income are greatest in the context of poverty (Deaton, 2001). Likewise, absolute deprivation becomes less of a health threat in affluent contexts where the majority of the population has already experienced health improvements. These mechanisms imply that an overall improvement in health could be most apparent in the earlier stages of Chinese economic reform.

SRH seemed to undergo a sharp drop in the early-to-mid 2000s, perhaps reflecting the lagged impact of growing income inequality. Such inequality has risen dramatically, with the GINI coefficient escalating from about 0.3 in the early 1980s to more than 0.45 in the early 2000s (Ravallion & Chen, 2007). Though economic growth and inequality have risen almost concurrently during economic reform, there may be lagged effects of inequality on population health as it operates through psychosocial pathways. Specific timing differs by studies (e.g., lags ranging from 5 years up to 15 years), but past research indicates that the population-wide health penalties of economic inequality are not instantaneous (Blakely, Kennedy, Glass, & Kawachi, 2000; see Zheng, 2012 for overview). Psychosocial pathways linking inequality and health include erosion of social cohesion and social capital (Wilkinson, 1996) and relative deprivation and subsequent stress (Kawachi, Lochner, & Prothrow-Stith, 1997). Empirical research shows that subjective-well-being, including life satisfaction, happiness, and social trust, has deteriorated (Brockmann et al., 2009; Easterlin et al., 2012; Hu, 2015; Tang, 2014). The timing of these declines coincides with downward trend of health we observed during the same period. Though again, we cannot be confident that such social changes explain health declines.

The most recent period in the WVS data, 2012, appears to show a SRH rebound. This rise could be interpreted in light of the junction of economic prosperity and state intervention. Starting in the mid-2000s, criticism of the problems instigated by market reform reached a climax (Whyte & Sun, 2010). During the 11th Five Plans (2006–10), the Chinese government emphasized balance between growth and equity to achieve a more harmonious society. Since the plan was initiated, economic inequality has decreased amidst sustained economic growth and coverage of the social protection system has expanded, including increased government health care funding (OECD, 2012). These efforts may be responsible for the recent growth in Chinese life satisfaction—a remarkable increase of 26 percentage point between 2007 and 2014 (Simons, Wike, & Oates, 2014). How self-rated health tracks with future change in Chinese economic growth and inequality is a topic for ongoing research.

There is another important caveat to the general conclusion that health has improved in reform-era China. What was in 1990 a relatively egalitarian distribution of SRH has been replaced by an increasingly unequal distribution with respect to income and education. These findings generally align with the fundamental cause perspective, a theory which argues that social stratification maintains a persistent gap between status groups over time, even as overall conditions improve amidst modernization (Link & Phelan, 2002). The current results, however, reveal even more than a persistent disparity: they indicate a *widening* gap between those in the top and bottom quartiles of income and between those with and without a high school degree. Those in the more disadvantaged strata of Chinese society have seen very little net improvement from 1990 the present day. This is an especially interesting finding in light of increased social protections undertaken in recent years, initiatives which many may have expected to close gaps between low- and high-income groups.

The study has several limitations. First, the cross-sectional nature of the data impedes causal inference. Although we speculate possible underlying causes of temporal trends in SRH, Age-Period-Cohort analyses of this type are descriptive and do not test specific mechanistic hypothesis. Another limitation is that changes in the response options for SRH differed in earlier and later versions of the WVS. This forced us to focus on differentiating good health from lower health ratings, instead of assessing an expanded set of SRH categories. Lastly, we acknowledge urban-rural dimensions of inequality in reform-era China (Chen et al., 2010; Schafer & Kwon, 2012) but are unable to empirically examine dynamics in our data. Unfortunately, WVS-China does not provide direct information about place of residence, a factor which deserves future consideration for understanding temporal trends in health inequality.

To our knowledge, the present study is the first to simultaneously consider age, period, and cohort influences on the self-rated health of Chinese adults during the reform era. This study contributes strong evidence of period changes in self-rated health. By revealing non-monotonic temporal trends, this study illustrates the complex nature of health change in recent Chinese history and suggests that while economic conditions were key to health improvement in the early stages of reform, an "entire array of social, political, and economic policies" seem to gain explanatory prominence as the period unfolded (Link & Phelan, 2002: 732). The Chinese government has further extended social protection during its 2011–2015 12th Plan period (OECD, 2012). Based on the current findings, we might expect that such efforts will help sustain positive trends in subjective health. Yet other recent policy innovations have been ineffectual in reducing socioeconomic health disparities, so targeted interventions will be needed to narrow the education- and income-based health gaps that have widened in recent years.

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