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An exploration of China's mortality decline under Mao: A provincial analysis, 1950–80

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Between 1950 and 1980, China experienced the most rapid sustained increase in life expectancy in documented global history. However, no study of which we are aware has quantitatively assessed the relative importance of the various explanations proposed for these gains in survival. We have created and analysed a new, province-level panel dataset spanning the decades between 1950 and 1980 by combining historical information from China's public health archives, official provincial yearbooks, and infant and child mortality records contained in the 1988 National Survey of Fertility and Contraception. Although exploratory, our results suggest that gains in school enrolment and public health campaigns together are associated with 55-70 per cent of China's dramatic reductions in infant and under-five mortality during our study period. These results underscore the importance of non-medical determinants of population health – and suggest that, under some circumstances, general education of the population may amplify the effectiveness of public health interventions.

Keywords: mortality; China; health improvement; less developed countries; population health; education

China's mortality decline under Mao

Online Supplement to Babiarz et al. 2014, An exploration of China's mortality decline under Mao: A provincial analysis, 1950–80, *Population Studies*

In this supplement, we provide additional details on the sources and methods used to compile our panel dataset containing mortality rates, determinants of population health, and other socio-economic characteristics of Chinese provinces during the 1950-80 period. We also provide Appendix Tables showing data availability for each province, and the results of alternate specifications described in Babiarz et al. (2014).

We obtained our data from three primary sources: (1) published public health histories (*Weishengzhi*) derived from each province's printed archives. Those of all but two of China's provinces during the Mao era (Tibet and Guizhou); (2) the National Survey of Fertility and Contraception, conducted in 1988, from which we constructed measures of the annual infant and under-five mortality rates for each province; (3) China's official provincial yearbooks. These are produced by the National Bureau of Statistics of China, and are also available online at www.Chinadataonline.org. We supplemented these records with statistics from the "China Statistical Data Compilation, 1949-2003" held at the University of Michigan's China Data Center.

Public health campaign data

The *Weishengzhi* of each province includes an appendix describing its construction, often detailing a committee writing process overseen by the provincial Bureau of Health and the province's archivists. The compilation of the *Weishengzhi* typically began in the early or mid-1980s, but did not culminate in their publication until the later 1990s. Many provincial volumes were no longer in print when we began to collect them, so we had to acquire them through second-hand book dealers and, in a few cases, directly from the provincial Bureaus of Health. As noted above, we were unable to obtain *Weishengzhi* for either Tibet or Guizhou, and were only able to obtain electronic versions of the *Weshengzhi* for Shandong and Neimenggu, or Inner Mongolia. According to the 1982 census, the population of Xizang (Tibet) and Guizhou accounted for 3.02 percent of the Chinese population (Banister 1987), therefore the provinces for which we have data

held more than 95 per cent of China's population in the Mao era. Note that the boundaries of a few provinces during the study period. The geographic boundaries of Inner Mongolia were reduced in 1969, but the original boundaries were restored in 1979, affecting its neighbors Gansu, Ningxia, Heilongjiang, Jilin, and Liaoning between 1969 and 1979. The documentation in the *Weishengzhi* regarding affected provinces claims that the data were adjusted to take account of these boundary changes. However, the fertility history data from the 1988 survey were not adjusted in this way.

The public health campaign data which we coded from each province's *Weishengzhi* include brief textual explanations of our coding, such as if the intervention applied only in a specific region of the province. '0's in the dataset arise when a *Weishengzhi* explicitly stated that there was no campaign of the relevant type in the given year; missing values occur when we could not tell from the text of the *Weishengzhi* if there was a campaign operating in the province in a particular year or not. For the analyses reported in our paper, we then coded the public health intervention variables as dichotomous variables. Province-years with missing values in the raw data are coded as '0' in the dichotomous variables. The provincial yearbooks are not consistent in whether they mention how long specific campaigns continued, and any explicit mention is usually tied to whether any other major public health event was taking place at the time. Low-intensity campaigns receive more attention in the yearbooks if little else was going on in the province. We therefore felt it was justifiable to code 'missing' and '0' values in the same way.

Mortality data

Our analyses focus on the annual infant mortality rates (IMR) and under-five mortality rates (U5MR) data for each province from the 1988 National Survey of Fertility and Contraception as described in section 3.2.

Socioeconomic characteristics and other determinants of population health

(1) The remainder of our data is available in China's official provincial yearbooks as well as the University of Michigan's China Data Center, China Data Online" (www.Chinadataonline.org)

includes annual data for each province since 1949 or beginning in the earliest available. It contains data on the following categories of variables, among others: health care infrastructure (including details on the number of hospitals, clinics, and doctors per 10,000 head of population); demographic characteristics (such as the total population, the proportions of the population which are male and female, crude birth rates and population growth rates); education statistics (including enrolment rates in primary, secondary, and higher education institutions and the number of full-time teachers at each level); and information about household consumption, income, and savings for the urban and rural portions of the population.

(2) The China Statistical Data Compilation, includes annual records for each province from 1949, or earliest available, for the following variables: GDP per head (total and by sector); employment rates and these rates broken down into figures for urban and rural areas, and, where available, by subsector and by ownership – state, collective, and other); other provincial government economic indicators (such as the amount invested in fixed assets, public revenue, price indices; agricultural and industrial output, and net exports of goods and services).

(3) Finally, we also included data on the age structure of the population of each province, namely the percentage of population aged over 60 and the percentage who were aged under 5, which we obtained from the *Laonian Renkou Ditu Ji* (Collection of Maps of the Elderly Population), edited by HE Huide (Ditu Publishing House, 1986; xeroxed hardcopy from Beijing National Library).

Appendix Table 1: Data availability by province, China 1950-1980. Dates are provided without the preceding 19 (50-80 = 1950-80)

	Anhui	Fujian	Gansu	Guangdong	Guangxi	Guizhou	Hainan	Hebei	Heilongjiang	Henan	Hubei	Hunan	Inner Mongolia	Jiangsu	Jiangxi	Jilin	Liaoning	Ningxia	Qinghai	Shaanxi	Shandong	Shanxi	Sichuan	Tibet	Xinjiang	Yunnan	Zhejiang
Infant mortality rate	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	-	50-80	50-80	50-80
Under-five mortality rate	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	-	50-80	50-80	50-80
Health																											
Vaccination campaigns	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
Reproductive health campaigns	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
Mosquito and vector control campaigns	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
Infectious disease control campaigns	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
Campaigns against malnutrition	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
N of hospital beds per 10,000 persons	50-80	50-80	50-80	50; 52; 57; 62; 65; 70; 75; 78-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75-80	50-80	50-80	50-80	52; 57; 65; 70; 75;78-80	50-80	50-80	50-80	50; 52; 57; 62; 65; 70-80	50-80	52; 57-80	52-80	50-80	50-80	72-80	58-80	50-80	50-80	50-80
N of doctors per 10,000 persons	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80
Education																											
Primary education enrolment (% of children aged 6-11)	50-80	50-80	50-80	50; 52; 57; 62; 65; 70; 75; 78-80	50-80	50-80	-	50-80	50-80	50-65; 70-80	52; 57; 62; 65; 70; 75-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-80	50-80	50-80	50-80
Secondary and higher education enrolment (% of children aged 12-18 and 18-21)	50-80	50-80	50-80	50; 52; 57; 62; 65; 70; 75; 78-80	50-80	50-69; 72-80	-	50-80	50-69; 72-80	50-65; 70-80	52; 57; 62; 65; 70; 75-80	50-80	52-69; 71-80	50-80	50-69; 70-80	50-80	50-69; 72-80	58-80	56-80	50-80	50-80	50-80	52; 57; 62; 65; 75; 78-80	65-69; 71-80	50-80	50-69; 70-80	50-80
Control variables: other socioeconomic characteristics of provinces																											
Total population (10,000 persons)	50-80	52-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-80	50-80	50-80	50-80
Per cent of population aged over 60	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80
Per cent of population aged under 5	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80	53-80
Per cent of population male	50-80	52-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-80	50-80	50-80	50-80
Per cent of population who live in agricultural areas	52-80	52-80	56-58; 61-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	71-80	50-80	50-80	50-80	52-80	50-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-80	50-80	50-80	50-80
Total agricultural production (10,000 tons) per head	78-80	57-80	79-80	79-80	50-80	52-80	65-80	50-80	52-80	50-80	53-80	52-80	50-80	50-80	50-80	52-80	52-80	58-80	50-80	50-80	50-80	50-80	78-80	52; 59-80	50-80	52-80	59-80
Production of grain (10,000 tons) per head	50-80	52-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-80	50-80	50-80	50-80
Production of fruit (10,000 tons) per head	50-80	52-80	50-80	52-80	52-80	50-80	52; 57; 62; 65; 70-80	50-80	52-61; 70-80	52-80	50-80	50-80	80	50-80	50-80	54-63; 65-80	50-80	50-65l 71-80	50-63; 67; 71-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	59-69; 71-80	50-80	53-58; 63; 70-80	71-80
GDP (current price, 100 Million RMB)	52-80	52-80	52-80	52-80	52-80	50-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80	52-80
Investment in fixed assets (current price) per head	50-80	52; 57; 62; 65; 70; 74-80	50-80	50-80	50-80	50-80	52; 57-80	50-80	50-80	50-80	50-80	50-80	53; 52-80	50-80	50-80	50-80	50-80	50-80	52-80	50-80	50-80	50-80	52; 57; 62; 65; 70; 75; 78-80	50-80	50-80	50-80	50-80
Local revenue (current price) per head	50-80	52-80	50-80	50-80	50-80	50-80	52-80	50-80	52-80	50-80	52-80	50-80	50-80	50-80	50-80	52-80	52-80	50-80	52-80	50-80	50-80	50-80	78-80	59-80	50-80	50-80	50-80
General retail price index (preceding year=100)	60-66; 71-80	51-80	51-65; 72-80	51-80	52; 57; 62; 65; 70; 75; 78-80	51-80	79-80	51-80	53-80	57-80	51-80	51-80	52-80	51-80	51-67; 71-80	51-80	51-80	58-80	51-80	51-80	51-80	51-80	52; 57; 62; 65; 70; 75; 78-80	-	51-80	51-80	53-80

Source: Provincial health archives (Weishengzhi)

Appendix Table 2: Lagged education and interactions with public health interventions, China 1960-80 - alternative standard errors

Dependent Variable	*ln* IMR					*ln* U5MR				
	Coefficient	P-value: Clustered Standard Errors	P-value: Pairs-Cluster Bootstrapped Standard Errors	P-value: Cluster Residual Bootstrapped Standard Errors	P-value: Wild Cluster Bootstrapped Standard Errors	Coefficient	P-value: Clustered Standard Errors	P-value: Pairs-Cluster Bootstrapped Standard Errors	P-value: Cluster Residual Bootstrapped Standard Errors	P-value: Wild Cluster Bootstrapped Standard Errors
Panel A										
Change in primary education enrolment 1950-1960	1.493***	0	0.008	0.00802	0.256	1.730***	0	0.004	0.00601	0.13
Change in secondary and higher education enrolment 1950-1960	-11.723***	0.00203	0.112	0.1022	0.238	-11.897***	0.00116	0.106	0.09419	0.236
Panel B										
Public health campaigns (principal component indices)										
Sanitary campaigns	-0.16	0.12028	0.02	0.22044	0.664	-0.174	0.10844	0.02	0.20641	0.634
Vaccinations	0.155	0.1625	0.134	0.32465	0.68	0.163	0.15138	0.112	0.29459	0.608
Reproductive health	0.071	0.42353	0.326	0.54509	0.852	0.06	0.47835	0.39	0.56713	0.91
Mosquito vector control	-0.042	0.48136	0.56	0.61924	0.986	-0.026	0.64131	0.626	0.77355	0.964
Other infectious disease control	-0.158**	0.02821	0.018	0.14228	0.818	-0.203**	0.00477	0.01	0.09419	0.776
Campaign against malnutrition	-4.432***	0.00128	0.00208	0.09218	0.37	-3.815**	0.00465	0.00208	0.10421	0.408
Interactions between 1950s increases in educational enrolment and 1960-80 public health campaigns										
Primary education and sanitary campaigns	0.021	0.32123	0.196	0.37675	0.814	0.036	0.77129	0.656	0.77756	0.944
Primary education and vaccinations	-0.205	0.32123	0.196	0.37675	0.814	-0.278	0.15146	0.104	0.25651	0.734
Primary education and reproductive health	0.295**	0.02744	0.006	0.08417	0.844	0.365**	0.01033	0	0.06613	0.786
Primary education and mosquito vector control	0.286	0.20357	0.202	0.33467	0.794	0.247	0.17638	0.162	0.32665	0.828
Primary education and other infectious disease control	0.387***	0.00204	0	0.04609	0.648	0.400***	0.00089	0	0.03206	0.622
Primary education and campaigns against malnutrition	-0.801	0.21386	0.27824	0.35377	0.788	-1.087*	0.07694	0.09917	0.16683	0.708
Secondary education and sanitary campaigns	1.846	0.21257	0.066	0.29659	0.75	1.938	0.20357	0.202	0.33467	0.794
Secondary education and vaccinations	-1.166	0.35602	0.446	0.48898	0.864	-1.045	0.42225	0.492	0.54509	0.842
Secondary education and reproductive health	-2.609*	0.06053	0.006	0.17034	0.668	-2.653*	0.04872	0.006	0.14028	0.688
Secondary education and mosquito vector control	-0.486	0.62689	0.614	0.71343	0.936	-0.37	0.70997	0.696	0.7996	0.912
Secondary education and other infectious disease control	1.627	0.09981	0.03	0.24449	0.842	2.104**	0.03404	0.016	0.1523	0.772
Secondary education and campaigns against malnutrition	72.366***	0.00189	0	0.0975	0.376	63.201**	0.00495	0	0.11415	0.428
Panel C										
Hospital beds per 10,000 persons	0.031***	0	0	0.02806	0.296	0.027***	0.00005	0.002	0.0521	0.324
Doctors per 10,000 persons	0.041***	0.00115	0.014	0.0501	0.178	0.039***	0.0024	0.036	0.05812	0.194
Province effects	no					no				
Year effects	yes					yes				
Province-year control variables	yes					yes				
N	255					255				
R-squared	0.835					0.870				

Provinces used in analysis include: Anhui, Beijing, Fujian, Gansu, Guangdong, Guangxi, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanghai, Shanxi, Sichuan, Tianjin, Xinjiang, Yunnan, and Zhejiang.
Province-level controls include population, birth rate, per cent of population aged over 60, per cent of population aged under 5, per cent of population male, per cent of population employed in agriculture, agricultural production per head, grain and fruit production per head, GDP, investment in fixed assets per head, local revenue per head, and retail price index.

Estimates for fixed effects and control variables are available upon request.
Standard errors reported in parentheses. *p<0.1, ** p<0.05 , and *** p<0.01
Sources: 1988 National Survey of Fertility and Contraception; Provincial health archives (Weishengzhi); China Statistical Data Compilation, 1949-2003; and provincial yearbooks.

Appendix Table 3: Lagged education and interactions with public health interventions , 1960-80 - individual level model

Dependent Variable	**Infant Death**		**Death Before Age 5**	
Panel A				
Change in primary education enrolment 1950-1960	0.083***	0.074***	0.130***	0.120***
	(0.017)	(0.015)	(0.024)	(0.022)
Change in secondary and higher education enrolment 1950-1960	-0.678***	-0.578***	-0.975***	-0.855***
	(0.169)	(0.134)	(0.228)	(0.174)
Panel B				
Public health campaigns (principal component indices)				
Sanitary campaigns	-0.008	-0.007	-0.013*	-0.0116*
	(0.005)	(0.004)	(0.007)	(0.006)
Vaccinations	0.008	0.007	0.011	0.0109
	(0.006)	(0.006)	(0.008)	(0.007)
Reproductive health	0.003	0.002	0.003	0.00148
	(0.003)	(0.003)	(0.004)	(0.003)
Mosquito vector control	0	0.001	0.002	0.00293
	(0.002)	(0.002)	(0.003)	(0.003)
Other infectious disease control	-0.010**	-0.008*	-0.016***	-0.0133***
	(0.004)	(0.004)	(0.005)	(0.004)
Campaign against malnutrition	-0.228***	-0.242***	-0.265**	-0.275***
	(0.069)	(0.063)	(0.092)	(0.088)
Interactions between increases in educational enrolment over the 1950s and 1960-80 public health campaigns				
Primary education and sanitary campaigns	0.001	-0.003	0.003	-0.00368
	(0.006)	(0.005)	(0.008)	(0.007)
Primary education and vaccinations	-0.013	-0.011	-0.023	-0.0202
	(0.011)	(0.009)	(0.015)	(0.012)
Primary education and reproductive health	0.018**	0.017**	0.029**	0.0287**
	(0.007)	(0.008)	(0.010)	(0.011)
Primary education and mosquito vector control	0.014	0.011	0.016	0.0108
	(0.009)	(0.008)	(0.010)	(0.010)
Primary education and other infectious disease control	0.021***	0.016**	0.028***	0.0208**
	(0.006)	(0.006)	(0.008)	(0.008)
Primary education and campaigns against malnutrition	-0.060**	-0.062**	-0.103**	-0.106***
	(0.029)	(0.026)	(0.038)	(0.034)
Secondary education and sanitary campaigns	0.092	0.088	0.137	0.136
	(0.071)	(0.060)	(0.096)	(0.079)
Secondary education and vaccinations	-0.061	-0.062	-0.072	-0.0838
	(0.077)	(0.067)	(0.103)	(0.083)
Secondary education and reproductive health	-0.138**	-0.110*	-0.177**	-0.145**
	(0.053)	(0.053)	(0.071)	(0.067)
Secondary education and mosquito vector control	-0.076*	-0.082**	-0.092	-0.102**
	(0.039)	(0.034)	(0.054)	(0.048)
Secondary education and other infectious disease control	0.115**	0.086	0.189**	0.155**
	(0.053)	(0.050)	(0.068)	(0.064)
Secondary education and campaigns against malnutrition	3.761***	3.980***	4.418***	4.596***
	(1.138)	(1.047)	(1.507)	(1.439)
Panel C				
Hospital beds per 10,000 persons	0.002***	0.002***	0.002***	0.00190***
	0.000	0.000	0.000	(0.001)
Doctors per 10,000 persons	0.002***	0.002***	0.002***	0.00264***
	(0.001)	(0.001)	(0.001)	(0.001)
Province effects	no	no	no	no
Year effects	yes	yes	yes	yes
Province-year control variables	yes	yes	yes	yes
Maternal control variables	no	yes	no	yes
N	330,961	303,276	330,961	303,276
R-squared	0.010	0.014	0.016	0.022

Notes: As for Table A2

Appendix Table 4: Lagged education and interactions with public health interventions, China 1960-80 - coarse enrolment rates

Dependent Variable	*ln* IMR	*lnU5MR*
	Cohort Life Table	
Panel A		
Change in primary education enrolment 1950-1960	2.252	3.006
	(1.915)	(1.940)
Change in secondary and higher education enrolment 1950-1960	-6.406	-6.717
	(9.044)	(8.946)
Panel B		
Public health campaigns (principal component indices)		
Sanitary campaigns	-0.210*	-0.233**
	(0.101)	(0.107)
Vaccinations	0.16	0.196
	(0.124)	(0.127)
Reproductive health	-0.028	-0.044
	(0.107)	(0.104)
Mosquito vector control	-0.081	-0.07
	(0.103)	(0.091)
Other infectious disease control	-0.149**	-0.188**
	(0.070)	(0.068)
Campaign against malnutrition	-2.009***	-1.634**
	(0.586)	(0.644)
Interactions between increases in educational enrolment over the 1950s and 1960-80 public health campaigns		
Primary education and sanitary campaigns	-0.163	-0.112
	(0.444)	(0.453)
Primary education and vaccinations	-0.819	-1.049
	(0.719)	(0.653)
Primary education and reproductive health	1.169*	1.447**
	(0.569)	(0.591)
Primary education and mosquito vector control	1.851	1.766
	(1.569)	(1.378)
Primary education and other infectious disease control	2.013***	2.049***
	(0.673)	(0.676)
Primary education and campaigns against malnutrition	-2.86	-3.71
	(2.663)	(2.633)
Secondary education and sanitary campaigns	7.139*	7.683*
	(3.732)	(4.133)
Secondary education and vaccinations	-2.772	-3.268
	(3.356)	(3.561)
Secondary education and reproductive health	-4.576	-4.978
	(5.013)	(4.924)
Secondary education and mosquito vector control	-3.775	-3.196
	(3.227)	(3.287)
Secondary education and other infectious disease control	0.466	1.553
	(2.425)	(2.582)
Secondary education and campaigns against malnutrition	98.435***	84.573**
	(30.634)	(31.955)
Panel C		
Hospital beds per 10,000 persons	0.027***	0.023**
	(0.008)	(0.008)
Doctors per 10,000 persons	0.037**	0.035**
	(0.014)	(0.015)
Province effects	no	no
Year effects	yes	yes
Province-year control variables	yes	yes
N	255	255
R-squared	0.802	0.835

Notes: As for Table A2

Appendix Table 5: Lagged education and interactions with public health interventions, China 1960-80 - alternative mortality estimates

Dependent Variable	*ln* IMR	*ln* U5MR	*ln* IMR	*ln* U5MR	*ln* IMR	*ln* U5MR
	Cohort Life Table		Period Life Table		Crude Rate	
Panel A						
Change in primary education enrollment 1950-1960	1.493***	1.730***	1.213***	1.783***	1.476***	1.709***
	(0.299)	(0.319)	(0.290)	(0.384)	(0.326)	(0.373)
Change in secondary and higher education enrollment 1950-1960	-11.723***	-11.897***	-11.863***	-13.874***	-9.981***	-11.302***
	(3.799)	(3.663)	(3.481)	(3.109)	(3.292)	(3.167)
Panel B						
Public health campaigns (principal component indices)						
Sanitary campaigns	-0.16	-0.174	-0.166	-0.196*	-0.183*	-0.183
	(0.103)	(0.108)	(0.097)	(0.112)	(0.105)	(0.107)
Vaccinations	0.155	0.163	0.189	0.206*	0.198	0.194
	(0.111)	(0.114)	(0.115)	(0.119)	(0.122)	(0.124)
Reproductive health	0.071	0.06	0.059	0.032	0.091	0.075
	(0.089)	(0.085)	(0.091)	(0.080)	(0.080)	(0.083)
Mosquito vector control	-0.042	-0.026	-0.06	-0.072	-0.055	-0.082
	(0.060)	(0.056)	(0.061)	(0.066)	(0.054)	(0.059)
Other infectious disease control	-0.158**	-0.203**	-0.150**	-0.197**	-0.216***	-0.208**
	(0.072)	(0.072)	(0.071)	(0.074)	(0.071)	(0.074)
Campaign against malnutrition	-4.432***	-3.815**	-4.041***	-4.023**	-4.490***	-4.156**
	(1.377)	(1.348)	(1.260)	(1.548)	(1.398)	(1.468)
Interactions between increases in educational enrolment over the 1950s and 1960-80 public health campaigns						
Primary education and sanitary campaigns	0.021	0.036	-0.031	0.064	0.009	0.039
	(0.121)	(0.123)	(0.131)	(0.135)	(0.125)	(0.128)
Primary education and vaccinations	-0.205	-0.278	-0.224	-0.26	-0.232	-0.217
	(0.207)	(0.194)	(0.198)	(0.215)	(0.242)	(0.231)
Primary education and reproductive health	0.295**	0.365**	0.258*	0.267	0.249*	0.225
	(0.134)	(0.142)	(0.131)	(0.155)	(0.134)	(0.134)
Primary education and mosquito vector control	0.286	0.247	0.32	0.384*	0.244	0.348*
	(0.225)	(0.183)	(0.243)	(0.205)	(0.190)	(0.196)
Primary education and other infectious disease control	0.387***	0.400***	0.382***	0.352**	0.426***	0.395**
	(0.125)	(0.120)	(0.119)	(0.139)	(0.135)	(0.140)
Primary education and campaigns against malnutrition	-0.801	-1.087*	-0.033	-0.724	-0.562	-0.733
	(0.644)	(0.615)	(0.580)	(0.763)	(0.663)	(0.752)
Secondary education and sanitary campaigns	1.846	1.938	2.02	2.282	2.293	2.227
	(1.481)	(1.542)	(1.429)	(1.585)	(1.522)	(1.537)
Secondary education and vaccinations	-1.166	-1.045	-1.569	-1.822	-1.807	-1.786
	(1.263)	(1.302)	(1.342)	(1.352)	(1.328)	(1.396)
Secondary education and reproductive health	-2.609*	-2.653*	-2.378*	-2.183*	-2.842**	-2.637**
	(1.390)	(1.346)	(1.326)	(1.192)	(1.181)	(1.241)
Secondary education and mosquito vector control	-0.486	-0.37	-0.292	-0.612	-0.096	-0.148
	(0.999)	(0.994)	(0.905)	(1.072)	(0.804)	(0.949)
Secondary education and other infectious disease control	1.627	2.104**	1.483	2.257**	2.407**	2.342**
	(0.989)	(0.993)	(0.941)	(1.072)	(0.917)	(1.037)
Secondary education and campaigns against malnutrition	72.366***	63.201**	64.033***	65.931**	72.468***	67.825**
	(23.286)	(22.489)	(21.230)	(26.260)	(23.546)	(24.945)
Panel C						
Hospital beds per 10,000 persons	0.031***	0.027***	0.031***	0.032***	0.032***	0.033***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)
Doctors per 10,000 persons	0.041***	0.039***	0.043***	0.042***	0.037***	0.037***
	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)
Province effects	no	no	no	no	no	no
Year effects	yes	yes	yes	yes	yes	yes
Province-year control variables	yes	yes	yes	yes	yes	yes
N	255	255	255	255	255	255
R-squared	0.835	0.870	0.809	0.878	0.848	0.887

Notes: As for Table A2