PROVINCIAL MORTALITY OF CHINESE OLDEST OLD [a]

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ABSTRACT

Population aged 80 and above are the fastest growing age group in China. Death is much more closely related to those oldest olds' everyday life than any other age groups. However, oldest old mortality is not yet well learned in China, especially at provincial level. Based on Chinese Longitudinal Healthy Longevity Survey (CLHLS) 1998-2000 longitudinal data, we use multinomial logistic regression to analyze provincial differentials in Chinese oldest old mortality. We find that Chinese oldest old have different death risks across provinces. Provincial differentials in Chinese oldest old mortality vary by both gender and rural-urban residence. Although provincial differentials in oldest old morality exist in rural China, they show little evidence in urban China. This paper also provides evidence of urban advantages in oldest old morality for females, but not for males. Finally, we find that selection effects happen not only between rural and urban areas but also across provinces.

China is currently witnessing fast population aging. Among the aged people, the oldest old are the weakest group and need most social and family support. Death is much more closely related to those oldest olds' everyday life than any other age groups. However, owning to data limitation, research on oldest old mortality is quite limited in terms of quantity and quality in China. Especially, research on provincial level oldest old mortality is much less developed in China. Does the oldest old mortality pattern change by province in China? Do the oldest old living in rural China experience higher death risks than their urban counterparts? Previous research has not answered those questions. We try to answer them in this paper based on the Chinese Longitudinal Healthy Longevity Survey (CLHLS) 1998-2000 longitudinal data.

Population aging is a global demographic trend attracting attention from all fields of researchers. It is more serious in the more developed countries than in the developing countries, but the pace of aging in developing countries is more rapid, and their transition from a young to an old age structure country is more compressed in time. Because of highly effective family planning program as well as improvements in longevity, China witnessed a very fast population aging during the last twenty years. China is experiencing population aging at an extraordinarily rapid pace(Ogawa 1988, Zeng at. el. 2001, Zeng and Vaupel 2002). Until 2000, there were 7% of the Chinese population aged 65 and above.

The older population is itself aging. Persons above 80 years old, called oldest old are the fastest growing age group. Currently, the oldest old make up 11 percent of the population aged 60 and above in China. There were about 13 million Chinese oldest old in 2000. This number is expected to clime quickly to about 32, 51, 76 and 114 million in the years 2020, 2030, 2040 and 2050 respectively (Zeng and et al 2003). Those oldest old persons are the most likely to need support from others in the society owing to their poor health status and low functional ability. However, this sub-population is not yet well learned and research on oldest old has not received enough attention. Previous empirical research on Chinese oldest old mortality is even less developed because of data limitation.

PREVIOUS RESEARCH

Mortality research in China has been hampered owing to the limited quality and quantity of reported data. Because of the possibility of serious underregistration of deaths or reliance on an unrepresentative sample of localities, researchers have been reluctant to take these reported death rates at face value (Banister and Preston 1981). Therefore, great efforts have to be put into the adjustment of China's mortality data. Since the 1980's, the quality of China's mortality data has been greatly improved as death registration came to be standardized (Song 2000). The usually available mortality data of China are primarily from national census data and national sampling survey data (Huang 2000). They are also the primary data resources for oldest old mortality research in China.

Gender Differentials

Compared with male oldest old in China, female oldest old are seriously disadvantaged in activities of daily living, physical performance, cognitive function and self-reported health (Zeng and et al 2003). However, in term of mortality, Chinese female oldest old present advantages over their male counterparts as other age groups. Zeng and Vaupel (2003) report that overall differences between male and female Han Chinese death rates after age 80 are statistically significant and those gender differentials of death rates at oldest-old ages tend to decrease with age. Specifically, Chinese Han females' death rates at ages 80-84, 85-89, 90-94, 95-99 and 100-105 are 25.8, 22.6, 19.4, 18.1 and 15.7 percent respectively lower than males (Zeng and Vaupel 2003). Chinese female life expectancy at age 80, 90 and 100 are 23%, 21% and 20% longer than their male counterparts (Zeng and et al 2003). Biological, behavioral and socioeconomic reasons are suggested to explain those gender differences in oldest old mortality (Zeng and et al 2003).

Rural Urban Differences

It is generally believed that China has achieved significant mortality decline since the People's Republic of China has been founded in 1949 (Banister and Preston 1981, Men 1992, Sun and Jin 1995, Song 2000, Banister and Hill 2004). This mortality decline happened in both urban and rural China, although rural China always showed higher mortality than urban China. Figure 1 displays mortality declines from 1949 to 1992 in both rural and urban China, although there is a huge increase in crude death rates around 1960 caused by a catastrophic famine and after the 1980's the crude death rates of China became stable because of population aging. There were continuous mortality differentials between rural and urban China from 1949 to 1992. Declines in age-specific mortality above age 65 are also observed in China (Banister and Hill 2004). Figure 2 displays the life expectancy at age 0 in urban and rural China by province in 1989-1990. The steeper life expectancy line of rural China in Figure 2 indicates that rural China has more provincial variances in life expectancy than urban China.

Figure 1 about here.

Figure 2 about here.

It is well known that rural-urban difference is one of the most significant regional differentials in China. In general, rural population experiences higher mortality than urban population in China. Song (2000) argued that death pattern of aged population is different between urban and rural China and he further pointed out that the differential in respiratory death was one of the most important reasons for the differentials in life expectancy at 65 between urban and rural China. However, as for the oldest old mortality, previous research does not provide consistent conclusion about whether urban China also show advantages over rural China. Although Chinese rural oldest old are significantly more active in their daily living than their urban counterparts (Zeng and et al 2001, Zeng and Vaupel 2002), the rural-urban differences in physical performance are not significant (Zeng and Vaupel 2002). The same research of Zeng and Vaupel (2002) also find that there are no differences in self-reported health status between rural and urban oldest old. The question whether oldest old morality is different between rural and urban China is not clearly answered by previous research.

Provincial Differentials

Regional differentials in mortality of China have been agreed upon by many researchers (Qi 1996, Tu and Wang 1996, Li and Feldman 1996, Huang 2000, Song 2000 and Li 2001). Province is one of the most important administrational units in China and provincial differentials in mortality are important reflects of regional differentials in China. Although much research has shown the evidence of provincial differentials in mortality in China because of different economic development levels (Men1992, Sun 1995, Huang 2000 and Li 2001)), previous research does not tell us if those provincial mortality differentials can also be applied to oldest old population in China.

In brief, previous research has demonstrated that female oldest old have advantages in mortality over their male counterparts. Rural-urban and provincial differences in total mortality are also well established. However, how are the provincial mortality patterns of Chinese oldest old population? Does the rural oldest old mortality differ from their urban counterparts? Previous studies have not answered those questions.

RESEARCH HYPOTHESES

The evidence of provincial differentials in total mortality motivates us to expect that oldest olds' death risks also vary by province in China. If so, we also expect that those provincial differentials in Chinese oldest old morality vary by gender and rural-urban residence because gender and rural-urban residence also affect mortality pattern. We expect that those provincial differentials in oldest old mortality are more significant in rural China than urban China, because development gaps within rural China is much more significant than within urban China. In addition, the evidence of higher mortality in rural China encourages us to expect that rural China also has higher oldest old morality than urban China.

Accordingly, we want to test three hypotheses in this paper. First, Chinese oldest old are subject to different death risks living in different provinces. Second, if so, those provincial differentials in oldest old mortality differ by gender and rural-urban residence. Specifically, rural China shows more significant provincial differentials in oldest old morality than urban China. Finally, oldest old in rural China experience higher death risks than their urban counterparts.

DATA, METHODS AND MEASUREMENTS

The primary data of this study is Chinese Longitudinal Healthy Longevity Survey (CLHLS) 1998-2000 longitudinal dataset. The CLHLS covers 22 out of the 31 provinces in China. The first wave dataset contains the information of 9,093 Chinese old respondents collected in the 1998 baseline survey. The youngest respondent was 77 years old and the oldest one was 122 at baseline survey in 1998. Since we focus our analysis on the oldest old mortality in this paper, all respondents whose age was less than 80 are excluded from this analysis. In addition, because all of the respondents in Beijing were lost to follow-up in 2000 survey, they are dropped form the final analysis. Consequently, final analysis of this paper includes 8,853 oldest old respondents aged 80 and above from 21 provinces in China in the 1998 baseline survey.[b] 3,478 (39.29%) of them are male and 5,375 (60.71%) are female. 3,272 (36.96%) of them lived in urban China and 5,581 (63.04%) lived in rural China when they were interviewed in 1998. 4,744 (53.59%) of them were alive and re-interviewed in 2000. 3,355(37.90%) of them died before 2000 survey and 754 (8.52%) of them were lost to follow-up in the 2000 survey. Table 1 lists the frequency distributions of the sociodemographic characteristics of the respondents in 1998 baseline survey for this study.

Table 1 about here

We use STATA MLOGIT to estimate multinomial logistic regression models of the risks of death before 2000 survey and lost to follow-up compared with being still alive. ANOVA coding is used so that the estimated effects represent odds ratios of died or lost versus alive for the specific province relative to the average level of all provinces. If there are no respondents in the cells, the estimates are constrained to be 0 in the models.

The dependent variable of this study is the survival status of the respondent in 2000 survey. It has three outcomes: still alive, lost to follow-up and died before 2000 survey. The frequencies of survival status of the respondents by province and rural-urban residence are listed in table 2. The primarily independent variables include province, rural-urban residence and gender. Current residence of the respondent is coded 0 for urban area and 1 for rural area. Gender is coded 0 for males and 1 for females. Other covariates include age, education, current marital status, main source of financial support and main occupation before age 60. Those covariates are controlled because of

[b] Among the 8,853 oldest old respondents finally included in this study, 914 (10.32%) of them reported age of 100. This frequency is larger than that of any other reported age. This might be a clue of age reporting problem in the dataset.

potential associations with the dependent variable.

Table 2 about here

Education is measured by years of schooling and its missing values are replaced with the mean years of schooling. Marital status, financial support sources and occupation are all categorical variables and missing values of them are regarded as separate categories.

RESULTS

Provincial Differentials in Chinese Oldest Old Mortality

Table 3 displays the odds of died or lost versus alive by province, rural-urban residence and gender without controlling for any covariates. Table 1 shows that Jilin is the province with the highest death risk for urban, rural and total oldest old while Henan has the lowest death risk for rural and total oldest old. Sichuan and Fujian show the lowest death risk for urban oldest old. Table 4 displays the multinomial logistic regression estimates of the odds ratios of lost or died versus alive relative to the average level without controlling for any other covariates.

Table 3 about here

Table 4 about here

Those provincial variations could not be explained by the sociodemographic characteristics. After controlling for the sociodemographic covariates, some provinces still display significant differences in death risks from the average level. Table 5 and 6 present the estimated effects with controlling for age, gender, rural-urban residence, education, marital status, main financial source and main occupation before age 60. After controlling for the sociodemographic covariates, Jilin still shows significantly higher death risk and Henan, Guangdong and Guangxi show significantly lower death risks than the overall samples.

Provincial differentials in oldest old morality show some variations between females and males in China. This is presented in table 5. Although Guangxi shows both female and male advantages in oldest old mortality over the overall samples, many provinces do not show the same patterns of oldest old mortality for females and males. For example, although female oldest old in Hebei have the most advantages in death risks over the total female samples, their male counterparts show the most disadvantages over the total male samples. In contrast, female oldest old in Shaanxi have significant disadvantages in death risks over the overall female samples while their male counterparts show significant advantages over the overall male samples. Jilin is the province with the most female disadvantages in oldest old death risks while their male counterparts do not show different death risks from the overall samples. Female oldest old in Guangdong have lower death risks than the overall female samples but their male counterparts did not show significant differences from the overall male samples. Henan and Hubei both have male advantages in oldest old mortality but they do not show female advantages.

Table 5 about here

Table 6 shows provincial differentials in oldest old morality in rural and urban China. For rural oldest old, Jilin has the most disadvantages in death risks while Henan, Guangdong, Guangxi and Sichuan show advantages over the overall rural samples. Death risks of oldest old show much less variation in urban China than rural China. In urban China, only Fujian shows lower death risks than overall urban level and all of the other provinces do not show significant differences in death risks. Nevertheless, urban oldest old have much less differentials in death risks across provinces than their rural counterparts.

Table 6 about here

Rural-urban Differences in Chinese Oldest Old Mortality

Table 5 shows that the odds of death for rural oldest old are 12.9% higher than that of their urban counterparts after controlling for the effect of provinces and other covariates. This difference varies between females and males. Table 3 shows that although rural female oldest old have 17% higher death risks than their urban counterparts, rural male oldest old do not show different death risk from their urban counterparts.

Table 4 confirms previous research in terms of gender differentials in Chinese oldest old mortality. Both rural females and urban females present significant advantages in death risks over their male counterparts.

Selection Effects

We also estimate the odds and odds ratios of lost versus alive for each province. It confirms previous studies about the selection effects. In general, rural respondents have lower lost risk than urban respondents, because urban residents tend to move more often than rural residents. However this rural selection effect is just significant for females, not for males. Rural male oldest old do not show significant lower lost risk than their urban counterparts. The difference in selection effects between urban and rural China might contribute to the difference of provincial differential in death risks between urban and rural China. In addition, estimates of selection effects by province also show that the lost risks are higher in some provinces while lower in other provinces. In this sense, the selection effects vary across provinces. We find no evidence of selection effects between genders.

DISCUSSIONS

We use Chinese Longitudinal Healthy Longevity Survey (CLHLS) 1998-2000 longitudinal data to analyze provincial differences in Chinese oldest old mortality. we find that Chinese oldest old have different death risks across provinces. Jilin is the province with the highest death risk for oldest old, especially for female and rural oldest old. Henan has the lowest death risk for oldest old, especially for male and rural oldest old. Those provincial differentials in oldest old mortality vary by both gender and rural-urban residence. Although provincial differentials in oldest old morality exist in rural China, they show little evidence in urban China. We also find the evidence of urban advantages in oldest old morality for females, but not for males. Selection effects happen not only between rural and urban areas but also among provinces.

We have further tested if these rural-urban differentials and gender differentials in oldest old mortality change with provincial characteristics, such as GDP per capita, urban population proportion and illiterate rate. However, we fail to find the evidence of interaction effects on oldest old mortality of the rural-urban residence or gender with those provincial characteristics.

Why does rural China show more variations in provincial oldest old mortality than urban China? There are two potential explanations for it. First, rural China show more hetoscedasticity among provinces than urban China in term of economic development, living standard, medical care condition and so on. In some provinces, rural residents are generally rich and some of them are even richer than some urban residents. In those rich rural areas, the living standard is high and health and aging caring system are well developed. In contrast, rural residents are much poorer in other provinces. Their living standard is very low and health and aging caring system in those rural areas are quite undeveloped. However, those provincial differentials are not so significant in urban China as in rural China. Although big cities usually have higher living standard and better health and aging caring system than middle and small cities, the differences are not so big as those in rural areas. The more significant hetoscedasticity within rural China than urban China might result in more variances in oldest old mortality in rural China than urban China. Second, urban oldest old are more likely to be lost to follow-up than rural oldest old in China, so there might be more selection bias in urban China. This selection bias might hidden the variations of provincial oldest old mortality in urban China.

Another interesting finding of this study is that there is no significant rural-urban difference in oldest old mortality among males. Why? One of the possible explanations is that rural male oldest old tend to have more daily physical activities than urban male oldest old. For example, rural male oldest old are likely to continue to perform garden works, grow vegetables and perform other light labors in the fields, which help them to keep good physical health and thus reduce mortality. That makes up for their disadvantages in living standard and medical care conditions compared with their urban counterparts. Consequently, rural-urban oldest old mortality differences are not significant among males. On the other hand, rural female oldest old usually do not have to perform those kinds of field work because of the traditional work division between genders in rural China. Therefore, rural female oldest olds' disadvantages in living standard, medical care and others compared with their urban counterparts are reflected on their mortality disadvantages.

Provincial differentials in oldest old mortality are reflects of regional development differentials in China. Why does Jilin show such high death risks for oldest old? Why do some of the other provinces show lower death risks for oldest old? What are the exact reasons for those provincial differentials are not quite clear now. This is the primary limitation of this paper, which is also what our future research will focus on. In addition, sine the dataset we use just cover the oldest olds' death information from 1998 to 2000, the results are quite limited in terms of time extension. Nevertheless, this paper is a preliminary study of provincial differentials in oldest old mortality in China. Provincial differentials in Chinese oldest old mortality and their cause analysis need to be further studied.

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Table 1: Frequency distributions of the sociodemographic Characteristics of the respondents in 1998 baseline survey

Socio-demo Variables	Frequency	Percent
Residence		
urban	3,272	36.96
rural	5,581	63.04
Sex		
male	3,478	39.29
female	5,375	60.71
Age		
80-84	1,871	21.13
85-89	1,561	17.63
90-94	1,619	18.29
95-99	1,385	15.64
100-104	2,191	24.75
105+	226	2.55
Year of Schooling		
0 Illiterate	6,001	67.78
1-5 Primary School	1,873	21.16
6-11 Middle School	696	7.86
12+ College +	236	2.67
Missing	47	0.53
Marital Status		
Currently Married	1,370	15.47
Seperated	105	1.19
Divorced	58	0.66
Widowed	7,207	81.41
Never married	108	1.22
Missing	5	0.06
Total	8,853	100.00

Table 2: Frequencies of survival status by province and rural-urban residence of Chinese oldest old 1998-2000

province	Urban			Rural			Total		
	Lost	Alive	Died	Lost	Alive	Died	Lost	Alive	Died
tianjian	9	38	21	0	19	15	9	57	36
hebei	2	23	11	1	13	18	3	36	29
shanxi	1	25	16	0	14	15	1	39	31
liaoning	33	78	59	3	64	56	36	142	115
jilin	18	48	41	0	9	20	18	57	61
helongjiang	20	56	44	0	6	11	20	62	55
shanghai	38	135	101	20	60	46	58	195	147
jiangsu	37	197	118	28	414	369	65	611	487
zhejiang	14	98	67	40	262	250	54	360	317
anhui	20	81	41	20	185	147	40	266	188
fujian	10	110	51	2	121	110	12	231	161
jiangxi	2	29	14	3	52	45	5	81	59
shangdong	27	52	38	20	156	114	47	208	152
henan	15	35	17	32	155	91	47	190	108
hubei	19	62	39	13	95	77	32	157	116
hunan	10	61	29	6	104	99	16	165	128
guangdong	24	93	60	40	288	185	64	381	245
guangxi	3	162	88	19	595	379	22	757	467
chongqing	16	73	35	47	83	59	63	156	94
sichuan	82	308	143	56	204	152	138	512	295
shaanxi	3	43	29	1	38	35	4	81	64
Total	403	1807	1062	351	2937	2293	754	4744	3355

Table 3: Odds of Died/Lost vs. Alive by Province, Rural-urban Residence and Gender

	Rural						Urban						Total					
	Female N=3440		Male N=2141		Sub-total N=5581		Female N=1935		Male N=1337		Sub-total N=3272		Female N=5375		Male N=3478		Total N=8853	
	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died
Tianjin	0	.727	0	.875	0	.789	.115	.423	.500	.833	.237	.553	.081	.514	.300	.850	.158	.632
Hebei	.167	1.167	0	1.571	.077	1.385	0	.200	.667	2.33	.087	.478	.038	.423	.200	1.800	.083	.806
Shanxi	0	1.167	0	1.000	0	1.071	.077	.615	0	.667	.040	.640	.053	.789	0	.800	.026	.795
Liaoning	.095	1.143	.023	.744	.047	.875	.478	.848	.344	.625	.423	.756	.358	.940	.160	.693	.254	.810
Jilin	0	7.000	0	1.625	0	2.222	.500	.917	.250	.792	.375	.854	.480	1.160	.188	1.000	.316	1.070
Heilongjiang	0	1.25	0	3.000	0	1.833	.407	.741	.310	.828	.357	.786	.355	.806	.290	.968	.323	.887
Shanghai	.237	.789	.500	.727	.333	.767	.286	.883	.276	.569	.281	.748	.270	.852	.338	.613	.297	.754
Jiangsu	.069	.908	.065	.863	.068	.891	.189	.676	.186	.500	.188	.599	.105	.839	.109	.732	.106	.797
Zhejiang	.151	1.034	.155	.853	.153	.954	.145	.727	.140	.628	.143	.684	.149	.950	.151	.792	.150	.881
Anhui	.089	.772	.145	.838	.108	.795	.347	.500	.114	.514	.247	.506	.160	.698	.134	.722	.150	.707
Fujian	.026	.936	0	.860	.017	.909	.143	.607	.037	.315	.091	.464	.075	.799	.021	.557	.052	.697
Jiangxi	.088	.706	0	1.167	.058	.865	.200	.700	0	.368	.069	.483	.114	.705	0	.757	.062	.728
Shandong	.087	.815	.188	.609	.128	.731	.425	.55	.833	1.333	.519	.731	.189	.735	.289	.724	.226	.731
Henan	.224	.663	.175	.456	.206	.587	.667	.476	.071	.500	.429	.486	.303	.630	.155	.465	.247	.568
Hubei	.189	.962	.071	.619	.137	.811	.552	.966	.091	.333	.306	.629	.317	.963	.080	.493	.204	.739
Hunan	.062	1.049	.043	.609	.058	.952	.196	.451	0	.600	.164	.475	.114	.818	.030	.606	.097	.776
Guangdong	.156	.725	.116	.529	.139	.642	.254	.556	.267	.833	.258	.645	.183	.678	.146	.589	.168	.643
Guangxi	.025	.638	.043	.635	.032	.637	.033	.622	0	.444	.019	.543	.027	.634	.033	.590	.029	.617
Chongqing	.648	.667	.413	.793	.566	.711	.371	.629	.079	.342	.219	.479	.539	.652	.224	.537	.404	.603
Sichuang	.294	.765	.247	.718	.275	.745	.231	.457	.311	.474	.066	.464	.257	.582	.286	.568	.270	.576
Shaanxi	.056	1.389	0	.500	.026	.921	0	.952	.136	.409	.070	.674	.026	1.154	.071	.452	.049	.790

i. No covariates are controlled in this table.

Table 4: Multinomial logistic estimates of odds ratios of died/Lost vs. alive by province, rural-urban residence and gender

	Rural						Urban						Total					
	Female N=3440		Male N=2141		Sub-total N=5581		Female N=1935		Male N=1337		Sub-total N=3272		Female N=5375		Male N=3478		Total N=8853	
	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died	Lost	Died
Tianjin	0	.808	0	1.115	0	.942	.452	.679	0	1.083	1.358	.933	.564	.680	2.281*	1.204	1.166	.860
Hebei	1.315	1.145	0	2.003	.641	1.488	0	.397*	2.468	3.243*	.498	.808	.268	.560*	1.324	2.509**	.616	1.097
Shanxi	0	1.296	0	1.274	0	1.278	.209	.974	0	1.300	.229	1.081	.366	1.045	0	1.293	.189*	1.082
Liaoning	.818	1.138	.072	.856	.477	.954	2.127***	1.370	2.157**	1.041	2.425***	1.277	2.492***	1.245	1.266	.994	1.873***	1.103
Jilin	0	7.776**	0	2.071*	0	2.651**	2.174**	1.470	1.473	1.310	2.150**	1.442	3.340***	1.535	1.434	1.425	2.333**	1.457**
Heilongjiang	0	1.389	0	3.823*	0	2.187	1.769	1.190	1.915	1.376	2.047**	1.327	2.469**	1.067	2.263**	1.379	2.383***	1.208
Shanghai	2.147**	.789	5.058***	.824	3.635***	.836	1.275	1.432**	1.782*	.957	1.614**	1.263*	1.876***	1.128	2.714***	.878	2.197***	1.026
Jiangsu	.631*	.910	.675	1.004	.742	.975	.845	1.097	1.207	.844	1.077	1.011	.729*	1.110	.877	1.053	.785*	1.085
Zhejiang	1.381	1.036	1.655	.992	1.680**	1.043	.628	1.177	.832	1.052	.819	1.154	1.038	1.258**	1.214	1.138	1.108	1.199**
Anhui	.815	.773*	1.476	.970	1.182	.868	1.537	.808	.637	.858	1.415	.855	1.112	.924	1.064	1.035	1.111	.962
Fujian	.221**	.936	0	1.097	.161**	.993	.616	.982	.166**	.529**	.521**	.783	.519**	1.057	.140**	.799	.384***	.949
Jiangxi	.777	.705	0	1.487	.587	.943	.709	1.098	0	.718	.395	.815	.791	.933	0	1.223	.456*	.992
Shandong	.788	.816	1.948*	.705*	1.401	.799*	1.878**	.887	5.022***	2.148**	2.977***	1.234	1.318	.973	2.321***	1.037	1.669**	.995
Henan	2.056***	.664**	1.797	.527**	2.267***	.642***	2.906***	.762	.153	.811	2.457***	.820	2.105***	.834	1.223	.666**	1.827***	.774**
Hubei	1.714	.962	.597	.712	1.485	.885	2.426***	1.552*	.472	.556*	1.757**	1.062	2.206***	1.275	.615	.707*	1.506**	1.006
Hunan	.554	1.050	.132	.690	.613	1.039	.854	.729	0	1.170	.940	.803	.791	1.083	.165	.864	.716	1.056
Guangdong	1.428	.726**	1.220	.615***	1.528**	.702***	1.125	.900	1.630	1.386	1.479*	1.089	1.271	.898	1.170	.847	1.241	.876
Guangxi	.226***	.639***	.444**	.741**	.349***	.697***	.132***	1.009	0	.867	.106***	.917	.185***	.840**	.259***	.849	.215***	.840**
Chongqing	5.944***	.667*	4.243***	.905	6.224***	.776	1.627	1.013	.411	.572*	1.256	.810	3.752***	.863	1.781**	.770	2.983***	.820
Sichuang	2.701***	.766*	2.645***	.832	3.025***	.814*	1.043	.742**	2.078***	.802	1.526***	.784**	1.787***	.771**	2.325***	.817*	1.991***	.785
Shaanxi	.445	1.382	0	.637	.222	1.002	0	1.891**	.701	.675	.400	1.139	.178*	1.527**	.516	.646	.365**	1.076
Pseudo R^2	.0307		.0268		.0272		.0256		.0272		.0216		.0252		.0230		.0208	

i. p<0.1 **p<0.05 ***p<0.005

ii. No covariates are controlled in this table.

iii. The estimated effects represent odds ratios of died or lost versus alive for the specific province relative to the average level of all provinces.

Table 5: Multinomial logistic estimates of odds ratios of died/lost vs. alive by province and gender

	Female N=5375		**Male N=3478**		**Total N=8853**	
	Lost	Died	Lost	Died	Lost	Died
Tianjin	.471	.636	2.34	1.417	1.013	.897
Hebei	.212	.483**	1.377	2.665**	.562	1.068
Shanxi	.332	1.166	0	1.733	.183*	1.317
Liaoning	2.093***	1.285	1.289	.929	1.730***	1.085
Jilin	2.548**	1.939**	1.240	1.198	1.907**	1.498**
Heilongjiang	1.863*	1.385	1.770	1.241	1.872**	1.329
Shanghai	1.573**	1.156	2.342***	1.065	1.864***	1.110
Jiangsu	.814	1.045	.936	.952	.871	1.004
Zhejiang	1.171	1.186	1.387	1.064	1.236	1.132
Anhui	1.312	.899	1.170	1.146	1.265	.979
Fujian	.514**	.961	.141**	.797	.378***	.886
Jiangxi	.926	.945	0	1.137	.509	.971
Shandong	1.477*	.955	2.592***	1.067	1.839***	.990
Henan	2.589***	.834	1.249	.610**	2.055***	.743**
Hubei	2.482***	1.303	.625	.678*	1.619**	.991
Hunan	.881	1.126	.176	.661	.715	1.008
Guangdong	1.465*	.779**	1.320	.845	1.408**	.793**
Guangxi	.224***	.767**	.283***	.777**	.253***	.777***
Chongqing	4.010***	.754	1.783*	.918	3.079***	.805
Sichuang	1.790***	.852	2.039***	.904	1.915***	.881
Shaanxi	.165*	1.540*	.520	.622*	.347**	1.075
Rural	.578***	1.170**	.850	1.038	.668***	1.129**
Pseudo R^2	.1056		.0973		.0947	

i. p<0.1 **p<0.05 ***p<0.005

ii. In this table rural-urban residence, age, education, marital status, main financial resource and occupation are controlled. For the model of total sample gender is also controlled.

iii. The estimated effects represent odds ratios of died or lost versus alive for the specific province relative to the average level of all provinces.

Table 6: Multinomial logistic regression estimates of odds of died/lost vs. alive by province and rural-urban residence

	Rural N=5581		**Urban N=3272**		**Total N=8853**	
	Lost	Died	Lost	Died	Lost	Died
Tianjin	0	1.110	1.241	.818	1.013	.897
Hebei	.679	1.594	.452	.678	.562	1.068
Shanxi	0	1.392	.241	1.266	.183*	1.317
Liaoning	.483	.960	2.336***	1.178	1.730***	1.085
Jilin	0	2.422**	1.971**	1.347	1.907**	1.498**
Heilongjiang	0	1.809	1.911**	1.317	1.872**	1.329
Shanghai	3.377***	.965	1.463*	1.194	1.864***	1.110
Jiangsu	.732	.898	1.243	1.066	.871	1.004
Zhejiang	1.687**	1.047	.850	1.186	1.236	1.132
Anhui	1.234	.897	1.599*	.994	1.265	.979
Fujian	.153**	.951	.509**	.727*	.378***	.886
Jiangxi	.609	1.016	.417	.642	.509	.971
Shandong	1.448	.856	2.880***	1.208	1.839***	.990
Henan	2.264***	.676**	2.271**	.790	2.055***	.743**
Hubei	1.520	.839	1.906**	1.199	1.619**	.991
Hunan	.596	.959	.950	.947	.715	1.008
Guangdong	1.554**	.688***	1.530*	.943	1.408**	.793**
Guangxi	.342***	.668***	.113***	.985	.253***	.777***
Chongqing	5.783***	.753	1.304	.870	3.079***	.805
Sichuang	2.875***	.808*	1.590***	.942	1.915***	.881
Shaanxi	.244	.944	.378*	1.180	.347**	1.075
Female	1.035	.650***	1.083	.582***	1.070	.625***
Pseudo R^2	.0989		.0923		.0947	

i.* p<0.1 **p<0.05 ***p<0.005

ii. In this table gender, age, education, marital status,main financial resource and occupation are controlled. For the model of total sample rural-urban residence is also controlled.

iii. The estimated effects represent odds ratios of died or lost versus alive for the specific province relative to the average level of all provinces.

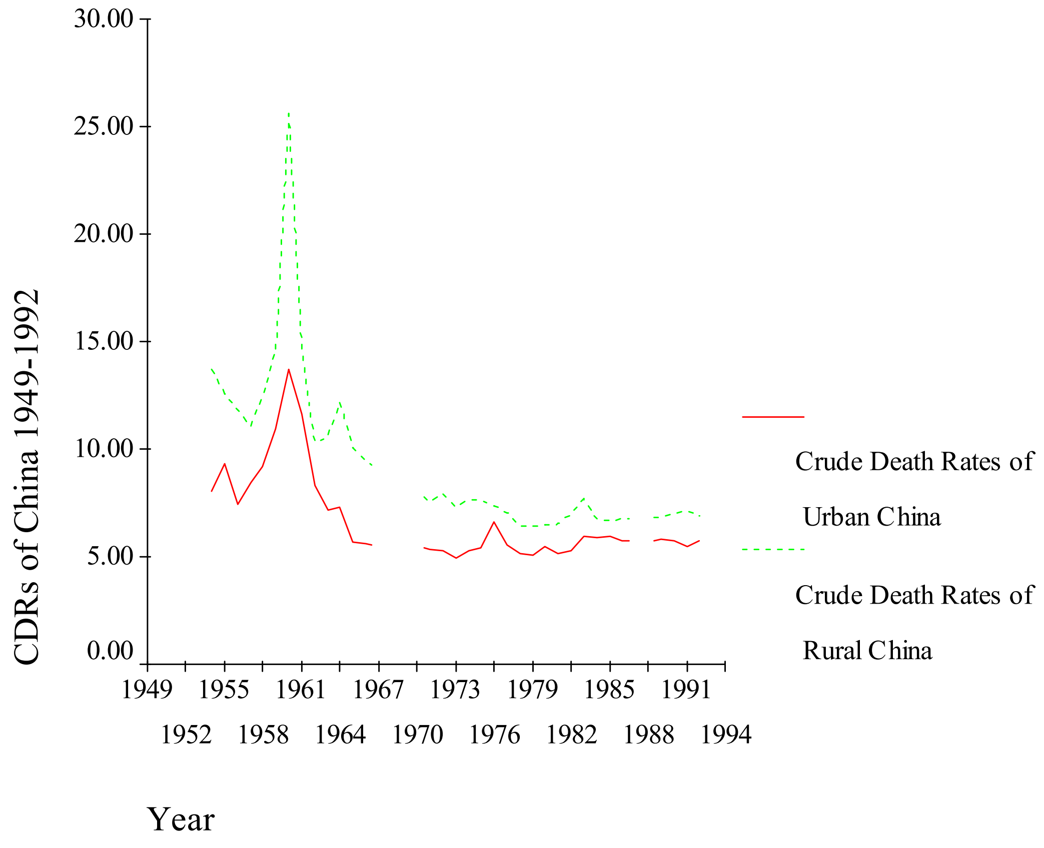

Figure 1: Crude death rates of urban and rural China 1949-1992
Data source: Mortality Data of China 1995

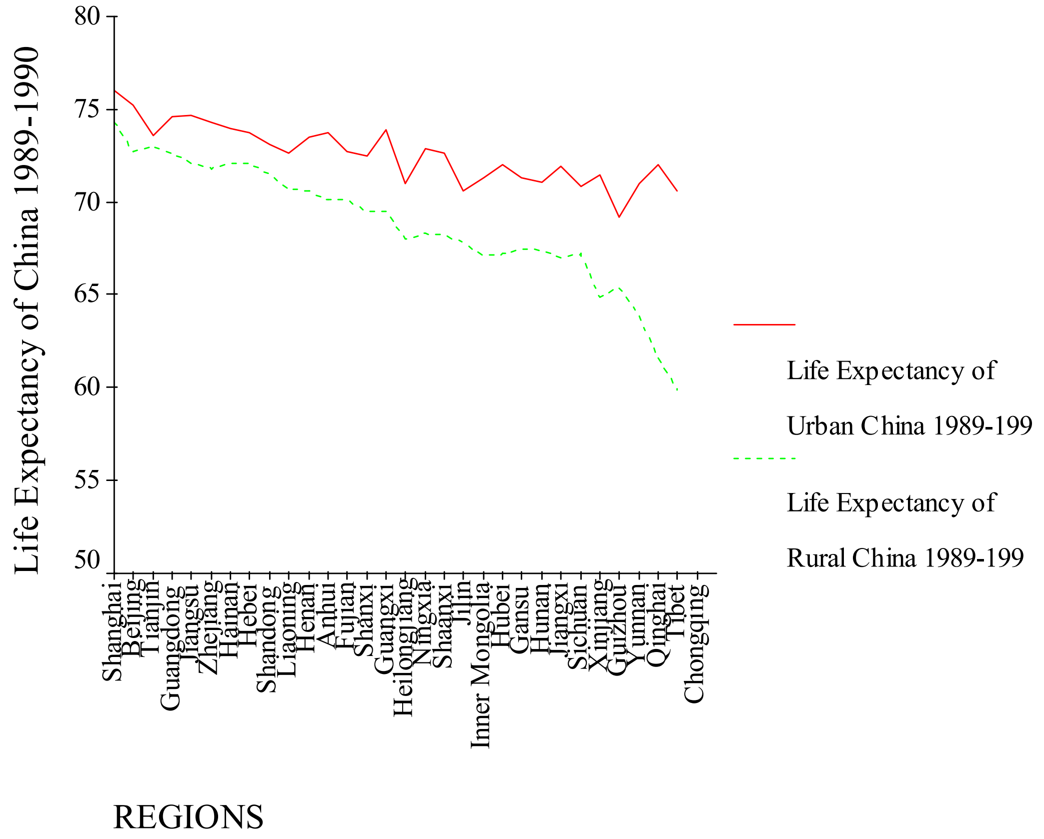

Figure 2: Life expectancies of urban and rural China 1989-1990 by province
Data source: Mortality Data of China 1995