Web Appendix 1. Distributions of Number of City Districts and Samples by Province

Provinces	No. of Cities	No. of City Districts	No. of Samples	Provinces	No. of Cities	No. of City Districts	No. of Samples
Beijing	1	12	255	Jiangxi	8	22	70
Tianjin	1	13	137	Shandong	9	31	320
Hebei	6	17	70	Henan	8	40	156
Shanxi	7	13	85	Hubei	8	46	347
Liaoning	7	39	439	Hunan	13	42	208
Jilin	9	31	230	Guangdong	10	30	242
Heilongjiang	12	46	250	Guangxi	10	48	680
Shanghai	1	19	543	Chongqiong	1	24	209
Jiangsu	11	53	944	Sichuan	15	53	703
Zhejiang	11	54	769	Shaanxi	6	22	134
Anhui	9	40	273				
Fujian	9	40	294	Total	171	735	7,358

Web Appendix 2. API Definition and Classification

The National Environmental Monitoring Center, China, collects information to construct API based on the following pollutant concentrations: SO_2, NO_2, and inhalable particulates (including PM_{10}, CO, and O_3). A sub-API is calculated daily for each pollutant concentration according to the criteria shown in Table A. Then the maximum of all sub-APIs is taken as the daily API of the city. The yearly API, which is the average of daily APIs for a given year, is released by the Ministry of Environmental Protection of China, which classifies air quality into seven categories based on the yearly API with a score from 1 to 7: Excellent (API 0-50), good (API 51-100), slightly polluted (API 101-150), light polluted (API 151-200), moderately polluted (API 201-250), moderately heavily polluted (API 251-300), and heavily polluted (API>300). Please refer http://www.sepa.gov.cn/english/airqualityinfo.htm for more information.

Table A. The API value and corresponding pollutant concentrations

Air Pollution Index	Pollutant Concentrations (mg/cubic meter)				
	SO_2 (daily average)	NO_2 (daily average)	PM_{10} (daily average)	CO (hourly average)	O_3 (hourly average)
50	0.050	0.080	0.050	5	0.120
100	0.150	0.120	0.150	10	0.200
200	0.800	0.280	0.350	60	0.400
300	1.600	0.565	0.420	90	0.800
400	2.100	0.750	0.500	120	1.000
500	2.620	0.940	0.600	150	1.200

Web Appendix 3. Regression Models

(1) Two-level linear regression models

The two-level linear regression models employed in this study for IADL difficulty and cognitive impairment can be summarized as the following simultaneous equations:

$$Y_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + e_{ij} \text{ (at the individual-level)}$$

$$\beta_{0j} = \gamma_{00} + \sum_{s=1}^{S} \gamma_{0s} W_{sj} + u_{oj} \text{ and } \beta_{qj} = \gamma_{q0} \text{ (at the city district-level)}$$

Where, j =1, …, J (J =735) is the code number of city districts; i =1,…, n_j is the code number of the individuals in Unit j; Y_{ij} is the dependent variable of either IADL difficulty or cognitive impairment; β_{qj} $(q = 0,1,...,Q)$ is individual-level coefficients; Q is the total number of control variables at the individual level; X_{qij} refers to individual-level variable q for individual i in city district j; e_{ij} is the individual-level random effect; γ_{0s} $(s = 0,1,...,S)$ and γ_{q0} are city district-level coefficients; S is the total number of city district-level variables; W_{sj} refers to city district-level variable s for unit j; u_{oj} is the city district-level random effect.

(2) Two-level logistic regression models

The two-level logistic regression models employed in this study for ADL difficulty and poor self-rated health can be summarized as the following simultaneous equations:

$$\log\left[\frac{\phi_{ij}}{1-\phi_{ij}}\right] = \beta_{0j} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + e_{ij} \text{ (at the individual-level)}$$

$$\beta_{0j} = \gamma_{00} + \sum_{s=1}^{S} \gamma_{0s} W_{sj} + u_{oj} \text{ and } \beta_{qj} = \gamma_{q0} \text{ (at the city district-level)}$$

Where, ϕ_{ij} is the probability for having ADL difficulty or poor self-rated health for individual i in city district j; all other symbols have the same meanings as defined above.

Web Appendix 4. The Average Level of API by City District GDP per Capita

GDP per capita	Mean of API	S. D.	# of Districts
Low	3.25	1.02	105
Medium	3.57	1.26	332
High	3.47	1.15	298

P-value of the ANOVA F-test: .062

Reference

Raudenbush S, Bryk A, Cheong YF., et al. *HLM: Hierarchical Linear and Nonlinear Modeling*. Scientific Software International, Inc.: Lincolnwood, IL; 2004.