

**Association between control status of blood pressure and frailty among middle-aged and older adults with hypertension in China: a longitudinal study**

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Supplementary materials

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Table S1. Summary of all Frailty Index Items

1.Have Difficulty Running Or Jogging About 1 Km.
2.Have Difficulty Walking 1 Km.
3.Have Difficulty Walking 100 Meters.
4.Any Pain.
5.Difficult For Controlling Urination And Defecation.
6.Hearing Problem.
7.Eyesight Problem.
8.Speech Problem.
9.Difficulty Getting Up From Chair After Sitting For Long Periods.
10.Difficulty Climbing Several Flights of Stairs Without Resting.
11.Difficulty Stooping, Kneeling or Crouching.
12.Difficulty Reaching or Extending Your Arms Above Shoulder Level.
13.Difficulty Lifting or Carrying Weights Over 10 Jin.
14.Difficulty Picking Up a Small Coin From A Table.
15.Difficulty With Dressing.
16.Difficulty With Bathing Or Showering.
17.Difficulty With Eating.
18.Difficulty With Getting Out of Bed Or Getting In Bed.
19.Difficulty Using The Toilet.
20.Difficulty Managing Money.
21.Difficulty Taking Medications.
22.Difficulty Shopping For Groceries.
23.Difficulty Preparing a Hot Meal.
24.Difficulty Cleaning House.
25.Ever Had Diabetes.
26.Ever Had Cancer.
27.Ever Had Lung Disease.
28.Ever Had Heart Problem.
29.Ever Had Stroke.
30.Ever Had Psychological Problem.
31.Ever Had Arthritis.
32.Ever Had Dyslipidemia.
33.Ever Had Liver Disease.
34.Ever Had Kidney Disease.
35.Ever Had Stomach Or Digestive Disease.
36.Ever Had Asthma.
37.Fractured Hip.
38.Fallen Down.
39.Ever Had Memory Problem.
40.Immediate Word Recall.
41.Delayed Word Recall.

42.Auxiliary.
43.Felt Depressed Much Of The Time During The Past Week.
44.Felt Everything They Did During The Past Week Was An Effort.
45.Felt Their Sleep Was Restless.
46.Was Happy.
47.Felt Lonely.
48.Bothered By Little Things.
49.Could Not Get Going.
50.Had Trouble Keeping Mind On What Is Doing.
51.Feel Hopeful About The Future.
52.Feel Fearful.
53.Cognition Date Naming-Month.
54.Cognition Date Naming-Day Of Month.
55.Cognition Date Naming-Year.
56.Cognition Date Naming-Day Of Week.

**Table S2** Variable description

<b>Variable name</b>	<b>Definition or code</b>
<b>Dependent variable</b>	
Frailty	0=non-frail or pre-frail (frailty score<0.25); 1=frail (frailty score $\geq$ 0.25 to 1.00).
<b>Independent variables</b>	
Blood pressure control	0=well controlled; 1=poorly controlled.
<b>Covariates</b>	
Age	--
Gender	1=male; 2=female.
Marital status	1=married or partnered; 2=separated, divorced or widowed.
Hukou status	Hukou indicates the respondent's hukou place and is a special identifier in China. Hukou status affects many aspects of life in China such as buying a house, buying a car, children's school enrollment and other welfare. 1=Agricultural hukou; 2=Non-agricultural hukou; 3=Unified residence hukou or do not have hukou.
Education levels	Education level is a simplified version of 1997 International Standard Classification of Education (ISCED-97) codes. 1=Less than lower secondary education; 2=Upper secondary & vocational training; 3=Tertiary education.
Living areas	Living area indicates the household living region and is defined by National Bureau of Statistics of the People's Republic of China. 1=rural; 2=urban.
Public health insurance coverage	A code of 0 indicates that the respondent is not covered by any public health insurance plan. A code of 1 indicates that the respondent is covered by at least one type of public health insurance plan, including Urban Employee Medical Insurance, Urban Resident Medical Insurance, New Cooperative Medical Insurance, Urban and Rural Resident Medical Insurance, Government Medical Insurance, Medical Aid or other government insurance plan.
Current work status	Current work status indicates whether the respondent engaged in any work in the past year. Participants were coded as 1 if they engaged in agricultural work, non-agricultural employed work, non-agricultural self-employment work, or non-agricultural family business work per the labor force status of each wave respectively. And this variable was assigned 0 if the respondent is unemployed, retired, or never worked per the labor force status of each wave respectively.
Alcohol intake	Alcohol intake indicates whether the respondent has had an alcoholic beverage in the last 12 months. A code of 0 indicates that the respondent reports not having any alcoholic beverage in the last 12 months. A code of 1 indicates that the respondent reports having had an

	alcoholic beverage in the last 12 months.
Smoking	It indicates the respondent's current smoking habit. 0=never smoke; 1=ever smoke but quit now; 2=still smoking now.
Household per capita consumption	Household per capita consumption is calculated by taking total household consumption divided by the number of people in the household. The amount of total household consumption as aggregated from all consumption activities: food consumption in last week, non-food in the past 30 days, and other non-food consumption in the past year.
Comorbidity	Comorbidity indicates whether the respondent are suffering from other chronic noncommunicable diseases besides hypertension. 0=no; 1=yes.
Antihypertensive treatment	Antihypertensive treatment whether the respondents are taking western medicine or Chinese medicine, or other measures to control blood pressure.

**Table S3** Description of covariates in the baseline before and after imputation\*

Variable name	Variable type	Missing values	Mean	
			before imputation	after imputation
Age	continuous	0	61.89	61.89
Gender	binary	0	1.54	1.54
Education levels	ordered-categorical	0	1.15	1.15
Marital status	binary	1	0.86	0.86
Living areas	binary	0	1.43	1.43
Hukou status	ordered-categorical	7	1.29	1.29
Public health insurance coverage	binary	30	0.97	0.97
Current work status	binary	26	0.58	0.58
Alcohol intake	binary	2	0.3	0.3
Smoke	ordered-categorical	652	0.4	0.5
Household per capita consumption	continuous	1057	11828.73	11653.24
Comorbidity	binary	0	0.8	0.8
Antihypertensive treatment	binary	6	0.81	0.81

\* The imputing method was from the posterior predictive distribution (ppd).

Table S6 STROBE Statement

	Item No	Recommendation	Whether contained in the manuscript
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	√
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	√
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	√
Objectives	3	State specific objectives, including any prespecified hypotheses	√
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	√
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	√
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	√
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	Not applicable.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	√
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	√
Bias	9	Describe any efforts to address potential sources of bias	√
Study size	10	Explain how the study size was arrived at	√
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	√
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	√
		(b) Describe any methods used to examine subgroups and interactions	√
		(c) Explain how missing data were addressed	√

		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	√
		(e) Describe any sensitivity analyses	√
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	√
		(b) Give reasons for non-participation at each stage	√
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	√
		(b) Indicate number of participants with missing data for each variable of interest	√
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	√
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	√
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	√
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	√
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	√
		(b) Report category boundaries when continuous variables were categorized	√
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	<i>Not applicable.</i>
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	√
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	√
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	√
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar	√



		studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	√
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	√

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

**Table S5** Baseline description of the participants enrolled in the Cox regression (N=1932)

	Well-controlled (N=1624)	Poorly-controlled (N=308)	P value
Age	61.02 ± 8.63	59.66 ± 8.27	0.011
Gender			0.914
Male	886 (54.56%)	167 (54.22%)	
Female	738 (45.44%)	141 (45.78%)	
Education levels			0.06
Less than lower secondary	1320 (81.28%)	267 (86.69%)	
Upper secondary & vocational training	244 (15.02%)	35 (11.36%)	
Tertiary	60 (3.69%)	6 (1.95%)	
Marital status			0.67
Married	156 (9.61%)	32 (10.39%)	
Divorced or widowed	1468 (90.39%)	276 (89.61%)	
Living areas			<0.001
Rural	802 (49.38%)	190 (61.69%)	
Urban	822 (50.62%)	118 (38.31%)	
Hukou status <sup>a</sup>			<0.001
Agricultural	1039 (64.06%)	237 (77.20%)	
Non-agricultural	557 (34.34%)	67 (21.82%)	
Unified residence or Do not have	26 (1.60%)	3 (0.98%)	
Public health insurance coverage			0.564
Not covered	43 (2.67%)	10 (3.26%)	
Covered	1568 (97.33%)	297 (96.74%)	
Current work status			0.018
Not working	620 (38.49%)	96 (31.37%)	
Working	991 (61.51%)	210 (68.63%)	
Alcohol intake			0.463
Do not drink	1042 (64.20%)	191 (62.01%)	
Drink	581 (35.80%)	117 (37.99%)	
Smoke			0.100
Never	902 (71.64%)	159 (67.95%)	
Quit now	158 (12.55%)	25 (10.68%)	
Smoke	199 (15.81%)	50 (21.37%)	
Household per capita consumption	12834.53 ± 17685.92	10960.66 ± 13959.56	0.017
Comorbidity			0.673
No	471 (29.00%)	93 (30.19%)	
Yes	1153 (71.00%)	215 (69.81%)	
Antihypertensive treatment			<0.001
No	335 (20.65%)	93 (30.19%)	
Yes	1287 (79.35%)	215 (69.81%)	

**Table S6** Baseline distribution of frailty scores and prevalence of frailty in the well-controlled and poorly controlled BP groups within different subgroups\*

	Well-controlled (N=2600)		Poorly-controlled (N=654)	
	Mean (SD)	N(%)	Mean (SD)	N(%)
<b>Age group</b>				
<60 years old	0.20 ± 0.11	310 (30.1%)	0.25 ± 0.13	122 (43.4%)
≥60 and <75 years old	0.24 ± 0.12	553 (41.3%)	0.30 ± 0.14	186 (57.94%)
≥75 years old	0.28 ± 0.13	113 (48.9%)	0.34 ± 0.13	38 (73.1%)
<b>Gender</b>				
Male	0.20 ± 0.11	313 (26.1%)	0.25 ± 0.13	118 (41.4%)
Female	0.25 ± 0.12	663 (47.3%)	0.31 ± 0.13	228 (61.8%)
<b>Living area</b>				
Rural	0.25 ± 0.12	625 (43.8%)	0.29 ± 0.13	234 (55.2%)
Urban	0.20 ± 0.11	351 (29.9%)	0.27 ± 0.13	112 (48.7%)

SD, standard deviation.

\*Mean and SD were used to describe the distribution of frailty score; N(%) was used to describe the prevalence of frailty, which means frailty score > 0.25.