Depression on Survival Among Chinese Older Adults

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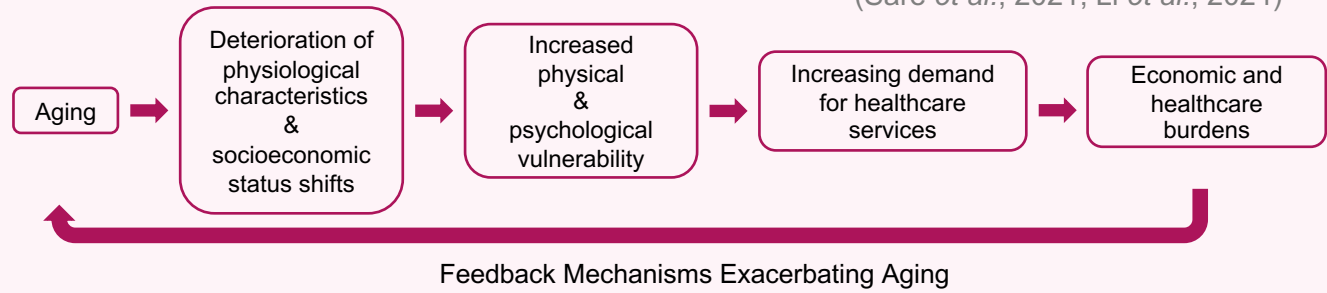
UCL

Introduction

Background

Global population aging – 1.5 billion (16%) people aged ≥ 65 by 2050.
(Padeiro, Santana and Grant, 2023)

Population aging in China – 365 million (26.1%) people aged ≥ 65 by 2050.
(Fang *et al.*, 2020)

Implications of population aging
(Šare *et al.*, 2021; Li *et al.*, 2024)

Aging → Deterioration of physiological characteristics & socioeconomic status shifts → Increased physical & psychological vulnerability → Increasing demand for healthcare services → Economic and healthcare burdens

Feedback Mechanisms Exacerbating Aging

Later-life depression – rising prevalence (33%); increasing per capita annual medical expenditure; stigmatized public perception.
(Hsieh and Qin, 2017; Yang *et al.*, 2020; Cui *et al.*, 2022)

Research Gaps

Depression and mortality – Depression measurement included sleep items
Sleep duration and mortality – Inconsistent findings (J-shaped and U-shaped relationship)
Depression and sleep duration – Inadequate longitudinal studies

Research questions and objectives

How is depression related to all-cause mortality among older Chinese adults?

OB1: To investigate the association between depression and all-cause mortality.
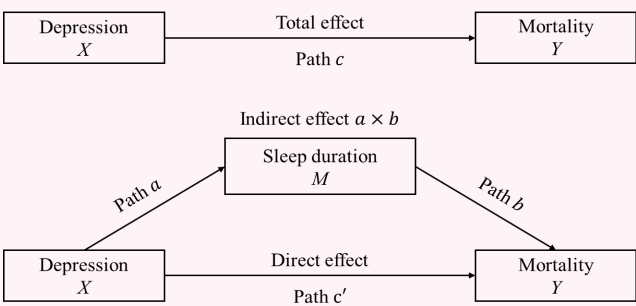**OB2**: To examine potential mediating effect of sleep duration in the association between depression and mortality.
OB3: To explore the possible gender differences in the relationship between depression and mortality.

Statistical modelling

OB1 Cox proportional hazard (PH) regression model:
$$h_i(t) = h_0(t) \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik})$$
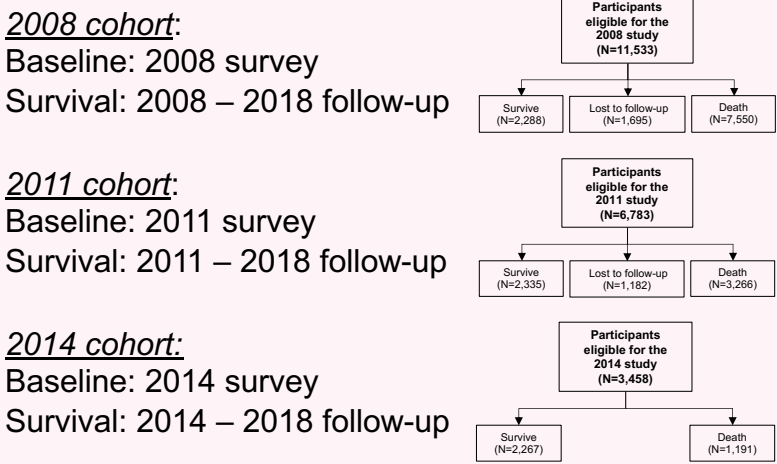
OB2 Mediating models

Depression X —— Total effect / Path c —— Mortality Y

Indirect effect $a \times b$
Sleep duration M
Path a / Path b

Depression X —— Direct effect / Path c' —— Mortality Y

OB3 Gender-based subgroup analysis

Methodology

Data source
Chinese Longitudinal Healthy Longevity Survey
1998, 2000, 2002, 2005, 2008-2009, 2011-2012, 2014, 2017-2018

Sample selection for three cohorts   Dataset

2008 cohort:
Baseline: 2008 survey
Survival: 2008 – 2018 follow-up

2011 cohort:
Baseline: 2011 survey
Survival: 2011 – 2018 follow-up

2014 cohort:
Baseline: 2014 survey
Survival: 2014 – 2018 follow-up

Participants eligible for the 2008 study (N=11,533) — Survive (N=2,288) / Lost to follow-up (N=1,695) / Death (N=7,550)
Participants eligible for the 2011 study (N=6,783) — Survive (N=2,335) / Lost to follow-up (N=1,182) / Death (N=3,266)
Participants eligible for the 2014 study (N=3,458) — Survive (N=2,267) / Death (N=1,191)
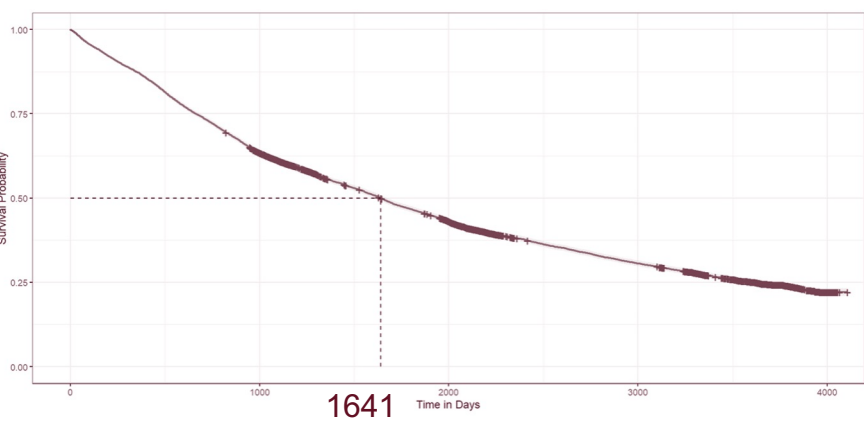
Measures
Survival: 1-died, 0-survived or lost to follow-up.
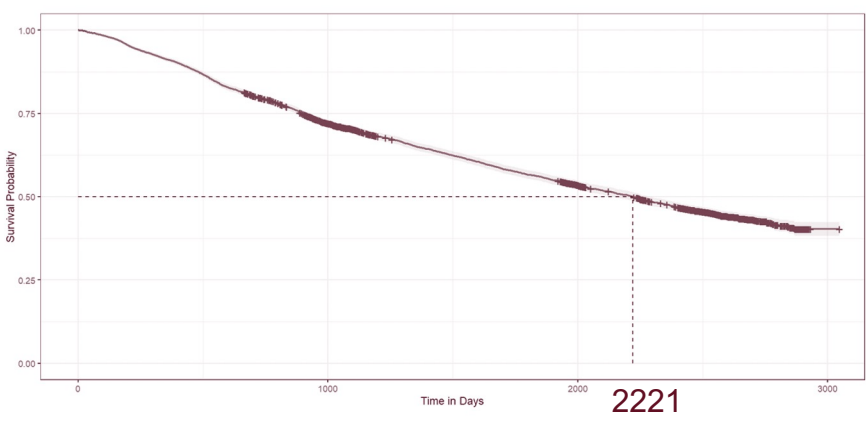*Survival time*: Baseline for each cohort to date of death/the last available interview.
Depression: Sum of five self-reported items, ranging from 0-20.
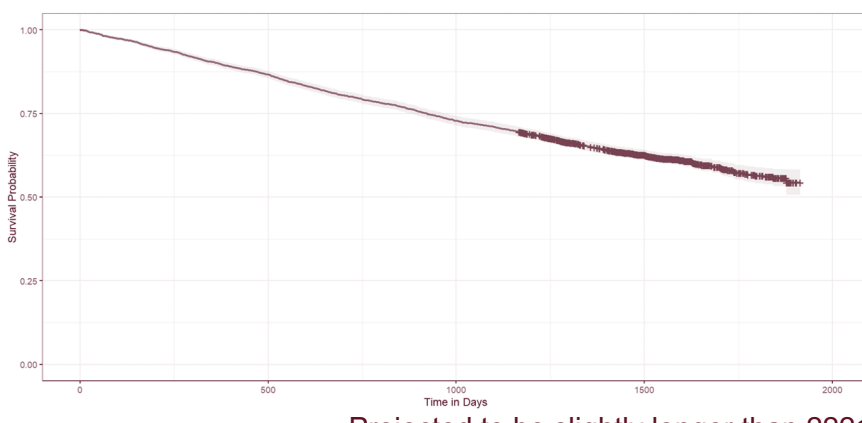
Results: Median survival time

2008 Study — Strata + All

1641

2011 Study — Strata + All

2221

2014 Study — Strata + All

Projected to be slightly longer than 2221

Results: Cox models

2008 Study

Variable	Model 1 HR (95% CI)	Model 1 p value	Model 2 HR (95% CI)	Model 2 p value	Model 3 (Full Model) HR (95% CI)	Model 3 (Full Model) p value
Depression	-		1.019 (1.012 - 1.026)	<0.001	1.021 (1.013 - 1.028)	<0.001
Sleep duration (hours)	-		-		1.024 (1.013 - 1.034)	<0.001
Demographic factors	Controlled		Controlled		Controlled	
Socio-economic factors	Controlled		Controlled		Controlled	
Lifestyle factors	Controlled		Controlled		Controlled	
Health-related factors	Controlled		Controlled		Controlled	
			(Depression added)		(Sleep duration added)	

2011 Study

Model 3 (Full Model) HR (95% CI)	p value
1.015 (1.004 - 1.026)	0.008
1.023 (1.008 - 1.038)	0.002
Controlled	
Controlled	
Controlled	
Controlled	

Consistent

2014 Study

Model 3 (Full Model) HR (95% CI)	p value
1.033 (1.015 - 1.051)	<0.001
1.035 (1.009 - 1.061)	0.008
Controlled	
Controlled	
Controlled	
Controlled	

Results: Mediating models

2008 Study

Mediating Models	Path	β (95% CI)	p value	Proportion of effect (%)
Outcome: mortality				
Depression	c (Total effect)	0.060 (0.054 - 0.067)	<0.001	100
Outcome: sleep duration				
Depression	a	-0.052 (-0.064 - -0.040)	<0.001	-
Outcome: mortality				
Depression	c' (Direct effect)	0.065 (0.058 - 0.072)	<0.001	108
Sleep duration	b	0.098 (0.088 - 0.109)	<0.001	-
Mediating effect	a×b (Indirect effect)	-0.005		-8

2011 Study

Mediating Models	Path	β (95% CI)	p value	Proportion of effect (%)
Outcome: mortality				
Depression	c (Total effect)	0.059 (0.049 - 0.068)	<0.001	100
Outcome: sleep duration				
Depression	a	-0.060 (-0.075 - -0.044)	<0.001	-
Outcome: mortality				
Depression	c' (Direct effect)	0.065 (0.055 - 0.075)	<0.001	110
Sleep duration	b	0.103 (0.088 - 0.118)	<0.001	-
Mediating effect	a×b (Indirect effect)	-0.006		-10

2014 Study

Mediating Models	Path	β (95% CI)	p value	Proportion of effect (%)
Outcome: mortality				
Depression	c (Total effect)	0.069 (0.053 - 0.085)	<0.001	100
Outcome: sleep duration				
Depression	a	-0.078 (-0.099 - -0.057)	<0.001	-
Outcome: mortality				
Depression	c' (Direct effect)	0.079 (0.062 - 0.095)	<0.001	114
Sleep duration	b	0.106 (0.079 - 0.132)	<0.001	-
Mediating effect	a×b (Indirect effect)	-0.008		-12

Results: Subgroup analysis (Controlling for baseline characteristics)

2008 Study

Variable	Male HR (95% CI)	Male p value	Female HR (95% CI)	Female p value
Depression	1.029 (1.018 - 1.040)	<0.001	1.014 (1.005 - 1.024)	0.003

2011 Study

Variable	Male HR (95% CI)	Male p value	Female HR (95% CI)	Female p value
Depression	1.016 (1.000 - 1.033)	0.053	1.014 (1.000 - 1.029)	0.056

2014 Study

Variable	Male HR (95% CI)	Male p value	Female HR (95% CI)	Female p value
Depression	1.035 (1.009 - 1.061)	0.008	1.029 (1.004 - 1.055)	0.022

Discussion and conclusions

Main findings
- Diminishing marginal increase in median survival time.
- Significant associations between depression and all-cause mortality.
  - Stronger association in males.
- Intermediary role of sleep duration.
  - Increasing effect across three cohorts.

Strengths and limitations
- *Strengths*: comparisons of three cohorts.
- Limitations: measurement error and recall bias; unmeasured confounders.

Further study
- Time-dependent Cox models

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