



MINDMAP

Promoting mental well-being and healthy ageing in cities

KING'S
College
LONDON

Public transport policy, mental health and cognitive function: The free Bus Pass

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Introduction

- Social engagement is a key risk factor for depression (Glass et al 2006) and cognitive decline (Bassuk et al 1999) in older age
- Research suggests public transport and other elements of urban design may promote social engagement in older age (Levasseur et al 2015; Vaughan et al 2016)
- Lack of research linking specific policies to social engagement and improvements in mental health and cognition among older people (Gardiner et al 2016)

AGE-FRIENDLY CITY TOPIC AREAS



Evidence?

The Free Bus Pass policy in the UK

- **The policy:**
 - April 2006: free bus travel for people aged 60+
 - April 2010: incremental increases in eligibility age
- **Prior evidence:**
 - Increased public transport use (Dept. Transport 2009; Webb et al 2011)
 - Lower levels of obesity (Webb et al 2011) & increased physical activity (Webb et al 2016)
 - Improved quality of life (Green et al 2014; Jones et al 2013; Mackett 2013; Andrews et al 2012)

Research Questions

1. Did the increase in public transport use reduce depressive symptoms and improve cognitive function?
2. Are increased social engagement and reduced social isolation potential mechanisms?

Data and measures

- **Data:**
 - English Longitudinal Study of Ageing, 2002 – 2014
 - 18,483 participants 50+ and observed at least once
- **Measure of policy exposure: Free Bus Travel Eligibility**
 - 2006-2010: Age 60 and older
 - 2010-2014: Eligibility age increases monthly in accordance with women's state pension age
- **Measure of public transport use**
 - Do you use public transport... a lot, quite often, sometimes, rarely, or never

Depressive symptoms & cognitive function

- **Depressive Symptoms:** 8-item CES-D Score (interpersonal relations, positive affect, depressed affect, and somatic activity)
- **Cognitive function:**
 - **Memory:** immediate and delayed word recall test
 - **Executive Function:** animal names test
 - **Processing Speed:** letter cancellation test
 - **Total Cognitive Function:** average of memory, executive function, & processing speed Z scores

Mechanisms

- **Loneliness:** UCLA scale on feelings of lacking companionship, isolation, and being left out
- **Social Isolation:** Scale of 5 items measuring contact with others & social participation
- **Group Membership:** membership to group, club, or organization
- **Volunteering** at least monthly
- **Contact with children, family, friends** at least monthly

Approach: 2SLS Instrumental variable analysis

Stage 1

$$(1) x = \beta_0 + \beta_1 z + \beta_2 covar + u$$

Free Bus Pass
eligibility (z)

Demographics, ADLs,
IADLs, car ownership,
economics, region
($covar$)

Stage 2

Transport
use (x)

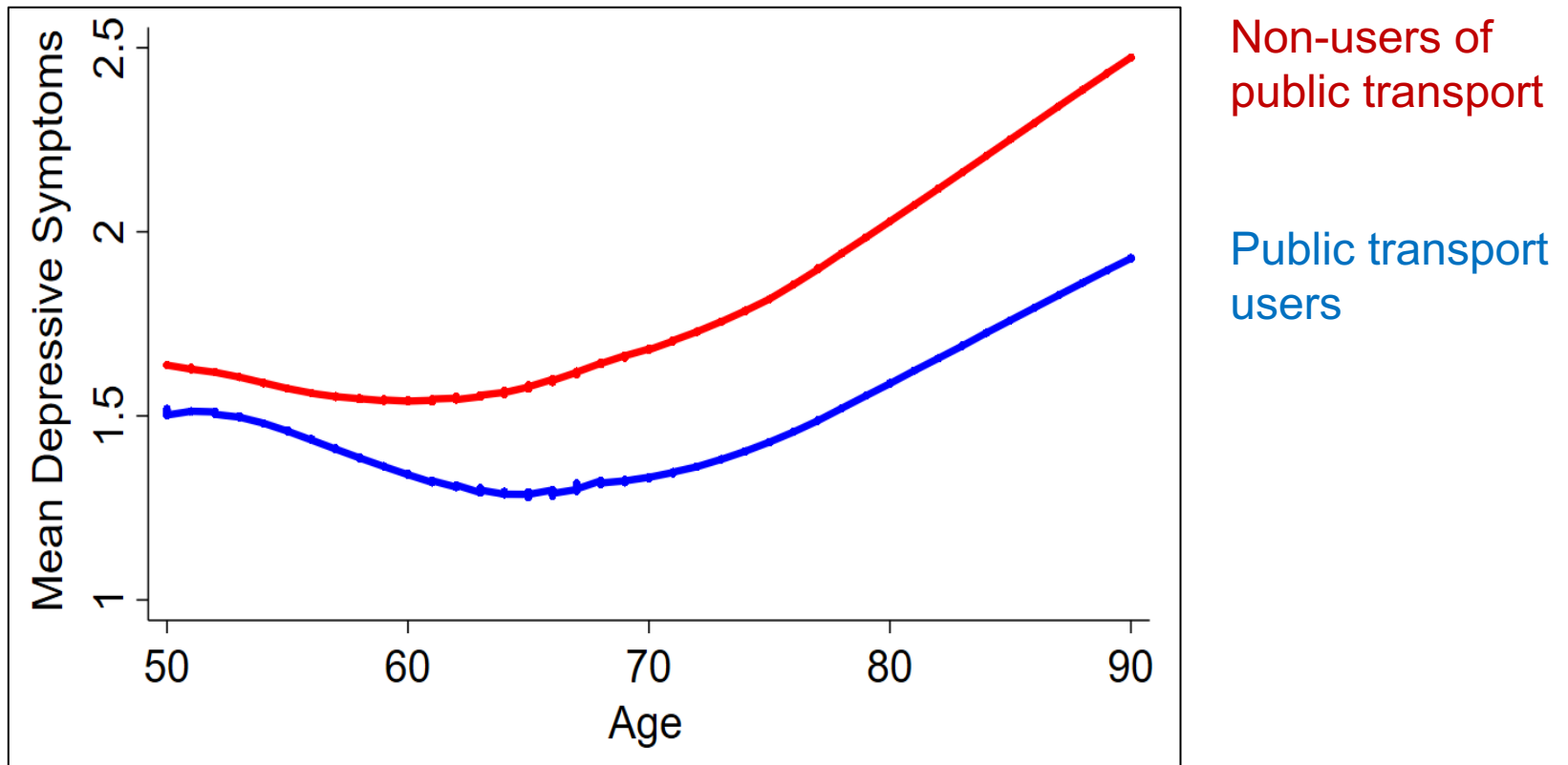
Depressive
symptoms (y)

$$(2) y = \pi_0 + \pi_1 \hat{x} + \pi_2 covar + v$$

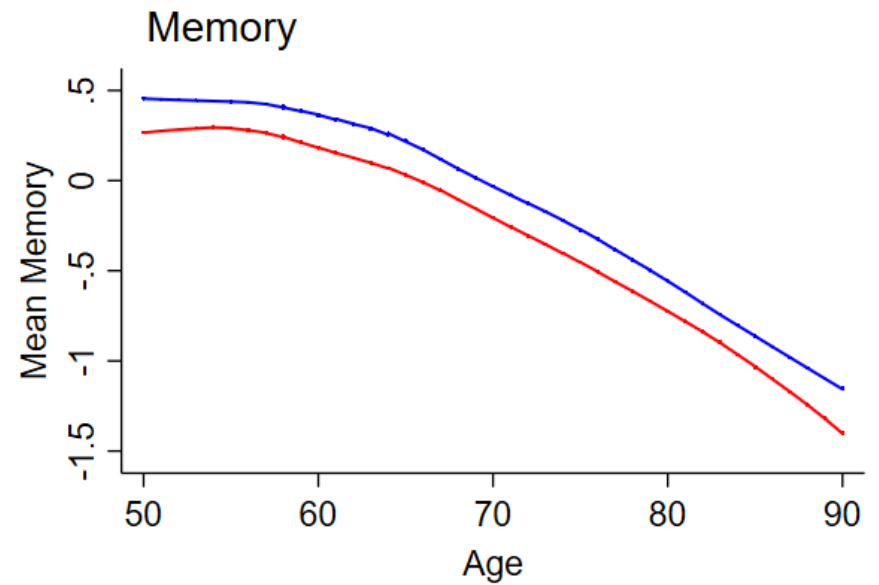
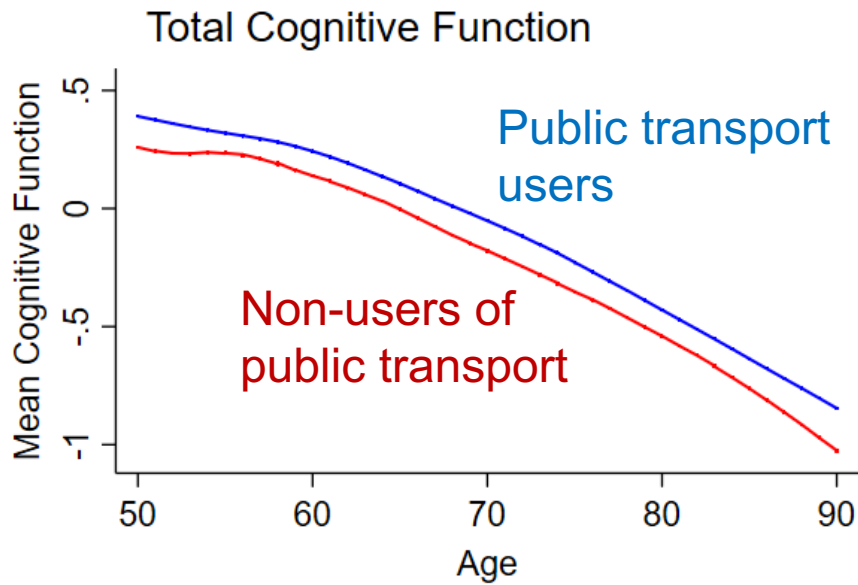
Results



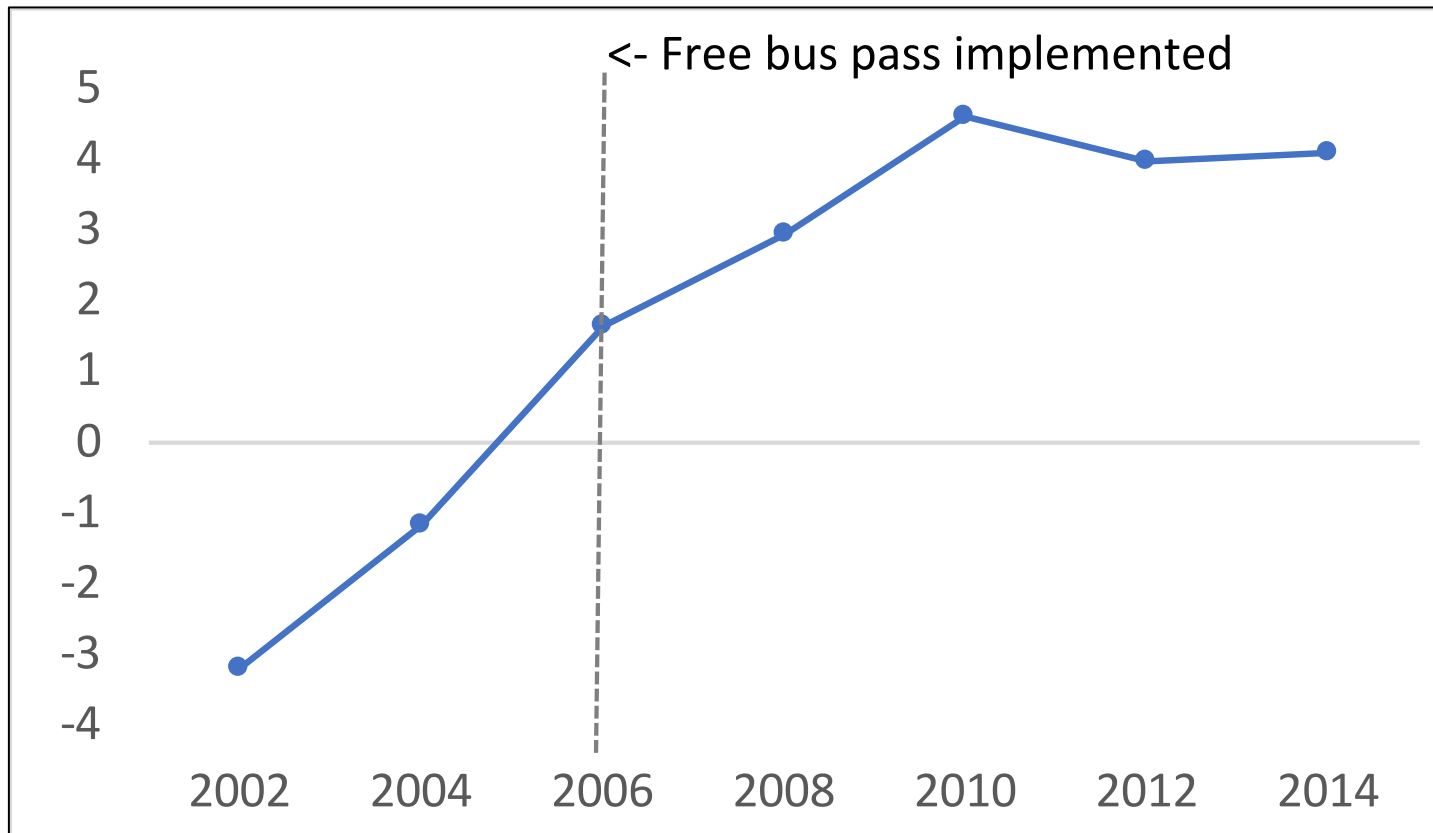
Mean depressive symptom (CESD) score by age



Total cognitive function and memory scores by age



Percentage point difference in transport use between those above & below eligibility age, by year



1st stage: Impact of becoming eligible for free bus on public transport use

	Probability of transport use β (95% CI)
Eligible for free bus travel	0.074 (0.060, 0.089)***

7% increase in transport use if eligible to free bus pass

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Model controls for age, age squared, wave, gender, any ADL limits, any IADL limits, car ownership, log net total non-pension wealth, log equivalised income, employment status, marital status, number of kids in the household, region

2nd stage: Impact of increased transport use (as result of free bus pass) on depressive symptoms

	Model 1: IV β (95% CI)
Total Sample	-0.952 (-1.712, -0.192)*

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

2nd stage: Impact of increased transport use (as result of free bus pass) on cognitive scores

	IV 2nd Stage β (95% CI)
Total Cognitive Function	0.346 (0.017,0.674)*
Memory	0.546 (0.111,0.982)*
Executive Function	0.323 (-0.153,0.800)
Processing Speed	0.332 (-0.234,0.898)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Mechanisms linking transportation use and mental health

Outcome	Model 1: IV
	β (95% CI)
Loneliness†	-0.794 (-1.528 to -0.061)*
Social isolation‡	-0.437 (-0.941 to 0.067)
Member of group/organisation/club	0.156 (-0.054 to 0.365)
Volunteers at least monthly	0.237 (0.059 to 0.414)**
Face-to-face contact with friends at least monthly	0.311 (0.109 to 0.513)**
Face-to-face contact with children at least monthly	0.480 (0.208 to 0.752)***
Face-to-face contact with family members at least monthly	-0.320 (-0.566 to -0.073)*

Conclusion

- Free bus passes linked to increased public transport use, volunteering, and seeing children & friends more often
- The increase in public transport use led to a decline in depressive symptoms
- Increased transport use due to the free bus pass improved cognitive function, particularly memory scores
- Transportation policies may serve as public health instruments to improve mental health, maintain cognitive function and preserve social engagement in older age