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# Public transport use and health status in later life: which relationship?

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Spatial challenges  
for the New World  
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# Introduction

Year	Average Age	% population ≥ 65
2019	45.4 years	22.8%
2040	50.2 years	32.2%

**Table:** Italian population projections (<http://dati-anziani.istat.it>), authors' elaboration


- Elderly Mobility → improves cognition, reduce falls, prevents mortality, etc.

Key priority of the *World Health Organization* is the provision of appropriate **transport services** for the satisfaction of the ageing mobility needs (WHO, 2018).



**RESEARCH QUESTION:** What is the link between the **health status** of the Italian elderly (as measured by mental, physical and self-perceived health indicators) and **the frequency of the local public transport (LPT) use** with respect to private car?

# Literature review 1/2

- How do the elderly people select **transport modes**?
  - **Age**: Between **65-84 years old**, 60% of travels are made by car, while **after the age of 84 years old** the elderly switch to public transport services (Levin and Berg, 2009)
  - **Gender**: **Older men** use more frequently the private car than **women** (Klein-Hitpaß and Lenz, 2011)
- **Driving cessation**  feelings of discomfort asking for lifts, depressive symptoms, limitations to out-of-home and social activity participation, and social isolation.



*Providing alternative means of transport can support the elderly mobility and, thus, life satisfaction*  
(Lee and Choi, 2019).



# Literature review 2/2

## Role of Public Transport use on elderly's health

### Physical Health

physical activity (Coronini-Cronberg et al., 2012)

obesity (Webb et al., 2012)

gait speed (Webb et al., 2016)

walking speed (Rouxel et al., 2017)

adiposity (Lavery et al., 2018b)

cognition (Reinhard et al., 2019)

### Psychological Health

loneliness (Van den Berg et al., 2016)

mental health (Chiatti et al., 2017)

feelings of loneliness, volunteering, regular contact with family and friends (Reinhard et al., 2018)



Facilitates increased physical activity and social interactions, thus, **improving well-being** (Jackson et al., 2019)

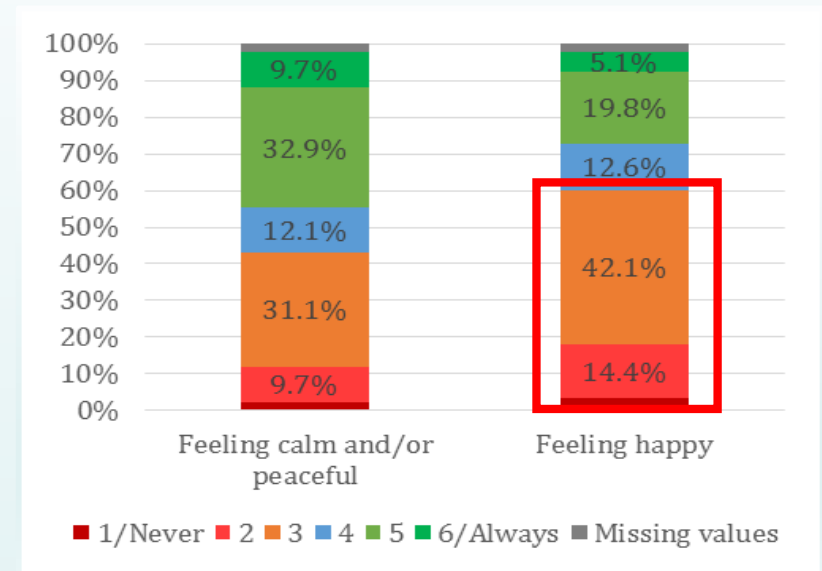
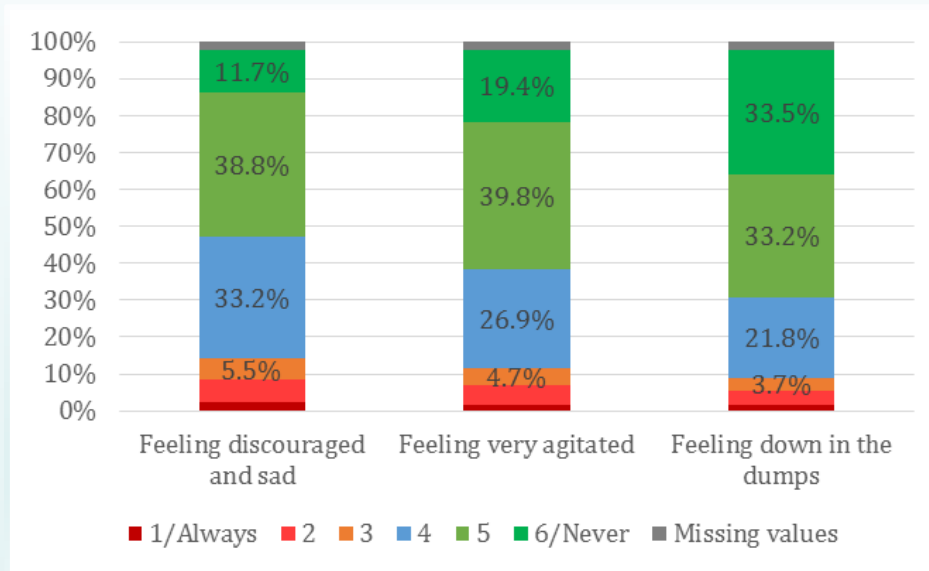
# Data

➤ ISTAT “Aspects of Daily Life” 2017 survey

<b>Dependent Variables (Health indicators)</b>	<b>Independent Variables (Frequency of Transport use)</b>	<b>Other covariates</b>
<b>Mental health indicator</b> (Score range 5-30) <i>e.g. calm and/or peaceful, discouraged and sad, very agitated, down in the dumps, happy</i>	<b>LPT</b>	<b>age, gender, civil status, number of family members, source of income, level of education, residence area and social contacts</b>
<b>Physical health indicator</b> (Score range 0-5) <i>e.g. diabetes, arterial, hypertension, angina pectoris or other heart diseases, arthrosis and/or arthritis and osteoporosis</i>	<b>Private car</b>	
<b>Self-perceived health indicator</b>		



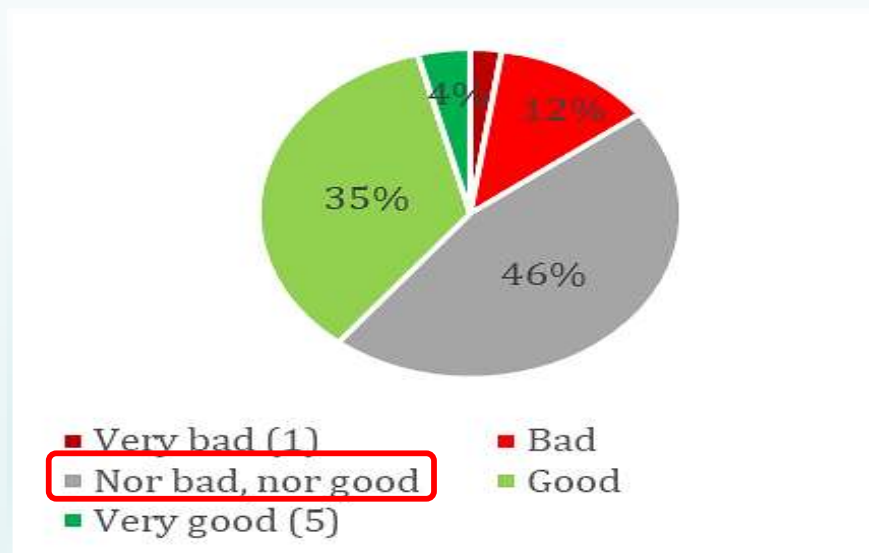
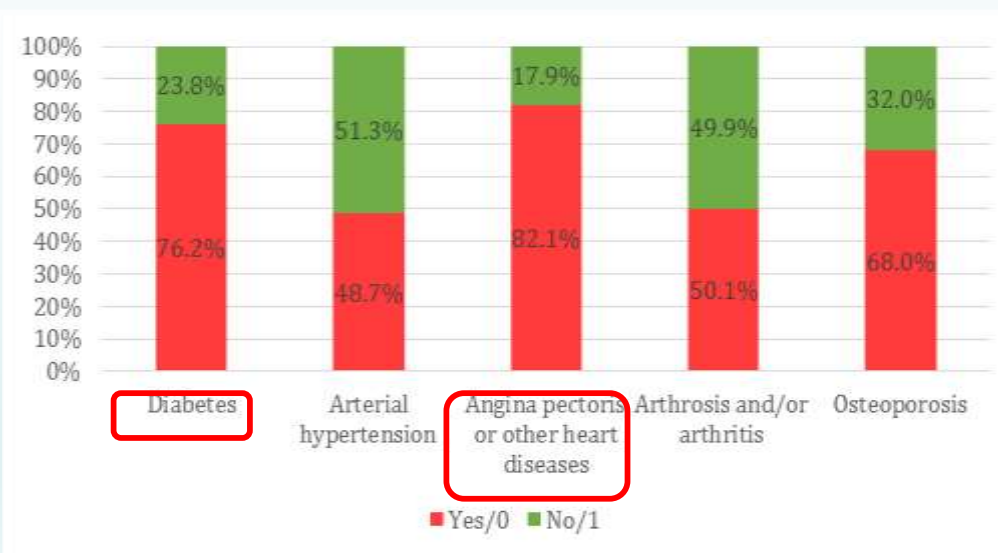
# Descriptive Statistics - Health Measures 1/2



**Figure 1 – Frequency of negative feelings among older adults interviewed (%)**  
 (Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)

**Figure 2 – Frequency of positive feelings among older adults interviewed (%)**  
 (Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)

# Descriptive Statistics - Health Measures 2/2



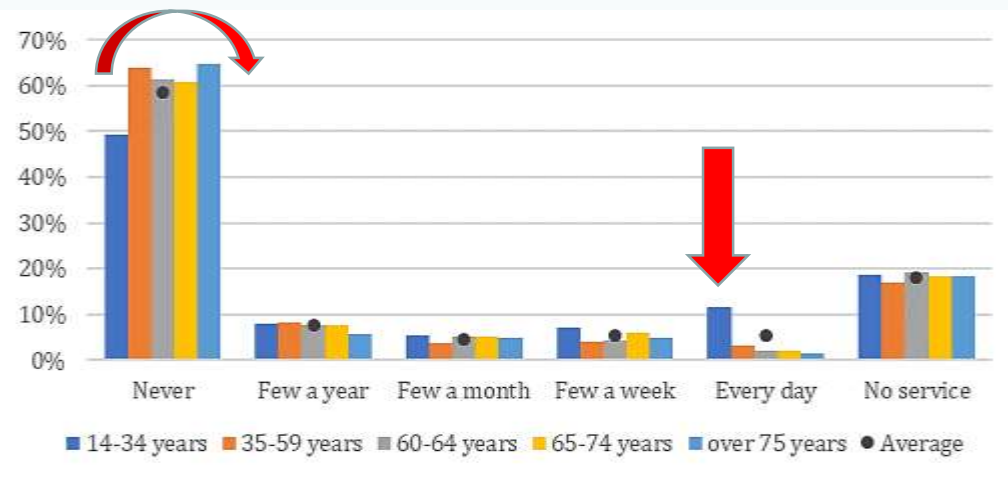
**Figure 3 – Frequency of diseases among elders interviewed (%)**

(Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)

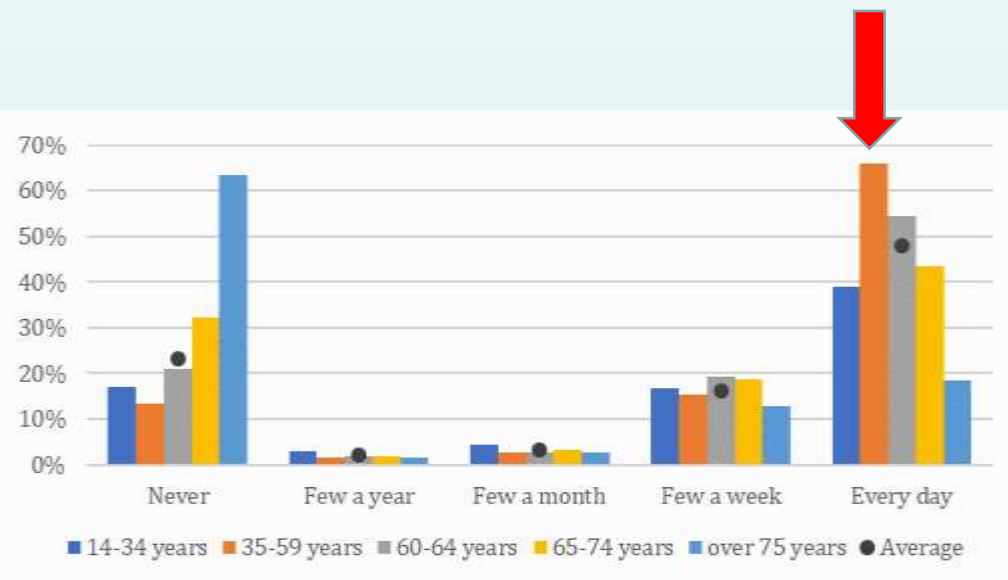
**Figure 4 – Frequency of self-perceived health responses (%)**

(Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)

# Descriptive Statistics - Transport Use



**Figure 5 - Frequency of LPT usage among age cohorts (%)**  
 (Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)



**Figure 6 - Frequency of driving a private car among age cohorts (%)**  
 (Authors' elaboration on ISTAT "Aspects of Daily Life" 2017 survey)



# Methodology

## Mental Health

- $M_i^* = \alpha_0 + \alpha'_1 X_i + \alpha_2 \times LPT_i + \alpha_3 \times Cars_i + \varepsilon_{i,M}$

## Physical Health

- $P_i^* = \beta_0 + \beta'_1 X_i + \beta_2 \times LPT_i + \beta_3 \times Cars_i + \varepsilon_{i,P}$

## Self-perceived Health

- $S_i^* = \gamma_1' X_i + \gamma_2 \times LPT_i + \gamma_3 \times Cars_i + \varepsilon_{i,S}$

Instrument  $\delta_2$ : LPT accessibility issues

$$LPT_i^* = \delta_1' X_i + \delta_2 \times Z_{i,LPT} + \varepsilon_{i,LPT}$$

Instrument  $\theta_2$ : Residential parking issues

$$Cars_i^* = \theta_1' X_i + \theta_2 \times Z_{i,Cars} + \varepsilon_{i,Cars}$$

# Determinants of LPT and Private car usage

Dependent variable: Instrumental variable	LPT use			Private car use		
	Coefficient		S.E.	Coefficient		S.E.
<b>LPT accessibility issues#1</b>	<b>-0.087</b>	***	0.013			
<b>Residential parking issues#2</b>				<b>-0.103</b>	***	0.010
Age (ref.: 60-64)						
65-74	0.126	***	0.034	-0.280	***	0.028
75+	0.081	*	0.038	-0.957	***	0.032
Gender (ref.: Female)						
Male	-0.224	***	0.028	1.075	***	0.023
Civil status (ref.: Not married)						
Married	-0.163	**	0.056	0.382	***	0.048
Divorced	0.042		0.062	0.342	***	0.055
Widowed	-0.118	*	0.054	-0.027		0.047
Family members (ref.: Alone)						
Two	-0.058		0.043	-0.013		0.039
More than two	-0.187	***	0.047	-0.086	*	0.041
Income type (ref: Family aid)						
Self-sufficiency	-0.111	*	0.045	0.374	***	0.037
Education (ref.: Primary school)						
Middle school	0.261	***	0.033	0.337	***	0.027
High school	0.444	***	0.034	0.585	***	0.029
University degree	0.574	***	0.045	0.656	***	0.040
Residence area (ref.: North)						
Centre	-0.227	***	0.032	0.033		0.028
South and Islands	-0.441	***	0.030	-0.185	***	0.024
Social contacts (ref.: No contacts)						
One group	0.036		0.041	0.099	**	0.034
Two groups	0.034		0.032	0.227	***	0.027







# Determinants LPT and Private car usage

- **Ageing** is significantly related to an increasing usage of LPT and, in contrast, to a lower probability to frequently drive private cars.
- **Men** reported to be less prone to use LPT many times a week but to be more willing to drive cars.
- Living in **larger families** may imply the need for a higher trip flexibility, therefore the LPT usage turns out to be reduced when being married and/or living with more than two persons.
- For increasing **levels of education, better economic conditions** and intense **social contacts**, a more frequent usage of cars (as a driver) is reported.
- Older adults living **in central or southern Italian regions** display lower public transit-related mobility rates because of the lack of public transport services.

# Transport use and its relation with health

Dependent variable (outcomes)	Mental health			Physical health			Self-perceived health		
Variable (exposures)	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.
<b>LPT use (ref: Never)</b>									
<b>Few times a year</b>	<b>1.114</b>	***	0.287	0.133		0.068	0.028		0.041
<b>Few times a month</b>	<b>1.409</b>	***	0.355	<b>0.186</b>	*	0.085	0.055		0.048
<b>Few times a week</b>	<b>2.171</b>	***	0.427	<b>0.323</b>	**	0.103	<b>0.113</b>	*	0.052
<b>Every day</b>	<b>2.563</b>	***	0.615	<b>0.459</b>	**	0.148	<b>0.315</b>	***	0.081
<b>Private car use (ref: Never)</b>									
<b>Few times a year</b>	0.353		0.389	-0.178		0.092	0.102		0.079
<b>Few times a month</b>	<b>0.936</b>	**	0.331	<b>0.194</b>	**	0.079	<b>0.311</b>	***	0.061
<b>Few times a week</b>	<b>1.276</b>	***	0.303	0.132		0.076	<b>0.396</b>	***	0.037
<b>Every day</b>	<b>1.691</b>	**	0.541	0.042		0.138	<b>0.496</b>	***	0.047
Age (ref.: 60-64)									
65-74	0.138		0.130	-0.371	***	0.030	-0.283	***	0.028
75+	0.018		0.207	-0.652	***	0.051	-0.473	***	0.034
Gender (ref.: Female)									
Male	0.460	*	0.206	0.324	***	0.052	0.016		0.027
Civil status (ref.: Not married)									
Married	-0.119		0.212	0.015		0.049	-0.017		0.047
Divorced	-1.129	***	0.240	-0.516		0.056	-0.132	*	0.054
Widowed	-0.746	***	0.195	-0.214	***	0.045	-0.093	*	0.045
Family members (ref.: Alone)									
Two	0.087		0.153	-0.008		0.035	-0.049		0.035
More than two	-0.181		0.164	0.035		0.038	0.008		0.037
Income type (ref.: Family aid)									
Self-sufficiency	0.082		0.172	-0.014		0.040	-0.062		0.037
Education (ref.: Primary school)									
Middle school	-0.079		0.128	0.091	**	0.030	0.067	*	0.027
High school	0.157		0.156	0.163	***	0.037	0.188	***	0.029
University degree	0.177		0.203	0.240	***	0.049	0.312	***	0.039
Residence area (ref.: North)									
Centre	-0.455	***	0.117	-0.052		0.027	-0.097	***	0.026
South and Islands	-0.304	**	0.116	-0.228	***	0.028	-0.208	***	0.024
Social contacts (ref.: No contacts)									
One group	0.313	*	0.142	0.026		0.033	0.094	**	0.032
Two groups	0.836	***	0.116	0.040		0.027	0.142	***	0.025
Constant	19.613	***	0.305	3.845	***	0.072	NA		
Log-likelihood	-57942.09			-41401.59			-36870.17		
Likelihood-ratio test ( $\chi^2$ )	8106.38			8817.68			8679.34		
Prob > $\chi^2$	0.0000			0.0000			0.0000		

# Transport use and its relation with health

	Mental Health		Physical Health		Self-perceived Health	
<p><b>Public Transport</b></p> 	<p>More likely to feel joy and/or less depressive, with their <b>everyday usage</b> being particularly effective.</p>		<p>Associated to overall better health conditions, especially when the usage frequency <b>is few times a week or every day.</b></p>		<p>Better overall health only when the elderly take transit <b>every day.</b></p>	
<p><b>Driving a car</b></p> 	<p>Driving <b>more times a week</b> lets older people overcome psychological harms, such as anxiety and melancholy.</p>		<p>Driving is <b>not related significantly</b> to physical conditions, except for a positive effect when considering older adults driving a car <b>few times a month.</b></p>		<p>A strong precondition for reporting a good self-perceived health <b>even for a more sporadic car usage.</b></p>	
<p><b>Other covariates</b></p> 	<p>Being male (+), having strong ties with relatives and friends (+), living in central or southern regions of Italy (-) and being divorced or widowed (-) are statistically significant.</p>		<p>Being male (+), with higher education (+) and has positive effects on physical health. Also, ageing (-), living in the southern regions of Italy (-) and being widowed (-) are strong determinants of physical conditions.</p>		<p>Having higher education (+) and maintaining a contact with family and/or friends (+) improves self-perceived health. Being divorced or widowed (-), living in the central or southern regions of Italy (-) and with age (-) increase self-perceived health deteriorates.</p>	

# Policy implications

**Age -friendly policies (ideally national) for intense LPT use considering associations with increasing feelings of happiness, better self-perceived health and psychological status**



**Infrastructural policies: first last mile, service-oriented policies and residential parking issues**

**Public transport policies for vulnerable elderly groups: women, living alone, not being not financially self-sufficient**



# Limitations

- The available **data are cross-sectional** making it difficult to demonstrate causality of the relationships.
- In the dataset, since the health status is measured by **self-perceived assessments**, its values could be either overestimated or underestimated.
- The **lack of existing literature in Italy** limits our discussion on the contrasting evidence between Italy and other European countries.



# Conclusion and Further Research

- ❖ LPT need to be considered not only as an instrument for mobility but as an active way of traveling for **health support** and environmental sustainability.
- ❖ A **mixture of interventions** facilitating the accessibility to the LPT system are key ingredients for the promotion of LPT use by the elderly.
- ❖ Need for provision of LPT policies for the **most fragile** elderly groups.

## FOR THE FUTURE:

1. Large datasets will allow the construction of a multidimensional **indicator of well-being** and feed powerful techniques of data interpretation such as **data mining**.
2. Systematic efforts to **record the existing ageing-focused policies**.



*Thank you for your attention*

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