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# Estimating the life-expectancy with and without cognitive impairment in Brazil and exploring the role of demographic, social and health determinants of cognitive impairment

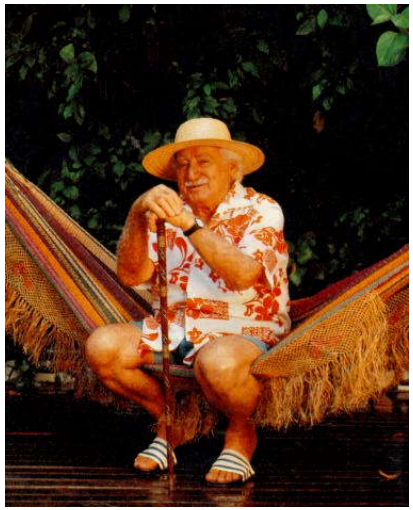
**Ligiana Pires Corona**
Universidade de São Paulo, Brazil
**Flávia Cristina Drumond Andrade**
University of Illinois at Urbana-Champaign, USA
**Maria Lúcia Lebrão, Yeda Aparecida de Oliveira Duarte**
Universidade de São Paulo, Brazil



# Aging process in Brazil

**Aging in Brazil and Latin America is fast-paced and even faster among oldest-old.**

1950: 2.6 million (4.9%)
2010: 20 million (10%)
2030: 40.7 million (17.1%)



**At the same time, Brazil has experienced important gains in life expectancy.**

1950: 51 years
2010: 72 years
2030: 77.4 years

**1 million individuals live with dementia in Brazil and is expected to double in the next 20 years**

# Previous studies focusing on cognitive impairment in Brazil

- Most focus on cross-sectional data
- Most limited to small samples
- Few focus on risk and protective factors
- Dorsi and colleagues (2011)
  - positively associated with higher age, female gender, being widowed or divorced, lower income, being depressed, and having four or more limitations on ADL;
- Yassuda and colleagues (2012) found that age and grip strength were associated with MMSE performance.

- Maurer (2011) based on SABE-baseline.

# Aims

- First, we estimated the life expectancy with and without cognitive impairment in a sample of older adults in São Paulo-Brazil.

- The second aim was to investigate the demographic, social and health determinants of the incidence of cognitive impairment and mortality in this sample.

# Methods

- For the first aim, we used the Interpolation of Markov Chains method to estimate the life expectancy with and without cognitive impairment.
- For the second aim, we used multinomial regression models to address incidence of cognitive impairment and mortality for older adults cognitively intact at baseline.

# Data - SABE São Paulo

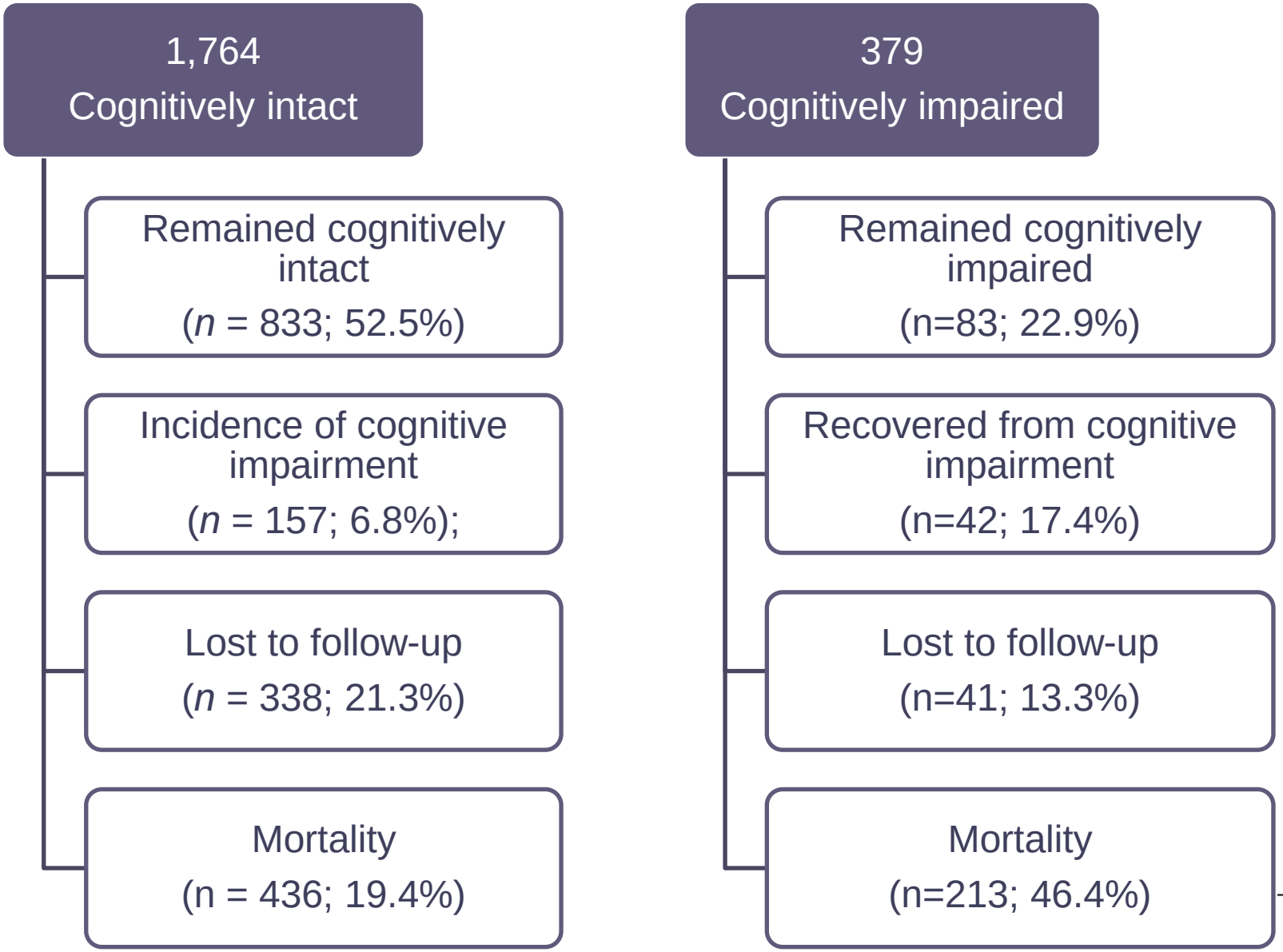
- SABE Study (Saúde, Bem-Estar e Envelhecimento [Health, Well-being, and Ageing])
- Started as a multicenter survey carried out in the main urban centers of seven countries in Latin America and the Caribbean.
  - First wave conducted in 2000

- **In Brazil**
  - multiple-stage probabilistic sample
  - 2,143 complete interviews

  (response rate 84.6%).

- Follow-up in 2006

# Data- SABE São Paulo



# Main variable

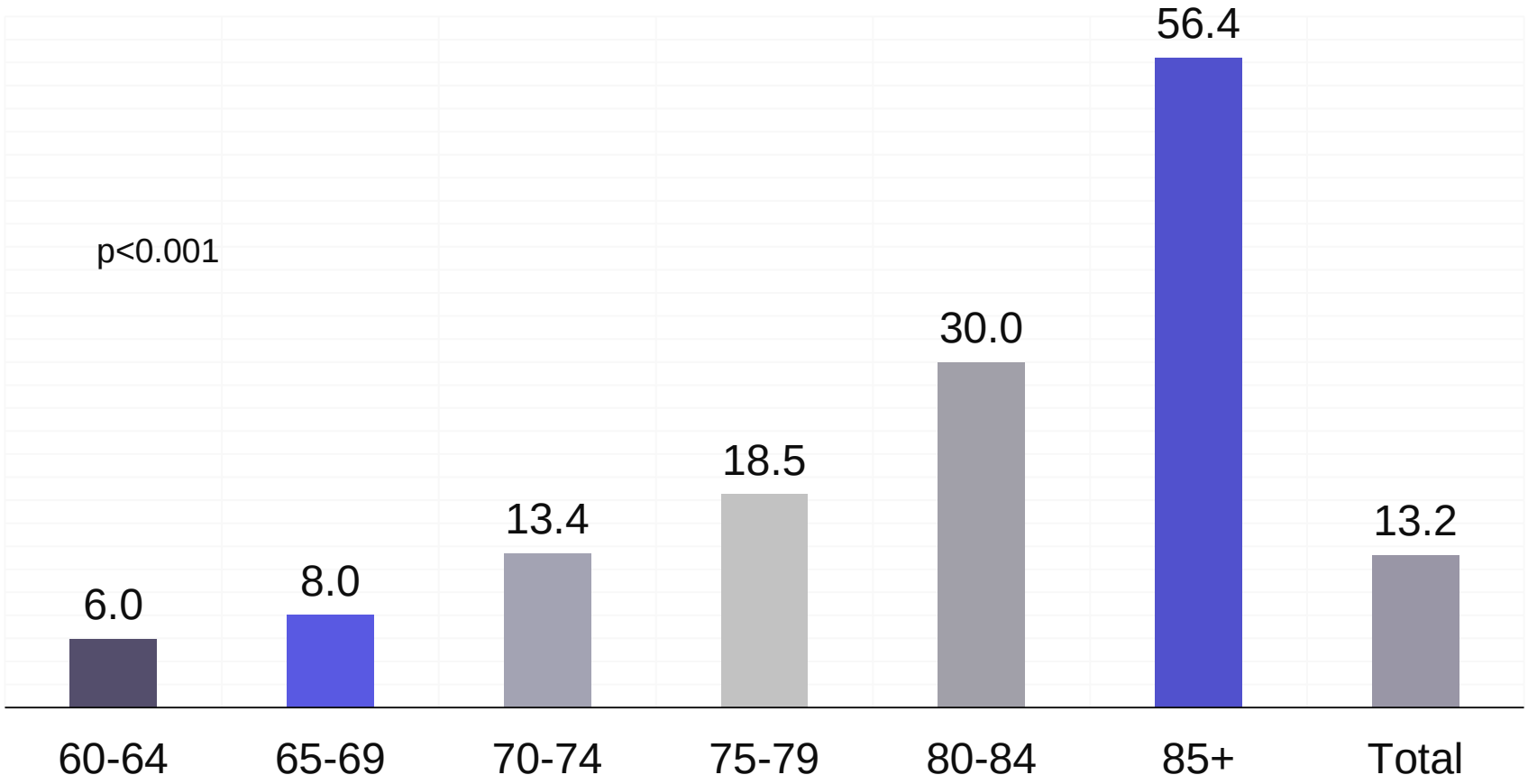
- We used a modified version of the mini-mental state examination (MMSE) to screen older adults with possible cognitive impairment.
- This version has been validated in Latin America for use in older adult populations with lower levels of education (Icaza & Albala, 1999).
- Those with a score of 12 or less were classified as cognitively impaired.

# Control variables at baseline

| | |
|---|---|
| Baseline conditions | • Gender<br>• Age<br>• Education |
| Early conditions | • Rural residence during the first 15 years of life<br>• Time of hunger or lack of food during childhood |
| Midlife conditions | • Marital status<br>• Number of children ever born<br>• Work type |
| Late life conditions | • Smoking<br>• Exercise or physical activity practice<br>• Chronic conditions (hypertension, diabetes, pulmonary disease, cardiovascular disease, stroke, arthritis and depressive symptoms)<br>• Body Mass Index (BMI) |

# DESCRIPTIVE RESULTS

# Prevalence (%) of cognitive impairment at baseline (2000) by age groups (n=2,143)



# Summary statistics for the study variables (weighted) at 2000 baseline by cognitive condition at baseline (*n* = 2143)

| Characteristics | Cognitively intact | Cognitively impaired | p |
|---|---|---|---|
| **Control Variables** | | | |
| Age (years, mean) | 68.5 | 75.2 | <0.001 |
| Education (years, mean) | 8.2 | 6.1 | <0.001 |
| **Early-life Characteristics** | | | |
| Lived in Rural Area First 15 Years of Life (%) | 61.0 | 73.4 | 0.002 |
| Hungry as a Child (%) | 19.6 | 19.6 | 0.994 |
| **Midlife Characteristics** | | | |
| Married (%) | 59.6 | 40.5 | <0.001 |
| Number of Children (number, mean) | 1.3 | 1.4 | <0.001 |

# Summary statistics for the study variables (weighted) at 2000 baseline by cognitive condition at baseline (*n* = 2143)

| Late-life and Health Characteristics | Cognitively intact | Cognitively impaired | p |
|---|---|---|---|
| **Smoking Habits (%)** | | | 0.463 |
| **Never Smoked** | 52.4 | 50.8 | |
| **Former Smoker** | 32.2 | 30.6 | |
| **Current Smoker** | 15.4 | 18.6 | |
| **BMI (kg/m2, mean)** | 26.8 | 25.5 | <0.001 |
| **Physical Activity (practice at least 3x/week)** | 29.3 | 8.6 | <0.001 |
| **Hypertension (%)** | 52.2 | 56.4 | 0.314 |
| **Diabetes (%)** | 16.8 | 15.5 | 0.592 |
| **Chronic Pulmonary Disease (%)** | 9.4 | 11.0 | 0.460 |
| **Cardiovascular Disease (%)** | 17.6 | 19.4 | 0.471 |
| **Stroke (%)** | 5.7 | 17.9 | <0.001 |
| **Cancer (%)** | 3.3 | 4.9 | 0.191 |

# LIFE EXPECTANCY WITH AND WITHOUT COGNITIVE IMPAIRMENT

# Life expectancy

| Age | TLE | Cognitively intact | Cognitively impaired | |
|---|---|---|---|---|
| **Males** | | | | % |
| **60** | 16.6 | 14.6 | 2.0 | 12.0 |
| **65** | 13.7 | 11.5 | 2.1 | 15.6 |
| **70** | 11.0 | 8.8 | 2.3 | 20.6 |
| **75** | 8.6 | 6.3 | 2.4 | 27.4 |
| **80** | 6.6 | 4.2 | 2.4 | 36.5 |
| **85** | 4.8 | 2.5 | 2.3 | 47.9 |
| **90** | 3.5 | 1.3 | 2.1 | 61.4 |
| **Females** | | | | |
| **60** | 21.6 | 18.4 | 3.2 | 15.0 |
| **65** | 18.2 | 14.8 | 3.4 | 18.5 |
| **70** | 14.9 | 11.4 | 3.5 | 23.4 |
| **75** | 11.9 | 8.3 | 3.6 | 30.0 |
| **80** | 9.2 | 5.7 | 3.6 | 38.7 |
| **85** | 6.9 | 3.5 | 3.4 | 49.7 |
| **90** | 5.0 | 1.9 | 3.2 | 62.7 |

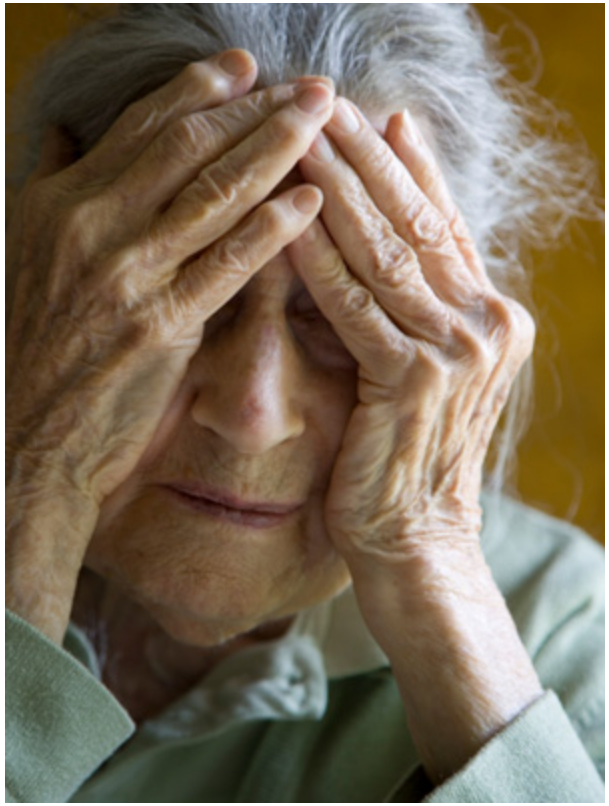
# Main findings from aim 1

- Life expectancy with cognitive impairment is fairly constant with increases in age (~2.0-2.4 for males and ~3.2-3.6 among females)
  - *However, this reflects increases in the % of years lived with cognitive impairment.*

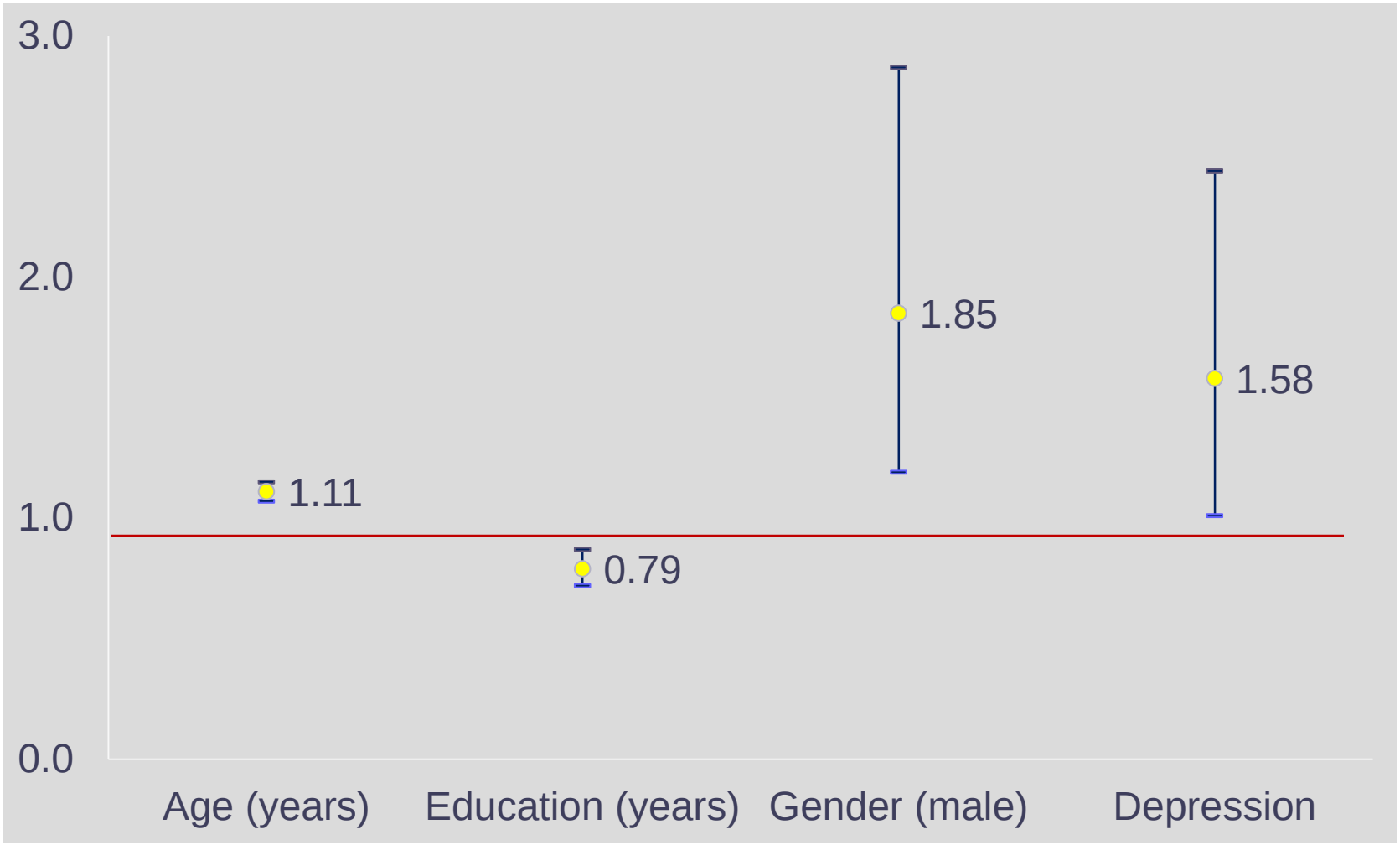
- Women expect to spend a larger number of remaining years with cognitive impairment than men.
  - *At age 60, women expect to live 3.2 years with cognitive impairment vs. 2.0 years among men.*

- Cognitive impairment shortens life expectancy.

# DETERMINANTS OF COGNITIVE DECLINE AND MORTALITY



# Relative risks ratios: assessing the determinants of incidence of cognitive impairment among older adults (n=1,764)



# Main findings from aim 2
# Incidence of cognitive impairment

- Cognitive impairment increases with age
  - result from the accumulation of adverse socioeconomic conditions and diseases during lifetime
- Strong association between education and cognition at older ages may stem from a variety of sources:
  - ability-based selection into education; education-induced changes in brain function that buffer the effects of neuropathology
  - indirect effects mediated through the relationship between education and other cognitive resources across the life course, such as occupation, health, or lifestyle factors

# Main findings from aim 2
# Incidence of cognitive impairment

- Prevalence of cognitive impairment at baseline was similar between women and men (13.5% and 12.6%).
- Yet, gender was a risk factor for incidence of cognitive impairment.

⇩

Being male increased the incidence of cognitive impairment by 81%.

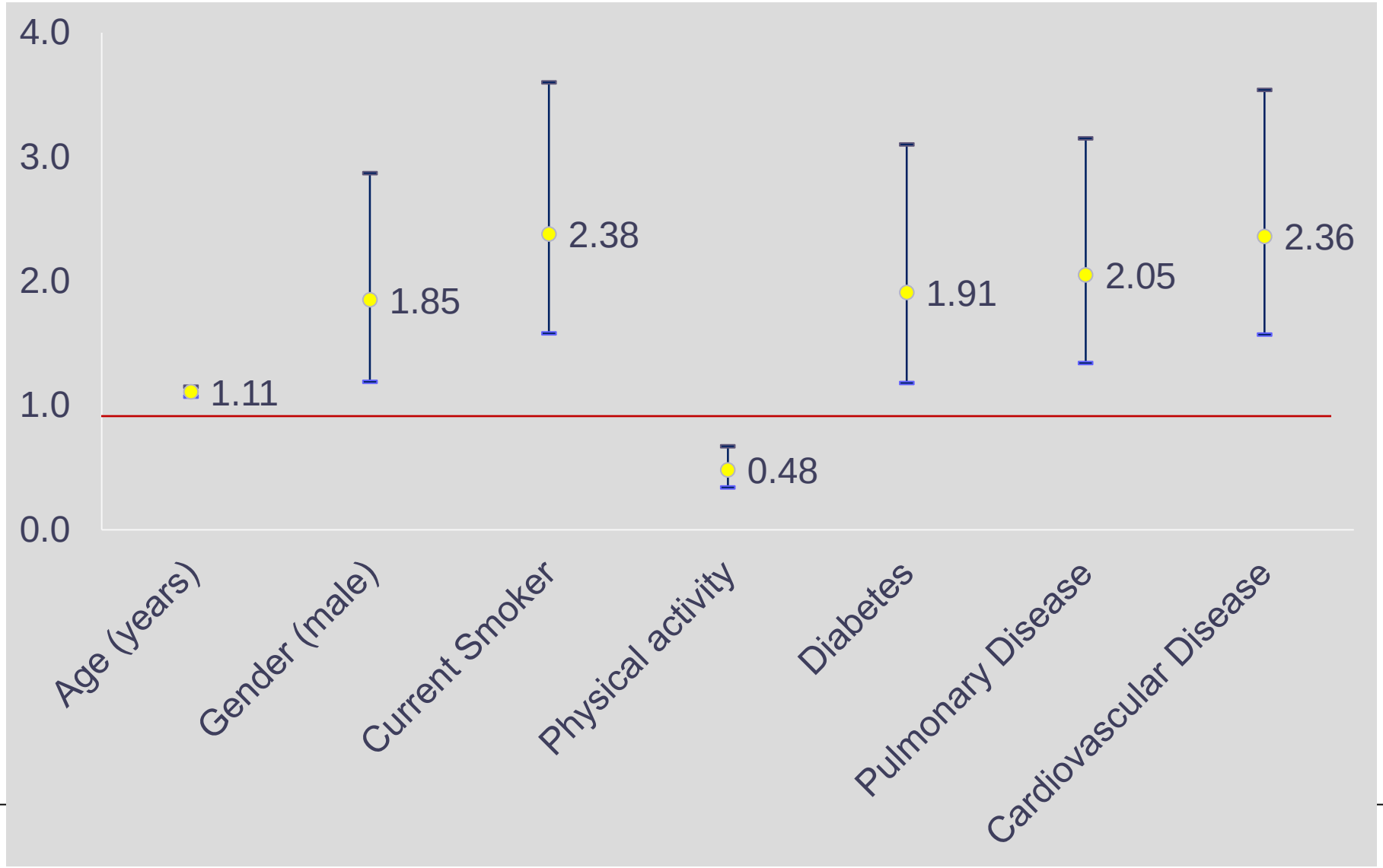
- Gender difference on cognitive impairment can be attributed to differences in education between men and women among older adults

⇩

Educational attainment among women is lower than among men.

- We used a modified version of MMSE (Icaza & Albala, 1999), which is less dependent upon education.

# Relative risks ratios: assessing the determinants of mortality among older adults without cognitive impairment at the baseline (n=1,764)



# Main findings from aim 2
# Mortality

- Higher age, being male, higher number of chronic conditions, and being smoker were major determinants of mortality.

- Engaging in physical activity at least 3 times per week was an important protective factor for mortality.

Role of lifestyle

# Thank you

For additional information please contact:
Ligiana Corona
licorona@usp.br
Flavia Andrade
fandrade@illinois.edu
Or check:
http://www.fsp.usp.br/sabe/
http://kch.illinois.edu/Research/Labs/HealthAging/

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# Table 1: Total life expectancy and life expectancy without and with cognitive decline

| Age | TLE | | Without cognitive impairment | | With cognitive impairment | |
|---|---|---|---|---|---|---|
| Males | | s.d. | | s.d. | | s.d. |
| 60 | 16.6 | 0.6 | 14.6 | 0.6 | 2.0 | 0.3 |
| 65 | 13.7 | 0.5 | 11.5 | 0.5 | 2.1 | 0.3 |
| 70 | 11.0 | 0.5 | 8.8 | 0.4 | 2.3 | 0.3 |
| 75 | 8.6 | 0.4 | 6.3 | 0.4 | 2.4 | 0.3 |
| 80 | 6.6 | 0.4 | 4.2 | 0.4 | 2.4 | 0.3 |
| 85 | 4.8 | 0.4 | 2.5 | 0.3 | 2.3 | 0.4 |
| 90 | 3.5 | 0.4 | 1.3 | 0.3 | 2.1 | 0.4 |
| Females | | | | | | |
| 60 | 21.6 | 0.7 | 18.4 | 0.6 | 3.2 | 0.3 |
| 65 | 18.2 | 0.6 | 14.8 | 0.5 | 3.4 | 0.4 |
| 70 | 14.9 | 0.5 | 11.4 | 0.5 | 3.5 | 0.4 |
| 75 | 11.9 | 0.5 | 8.3 | 0.5 | 3.6 | 0.4 |
| 80 | 9.2 | 0.5 | 5.7 | 0.4 | 3.6 | 0.4 |
| 85 | 6.9 | 0.5 | 3.5 | 0.4 | 3.4 | 0.4 |
| 90 | 5.0 | 0.4 | 1.9 | 0.4 | 3.2 | 0.4 |

# Life expectancy conditional on the baseline status

| | Cognitively intact | | | Cognitively impaired | | |
|---|---|---|---|---|---|---|
| | Without | With | TLE | Without | With | TLE |
| **Males** | | | | | | |
| **60** | 14.7 | 1.9 | 16.6 | 9.4 | 5.4 | 14.8 |
| **65** | 11.8 | 2.0 | 13.8 | 5.9 | 5.6 | 11.6 |
| **70** | 9.2 | 2.0 | 11.2 | 3.4 | 5.4 | 8.8 |
| **75** | 7.0 | 2.0 | 8.9 | 1.8 | 4.9 | 6.7 |
| **80** | 5.2 | 1.9 | 7.0 | 0.9 | 4.2 | 5.0 |
| **85** | 3.7 | 1.7 | 5.4 | 0.4 | 3.4 | 3.8 |
| **90** | 2.6 | 1.5 | 4.1 | 0.2 | 2.7 | 2.8 |
| **Females** | | | | | | |
| **60** | 18.5 | 3.2 | 21.7 | 12.8 | 7.0 | 19.8 |
| **65** | 15.0 | 3.2 | 18.3 | 8.3 | 7.4 | 15.7 |
| **70** | 11.9 | 3.2 | 15.1 | 5.0 | 7.3 | 12.3 |
| **75** | 9.1 | 3.2 | 12.3 | 2.7 | 6.7 | 9.4 |
| **80** | 6.8 | 3.0 | 9.8 | 1.4 | 5.8 | 7.2 |
| **85** | 4.9 | 2.7 | 7.6 | 0.6 | 4.8 | 5.5 |
| **90** | 3.4 | 2.4 | 5.9 | 0.3 | 3.9 | 4.2 |

**Table 2**
**Life Expectancy (LE) With and Without Cognitive Impairment**

| Age | Total LE | Cognitively Intact LE | LE With Impairment | Percentage Total LE With Impairment |
|---|---|---|---|---|
| Total sample | | | | |
| 70 | 14.41 (14.10-14.72) | 13.12 (12.83-13.41) | 1.29 (1.19-1.39) | 9.0% |
| 80 | 8.50 (8.27-8.73) | 7.13 (6.92-7.34) | 1.37 (1.25-1.49) | 16.1% |
| 90 | 4.63 (4.39-4.88) | 3.12 (2.90-3.34) | 1.51 (1.32-1.70) | 32.6% |
| Low education | | | | |
| 70 | 13.24 (12.77-13.72) | 11.61 (11.16-12.07) | 1.63 (1.45-1.80) | 12.3% |
| 80 | 8.01 (7.71-8.31) | 6.33 (6.05-6.60) | 1.68 (1.51-1.85) | 21.0% |
| 90 | 4.6 (4.28-4.92) | 2.87 (2.58-3.16) | 1.73 (1.47-2.00) | 37.6% |
| High education | | | | |
| 70 | 15.08 (14.67-15.49) | 14.06 (13.67-14.45) | 1.02 (0.90-1.15) | 6.8% |
| 80 | 8.82 (8.47-9.17) | 7.72 (7.40-8.04) | 1.1 (0.94-1.26) | 12.5% |
| 90 | 4.65 (4.28-5.02) | 3.41 (3.06-3.75) | 1.24 (0.98-1.51) | 26.7% |

Note: Confidence intervals given in parentheses.

Lievre, Alley and Crimmins (2008)

| Years of education | Gender | | Cognitive Status at baseline | | Total |
|---|---|---|---|---|---|
| | Female | Male | Cognitivelly intact | Cognitivelly impaired | |
| No formal education | 22.15 | 16.27 | 16.12 | 43.55 | 19.72 |
| 1 - 3 years | 26.06 | 24.61 | 24.22 | 33.66 | 25.46 |
| 4 - 7 years | 36.67 | 36.95 | 39.42 | 19.35 | 36.78 |
| 8 years or more | 15.12 | 22.17 | 20.24 | 3.44 | 18.04 |

# Other results (abstract)

- For those who started cognitively impaired in baseline:
- Compared to those who remained with cognitive decline, recovery was associated with lower age (RRR=.92, 95% CI 0.87-0.96), residency in rural areas during childhood (RRR=3.49, 95% CI 1.25-9.79), and absence of stroke (RRR=0.14, 95% 0.03-0.72).
- Those who were older (RRR= 1.07, 95% CI 1.02-1.12) or had pulmonary disease (4.10, 1.02-16.42) were more likely to die.

# Lost to follow-up

- Another limitation of our study relates to attrition, which has important effects on studies focused on older adults.
- In the 6-year-period analysis, those lost to follow-up had higher education, lower number of children, and were more likely to be former smokers than those who remained in the study.