



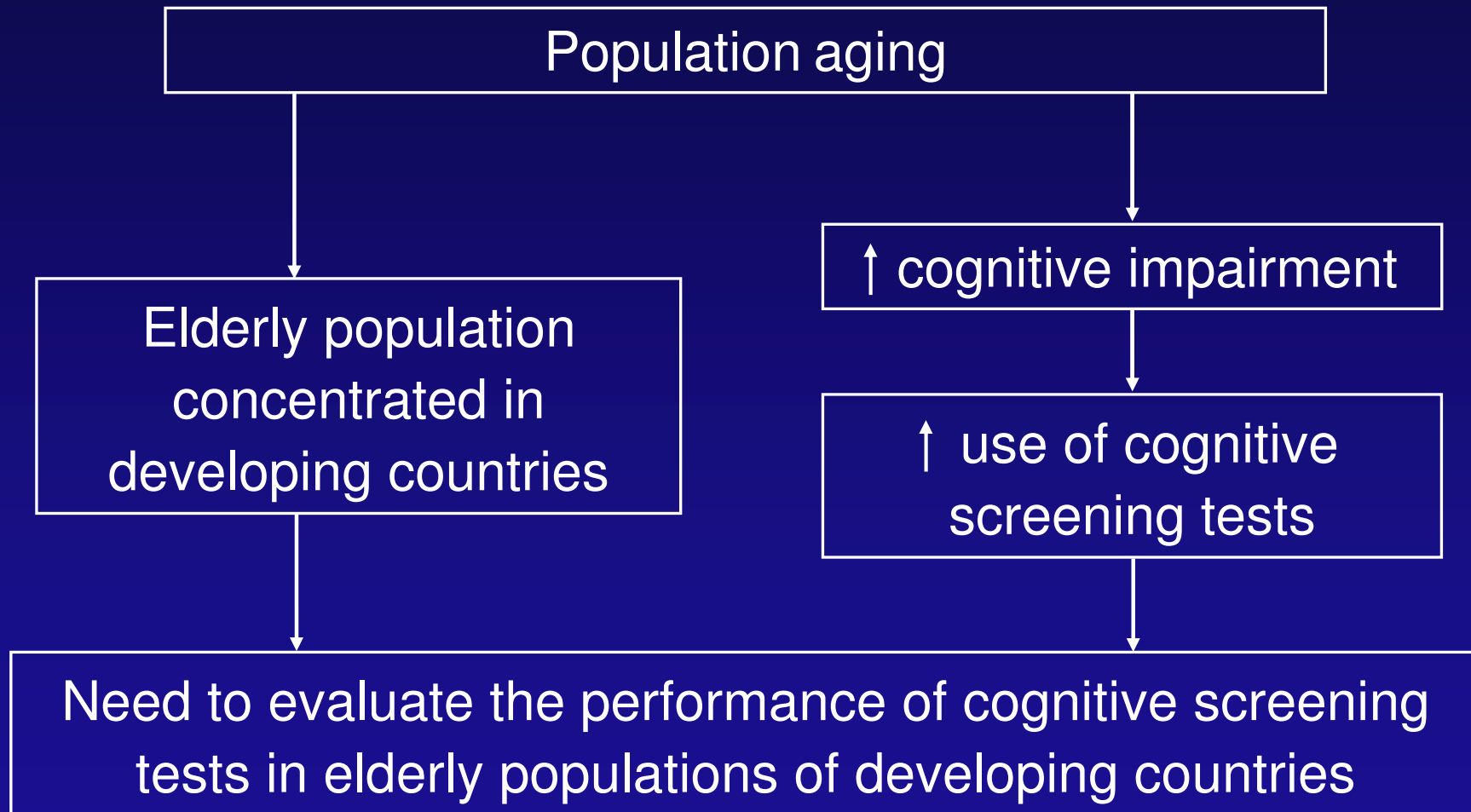
**Evaluating the construct validity of the  
Mini-mental State Examination in elderly  
with low levels of schooling:  
the Bambuí Health Aging Study**

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# INTRODUCTION



# OBJECTIVE

- To evaluate the construct validity of the Mini-mental State Examination in a population-based sample of older persons with low levels of schooling

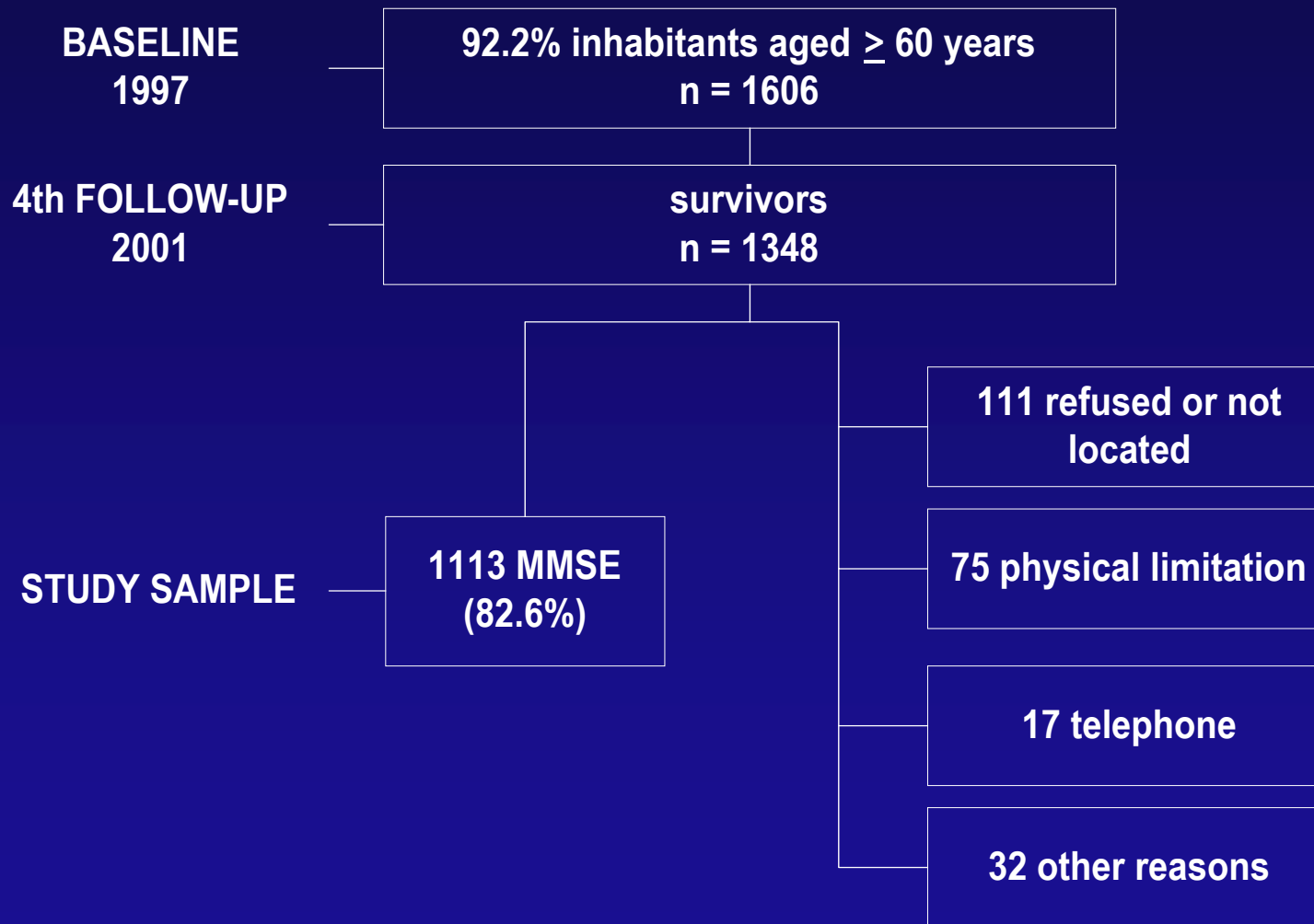
# METHODS

## Subjects – The Bambuí Health Aging Study

- Population-based cohort study of older persons
- Bambuí: SE Brazil, 15,000 inhabitants
- Baseline: 1997, 92.2% of residents aged  $\geq 60$  years
- Baseline and annual follow-up interviews include the MMSE
- Subjects are interviewed at home by trained lay interviewers

# METHODS

## Study Sample



# **METHODS**

## **MMSE – Adapted from Seabra et al., 1990**

1. Year
2. Part of the day
3. Date
4. Month
5. Day of the week
6. State
7. City
8. Suburb
9. Room of the house
10. Address

# METHODS

## MMSE – Adapted from Seabra et al., 1990

11. Register the word 'cat'
12.       “       “       “       'tree'
13.       “       “       “       'guitar'
- 14-18.   Sum by fives from zero to 25
19.   Spell 'Maria' backwards
- 20-22.   Recall words mentioned previously
23.   Name a watch
24.   Name a pencil

# **METHODS**

## **MMSE – Adapted from Seabra et al., 1990**

25. Repeat a sentence
26. Read and obey 'close your eyes'
27. Take paper in right hand
28. Fold paper in half
29. Place paper on lap
30. Write a sentence
31. Copy pentagons

# METHODS

## Exploratory Factor Analysis

Observed variables/items	A B C D E F G
-----	
Underlying constructs (latent factors)	x y

By analyzing the correlation between the observed variables → strongly correlated variables will be grouped into a factor

# METHODS

## Exploratory Factor Analysis

Observed variables

MMSE items

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Latent factors

MMSE factors

“the degree to which the measured variables used in the study represent the hypothesized constructs” →  
construct validity

(Heppner et al., 1992)

# METHODS

## Statistical Analysis

- 31MMSE items coded 1 if correct, zero if otherwise
- Exploratory factor analysis
  - Based on a tetrachoric correlation matrix
  - Estimator: unweighted least squares
  - Computation of correlation coefficients: numerical maximum likelihood approach
  - Number of factors to be rotated: scree test, interpretability of factors
  - Promax (oblique) rotation
- Descriptive analysis: Stata 9.2  
Exploratory factor analysis: Mplus software

# RESULTS

## Sample Characteristics

	n	%
Total sample	1113	100
Gender		
Men	427	38.4
Women	686	61.6
Age (years)		
<75	743	66.8
≥75	370	33.2
Schooling (years)		
0 to 3	681	61.2
4 to 7	332	29.9
≥ 8	99	8.9

# RESULTS

## Exploratory Factor Analysis

- $n = 1113$
- Exploratory factor analysis of 31 MMSE items  
↓  
exclusion of the 3 registration items
- Exploratory factor analysis of 28 remaining MMSE items  
↓  
4-factor solution

# RESULTS

## Exploratory Factor Analysis

- Factor 1: concentration
  - Serial summing by fives
    - First addition 0.89
    - Second addition 0.94
    - Third addition 0.95
    - Fourth addition 0.90
    - Fifth addition 0.86
- Factor 2: memory
  - Recall the word
    - Cat 0.97
    - Tree 0.77
    - Guitar 0.56
  - Day of the week 0.40

# RESULTS

## Exploratory Factor Analysis

- Factor 3: language, praxis, orientation
  - Spell 'Maria' backwards 0.91
  - Write a complete sentence 0.80
  - Copy drawing of pentagons 0.78
  - Read and obey 'close your eyes' 0.55
  - Repeat sentence 0.52
  - Orientation
    - Year 0.85
    - Date 0.39
    - Month 0.63
    - Day of the week 0.38
    - State 0.67
    - Suburb 0.68
    - Room of the house 0.67
    - Address 0.45

# RESULTS

## Exploratory Factor Analysis

- Factor 4: naming
  - Name a watch 1.00
  - pencil 0.91
  - City 0.53
  - Take paper in right hand 0.48
- Low loadings on all factors
  - Part of the day
  - Fold paper in half
  - Put paper down on lap

# DISCUSSION

## Comparison with previous studies

- Methodological differences
- 4 studies considered MMSE items individually
  - No consensus
  - Similarities

Factor with serial sevens or serial fives

Orientation items tended to cluster

Registration items tended to cluster

Recall items tended to cluster

(Jones & Gallo, 2000; Baños & Franklin, 2002; Lopez et al., 2005; Castro-Costa et al., submitted)

# CONCLUSION

- Exploratory factor analysis → four factors
  - Concentration
  - Memory
  - Language, praxis, orientation
  - Naming
- Supports the use of the MMSE as an cognitive screening instrument that taps into several cognitive domains, in a population of elderly with low levels of schooling