

# Prevalence and determinants of metabolic syndrome and pre-frailty comorbidity in elderly: results from the WhiteHall II study

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WORLD CONGRESS OF EPIDEMIOLOGY 2024



Between 2000 and 2050, the **proportion of the world's population over 60 y.o. will double** from about 11% to 22%; 30% in Europe.

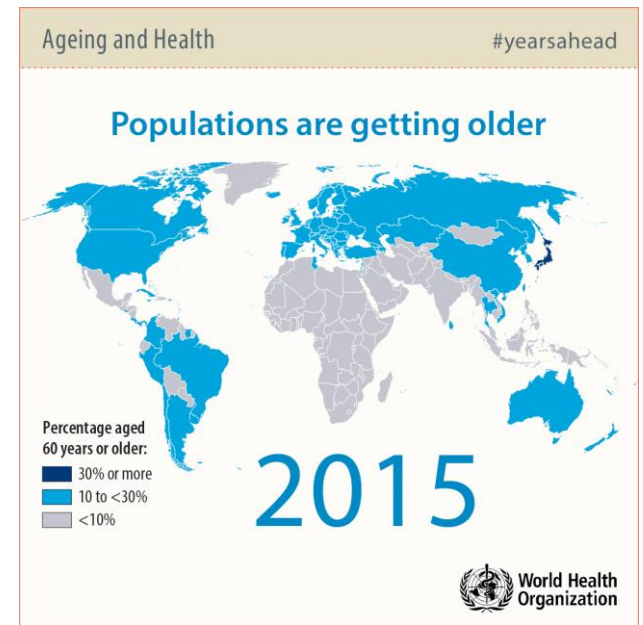


In Europe, in 2022, **life expectancy: 80.3 years** (up by 0.5 years from 2021).

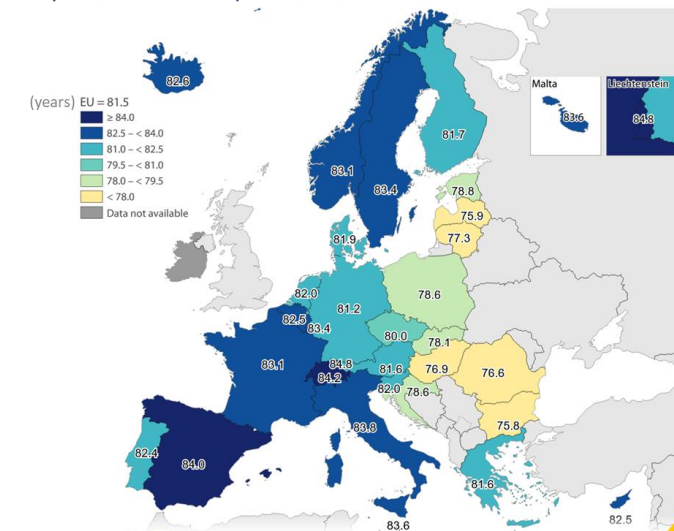
- 83.3 yrs for women (0.4 higher than in 2021)
- 77.9 yrs for men (0.7 higher than in 2021)

**Healthy life expectancy** (without incapacities in quotidian life):

- 64.2 yrs for women (77.4 % of life expectancy)
- 63.1 yrs for men (81.7 % of life expectancy)



Life expectancy at birth in Europe in 2023



# AGEING

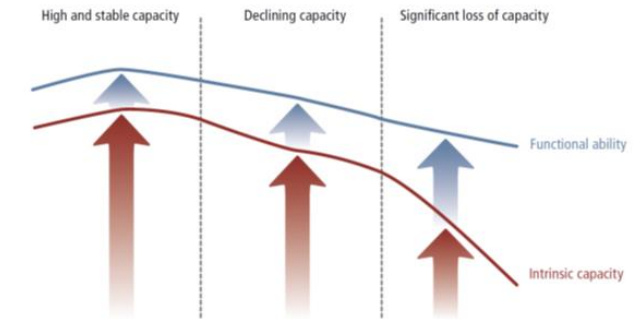
Gradual deterioration of physical and mental capacities, increased risk of diseases



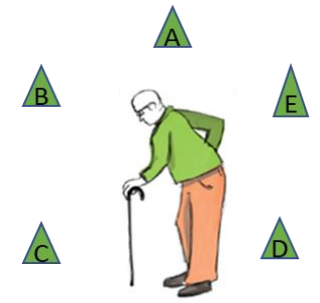
(WHO, 2015)  
(Veerapu, 2017)  
(INSEE, 2019)



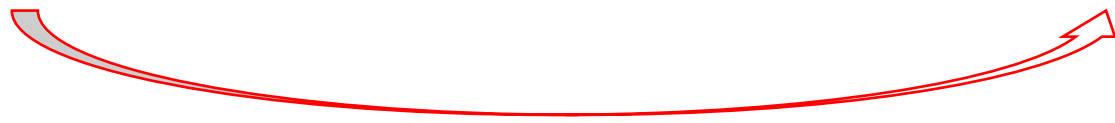
WHO objectives  
**Healthy Ageing:**  
Ageing without  
disabilities



**Precursors**  
Disabilities/dependencies



**Pathologies & Geriatric  
Syndromes**



**Target**

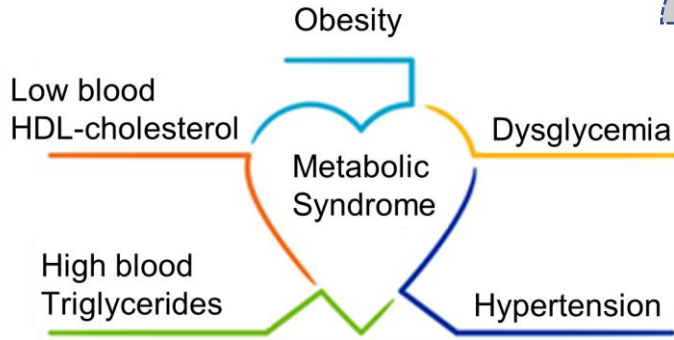


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# GERIATRIC SYNDROMES

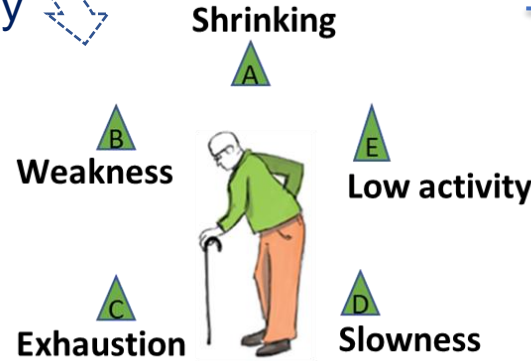
Alberti & coll, 2009



**Metabolic syndrome (MetS)  
&  
Components**



Fried & coll, 2001



**Frailty syndrome  
&  
Components**



**Both, but Frailty is a better predictor**



- Functional decline
- Falls
- Cognitive decline
- Disability
- Mortality

➤ Very high prevalence (25% world population, up to 40% > 65 y.o.)

➤ Prevalence from 12% to up to 20%

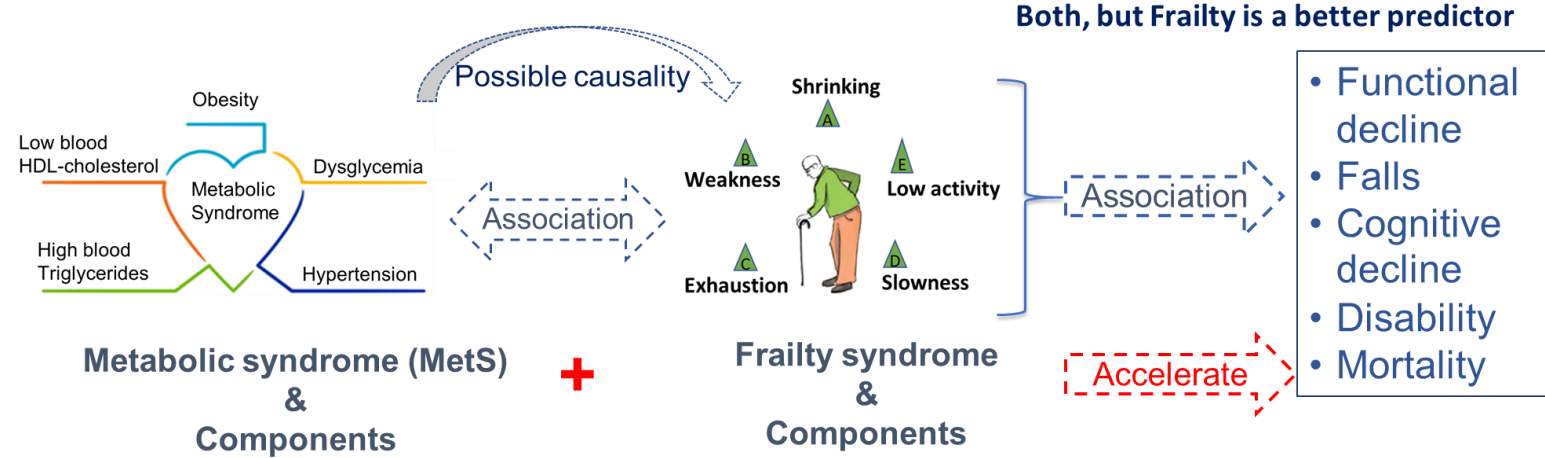


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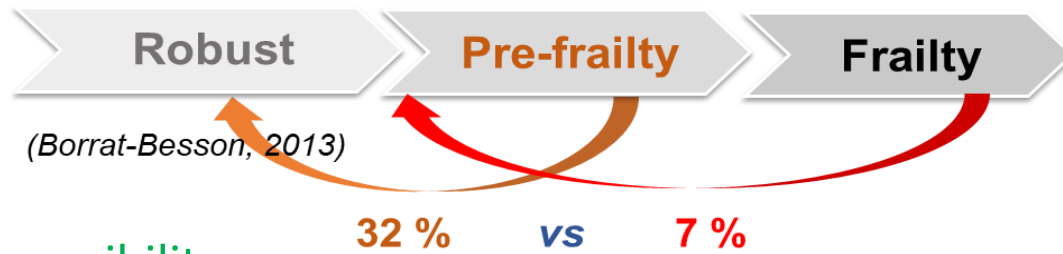


Viscogliosi, 2016  
 McCarthy, 2023  
 Barzilay, 2007  
 Crow, 2019  
 Bastos-Barbosa, 2012

# STUDY OBJECTIVE

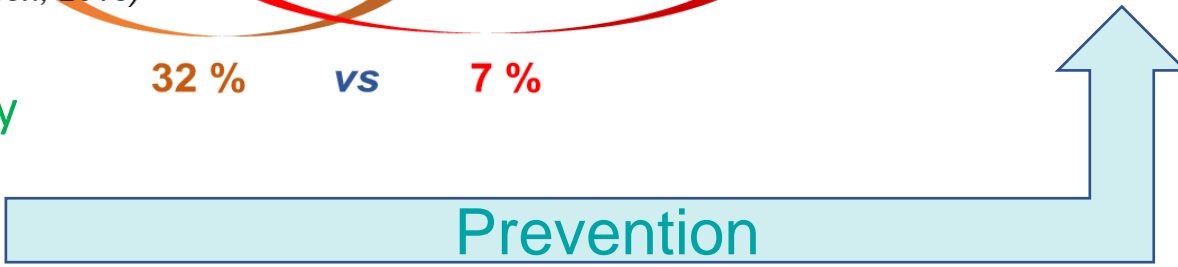


Interest of early diagnostic



Reduction of adverse events (Pujos-Guillot, 2018; Chen, 2021)

Reversibility

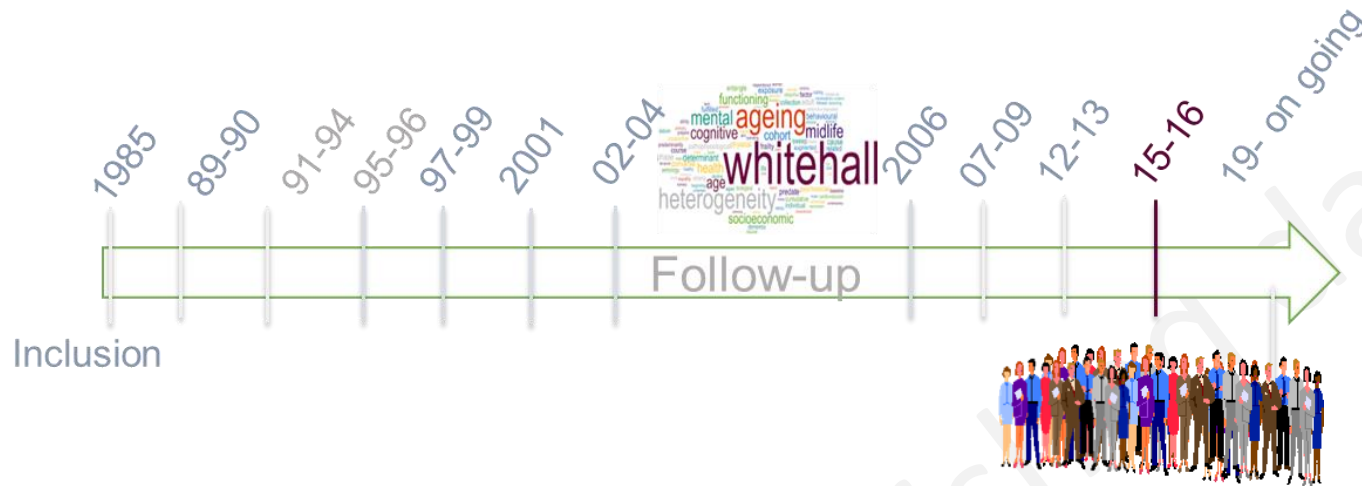


## PREVALENCE & DETERMINANTS OF METS - PRE-FRAILTY COMORBIDITY IN ELDERLY



# METHODOLOGY

## WhiteHall II: Stress and Health Study to investigate the causes of social inequalities in health and for studies on ageing



N=10,308  
35-55 y.o.

### Cross-sectional study

N=5,632 M&F  
63-85 y.o.

**Outcomes**  
MetS: Alberti *et al.* definition (2009)  
Pre-frailty: Fried *et al.* definition (2001)  
Comorbidity: MetS + Pre-frailty

10,308 participants at baseline

4,676 excluded:  
- Deceased (n=1,799)  
- Non-responding (n=2,877)

5,632 participants

1,805 excluded:  
Missing data for MetS &/or Pre-frailty

3,827 participants

429 excluded:  
- Dementia, CHD, Depression, Parkinson's, End-stage renal disease, CPDO, stroke (n=313)  
- Frailty (n=116)

**3,398 subjects**

- MICE (10 datasets)
- Multinomial logistic regression: adjusted for sociodemographic, lifestyle & health data
- Interaction: Age & sex



# PREVALENCE

## MetS

Prev: 44.8%  
M vs F: 46.9% vs 38.9%;  
P<0.0001

## Pre-frailty

Prev: 47.3%  
M vs F: 46.0% vs 50.8%;  
P<0.0001

## Comorbidity

Prev: 23.2%  
M vs F: 23.9% vs 21.3%;  
P<0.0001

N: 3,398

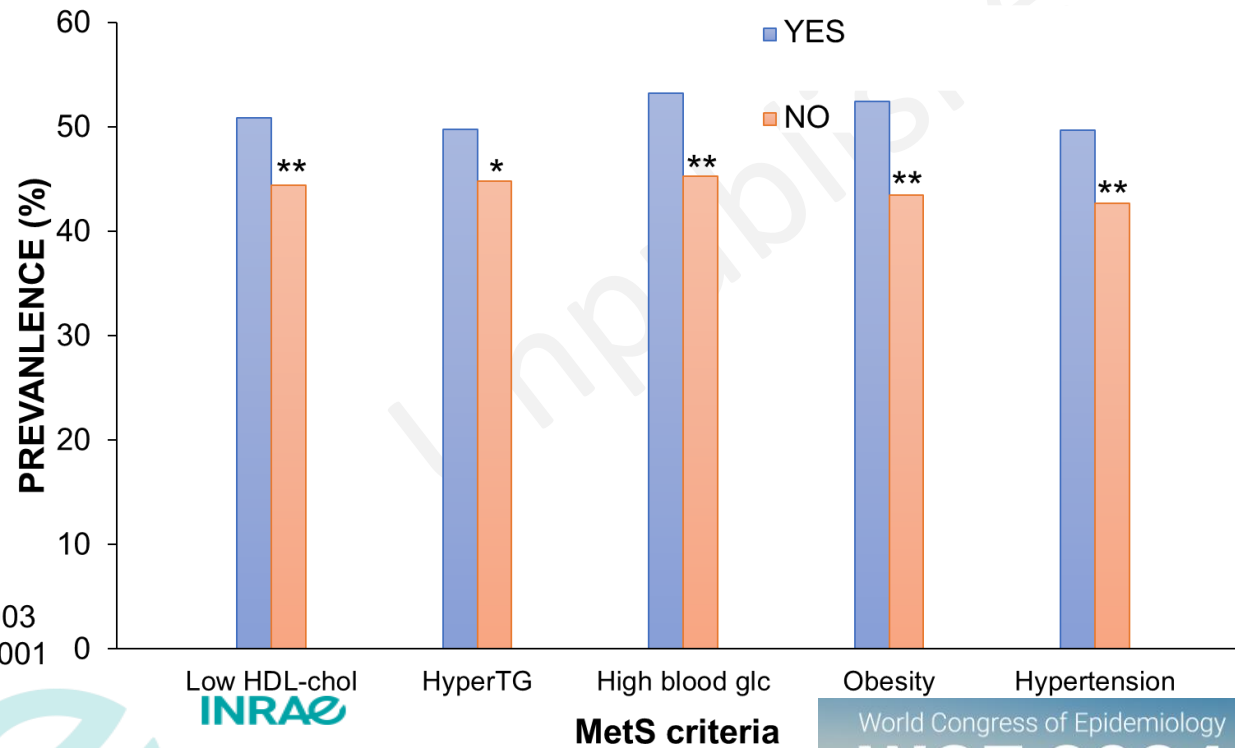
Age: 71.9 (5.5) y.o.

Male: 73.6 %

## Characteristics of Comorbid subjects

- Older,
- Male,
- Non-Caucasian,
- Overweight,
- Former smokers,
- Single/widowed,
- Highly sedentary,
- Low physical activity levels,
- Consumed Less than 1 fruit/veg per day,
- Diabetic
- Low physical SF36
- Low mental SF36

Pre-frailty in MetS vs Non MetS criteria



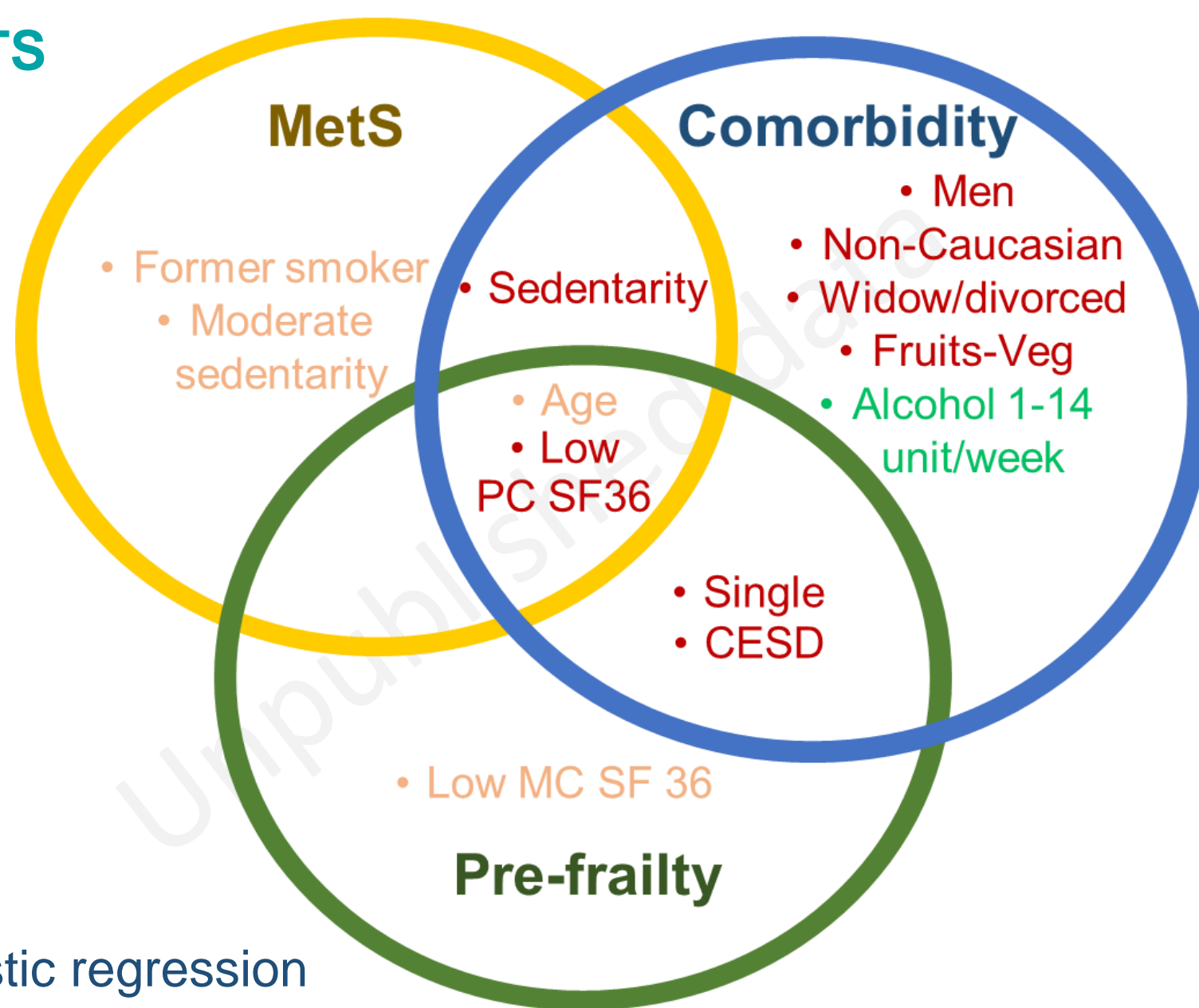
\*: p=0.003  
\*\*: p<0.0001

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MetS criteria

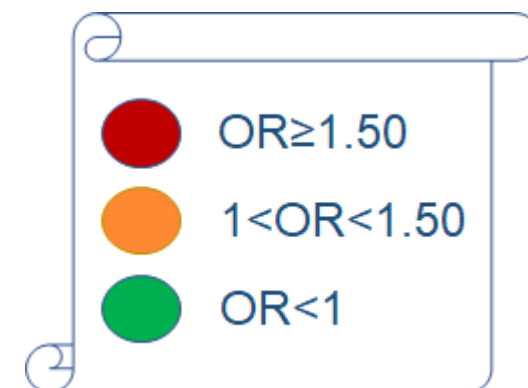


# DETERMINANTS



Multinomial logistic regression

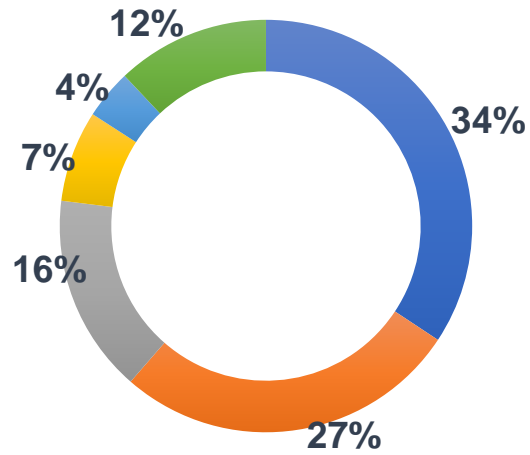
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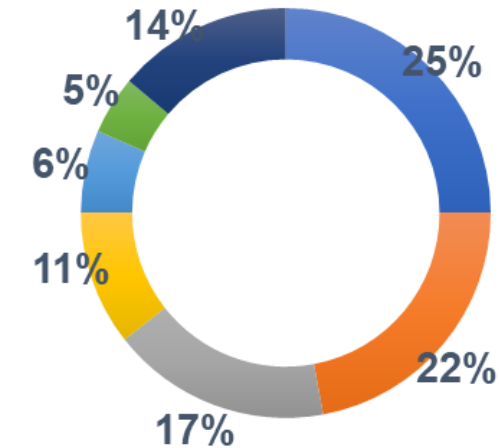
# STUDY OF SUB-PHENOTYPES OF AGEING SYNDROMES

## Pre-frailty sub-phenotypes



- (Phy\_Act)
- (Phy\_Act-Handgrip)
- (Phy\_Act-Exhaustion)
- (Handgrip)
- (Exhaustion)
- 9 Others

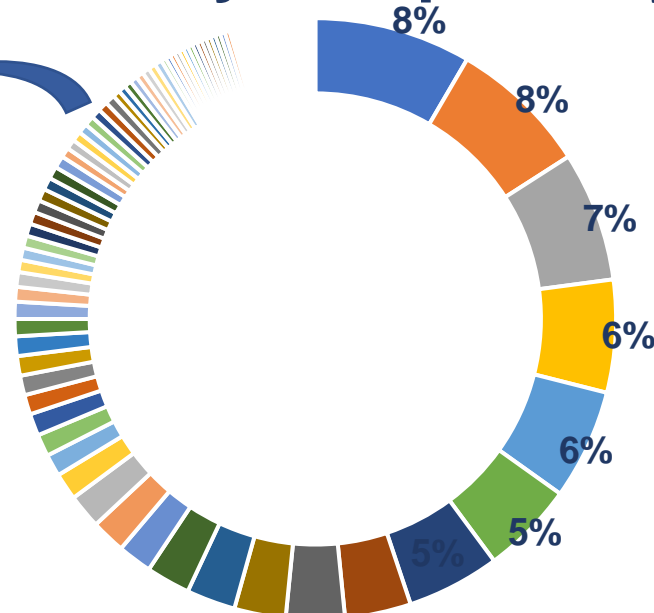
## MetS sub-phenotypes



- (Chol-HTg-HBP)
- (Chol- Obe-HTg-HBP)
- (Chol-Hgly- HTg-HBP)
- (Chol- Obe- HTg)
- (Obe-Hgly-HBP)
- 11 Others

HBP: High Blood Pressure

## Comorbidity sub-phenotypes



- 1 (Phys\_Act)-(HTg-HBP)
- 2 (Phys\_Act)-(Chol-HTg-HBP)
- 3 (Phys\_Act)-(Chol-Obe-HTg-HBP)
- 4 (Handgrip)-(Chol-HTg-HBP)
- 5 (Handgrip)-(Chol-Obe-HTg-HBP)



Cut-off?  
Aggregation?  
Sub-phenotypes of interest for metabolomic exploration?

# TAKE HOME MESSAGE

- Notable prevalence of MetS - pre-frailty comorbidity among elderly, underscoring the widespread coexistence of these conditions in this population.
- Several determinants were associated with an increased likelihood of MetS - pre-frailty comorbidity. These findings highlight the need for targeted interventions to address these risk factors.
- While MetS, pre-frailty, and their comorbidity share several determinants, the study reveals that their effects on each condition may significantly differ.

This suggests that the MetS - pre-frailty comorbidity should be regarded as a distinct pathological state requiring specific clinical attention.



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# ACKNOWLEDGEMENTS



Plate-Forme  
EXPLORATION du METABOLISME  
des gènes aux métabolites



Unité de Nutrition Humaine



METABOLIC PHENOTYPE, NUTRITION AND MODELING  
MAPPING



**Blandine COMTE**



**Estelle PUJOS-GUILLOT**



**Léopold FEZEU**

*PhD directors and supervisor*



All participants in the Whitehall II Study, Whitehall II researchers and support staff.

University College of London



Whitehall II study



**Archana Singh-Manoux**



**Benjamin Landre**



Thank you very much  
for your attention



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