# Association of socioeconomic status with allostatic load in the Swiss population-based CoLaus study

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# Background

- Recently research started addressing the issue of how SES is biologically embedded
- **Chronic stress** often proposed as important pathway
- **ALLOSTATIC LOAD** → indicator of the cumulative physiological toll on multiple biological systems over the years (McEwen, 1996)

→ physiological consequences of exposure to chronic stress

# Background

- AL associated with cardiovascular morbidity and mortality, and with poorer cognitive and physical functioning
- Several studies (especially in North America) show associations between low SES and allostatic load
- SES associated differences in AL shown to explain 30% of SES differences in mortality in one study

→Very few studies in Europe and even fewer on population-based samples

→ Few SES indicators examined

# Objectives

1. To assess the association of SES with allostatic load in the population-based study Colaus.

2. To compare two measures of SES (education and receiveing social transfers) in relation to AL.

# Data & Methods

# Data

Swiss Population Based Colaus Study

- Established in 2003
- 6184 participants
- Aged 35 – 75 years
- Random sample of the city of Lausanne (N~120.000)

5074 participants not in age of retirement

- ✓ 26 excluded for missing data on SES
- ✓ 1410 missing data on AL components
- ✓ **3589 participants in the final sample (1812 women)**

# Measures

## Socioeconomic indicators:

- **Educational level**: (1) primary education, (2) apprenticeship, (3) secondary school and (4) university
- **Receiving social transfers:** assessed with the question: “Do you receive social help”? (yes/no)
- **SES score:** (1) high education and no ST, (2) high education and ST, (3) low education and no ST and (4) low education and ST

## Allostatic load:

- **Classic Index (AL1):** based on cardiovascular, metabolic, dyslipidemic and inflammatory markers
- **New Index (AL2):** additionally includes oxidative stress and other markers of inflammation and dyslipidemia

→ Neuroendocrine markers not available

## Confounders: Health behaviors and marital status

| Homeostatic System** | Component (Risk Factor) | Risk quartile | AL1 | AL2 |
|---|---|---|---|---|
| **Cardiovascular system** | | | | |
| | Systolic blood pressure | top | X | X |
| | Diastolic blood pressure | top | X | X |
| | Heart rate | top | X | X |
| **Metabolism** | | | | |
| | Insulin | top | X | X |
| | Glucose | top | X | X |
| | Body mass index | top | X | X |
| | Waist-to-hip ratio | top | X | X |
| | Leptin* | top | | X |
| | Adiponectin* | bottom | | X |
| **Lipids** | | | | |
| | HDL cholesterol | bottom | X | X |
| | Total cholesterol | top | X | X |
| | Tryglycerides* | top | | X |
| | Apolipoprotein B* | top | | X |
| **Inflammation** | | | | |
| | C-reactive protein | top | X | X |
| | Interleukin-6 | top | X | X |
| | Interleukin-1B* | top | | X |
| | Tumor-necrosis factor alpha* | top | | X |
| **Oxidative Stress** | | | | |
| | Uric acid* | top | | X |
| | Homocysteine* | top | | X |
| | Gamma-glutamyl transferase* | top | | X |

# Statistical analysis

**Methodology: Logistic regression of dichotomized AL scores on SES**

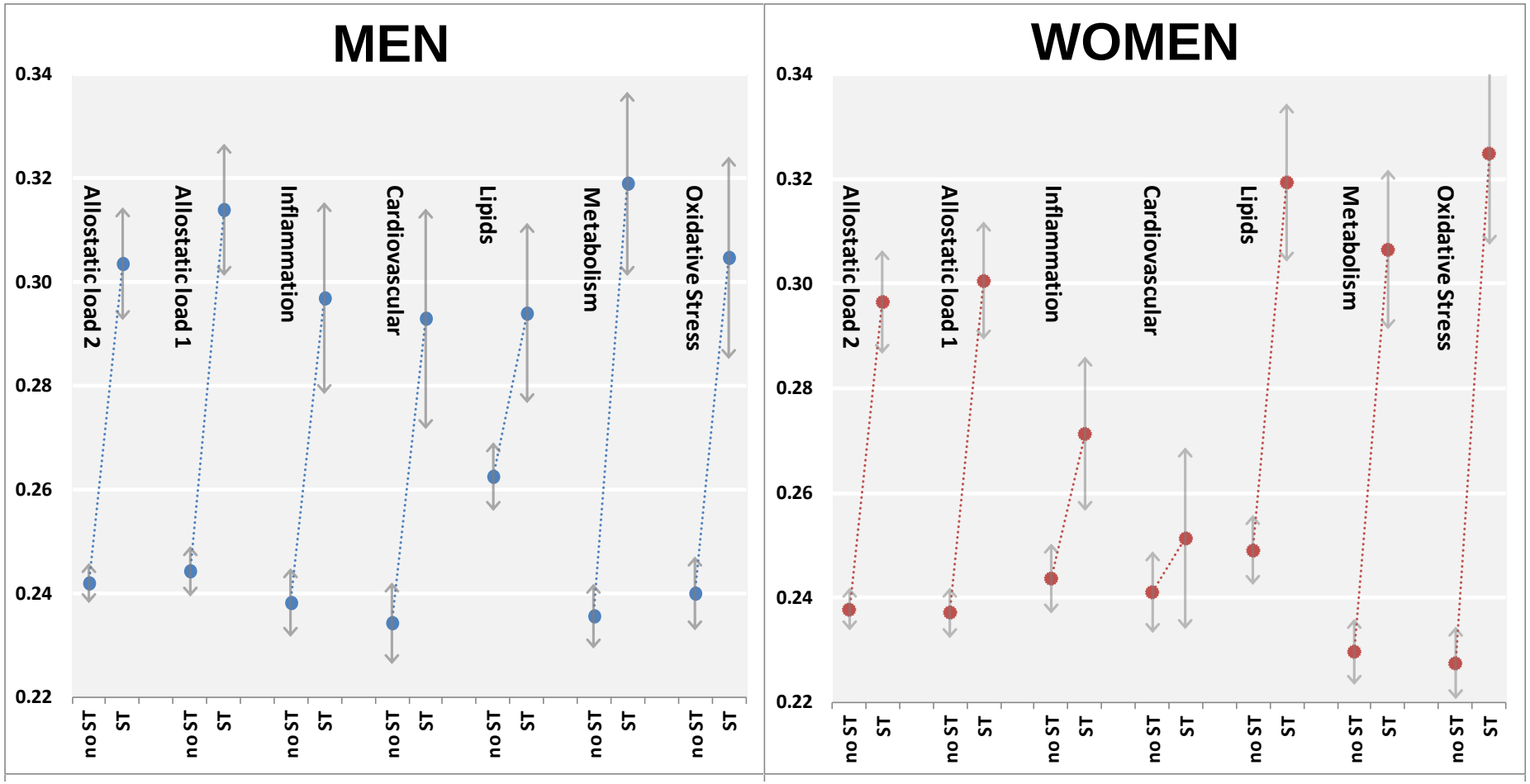
- **Model 1** → Age-adjusted
- **Model 2:** model 1 + alternative SES indicator
- **Model 3:** model 1 + health behaviours and marital status

→Analysis stratified by sex

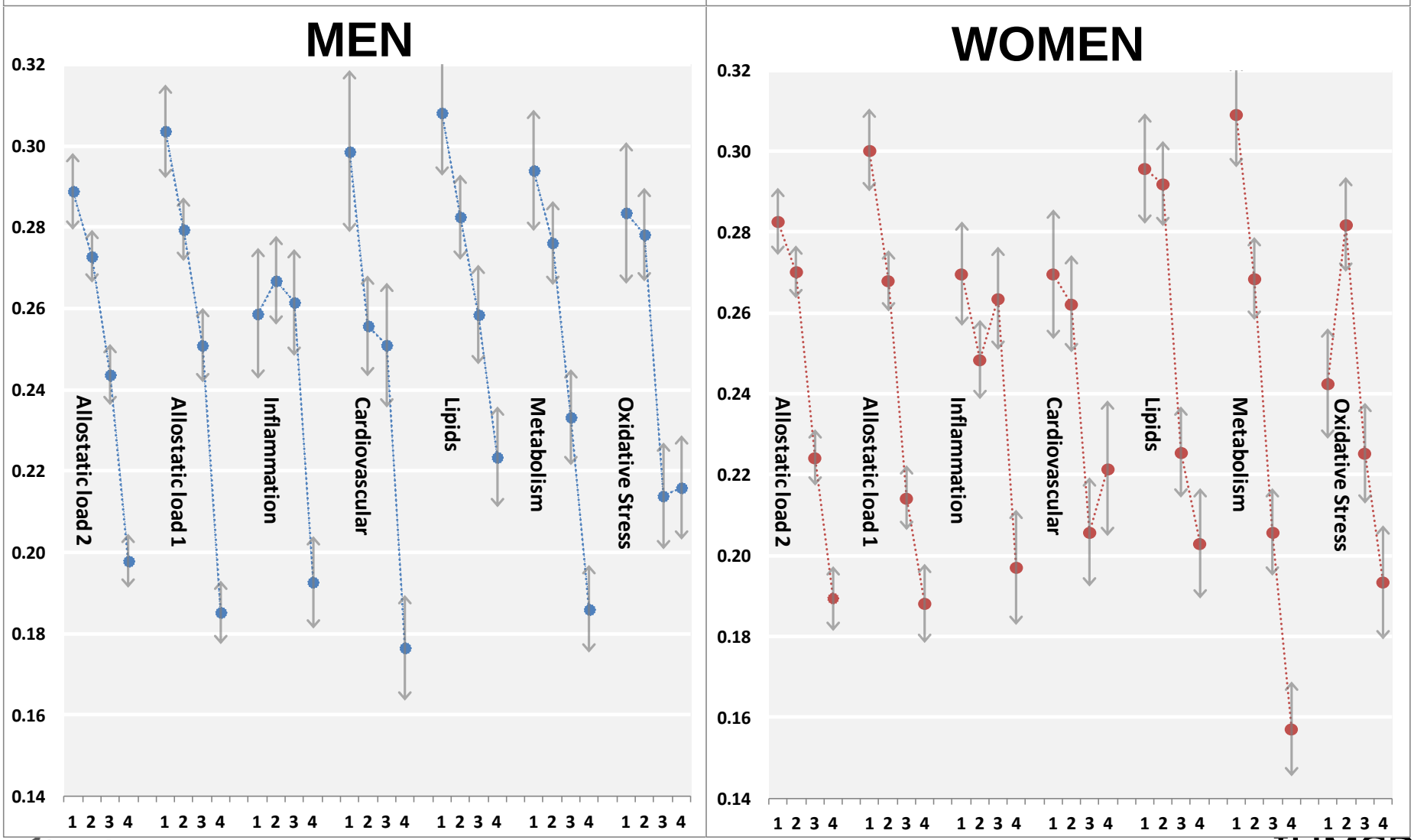
→Analysis repeated using quintile regression on continuous AL scores

# Results

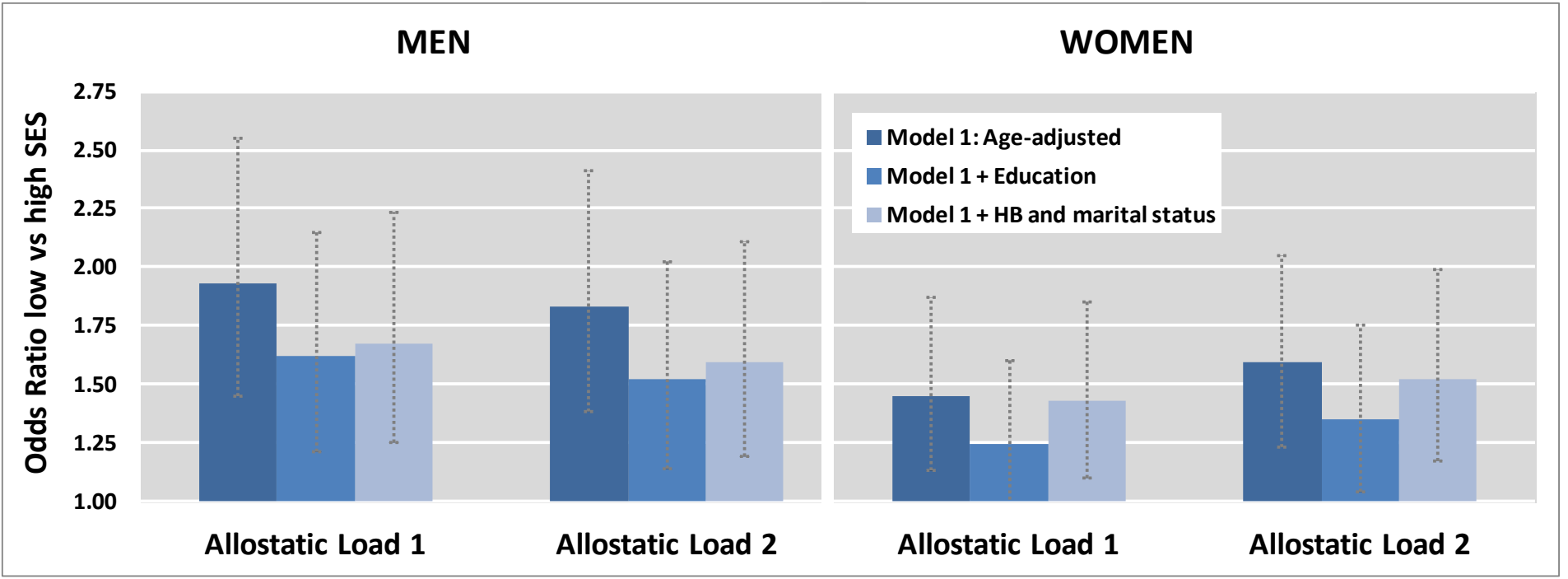
# Mean score of AL by social transfer status



# Mean score of AL by educational level

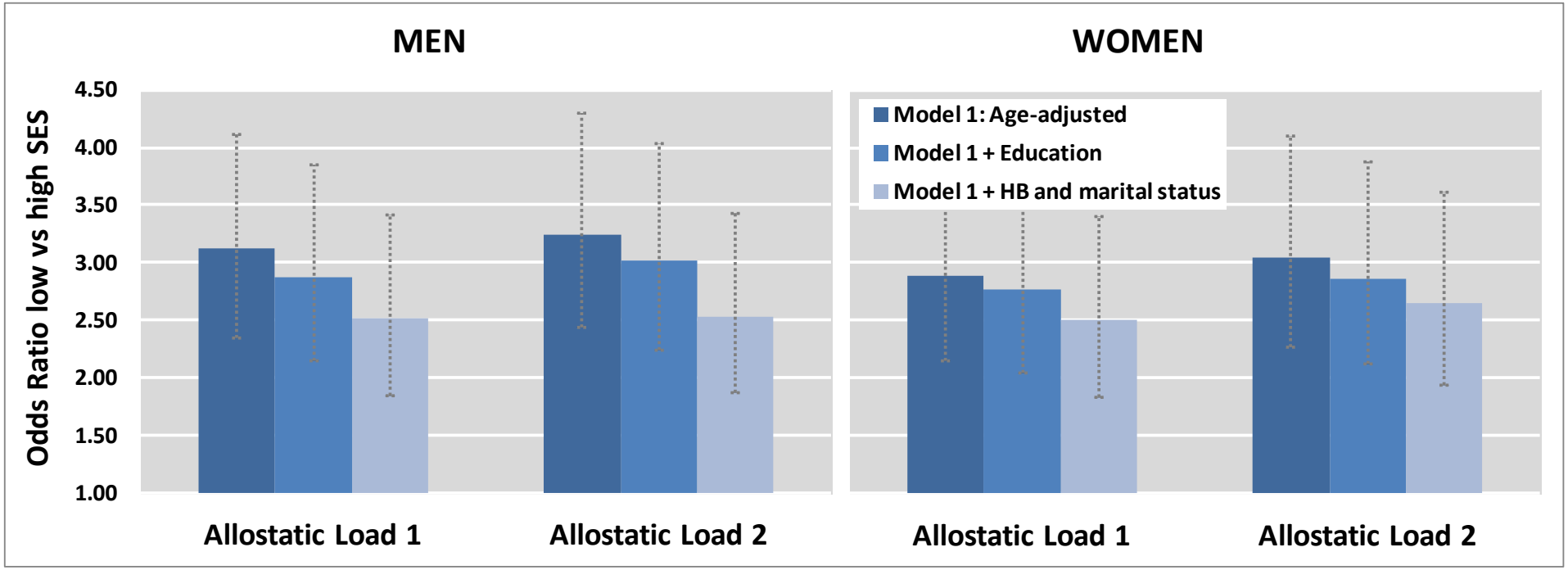


# Association of AL with receiving social transfers



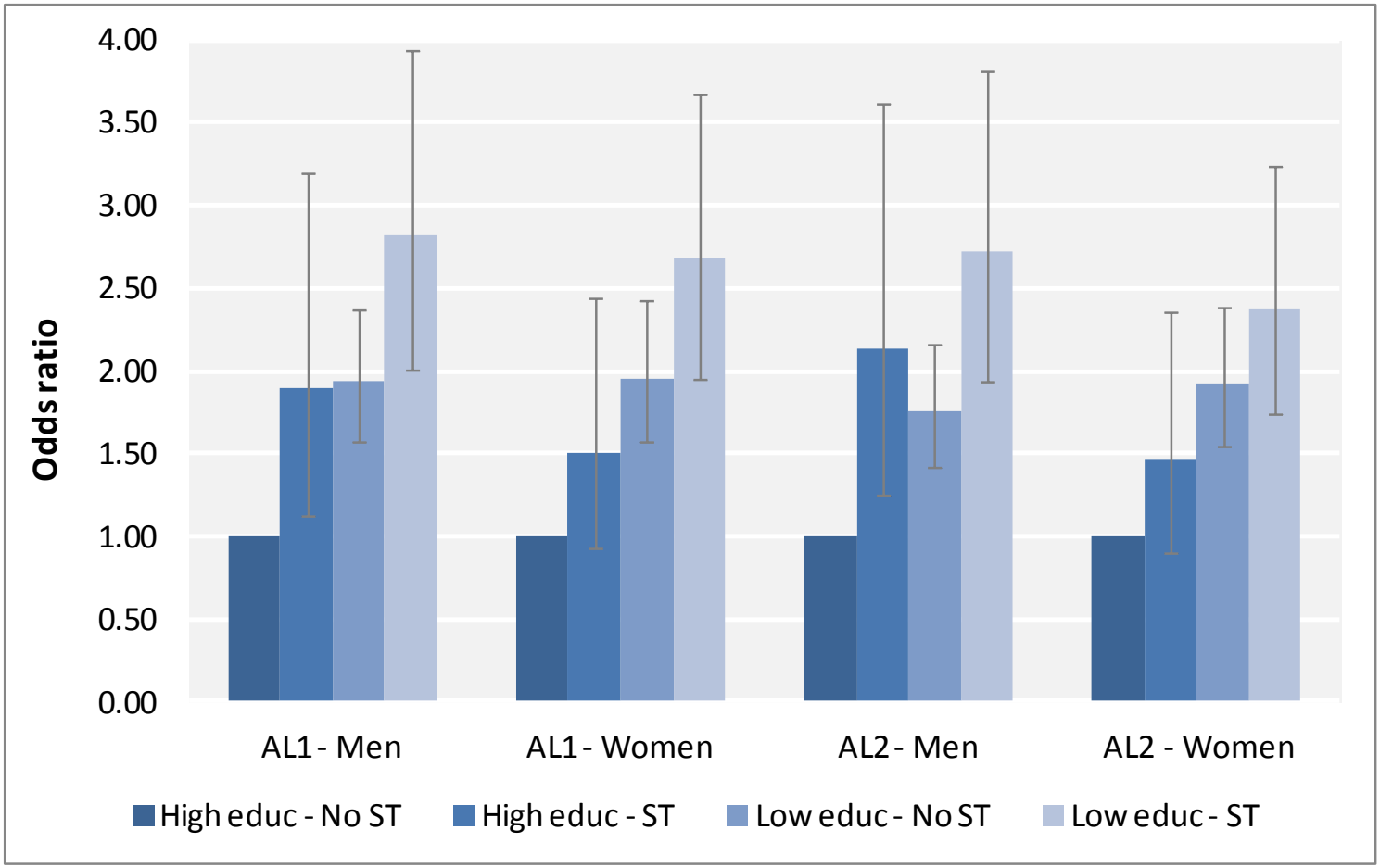

HB: Health behaviours

# Association of AL with educational level




HB: Health behaviours

# Association of AL with SES score



# Discussion

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- Strong and robust associations between SES and allostatic load in adult men and women from a population-based study in Lausanne
- Education and receiving social transfers seem to independently predict higher levels of AL

→ Possibly represent two dimensions of SES

- Associations of SES with AL indipendent of age, health behaviors and marital status

# Discussion

- Link between receiving social transfers and AL (might capture aspects related to a stressful life or financial adversity not accounted for by education)
- New AL index including component of oxidative stress (i.e.: uric acid, homocysteine, gamma-glutamyl transferase)
- Additional markers (Interleukin-1B, TNF-α, Leptin, adiponectin)

→ Need to explore association of new AL index with health outcomes

# Strengths & limitations

## Strengths

- Richness of available cardiometabolic phenotypes
- The study is population-based

## Limitations

- Neuroendocrine markers not available
- Potential confounding by diet could not be assessed
- Difficult to assess causation as study is cross-sectional

# Implications

- In one of the world's richest countries, men and women reporting to receive social transfers or with a low educational attainment had higher measured cumulative homeostatic dysregulation, independently of age, marital status, and health behaviors
- Need to understand underlying mechanisms (i.e.: gene regulation)

# Thank you for your attention