

# Associations of Obesity Phenotypes with Incident and Recurrent Falls in Older Adults: A Cross-Cohort Analysis

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## INTRODUCTION

- Over 14 million (1 in 4 older adults) report falling every year
- Age-related visceral fat gain and muscle strength decline occur independently of overall weight gain, but the impact of different obesity phenotypes on falls is understudied

## OBJECTIVE

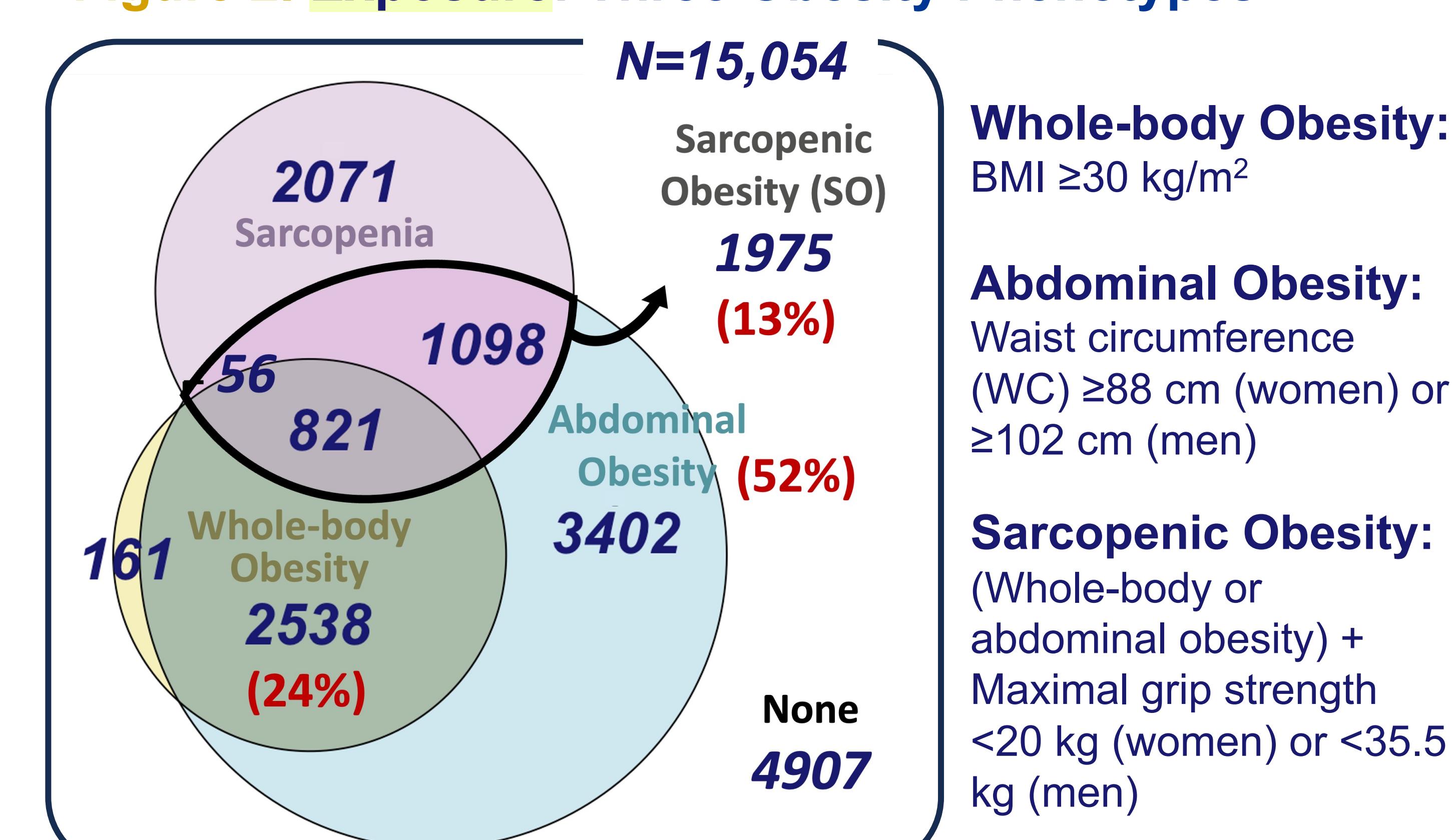
To evaluate the association between obesity phenotypes (whole-body, abdominal, sarcopenic obesity) and self-reported falls in older adults using the harmonized cohorts

## METHODS

**Table 1. Study population: N=15,054 from Harmonized Data of 4 U.S. Longitudinal Aging Cohorts (1992-2016)**

|                     | CHS                         | Health ABC                          | MrOS                                | WHI LLS                                   |
|---------------------|-----------------------------|-------------------------------------|-------------------------------------|---|
| Full Name           | Cardiovascular Health Study | Health, Aging, and Body Composition | Osteoporotic Fractures in Men Study | Women's Health Initiative Long Life Study |
| Age                 | 65+ years                   | 70-79 years                         | 65+ years                           | 63-93 years                               |
| Sites               | 4 sites                     | 2 sites                             | 6 sites                             | 40 sites                                  |
| Years               | 1992-2005                   | 1997-2009                           | 2000-2016                           | 2012-2016                                 |
| Women (%) (N=8,210) | 2,482 (57.2)                | 1,412 (52.3)                        | -                                   | 4,316 (100)                               |
| Men (%) (N=6,844)   | 1,856 (42.8)                | 1,287 (47.7)                        | 3,701 (100)                         | -   |
| N by Cohort         | 4,338                       | 2,699                               | 3,701                               | 4,316                                     |
| Overall %           | 28.8                        | 17.9                                | 24.6                                | 28.7                                      |

**Figure 2. Exposure: Three Obesity Phenotypes**



**Outcome:** Annual self-reported fall outcomes (past 25 years), including any fall (0 vs. 1); recurrent falls (<2 vs.  $\geq 2$ ) (Figure 1); and number of falls (0 vs. 1, and  $\geq 2$ )

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Older adults with **sarcopenic obesity** have  
**47% higher odds of any fall** and  
**61% higher odds of recurrent falls**  
compared to non-obese non-sarcopenic adults.

## STATISTICAL ANALYSES (Table 2 & Figure 1)

- Univariate analysis: Independent t-test/Wilcoxon rank-sum test or Chi-square test by groups (Table 2)
  - Multivariable Generalized Estimating Equation with AR(1):
- |                     |   |
|---------------------|---|
| Any/recurrent falls | Binomial distribution & logit link function               |
| Number of falls     | Multinomial distribution & cumulative logit link function |
- Covariates specified under Figure 1

**Table 2. Baseline Characteristics by SO Groups**

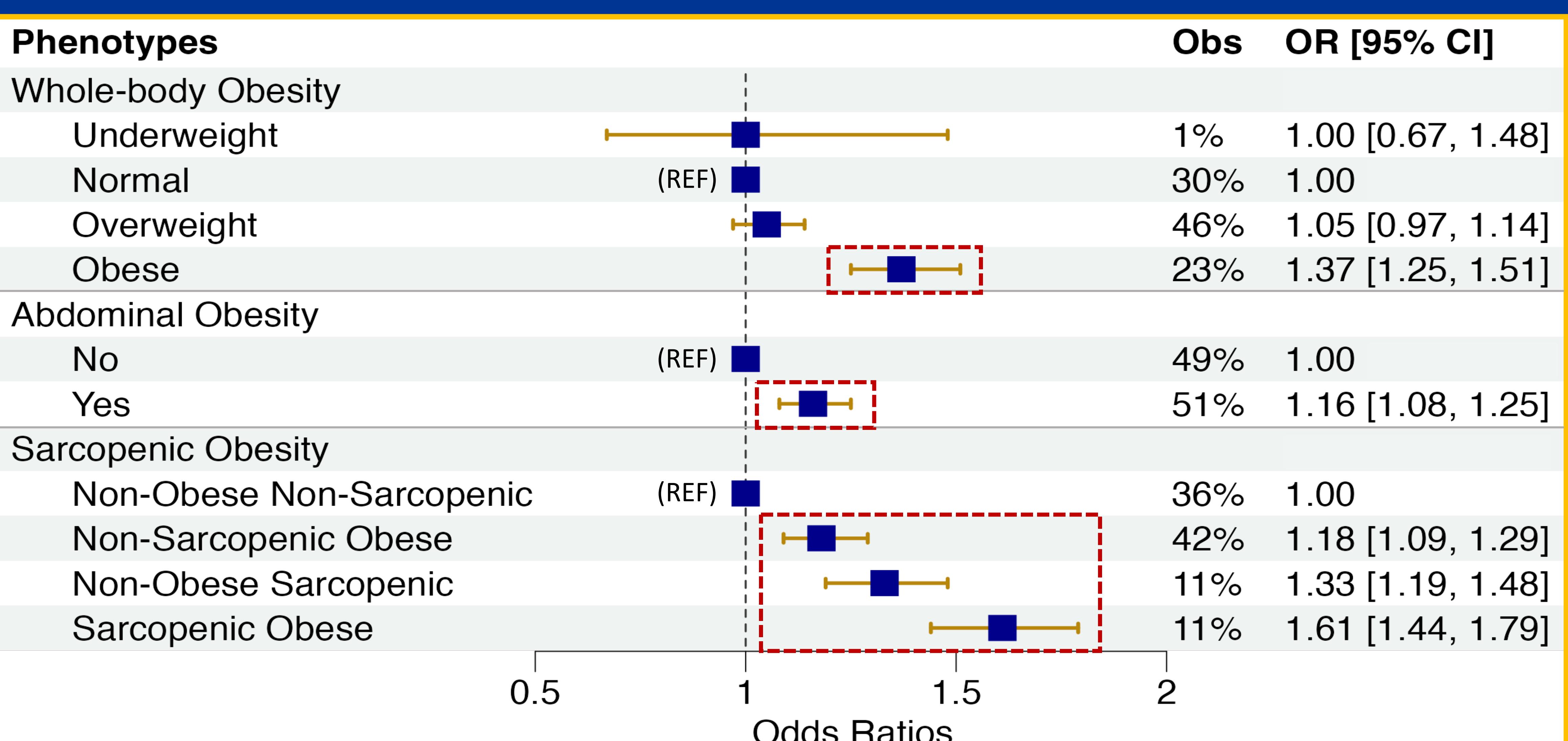
|                                   | Non-Obese<br>Non-Sarcopenic<br>(N=4907) | Non-Sarcopenic<br>Obese<br>(N=6101) | Non-obese<br>Sarcopenic<br>(N=2071) | Sarcopenic<br>Obesity<br>(N=1975) |
|-----------------------------------|---|-------------------------------------|-------------------------------------|-----------------------------------|
| Any fall ( $\geq 1$ ), % *        | 17.7                                    | 19.5                                | 25.5                                | 29.2†‡                            |
| Recurrent falls ( $\geq 2$ ), % * | 6.0                                     | 6.8                                 | 9.2                                 | 12.1†‡                            |
| Sex (male), % *                   | 60.2                                    | 39.4                                | 43.8                                | 29.3†‡                            |
| Age, years *                      | 74.1 (5.4)                              | 73.7 (4.9)                          | 79.0 (6.4)                          | 77.7 (6.2)†‡                      |
| Physical activity, min/wk *       | 385.3 (94.7)                            | 323.3 (89.6)                        | 298.9 (89.9)                        | 354.8 (93.5)†‡                    |
| BMI, kg/m <sup>2</sup> *          | 24.4 (2.6)                              | 30.0 (4.5)                          | 23.8 (2.8)                          | 30.0 (4.7)†‡                      |
| Race, % *                         | White                                   | 77.0                                | 82.6                                | 77.1†‡                            |
|                                   | Black                                   | 20.3                                | 14.9                                | 21.3†‡                            |
|                                   | Other                                   | 2.7                                 | 1.3                                 | 2.5                               |
| Education, % *                    | <High school                            | 12.0                                | 17.1                                | 11.1                              |
|                                   | Some college                            | 21.8                                | 28.0                                | 21.1                              |
|                                   | $\geq$ College graduate                 | 66.2                                | 54.9                                | 67.8                              |
| Current smoking, % *              | 7.4                                     | 6.0                                 | 5.6                                 | 6.4†‡                             |
| Alcohol drinking, % *             | Never                                   | 36.8                                | 44.0                                | 37.9                              |
|                                   | <1 drink/wk                             | 19.3                                | 22.2                                | 22.4                              |
|                                   | $\geq 1$ drinks/wk                      | 43.9                                | 33.8                                | 39.7                              |
|                                   |   |                                     |                                     | 18.0†‡                            |

\* P-value  $< 0.05$  (one-way ANOVA/Kruskal-Wallis or Chi-square test by groups)

†: Significantly different (Sarcopenic Obese vs. Non-Sarcopenic Obese)

‡: Significantly different (Sarcopenic Obese vs. Non-Obese Sarcopenic)

**Figure 1. Associations of Obesity Phenotypes with Recurrent Falls (Obs=113,082)**



\* Cohort indicator (4 studies), age (years, continuous; time-varying), sex, race (White, Black, others), education (<high school, high school, >high school), smoking (never, former, current; time-varying), alcohol (none,  $\leq 1$  drink/week,  $> 1$  drink/week; time-varying), and self-reported physical activity (standardized physical activity/week; time-varying)

**ACKNOWLEDGEMENTS:** Non-fracture Fall Injury (NFFI) project: Supported by National Institute of Aging (NIA) for Non-Fracture Fall Injuries and Long-Term Geriatric Consequences in Older Women and Men from a Cross-Cohort Study (R01 AG061136; PI: Strotmeyer, ES). CHS: Supported by National Heart, Lung, and Blood Institute (NHLBI), National Institute of Neurological Disorders and Stroke (NINDS), and NIA under the following grant numbers: HHSN268201200036C, HHSN268200800007C, HHSN268201800001C, N01HC55222, N01HC85079, N01HC85080, N01HC85081, N01HC85082, N01HC85083, N01HC85086, 75N92021D00006, U01HL080295, U01HL130114, R01HL172803, and R01AG023629/MrOS: Supported by National Institutes of Health (NIH), NIA, National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), and National Center for Advancing Translational Sciences (NCATS) under the following grant numbers: U01 AG027810, U01 AG042124, U01 AG042139, U01 AG042140, U01 AG042143, U01 AG042145, U01 AG042168, U01 AR066160, R01 AG066671, and U1L TR002369/Health ABC: Supported by NIA and National Institute of Nursing Research (NINR) under the following grant numbers: N01-AG-6-2101, N01-AG-6-2103, N01-AG-6-2106, NIA grant R01-AG028050, and NINR grant R01-NR012459/WHI: Supported by National Heart, Lung, and Blood Institute (NHLBI), NIH, and U.S. Department of Health and Human Services (HHS) under the following grant numbers: 75N92021D00001, 75N92021D00002, 75N92021D00003, 75N92021D00004, and 75N92021D00005.

## STRENGTHS AND LIMITATIONS

- Strengths:** 1) Large longitudinal cross-cohort study; 2) Covers 25 years of data (1992 to 2016); 3) Includes longitudinal fall outcomes and time-varying covariates collected at various time points
- Limitations:** 1) Obesity assessed by indirect measures; 2) Obesity phenotypes assessed at baseline only due to limited data availability; 3) Generalizability may be limited to older adults in the U.S. population

## CONCLUSIONS AND FUTURE DIRECTIONS

- Sarcopenia and sarcopenic obesity significantly increase fall risk in older women, highlighting the critical role of muscle strength preservation in fall prevention
- We are evaluating interpolation methods to optimize the use of time-varying obesity phenotype measures