Associations of Obesity Phenotypes with Incident Fall Rates: Results from the Objective Physical Activity and Cardiovascular Health in Older Women (OPACH)

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INTRODUCTION

- Age-related fat accumulation and loss in muscle and muscle strength may lead to obesity phenotypes of whole-body, abdominal, and sarcopenic obesity.
- Age-related visceral fat gain and muscle strength decline occur independently of overall weight gain, each linked to adverse outcomes in aging.

► Research on the impact of different obesity phenotypes on falls among older adults remains limited.

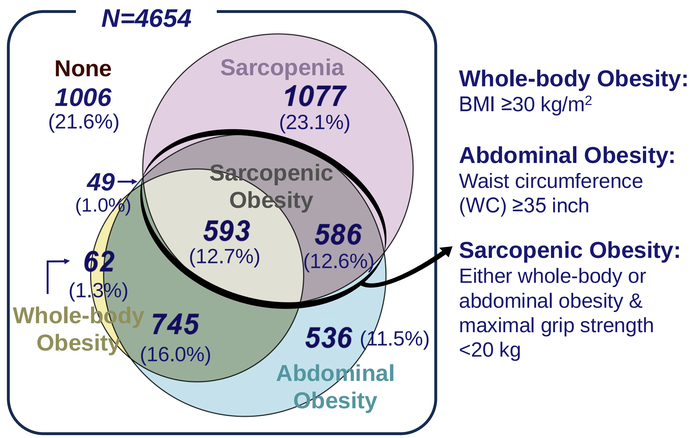
OBJECTIVE AND HYPOTHESIS

- To evaluate associations of obesity phenotypes (whole-body, abdominal, and sarcopenic obesity) with self-reported falls in older community-dwelling women
- *Hypothesis*: Older women with sarcopenia regardless of obesity status will have higher fall rates vs. non-sarcopenia women.

METHODS

- **Study population: OPACH, an ancillary study of the Women's Health Initiative (WHI)**
  - 4,654/5,971 women (79.1±6.6 years; 66.1% White) with complete results of clinic visits (2012-13; Long Life Study baseline) and ≥ 1 month of fall calendars over 13 months (2012-2015; OPACH)
- **Exposure: Obesity phenotypes including 1) whole-body, 2) abdominal, and 3) sarcopenic obesity (Fig 2)**
- **Outcome: Fall counts** (daily fall calendars: "Yes, I fell")

Figure 2. Diagrams & Definitions of Obesity Phenotypes



Whole-body Obesity: BMI ≥30 kg/m²

Abdominal Obesity: Waist circumference (WC) ≥35 inch

Sarcopenic Obesity: Either whole-body or abdominal obesity & maximal grip strength <20 kg

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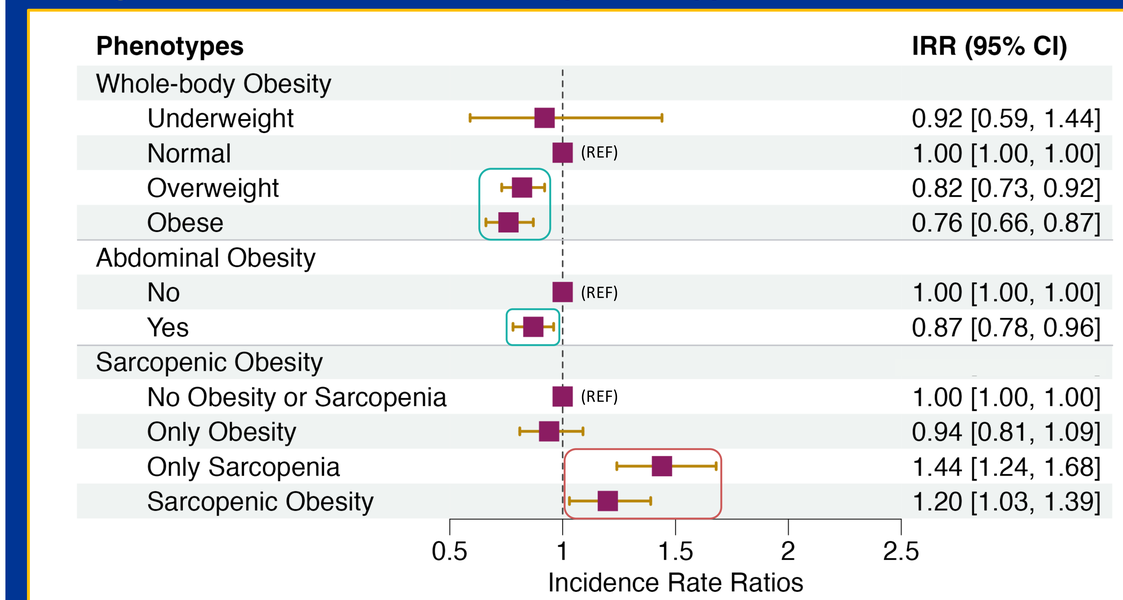
Sarcopenia and **sarcopenic obesity** are associated with a **higher incident fall rate** in older women.

Protective associations of whole-body overweight, obesity, and abdominal obesity **do not exist when accounting for sarcopenia**.

Figure 1. Associations of Obesity Phenotypes with Incident Fall Rate



* Adjusted for age, race, ethnicity, education, physical activity level, alcohol drinking, current smoking, and self-rated health.

* Whole-body obesity: Underweight (N=63; BMI <18.5 kg/m²), normal (N=1472; 18.5 kg/m² ≤ BMI <25 kg/m²), overweight (N=1670; 25 kg/m² ≤ BMI <30 kg/m²), obese (N=1449; BMI ≥30 kg/m²); Abdominal obesity: N=2460; WC ≥35 inch; Sarcopenic obesity: N=1228; Having either whole-body obesity or abdominal obesity & maximal grip strength <20 kg.

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STATISTICAL ANALYSES

- Univariate analysis: one-way ANOVA/Kruskal-Wallis or χ^2/Fisher's Exact test by groups (**Table 1**)
- Negative binomial regression for fall rates per month (IRR; # of falls adjusted for # of total calendars) by obesity phenotypes
- Covariates in the fully adjusted model: age, race, ethnicity, education, physical activity level, alcohol drinking, current smoking, and self-rated health **(Table 1)**

Table 1. Characteristics by Obesity x Sarcopenia Groups

Mean (SD) or %		None (N=1006)	Only Obesity (N=1343)	Sarcopenic Obesity (N=1228)	Only Sarcopenia (N=1077)
Average fall rate, #/month *		7.1 (15.8)	7.4 (22.1)	10.4 (24.3)	13.8 (88.4)†
≥1 fall, % *		42.4	41.0	46.8†	48.3†
Age, years *		77.5 (6.4)	76.8 (6.2)†	80.4 (6.3)†	82.1 (6.1)†
Weekly physical activity, min *		385.3 (94.7)	323.3 (89.6)†	298.9 (89.9)†	354.8 (93.5)†
BMI, kg/m² *		24.1 (2.7)	31.8 (5.4)†	31.0 (5.1)†	23.7 (2.9)†
Race, % *	White	61.8	54.4†	71.2†	78.8†
	Black	36.1	43.3†	27.1†	19.2†
	Other	2.1	2.3†	1.7†	2.0†
Hispanic/Latino ethnicity, % *		16.2	11.5†	11.5†	13.6
Education, %*	<High school	15.8	20.6†	22.1†	21.0†
	Some college	36.5	38.9†	40.1†	36.0†
	≥College graduate	47.7	40.5†	37.8†	43.0†
Current smoking, % *		3.6	3.4	1.7†	2.0†
Alcohol drinking, % *	Never	30.9	41.1†	39.0†	36.9†
	<1 drink/week	31.8	34.9†	37.5†	30.3†
	1-4 drinks/week	22.6	15.1†	15.4†	18.0†
	>4 drinks/week	14.7	8.9†	8.1†	14.8†
Self-rated health, % *	Worse	9.5	13.0†	16.8†	14.5†
	Same	73.5	68.7†	68.2†	68.9†
	Better	17.0	18.3†	15.0†	16.6†

* ***P*-value <0.05** (one-way ANOVA/Kruskal-Wallis or χ2/Fisher's Exact test by groups)
† significant pairwise comparison when compared to the 'None' group

STRENGTHS AND LIMITATIONS

- **Strengths:** 1) Directly measured BMI, WC, and grip strength; 2) Adjusted for many covariates including lifestyle risk factors; 3) Ethnic/racially diverse population of older women included
- **Limitations:** 1) Generalizable to older women, analyses needed for older men; 2) Body composition not directly measured

CONCLUSIONS AND FUTURE DIRECTIONS

- Sarcopenia may be a risk factor for higher fall rates in women ≥65 years, even with a higher BMI and WC.
- Future studies should directly assess sarcopenia, as well as direct fat and lean mass measures, to explore mechanisms linking age-related changes to falls.