

# Association of Dysanapsis With Chronic Obstructive Pulmonary Disease Among Older Adults

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## Supplemental content

**IMPORTANCE** Smoking is a major risk factor for chronic obstructive pulmonary disease (COPD), yet much of COPD risk remains unexplained.

**OBJECTIVE** To determine whether dysanapsis, a mismatch of airway tree caliber to lung size, assessed by computed tomography (CT), is associated with incident COPD among older adults and lung function decline in COPD.

**DESIGN, SETTING, AND PARTICIPANTS** A retrospective cohort study of 2 community-based samples: the Multi-Ethnic Study of Atherosclerosis (MESA) Lung Study, which involved 2531 participants (6 US sites, 2010-2018) and the Canadian Cohort of Obstructive Lung Disease (CanCOLD), which involved 1272 participants (9 Canadian sites, 2010-2018), and a case-control study of COPD: the Subpopulations and Intermediate Outcome Measures in COPD Study (SPIROMICS), which involved 2726 participants (12 US sites, 2011-2016).

**EXPOSURES** Dysanapsis was quantified on CT as the geometric mean of airway lumen diameters measured at 19 standard anatomic locations divided by the cube root of lung volume (airway to lung ratio).

**MAIN OUTCOMES AND MEASURES** Primary outcome was COPD defined by postbronchodilator ratio of forced expired volume in the first second to vital capacity (FEV<sub>1</sub>:FVC) less than 0.70 with respiratory symptoms. Secondary outcome was longitudinal lung function. All analyses were adjusted for demographics and standard COPD risk factors (primary and secondhand tobacco smoke exposures, occupational and environmental pollutants, and asthma).

**RESULTS** In the MESA Lung sample (mean [SD] age, 69 years [9 years]; 1334 women [52.7%]), 237 of 2531 participants (9.4%) had prevalent COPD, the mean (SD) airway to lung ratio was 0.033 (0.004), and the mean (SD) FEV<sub>1</sub> decline was -33 mL/y (31 mL/y). Of 2294 MESA Lung participants without prevalent COPD, 98 (4.3%) had incident COPD at a median of 6.2 years. Compared with participants in the highest quartile of airway to lung ratio, those in the lowest had a significantly higher COPD incidence (9.8 vs 1.2 cases per 1000 person-years; rate ratio [RR], 8.12; 95% CI, 3.81 to 17.27; rate difference, 8.6 cases per 1000 person-years; 95% CI, 7.1 to 9.2; *P* < .001) but no significant difference in FEV<sub>1</sub> decline (-31 vs -33 mL/y; difference, 2 mL/y; 95% CI, -2 to 5; *P* = .30). Among CanCOLD participants (mean [SD] age, 67 years [10 years]; 564 women [44.3%]), 113 of 752 (15.0%) had incident COPD at a median of 3.1 years and the mean (SD) FEV<sub>1</sub> decline was -36 mL/y (75 mL/y). The COPD incidence in the lowest airway to lung quartile was significantly higher than in the highest quartile (80.6 vs 24.2 cases per 1000 person-years; RR, 3.33; 95% CI, 1.89 to 5.85; rate difference, 56.4 cases per 1000 person-years; 95% CI, 38.0 to 66.8; *P* < .001), but the FEV<sub>1</sub> decline did not differ significantly (-34 vs -36 mL/y; difference, 1 mL/y; 95% CI, -15 to 16; *P* = .97). Among 1206 SPIROMICS participants (mean [SD] age, 65 years [8 years]; 542 women [44.9%]) with COPD who were followed up for a median 2.1 years, those in the lowest airway to lung ratio quartile had a mean FEV<sub>1</sub> decline of -37 mL/y (15 mL/y), which did not differ significantly from the decline in MESA Lung participants (*P* = .98), whereas those in highest quartile had significantly faster decline than participants in MESA Lung (-55 mL/y [16 mL/y]; difference, -17 mL/y; 95% CI, -32 to -3; *P* = .004).

**CONCLUSIONS AND RELEVANCE** Among older adults, dysanapsis was significantly associated with COPD, with lower airway tree caliber relative to lung size associated with greater COPD risk. Dysanapsis appears to be a risk factor associated with COPD.

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**Group Information:** A full list of participating MESA, CanCOLD, and SPIROMICS investigators and institutions can be found at <http://www.mesa-nhlbi.org>, <http://www.cancold.ca>, and <http://www.spiromics.org>, respectively.

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