Estimating The Prevalence Of Chronic Obstructive Pulmonary Disease Using Pre- And Post-Bronchodilator Spirometry Testing: Data From The National Health And Nutrition Examination Survey, 2007-2010

T. Tilert[1], R. Paulose-Ram[2], C. Dillon[2], E. Hnizdo[3], B. Doney[3],

[1]CDC/National Center for Health Statistics, Hyattsville, MD, [2]Centers for Disease Control and Prevention, Hyattsville, MD, [3]CDC/National Institute for Occupational Safety and Health, Morgantown, WV

Rationale: During 2007-2010, the National Health and Nutrition Examination Survey (NHANES), a nationally representative survey of the non-institutionalized US population, conducted a spirometry component which obtained pre-bronchodilator pulmonary lung function data on survey participants 6-79 years of age and post-bronchodilator pulmonary lung function data for the subset of this group with airflow limitation. Data on respiratory symptoms and other respiratory related data were also collected. These data offered a unique opportunity to examine multiple approaches to estimating the prevalence of COPD in a nationally representative US sample.

Methods: NHANES 2007-2010 spirometry data were analyzed. Among those aged 40-79 years, 5,823 received the pre-bronchodilator spirometry. Those with likely airflow limitation were selected for the post-bronchodilator test (n=1,110). Airflow limitation was defined based on two criteria: 1) forced expiratory volume in 1 second (FEV_1)/forced vital capacity (FVC) < 70%[1,2] and 2) FEV_1/FVC < lower limit of normal (LLN) according to age, sex, height, and race/ethnicity[1,3,4]. Persons were classified as having chronic obstructive pulmonary disease (COPD) based on 1) having airflow limitation as defined above using pre- or post-bronchodilator values or 2) reporting the use of daytime supplemental oxygen therapy plus a physician diagnosis of COPD (ever had emphysema or current chronic bronchitis). The final analytic samples for the pre-bronchodilator and post-bronchodilator analyses were 77.1% (n=5,477) and 50.8% (n=564) of those eligible, respectively. To account for this non-response in the estimation of COPD, we used a method where NHANES examination weights were adjusted to the eligible pre-bronchodilator and post-bronchodilator subpopulations.

Results: In 2007-2010, using the FEV1/FVC ratio <0.7 diagnostic criterion and pre-bronchodilator test results, the estimated prevalence of COPD was 20.9% (SE 1.1) among US adults aged 40-79 years. Applying the same criterion to post-bronchodilator test results, the prevalence was 14.0% (SE 1.0). Using the FEV1/FVC ratio <LLN diagnostic criterion and pre-bronchodilator test results, the estimated prevalence of COPD was 15.4% (SE 0.8), while applying the same diagnostic criterion to post-bronchodilator test results, the prevalence was 10.2% (SE 0.8).

Conclusions: The overall prevalence of COPD among US adults aged 40-79 years varied from 10.2% to 20.9% based on whether pre- or post-bronchodilator values were used and which diagnostic criterion (fixed ratio or LLN) was applied. The overall prevalence decreased by approximately 33% when airflow limitation was based on post-bronchodilator as compared to pre-bronchodilator spirometry, regardless of which diagnostic criterion was used.

References:

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