Scientific Letter

An Euler Proportional Venn Diagram of Obstructive Lung Disease

To the Director,

Heterogeneity in the presentation of chronic obstructive pulmonary disease (COPD) is large, and individual patients commonly share traits of chronic bronchitis, emphysema and asthma, or even all three of these conditions combined.[1] Perhaps one of the most iconic graphical representations of COPD is the Venn diagram of obstructive lung disease (Fig 1a), which was included in the 1995 American Thoracic Society (ATS) COPD guidelines.[2] That was a non-proportional Venn diagram, without quantifying the eleven subpopulations represented there, although only seven domains were mutually exclusive. It took eight years to include proportionality for the first time[3] (Fig. 1b). To the best of our knowledge there has been only one external replication.[4] However, to date all these were mere approximations undertaken with available simple proportional Euclidean geometry[5]; in both, the area of the full circles represented the exact population size, but only approximating
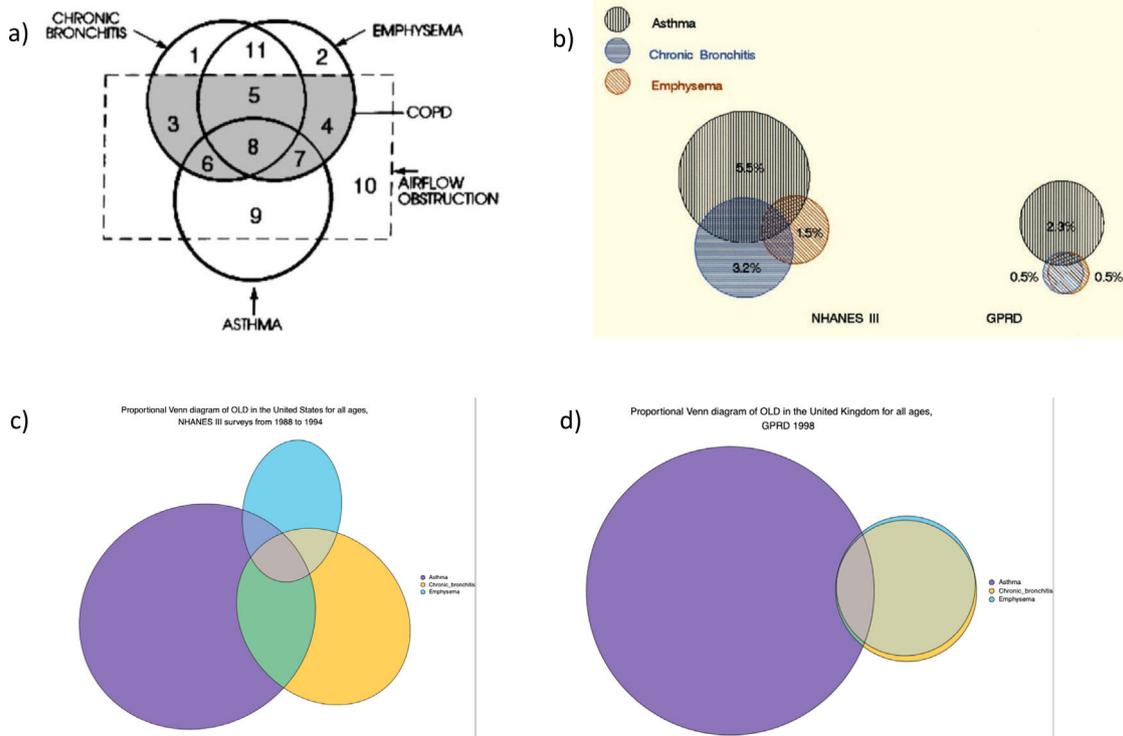

Fig. 1. Population proportionality of obstructive lung disease. (a) Nonproportional Venn diagram of COPD showing subsets of patients with chronic bronchitis, emphysema, and asthma. Reprinted with permission from the American Thoracic Society.[2] (b) Euclidean Proportional Venn diagram of OLD in the United States (NHANES III surveys from 1988 to 1994) and United Kingdom (GPRD 1998) for all ages. Reprinted with permission from Chest.[3] (c) Euler Proportional Venn diagram of OLD for all ages in the United States (NHANES III surveys from 1988 to 1994). (d) Euler Proportional Venn diagram of OLD for all ages in United Kingdom (GPRD 1998). Footnote: In Fig. 1a the subsets comprising COPD are shaded. Subset areas are not proportional to the actual relative subset sizes. Asthma is by definition associated with reversible airflow obstruction, although in variant asthma special maneuvers may be necessary to make the obstruction evident. Patients with asthma whose airflow obstruction is completely reversible (i.e., subset 9) are not considered to have COPD. Because in many cases it is virtually impossible to differentiate patients with asthma whose airflow obstruction does not remit completely from persons with chronic bronchitis and emphysema who have partially reversible airflow obstruction with airway hyperreactivity, patients with unremitting asthma are classified as having COPD (i.e., subsets 6, 7, and 8). Chronic bronchitis and emphysema with airflow obstruction usually occur together (subset 5), and some patients may have asthma associated with these two disorders (i.e., subset 8). Individuals with asthma who have been exposed to chronic irritation, as from cigarette smoke, may develop chronic productive cough, which is a feature of chronic bronchitis (i.e., subset 6). Such patients often are referred to in the United States as having asthmatic bronchitis or the asthmatic form of COPD. Persons with chronic bronchitis and/or emphysema without airflow obstruction (i.e., subsets 1, 2, and 11) are not classified as having COPD. Patients with airway obstruction due to diseases with known etiology or specific pathology, such as cystic fibrosis or obliterative bronchiolitis (subset 10), are not included in this definition.

each overlapping region.[3,4] Overall, with limited success in diagram accuracy.

By using newly available tools of Euler diagrams graphic display,[6,7] we present in here the first truly Proportional Venn Diagram of Obstructive Lung Disease of our previously reported study (Figs. 1c and 1d).[3] We encourage others to replicate our findings in different populations with obstructive lung disease and other settings,[8–10] as pictorial Images[11] are used to simplify an often complex natural world,[12] but lack of representativity may distort reality and confuse both patients and their caretakers.[13]

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Conflict of interest

The authors declare there are no conflicts of interest to disclose in relation with this manuscript.

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