



Important Differences in Pulmonary Diseases

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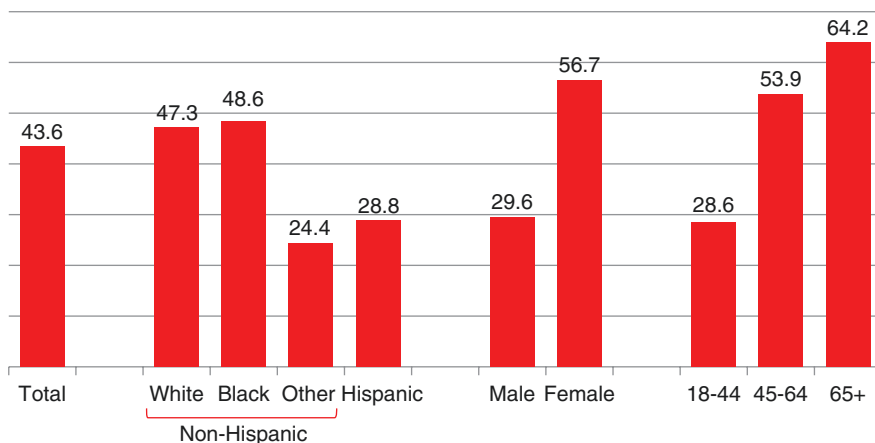
Disparities in outcomes for pulmonary diseases are the most evident of all chronic diseases. A “Disparities in Respiratory Health” report put out jointly by the American Thoracic Society, and the European Respiratory Society indicates that “the lowest social groups are up to 14 times more likely to have respiratory diseases than the highest” [1]. Some data also suggests that African Americans may be more susceptible to chronic lung disease due to a smaller trunk/leg ratio compared to European Americans [2, 3]. The relatively smaller thorax in African Americans (and woman) may make exposure to toxins, like cigarette smoke, more damaging with less exposure. Other possible explanations include genetic/epigenetic differences, proteases, and/or cytokines that may influences how the lung reacts to exposures [2].

9.1 COPD (Emphysema and Chronic Bronchitis)

While COPD has historically been considered a “white male smoker’s disease,” newer data and migrating smoking demographics have shown an increased prevalence in woman and a rapidly growing incidence in African Americans. Chronic obstructive pulmonary disease (COPD) disproportionately affects ethnic minorities and low socioeconomic groups not just in the United States but across the world. Because of disproportional poverty and urban living, African Americans have an increased exposure to indoor and outdoor pollution, occupational and environmental hazards, and tobacco smoke, which contribute to disparities in prevalence and outcomes of COPD. In short, the social determinants of health (healthcare access, educational opportunities, economic stability, and social and community environment) complicate the course of COPD for too many African Americans [3].

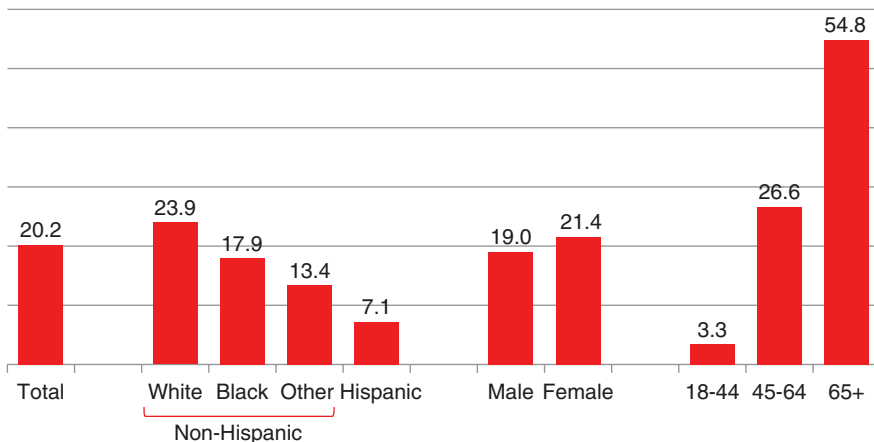
Although African Americans are thought to have an overall lower prevalence of COPD in the United States, several reports have demonstrated that African Americans develop COPD with less cumulative smoking and at younger ages [4, 5]. These worse outcomes are more pronounced in the presence of current smoking, asthma, maternal smoking, and maternal COPD. Data suggests that the prevalence of emphysema is lower in African Americans while chronic bronchitis is higher when compared by race (Fig. 9.1).

Chronic Bronchitis – Prevalence Rates per 1,000, 2011



Source: CDC, NHIS 2011.

Emphysema – Prevalence Rates per 1,000, 2011



Source: CDC, NHIS 2011.

Fig. 9.1 Prevalence of chronic bronchitis and emphysema by race, sex, and age. <https://www.lung.org/assets/documents/research/copd-trend-report.pdf>

A study by Hardin et al. at Harvard Medical School showed that African Americans had a significantly higher history of asthma and therefore were more likely to have more frequent COPD exacerbations [6].

COPD is an independent risk factor for lung cancer, with chronic bronchitis and/or emphysema increasing lung cancer risk by two- to fivefold as compared to smokers with normal spirometry. African Americans are at higher risk for developing COPD and lung cancer [7]. Research done by Mark Dransfield showed that African Americans (women in particular) are more susceptible to the damaging effects of tobacco smoke when compared to European American men [8]. Therefore, while all tobacco smokers may be at comparable risk for the development of COPD, African Americans and women who develop COPD may be particularly susceptible to progressive disease [9, 10]. These added adverse events make smoking cessation counseling critical.

Another study by Han et al. looked at quality of life and related it to COPD exacerbations and found that African Americans had more frequent hospitalizations despite similar quality of life indexes [11]. The same study noted disparities in home oxygen prescriptions, influenza vaccination administrations, and referral for smoking cessation counseling which were surmised to be contributing to the increased hospitalizations [11].

Hyun Lee and colleagues looked at NHANES data for COPD-related comorbidities to see if racial differences existed and found some interesting trends [12]. African Americans had a number of comorbidities including a high prevalence of current smokers, a history of asthma, hypertension, stroke, diabetes, anemia, and rheumatoid arthritis [12].

Finally, Tadahiro Goto at Massachusetts General looked at the readmission rates for patients with COPD. Overall there was a 20% 30-day readmission rate for patients with COPD. When examined by race, he found that African American patients had a higher rate of asthma-COPD overlap with asthma as a predominant cause for readmission. COPD patients with asthma had significantly more exacerbations and readmissions. Because of the asthma component, the authors presumed that long-acting beta2-agonist and inhaled corticosteroid use would benefit these patients more [13]. When African American patients present with COPD, it is critical to determine if they have a history of asthma.

9.2 Asthma

Asthma occurs in almost 14% of African American children with a higher prevalence in girls (15.7% compared to 11.4%) [14]. African American adults are three times more likely to die from asthma. In fact, mortality rates are highest in African

American women, whose rate is more than two times higher than that of European American women. African American children have a death rate ten times that of European American children [14]. Overall, the African American mortality rate, emergency department visit rate, and hospital admission rate for asthma are all multiple times higher than European Americans [15]. Despite the high mortality, increased ED visits and hospitalizations, and poor outcomes, African Americans have lower physician office visits, lower specialty office visits, and lower levels of asthma care as recommended by guidelines [16]. Because of the fewer referrals to pulmonologists, there is less pulmonary function testing and diagnosis confirmation. Given the worse outcomes yet less intensive interventions, front-line providers have a unique opportunity to make a big difference in the quality of care of asthma in this population.

Risk factors for increased mortality in patients with asthma include multiple emergency department visits or hospitalizations, history of intubation or ICU admission in the past 5 years, non-use of inhaled corticosteroids, current smoking, psychosocial stress and depression, socioeconomic factors, and negative attitudes and beliefs regarding the benefit of medications [15]. Unfortunately, African Americans disproportionately have these comorbidities, factors, and beliefs.

As in COPD, environmental factors also play a prominent role in the frequency and severity of asthma. Because African Americans live disproportionately in urban areas where industrial pollutants and occupational exposures occur, asthma occurrence and severity are worse. Differences in housing, with a higher rate of living in poverty, also increase the exposure to asthma-inducing antigens (dust, dust mites, mold, cockroaches, mice, rats, and more). Rates of asthma were also significantly higher among children whose home exteriors and interiors were described as being in “poor condition” [17]. Essentially, social and economic variables working at the individual, household, and neighborhood level can greatly impact the occurrence and severity of asthma [18].

Obesity is another important modifiable risk factor. Higher BMI is associated with more uncontrolled asthma, increased severity of asthma, and increased number of medications. Weight loss is associated with improved outcomes [19]. Addressing obesity and its impact on asthma with our patients is important.

A study by Brehm et al. at Brigham and Woman’s Hospital found that vitamin D deficiency was associated with increased asthma severity [20]. The vitamin D insufficiency occurred more often with older age, higher BMI, and African American race. When the vitamin D level exceeded 30 ng/ml, the likelihood of an asthma exacerbation decreased. The odds of any hospitalization or emergency department visit was higher in patients with low vitamin D even after adjusting for age, sex, BMI, and baseline asthma severity [20]. A majority of African Americans have low

vitamin D levels [21]. Note that a number of other researchers have also looked at the connection between vitamin D and asthma and not found either a true connection, or benefit from vitamin D supplementation [22].

Another curious finding was the positive association with breast feeding and a lower prevalence of asthma exacerbations, even after controlling for socioeconomic status, maternal smoking, BMI, and a number of other factors [23]. One third of African American children are never breast fed and are also at increased risk for worse asthma outcomes [23].

The treatment of asthma is essentially the same across racial groups with a long-acting beta2-agonist and inhaled corticosteroid combination resulting in greater improvements in pulmonary function and asthma control [14].

9.3 Sarcoidosis

Sarcoidosis is a multisystem disease of unknown origin characterized by non-caseating granulomatous inflammation at the affected site. Although any organ can be involved, the disease most commonly (>90%) affects the lungs and intrathoracic lymph nodes. Disparities in outcomes exist by race, ethnicity, sex, and socioeconomic groups, with African Americans having disproportionately more severe disease. Mortality rates are highest in African Americans, and they tend to have more severe lung involvement [24–26]. Environmental exposures are also linked to sarcoidosis due to a clustering of outbreaks during flu seasons. Geographic variations with increased occurrences in the southeast and coastal areas also support a role for environmental factors in sarcoidosis. Some scientists suggest that exposure to molds, mildews, and musty odors at home or work conveys a small increased risk [27].

It remains unclear how much racial differences are due to genetics, socioeconomic factors, or a combination of the two. Researchers have found specific genes in African Americans that are associated with more severe disease and worse outcomes and another set of genes in European Americans that are associated with milder disease [28]. Data show that lower socioeconomic status patients have more advanced and persisting disease with African Americans comprising a greater proportion of these patients [29].

Sarcoidosis is more often symptomatic in African Americans and has more extrapulmonary presentations including more skin, bone marrow, and eye involvement when compared to majority populations. Even the lung involvement is more obvious with African American patients having decreased forced vital capacity and increased shortness of breath. African Americans have higher granuloma density compared with other races despite similar stages of disease and are diagnosed

approximately 10 years earlier than European American patients, due to earlier onset of symptoms [29].

A study by Mirsaeidi and colleagues of mortality in patients with sarcoidosis found dramatically more deaths due to respiratory failure, cardiac arrest, pulmonary hypertension, heart failure, pulmonary fibrosis, hypertension, diabetes, and renal failure [29]. Overall African Americans had an eightfold higher mortality rate compared to European Americans. This study also found a different geographical distribution for African Americans with increased cases in the District of Columbia, North and South Carolina, Pennsylvania, and New Jersey [29].

There are also differences in outcomes based on ethnicity and gender among families with sarcoidosis with African American women dying at a higher rate and younger age than European Americans. Yvette Cozier and colleagues at the Slone Epidemiology Center at Boston University looked closely at sarcoidosis in African American women as part of the Black Women's Health Study [25]:

the lung was the organ most commonly involved in the disease process, with 61% of women having lung involvement, followed by intrathoracic lymph nodes (35%); 96% had intrathoracic involvement. There was also substantial extrapulmonary disease; sites affected most often were the skin (including erythema nodosum) (20%), and eyes (16%). Cardiac sarcoidosis was reported for only one woman. Chest radiograph was reported as the method of diagnosis for 73% of women, followed by biopsy (54%), and chest CT scan (31%). Sixty percent of women with a diagnostic chest radiograph were classified by their physicians as stage II or higher. Comorbid illness was noted for 56% of cases: conditions reported by physicians included asthma, hypertension, type 2 diabetes, cancer, scleroderma, lupus, obesity, hypercholesterolemia, and depression. [25]

In terms of clinical presentation, patients in this study presented with shortness of breath (45%), fatigue (41%), and cough (40%) most frequently [25]. Twenty-five percent presented with sinus congestion and 20% had chest pain. Palpitations as a presenting complaint are highly suggestive of sarcoid cardiac involvement [30]. Pulmonary hypertension, which occurs more often in African Americans, heralds a poor prognosis when developed [31, 32].

There is general consensus that patients with sarcoidosis and no evidence of end-organ impairment and minimal respiratory symptoms should not be treated [33]. Because African Americans tend to have more severe disease with more varied organ involvement, it is going to be critical that these patients be followed closely. If more advanced disease is determined, the treatment generally involves steroids for an extended period of time. Steroid-sparing medications (hydroxychloroquine, methotrexate, azathioprine, tumor necrosis factor, etc.) are also gaining popularity, but no studies related to response differences based on race have indicated any advantages [33].

9.4 Obstructive Sleep Apnea (OSA)

A study by Chen et al. at the Harvard School of Public Health confirmed there are more sleep apnea, interrupted sleep, and daytime sleepiness in African Americans than in European Americans [33]. The lost sleep leads to daytime sleepiness, fatigue, poor concentration, poor energy, increased hypertension, heart disease, poor digestion and metabolism, and more [34].

A number of studies have found increased sleep-disordered breathing in African Americans, and these disparities persist even after controlling for BMI [35–37]. While increased obesity does directly increase the occurrence of OSA in African Americans, it is likely not the entire cause. In terms of risk factors, African Americans tend to have craniofacial soft tissue features that contribute to obstructive sleep apnea including a larger tongue area. For those significantly obese patients, weight loss can reverse obstructive sleep apnea in some [38].

There is also a significant disparity with African American children having 20% more sleep apnea severity and oxygen desaturation [35].

African American children are 4–6 times more likely to have OSA compared to white children. Even among young adults less than 26 years of age, African Americans are 88% more likely to have OSA as compared to whites. Among middle-aged populations, the evidence for a disparity in OSA prevalence is weaker as differences in OSA prevalence from community based studies are evident in some but not all studies. In contrast, data from older populations suggests a disparity may re-emerge in this age group. While African Americans had similar prevalence of OSA as whites (32% and 30% respectively) in a community-based survey of individuals 65 years of age and older, this group was 2.1 times more likely to have severe OSA. [35]

Chen also found significantly increased sleep apnea patterns with more snoring, more obesity, and worse global functioning in African Americans. They also showed decreased formally diagnosed sleep apnea in African Americans despite the disproportional increased occurrence [34].

African Americans have a poorer sleep quality overall associated with shortest sleep duration and the highest levels for excessive daytime sleepiness [39]. With prolonged loss of sleep, the risk for hypertension and resultant strokes, heart disease, and kidney failure ensues [40].

Continuous positive airway pressure (CPAP) therapy is the treatment of choice for mild, moderate, and severe obstructive sleep apnea. CPAP reduces daytime sleepiness, depression, and hypertension and improves alertness and global quality of life [41].

Schwartz and colleagues at the University of South Florida looked at veteran data and found that only a fraction of patients with sleep apnea and a CPAP machine

use it. In African Americans, the use of this technology is even worse. African Americans were over five times more likely to not use their CPAP machine than European Americans [42]. They also found that when African Americans had severe OSA, they were three times more likely to use CPAP than African Americans with mild or moderate symptoms [42].

Addressing poor compliance with CPAP usage has been a growing medical concern. Jessie Bakker and colleagues at Harvard Medical School looked at an array of published approaches to improved compliance with CPAP and concluded that remote monitoring associated with a personalized behavioral modification plan would likely be part of the solution to this difficult and pervasive problem [43].

To be implemented clinically, it is critical that an adjunct therapy to promote CPAP adherence be cost-effective, feasible in a wide range of settings, and scalable to large and diverse patient populations. The most efficacious interventions tested to date have been behavioral in nature; when combined with the remote-monitoring capabilities available in modern CPAP machines, these theory-driven methods could hold the answer to increasing real-world CPAP adherence rates. [43]

Patients with sleep apnea will need a compliance discussion on follow-up visits that includes an assessment of their CPAP comfort including mask style, sleeping position, and what approaches they have used to improve compliance. It is also worth reviewing the significant improvement in sleep apnea comorbidities (hypertension, cardiovascular, daytime alertness, etc.) when emphasizing CPAP use.

Important Differences in Pulmonary Diseases

- Because of disproportional poverty and urban living, African Americans have an increased exposure to indoor and outdoor pollution, occupational and environmental hazards, and tobacco smoke, which contribute to disparities in prevalence and outcomes of COPD.
- African American patients had a higher rate of asthma-COPD overlap with asthma as a predominant cause for resistant treatment and hospital readmission.
- African Americans have a higher rate of chronic bronchitis and a lower rate of emphysema when compared to European Americans.
- Vitamin D insufficiency is associated with higher odds of severe asthma exacerbation, and having a vitamin D level greater than 30 ng/ml is protective against severe asthma exacerbations.

- African Americans with COPD are significantly younger, smoke less, report concurrent asthma more frequently, and have less radiographic emphysema on volumetric computed tomography.
- There is more sleep apnea, interrupted sleep, and daytime sleepiness in African Americans than in European Americans.
- African Americans had a significantly higher history of asthma and were more likely to have more frequent COPD exacerbations.
- African Americans (women in particular) are more susceptible to the damaging effects of tobacco smoking when compared to European American men.
- Asthma occurs in almost 14% of African American children with a higher prevalence in girls.
- African American mortality rate, emergency department visit rate, and hospital admission rate for asthma are all multiple times higher than European Americans.
- Obesity is associated with more uncontrolled asthma, increased severity of asthma, and increased number of medications.
- Breast feeding is associated with a lower prevalence and severity of asthma.
- Sarcoidosis is more severe (eight times higher mortality) with more end-organ damage in African Americans with an increased occurrence in woman.
- African Americans have a poorer sleep quality overall associated with worse insomnia levels and the highest levels for excessive daytime sleepiness.
- African Americans were over five times more likely to not use their CPAP machine than European Americans.

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