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Health and Demographic Factors for Chronic Obstructive Pulmonary Disease Among Hispanic Adults in the United States: Analysis of Behavioral Risk Factor Surveillance System Survey Data

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Abstract

Introduction: Appropriate diagnosis and regular primary care appointments are markers of quality chronic obstructive pulmonary disease (COPD) care. Underdiagnosis of COPD has been associated with an absence of health insurance, lower socioeconomic status, and race and ethnicity. **Methods:** This study examined predictors of COPD using data from the Behavioral Risk Factor Surveillance System (BRFSS, 2021) to provide information for prevention messaging and interventions. Participants included Hispanic adults ($n = 17{,}782$) aged 45 years and older. Chi-square tests and a multinomial logistic regression analysis (adjusted with the BRFSS weighting variable) were used to understand how sex, income, health status, smoking behaviors, asthma morbidity, and health insurance coverage were related to having COPD. **Results:** Patients with poor health, lower income level, current smokers, former smokers, or asthma were more likely to report COPD. Females were more likely to report COPD than males. Patients with COPD were more likely to be without health insurance when compared to those who did not have COPD, indicating unmet medical needs. **Conclusion:** Studies such as this one, aiming to evaluate the relationship between COPD prevalence and predictors of health and outcomes among Hispanic patients in the United States will remain important for developing health messaging to attenuate disease progression.

Keywords

chronic obstructive pulmonary disease, population-based study, Hispanic Americans, healthcare disparities

Introduction

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide and the sixth leading cause of death in the United States (U.S.) (CDC, 2023, WHO, 2023). COPD is a progressive disease that encompasses chronic bronchitis and emphysema (Croft et al., 2018; Kuntz & Holden, 2021). Symptoms of COPD are characterized by irreversible airflow obstruction, shortness of breath, and a productive cough (Clark et al., 2023). Approximately 16 million adults aged 45 years and older (particularly women) are affected by COPD in the U.S., and estimates suggest that many more persons have undiagnosed COPD (CDC, 2023; Pleasants et al., 2016). The most common cause of COPD is smoking; however, other risk factors include occupational and environmental exposures, chronic respiratory infections, and genetic predisposition to this disease (Croft et al., 2018).

Patients with COPD experience greater disability and more days of poor physical health related to chronic fatigue and comorbid health conditions such as asthma (Andersson et al., 2015; Heintzman et al., 2019). Appropriate diagnosis and regular primary care appointments are markers of quality COPD care (Heintzman et al., 2019). Underdiagnosis of COPD has been associated with well-established health disparities including an absence of health insurance, lower socioeconomic status, and race and ethnicity (Clark et al., 2023; Díaz et al., 2018; Ejike et al., 2021; Mamary et al., 2018). Specifically, research suggests that COPD among Hispanic patients may be underdiagnosed or misdiagnosed as other pulmonary ailments such as dyspnea or asthma, indicating disparities in COPD diagnosis, prevalence, and treatment among this group (Barr et al., 2016; Sood et al., 2022). Further, a recent

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study found Hispanic residents to be less likely to have health insurance and more likely to live in "pulmonology desserts," counties that are an hour or more away from the nearest pulmonologist (Brooks & Pola, 2022).

Individuals of Hispanic origin make up the largest and fastest growing ethnic minority groups in the U.S., however, this population is vastly underrepresented in COPD and smoking cessation research (Medina-Ramirez et al., 2022). Although there may be a lower smoking prevalence among Hispanic adults compared with non-Hispanic White adults (NHW), Hispanic adults remain less likely than NHW to receive recommended medical screenings to identify COPD, or to be counseled by their healthcare providers to quit smoking (Díaz et al., 2018; Rabin et al., 2022). Further, this population continues to face multiple cultural and socioeconomic barriers that lead to prominent health disparities in COPD diagnosis and treatment including inequalities in access to health services and preventive care services (Díaz et al., 2018; Medina-Ramirez et al., 2022; Velasco-Mondragon et al., 2016).

Identifying risk factors for COPD among Hispanic patients will inform preventive strategies and interventions targeted to halt COPD progression in this group (Paige et al., 2023). In the current study, we examine risk factors for this population in a national dataset. The aim of this was to examine the relationship of critical health (e.g. health status, health behaviors) and demographic factors to COPD among Hispanic adults aged 45 years and older. Further, understanding how variables, such as health status and behaviors, are related to COPD prevalence in Hispanic adults can provide information for health professionals that will be important for developing health messaging to mitigate disease progression and to determine risk groups in need of intervention.

Methods

Participants and Procedures

For this study, data were obtained from the 2021 Behavioral Risk Factor Surveillance System (BRFSS) Survey (CDC, 2022). The BRFSS is an annual random digit dialed telephone health survey of adults conducted annually with assistance from the Centers for Disease Control and Prevention (CDC) by U.S. state health departments as well as the District of Columbia and U.S. territories (CDC, 2022). In our current study, the sample of interest was Hispanic adults aged 45 years and older ($n =$ 17,782). The institutional review board at the University determined the use of BRFSS data as "not human subjects" research due to the use of publicly available, de-identified data.

Measures of Health

We used several variables in study analyses (see BRFSS codebook, Centers for Disease Control, CDC, 2022). For example, COPD was defined by the subject's affirmative responses to the question, "Have you ever been told you had COPD, emphysema or chronic bronchitis?" The survey response categories were "Yes," "No," "Don't know/Not sure," or "Refused." Reponses coded "Yes" (coded as 0) or "No" (coded as 1) were used in analyses. Healthcare access and health insurance coverage were assessed with this question: "Do you have some form of health insurance?" The survey response categories were: "Have some form of insurance," "Do not have some form of insurance," or "Don't know, refused or missing response." Two responses were analyzed: "Has health insurance," (coded 1) or "Does not have health insurance," (coded 0). Information about household income was provided in increments of $5,000 ranging from "Less than $10,000," to "$200,000 or more." Respondents could also answer "Don't know/Not sure" or "Refused." This variable was dichotomized, "lower income" or "higher income"; respondents were considered low-income (coded 0) if they reported at total of income of less than $35,000, and high-income (coded 1) if they reported their household income to be above $50,000. Those who responded "Don't know/Not sure" or "Refused" were not included in analyses. Physical health was measured by responses to the question, "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" This variable was dichotomized. We considered 0–15 days of poor health as "good health," (coded 1) and 16–30 days of poor physical health as "poor health," (coded 0). We examined smoking behavior with the question, "How often do you smoke?" Survey responses included "Every day," "Some days," "Former," "Never smoked," or "Don't know/Refused." Responses included in analyses included "Every day" and "Some days," which were considered "Current smoker" (coded as 1), "Former smoker" (coded as 2), and "Never a smoker" (coded as 3). Asthma morbidity was assessed by the question, "Have you ever been told you had asthma?" Survey responses included "Yes," "No," or "Don't know/Not sure," or "Refused." "Yes" (coded 0) and "No" (coded 1) responses were analyzed. Sex was coded as male (coded 0) and female (coded 1). The weighting variable, adjusted for landline and cellular telephone use, is recommended for use when generalizing to the national sample (CDC, 2022; Iachan et al., 2016). Hence, the weighting variable, for landline and cellular telephone participants (_LLCPWT), was used in study analyses.

Statistical Analyses

All data analyses were performed using the IBM SPSS software (Version 29). Descriptive statistics were calculated to provide information on frequencies and percentages for demographic variables. We examined the relationships between predictors (sex, income level, physical health, current smoker, former smoker, never smoker, ever had asthma, and having health insurance) and COPD status using chi-square tests adjusted with the sampling weight for the BRFSS. Next, a multinomial logistic regression analysis (adjusted with the BRFSS weighting variable) was used to understand how sex, income level, physical health, smoking status, asthma morbidity, and health insurance coverage were related to having COPD for those who were Hispanic and 45 years of age and older.

Results

Demographic information for the sample is presented in Table 1. 6.3% of Hispanic adults aged >45 years ($n = 1,112$) self-reported a diagnosis of COPD, emphysema or chronic bronchitis by a healthcare practitioner.

Results of chi-square tests with Hispanic adults are presented in Table 2.

Results indicated that predictors were associated with COPD status. Results indicated that those with poor health, lower income level, or asthma were more likely to report COPD. Current and former smokers were more likely to report a diagnosis of COPD than participants who reported never smoking. Females were more likely to report COPD than males. Surprisingly, those with health insurance were more likely to report COPD than those without health insurance (see Table 2).

A multinomial logistic regression was conducted to examine the impact of our predictors of COPD for Hispanic adults over 45 years of age. Table 3 presents significant levels, odds ratios, and confidence intervals. The referent group was not having COPD.

The omnibus chi-square test indicated the model was significant ($p < .001$). Participants with COPD were 1.3 times more likely to have higher ratings days in poor health than good health in comparison to those without COPD. Income level was significant with an odds ratio close to one. Smoking status was significant. Those with COPD were 3.8 times more likely to be current rather than never smokers in comparison to those without COPD. And those with COPD were about two times more likely to be former rather than never smokers than those without COPD. Those with COPD were 5.7 times more likely to have asthma rather than never have asthma compared to those without COPD. Participants with COPD were more likely to *not* have health insurance compared to having health insurance than those without COPD. Finally, those with COPD were more likely to be female than male compared to those without COPD (see Table 3).

Table 1. Sociodemographic Details for Hispanic Adults.

Characteristic ($n = 17,782$)[a]	*n* (%)
Ethnicity	
Hispanic	17,782 (5.8)
Age range	
45 to 54	6,722 (37.8)
55 to 64	5,506 (31.0)
65 or older	5,554 (31.2)
Sex	
Male	7,134 (40.1)
Female	7,897 (44.4)
Missing data	2,751 (15.5)
COPD	
No	16,588 (93.3)
Yes	1,112 (6.3)
Missing data	82 (.5)
Poor physical health	
Above 15 days	2,361 (13.3)
0–15 days	3,802 (21.4)
Missing data	11,619 (65.3)
Income level	
≤$35,000	6,434 (36.2)
>$50,000	7,494 (42.1)
Missing data	3,854 (21.7)
Smoker	
Current	1,882 (10.6)
Former	3,988 (22.4)
Never	10,881 (61.2)
Missing data	1,031 (5.8)
Ever had asthma	
No	15,271 (85.9)
Yes	2,470 (13.9)
Missing data	41 (.2)
Health insurance	
No	2,311 (13.0)
Yes	14, 851 (83.5)
Missing data	620 (3.5)

[a]Total BRFSS survey respondents included $N = 306,503$.

Discussion

We used the BRFSS dataset to better characterize the relationship of critical predictors of health and diagnosis of COPD among Hispanic adults aged 45 years and older. In the current study, the prevalence of self-reported COPD among Hispanic patients was low (6.3%), which is similar to those of other national studies examining the prevalence of COPD among Hispanic adults using the BRFSS dataset (Djibo et al.,

Table 2. Chi-Square Results for the Relationship of Predictors for COPD in Hispanic Adults 45 and Older.

Predictors/ Responses	*p*	COPD	
		Yes *n* (%)	No *n* (%)
Physical health	<.001		
Good		261,717 (8.0%)	3,018,509 (92.0%)
Poor		273,300 (13.2%)	1,797,727 (86.8%)
Income	<.001		
Low		434,893 (6.4%)	6,314,397 (93.6%)
High		235,134 (4.0%)	5,604,478 (96.0%)
Smoker	<.001		
Current		197,670 (12.8%)	1,349,758 (87.2%)
Former		239,706 (7.1%)	3,145,693 (92.9%)
Never		372,498 (3.7%)	9,762,001 (96.3%)
Ever had asthma	<.001		
Yes		399,188 (20.9%)	1,513,889 (79.1%)
No		449,887 (3.2%)	13,594,039 (96.8%)
Health insurance coverage	<.001		
Yes		707,489 (5.5%)	12,257,914 (94.5%)
No		122,057 (4.8%)	2,413,053 (95.2%)
Sex	<.001		
Female		383,850 (5.8%)	6,205,569 (94.2%)
Male		318,391 (4.5%)	6,785,915 (95.5%)

Note. Data were adjusted using the sampling weight for the BRFSS.

Table 3. Multinomial Logistic Regression Results for Hispanic Adults 45 Years and Older with COPD for Predictors: Days of Poor Health, Income, Smoking Status, Asthma Status, Health Insurance Coverage Status.

Predictor	Category	*p*	Exp(B)	95% Confidence Interval	
Days of poor physical health		<.001			
	Poor health (above 15 days of poor health)		1.288	1.278	1.298
	Referent (0–15 days of poor health)				
Income		<.001			
	Low income		1.028	1.020	1.037
	Referent, higher income				
Smoking		<.001			
	Current smoker		3.803	3.766	3.839
	Former smoker		1.924	1.906	1.942
	Referent, never smoked				
Asthma		<.001			
	Yes		5.716	5.670	5.761
	Referent, no				
Health insurance		<.001			
	No		1.760	1.743	1.777
	Referent, yes				
Sex		<.001			
	Male		.895	.888	.903
	Referent, female				

Note. Data were adjusted using the sampling weight for the BRFSS.

2020; Dodd & Mazurek, 2020). However, study findings provide ideas for key factors to review for Hispanic patients at risk for COPD development including days of poor physical health, a history of smoking tobacco, and a history of asthma. Study findings also indicated that females were more likely to report having COPD compared to males. Findings of previous studies have identified females with COPD to experience a higher risk of exacerbations and more pronounced symptoms when compared to males, and current findings reinforce that females remain an important group to reach in COPD prevention messaging, diagnosis, and treatment (Jackson et al., 2012; Pleasants et al., 2015).

Analyses revealed that respondents with COPD were reporting more days of poor physical health. Prior studies have reported the relationship between poor physical health and COPD in adults irrespective of their ethnic group (Andersson et al., 2015; Clark et al., 2023). One scoping review found increased days of poor physical health in COPD patients to be linked to dyspnea, pain, lack of sleep, and fatigue (Clark et al., 2023). Another study reported a reduction in physical activity and functional performance among patients with COPD and poor physical health (Andersson et al., 2015). Further, participants with COPD were reporting past asthma diagnoses. Patients with overlapping asthma and COPD have been shown to experience more frequent exacerbations, resulting in greater healthcare utilization (Dodd & Mazurek, 2020), indicating that Hispanic patients with asthma need education about risk for exacerbation of COPD symptoms and breathing difficulties when they also have asthma. It will also be important to continue to screen Hispanic patients with asthma for COPD, since COPD may be underdiagnosed in this population (Barr et al., 2016; Sood et al., 2022).

Our results about the relationship of household income to COPD were different for chi-square and multinomial logistic regression analyses. There may be other factors related to income influencing results in the complex model or it may be that other variables are more important than income in determining whether patients receive a diagnosis and care. For example, previous research has found patients with COPD may experience inadequate transportation to reach medical care and a lower density of specialist care, regardless of income level (Gaffney et al., 2022). Future studies should examine how these issues can influence access to specialty care to receive a COPD diagnosis. Results of a chi-square analysis indicated respondents with COPD reported more current than former smoking. Thus, it remains imperative to reach smokers with prevention messaging about potential health consequences of smoking (Liu et al., 2015). Meeting this challenge is important, because it can be difficult to reach smokers with tobacco education and cessation programs due to perceived and structural barriers including concerns about anxiety, insomnia, weight gain, and transportation (Garg et al., 2022; McHugh et al., 2017).

Results of the multinomial logistic regression revealed persons who were Hispanic and had COPD were more likely to be without health insurance than those who did not have COPD. An absence of health insurance coverage may indicate unmet medical needs, which can be detrimental to the health of those with COPD (Heintzman et al., 2019). Heintzman et al. (2019) identified uninsured patients diagnosed with obstructive lung disease to have significantly lower primary care visit rates over 5 years when compared to their insured counterparts, regardless of race/ethnicity. Health insurance coverage may increase access to pulmonary rehabilitation, which has been identified in past studies to significantly lower COPD-related disability and mortality following hospital discharge (Lindenauer et al., 2020). To this effect, Lindenauer et al. (2020) found Medicare fee-for-service patients hospitalized for COPD in the U.S., who began pulmonary rehabilitation within 90 days of hospital discharge, to have significantly better 1-year survival compared with initiation after 90 days or not at all.

Several limitations should also be noted. First, the BRFSS is a cross-sectional study and longitudinal research may provide more information about how COPD progresses over the life course. Second, respondents self-reported COPD prevalence and days of poor health; data from medical records or

physician's medical diagnosis may provide more reliable information. A medical diagnosis and spirometry testing by a medical professional would provide a more accurate overview of COPD prevalence and asthma. However, other research indicates that self-report of health problems and poor health are related to health problems and recall is a reliable way to ascertain disease status (Kim et al., 2020). The BRFSS did not fully identify different types of Hispanic subgroups (e.g. Cuban, Mexican, Puerto Rican, South American) in the U.S. data, and rates of COPD and smoking status may vary across subgroups. For example, adults who are Hispanic and are of Cuban, Puerto Rican, and South American heritage tend to have higher smoking rates when compared to Mexican Americans suggesting they face higher disparities in COPD (Medina-Ramirez et al., 2022; Sood et al., 2022). This may be partly explained by genetic differences in racial ancestry (Díaz et al., 2018). Assessing differences by subgroup will provide further information to inform interventions and prevention efforts. Our focus was identifying risk for participants who were Hispanic, however, other race groups may have higher levels of COPD and risks for these groups need to be examined in future studies (Nastars et al., 2019). We dichotomized some variables, and findings may differ if all response anchors were considered. Secondary data was used, and therefore information about why participants are smoking and experience poor health, for example, were not fully explored. Qualitative research may reveal reasons for lack of diagnoses, reasons for smoking and not accessing care that will be beneficial for the development of interventions.

Clinical implications

COPD prevention messages that detail the severe effects of the disease, and how smoking increases risks of poor health, can be effective for motivating participants to begin tobacco cessation and communicate with their healthcare provider about the disease (Paige et al., 2023). Before implementing messaging, several considerations will be important, such as ensuring messages are culturally appropriate, compliance with HIPPA regulations, and use of informed consent. Future studies also should explore patient preferences for receiving prevention messages (i.e. the modality and delivery). Paige et al. (2023) found prevention messages promoting clinical conversations about COPD were more effective when they were delivered by a medical authority, including a clinician or healthcare organization. Using experts to provide prevention messaging at community centers may indicate a path forward for improving health messaging and initiating education and diagnosis for COPD among Hispanic patients. Community centers, such as faith-based organizations remain a unifying force in ethnic minority communities encouraging participation in interventions and providing networks of support among participants (Odhiambo et al., 2022; Prendergast et al., 2020). Using a collaborative approach to bridge community needs and resources available at faith-based organizations can raise awareness and improve diagnosis and treatment of health conditions, including COPD and asthma in adults. Faith-based settings provide an opportunity to connect participants with a smoking history to a COPD risk assessment, lung function tests, and to general practitioners, or other qualified healthcare specialists to diagnose and treat COPD (Odhiambo et al., 2022). Past studies researching COPD care in faith-based settings have predominantly focused on African American communities and future studies with participants who are Hispanic, in their community faith-based settings are needed (Odhiambo et al., 2022).

Conclusions

Population-based studies such as this one, utilizing the BRFSS dataset to evaluate the relationship between self-reported COPD prevalence and predictors of health and outcomes among Hispanic patients in the U.S. will remain important for developing health messaging in primary care and community-based settings. Hispanic adults with self-reported COPD were more likely to experience more days of poor physical health, be current smokers, have asthma, and not have health insurance coverage. Targeting interventions toward those in low-income families, females, and those in poor health may reach those in need of care that will help them reduce smoking and learn about healthcare for COPD. Moreover, future studies, identifying risk factors for those in different Hispanic subgroups are needed, to determine the most important factors to address in each subgroup.

Declaration of Conflicting Interests

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