

DIFFERENCES IN RATES OF OBSTRUCTIVE LUNG DISEASE BETWEEN AFRICANS AND AFRICAN AMERICANS

Objective: The prevalence of obstructive lung disease is rising in the United States, particularly among those of African descent. Rates of ventilatory impairment and reported respiratory symptoms were examined in a cross-sectional study of urban Nigerian civil servants who are in transition to a westernized lifestyle.

Design: 410 civil servants (235 men, 175 women) aged 30–69 years in Benin City, Nigeria (West Africa) were recruited for a cross-sectional study on respiratory health and compared to 3,397 African Americans enrolled in NHANES III between 1988 and 1994.

Methods: Forced vital capacity (FVC), expiratory flow rate in 1 sec (FEV1), FEV1/FVC ratio, and peak expiratory flow rate (PEFR) were measured by spirometry. Demographic characteristics and respiratory symptoms were ascertained by questionnaire.

Results: Nigerians had lower age and height adjusted FVC and FEV1 than African Americans in both genders, independent of smoking and respiratory disease. However, relative lung function was better among Nigerians. Fewer Nigerians had an age-adjusted FEV1/FVC ratio below 0.70 than African Americans (10.54 vs 14.10/100 men, 6.29 vs 8.67/100 women). Overall, Nigerians had a lower age-adjusted prevalence of any self-reported respiratory symptoms than African Americans (3.65 vs 22.90/100 men, 4.57 vs 35.38/100 women). Similarly, Nigerians had a lower age-adjusted prevalence of current smoking than African Americans (10.82 vs 46.50/100 in men and 0 vs 30.93/100 in women).

Conclusions: Urban Nigerians who have limited exposure to cigarette smoke and who work in a non-industrial setting have a low prevalence of obstructive lung disease. (*Ethn Dis.* 2002;12[suppl3]:S3-107–S3-113)

Key Words: Obstructive Lung Disease, Respiratory Symptoms, Spirometry, Blacks, Africa

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INTRODUCTION

Racial differences are evident in the prevalence of asthma and chronic obstructive pulmonary disease (COPD) in the United States. Blacks have a higher prevalence rate of asthma than Whites,^{1,2} but a lower rate of COPD than Whites.^{3,4} There is growing evidence that the rates of chronic obstructive lung diseases (asthma and COPD) are increasing among Black adults in sub-Saharan Africa.^{5–11} Several environmental factors have been associated with this rising trend in the prevalence of obstructive lung disease in sub-Saharan Africa, including ambient air pollution,⁵ cigarette smoking, urbanization,⁶ and occupational exposure to industrial hazards.^{7–11} However, few studies of African adults have examined the prevalence of impaired lung function in adults with limited exposure to pollutants.^{12,13}

A cross-sectional study was conducted to determine the respiratory status of the urban Black workforce in Nigeria, West Africa. The purpose of this cross-sectional study was to estimate the prevalence of obstructive lung diseases based on self-reported chronic respiratory symptoms and spirometric measurements in African adults in Nigeria and compare their rates to those of Blacks in the United States.

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METHODS

Study Population in Nigeria

At baseline, 804 men and women were recruited in 1992 for a study on risk factors for hypertension in a cohort of civil servants aged 20–64 years in Benin City, Nigeria. Recruitment of the study population has been described elsewhere.¹⁴ Blood pressure levels were determined at baseline in 1992 and at final followup in 1999 based on a standardized protocol.¹⁵ Height, weight, waist, and hip measurements were also measured at both time periods. In addition, risk factors for hypertension, including demographic characteristics, physical activity, smoking history, and alcohol consumption, were ascertained through a questionnaire administered by interviewers to participants.¹⁶

Institutional review board approval for the study protocol was obtained from the University of Pittsburgh in Pittsburgh, Pennsylvania and GIMS Hospital in Benin City, Nigeria. All individuals who returned for final followup in 1999 were eligible to participate in the current study on respiratory health upon giving informed consent. A respiratory health questionnaire, adapted from the American Thoracic Society questionnaire, was administered.¹⁷ In addition, information on home environment and sociodemographic factors was also ascertained to examine risk factors for obstructive lung diseases. Chronic respiratory symptoms based on self-report were classified into 4 descriptive categories: wheezing on most days on nights apart from colds (persistent wheezing); cough that occurred on most days or nights for at least 3 consecutive months during the year (chronic cough); expectoration on most days or nights for at least

3 consecutive months during the year (chronic phlegm); and, persistent sensation of shortness of breath when walking on a level surface (dyspnea).

Spirometry was conducted in all consenting participants, except for those who reported having an acute respiratory illness, a history of tuberculosis, or recent surgery. Spirometric testing was conducted using a flow-sensing spirometer (KOKO F3100, PDS Instrumentation, Louisville, Colo). Each participant was actively coached during the lung function tests after the correct technique for the FVC maneuver had been demonstrated. A maximum of 8 trials were conducted to obtain a minimum of 3 acceptable tests with reproducible FEV1 and FVC values. Upon completion of each trial, the real-time display of the flow-volume and volume-time curves were evaluated for acceptability and reproducibility based on the protocol recommended by the American Thoracic Society.¹⁸ The spirometer was calibrated for volume daily. A constant barometric pressure of 760 mm Hg was used in this study because the altitude at Benin City was close to sea level (79 meters).

Study Population in the United States

The analysis on African Americans was based on data from the Third National Health and Nutrition Examination Survey (NHANES III) conducted from 1988 to 1994. NHANES III was a stratified, multistage probability sample of the US population that involved enrollment of households from 81 counties across the United States. Details of the survey design and the research protocol have been extensively described elsewhere.^{19,20} Raw data with information on demographic characteristics, respiratory symptoms, diagnosed disease, anthropometric measurements and spirometric measurements on the NHANES III study population were obtained on CD-ROM from the National Center for Health Statistics. Two NHANES III data files were used in this

analysis: the Adult Household Data File (Catalog # 77560) and the Examination Data File (Catalog # 76200).

Statistical Analysis

The prevalence rate of chronic respiratory symptoms and impaired lung function was estimated by gender in adults aged 30–69 years in Benin City, Nigeria and the United States. Two age groups were used to compute age-specific rates by sex: 30–49 and 50–69 years. In addition, the prevalence estimates in the 2 study populations were age-adjusted by direct standardization method using 1990 Census data for Black adults aged 30–69 years in the United States. Ninety-five percent confidence limits were computed for all prevalence estimates and compared to determine if there was any overlap in confidence limits between populations. The 95% confidence limits for the US population were computed using the normal approximation for the binomial distribution since the sample size was large. Conversely, the 95% confidence limits for prevalence estimates in Benin City were computed using the exact binomial method by Blithe, Still, and Casella with StatXact version 4.0 (Cytel Software Corporation, Cambridge, Mass).

RESULTS

On average, Nigerians were older and smaller in stature than African Americans. Nigerians had lower age- and height-adjusted measurements of FVC and FEV1 than African Americans in either sex, independent of reported history of smoking and respiratory disease (Table 1). When the effects of smoking and chronic respiratory disease were excluded in men, there were no differences in the age-adjusted FEV1/FVC ratio between populations. In contrast, the age-adjusted FEV1/FVC ratio was significantly lower in Nigerian women than in African-American women when the effect of smoking and reported symptoms was eliminated.

Nigerians had lower age-specific rates of self-reported symptoms of chronic cough, chronic phlegm, and dyspnea than African Americans (Tables 2 and 3). Overall, the age-adjusted prevalence rates of having any respiratory symptoms was lower in Nigerians than in African Americans (3.65 vs 22.90 per 100 in men and 4.57 vs 35.38 per 100 in women). Similarly, age-adjusted prevalence of FEV1/FVC ratio below 0.70 was lower in Nigerians than in African Americans (10.54 vs 14.10 in men and 6.29 vs 8.67 in women). Dyspnea was the most frequently reported respiratory symptom among African Americans, while chronic phlegm production and dyspnea were reported most often in Nigerian men and women, respectively. However, the prevalence of these respiratory symptoms in Nigerians was relatively low.

African-American men in the United States were twice as likely to report a positive history of smoking than Nigerian men in Benin City (overall rate of 70.66 per 100 vs 32.19 per 100). Among male current smokers, African Americans were more than 4 times more likely to be current smokers than Benin City men (overall rate of 45.94 per 100 vs 9.44 per 100). In addition, American-American men smoked more cigarettes daily and for a longer duration for Benin City men (data not shown).

The prevalence of reported symptoms was lower in both Benin City and African-American adults when rates among “never” smokers were examined (Tables 4 and 5). Overall, the rates of reported symptoms were similar between both groups of male, “never” smokers, except for the rates of dyspnea, which remained much higher in African-American men than in Nigerian men. Comparisons of rates of reported symptoms in African-American women to Nigerian women yielded similar results to those observed in men. However, differences in the rates of reported symptoms between Nigerians and African Americans were more dramatic among female “never” smokers than among male, “never” smokers.

Table 1. Mean characteristics in individuals aged 30–69 years (Nigerians vs African Americans)

Characteristic	Mean		N	African Americans‡	P Value
	N	Nigerians			
Men	233		1539		
Age, yr		48.8 (6.7)		46.4 (11.8)	0.003
Height, m		1.69 (0.08)		1.76 (0.07)	<0.001
Weight, kg		67.5 (12.1)		83.2 (18.2)	<0.001
Body mass index, kg/m ²		23.5 (3.6)		26.8 (5.3)	<0.001
Waist, cm		86.0 (10.6)		94.1 (14.3)	<0.001
Lung function (SE)*†					
All participants	156		1270		
FVC, L		3.91 (0.05)		4.10 (0.02)	<0.001
FEV1, L/s		3.03 (0.05)		3.20 (0.02)	<0.001
FEV1/FVC		0.79 (0.01)		0.78 (0.00)	0.064
“Never” smokers	103		366		
FVC, L		3.81 (0.07)		4.04 (0.03)	0.003
FEV1, L/s		2.98 (0.06)		3.24 (0.03)	<0.001
FEV1/FVC		0.80 (0.01)		0.80 (0.00)	0.885
Healthy, “never” smokers	101		281		
FVC, L		3.79 (0.07)		4.07 (0.04)	<0.001
FEV1, L/s		2.97 (0.06)		3.30 (0.03)	<0.001
FEV1/FVC		0.80 (0.01)		0.81 (0.00)	0.313
Women	175		1858		
Age, yr		46.4 (6.2)		45.4 (11.6)	0.067
Height, m		1.61 (0.06)		1.63 (0.06)	<0.001
Weight, kg		69.4 (14.0)		79.3 (20.3)	<0.001
Body mass index, kg/m ²		26.8 (5.0)		29.8 (7.3)	<0.001
Waist, cm		90.8 (11.7)		96.1 (16.4)	<0.001
Lung function (SE)*†					
All participants	115		1586		
FVC, L		2.81 (0.04)		2.96 (0.01)	<0.001
FEV1, L/s		2.19 (0.04)		3.20 (0.01)	<0.001
FEV1/FVC		0.80 (0.01)		0.80 (0.00)	0.325
Never smokers	115		854		
FVC, L		2.79 (0.04)		2.95 (0.02)	<0.001
FEV1, L/s		2.18 (0.04)		2.40 (0.01)	<0.001
FEV1/FVC		0.80 (0.01)		0.80 (0.00)	0.002
Healthy, never smokers	109		538		
FVC, L		2.82 (0.04)		3.00 (0.02)	<0.001
FEV1, L/s		2.21 (0.04)		2.45 (0.02)	<0.001
FEV1/FVC		0.80 (0.01)		0.82 (0.00)	<0.001

* FVC and FEV1 are adjusted for age and height while FEV1/FVC ratio is adjusted for age only.

† Standard error for adjusted mean lung function in parentheses.

‡ Mean values were computed using data from the National Center for Health Statistics.

§ None of the Nigerian women reported that they ever smoked.

DISCUSSION

Spirometric measurements of FVC and FEV1 were lower in Nigerians than in African Americans in either sex. The overall mean FEV1/FVC ratio, a screening measure for airway obstruction, was found to be similar between Nigerians and African Americans. This finding is consistent with other data that show that FEV1/FVC ratio is similar between

populations with different ventilatory capacity.^{21–23} FEV1/FVC is a measurement of expiratory flow rate (FEV1) that is adjusted for lung size using FVC.²³ When the effect of smoking and respiratory symptoms was excluded, the age-adjusted FEV1/FVC ratio was similar between both groups of men, but this ratio was significantly lower in Nigerian women than in African-American women. The overall age-adjusted prev-

alence of an FEV1/FVC ratio below 0.70, a screening measure for obstructive lung disease, was lower in Nigerians than in African Americans even when the effect of smoking was excluded, suggesting other factors may account for these rate differences.

African Americans have lower levels of ventilatory function (FVC and FEV1) than Caucasians even after adjustment for stature. Race accounts for up to 10% of between-person differences in lung function. These racial differences in lung function have been attributed to the smaller trunk-to-leg ratio and chest diameter in African Americans than in Caucasians.²⁴ Racial admixture in African Americans may account for the higher levels of normal pulmonary function than in Nigerians who have little or no racial admixture. In this current study, spirometric measurements of FVC and FEV1 were lower in Nigerians than in African Americans independent of age and height. It is likely that measurements of body composition, such as chest size and the trunk-to-leg ratio, may explain these differences between Nigerians and African Americans.

The prevalence of reported chronic respiratory symptoms was low in Nigerians. The age-adjusted prevalence of having any chronic symptoms was 5-fold or greater in African Americans than in Nigerians. Similarly, smoking rates were also much higher in African Americans than in Nigerians. The rate differences in respiratory symptoms were found to be partly related to differences in smoking patterns between the 2 groups. However, rates of dyspnea, a cardinal symptom of smoking-related respiratory disease, still remained much lower in Nigerians than in African Americans when the “never” smokers were examined. It is possible that African Americans may have higher rates of other chronic diseases, such as congestive heart failure and coronary heart disease, that may result in elevated rates of dyspnea even in the absence of smoking.

Table 2. Prevalence rates* of chronic respiratory symptoms in men (Nigerians vs African Americans)

Characteristic	Nigerians			African Americans†		
	N‡	N‡	Age-Specific Rate (95% CI), per 100	N‡	N‡	Age-Specific Rate (95% CI), per 100
Chronic cough						
30-49 yr	115	0	—	968	65	6.71 (5.14, 8.28)
50-69 yr	118	2	1.69 (0.30, 5.72)	571	54	9.46 (7.07, 11.85)
Total	233	2	0.53 (0, 1.25)	1539	119	7.57 (6.25, 8.89)
Chronic phlegm						
30-49 yr	115	2	1.74 (0.31, 5.84)	968	63	6.51 (4.96, 8.06)
50-69 yr	118	4	3.39 (1.17, 7.95)	571	54	9.46 (7.07, 11.85)
Total	233	6	2.26 (0.32, 4.19)	1539	117	7.43 (6.13, 8.74)
Dyspnea						
30-49 yr	115	1	0.87 (0.04, 4.32)	968	131	13.55 (11.39, 15.71)
50-69 yr	118	3	2.54 (0.70, 6.90)	571	155	27.19 (23.54, 30.84)
Total	233	4	1.39 (0, 2.86)	1539	286	17.81 (15.94, 19.68)
1 or more symptoms						
30-49 yr	115	3	2.61 (0.54, 7.44)	968	180	18.60 (16.19, 21.19)
50-69 yr	118	7	5.93 (2.42, 11.84)	571	185	32.40 (28.57, 36.41)
Total	233	10	3.65 (1.24, 6.01)	1539	365	22.90 (20.83, 24.97)
Ever smoked§						
30-49 yr	115	39	33.91 (25.35, 42.73)	968	650	67.22 (64.26, 70.18)
50-69 yr	118	36	30.51 (22.55, 39.08)	571	436	76.49 (73.02, 79.96)
Total	233	75	32.85 (26.36, 39.34)	1539	1086	70.11 (67.81, 72.42)
Current smoking						
30-49 yr	115	15	13.04 (7.62, 20.24)	968	479	49.48 (46.32, 52.64)
50-69 yr	118	7	5.93 (2.82, 11.37)	571	228	39.93 (35.91, 43.95)
Total	233	22	10.82 (5.73, 15.91)	1539	707	46.50 (36.26, 56.74)
FEV1/FVC < 0.70						
30-49 yr	80	7	8.75 (3.59, 17.20)	831	53	6.46 (4.87, 8.36)
50-69 yr	76	11	14.47 (7.45, 24.42)	449	139	30.96 (26.71, 35.46)
Total	156	18	10.54 (5.62, 15.46)	1270	192	14.10 (12.33, 15.87)

* Total rates are age-adjusted to US 1990 standard population.

† Rates computed from National Center Health Statistics data on NHANES III, 1988-1994.

‡ N denotes the number in the age group while N denotes the number with each respective condition.

§ Ever smoked defined as smoking 100 cigarettes or more in lifetime in NHANES III.

|| Only data for subjects with spirometric values of adequate acceptability and reproducibility are presented.

Several factors may explain the disproportionately higher rates of reported symptoms in African Americans including diet, child survival, and reporting patterns of respiratory disease. One study on dietary intake of Benin City adults showed that their daily fish intake was 4-fold higher than the mean intake in American adults (70.5 g vs 17.0 g).²⁵ Some studies suggest that dietary intake of fish may have a protective effect against smoking-related COPD,²⁶ asthma,²⁷ and reduced lung function.²⁸

It is plausible that the lower rates of reported symptoms in Nigeria might be partly explained by the survival of healthy individuals who are less likely to succumb to the obstructive lung diseases. African Americans have dispropor-

tionately high rates of delivery of low birth weight and premature infants in the United States.²⁹ Neonatal care for such infants has markedly improved their survival in the United States. In contrast, the prognosis of such infants in developing countries, such as Nigeria, is poor due to the limited healthcare resources. While these infants in the United States may not die during their first year of life, they may be more prone to respiratory health problems than term-infants of normal birth weight.³⁰ Infants born of low birth weight³¹ or born prematurely³² have a higher risk of developing obstructive lung disease in their adult life. In addition, children with a history of recurrent respiratory disease have an elevated risk of developing ob-

structive lung disease during adulthood.³³⁻³⁵

There are some limitations to these prevalence estimates of obstructive lung disease. None of the data on chronic respiratory symptoms in Nigerians and African Americans were ascertained clinically. All these data were based on self-report. While a fixed FEV1/FVC ratio below 0.70 was used as a screening cut-point for identifying individuals with ventilatory impairment in this study, this measure does not account for age-related decline in lung function. The study population in Nigeria was recruited from its place of employment, and therefore a healthy worker effect may have resulted in lower prevalence estimates in this population of adults who were originally recruited for a

Table 3. Prevalence rates* of chronic respiratory symptoms in women (Nigerians vs African Americans)

Characteristic	Nigerians			African Americans†		
	N‡	N‡	Age-Specific Rate (95% CI), per 100	N‡	N‡	Age-Specific Rate (95% CI), per 100
Chronic cough						
30–49 yr	116	1	0.86 (0.04, 4.28)	1213	73	6.02 (4.69, 7.35)
50–69 yr	59	1	1.69 (0.09, 8.44)	645	46	7.13 (5.15, 9.11)
Total	175	2	1.14 (0, 2.71)	1858	119	6.39 (5.28, 7.50)
Chronic phlegm						
30–49 yr	116	0	—	1213	70	5.77 (4.46, 7.08)
50–69 yr	59	0	—	645	49	7.60 (5.56, 9.64)
Total	175	0	—	1858	119	6.38 (5.27, 7.49)
Dyspnea						
30–49 yr	116	4	3.45 (1.19, 8.09)	1213	355	29.27 (26.70, 31.84)
50–569 yr	59	2	3.39 (0.61, 10.98)	645	241	37.48 (33.74, 41.22)
Total	175	6	3.43 (0.73, 3.46)	1858	596	32.03 (29.91, 34.14)
1 or more symptoms						
30–49 yr	116	5	4.31 (1.41, 9.77)	1213	397	32.73 (30.09, 35.45)
50–69 yr	59	3	5.08 (1.06, 14.15)	645	262	40.62 (36.80, 44.52)
Total	175	8	4.57 (1.48, 7.66)	1858	659	35.38 (33.21, 37.55)
Ever smoked§						
30–49 yr	116	0	—	1213	544	44.85 (42.05, 47.65)
50–69 yr	59	1	1.69 (0.09, 8.44)	645	310	48.06 (44.20, 51.92)
Total	175	1	0.57 (0, 0.58)	1858	854	45.93 (43.66, 48.19)
Current smoking						
30–49 yr	116	—	—	1213	407	33.55 (25.03, 42.07)
50–69 yr	59	—	—	645	166	25.74 (14.58, 36.90)
Total	175	—	—	1858	573	30.93 (28.88, 33.02)
FEV1/FVC < 0.70¶						
30–49 yr	78	3	3.85 (0.80, 10.83)	1065	46	4.32 (3.18, 5.72)
50–69 yr	36	4	11.11 (3.11, 26.03)	521	90	17.27 (14.13, 20.80)
Total	114	7	6.29 (1.82, 10.76)	1586	136	8.67 (7.31, 10.03)

* Total rates are age-adjusted to US 1990 standard population.

† Rates computed from National Center Health Statistics data on NHANES III, 1988–1994.

‡ N denotes the number in the age group while N denotes the number with each respective condition.

§ Ever smoked defined as smoking 100 cigarettes or more in lifetime in NHANES III.

|| None of the Benin City women reported that they currently smoked cigarettes.

¶ Only data for subjects with spirometric values of adequate acceptability and reproducibility are presented.

cohort study on hypertension. However, when baseline hypertension status as a measure of ill health was compared by final follow-up status in 1999, there was no evidence in any systematic bias in participation after controlling for potential confounding by age.

This descriptive study on the respiratory health status of West African adults with no occupational exposure to industrial irritants had several strengths. Respiratory health status was examined using objective measurements of lung function while previous studies have focused exclusively on self-report of respiratory symptoms and chronic respiratory disease. Data on the population at risk for establishing

the denominator were available for estimation of the prevalence of chronic respiratory diseases. This study population consisted of a workforce of non-industrial, office-based workers employed in civil service who could be easily followed because they had steady employment in civil service. In addition, this study population is in transition to a westernized lifestyle providing a unique opportunity for the respiratory health status of Nigerians to be compared with that of African Americans with whom they share a common ancestry. Although the study population in Nigeria was not representative of the majority of Nigerian adults who are predominantly illiterate, rural subsistence farm-

ers,³⁶ this population provided an opportunity to examine lung function and to ascertain the respiratory health status in a population of ethnically similar African adults who had no occupational exposure to industrial respiratory irritants.

This study estimated the prevalence of obstructive lung disease in a population of Nigerian adults whose respiratory status was previously unknown. In the absence of occupational exposure to respiratory irritants among Nigerian adults with low rates of smoking, the burden of disease due to chronic respiratory symptoms was found to be low. The prevalence of obstructive lung disease may be even lower in the popula-

Table 4. Prevalence rates* of chronic respiratory symptoms in male “never” smokers (Nigerians vs African Americans)

Characteristic	Nigerians			African Americans†		
	N‡	N‡	Age-Specific Rate (95% CI), per 100	N‡	N‡	Age-Specific Rate (95% CI), per 100
Chronic cough						
30–49 yr	76	0	—	317	10	3.15 (1.52, 5.72)
50–69 yr	72	1	1.22 (0.04, 7.50)	134	8	5.17 (2.61, 11.42)
Total	158	1	1.34 (0, 3.29)	451	18	4.03 (2.21, 5.86)
Chronic phlegm						
30–49 yr	76	1	1.32 (0.03, 7.11)	317	6	1.89 (0.69, 4.07)
50–69 yr	72	2	2.44 (0.34, 9.68)	134	7	5.22 (2.12, 10.47)
Total	158	3	1.77 (0, 3.89)	451	13	2.93 (1.37, 4.50)
Dyspnea						
30–49 yr	76	0	—	317	29	9.15 (6.21, 12.87)
50–69 yr	72	2	2.44 (0.34, 9.68)	134	33	24.63 (17.60, 32.81)
Total	158	2	1.77 (0, 3.89)	451	62	13.98 (10.82, 17.13)
1 or more symptoms						
30–49 yr	76	1	1.32 (0.03, 7.11)*	317	36	11.36 (8.08, 15.37)
50–69 yr	72	4	5.56 (1.53, 13.62)†	134	36	26.87 (19.58, 35.20)
Total	158	5	2.64 (0.22, 5.05)	451	72	16.20 (12.84, 19.55)
FEV1/FVC < 0.70§	76					
30–49 yr	49	3	6.12 (1.28, 16.87)	261	12	4.60 (2.40, 7.89)
50–69 yr	54	1	1.85 (0.05, 9.89)	105	16	15.24 (8.96, 23.56)
Total	103	4	4.79 (0.04, 9.54)	366	28	7.92 (5.15, 10.69)

* Total rates are age-adjusted to US 1990 standard population.

† Rates computed from National Center Health Statistics data on NHANES III, 1988–1994.

‡ N denotes the number in the age group while N denotes the number with each respective condition.

§ Only data for subjects with spirometric values of adequate acceptability and reproducibility are presented.

Table 5. Prevalence rates* of chronic respiratory symptoms in female “never” smokers (Nigerians vs African Americans)

Characteristic	Nigerians			African Americans‡		
	N†	N†	Age-Specific Rate (95% CI), per 100	N†	N†	Age-Specific Rate (95% CI), per 100
Chronic cough						
30–49 yr	116	1	0.86 (0.04, 4.28)	669	29	4.33 (2.92, 6.17)
50–69 yr	58	1	1.72 (0.02, 4.71)	335	23	6.87 (4.40, 10.12)
Total	174	2	1.15 (0, 2.74)	1004	52	5.19 (3.82, 6.56)
Chronic phlegm						
30–49 yr	116	0	—	669	28	4.19 (2.80, 5.99)
50–69 yr	58	0	—	335	25	7.46 (4.89, 10.82)
Total	174	0	—	1004	53	5.29 (3.91, 6.67)
Dyspnea						
30–49 yr	116	4	3.45 (1.19, 8.09)	669	176	26.31 (23.01, 29.82)
50–69 yr	58	2	3.45 (0.42, 11.91)	335	122	36.42 (31.26, 41.82)
Total	174	6	3.45 (0.74, 6.16)	1004	298	29.41 (26.89, 32.52)
1 or more symptoms						
30–49 yr	116	5	4.31 (1.41, 9.77)	669	194	29.00 (25.58, 32.60)
50–69 yr	58	3	5.17 (1.08, 14.38)	335	130	38.81 (33.56, 44.25)
Total	174	8	4.60 (1.49, 7.71)	1004	324	32.29 (29.41, 35.17)
FEV1/FVC < 0.70§						
30–49 yr	78	1	1.28 (0.03, 6.94)	585	17	2.91 (1.70, 4.61)
50–69 yr	36	3	8.33 (1.75, 22.47)	267	27	10.11 (6.77, 14.37)
Total	114	4	3.65 (0.19, 7.11)	852	44	5.33 (3.81, 6.84)

* Total rates are age-adjusted to US 1990 standard population.

† N denotes the number in the age group while N denotes the number with each respective condition.

‡ Rates computed from National Center Health Statistics data on NHANES III, 1988–1994.

§ Only data for subjects with spirometric values of adequate acceptability and reproducibility are presented.

tion of Nigerian adults who are primarily rural and who have minimal exposure to polluted air. The persistently higher rates of symptoms in African Americans than in Nigerians, particularly of dyspnea, suggested that differences in obstructive lung disease between Nigerians and African Americans may also be explained by other factors in addition to smoking.

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