

EDUCATION, INCOME AND DISABILITY IN AFRICAN AMERICANS

Objective. To determine whether the association between SES and disability vary by age in African Americans.

Methods. Logistic regression models were conducted to estimate the association between SES and disability by age group in 395 African Americans participating in the Carolina African American Twin Study of Aging. Disability was defined as difficulty in performing at least one of seven basic activities of daily living. Education and family income were used as measures of SES. Age was categorized as individuals aged <49 years and aged \geq 50 years.

Results. After adjusting for demographic and health-related characteristics among older adults, a higher odds of disability was associated with no post-secondary education (OR=3.09, 95% CI: 1.24–7.71), and with low-income (OR=2.74, 95% CI: 1.17–6.43) compared to more educated or affluent people, respectively. No association between SES and disability was observed in young adults. When considering the combined effect of no post-secondary education and low-income on disability, older adults with no post-secondary education had a greater odds of being disabled (OR=2.63, 95% CI: 1.03–6.73) relative to those with a post-secondary education controlling for covariates.

Conclusions. The findings demonstrate the advantage of disentangling the confounding of race and SES as an initial step to understanding the relationship among age, SES and disability in African Americans. (*Ethn Dis.* 2013;23[1]: 12–17)

Key Words: Education, Income, SES, Disability, African Americans, Health Disparities

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INTRODUCTION

Socioeconomic disparities in functional status are well-established such that members of low socioeconomic status (SES) groups consistently exhibit poorer physical functioning than members of higher SES groups.^{1–8} Moreover, this association has been consistently demonstrated across different populations and with different measures of function.^{9–11} Nevertheless, how specific measures of SES (eg, education and income) are related to physical function is not well understood. This is, in part, because many studies examining the relationship between SES and function have measured the multidimensional construct of SES as a single measure.^{10,12,13} Yet different SES measures could influence functional status at various stages of the life course and operate through different mechanisms.^{10,12,14,15} Thus, it is important for scientists to understand how different SES measures affect functional status over the life course for targeting interventions^{4,8} and establishing appropriate health policies.^{10,12}

Efforts to enhance the understanding of the relationship between SES and function continue to be hampered by insufficient knowledge of the mechanisms through which SES impacts physical function. Limitations to elucidating these mechanisms include the confounding of race and SES,^{16,17} use of a single measure of SES,^{12,10,16,18} and a narrow age range of study participants.^{3,8,19–23} A strong correlation exists between race and SES and each is strongly associated with functional sta-

tus. Disentangling the individual effects of these two factors can be difficult because racial minorities are likely to be members of the lowest SES groups. Although this issue is normally addressed by using multivariate modeling, this may be inadequate due to the small cell sizes in some of the race/SES groups.^{24,25} Two approaches that investigators have employed include: 1) limiting the confounding between race and SES by examining race differences in socioeconomically integrated populations²⁴; and 2) by examining SES differences within a particular race/ethnic group such as African Americans.²⁵

Despite evidence that SES differences in function exist across the life course, much of the research has focused on older adults.^{3,20,26–31} Focusing on the upper end of the age spectrum limits our understanding since it is evident that disparities in functional status emerge well before late life. Data from a cohort aged 51–61 years living in the St. Louis area indicate that Blacks have a higher prevalence of sub-clinical disability relative to a national sample of similarly aged Whites.²¹ Furthermore, the prevalence of disability increases at different rates for African Americans compared to Whites such that at most ages, the prevalence of disability observed among African Americans occurred at least 10 years later in Whites.³² Yet, little is known regarding the effect of age on the relationship between SES and disability in African Americans³³ because African Americans are less likely to survive or be healthy enough to participate in an older cohort.^{34–37} Understanding how SES relates to disability in African Americans and evaluating the role of age may help us understand the mechanisms that link SES to disability in middle-to-old age in

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African Americans without the confounding of race with SES.

The objective of our study was to determine whether the association between SES and disability vary by age in African Americans. Younger African Americans are less likely to be disabled; therefore, we anticipate that the relationship between SES and disability would be greater among older African Americans.

MATERIALS AND METHODS

The Carolina African American Twin Study of Aging (CAATSA) was designed to examine the health status, and cognitive, physical and psychosocial functioning of adult African American twins aged 22 years and older in North Carolina.³⁸ This population-based sample of participants was identified from birth records between the years of 1913 and 1975 from 23 vital statistics offices in North Carolina counties. Birth records were then entered into a computerized database of twin births. After the records were computerized, potential participants were located through voter registries and telephone *White Pages* searches. The protocol for data collection consisted of two parts. The survey was administered in person by a trained interviewer and consisted of a structured questionnaire that included demographic and socioeconomic information, self-reported health behaviors, chronic conditions, perceived stress, personality, memory, and well-being. Additionally, assessments of blood pressure (BP) and

peak expiratory flow were obtained following the survey. Participants were enrolled between 1999 and 2003. All participants provided informed consent and the study was approved by the institutional review boards at the University of North Carolina Chapel Hill and Pennsylvania State University. Additional information regarding the CAATSA study design can be found elsewhere.³⁸ To eliminate the effect of genetic relatedness, only one member of each twin pair was included in these analyses.

Measures

The dependent variable, disability, was based on participant's report of difficulty in performing basic activities of daily living (ADLS), which included eating, dressing, grooming, walking, bathing, using the toilet, and transferring in and out of bed.³⁹ A binary variable was created for each ADL to indicate whether the individual had difficulty in performing that specific activity or not. After summing these seven binary variables, a dichotomous variable for disability was created to identify those individuals who had difficulty in a least one ADL.

The two socioeconomic status measures, education and income, were based on participant's self report. Educational attainment was based on years of education completed. Because of the strong positive relationship between education and health,^{40,41} we wanted to determine the effect of education beyond high school. Participants who finished 12 or fewer years of education were considered to have no post-secondary education. Income was derived from self-reported family income based on participants' selection of 1 of 16 categories ranging from <\$100 to >\$1500 per month in \$100 dollar increments. Participants who reported an income of ≤\$1500 per month were considered to have low-income.

Age was measured as continuous variable ranging from aged 22 to

89 years. We created a dichotomous variable to identify those individuals from 22–49 years of age in the younger group and individuals from 50–89 years of age in the older group.

The covariates included demographic and health-related factors. Demographic characteristics included: sex (1=male; 0=female) and marital status (1=married, 0=not married). Health-related factors included: obesity, defined as body mass index ≥ 30 kg/m² (1=yes, 0=no), current smoking (1=yes, 0=no), alcohol consumption, and prevalent health conditions. Participants reported their alcohol consumption as never, not in the last year, a few times a year, once or twice a month, once a week, two or three times a week, and daily or almost daily. A dichotomous variable was created to identify participants who consumed alcohol at least a few times a year vs those who never or did not consume alcohol in the last year. Participants reported whether they had been told by a doctor if they had: diabetes, heart disease, high blood pressure, or arthritis. Each of the conditions were coded as binary variables (1=present; 0=absent) and summed to create a variable representing the total number of chronic health conditions, which was then dichotomized as having two or more conditions compared to one or none.

Statistical Analyses

We evaluated the mean and proportional differences by age for the demographic characteristics, SES measures, health-related factors, and disability using Student's *t* and Chi-square tests, respectively. Multivariable logistic regression models were conducted to estimate the association between SES and disability by age. We conducted six multivariable logistic regression models for disability by age, including a model consisting of education only, a model consisting of income only, and a model consisting of both SES measures. This approach allowed us to examine the separate (ie, education or

Table 1. Select demographic and health-related characteristics for the total sample and by age group in the Carolina African American Twin Study of Aging^a

Variables	Total N=395	Aged 22–49 Years n=182	Aged 50–89 Years n=213	P
Age, years	50.9±14.9	37.8±7.5	62.2±9.6	<.001
Male, %	39.2	40.7	38.0	.594
Married, %	44.9	40.3	48.8	.092
No post-secondary education, %	57.7	45.8	67.8	<.001
Low-income, %	40.5	28.3	51.0	<.001
Obese, %	49.1	46.8	51.1	.134
Alcohol consumed, %	45.4	60.8	32.2	<.001
Current smoker, %	21.0	24.3	18.1	.132
More than one health condition, %	31.2	11.6	47.9	<.001
Disabled, %	24.4	10.5	36.3	<.001

^a Plus-minus values are means ± SD. Low income was defined as income reported below \$1500 per month. Prevalent health conditions consisted of ever being told by a doctor that you have: diabetes, heart disease, hypertension, or arthritis. Disability was defined as reported difficulty in performing at least one of the seven basic activities of daily living (ie, eating, bathing, grooming, walking, dressing, transferring in and out of bed, and using the toilet).

income), and combined (ie, education and income) associations between SES and disability by age. All models controlled for the demographic and health-related characteristics described herein. $P < .05$ were considered statistically significant and all tests were two-tailed. Analyses were conducted using SAS, version 9.1.3, software (SAS Institute, Inc., Cary, North Carolina).

RESULTS

The distribution of select demographic and health-related characteristics for the total sample and by age is presented in Table 1. Of the African American participants, 46% were between aged 22 and 49 years old. There

were similar proportions of young and older adults who were male or married. Fewer young adults had no post-secondary education and were in the low-income category compared to older adults. Although a higher proportion of young adults consumed alcohol relative to older adults, similar proportions of younger and older adults were obese or currently smoke. However young adults had a better health status than older adults with a smaller proportion of them reporting more than one prevalent health condition and fewer of them reporting disability.

The distribution of the disability and SES by age is shown in Table 2. In both age groups, a higher proportion of adults with no post-secondary education or low income reported being disabled.

Table 2. Association between disability and socioeconomic status by age in the CAATSA Study

	No Post-Secondary Education		Low Income	
	No	Yes	No	Yes
Aged 22–49 years				
Disabled, %	6.2	15.9*	6.5	22.5 ^a
Aged 50–89 years				
Disabled, %	16.2	46.2*	21.4	51.0 ^a

^a $P < .05$. Disability was defined as reported difficulty in performing at least one of the seven basic activities of daily living (ie, eating, bathing, grooming, walking, dressing, transferring in and out of bed, and using the toilet). Low income was defined as income reported below \$1500 per month. No post-secondary education was defined as participants who finished ≤ 12 years of education.

The association between SES and disability stratified by age is displayed in Table 3. Among young adults, neither education nor income was associated with disability in any of the models. However, after adjusting for demographic and health-related characteristics, older adults with no post-secondary education had higher odds of disability compared to older adults with post-secondary education. Similarly, older adults with low-income had higher odds of disability than those with a higher income. When considering a model that includes both no post-secondary education and low-income on disability, education, but not income, was associated with disability. More specifically, those older adults with no post-secondary education had a greater odds of being disabled (OR=2.63, 95% CI: 1.03–6.73), relative to those with a post-secondary education controlling for demographic and health-related characteristics.

DISCUSSION

In our study we examined data from the CAATSA to determine if the relationship between SES and disability varied by age. Among older adults, we found education and income to be independently associated with disability.

Table 3. Association between disability and socioeconomic status by age in the CAATSA Study

	No Post-Secondary Education	Low Income
	OR (95% CI)	OR (95% CI)
Aged 22–49 years		
Model 1	1.87 (0.57, 6.07)	
Model 2		3.79 (0.98, 14.65)
Model 3	1.64 (0.47, 5.69)	3.37 (0.85, 13.40)
Aged 50–89 years		
Model 1	3.09 (1.24, 7.71)	
Model 2		2.74 (1.17, 6.43)
Model 3	2.63 (1.03, 6.73)	2.27 (0.95, 5.41)

Models adjusted for age, sex, marital status, obesity, alcohol consumption, current smoking status, and more than one prevalent health condition. Post secondary education and high income were the reference groups.

However when examining the joint association of education and income with disability, only education remained significant. These findings highlight the importance of understanding how specific measures of SES are related to disability in African Americans.

Consistent with our hypothesis, the relationship between SES and disability did vary by age. Among younger adults, (aged 22–49 years) we did not find a relationship between education or income, and disability. Previous studies demonstrate that disability occurs before aged 65 years^{5,21,42,43} but only one of these studies focused on African Americans.²¹ In that study, Miller and colleagues found that African Americans aged 51–61 years had a higher prevalence of sub-clinical disability (defined as a stage in the course of disability with no reported difficulty in the task but reported task modification).²¹ Thus, in our study it is likely that sufficient time may not have elapsed for disability to manifest in this group. This is evidenced

by the wide CIs, which is indicative of the small number of young adults who reported disability. Moreover, Iezzoni and colleagues²⁸ found that 4% of adults aged 18–49 years in a national sample reported mobility difficulty, defined as difficulty walking a quarter mile or climbing up 10 steps, a precursor to disability. Information regarding mobility difficulty was not obtained in our study. Future work should examine earlier stages of the disablement process (ie, impairments and functional limitations) in younger age groups.

Investigators have stated the importance of understanding how specific measures of SES affect health outcomes and how certain social factors (race, age, sex) may impact that relationship.^{33,44} In this study among participants aged ≥50 years we observed that education was independently and jointly associated with disability; income was only independently associated with disability. These findings indicate that these two SES measures are important but distinct in their association with disability. Education as measured by the number of years of formal schooling is a relatively distal measure of SES; whereas, income is a proximal measure as it represents the financial resources one currently has available. Furthermore, because education is obtained early in the life course and remains relatively

stable, those with more education are likely to have better opportunities, such as the option to select healthier foods, live in better quality neighborhoods and have jobs and working conditions that are less likely to lead to disability.^{40,45,46} Education is likely to act as a leveler for income. That is, one’s education determines one’s occupation which subsequently determines one’s income.^{47,48} These findings also indicate that having a better education can lead to better choices of work that may not lead to disability.

This study contributes to the disability literature in a number of ways. First, we were able to examine the association between education and income – the two most commonly used SES measures – in a cohort of African Americans with a wide age range. There are several national studies that could have been used to address this research question. However the lower age range of those participants is typically aged 50 years. Because African Americans experience mobility difficulty⁴³ and ADL and IADL disability earlier than Whites,²² it is important to understand this relationships earlier in African Americans. Second, there is a paucity of research examining the contribution of education and income to disability with a sufficient number of African Americans.^{10,33} Third, this work allowed us to begin to decompose SES into specific measures so that we can understand the mechanisms of how each measure of SES is associated to disability in African Americans. Fourth, by studying SES differences among African Americans we were able to eliminate the confounding of race and SES²⁴ as well as understand the variability of SES within this group.²⁵ Notwithstanding these contributions, our findings should be considered within the context of the following caveats. Education and income was collected simultaneously with disability; thus precluding the opportunity to establish temporal relationships. Only

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with a longitudinal design and a sufficient number of African Americans will we be able to establish temporal relationships, assess how each measure influences disability, and distinguish between age, cohort, and life course effects. Further, the possibility exists for reverse causation. That is, whether poor functioning could cause low SES. Although disability can influence SES, there is compelling evidence that SES strongly affects physical function.^{41,46,49,50} The etiology of disability likely varies by age. In young age, disability may be congenital or the result of an injury; whereas in old age, it is more likely to be a result of a myriad of extrinsic and intrinsic factors.⁵¹ One important factor that was not obtained in this study is cause of disability. Future work should include identifying and understanding the cause of disability in African Americans. Because this work was conducted on a sample of African Americans, it is not clear if these findings would differ for other ethnic groups. Age effects are confounded with cohort effects in cross-sectional studies.⁵² As such, the age effect observed in this study should not be used to infer changes over the life course. Future work should include a longitudinal study of African Americans with various levels of SES to understand the natural history of functional decline and its progression to disability.

The findings presented here demonstrate the advantage of disentangling the confounding of race and SES as an initial step to understanding the relationship between SES and disability in a sample of African Americans whose age ranges from 22 to 89 years. Moreover, the results raise interesting questions that need to be answered in future research. For example, do those with higher incomes have better jobs that were not as physically taxing? How did discrimination and desegregation reduce not only educational opportunities but employment opportunities that affected income that may subsequently affect physical functioning? Nevertheless,

these findings should aid future studies that develop more complicated and appropriately constrained models of this complex relationship. A better understanding of how SES affects disability in African Americans may contribute to the reduction of disparities in functional status in the United States.

ACKNOWLEDGMENTS

The CAATSA was funded by a grant from the National Institute on Aging (1R01-AG13662-01A2) to the last author. Research conducted by the first author was supported by a grant from the National Center for Minority Health and Health Disparities (P60MD000214-01). The first author is a Visiting Research Fellow at Duke University's Center for Biobehavioral and Social Aspects of Health Disparities.

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