

Racial Differences in Patterns of Use of Rehabilitation Services for Adults Aged 65 and Older

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OBJECTIVES: To examine racial differences in the use of rehabilitation services and functional improvement during receipt of services.

DESIGN: Secondary analysis of the 2016 National Health and Aging Trends Study (NHATS).

SETTING: Standardized in-person home interviews.

PARTICIPANTS: Community-dwelling Medicare enrollees (N = 6,309), 1,276 of whom reported receiving rehabilitation services in the previous 12 months.

MEASUREMENTS: Self-reported use of rehabilitation services, setting (inpatient, outpatient, home based), reason for use, and perceptions of change in functioning after receiving services.

RESULTS: Controlling for sex, dual eligibility for Medicaid, age, number of chronic conditions, functional mobility at the prior round, income, and geographic region, the odds of receiving rehabilitation services in any setting was 1.38 times as great in whites as in blacks (95% confidence interval = 1.09–1.75). Of those receiving therapy, whites were more likely to receive home-based and inpatient rehabilitation services, but there were no racial differences in improvement in function.

CONCLUSION: Strategies are needed to identify possible barriers to use of rehabilitation services for vulnerable groups of aging individuals who need rehabilitation services, particularly older blacks. *J Am Geriatr Soc* 65:2707–2712, 2017.

Key words: aging; rehabilitation; disparities

Although older adults do not universally experience disability, the prevalence of disability is substantial, affecting nearly half of adults aged 65 and older, and increases sharply with age.¹ Nationwide, the prevalence of late-life disability declined in the latter part of the 20th century,² but in recent years, the trend has plateaued, and researchers warn of a possible reversal in the near future as the Baby Boom generation ages.³ Racial and ethnic differences in disability prevalence have been widely documented, with higher rates persisting for blacks than whites, even after controlling for potentially confounding demographic and socioeconomic characteristics.^{4–7} Over the past few decades, older blacks have gained fewer years of active life than older whites.⁸

Rehabilitation services can assist in improving function and quality of life throughout later life. Rehabilitation specialists play a unique role in prescribing exercise to alleviate pain and increase strength, aerobic conditioning, and movement. A metaanalysis examining the effects of physical activity in older adults found that regular physical activity can prevent and decrease age-related functional decline.⁹ Although these findings provide support for the use of rehabilitation in addressing functional impairment and subsequent disability in older individuals, previous research has demonstrated that use of rehabilitation declines with age.¹⁰

Studies examining predictors of rehabilitation in later life vary with respect to conclusions about racial and other demographic differences.^{11–13} For example, one study found that race was not a significant determinant in overall use of physical therapy but that blacks were more likely to receive greater amounts.¹³ Others have found that blacks are less likely than whites to receive outpatient therapy services for musculoskeletal conditions.^{10,14} Another study reported that blacks demonstrated less functional improvement after inpatient rehabilitation for hip fracture than whites.¹⁵ Although these studies suggest racial differences in patterns of use of rehabilitation and in outcomes after treatment, most of the research has been conducted in settings with selective populations, limiting their generalizability, and few studies have explored the reasons for

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observed differences, although there is speculation that differences in insurance coverage may play a role.^{12,13} In particular, older blacks are much more likely than whites to be dually eligible for Medicaid and much less likely to have private supplemental insurance.¹⁶

A recent study of the 2015 National Health and Aging Trends Study (NHATS) described the older population's use of rehabilitation services and found that use was 20% lower in blacks than whites,¹⁷ but further work is necessary to examine how use of rehabilitation and its perceived effectiveness vary according to race after adjusting for potential confounders. The primary aim of this study was to examine racial differences in use of rehabilitation services and self-report of functional improvement after receipt of services by older adults. The secondary aim was to examine racial differences in rehabilitation services according to setting in which the services were received, controlling for sociodemographic factors.

METHODS

Data Source

Data were from the 2016 round of the NHATS. NHATS began in 2011 with a sample of 8,245 Medicare beneficiaries. The Medicare enrollment database was used as the sampling frame to create a nationally representative cohort of persons aged 65 and older in the United States.¹⁸ Information regarding the complex survey sample design can be found at www.nhatsdata.org. In 2015, the cohort was replenished (~half continuing from the initial 2011 sample and half new sample beginning in 2015).¹⁹ The 2016 round included 6,309 completed sample interviews in settings other than nursing homes.

Individuals enrolled in NHATS participate in an annual interview consisting of items that detail physical functioning, the home environment, and social participation and complete a battery of physical performance measures.²⁰

Measures

NHATS sample members reported on their use of rehabilitation services (defined to participants as receiving services that include physical therapy, occupational therapy, and speech therapy) in the past 12 months, the setting where services were received, their perceptions of improvements while receiving rehabilitation services, and whether their rehabilitation goals were met. Information on reasons for use of rehabilitation services was also collected.

Primary race was assessed using the question "What race {do you/does the sampled person} consider {yourself/himself/herself} to be: white, black or African American, American Indian, Alaska Native, Asian, Native Hawaiian, Pacific Islander, or something else?" Individuals who endorsed more than one group were asked to report the primary race. Individuals were also asked if they considered themselves to be Hispanic or Latino.

A number of control variables previously shown to predict rehabilitation use were also included in analyses: sex,¹² dual eligibility,¹¹ age,¹³ number of chronic conditions,¹³ income,¹³ region,^{12,13} access to transportation,

living situation, and functional mobility before rehabilitation. Age was included as a categorical variable (65–74, 75–84, ≥85). To classify comorbidity, a count of the number of chronic conditions (heart attack, heart disease, hypertension, arthritis, osteoporosis, diabetes mellitus, lung disease, stroke, dementia or Alzheimer's disease, cancer) was used, classified as none, 1 to 3, 4 or more, and missing. Income was calculated at the 25th, 50th, and 75th percentiles using a self-reported income variable. For cases with missing income, we used an imputed income variable provided by NHATS.²¹ In NHATS, U.S. Census division is provided. Because of small sample sizes, we recoded division into four regions: Northeast, Midwest, South, and West. Participants self-reported transportation access. Individuals who had transportation drove independently, received a ride from family or friends, used public transportation, or had a ride otherwise provided (e.g., shuttle service, car service). Based on a household roster, participants were classified as living alone or with others. Functional mobility was calculated using the Short Physical Performance Battery (SPPB) from the 2015 round.²² SPPB functional scores were categorized as low (<6 points), intermediate (7–9 points), and high (10–12 points).²³

This analysis received exempt status from the Boston Medical Center Institutional Review Board.

Analysis

For all analyses, analytical weights were used to account for the complex survey design of NHATS. Results are therefore generalizable to the community-dwelling U.S. population aged 65 and older in 2016.¹⁸ Descriptive statistics were calculated for the entire older population in 2016 and the subset of those who had received rehabilitation services in the prior year. Because of limited sample sizes for Hispanic and other groups, we focused this analysis to two groups: non-Hispanic whites ($n = 4,357$) and non-Hispanic blacks ($n = 1,284$).

All statistical analyses were performed using SAS version 9.3 (SAS Institute, Inc., Cary, NC).

Racial Differences in Rehabilitation Service Use According to Setting and Perceived Improvement

We calculated overall and according to racial group the frequency of use of any rehabilitation during the previous 12 months and use by setting (inpatient, outpatient, home based) of those receiving rehabilitation services. Rao Scott chi-square tests were used to determine significant differences in use according to racial group, rehabilitation use according to setting, overall self-report of improvement from rehabilitation, self-report of improvement from rehabilitation according to reason for rehabilitation, and whether goals for rehabilitation services were met.

Racial Differences in Rehabilitation Use According to Setting

We used logistic regression models to identify racial differences in use of rehabilitation services, controlling for other predictors of rehabilitation use overall and according to setting. Race was the primary predictor of interest, and in

all analyses, we controlled for variables previously shown to affect use of rehabilitation.

RESULTS

Descriptive Findings

A significantly higher proportion of whites reported using rehabilitation services (21.5%) than blacks (16.3%) (Table 1). Significant differences were observed for outpatient services (blacks 9.9%, whites 15.3%). Of those using rehabilitation in the last year, blacks disproportionately used home-based services.

Significant differences were found between blacks and whites with respect to sex, education, age, region, income, supplemental insurance coverage, dual eligibility for Medicaid, having transportation, living alone, and functional mobility. Whites had a much lower rate of dual eligibility than blacks (6.4% vs 30.8%) and a higher rate of enrollment in supplemental insurance coverage (70.6% vs

48.9%). More blacks were in the lowest functional category (50.7%) than whites (32.4%).

Of those who received rehabilitation services, significant differences were observed between blacks and whites in education, region, income, supplemental insurance coverage, dual-eligibility, having transportation, and functional mobility. Almost half (46.8%) of blacks who received rehabilitation services resided in the South, and 36% had incomes of less than \$17,962. Fewer blacks were covered under Medicare supplemental insurance than whites (62.6% vs 74%), and a larger proportion of blacks were dually eligible for Medicaid (29.4% vs 7.7%). A larger proportion of blacks compared to whites who received rehabilitation services were in the lowest functional category in the prior year (49.2% vs 29.6%).

Significant differences in the characteristics of those using rehabilitation services were found according to race and setting (Table 2). Blacks who underwent rehabilitation in these settings were more likely to have less than high school education, were in the lowest income quartile, and

Table 1. Rehabilitation Use and Sociodemographic Characteristics in All Adults Aged 65 and Older and Those Receiving Rehabilitation Services in the Last Year

Factor	All Older Adults			Older Adults Receiving Rehabilitation Services		
	All, n = 6,309	White, n = 4,357	Black, n = 1,284	All, n = 1,276	White, n = 953	Black, n = 209
Used rehabilitation in past 12 months ^a	20.2	21.5	16.3			
Rehabilitation use according to setting						
Inpatient	6.4	6.6	6.0	31.6	30.9	36.9
Home-based ^b	7.2	7.2	7.1	35.5	33.7	44.1
Outpatient ^a	13.9	15.3	9.9	68.8	71.3	61.4
Female ^a	55.4	55.6	60.2	60.5	61.6	63.6
Education ^{a,b}						
<High school	16.4	11.1	30.6	13.1	10.5	21.8
High school	27.6	26.9	26.6	25.0	23.3	28.1
≥Some college	56.0	56.2	42.8	61.9	66.2	50.0
Age ^a						
65–74	52.9	51.8	54.1	48.2	48.3	50.6
75–84	33.4	34.2	34.0	34.5	34.3	36.5
≥85	13.7	14.0	11.9	17.3	17.4	12.9
Region ^{a,b}						
Northeast	18.4	18.8	14.4	21.1	21.3	19.6
Midwest	22.0	24.7	20.1	21.1	22.2	24.1
South	37.8	35.8	58.1	35.5	35.3	46.8
West	21.7	20.7	7.3	22.3	21.2	9.4
Income, \$ ^{a,b}						
<17,962	21.0	14.7	42.3	17.6	13.7	36.0
17,962–34,955	23.7	22.8	28.8	23.3	22.8	30.5
34,956–64,939	25.6	28.2	16.9	27.0	28.7	18.0
≥64,939	29.8	34.3	12.1	32.1	34.9	15.5
Medicare supplemental insurance ^{a,b}	65.9	70.6	48.9	71.6	74.0	62.6
Dually eligible for Medicaid ^{a,b}	12.8	6.4	30.8	12.1	7.7	29.4
Has transportation ^{a,b}	79.7	85.2	63.5	74.4	78.6	59.8
Lives alone ^a	29.7	30.1	35.7	31.3	32.0	38.8
Short Physical Performance Battery score ^{a,b}						
≤6 (low)	36.0	32.4	50.7	46.1	29.6	49.2
7–9 (intermediate)	37.6	38.3	38.4	32.1	39.9	39.0
10–12 (high)	26.4	29.3	10.9	21.8	30.5	11.8

P < .05 for black/white comparisons of ^aall older adults, ^bolder adults undergoing rehabilitation.

Table 2. Sociodemographic Characteristics of the 65 and Older Population Using Rehabilitation Services in the Last Year According to Type of Service and Race

Characteristic	Inpatient Rehabilitation		Home-Based Rehabilitation		Outpatient Rehabilitation	
	White, n = 317	Black, n = 85	White, n = 360	Black, n = 109	White, n = 621	Black, n = 114
Female	61.2	60.1	57.2	64.2	62.2	62.1
Education ^{a,b,c}						
<High school	15.8	24.6	15.5	25.2	6.8	15.5
High school	27.7	38.8	28.0	33.2	21.1	26.7
≥Some college	56.5	36.6	56.5	41.6	72.1	57.8
Age						
65–74	37.2	42.7	35.2	41.7	56.4	52.9
75–84	40.1	39.9	36.0	36.3	33.0	41.0
≥85	22.7	17.4	28.8	22.0	10.6	6.1
Region ^b						
Northeast	19.5	18.9	23.9	12.9	20.6	19.6
Midwest	21.7	25.5	18.3	27.7	23.0	25.4
South	39.8	47.3	41.9	48.2	33.0	46.4
West	19.1	8.3	16.0	11.2	23.4	8.6
Income, \$ ^{a,b,c}						
<17,962	22.2	35.6	19.5	39.3	8.8	29.2
17,962–34,955	28.1	33.7	24.6	34.1	21.6	33.7
34,956–64,939	22.5	21.1	33.0	11.4	27.8	20.3
≥64,939	27.2	9.6	22.9	15.1	41.8	17.8
Medicare supplemental insurance ^{b,c}	68.6	48.7	66.3	55.2	78.7	63.1
Dually eligible for Medicaid ^{a,b,c}	11.8	30.5	12.8	33.6	3.5	23.2
Has transportation ^{a,b}	65.3	49.2	57.2	43.8	90.3	78.5
Lives alone ^b	35.9	25.2	33.9	31.9	28.7	46.4
Short Physical Performance Battery score ^{a,b}						
≤6 (low)	58.4	66.8	61.9	75.3	33.5	47.9
7–9 (intermediate)	31.6	32.6	27.6	22.3	34.1	41.4
10–12 (high)	10.0	0.6	10.5	2.4	32.4	10.7

P < .05 for black/white comparisons for ^ainpatient rehabilitation, ^boutpatient rehabilitation, ^chome-based rehabilitation.

had higher rates of being dually eligible for Medicaid. Of those who underwent rehabilitation in outpatient and home-based settings, whites had significantly higher rates of having supplemental insurance (78.7% and 66.3%, respectively). In inpatient and outpatient settings, significant differences were found in functional mobility between blacks and whites, with a higher proportion of blacks in the lowest functional category (66.8% vs. 58.4% and 47.9% vs. 33.5%, respectively).

Multivariate Results

In fully controlled models, the odds of receiving rehabilitation services in any setting were 1.38 times as great for whites as for blacks (Table 3). Having fewer chronic conditions and lower levels of education were associated with lower odds of receiving rehabilitation services. Being in the highest income quartiles and having Medicare supplemental insurance increased the odds of using rehabilitation. Access to transportation was associated with lower odds of undergoing rehabilitation, whereas having the lowest level of function was associated with greater odds.

After controlling for covariates, the odds of using home-based rehabilitation were 1.53 times as great for whites, and the odds of using inpatient rehabilitation were 1.63 times as great, but no significant differences were observed in use of outpatient rehabilitation. Predictors of rehabilitation use varied according to setting. Individuals

who were white, with more chronic conditions, higher incomes, and lower functional mobility status were more likely than others to use home-based services. Whites, those with more chronic conditions, and those in the lowest functional mobility category were more likely to undergo inpatient rehabilitation. Those who were male and had fewer chronic conditions and lower levels of education were less likely to undergo outpatient rehabilitation, whereas those in the youngest age category, with the highest income, and with Medicare supplemental insurance were more likely to do so. Having transportation was associated with lower odds of home-based and inpatient use but higher odds of outpatient service use.

No significant racial differences were found with regard to overall improvement in function or goals met by rehabilitation services (Supplemental Table S1). A majority of blacks and whites reported overall improvement (61.9% and 64.4%) and meeting goals (53.8% and 57.2%). Approximately one-third of the sample reported no change from rehabilitation services received (32.0% whites; 35.9% blacks)

DISCUSSION

Older black Americans do not use rehabilitation services at the same rates as whites, and this finding holds after controlling for socioeconomic, demographic, and function-related characteristics. Whites are more likely to be served

Table 3. Predictors of Use of Rehabilitation Services

Predictor	Use of Any Rehabilitation	Use of Inpatient Rehabilitation	Use of Home-Based Rehabilitation	Use of Outpatient Rehabilitation
	Odds Ratio (95% Confidence Interval)			
White	1.38 (1.09–1.75) ^a	1.63 (1.11–2.39) ^a	1.53 (1.09–2.16) ^a	1.13 (0.79–1.61)
Male	0.80 (0.66–0.95) ^a	1.05 (0.80–1.39)	1.29 (0.96–1.74)	0.69 (0.56–0.84) ^a
Dually eligible	1.05 (0.79–1.39)	1.17 (0.71–1.91)	1.37 (0.98–1.93)	0.82 (0.55–1.22)
Age (reference ≥85)				
65–74	1.00 (0.77–1.30)	0.95 (0.62–1.46)	0.74 (0.49–1.11)	1.41 (1.03–1.92) ^a
75–84	0.95 (0.76–1.19)	1.10 (0.78–1.54)	0.77 (0.54–1.09)	1.29 (0.96–1.72)
Number of chronic conditions (reference ≥4)				
0	0.24 (0.16–0.37) ^a	0.13 (0.06–0.31) ^a	0.17 (0.07–0.39) ^a	0.33 (0.20–0.56) ^a
1–3	0.54 (0.45–0.64) ^a	0.56 (0.43–0.73) ^a	0.42 (0.32–0.55) ^a	0.72 (0.56–0.93) ^a
Income percentile (reference < 25th percentile)				
25th	1.34 (0.95–1.80)	1.14 (0.73–1.79)	1.28 (0.85–1.92)	1.44 (0.97–2.14)
50th	1.52 (1.07–2.15) ^a	0.98 (0.61–1.57)	1.92 (1.33–2.77) ^a	1.44 (0.90–2.30)
75th	1.68 (1.22–2.33) ^a	1.23 (0.76–1.98)	1.43 (0.94–2.16)	1.84 (1.21–2.80) ^a
Education (reference ≥some college)				
<High school	0.72 (0.54–0.96) ^a	0.87 (0.57–1.34)	0.78 (0.53–1.14)	0.60 (0.42–0.85) ^a
High school	0.72 (0.58–0.88) ^a	0.91 (0.67–1.22)	0.86 (0.65–1.14)	0.69 (0.55–0.87) ^a
Medigap supplement	1.37 (1.14–1.64) ^a	1.09 (0.85–1.40)	1.05 (0.84–1.31)	1.55 (1.21–1.99) ^a
Region (reference West)				
Northeast	1.18 (0.85–1.64)	1.00 (0.66–1.53)	1.50 (0.91–2.46)	1.09 (0.72–1.63)
Midwest	0.90 (0.68–1.20)	0.98 (0.63–1.54)	1.06 (0.69–1.61)	0.84 (0.60–1.19)
South	0.94 (0.74–1.20)	1.13 (0.73–1.74)	1.52 (0.99–2.33)	0.79 (0.60–1.04)
Has transportation	0.69 (0.56–0.85) ^a	0.51 (0.38–0.69) ^a	0.34 (0.25–0.47) ^a	1.68 (1.29–2.20) ^a
Lives alone	1.11 (0.94–1.32)	1.07 (0.84–1.37)	1.01 (0.78–1.31)	1.08 (0.87–1.35)
Short Physical Performance Battery score (reference high)				
Low	1.50 (1.16–1.95) ^a	3.63 (2.14–6.13) ^a	2.95 (1.77–4.90) ^a	1.27 (0.96–1.70)
Intermediate	0.99 (0.76–1.29)	2.19 (1.26–3.79) ^a	1.61 (0.99–2.62)	0.87 (0.65–1.17)

^aP < .05.

in outpatient settings than blacks, but differences are fully accounted for in multivariate models. In contrast, there are no racial differences in (unadjusted) home-based and inpatient use, but once differences between blacks and whites are accounted for, whites have higher rates of use in both of these settings. Finally, we found no racial differences in perceptions about rehabilitation effectiveness, although a substantial minority of the sample reported no improvement in function.

A higher proportion of older blacks were low functioning, and they had lower odds of undergoing rehabilitation, suggesting that greater use of rehabilitation services by older black Americans has the potential to improve late-life functioning in this population. Future work is needed to determine the contribution of rehabilitation to differences in functional decline and resultant disability prevalence at the population level and to quantify the likely effects on population-level disparities of equalizing access.

The drivers that influenced use of rehabilitation services varied according to setting. Having access to transportation was associated with greater odds of use of outpatient services but lower odds of use of inpatient and home services. This finding may demonstrate the influence of transportation in rehabilitation referral patterns for older adults, because providers may be more likely to refer to inpatient or home services for those who are unable to drive or lack reliable transit options. A combination of Medicare and Medicaid usually covers inpatient rehabilitation services, according to patient diagnosis, whereas

outpatient rehabilitation usually involves a copayment for treatment and services rendered. These differences in payment mechanism and added costs may be contributing to the differences in use of rehabilitation according to income level and for those with Medicare supplemental insurance.

Low functional mobility in the prior year was a significant contributor to use of any, home-based, and inpatient rehabilitation. Individuals in the lowest functional mobility category had marked impairments in balance, lower extremity strength, and gait speed. These functional limitations can lead to less ability to participate in community-based activities and therefore may limit ability to participate in rehabilitation outside of the home or inpatient setting.

Limitations

Participants reported use of rehabilitation services in the last 12 months. Information on the timing of events that increase the need for rehabilitation (e.g., stroke, injurious fall, surgery) was not available from the survey. Although we controlled for functional mobility in the prior year, we were unable to control for the severity of specific conditions. As a result, differences between blacks and whites may not have been fully captured. Regional differences were characterized broadly, which may have dampened further regional disparities in use of rehabilitation. This study drew upon self-report measures of use of rehabilitation services and subjective assessments of improvement in

function, which could have measurement properties that systematically vary according to race that the socioeconomic and demographic factors in our models did not capture. We were also unable to explore differences in physical, occupational, and speech therapy because participants were not asked to distinguish types of rehabilitation services used.

CONCLUSIONS

This study reveals racial differences in the overall use of rehabilitation services in community-dwelling individuals aged 65 and older. In this nationally representative sample, we found that, despite differences in patterns of use, blacks and whites reported equivalent overall improvement in function after completing rehabilitation. This study is the first of its kind to establish that the predictors driving the use of rehabilitation services vary according to the setting in which rehabilitation services are received. Further study is needed to develop strategies aimed at identifying possible barriers to use of rehabilitation services for vulnerable groups of aging individuals, particularly those who are black, dually eligible, and of the oldest age groups and lowest functioning.

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Conflict of Interest: Dr. Freedman and Dr. Jette are investigators with NHATS. Dr. Cabral and Dr. Keeney have no conflicts of interest to declare.

Author Contributions: Jette, Keeney: Study concept and design. Keeney, Cabral, Freedman: Statistical analysis, interpretation of data. All authors: Preparation of manuscript.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Reports of Improvement in Functioning During Rehabilitation

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