

# Racial Differences in Chronic Conditions and Sociodemographic Characteristics Among High-Utilizing Veterans

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## Abstract

**Purpose** African-Americans are disproportionally represented among high-risk, high-utilizing patients. To inform program development for this vulnerable population, the current study describes racial variation in chronic conditions and sociodemographic characteristics among high-utilizing patients in the Veterans Affairs Healthcare System (VA).

**Methods** We identified the 5 % most costly Veterans who used inpatient or outpatient care at the VA during fiscal year 2010 ( $N=237,691$ ) based on costs of inpatient and outpatient care, pharmacy services, and VA-sponsored contract care. Patient costs and characteristics were abstracted from VA outpatient and inpatient data files. Racial differences in

sociodemographic characteristics (age, sex, marital support, homelessness, and health insurance status) were assessed with chi-square tests. Racial differences in 32 chronic condition diagnoses were calculated as relative risk ratios.

**Results** African-Americans represented 21 % of high-utilizing Veterans. African-Americans had higher rates of homelessness (26 vs. 10 %,  $p<0.001$ ) and lower rates of supplemental health insurance (44 vs. 58 %,  $p<0.001$ ). The mean number of chronic conditions was similar across race. However, there were racial differences in the prevalence of specific chronic conditions, including a higher prevalence of HIV/AIDS (95 % confidence interval (CI) 4.86, 5.50) and schizophrenia (95 % CI 1.94, 2.07) and a lower prevalence of ischemic heart disease (95 % CI 0.57, 0.59) and bipolar disorder (95 % CI 0.78, 0.85) among African-American high-utilizing Veterans.

**Conclusion** Racial disparities among high-utilizing Veterans may differ from those found in the general population. Interventions should devote attention to social, environmental, and mental health issues in order to reduce racial disparities in this vulnerable population.

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## Introduction

A small number of patients account for the majority of healthcare costs [1–4]. This finding is surprisingly consistent across populations—the top 5 % of non-institutionalized US citizens account for 49 % of medical spending [1] and the top 5 % of Medicaid spenders account for 51 % of Medicaid costs [2]. Further, despite differences between the Veterans Affairs Healthcare System (VA), which is a national integrated system available to all Veterans at low or no cost, and non-VA

healthcare, one study found that VA patients adhere to the same pattern: the top 5 % of spenders within the VA account for 47 % of total VA costs [5]. High-utilizing patients frequently have multiple chronic medical and mental health conditions [2, 3], but lack the socioeconomic and/or psychosocial resources to manage their health issues [3]. As a result, these patients often receive care in acute settings that are not equipped to provide social services or self-management support (e.g., emergency departments, hospitals) [3].

In an effort to contain escalating costs, many healthcare systems are developing programs to improve care and lower the costs for high-risk, high-utilizing patients [3, 6]. In general, these programs provide intensive outpatient treatment through a combination of methods, including 24-h access to providers, medication reconciliation, and health coaching [6–14]. Such services are usually implemented through a “medical home” in order to enhance patient engagement and care coordination [6–15]. Programs for high-utilizing patients also tend to focus on problems that are not traditionally considered part of the medical care, such as housing and transportation assistance [3, 16].

Anecdotal reports from such programs are overwhelmingly positive [3], and well-designed observational studies suggest that intensive management programs can lower costs and improve patient outcomes [8, 17]. Findings from a limited number of randomized controlled trials (RCTs) also suggest that intensive management programs can result in improved quality of life [18, 19], improved quality of care [18, 20], and/or less acute care utilization (e.g., Emergency Department visits [18]). However, to date, most rigorously studied programs (i.e., those tested in RCTs) have not lowered overall costs, though some programs may be cost neutral [19].

Understanding the needs of high-utilizing patients is critical to developing effective intensive outpatient programs. Information on the needs of African-American patients is particularly important as African-Americans are overrepresented among some populations of high-utilizing patients, including those served by Medicare [21] and those served by the VA [5]. There are several possible reasons for this disparity. For example, high-utilizing patients frequently have medical conditions that are prevalent and poorly controlled among African-American patients [22–26], such as diabetes, hypertension, and heart disease [1–4, 21]. High-utilizing patients and African-American patients are also more likely to be negatively affected by social determinants of health, like socioeconomic status [3, 27].

A widely used framework for health disparities research [28] describes three phases of research on health disparities: first-generation studies that *describe* disparities, second-generation studies that use the results of first-generation studies to further causal *understanding* of disparities, and third-generation studies that use the results of the first- and second-generation studies to test ways to *reduce* or *eliminate*

disparities. We sought to conduct a first-generation study in order to eventually inform healthcare delivery for high-utilizing Veterans. Specifically, our goal was to examine racial variation in sociodemographic characteristics and chronic condition prevalence among this population. Due to a dearth of Veteran or civilian data on racial differences in chronic condition prevalence among high-utilizing patients, hypotheses were based on data from the general civilian [27, 29] and Veteran [26] populations. We hypothesized that African-American high-utilizing Veterans would have a greater number of chronic conditions, less marital support, and less stable housing than their Caucasian counterparts.

## Materials and Methods

This research used a deidentified data set based on national, administrative, VA data. Research was conducted under a designation of non-research by the Stanford University Institutional Review Board.

**Population and Data Sources** The present sample is part of a larger, national sample of all Veterans who received inpatient or outpatient care at the VA during fiscal year 2010 ( $N=5,533,128$ ). A total of 299,134 Veterans were excluded from this larger data set due to missing sociodemographic data and one Veteran was excluded for outlier cost data. No Veterans were excluded for missing race data. Therefore, the final sample of the larger data set consisted of 5,233,994 Veterans.

Analyses for this study were based on a sample comprising the 5 % costliest African-American and Caucasian Veterans who received inpatient or outpatient care at the VA during fiscal year 2010 ( $N=237,691$ ). We focused analyses on African-American and Caucasian Veterans because there was little representation of other racial/ethnic groups. The total sample of the 5 % costliest Veterans in fiscal year 2010 ( $N=261,699$ ) was mostly Caucasian, non-Hispanic (70 %;  $n=181,822$ ); 55,809 (21 %) of these Veterans were African-American, non-Hispanic; 14,558 (6 %) were Hispanic; and 4,211 (2 %) were “Other.” There was little missing/unknown race data among these high-cost Veterans—only 5,239 Veterans (2 %) had missing/unknown race data. The low rates of missing race data may be due to the use of inpatient records [30]. However, it should be noted that VA patients without race data are more likely to be younger, male, and have non-VA health insurance [30].

Costs were based on inpatient and outpatient care, pharmacy records, and VA-sponsored contract care. The VA does not maintain billing records; therefore, costs for inpatient and outpatient visits were estimated with the 2010 Average Cost data files based on Medicare payments for comparable care [31–33]. Costs for inpatient care were determined by diagnosis-related group codes, and costs for outpatient care

were determined by procedure codes. Costs for prescription medications filled in VA and service-specific payments to VA-sponsored contract care providers came from the 2010 Decision Support System Pharmacy files and 2010 Fee Basis files, respectively.

**Veteran Characteristics** The following characteristics were coded as dichotomous variables based on data from VA outpatient and inpatient administrative data files. Data on date of birth (used to calculate age), race, and sex were collected when Veterans enrolled in VA services. Age was coded such that “1” indicated “at or over age 65” and “0” indicated “below age 65.” Age was dichotomized to ease interpretation of findings. In addition, patients become eligible for Medicare at age 65, which may result in changes in healthcare utilization, particularly with regards to care received within versus outside the VA. Race was coded such that 1 indicated “African-American” and 0 indicated “Caucasian.” Sex was coded such that 1 indicated “male” and 0 indicated “female.”

**History of homelessness, marital support** (i.e., married or not, as a proxy for social support), and **the presence of non-VA health insurance** were coded such that 1 indicated the presence and 0 indicated the absence of the characteristic during the year of investigation. Veterans were considered to have a history of homelessness if they met at least one of the following three criteria based on administrative data: (1) the presence of the code for “lack of housing” (V60.6) based on the International Classification of Diseases–Ninth Edition–Clinician Modification (ICD-9-CM); (2) the presence of a clinic stop code associated with housing assistance or a homeless bed section; or (3) a positive homeless indicator in the outpatient database. Data entered by clerks or providers at patient visits were used to assess marital support and non-VA health insurance (clerks ensure that insurance status is updated prior to clinic visits, at a minimum, every 6 months).

Data were also collected on the following *conditions* using ICD-9-CM codes present at least twice in inpatient or outpatient data files in 2010: acid-related diseases (gastrointestinal ulcers, gastritis, esophageal reflux, and dyspepsia), alcohol/drug dependence or abuse, Alzheimer’s disease, arthritis, asthma, cancer, chronic renal failure, chronic obstructive pulmonary disease (COPD), depression, diabetes, headache, heart failure, hearing problem, hepatitis C, HIV/AIDS, hyperlipidemia, hypertension, ischemic heart disease, low back pain, manic depression, multiple sclerosis, osteoporosis, Parkinson’s disease, peripheral vascular disease, post-traumatic stress disorder, prostatic hyperplasia, peripheral vascular disease, schizophrenia, spinal cord injury, stroke, and thyroid disorder, urinary incontinence, and vision problem. Conditions were chosen based on prevalence and past associations with management challenges or cost [34–37].

**Statistical Analyses** Racial differences in total costs were assessed with a *t* test. Racial differences in sociodemographic characteristics and comorbid medical and mental health conditions were assessed with chi-square tests. Racial differences in the mean number of chronic conditions were calculated with a *t* test and an analysis of co-variance (ANCOVA), which adjusted for the following sociodemographic variables: age, sex, history of homelessness, marital support, and presence of non-VA health insurance. Control variables were chosen based on past research of high-utilizing patients [1–3, 38].

Racial differences in specific chronic condition diagnoses and total medical and mental health conditions were calculated as relative risk ratios [38], with race as the independent variable and the condition or condition count as the outcome variable. Our primary interest was unadjusted differences in prevalence as these represented the burden handled by existing programs. However, we ran three logistic regression models for each chronic condition and total condition variable: first, an unadjusted model; second, a partially adjusted model, controlling for age and sex; and third, a fully adjusted model, controlling for all of the sociodemographic variables listed above. We chose to run partially and fully adjusted models in order to investigate results due to essentially immutable characteristics (i.e., age and sex) compared to characteristics that might be manipulated in second- or third-generation studies designed to understand, reduce, or eliminate health disparities (e.g., housing, social support). The Bonferroni correction for multiple comparisons suggested  $\alpha < 0.001$ ; therefore, results with  $p < 0.001$  were considered statistically significant. All analyses were conducted in STATA version 12 [39].

## Results

Sample characteristics are described in Table 1. In unadjusted analyses, African-American high-utilizing Veterans had significantly higher rates of homelessness (26 vs. 10 %,  $p < 0.001$ ), were less likely to be married (30 vs. 44 %,  $p < 0.001$ ), and were less likely to have non-VA insurance (44 vs. 58 %,  $p < 0.001$ ) compared to Caucasian high-utilizing Veterans. African-American high-utilizing Veterans were also more likely to be under the age of 65 (29 vs. 46 %,  $p < 0.001$ )—the mean age of African-American high-utilizing Veterans was 60.49 years (SD=12.11 years; range 20–101 years) and the mean age of Caucasian high-utilizing Veterans was 64.63 years (SD=13.18 years; range 18–104 years). The mean age for the total sample of high-utilizing Veterans was 63.66 years (SD=13.05 years; range 18–104 years). Results of a two-group mean comparison test ( $p = 0.10$ ) and results of the ANCOVA ( $p = 0.79$ ) suggested no

**Table 1** Characteristics of the 5 % highest-cost Veterans in the Veterans Affairs Healthcare System (VA) during fiscal year 2010

	Caucasian		African-American		$\chi^2$
	$N=181,882$		$N=55,809$		
	$N$	%	$N$	%	
Male	173,376	95	52,427	94	171.99*
Non-VA insurance	105,946	58	24,377	44	3.7e+03*
Married	80,315	44	16,809	30	3.5e+03*
History of homelessness	19,057	10	14,291	26	8.1e+03*
Age $\geq 65$	82,895	46	16,374	29	4.6e+03*
$\geq 1$ Medical condition	167,723	93	52,029	93	0.59
$\geq 1$ Mental health condition	82,344	45	30,456	55	1.5e+03*
$\geq 1$ Medical and $\geq 1$ mental health condition	76,104	42	28,000	50	1.2e+03*

\* $p < 0.001$ 

differences in the mean number of chronic conditions between African-American ( $M=4.39$ ,  $SD=2.20$ ) and Caucasian ( $M=4.41$ ,  $SD=2.29$ ) high-utilizing Veterans in unadjusted or adjusted analyses. African-American high-utilizing Veterans had higher costs than Caucasian high-utilizing Veterans: the mean cost for African-Americans was \$76,090 ( $SD=\$68,374$ ) versus \$72,261 ( $SD=\$63,019$ ) for Caucasians,  $t(237,689)=-12.30$ ,  $p < 0.001$ .

Table 2 presents unadjusted, partially adjusted, and fully adjusted relative risks and confidence intervals (CIs) for having at least one medical and/or mental health condition. There were essentially no racial differences in the proportion of high-utilizing Veterans with one or more medical conditions in unadjusted or adjusted analyses. A larger proportion of African-American high-utilizing Veterans had one or more mental health conditions (55 vs. 45 %,  $p < 0.001$ ) or co-occurring medical and mental health conditions (50 vs. 42 %,  $p < 0.001$ ) in unadjusted analyses. However, these differences were attenuated in partially adjusted models and reversed in fully adjusted models (see Table 2).

Table 2 also presents unadjusted, partially adjusted (controlling for age and sex), and fully adjusted (controlling for age, sex, history of homeless, marital support, and insurance status) relative risks and CIs for a sample of medical and mental health conditions that were prevalent or had marked racial differences in prevalence. Results for all conditions are reported in Online Resource 1. Below, we first describe the results from the unadjusted models. In the final paragraph, we note some differences between unadjusted and adjusted models.

Relative risks for certain medical conditions, such as diabetes (95 % CI 1.04, 1.07) and hypertension (95 % CI 0.09, 1.11), were relatively similar across race. However, African-American high-utilizing Veterans were much more likely to have infectious disease diagnoses, including being five times more likely to have a diagnosis of HIV/AIDS (95 % CI 4.86,

5.50) and twice as likely to have a diagnosis of hepatitis C (95 % CI 2.32, 2.44). African-American high-utilizing Veterans were also more likely to have a diagnosis of chronic renal failure (95 % CI 1.50, 1.56). Several conditions were significantly less common among African-American high-utilizing Veterans when compared to Caucasian high-utilizing Veterans. For example, COPD was almost half as common among African-American high-utilizing Veterans (95 % CI 0.53, 0.56), and the same was true for ischemic heart disease (95 % CI 0.57, 0.59) and thyroid disorder (95 % CI 0.49, 0.53). Peripheral vascular disease was also significantly less common among African-American high-utilizing Veterans compared to Caucasian high-utilizing Veterans (95 % CI 0.64, 0.68).

Among mental health conditions, African-American high-utilizing Veterans were much more likely to have a diagnosis of schizophrenia (95 % CI 1.94, 2.07) and were also more likely to have a diagnosis of alcohol/drug use disorders (95 % CI 1.89, 1.95). African-American high-utilizing Veterans were less likely to have a diagnosis of bipolar disorder than Caucasian high-utilizing Veterans (95 % CI 0.78, 0.85). Rates of depression were similar among African-American and Caucasian high-utilizing Veterans (95 % CI 1.03, 1.06).

As seen in Table 2, for many conditions, racial differences persisted, but were attenuated in partially adjusted models (controlling for age and sex) and fully adjusted models (controlling for all covariates: age, sex, history of homeless, marital support, and insurance status). The largest differences occurred between the unadjusted and fully adjusted models. For example, as noted above, African-American high-utilizing Veterans were five times as likely to have a diagnosis of HIV/AIDS, but were only four times as likely to have such a diagnosis after adjusting for all covariates (95 % CI 3.82, 4.33). Similarly, relative risks for alcohol/drug disorders were significantly lower in adjusted models (95 % CI for the fully adjusted model 1.30, 1.36). However, for some conditions,

**Table 2** Relative risks of select chronic conditions among African-American high-utilizing Veterans receiving Veterans Affairs Healthcare System (VA) care in fiscal year 2010

	Unadjusted RR (95 % CI)	Partially adjusted RR <sup>a</sup> (95 % CI)	Fully adjusted RR <sup>b</sup> (95 % CI)	Overall prevalence (%)
<b>Medical conditions</b>				
≥1 Medical condition	1.00 (1.00, 1.00)	1.01 (1.00, 1.01)	1.01 (1.01, 1.01)	93
Acid-related disorder	0.81 (0.79, 0.83)	0.80 (0.78, 0.82)	0.80 (0.78, 0.82)	18
Cancer	0.88 (0.87, 0.90)	0.97 (0.95, 0.99)	1.05 (1.03, 1.07)	25
Chronic obstructive pulmonary disease	0.55 (0.53, 0.56)	0.57 (0.56, 0.59)	0.59 (0.57, 0.60)	20
Chronic renal failure	1.53 (1.50, 1.56)	1.83 (1.79, 1.87)	1.92 (1.89, 1.96)	14
Diabetes	1.06 (1.04, 1.07)	1.11 (1.09, 1.12)	1.18 (1.17, 1.20)	34
Heart failure	0.86 (0.84, 0.89)	1.01 (0.98, 1.04)	1.09 (1.06, 1.12)	13
Hepatitis C	2.38 (2.32, 2.44)	1.89 (1.85, 1.94)	1.72 (1.67, 1.77)	8
HIV/AIDS	5.17 (4.86, 5.50)	4.22 (3.98, 4.47)	4.07 (3.82, 4.33)	2
Hypertension	1.10 (1.09, 1.11)	1.16 (1.15, 1.17)	1.15 (1.15, 1.16)	64
Ischemic heart disease	0.58 (0.57, 0.59)	0.61 (0.59, 0.62)	0.69 (0.68, 0.71)	27
Low back pain	1.00 (0.98, 1.02)	0.92 (0.90, 0.94)	0.88 (0.86, 0.89)	21
Peripheral vascular disease	0.66 (0.64, 0.68)	0.73 (0.71, 0.76)	0.79 (0.77, 0.82)	10
Stroke	1.14 (1.10, 1.17)	1.29 (1.24, 1.33)	1.37 (1.32, 1.41)	8
Thyroid disorder	0.51 (0.49, 0.53)	0.53 (0.51, 0.55)	0.56 (0.53, 0.58)	8
Vision disorder	1.14 (1.11, 1.18)	1.16 (1.13, 1.20)	1.14 (1.11, 1.17)	9
<b>Mental health conditions</b>				
≥1 Mental health condition	1.21 (1.19, 1.22)	1.06 (1.05, 1.06)	0.95 (0.93, 0.96)	47
Alcohol/drug disorder	1.92 (1.89, 1.95)	1.51 (1.49, 1.52)	1.33 (1.30, 1.36)	20
Bipolar disorder	0.82 (0.78, 0.85)	0.67 (0.65, 0.70)	0.51 (0.48, 0.53)	6
Depression	1.05 (1.03, 1.06)	0.93 (0.91, 0.94)	0.79 (0.77, 0.80)	29
Post-traumatic stress disorder	1.13 (1.10, 1.15)	0.96 (0.94, 0.98)	0.92 (0.90, 0.94)	17
Schizophrenia	2.01 (1.94, 2.07)	1.71 (1.66, 1.77)	1.57 (1.52, 1.63)	6
≥1 Medical and ≥1 mental health condition	1.20 (1.19, 1.21)	1.06 (1.05, 1.07)	0.98 (0.96, 0.99)	44

RR relative risk, CI confidence interval

<sup>a</sup> Partially adjusted RR represents the relative risk for African-American high-utilizing Veterans in reference to Caucasian high-utilizing Veterans adjusted for age and sex

<sup>b</sup> Fully adjusted RR represents the relative risk for African-American high-utilizing Veterans in reference to Caucasian high-utilizing Veterans adjusted for age, sex, history of homeless, marital support, and insurance status

including chronic renal disease and stroke, the racial disparities were larger in adjusted models (see Table 2). For other conditions, the racial disparities switched directions in adjusted models. For example, African-American high-utilizing Veterans were more likely than their Caucasian counterparts to have a depression diagnosis in the unadjusted model, but were less likely to have a depression diagnosis in partially or fully adjusted models (95 % CI for the fully adjusted model 0.77, 0.80).

## Discussion

African-Americans are overrepresented among high-utilizing patients in the VA healthcare system and nationally [21, 38]. In the VA, African-American Veterans make up 21 % of the high-utilizing population, but only between 9 and 14 % of the

remaining population [5, 40]. This disparity indicates that intensive management programs designed to improve care and reduce costs for high-utilizing Veterans could reduce racial disparities by addressing the specific needs of African-Americans. The results of this study suggest that, while total chronic condition prevalence is similar between African-American and Caucasian high-utilizing Veterans, African-Americans in this population may need more social services and support, as well as targeted interventions for specific medical and mental health conditions.

The fact that the mean number of chronic conditions did not differ between African-American and Caucasian high-utilizing Veterans is a novel finding that contrasts with previous observations in the general population. For example, analyses of the Health and Retirement Study, a longitudinal, nationally representative study of older adults, suggest that



African-Americans have a greater number of chronic conditions than Caucasians both cross-sectionally and longitudinally [29]. With regards to prevalence patterns for specific conditions, some patterns (e.g., chronic renal failure) were similar to those found in studies within non-high-utilizing Veteran populations [23]. Other prevalence patterns differed in our sample as compared to the general population. For example, heart disease and heart failure are generally more prevalent among African-American patients [41, 42], but were observed at lower or similar rates to Caucasians among African-Americans in this sample of high-utilizers.

One possible explanation for the lack of differences in chronic condition prevalence is the study's focus on high-utilizing patients. These patients frequently interact with the healthcare system and may be more likely to receive diagnoses of and treatments for risk factors that could prevent conditions like heart disease and heart failure. In addition, the VA provides patients with access to affordable healthcare and social services. Therefore, in contrast to the civilian African-American population, African-American Veterans have greater access to services that may prevent the development and progression of some chronic conditions. At the same time, there is strong evidence of some racial disparities in chronic condition prevalence and treatment among Veterans served by the VA [26, 43].

Not all racial differences in this sample were surprising. As in past research, African-Americans had higher rates of chronic renal failure and HIV/AIDS [26] and lower rates of COPD [44]. In addition, the data replicate previous findings regarding serious mental illness in Veteran and civilian populations [45, 46]. When compared to Caucasian high-utilizing Veterans, African-American high-utilizing Veterans were almost twice as likely to have a diagnosis of schizophrenia and almost half as likely to have a diagnosis of bipolar disorder. The existing literature suggests that such findings are not due to true differences in prevalence. Rather, the results are more likely due to implicit bias during in-person evaluations (e.g., clinicians may overvalue psychotic symptoms that are more common among African-Americans [46]). Future research is needed on how to best address racial bias in the diagnosis and treatment of mental health disorders.

As hypothesized, African-American high-utilizing Veterans were less likely to have housing, non-VA insurance, or marital support than their Caucasian peers. Lacking this type of social and financial support is associated with a number of negative outcomes, including increased stress and greater morbidity and mortality risks [47]. Indeed, sociodemographic characteristics did appear to underlie some of the racial differences observed in chronic condition rates among this sample of high-utilizing Veterans. For example, while African-American high-utilizing Veterans were more likely to have one or more mental health conditions and co-occurring medical and mental health conditions, these findings were

attenuated after adjusting for sociodemographic factors. Similarly, prevalence differences for several conditions were also attenuated in adjusted models. As such, some of the same socioeconomic disparities that drive racial differences in the general population may affect high-utilizing Veterans.

The fact that many disparities persist despite the services available to Veterans highlights the fact that social and environmental issues should be targets for second- and third-generation studies that attempt to understand and reduce racial disparities among high-utilizing patients. Differences among unadjusted and adjusted models suggest that this may be especially important for certain conditions, including alcohol/drug disorders and infectious diseases. This is of paramount importance for VA programs given that the lower rates of non-VA insurance among high-utilizing African-American Veterans may indicate a greater reliance on VA healthcare among African-Americans. At the same time, it is not immediately clear why disparities in some conditions increased in adjusted models, and future first- and second-generation studies are needed to elucidate other factors driving racial differences in this population.

Future research should also assess potential differences in costs of care among racial/ethnic groups. It is not immediately clear why total costs were higher among African-American high-utilizing Veterans compared to those among Caucasian high-utilizing Veterans. Condition-specific analyses of cost data are outside the scope of this paper, but it is possible that the difference is due to more costly conditions being more prevalent among African-American high-utilizing Veterans. It is also possible that because they are less likely to have non-VA insurance and more likely to have a history of homelessness, caring for African-American high-utilizing Veterans with any condition is more expensive than caring for similar Caucasian patients. Future second-generation studies, which determine whether racial differences in costs are driven by specific conditions (e.g., schizophrenia) or circumstances (e.g., homelessness/insurance status), can provide important information that will help researchers and clinicians better target health disparities as well as improve health equity, health outcomes, and healthcare costs.

Peer support interventions are another possible target of second- and third-generation studies as they could provide social support and help high-utilizing African-American Veterans obtain housing and other social services. At least one study has shown that a group intensive peer support program for homeless Veterans, many of whom had multimorbid medical and mental health conditions, resulted in higher ratings of social integration and faster rates of housing voucher acquisition [48]. Peer support programs are also associated with improved medical and mental health outcomes among African-American Veterans and civilians (e.g., diabetes [49, 50] or depression [51]). An additional potential target for second- and third-generation studies is mobile technology. A

recent pilot study, based on work in civilian populations, suggests that text-message appointment reminders can be used to increase homeless Veterans' attendance at medical visits and reduce overall healthcare costs [52]. However, in order to truly tailor care, additional research is needed on the efficacy and effectiveness of such programs for the conditions most prevalent among African-American high-utilizing Veterans. In addition, future work is needed to compare the needs of high-utilizing Veterans to the needs of the general Veteran population.

We found that almost half of African-American high-utilizing Veterans had at least one medical and mental health disorder. This pattern of multimorbidity and the common conditions among these patients (e.g., chronic renal failure, schizophrenia, HIV/AIDS) points to the need for increased care coordination among medical and mental health specialties. Such programs for multimorbid patients represent a crucial area of future research as most current programs integrate general mental health into primary as opposed to specialty care [53]. Some social services and condition-specific interventions already exist within the VA (e.g., programs for serious mental illness [54] or HIV/depression [55]), and integrating such programs with interventions for high-risk, high-utilizing Veterans could reduce racial disparities and improve overall care.

This work has several limitations. Veterans have different risk factors (e.g., exposure to Agent Orange) and access to a number of resources (e.g., comprehensive mental healthcare) that other complex, vulnerable populations often lack. The implementation of the Affordable Care Act may ameliorate many of these differences. However, our focus on VA patients reduces generalizability to high-utilizing patients in other settings. Other limitations include the fact that this report characterizes African-American and Caucasian high-utilizing Veterans using data from a single year and cannot be used to draw conclusions regarding causes of racial disparities or to interpret the needs of other racial/ethnic groups. Furthermore, use of data from a single year may have biased results for disorders that tend to be under-coded, such as dementia [56]; however, high-utilizing patients have frequent encounters with the healthcare system, leading to a lower likelihood of under-coded diagnoses. In addition, despite the low rates of missing data in this study, race data from VA administrative files is not always accurate. Finally, our analyses were exploratory and therefore prone to type I error.

Nevertheless, our study highlights a number of differences between African-American and Caucasian high-utilizing patients in the VA healthcare system and can inform the development of programs that address the needs of African-Americans in this population. African-American high-utilizing Veterans were younger, had lower levels of marital support, had lower rates of non-VA insurance, and had less housing stability than their Caucasian counterparts. Although

they had a similar number of chronic conditions, African-American high-utilizing Veterans had higher rates of certain complex infectious diseases and serious mental illnesses. Integrating specialty medical and mental healthcare and incorporating peer support into programs for high-utilizing patients may help address disparities among this high-risk and vulnerable population.

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**Conflict of Interest** JYB, CPC, and DMZ declare that they have no conflicts of interest.

**Human Subjects** No animal or human studies were carried out by the authors for this article. This research used a deidentified operations data set and was conducted under a designation of non-research by the Stanford University Institutional Review Board.

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