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**Objective:** To examine the relationships between resiliency, sociodemographic factors, and allostatic load among male Veterans.

**Design/Study Participants:** Cross-sectional study with minority (African American or Hispanic) and non-minority (White) male Veterans undergoing prostate biopsy.

**Setting:** Veterans Affairs Medical Center located in Charleston, SC.

**Main Outcome Measures:** Self-reported resilience measured using the two item subscale from the Connor-Davidson Resiliency Scale and allostatic load determined from biomarkers measured in blood.

**Results:** In this small sample, bounce-back resilience and allostatic load level had a significant negative correlation, while adaptation resilience and allostatic load were slightly correlated, but the association was not statistically significant. Sixty-six percent of participants reported that they were able to adapt and 40% reported they were able to bounce back. Higher income and lower PSA level were significantly correlated with greater adaptation resilience. Minority men were significantly more likely than non-minority men to report that they are able to bounce back. Married men were also significantly more likely than unmarried men to report that they were able to bounce back.

**Conclusion:** It may be important to target resiliency training programs to Veterans based on their social determinants and to examine the effects of these programs on allostatic load. *Ethn Dis.* 2020;30(Suppl 1):177-184; doi:10.18865/ed.30.S1.177

**Keywords:** Resiliency; Sociodemographics; Allostatic Load; Male Veterans

## INTRODUCTION

For the past two decades, considerable efforts have been made to reduce racial and ethnic disparities in health care and outcomes. A large majority of this work has focused on characterizing and documenting the ways in which racial/ethnic minorities differ from Whites with respect to health care and outcomes and using this information to develop individual, community, and system-based interventions and policies that address multilevel risk factors.<sup>1</sup> Data from national and regional surveys demonstrate that progress has been made to improve health care outcomes in racial/ethnic minority groups, but disparities continue to exist, especially in subgroups of individuals.<sup>2</sup> For instance, the life expectancy for minority men continues to be significantly lower compared with White men.<sup>3</sup> For this

reason, new models and approaches need to be developed, especially as efforts are being made to address racial and ethnic disparities in health care and outcomes using precision medicine strategies that are personalized or tailored to social determinants and other factors to promote health promotion and disease prevention behaviors.<sup>4</sup> Topel and colleagues, for instance, are identifying multilevel determinants of resilience among African Americans within the context of cardiovascular disease prevention.<sup>5,6</sup>

Previous efforts have emphasized the importance of drawing attention to the assets that individuals and communities have for health promotion and disease prevention.<sup>7</sup> Just as communities have assets, individuals from racial/ethnic minority groups are likely to have developed resilience in response to exposure to adverse social and economic conditions and other circumstances that gener-

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ate stress. Increasingly, attention is being given to community and individual resiliency as a framework for addressing racial/ethnic disparities in health care and outcomes. Resilience is defined as the extent to which individuals are able to adapt and/or bounce back from adverse events or circumstances.<sup>8</sup> Resilience has been linked to racial/ethnic background, socioeconomic factors, and levels of social support.<sup>9</sup> In particular, racial differences in resilience

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*...we examined the extent to which the ability to adapt or bounce back from adversity was associated with sociodemographic factors, clinical variables, and allostatic load.*

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have been inferred from variations in mental health outcomes between African Americans and Whites and the greater adverse effects of factors such as low education on health outcomes among Whites relative to African Americans.<sup>10</sup> However, it is important to measure racial differences in resiliency directly using specific measures of this construct, especially in samples who are experiencing a stressful health event.

In this study, we examined resiliency among men undergoing a

health-related stressor: a prostate biopsy as part of active surveillance for a previous prostate cancer diagnosis, a rising PSA, or a positive digital rectal examination in the Veterans Affairs health care system. In addition to characterizing resiliency among these men, we examined the extent to which the ability to adapt or bounce back from adversity was associated with sociodemographic factors, clinical variables, and allostatic load. Allostatic load is an indicator of biological risk that is based on physiological biomarkers such as those for metabolic (HbA1c glucose levels) and autonomic (systolic and diastolic blood pressure) functioning,<sup>11</sup> which are also implicated in chronic diseases that are leading causes of morbidity and mortality among minority men. Allostatic load has been used as a unifying framework to understand which physiological processes affect health outcomes<sup>12-16</sup> and has also been examined as a mechanism of racial disparities in health outcomes.<sup>17-19</sup> Allostatic load represents the physiological consequences of efforts to manage and/or cope with stress and stressors.<sup>20</sup> Resilience has been described as successful allostasis<sup>21</sup>; for this reason, it is expected that individuals who have greater resilience should be at lower risk for high allostatic load.<sup>16</sup> To our knowledge, however, the association between resilience and allostatic load has not been examined in previous studies. Evaluating the relationship between allostatic load and resilience will provide important insights about the physiological risk associated with men's efforts to adapt or bounce back from stressful situations.

## MATERIALS AND METHODS

### Study Participants

Participants in this study were men undergoing a prostate biopsy because of a rising prostate specific antigen (PSA) level, an abnormal digital rectal examination (DRE), or as part of active surveillance for low-risk prostate cancer. Men were recruited from the Urology Clinic at the Ralph H. Johnson Veteran's Affairs Medical Center (RHJ VAMC) and completed a social determinants survey that was developed to measure social determinants of health and resiliency and sociodemographic characteristics among participants in studies that were being conducted as part of the Medical University of South Carolina's Transdisciplinary Collaborative Center in Precision Medicine and Minority Men's Health.<sup>22</sup> This study is based on the 47 patients who completed the social determinants study.

### Procedures

This study was approved by the institutional review boards at the RHJ VAMC and the Medical University of South Carolina (MUSC). Patients were invited to participate in the study by their urologist before obtaining a prostate biopsy at the RHJ VAMC. The study was described as a project that was being conducted to understand health behaviors and outcomes among men. Those who were interested in participating in the study met with a research coordinator to answer questions about the procedures involved in participation and to obtain written informed consent. Following provision of written informed consent, vital statistics and a blood

sample were collected by a trained clinical research coordinator using standard clinical procedures. Vital statistics included systolic and diastolic blood pressure, height and weight, waist-hip-ratio, and heart rate. From the 20 mL blood sample that was collected in purple and red top tubes, total cholesterol, HbA1C, C-reactive protein, creatinine, albumin, and serum dihydroepiandrosterone sulfate (DHEA-S) (a functional HPA axis antagonist) levels were determined in a CLIA-certified clinical lab. Blood samples were immediately processed for total cholesterol, HbA1c, creatinine, and albumin and stored at -20° for transport to MUSC research laboratory services for analyses of other biomarkers. Information on race and ethnicity, age, co-morbidities (hypertension, diabetes, heart problems, high cholesterol), prostate cancer variables (PSA, number of positive biopsy cores), and service era (Vietnam, Post-Vietnam, Persian Gulf War) were abstracted from the electronic health record. Participants were given a social determinants survey to complete at home and those who returned the completed social determinants survey were mailed a \$15 gift card.

### Measures

Race/ethnicity, age, co-morbidity status, and prostate cancer prognostic factors were abstracted from the patient's electronic medical record. We created a binary variable for race/ethnicity (minority for African American and Hispanic men and non-minority for White men) because of the small number of men who reported that their racial background was Hispanic. Participants were categorized as

having at least one co-morbidity or not having any co-morbidity based on documentation in the electronic health record of hypertension (yes or no), diabetes (yes or no), heart problems (yes or no), stroke (yes or no), or high cholesterol (yes or no). Specifically, men who had at least one of these conditions were categorized as having a co-morbidity and those who did not have any of these conditions were categorized as not having any co-morbidities. Prostate cancer prognostic factors (PSA, number of positive cores) were abstracted from electronic health records.

Allostatic load was determined based on data for 11 physical and physiological biomarkers (systolic blood pressure, diastolic blood pressure, heart rate, BMI, HBA1C, DHEA-S, total cholesterol, waist-hip-ratio, c-reactive protein, albumin, creatinine) as described by Seeman and colleagues.<sup>23</sup> As in previous reports,<sup>24</sup> the distribution of values for each of these biomarkers was examined in our sample to identify values that were in the highest risk quartile (lowest level for DHEA-S). Since the average values for many of these biomarkers were above normal ranges in our sample, values that were at or above the 75th quartile (25th quartile for DHEA-S) were categorized as being high risk and assigned a value of "1" to create a binary variable for each measure. All biomarkers were equally rated and the binary variables for each measure were summed to create an allostatic load score so that higher scores reflected greater physiological risk. Scores for allostatic load ranged from 0 to 8.

We used the two item sub-scale

from the Connor-Davidson Resiliency Scale to measure resiliency,<sup>25</sup> which asks participants to indicate the extent to which they are able to adapt to changes and bounce back after experiencing a hardship, illness, or injury. The two-item sub-scale has been validated in clinical samples<sup>26</sup> and is highly correlated with scores from the original 25-item scale and had good internal consistency (.81 in our sample). Since the relationship between resilience and allostatic load has not been evaluated in prior studies, and being able to adapt and bounce back are important characteristics of resilient individuals, we examined these items separately to determine if allostatic load had different associations with these two aspects of resiliency. We re-coded these items into dichotomous variables based on the distribution of responses and conceptual relevance to facilitate the analysis. Specifically, adaptation was recoded as often true/true nearly all the time vs not at all/rarely/sometimes true and being able to bounce back from injury, illness, or hardship was recoded as true nearly all the time versus not at all/rarely/sometimes/often true.

### Data Analysis

Because the sample consisted of 47 men, our analyses were primarily descriptive. First, we generated descriptive statistics to characterize the study sample in terms of race/ethnicity, age, prostate cancer variables, chronic disease status, and resiliency. We then conducted bivariate analyses consisting of chi square tests of association and t-tests to examine the association between resiliency variables and racial background, prostate cancer variables, co-morbidity, and allostatic load.

## RESULTS

Table 1 shows the characteristics of the study sample. Fifty-five percent were African American/Hispanic and 45% were White. In addition, 55% were married, 57% had at least some college education, 61% were employed, and 44% had an annual income that was  $\geq$ \$35,000. The average (SD) age of participants was 65.1 (6.8) and 57% were Vietnam Veterans. With respect to prostate cancer variables, the mean (SD) PSA and number of positive cores was 8.4 (5.8) and 2.8 (2.9), respectively. The mean (SD) allostatic load score was 2.71 (1.5).

Overall, 66% of participants reported that they were able to adapt when changes occur. Table 2 shows the bivariate analysis of being able to adapt. Of the sociodemographic factors, only income level was associated significantly with being able to adapt.

Men who had incomes  $>$ \$35,000 were significantly more likely than those with lower incomes to report that they are able to adapt (chi square=4.42,  $P=.04$ ). Of the prostate cancer variables, PSA was associated significantly with being able to adapt when changes occur. The mean PSA was significantly lower among men who reported that they were able to adapt compared with those who reported less resilience. There were non-significant differences in being able to adapt between men who had at least some college education compared with those with fewer years of formal education. There were also small differences in allostatic load between men who reported that they were able to adapt (Mean=3.0, SD=1.6) and those who had less resilience (Mean=2.2, SD=1.3) ( $t=-1.59$ ,  $P=0.12$ ).

Forty percent of participants reported that they can bounce back

after illness, injury, or hardship. As shown in Table 2, African American/Hispanic men (54%) were significantly more likely than White men (24%) to report that they can bounce back (chi square=4.35,  $P=.04$ ). Men who were married were also significantly more likely than unmarried men to report that they were able to bounce back following illness, injury, or hardship. As with being able to adapt, there were non-significant differences in being able to bounce back between men who had at least some college education and those who had fewer years of formal education. Lastly, mean levels for allostatic load were significantly higher between men who reported that they were able to bounce back (Mean=3.3, SD=1.3) and those who reported less resilience (Mean=2.3, 1.6) ( $t=-2.36$ ,  $P=.02$ ).

## DISCUSSION

To our knowledge, this is the first report to characterize resiliency in a racially diverse sample of Veterans who were experiencing a stressful health event based on their allostatic load and sociodemographic characteristics. Resilience is a multidimensional construct that reflects the extent to which individuals are able to thrive when facing adversity.<sup>25</sup> Resilience can be conceptualized as a trait, process, or outcome that can exist along a continuum<sup>27</sup>; previous reports have described conceptual distinctions between one's ability to bounce back or return to a pre-defined level of functioning and the extent to which an individual demonstrates resilience by adapting or

**Table 1. Sample characteristics, N=47<sup>a</sup>**

Variable	Level	n (%)
Race/ethnicity	Minority (African American/Hispanic)	26 (55%)
	Non-minority (White)	21 (45%)
Marital status	Married	23 (55%)
	Not married	19 (45%)
Education level	$\geq$ Some college	26 (57%)
	$\leq$ High school graduate	20 (43%)
Employment status	Employed	27 (61%)
	Not employed	17 (39%)
Income level	$>$ \$35,000	16 (44%)
	$<$ \$35,000	20 (56%)
Service era	Vietnam	27 (57%)
	Other	20 (43%)
Chronic disease status	Yes	38 (81%)
	No	9 (19%)
Age	Mean (SD)	65.1 (6.8)
PSA	Mean (SD)	8.4 (5.8)
Number of positive cores	Mean (SD)	2.8 (2.9)
Allostatic load	Mean (SD)	2.71 (1.5)

a. n may not equal 47 because of missing data.

**Table 2. Bivariate analysis of resiliency**

Variable	Level	Adaptation % Resilient	Chi Square	Bounce Back % Resilient	Chi Square
Race/Ethnicity	Minority	62%	.51	54%	4.35 <sup>a</sup>
	Non-minority	71%		24%	
Marital status	Married	61%	.02	56%	5.43 <sup>a</sup>
	Not married	63%		21%	
Education level	≥ Some college	77%	3.61 <sup>b</sup>	50%	2.97 <sup>b</sup>
	≤ High school	50%		25%	
Employment status	Employed	64%	.02	50%	1.12
	Not employed	67%		33%	
Income level	>\$35,000	88%	4.42 <sup>a</sup>	56%	1.62
	<\$35,000	55%		35%	
Service era	Vietnam	59%	1.27	33%	1.32
	Other	75%		50%	
Chronic disease	Yes	63%	.69	37%	1.06
	No	78%		56%	

  

	Resilient M (SD)	Not Resilient M (SD)	T-Value	Resilient M (SD)	Not Resilient M (SD)	T-Value
Age	64.2 (7.3)	66.9 (5.5)	1.32	64.4 (8.2)	65.6 (5.8)	.55
PSA	6.5 (2.7)	12.1 (8.2)	2.68 <sup>a</sup>	9.2 (6.9)	7.9 (5.0)	-.79
Number of positive cores	2.4 (3.1)	2.4 (2.6)	.04	3.3 (3.5)	1.7 (2.3)	-1.66
Allostatic load	3.0 (1.6)	2.2 (1.3)	-1.59	3.3 (1.3)	2.3 (1.6)	-2.36 <sup>a</sup>

a. P&lt;.05.

b. P&lt;.10.

M, Mean; SD, standard deviation

changing in response to adversity.<sup>28</sup> We examined these dimensions of resiliency and found that the majority of men reported that they were able to adapt when changes occur and a substantial percentage of men (40%) indicated they were able to bounce back after injury, illness, or hardship. These findings suggest that it may be easier for men to adapt to changing circumstances but less equipped to bounce back from stressful or challenging situations. As in the study conducted by Pietrzak and Cook,<sup>29</sup> men in the present study who had incomes >\$35,000 were more likely than those with lower incomes to report that they can adapt. Results from the National Health and Resilience Study in Veterans also demonstrated that men who were married, White,

and had a college degree were likely to be categorized as being resilient.<sup>29</sup> Similarly, men in our study who had at least some college education were more likely than men with fewer years of formal education to report that they could adapt when changes occur and bounce back following injury, illness, or hardship. But, only marital status and race/ethnicity were associated significantly with being able to bounce back among our study participants. Fifty-four percent of African American/Hispanic men in our study reported that they could bounce back from an injury, illness, or hardship compared with 24% of White men. This may be because African American and Hispanic men are more likely than White men to have experienced these events. African American men,

for instance are significantly more likely than White men to have experienced chronic medical conditions,<sup>30,31</sup> socioeconomic stressors, and be a victim of gun violence.<sup>32-34</sup>

Our findings raise important questions about the physiological risks associated with the efforts that male Veterans may use to adapt when changes occur and bounce back from injury, illness, and other hardships. According to previous reports, men who have greater resilience (eg, are able to adapt or bounce back),<sup>16</sup> should have lower risk for allostatic load. However, we found that allostatic load was significantly higher among men who reported that they were able to bounce back compared with those who were less resilient. A similar trend was found in terms of



the mean differences in allostatic load between men who reported that they are able to adapt when changes occur compared with those who were less able to do so. Resiliency is linked to the efforts that individuals use to cope with stressful situations. Among Veterans, resilience was associated with using coping strategies such as humor and less use of dysfunctional coping strategies (eg, self-blame). Other work has shown that problem-focused coping is associated with greater resilience whereas emotion-focused coping is associated with lower resili-

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ience in a community-based sample of Spanish adults.<sup>35</sup> Active duty service members and Veterans may use a number of different problem- (eg, active coping, planning) and emotion-focused (eg, acceptance, positive reframing, religion) strategies to cope with stressful events and situations. In research based on the Jackson Heart Study, African American men had higher allostatic load compared with

women, but allostatic load scores were only associated with disengagement coping among women.<sup>36</sup> Thus, future research should examine the direct and interactive effects between allostatic load, coping efforts, and resilience in larger samples of men, especially those who are Veterans.

In considering the results of this study, several limitations should be noted. First, we conducted a cross-sectional study of 47 Veterans from one VAMC who were undergoing a prostate biopsy. This study design does not allow us to determine causality with respect to resiliency and allostatic load. There may be differences in the association between resilience and allostatic load among men who are not experiencing an acute health-related stressor. Thus, prospective studies that compare resilience and allostatic load between Veterans who are experiencing a specific health-related stressor to those who are not experiencing a stressful diagnostic procedure should be conducted. Further, Veterans may be better able to adapt to changing circumstances because of their military experiences and other lifetime events. Men who have served in the military experience multiple situations (eg, routine rotations of work assignments and locations, deployment with or without family) that cannot be changed; acceptance was among the most used coping strategies among active duty service members and Veterans.<sup>37</sup> Veterans in previous research who had a longer time in service reported significantly higher levels of resilience compared with those with fewer years in the military.<sup>37</sup> Pietrzak and Cook also found that psychological resilience

was associated with experiencing a high number of traumas during one's lifetime among older Veterans.<sup>29</sup> Prospective studies that use longitudinal designs are needed in larger samples of VAMC and non-VAMC clinical settings to examine the causal relationship between allostatic load and resiliency. Future studies should also examine the association between resiliency and allostatic load in community-based samples of minority and non-minority men who are receiving medical care for other types of disease (eg, cardiovascular disease, diabetes). Lastly, while we used items from a validated resiliency instrument, it may be important to examine resiliency using more robust measures of this construct. Along with more robust measures of resiliency, it is also important to assess coping efforts to examine the extent to which these strategies mediate the relationship between resiliency and allostatic load.

## CONCLUSIONS

Our findings demonstrate that while most men reported that they were able to adapt when changes occur, additional support may be needed to enhance their ability to bounce back following injury, illness, or hardship. Resiliency training programs have been developed for military service members, college and medical students, health care professionals, patients who have acute medical conditions, and caregivers.<sup>38</sup> A recent systematic review and meta-analysis of resiliency training programs demonstrated that these programs have beneficial effects, especially those that

are based on mindfulness training and cognitive behavioral therapy.<sup>39</sup> Our findings provide insight on the characteristics of Veterans who may benefit from resiliency training. Unlike resilience training programs that target groups based on their occupation or medical condition, our findings suggest that it may be important to target these programs to Veterans based on their social determinants of health (SDOH) such as education, income, and racial/ethnic background. It may be important for resiliency training programs that are targeted to Veterans based on their SDOH to emphasize strategies and help men to identify resources that can help them to bounce back following injury, illness, or hardship. Lastly, the effects of resiliency training on allostatic load should also be examined.

#### ACKNOWLEDGEMENTS

This study was supported by National Institute of Minority Health and Health Disparities grant #U54MD010706. We are very appreciative to Tamara Dobson-Brown for assistance with data collection and management. We would like to thank the men who participated in this study.

#### AUTHOR CONTRIBUTIONS

Research concept and design: Hughes Halbert, Ambrose, Savage; Acquisition of data: Hughes Halbert, Jefferson, Ambrose, Caulder, Savage; Data analysis and interpretation: Hughes Halbert, Ambrose, Savage; Manuscript draft: Hughes Halbert, Jefferson, Ambrose; Acquisition of funding: Hughes Halbert; Administrative: Hughes Halbert, Jefferson, Caulder, Savage; Supervision: Hughes Halbert, Ambrose

#### CONFLICT OF INTEREST

No conflicts of interest to report.

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