Preventive Medicine Reports 15 (2019) 100948

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Does marriage matter? Racial differences in allostatic load among women

Courtney S. Thomas Tobin*, Millicent N. Robinson, Kiara Stanifer

Department of Community Health Sciences, Jonathan and Karin Fielding School of Public Health, University of California (UCLA), United States of America

ARTICLE INFO

Keywords:
Marriage, allostatic load
Racial disparities
women's health

ABSTRACT

Prior research suggests that there are health benefits associated with marriage, although the physiological implications of marital status for women's health is less clear. Given that recent trends indicate that Black women are less likely to marry than White women, the goal of this study was to evaluate whether marital status accounts for racial differences in women's physical health. Using data from the Nashville Stress and Health Study (2011–2014), we estimated the probability of high allostatic load (AL), a biological indicator of physiological dysregulation, among women aged 18–69. We examined AL scores by race and marital status, evaluated the extent to which Black-White differences persisted after accounting for marital status, and assessed whether the racial disparity in AL varied across marital status groups. Results indicated that Black women had higher AL than White women, although racial differences in AL were not explained by marital status. In addition, marital status was a significant predictor of AL among Black, but not White women. Moreover, the racial disparity in AL was smallest among never married women and largest among currently and formally married women. Taken together, these findings suggest that Black-White inequalities in women's physical health are not explained by racial differences in marital status, despite the widening racial gap in marriage. Nevertheless, marital status may be an influential factor in shaping outcomes among Black women.

1. Introduction

Despite longer life expectancy than men, women in the United States continue to have higher rates of physical morbidity, suggesting that they live longer but sicker lives than their male counterparts (National Center for Health Statistics, 2012). Recent reports indicate that women experience more comorbid chronic conditions, sick days, and hospital visits than men, excluding reproduction-related care (Buttorff et al., 2017; Raghupathi and Raghupathi, 2018). Furthermore, a substantial body of evidence documents stark racial disparities among women, such that Black women experience poorer physical health outcomes (e.g., diabetes, hypertension, obesity, maternal and infant mortality) than White women (Wilson et al., 2017). Previous research often emphasized socioeconomic differences as a primary explanation for these patterns (Wilson et al., 2017). However, more recent studies indicate racial inequalities persist across SES levels and are most pronounced among high-SES women (Farmer and Ferraro, 2005; Geronimus et al., 2006; Thomas, 2015; Upchurch et al., 2015). Such findings highlight the complexities of racial disparities and underscore the need to disentangle these mechanisms to better understand how health inequalities develop among women.

Population health research has identified an array of structural, psychosocial, and biological factors that contribute to women's physical health risk (Upchurch et al., 2015). Nevertheless, the specific mechanisms undergirding racial inequalities among this population are less clear. Historically, methods for examining women's health within population research have been limited, as many studies would simply control for gender differences without evaluating group-specific health patterns (Chyu and Upchurch, 2011). This approach poses a unique challenge to health disparities research as it fails to recognize the distinct health risks that women and men encounter (Goldman et al., 2004). At the same time, women's health studies have often neglected the role of race in shaping outcomes and contributing to distinct health risks for Black and White women (Geronimus et al., 2006; Geronimus, 1992). To gain a more comprehensive understanding of these inequalities, research that considers the independent and joint impact of race and gender on women's health is needed.

Prior research suggests that women and other marginalized groups (e.g. Black Americans, low SES individuals) face greater risk of exposure to the chronic, ongoing stress associated with living in a gendered and racialized society (Hargrove, 2018). As a result, Black women may be more likely than other groups to engage in persistent, high-effort coping that produces wear and tear on the body and ultimately leads to poor physical health outcomes (Geronimus et al.,

* Corresponding author.
E-mail address: courtneysthomas@ucla.edu (C.S. Thomas Tobin).

https://doi.org/10.1016/j.pmedr.2019.100948
Received 24 February 2019; Received in revised form 7 June 2019; Accepted 4 July 2019
Available online 19 July 2019

2010).These processes are captured within the composite measure of AL, which draws on an array of biomarkers to assess the body's physiological response to stress (McEwen and Seeman, 1999).

AL is particularly suited for the study of racial health disparities among women because it captures the effects of cumulative adversity (Green and Darity, 2010), which may be linked to the early onset of chronic conditions among Black women (Geronimus et al., 2010). With its multi-system approach, AL also effectively measures pre-clinical and comorbid health issues and provides a more comprehensive assessment of physical health status compared to single-indicator health outcomes (McEwen and Seeman, 1999). Evidence shows that Black women have higher AL scores than White women across the life course, and recent studies have examined the social and psychological factors that might account for these patterns (Geronimus et al., 2006; Chyu and Upchurch, 2011). For instance, Geronimus and colleagues (Geronimus et al., 2006) found that non-poor Black women reported higher AL scores than poor White women, suggesting that other, non-socioeconomic factors, may account for Black women's elevated risk of physiological dysregulation. In the present study, we evaluate the role of marital status as a social factor that may explain racial differences in AL among women.

1.1. Race, marital status, and allostatic load

A substantial body of evidence has linked social relationships to physical health status (Umberson and Montez, 2010). In particular, prior research underscores the health significance of marriage, outlining numerous behavioral, psychosocial, and physiological factors that may explain the association. For example, some have emphasized its role as both a salient source of social support and stress (Tumin, 2017; Kiecolt-Glaser et al., 2018), while others have pointed to marital status differences in mood, coping strategies, and health behaviors as potential explanations (Umberson and Montez, 2010). Despite a general consensus among scholars about the significant link between marriage and health, less is known about the specific ways in which marital status may shape physical health risks among women (Robles and Kiecolt-Glaser, 2003; Koball et al., 2010). Studies suggest a health benefit associated with marriage, with lower mortality rates among married women compared to unmarried, widowed, and divorced women (Koball et al., 2010). Prior research also posits that marital status may be especially salient for women, given the social centrality of marriage, persistence of traditional gender roles, and contemporary societal expectations that women should marry (Williams et al., 2010). As a result, some have argued that the mechanisms linking marital status to physical health may be distinct for women (Williams et al., 2010). However, additional research is needed to evaluate this hypothesis.

A handful of studies suggest there are physical health benefits associated with marriage (McEwen, 1998; Crimmins et al., 2003; Uchino, 2004).However, the physiological implications of marital status for women's health is less clear, largely because studies have focused on single health outcomes (e.g. hypertension) or have failed to assess differences across gender, race, and age. In a recent study, Rote (2016) evaluated marital status differences in AL among older adults and found that married individuals have significantly lower AL scores than those who are widowed; AL scores were similar for married, divorced, and never married individuals (Rote, 2016). With its examination of AL, this study utilizes a more comprehensive health assessment and provides key insights into the ways in which marital status may become embodied. Nevertheless, the extent to which marriage contributes to differences in physical health status among Black and White women remains unclear.

Understanding racial differences in the health consequences of marriage may be particularly important in light of contemporary marriage trends. For instance, recent reports indicate that 90% of White women marry by age 40, compared to < 67% of Black women (Raley et al., 2015). Thus, is it possible that the lower marriage rates of Black women contribute to their heightened physical health risk vis-à-vis White women? Findings are mixed, and some suggest that marriage has diminished returns for Black women (Keith and Brown, 2018), who encounter more relationship stress and fewer financial gains than their White counterparts[21, 27.] In contrast, others posit that Black Americans may receive more health benefits from marriage than Whites (Kiecolt-Glaser et al., 2018; Liu and Umberson, 2008). However, this possibility has been underexplored in prior research.

1.2. The present study

The goal of this study was to clarify the role of marital status in shaping Black-White differences in physical health status among women. We had three main objectives: (1) To examine racial differences in AL among women; (2) to evaluate the extent to which racial differences in AL persists with the consideration of marital status; and (3) to assess whether the racial disparity in AL varies across marital status groups. This study aims to provide important insights into the health benefits and/or consequences of marriage and its potential implications for racial inequalities in physical health among women. While many studies have focused on the psychological implications of marital status or examined single physical health outcomes, we contribute to research in this area by assessing AL, a biological indicator of physical health status. In addition, our study focuses on specifically on women in an effort to clarify the ways that gendered and race-based processes may influence the health implications of marriage and contribute to observed racial inequalities in physical health among this population.

2. Methods

2.1. Study design and sample

We used data from the Nashville Stress and Health Study (NSAHS), a community epidemiological survey of Black and White adults in Nashville, Tennessee. A random sample was obtained using a multi-stage, stratified sampling approach. Although African American households were oversampled, sampling weights allowed for generalizability to the county population. Between 2011 and 2014, 1252 respondents provided information about their personal and family backgrounds, stress and coping experiences, and health histories during three-hour computer-assisted interviews with interviewers of the same race. The following day, clinicians made in-home visits, arriving before breakfast to retrieve 12-hour urine samples and collect blood samples. They also measured blood pressure, took body (waist, hip, height, and weight) measurements, and documented prescription medication usage. < 1% of the sample was missing sociodemographic or biological data (due to difficulty in drawing sufficient blood, specimen contamination, or clinician visit refusal). Upon completion of the interviewing period, American Association for Public Opinion Research (AAPOR) rates were used to evaluate success across screening and interviewing phases (Response Rate 1 = 30.2; Cooperation Rate 1 = 74.2; Refusal Rate 1 = 30.2, Contact Rate 1 = 40.7). The NSAHS and all study procedures were approved by the Vanderbilt University Institutional Review Board and described in detail elsewhere (Turner et al., 2016).The present analyses examined 663 women (see Table 1).

2.2. Measures

2.2.1. Allostatic load (AL)

Scores were derived from 10 biomarkers, including *primary mediators* (norepinephrine, epinephrine, cortisol, dehydroepiandrosterone sulfate (DHEA-S)) and *secondary mediators* (systolic and diastolic blood pressure, total cholesterol, high density lipids (HDL), glycated hemoglobin, and waist-to-hip ratio). Primary mediators refer to the substances released by the body in response to stress, while secondary

Table 1
Sample characteristics by race, Nashville Stress and Health Study (2011–2014).

	All (*N* = 663)		White (*N* = 333)		Black (*N* = 330)		p-Value
	Mean or %	SE	Mean or %	SE	Mean or %	SE	
Marital status							
Never married (ref.)	28.42		21.67		44.18		$p < 0.001$
Married	48.97		58.72		26.20		
Other	22.61		19.61		29.62		
Age [23–69]	44.58	0.64	44.93	0.80	43.77	0.93	$p = 0.35$
Socioeconomic status (SES)[a] [−2.93–1.76]	−0.06	0.05	0.12	0.05	−0.46	0.12	p < 0.001
Parental status							
No children (ref.)	29.12		33.67		18.48		$p < 0.01$
Has children	70.88		66.33		81.52		
Depressive symptoms (CES-D) [0–53]	14.53	0.65	13.89	0.69	16.02	1.21	$p = 0.12$

Note: Ref. = reference category.
[a] Standardized; weighted means and percentages reported; range of continuous variables included in brackets.

mediators are the effects resulting from the actions of primary mediators (Geronimus et al., 2006). Based on guidelines established by the MacArthur studies, each biomarker was designated (0) *low-risk* or (1) *high-risk* based on established clinical risk levels (McEwen and Seeman, 1999; Crimmins et al., 2003; Turner et al., 2016); individuals taking blood pressure or cholesterol medication were also counted as "high-risk" for those biomarkers. Total AL scores were based on a count of these high-risk biomarkers and ranged from 0 to 10, with higher scores indicating greater physiological dysregulation across bodily systems. To account for the small percentage of respondents missing on individual biomarkers (< 2%), all analyses control for the *number of available biomarkers* (m = 9.67; sd = 0.06; range = 0–10) that were used to generate each person's AL score.

2.2.2. Race

Respondents self-identified as non-Hispanic *White* (reference category; *n* = 326) or *Black* (coded 1; *n* = 321).

2.2.3. Marital status

Marital status was assessed categorically: *(0) Never Married* (reference category; 28.42%), *(1) Married* (48.97%), *(2) Other* (i.e. divorced, widowed, separated; 22.61%).

2.2.4. Sociodemographic characteristics

Based on prior studies (Geronimus et al., 2006), we also included the following characteristics as covariates. *Age* was measured continuously in years (m = 44.58; sd = 0.64; range = 23–69). *Socioeconomic Status (SES)* was assessed with a composite score consisting of education (less than high school; high school/GED; some college; college graduate or higher), annual household income ($20,000; $20,000–$34,999; $35,000–$54,999; $55,000–$74,999; $75,000–$94,999; $95,000+), and occupational prestige based on the Nam-Boyd occupational status scale (Turner et al., 2016) (range = 0–100). Education, income, and occupation scores were standardized and summed to create a continuous SES score (m = −0.06; sd = 0.05; range = −2.93-1.76); positive scores indicated "above average SES" and negative scores denoted "below average SES" levels. Respondents reported whether they had children: (0) *no children* (reference category; 29.12%), (1) *has children* (70.88%). To account for potential selection effects across marital status groups (Keith and Brown, 2018), *depressive Symptoms* were assessed with the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Items were summed such that higher scores indicated higher depressive symptomatology (m = 14.53; sd = 0.65; range = 0–53; α = 0.89).

2.3. Analytic strategy

First, we estimated weighted means and percentages of all study variables; *t*-tests and chi-square tests of significance assessed differences across racial groups (Table 1). Second, we evaluated racial differences in the distribution of the high-risk biomarkers that comprise the composite AL score (Table 2). Next, we examined whether the relationship between race and AL persisted after accounting for marital status. Poisson models with robust standard errors were used to racial differences in AL scores and incidence rate ratios (IRRs) for the full sample are shown in Table 3 (Models 1–2). The impact of marital status was

Table 2
Distribution of high-risk allostatic load (AL) biomarkers among women by race. Data: Nashville Stress and Health Study (2011–2014).

	All (N = 663)	White (N = 333)	Black (N = 330)	p-Value
Mean AL score [0−10]	2.56 (0.10)	2.20 (0.11)	3.36 (0.10)	p < 0.001
Mean number of available biomarkers [0–10]	9.47 (0.08)	9.47 (0.12)	9.52 (0.10)	$p = 0.67$
High-risk primary mediators (%)				
(1) Norepinephrine	23.54	19.49	32.85	p < 0.001
(2) Epinephrine	18.60	16.56	23.36	$p = 0.09$
(3) Cortisol	19.89	17.62	25.41	$p = 0.11$
(4) Dehydroepiandrosterone sulfate (DHEA-S)	36.38	32.75	44.58	p < 0.01
High-risk secondary mediators (%)				
(5) Systolic blood pressure	38.09	30.73	55.21	p < 0.001
(6) Diastolic blood pressure	36.75	28.89	54.99	p < 0.001
(7) Total cholesterol	38.45	42.06	30.35	p < 0.01
(8) High density lipids	12.52	10.51	17.14	$p < 0.05$
(9) Glycated hemoglobin	22.76	16.77	36.86	p < 0.001
(10) Waist-to-hip ratio	22.55	18.86	31.16	p < 0.05

Note: Ref. = reference category.
Weighted means and percentages reported; standard errors are included in parentheses; range of continuous variables included in brackets.

Table 3
Incidence rate ratios (IRR) of allostatic load among women, Nashville Stress and Health Study (2011–2014).

	All (N = 663)				White (N = 333)		Black (N = 330)	
	Model 1		Model 2		Model 3		Model 4	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Race								
White (ref.)	1.00		1.00					
Black	1.45***	(1.28, 1.64)	1.46***	(1.29, 1.64)				
Marital status								
Never married (ref.)			1.00		1.00		1.00	
Married			1.04	(0.87, 1.25)	0.97	(0.74, 1.26)	1.05	(0.81, 1.37)
Other			1.06	(0.92, 1.22)	0.93	(0.71, 1.24)	1.24**	(1.06, 1.44)
Intercept	0.11***	(0.06, 0.19)	0.11***	(0.06, 0.19)	0.12***	(0.06, 0.24)	0.16***	(0.001, 0.01)

Note: Ref. = reference category; IRR = incidence rate ratio; CI = confidence interval; models control for age, socioeconomic status, parental status, and depressive symptoms.
* p < 0.05 (two-tailed tests).
** p < 0.01 (two-tailed tests).
*** p < 0.001 (two-tailed tests).

Table 4
Racial differences in allostatic load by marital status among women.
Data: Nashville Stress and Health Study (2011–2014); *N* = 647.

	Never married (n = 234)		Married (n = 230)		Other (n = 199)	
	IRR	95% CI	IRR	95% CI	IRR	95% CI
Race						
White (ref.)	1.00		1.00		1.00	
Black	1.30*	(0.92, 1.83)	1.54***	(1.29, 1.84)	1.55***	(1.32, 1.84)
Intercept	0.12***	(0.05, 0.29)	0.12***	(0.05, 0.32)	0.03***	(0.008, 0.10)

Note: Ref. = reference category; IRR = incidence rate ratio; CI = confidence intreval; models control for age, socioeconomic status, parental status, and depressive symptoms; "Other" = separated, widowed, divorced.
* *p* < 0.05 (two-tailed tests).
** *p* < 0.01 (two-tailed tests).
*** *p* < 0.001 (two-tailed tests).

also examined in race-stratified models (Table 3; Models 3–4), and a Chow test assessed whether there were significant racial differences in the magnitude of the marital status-AL association. In the final step of the analysis, a similar approach was used to evaluate racial differences in AL across marital status groups (Table 4).

3. Results

Findings indicate there were significant racial differences in marital status among women (Table 1). Compared to White women, a greater percentage of Black women were never married (44.18% vs. 21.67%) or experienced marital dissolution through a separation, divorce, or widowhood (29.62% vs. 19.61%). In contrast, more White women in the sample were married (58.72% vs. 26.20%). While the average age and level of depressive symptoms was similar across racial groups, Black women reported significantly lower SES levels than their White counterparts and were more likely to have children (81.52% vs. 66.33%).

Racial differences in AL biomarkers were also observed (Table 2). For primary mediators, more Black women reported high-risk norepinephrine and DHEA-S; there were no racial differences in epinephrine and cortisol. More Black women had high-risk secondary mediators, with one exception: 42.06% of White women reported high-risk total cholesterol, compared to just 30.35% of Black women. Nevertheless, Black women reported higher AL scores, with an average of 3.36 high-risk biomarkers compared to just 2.20 among White women.

These patterns persisted with sociodemographic factors and depressive symptoms considered in Table 3. Model 1 shows that the AL scores of Black women were 45% times higher than the AL scores of White women. Although this pattern persists in Model 2 with the consideration of marital status, there was not a significant association between marital status and AL. The impact of marital status was also examined among Black and White women separately in Models 3 and 4, and there was no significant association between marital status and AL among White women. However, there were significant differences among Black women. Results indicate that Black women who experienced marital dissolution had AL scores that were 24% times greater than the scores of Black women who never married (IRR = 1.24; 95% CI = 1.53–4.05; $p < 0.001$); incidence rates were similar for married and never married Black women. A significant Chow test (F = 18.91, df = 2256; p < 0.001) confirmed that the impact of marital status on AL was greater among Black women than White women.

In addition, the racial gap in AL among women varied significantly across marital status groups. Table 4 shows that Black and White women who never married had similar AL scores, while differences were observed among currently and formally married (i.e. separated, divorced, widowed) women. Compared to married White women, married Black women had AL scores that were 54% times higher. Similarly, formally married Black women had AL scores that were 55% times higher than the AL scores of formally married White women. Taken together, this indicates that the racial gap in AL among women is conditional on marital status. Although disparities persist among currently and formally married women, health risks appear similar among never married Black and White women.

4. Discussion

The present study aimed to clarify the role of marital status in shaping Black-White differences in physical health status among women. A substantial literature has emphasized the potential physical health benefits of marriage and demonstrates stark racial differences in marriage patterns (McEwen, 1998; Crimmins et al., 2003; Uchino, 2004). Yet, there has been limited consideration of the ways that marital status may contribute to racial disparities in women's health. Given Black women's elevated rates of marital strain and dissolution, some have also suggested that the health implications of marriage might vary by race (Keith and Brown, 2018). The present study adds to the literature by examining these issues and by assessing the impact of marriage on AL, a biological indicator of multi-system physiological dysregulation. Overall, we found little evidence to suggest that racial disparities in women's AL are due to differential marriage patterns.

Nevertheless, study results point to distinct pathways linking marriage to AL for Black and White women, providing several key insights that enhance our understanding of racial disparities in women's health.

First, as prior research has emphasized the protective effects of marriage, we expected to find lower AL scores among married women. However, we found that generally, marital status is not a significant predictor of women's AL. Though unexpected, this result is consistent with recent evidence indicating diminished health benefits of marriage among more recent birth cohorts (Tumin, 2017; Liu and Umberson, 2008). In one study, Tumin (Kiecolt-Glaser et al., 2018) largely attributes this shift to the deinstitutionalization of marriage in the United States and suggests that recent social and demographic changes may limit the health advantages traditionally associated with marriage for younger cohorts. Thus, it is possible that our findings simply reflect this trend among younger women. However, since the present study is among the first to examine the impact of marriage on women's AL within a racially and age-diverse sample of women, additional research is needed to clarify these patterns and to understand their implications for women's health.

Second, contrary to our expectations, marital status did not account for racial differences in AL among women. Consistent with national trends, study results indicated that marriage patterns differ significantly by race. Black women were less likely than White women to marry and more likely to have experienced marital dissolution through separation, divorce, or widowhood. Moreover, AL scores were much greater among Black women, even after accounting for sociodemographic characteristics. Although these findings paralleled those of other studies (Geronimus et al., 2006), we found no evidence to suggest that marital status explains these differences. In fact, AL scores were essentially the same after accounting for differences in marital status among women. This suggests that while there are stark racial differences in marriage, other factors likely play a more significant role in shaping disparities in health.

Nevertheless, the results of this study do point to very distinct health implications of marriage for Black and White women. We found that marital status was not significantly associated with AL among White women, but there was a significant relationship among Black women. Moreover, findings revealed that the racial gap in AL among women persists only among current and formally married women. Among those who never married, Black and White women reported similar AL scores. These patterns not only suggest that the physical health of Black and White women is shaped by different factors, but also that marriage may be associated with greater health risks for Black women, a finding consistent with the idea that marriage may confer "diminished health returns" for Black women (Keith and Brown, 2018).

Prior studies have attributed Black women's low marriage rates to systemic racism and high rates of Black male joblessness, incarceration, and economic marginality (Harknett and Mclanahan, 2004). These factors not only diminish Black women's chances of marrying, but may also contribute to distinct health risks faced by those who do choose to marry. For instance, elevated rates of stress, including chronic financial strain, may create more marital strain and contribute to higher rates of marital dissolution among Black women (Keith and Brown, 2018). Future studies should examine the role of SES and stress exposure as potential mechanisms underlying the relationship between marital status and AL among Black women. Taken together, the present study demonstrates the significance of marital status for Black women's heightened AL risk. While Black women face elevated odds of high AL regardless of their marital status, marriage seems to confer an added risk, underscoring the need for additional research to disentangle group-specific risk pathways linking marital status and physical health among this population.

4.1. Limitations

There were several limitations to this study. First, the data examined was cross-sectional, which poses challenges for establishing a causal link between marital status and AL. Prior research has noted that there may be selection effects, such that healthier people are more likely than unhealthy people to get married. Thus, future studies should evaluate the relationship between marital status and AL within longitudinal data. Second, our study used a regional sample of Black and White women, which may not be representative of broader populations. Third, in our measurement of marital status, we combined separated, widowed, and divorced women into the "Other" category due to small sample sizes. In addition, we did not distinguish single women cohabitating with a partner from other never married women, which may be insightful, as rates of cohabitation have increased in recent years (Kiecolt-Glaser et al., 2018). Future research should examine the health consequences of these other relationships types. Lastly, we did not consider other mechanisms such as relationship quality, stress exposure, and cohort effects, which may be important for shaping the meanings and health consequences of marriage among Black and White women.

4.2. Public health implications

Despite these limitations, this study provides several important contributions. Overall, these findings demonstrate that the health consequences of marriage are not "one size fits all." This information not only clarifies women's risk for physical health problems compared to men, but provides additional insights regarding important distinctions in physical health risk across subpopulations of women. In addition, these findings enhance our understanding of the physiological implications of social relationships, which may inform more effective public health interventions. Finally, this study adds to the literature, not only by demonstrating the physical health significance of marriage for Black women, but also by underscoring the need to examine within-group processes to clarify racial health inequalities and identify potentially modifiable factors to improve health outcomes among women.

This project was supported in part by the California Center for Population Research at UCLA (CCPR), which receives core support (P2C-HD041022) from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD).

Data collection for the NSAHS was supported by a grant (R01AG034067) from the Office of Behavioral and Social Science Research and the National Institute on Aging to R. Jay Turner. The study contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.

References

Buttorff, C., Ruder, T., Bauman, M., 2017. Multiple Chronic Conditions in the United States. RAND Corporation, Santa Monica, CA. https://www.rand.org/pubs/tools/TL221.html, Accessed date: 4 January 2019.

Chyu, L., Upchurch, D.M., 2011. Racial and ethnic patterns of allostatic load among adult women in the United States: Findings from the national health and nutrition examination survey 1999–2004. J Womens Health. 20 (4), 575–583.

Crimmins, E.M., Johnston, M., Hayward, M., Seeman, T., 2003. Age differences in allostatic load: an index of physiological dysregulation. Exp Gerontol. 38 (7), 731–734.

Farmer, M.M., Ferraro, K.F., 2005. Are racial disparities in health conditional on socioeconomic status? Soc Sci Med. 60 (1), 191–204.

Geronimus, A.T., 1992. The weathering hypothesis and the health of African-American women and infants: evidence and speculations. Ethn Dis. 2 (3), 207–221.

Geronimus, A.T., Hicken, M., Keene, D., Bound, J., 2006. "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. Am J Public Health. 96 (5), 826–833.

Geronimus, A.T., Hicken, M.T., Pearson, J.A., Seashols, S.J., Brown, K.L., Cruz, T.D., 2010. Do US black women experience stress-related accelerated biological aging? Hum Nat. 21 (1), 19–38.

Goldman, N., Weinstein, M., Cornman, J., et al., 2004. Sex differentials in biological risk factors for chronic disease: estimates from population-based surveys. J Womens Health. 13 (4), 393–403.

Green, T.L., Darity, W.A., 2010. Under the skin: using theories from biology and the social sciences to explore the mechanisms behind the black–white health gap. Am J Public Health. 100 (S1), S36–S39.

Hargrove, T.W., 2018. Intersecting social inequalities and body mass index trajectories

from adolescence to early adulthood. J Health Soc Behav. 59 (1), 56–73.
Harknett, K., Mclanahan, S.S., 2004. Racial and ethnic differences in marriage after the birth of a child. Am Sociol Rev. 69 (6), 790–811.
Keith, V.M., Brown, D.R., 2018. Mental health: an intersectional approach. In: Risman, B., Froyum, C., Scarborough, W. (Eds.), Handbook of the Sociology of Gender. Handbooks of Sociology and Social Research, 2nd ed. Springer International Publishing, Cham, Switzerland, pp. 131–142.
Kiecolt-Glaser, J.K., Wilson, S.J., Bailey, M.L., et al., 2018. Marital distress, depression, and a leaky gut: translocation of bacterial endotoxin as a pathway to inflammation. Psychoneuroendocrinology. 98, 52–60.
Koball, H.L., Moiduddin, E., Henderson, J., Goesling, B., Besculides, M., 2010. What do we know about the link between marriage and health? J Fam Issues. 31 (8), 1019–1040.
Liu, H., Umberson, D.J., 2008. The times they are a changin: marital status and health differentials from 1972 to 2003. J Health Soc Behav. 49 (3), 239–253.
McEwen, B.S., 1998. Stress, adaptation, and disease: allostasis and allostatic load. Ann N Y Acad of Sci. 840 (1), 33–44.
McEwen, B.S., Seeman, T., 1999. Protective and damaging effects of mediators of stress: elaborating and testing the concepts of allostasis and allostatic load. Ann N Y Acad Sci. 896 (1), 30–47.
National Center for Health Statistics, 2012. Health, United States, 2011: With Special Feature on Socioeconomic Status and Health. National Center for Health Statistics, Hyattsville, MD.
Radloff, L.S., 1977. The CES-D scale. App Psychol Meas. 1 (3), 385–401.
Raghupathi, W., Raghupathi, V., 2018. An empirical study of chronic diseases in the United States: a visual analytics approach to public health. Int J Environ Res Public Health. 15 (3), 431.
Raley, R.K., Sweeney, M.M., Wondra, D., 2015. The growing racial and ethnic divide in U.S. marriage patterns. Future Child. 25 (2), 89–109.
Robles, T.F., Kiecolt-Glaser, J.K., 2003. The physiology of marriage: pathways to health. Physiol Behav. 79 (3), 409–416.
Rote, S., 2016. Marital disruption and allostatic load in late life. J Aging Health. 29 (4), 688–707.
Thomas, C.S., 2015. A new look at the black middle class: research trends and challenges. Sociol Focus. 48 (3), 191–207.
Tumin, D., 2017. Does marriage protect health? A birth cohort comparison*. Soc Sci Q. 99 (2), 626–643.
Turner, R.J., Thomas, C.S., Brown, T.H., 2016. Childhood adversity and adult health: evaluating intervening mechanisms. Soc Sci Med. 156, 114–124.
Uchino, B.N., 2004. Physical Social Support and Health: Understanding the Health Consequences of Relationships. Yale University Press, New Haven, London.
Umberson, D., Montez, J.K., 2010. Social relationships and health: a flashpoint for health policy. J Health Soc Behav. 51 (1_suppl), S54–S66.
Upchurch, D.M., Stein, J., Greendale, G.A., et al., 2015. A longitudinal investigation of race, socioeconomic status, and psychosocial mediators of allostatic load in midlife women. Psychosom Med. 77 (4), 402–412.
Williams, K., Frech, A., Carlson, D.L., 2010. Marital status and mental health. In: Scheid Teresa, L., Brown Tony, N. (Eds.), A Handbook for the Study of Mental Health: Social Contexts, Theories, and Systems, 2nd ed. Cambridge University Press, New York, pp. 306–320.
Wilson, K.B., Thorpe, R.J., Laveist, T.A., 2017. Dollar for dollar: racial and ethnic inequalities in health and health-related outcomes among persons with very high income. Prev Med. 96, 149–153.