Too Much for a Heart to Bear: A Systematic Review and Mini Meta-Analysis on The Role of Skin-Deep Resilience in the Weathering of Black People in America

Chantelle Miller
DePaul, cmill135@depaul.edu

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Too Much for a Heart to Bear: A Systematic Review and Mini Meta-Analysis on The Role of
Skin-Deep Resilience in the Weathering of Black People in America

A Thesis
Presented in
Partial Fulfillment of the
Requirements for the Degree of
Master of Arts

By
Chantelle Christina Miller
June 2022

Department of Psychology
College of Science and Health
DePaul University
Chicago, Illinois
Thesis Committee

Kathryn E. Grant, Ph.D., Chairperson

Jocelyn S. Carter, Ph.D.
SKIN-DEEP RESILIENCE AND WEATHERING

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Biography

The author, Chantelle Christina Miller, was born in Lansing, Michigan on August 4th, 1994. Chantelle was raised in Virginia Beach, Virginia and graduated from Princess Anne High School in 2012. She received her Bachelor of Science in Psychology from Virginia Commonwealth University in Richmond, Virginia in 2016. She worked at her alma-mater as a Research coordinator from August 2016 to July 2018. In August of 2018, Chantelle began the Clinical-Child MA/PhD program at DePaul University.
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Abstract

Current public health data underscore CVD as the most predominant public health crisis affecting the U.S. population, claiming over 655,000 lives annually as the primary cause of one out of every four deaths (Kochanek, 2020; Rana et al., 2020; Salim et al., 2020). Current approaches to CVD primarily utilize a biomedical approach, are extremely costly to the U.S. economy, and appear to disproportionately support positive health outcomes in White individuals while Black individuals continue to exhibit heart health disparities (Carnethon et al., 2017; Ferdinand, 2016). Race-related health inequities must be addressed with a biopsychosocial preventative health approach to effectively redirect the trajectory of CVD in this nation (Hatala, 2012; Lämmle et al., 2011; Nguyen et al., 2021; Zittel et al., 2002). This study aimed to identify whether the pursuit and/or attainment of external metrics of resilience and success by Black individuals in the U.S. is associated with elevated signs of accelerated biological aging, also known as weathering (Geronimus et al., 2006; McEwen, 1998). Weathering reduces physiological vitality and thwarts the body’s ability to maintain homeostasis and regenerate from a range of health conditions including CVD. While educational attainment, high SES, and resilient coping are typically thought to be protective factors in health outcomes, skin-deep resilience theory suggests that high striving Black individuals may experience diminished health returns (Brody, Yu, Chen, Miller, et al., 2013a; Chen et al., 2015; Miller et al., 2016). The current study was a systematic literature review consisting of 18 articles and a mini meta-analysis using 6 articles from the review to understand the role that skin-deep resilience may have on weathering. Findings validate the phenomenon of skin-deep resilience and suggest a need to acknowledge race-related chronic stress as a social determinant of health, provide social supports to high achieving Black individuals coming for lower socioeconomic environments, provide early intervention to Black emerging adults who may be weathered from the effects of systematic racism.
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Introduction

Cardiovascular disease (CVD) is a broad term which refers to a vast group of conditions and diseases affecting the healthy functioning of the circulatory systems leading to complications with the arteries, veins, and heart (Institute of Medicine, 2011). Complications caused by cardiovascular disease vary greatly in their expression and severity and can persist for years or decades without noticeable symptoms thus contributing to many undiagnosed and untreated cases (Keteepe-Arachi & Sharma, 2017). Without early intervention or timely treatment, communities and families across the United States (U.S) tragically lose loved ones to the most common cardiovascular diseases including, but not limited to, high-blood pressure, coronary artery disease, angina, arrhythmia, heart attack, stroke, and heart failure (Mozaffarian et al., 2015). Current public health data underscore CVD as the most predominant public health crisis affecting the U.S population, claiming over 655,000 lives annually as the primary cause of one out of every four deaths (Kochanek, 2020; Rana et al., 2020; Salim et al., 2020).

Though these unfortunate CVD trends are historical and longstanding, over the last few decades, there has been a prominent and consistent decline in the age-adjusted mortality rates of CVD (Mensah et al., 2017; Rana et al., 2021). While the evidenced decline of CVD related death is remarkable and encouraging, it appears the decline is a result an over-investment in modern medicine therapies, technologies, and pharmaceuticals and of an underinvestment in prevention and risk factor intervention efforts (Ford et al., 2009; Mensah et al., 2017; Rana et al., 2021). Also, despite these declining mortality rates, CVD incidence and prevalence issues continue to dramatically overburden the nation’s healthcare system and economy.
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The Cost of Cardiovascular Disease.

In 2015, Pandya and colleagues analyzed past public health data on CVD incidence and prevalence trends, to specifically address the other side of the narrative of declining CVD mortality rates. Their analytic approach was designed to predict and simulate what the future incidence, prevalence, and total risk of CVD might be with CVD healthcare proceeding with business as usual. Results suggested that declining mortality rates had no association with the projected steady increase in CVD prevalence and risk factors for the next 15 years. Furthermore, simulated scenarios of care that were modeled after the usual patterns and characteristics of healthcare in the U.S., suggest that the continued reliance on medical and pharmaceutical treatments to delay the fatal effects of CVD, without reducing the prevalence, would cause the U.S healthcare system to collapse within the next decade in the absence of more effective and feasible prevention and interventions. Sadly, this collapse may occur sooner than forecasted due to a collective inability to anticipate an unprecedented global pandemic and the structural implications it would have on the United States healthcare system.

With these healthcare patterns in mind, it would be wise and ethical for government funded healthcare expenditures to be redirected towards prevention and intervention initiatives. Between 2011 and 2015 alone, the U.S government reported spending over $200 billion in direct and indirect costs to research and treat cardiovascular diseases (Cradock et al., 2017). Consistent with Pandya et al.’s findings, if fiscal decisions continue at that rate and pattern, the projected cost of cardiovascular disease by the year 2035 will be nearly $800 billion (Cradock et al., 2017). This excessive, taxpayer financed, deficit spending on research initiatives and medical treatments, is particularly concerning when considered with findings published in 2020 describing changes in the CVD mortality rate from the years 2011 to 2018 (Rana et al., 2021). Although a decrease in age-adjusted CVD mortality rates was observed, so was a notable plateau in the previously consistent declining data trends.
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Determinants of change in this trend are: 1) The population of older individuals, (age ≥ 65 years) is increasing at a drastically faster rate than the younger population. 2) There has been a distinct increase in deaths caused by heart failure. 3) In 2018 alone, 80.3% of all deaths in the 65 years and older population were due to heart disease (Rana et al., 2021). Though disconcerting, this specific plateau pattern was forecasted by many cardiovascular health researchers as it maps onto the Compression of Morbidity hypothesis, which speaks to the public health aim of shortening the amount of time spent suffering from symptoms of an onset illness and dying from that illness (Fries et al., 2011; Jones & Greene, 2012; Pandya et al., 2013; Pilkerton et al., 2015). As it applies in this context, this compression of time mostly takes place through secondary and tertiary prevention efforts (Fries et al., 2011) which utilize medical treatments and technologies to reduce and slow down disruptive symptoms, complications, and deteriorating states of health related to a disease diagnosis (Fries et al., 2011; Jones & Greene, 2012; Pandya et al., 2013; Pilkerton et al., 2015).

Upon further deliberation of these divergent data patterns and costly fiscal policies concerning this public health issue, there appears to be a fundamental misalignment of the priorities and problem definitions related to cardiovascular disease at various institutional and public policy levels (Cook, 1995). This misalignment, in turn, misinforms the development, objectives, focus, accuracy, dissemination, implementation, functionality, and effectiveness of (Pollack Porter et al., 2018), prevention efforts (Kahn et al., 2008), screening practices (Brindle et al., 2006), clinical treatments (Mensah et al., 2017; Pandya et al., 2013), and risk-factor interventions intended to reduce and eventually eradicate the ubiquitous and harmful impact that cardiovascular disease has in the U.S population (Diamond & Kaul, 2007). The unfortunate repercussion of these discordant aims and meanings are an unnecessarily expensive and overall ineffective cardiovascular health promotion
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model because it is informed by a limited and incomplete framework and a deeply rooted reluctance to get to the heart of public health issues; no pun intended (Mensah et al., 2017).

Prevention of CVD through a Biopsychosocial Model

While both medical care and prevention efforts are needed to inform the best possible approach for significantly reducing the burden of CVD, there has been an overemphasis on researching, developing, and implementing precise medical treatments and pharmaceutical regimens informed by biomedical models of care. These biomedical therapies are usually quite expensive and even the most effective ones are highly contingent upon healthcare accessibility, (Barghi et al., 2019; Mensah et al., 2017) practitioner bed-side manner, (Squier, 1990) and the use of treatment plans that are culturally responsive and specific to patient needs to ensure compliance and adherence to treatments (Alcalá et al., 2015; D. Allen et al., 2009; Mensah et al., 2017; Musich et al., 2016). Similarly, although numerous prevention/intervention efforts for cardiovascular disease exist, they predominantly accent biomedical elements such as the increase of physical activity and exercise, nutrition and dietary skills, substance abuse and smoking cessation, and health literacy training (Harris et al., 2009; Jones & Greene, 2012; Mensah et al., 2017; Redmond Nicole et al., 2011). While these biomedical models of care are undeniably essential, the last several decades of health inequity data, especially regarding cardiovascular disease, suggest a need to redirect a substantial amount of attention, resources, and energy towards a biopsychosocial prevention model that is holistic and informed by social determinants of health (Hatala, 2012; Lämmle et al., 2011; Nguyen et al., 2021; Zittel et al., 2002).

The advantages of intentionally prioritizing a biopsychosocial preventive care model include dramatically less up-front and operation costs and the development, dissemination, and implementation of more nuanced systems which are equipped to apprehend and address the key factors underlying persistent widespread health concerns, health inequities, and health disparities.
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(Hatala, 2012; McCartney et al., 2019; Mensah et al., 2017; Zittel et al., 2002). Furthermore, it is an
innovative approach which interrupts the pattern of utilizing approaches that are derived from highly
specific and unrealistic research contexts that have demonstrated a limited capacity for being
integrated, for one reason or another, into the wider health care systems of vulnerable populations
which happen to overrepresent the incidence and prevalence rates of cardiovascular risk factors and
disease in the U.S (Kahn et al., 2008; Larson et al., 2018; Mensah et al., 2017). Additionally, these
common biologically based approaches, along with numerous complementary screening and
diagnostic tools, have received government funding since the late 1990s and have only partially
contributed to the sharply declined mortality rates observed. However, the plateau of these rates, the
steadily increasing incidence and prevalence rates of CVD, and the longstanding designation of CVD
as the leading killer of Americans, suggests a great need to pivot towards a biopsychosocial prevention
model to heal the gaping wound of the CVD public health crisis.

Health Disparities Affecting Black People in the U.S.A.

The urgency with which biopsychosocial prevention approaches are needed is mostly evident
among Black people in the United States. Despite the substantial amount of government funds
which have been allocated towards the development of extraordinary, exciting, and innovative
advancements to medical care, medical technology, and health interventions targeting CVD
(Rana et al., 2020), their benefits have yet to be observed on a significant level when it comes to
individuals who identify as racial/ethnic minorities (Carnethon et al., 2017; Ferdinand, 2016).
The reality of racial/ethnic health disparities is yet another reason to critique the approach and
policies that have been standardized to date. Prevalence data collected from the National Health
Interview Survey in 2017 reported CVD trends by racial and ethnic groups from 1999 to 2017
and revealed that non-Hispanic White adults represented 11.5% of adults with heart disease and
they were the only racial/ethnic group to experience a statistically significant decrease in heart disease cases from 1999 to 2017. Comparatively, CVD prevalence rates remained stable from 1999 to 2017 for non-Hispanic Black adults, Hispanic/Latinx adults, and Asian American and Pacific Islander adults, (CDC, 2019). When prevalence rates were compared between racial/ethnic minorities, non-Hispanic Black adults represented significantly more CVD cases (9.5%) than Hispanic/Latinx adults (7.4%) and Asian American and Pacific Islander adults (6.0%) even though they only make up 12.5% of the adult U.S population with Hispanic/Latinx adults comprising 17% of the adult U.S population and Asian American and Pacific Islander adults comprising 6.2% of the adult U.S population (CDC, 2019; U.S Census Bureau [USCB], 2019). The most astonishing aspect of these data is the gross juxtaposition of the CVD prevalence rate for White adults (11.5%) to the prevalence rate of Black adults (9.5%) when non-Hispanic White adults represent over 63% of the adult population in the U.S (CDC, 2019; U.S Census Bureau [USCB], 2019).

While it is true that the overall death rate for Black adults in the U.S has decreased by about 25% in the last 20 years, Black people are dying at significantly faster rates and significantly younger ages from all health conditions than non-Black people. Markedly, they are two times as likely to die from heart disease than White adults in the U.S (CDC, 2017) and more than twice as likely to die from heart disease than their Asian American and Pacific Islander counterparts (CDC, 2019). Moreover, the American Heart Association (AHA) reports that almost 50% of all Black adults in the U.S are diagnosed with heart disease (46% of non-Hispanic Black men and nearly 50% of non-Hispanic Black women respectively), (AHA, 2013; AHA 2017). While it is established and known that there are questionable methodological decisions employed as it pertains to accurately capturing racial/ethnic demographics in national public health and census
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data, (Alba, 2018; Flanagin et al., 2021; Jarrín et al., 2020; Kaneshiro et al., 2011) these trends heavily suggest that non-Hispanic White adults (i.e., the racial/ethnic majority) are the most notable benefactors of the cardiovascular disease prevention and intervention efforts that have been developed in the last 40 years, while non-Hispanic Black adults bear the brunt of the negative cardiovascular health outcomes.

A Bottom-Up Approach to Address Health Inequities

These extensive health disparities that are unfortunately specific to Black individuals in the U.S are not new. Inequitable health outcomes for Black people related to cardiovascular disease and most chronic illnesses have been steadily observed and consistently recorded within the existing body of empirical research spanning the last 60 years (Nelson, 2002). It is evident that the root cause driving health disparities for this group has yet to be addressed despite the numerous and costly prevention/intervention and treatment programs that have supposedly been designed to address the health concerns of the Black population in America (Bell et al., 2018; Brewer & Cooper, 2014; Carnethon et al., 2017; Ferdinand, 2016; Redmond Nicole et al., 2011). Therefore, it may be wise for new proposals of biopsychosocial prevention/intervention healthcare models to utilize a bottom-up/outside-in approach, which would call for the underlying risk factors and social determinants of CVD in the group most sensitive and vulnerable to negative health outcomes to be identified and intentionally addressed. As evinced by longitudinal national cardiovascular health trends, this group would be Black people in the United States. Utilizing a bottom-up framework, the ultimate pathway for reducing health disparities of this group would be via community empowerment and capacity building for self and community advocacy. This would take place through agents of health promotion (i.e., researchers, policy makers, practitioners, etc.) employing a collaborative community-based
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(community being the target group) participation model while utilizing an intersectional lens, relevant critical social and race theories, cultural competency skills, and a community generated definition of the problem. Ideally, this process and approach would support the identification of the various biopsychosocial barriers which have clearly blunted the CVD health promotion efforts to date and eventually lead to the development of a comprehensive and effective prevention/intervention to the group, which could then be applied to the rest of the population as it would likely address the root concerns contributing to CVD incidence, prevalence, and mortality rates for those less sensitive to the negative health outcomes.

**Over-attributed Constructs: The Effects of Low SES & Low Education levels on CVD**

In the last several decades of research exploring CVD health outcomes in Black people, the roles and impact of poverty status and education level have been researched ad nauseam. This is to say that a multitude of findings in this area tend to frame all forms of racial/ethnic health disparities as being easily resolved by increasing income and education levels. However, previous studies have revealed that Black individuals in the USA who earn a high income, and/or are classified as being higher-SES, relative to the national poverty rate or a lower-SES reference group, remain 40% more likely to die from diagnoses of coronary artery disease and congestive heart failure than their White counterparts who receive the exact same diagnoses (Colantonio et al., 2016; Olafiranye et al., 2013; Otten, 1990). This persistent pattern has become most surprising in the last decade because Black people in America have experienced notable upward social mobility through educational attainment and career advancements (McDaniel et al., 2011). Nonetheless, in studies where “well-to-do” Black people were compared to their non-Black counterparts, they endorsed more physiological risk factors of cardiovascular disease such as
hypertension, unhealthy blood cholesterol levels, diabetes, obesity, and atherosclerosis (Frierson et al., 2013; McDaniel et al., 2011; Otten, 1990).

When considering the issue of poverty, it is well established that the poverty rate in America is disproportionately overrepresented by Indigenous Americans and Alaskan Native-people, Black people, and Hispanic people (Hunt, 2016; McCarty, 2016). However, because White people constitute most of the general population, they account for almost half of the number of Americans living in poverty today, which means that poverty and financial insecurity are pervasive and transracial issues experienced by many American (Fontenot et al., 2018; McCarty, 2016; Meade, 2014). Research on social determinants of health describe how the characteristics of low-income communities such as community crime and disorganization, limited accessibility to nutritious and fresh foods, over accessibility to illicit substances, and lack of safe community recreation spaces promote poor outcomes in all domains of life (Braveman & Gottlieb, 2014; Fauth et al., 2007; McCarty, 2016). What is surprising is then, is how low SES among White people has not resulted in the same level of CVD outcomes over the lifespan that are associated with Black people who live in low-resourced environments (Firebaugh & Acciai, 2016; Fontenot et al., 2018; Hunt, 2016; McCarty, 2016).

Likewise, although Black people have been historically underrepresented in the proportion of individuals with a college education, extent research studies on education level and CVD risk suggest that statistically significant associations found between education level, and cardiovascular risk factors, are partially explained, or attenuated by mediating variables -- leaving the most statistically meaningful education-level data to be found in the descriptive demographics of the sample, specifically race. For example, in a 2006 study by Yan and colleagues, researchers investigated the association between education level and a subclinical
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biomarker of atherosclerosis in a sample of Black and White participants who partook in a longitudinal study of Coronary Artery Risk Development in Young Adults (CARDIA), (Yan et al., 2006). Study results indicated that the group with the highest education was mostly made up of White women, and results indicated that education level had a significant inverse relationship to subclinical biomarkers of cardiovascular risk. This means that the group of participants with the lowest education levels, which was predominantly Black men, had the highest prevalence of subclinical biomarkers (Yan et al., 2006). Interestingly, cardiovascular risk factors assessed for all participants at baseline had a strong and positive correlation to the cardiovascular risk factors endorsed by the same participants at the 15-year follow up. This then explains why when the baseline data was adjusted for race, the effect size for education-level on CVD risk was reduced by half (Yan et al., 2006).

Ultimately, the last several years of research exploring the relationship between Black people’s socioeconomic status and education level, as predictors for severe health disparities has added little new knowledge to the field about tangible ways to address the underlying issues which continue to feed into inequitable health outcomes. In a 2016 article published in the journal of Health Psychology titled “Understanding associations among race, socioeconomic status, and health: Patterns and prospects,” the authors comment on this trend by implying that it should be a well-understood fact by now for researchers across all fields that “race/ethnicity and SES are linked to each other, but race matters more for health outcomes even after SES is considered” (Williams et al., 2016, p. 406). These types of research questions, although well-meaning and in consideration of biopsychosocial factors, often inadvertently perpetuate monolithic tropes about Black people being poor and uneducated, which over-attributes the gaps in health outcomes to individual-level factors, conveniently unrelated to initiatives oriented
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towards dismantling systemic inequality. The strength and relevancy of these types of attribution
theories and conceptualization studies are especially nullified when they fail to expound upon the
role that systemic racism plays when it comes to the prevalence of poverty and education
discrimination in the Black community and they don’t hold up well when dramatic health
disparities persist despite the substantial economic and educational advancements of Black
people in the U.S (Do et al., 2008; Fauth et al., 2007; Marron et al., 2018; Singh & Siahpush,
2002).

Under-attributed Constructs: The Effects of Systematic Racism

Accordingly, a biopsychosocial approach that is not informed by intersectionality and
critical race-theory is incomplete. Going forward, if the goal is to truly eradicate health
disparities in cardiovascular disease, it is essential for researchers to move beyond study
objectives and research questions which offer overly simplified and reductionist explanations
about the numerous inequities plaguing the wellbeing of Black people in America. For example,
previous theories explored in medical anthropology have attempted to posit that the high number
of health disparities seen in Black people in America such as elevated hypertension or
cholesterol issues, are the result of innate genetic structure differences leading to more salt-
retention, which stemmed from ancestral lineage surviving the arduous and taxing Middle
Passage during the time of the Atlantic Slave Trade (Curtin, 1992; Lujan & DiCarlo, 2018).

However, those theories have been debunked upon further understanding of how population
genetics work, deeper exploration of historical data, and multiple empirical research studies. The
extant literature has established that Black people in America have significantly higher rates of
hypertension and other chronic illnesses than Black people in the Caribbean and Black people in
Africa (Lujan & DiCarlo, 2018; Redmond Nicole et al., 2011) and Black immigrants to the U.S
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have less CVD risk factors than U.S born Black people (Turkson-Ocran et al., 2020). This
notable difference among diasporic groups of Black people suggests that the key differences in
the experiences of Black people in America and the experiences of Black people with origins in
other parts of the world, has to do with the degree to which the enslavement of Black people has
been and continues to be an integral and foundational component to the socio-political
development of the United States. Therefore, it is crucial to consider how the deeply rooted and
systemic nature of slavery and colonialism which has defined the United States for centuries may
be driving pervasive health-inequities for Black people.

The Nature of Slavery in the U.S

The enslavement of Black people in America has had far-reaching effects which continue
to inform current-day race-relations, institution-structures, policymaking, and law-enforcement
practices in the United States in a way that is uniquely detrimental for Black people’s health and
well-being. For example, by the time U.S President Abraham Lincoln signed the Emancipation
Proclamation in 1863 to free enslaved people in the United States, Spain, Britain, Denmark,
Mexico, and France had all abolished slavery, the earliest being 52 years before the U.S
(Morgan, 2018; Ray, 1989; Sherwood, 2004). The rigid resistance that ultimately defined the
United States’ approach to abolition was entangled within the culture and economy of the
geographic South. Although The United States was in a political and economic position to take
in only about 3% of enslaved Black people from Africa during the trans-Atlantic slave-trade, by
the mid-1700s the results of a startlingly concerted effort towards systematically forcing the
reproduction of slaves became evident (Bertocchi, 2016). By the late 1860s, this process,
business, and institution of “slave-breeding” became more critical to the economy and the culture
of the geographic South in the U.S than the actual labor that slavery provided (Acharya et al.,
To avoid confronting the cruel and inhumane nature of the practice of slavery, White people in the South cited their beliefs on the ‘inherent sub-human’ nature of Black people and the Christian beliefs of the nation that exercised slavery as morally appropriate (Acharya et al., 2016; Bertocchi, 2016). And although the majority of White people in the geographic North wanted to preserve the Union and agreed with abolitionists on the moral sickness of slavery, they were hardly anti-racist and were not proponents of living alongside Black people (Fredrickson, 2005; Leibbrand et al., 2020).

Acknowledging these historically documented truths about the racist beliefs which were celebrated and upheld by most of the general population of White people in the U.S demonstrates how and why the enslavement of Black people was maintained for so long while the rest of the developing world worked towards a more civilized reality. Furthermore, reflecting on how that racism remains deeply embedded within the fiber of American society and the American collective conscious, provides substantial context for understanding what lingering negative biopsychosocial effects may characterize the Black experience in America today (Blair et al., 2011; FitzGerald & Hurst, 2017).

**Racism, Discrimination, & Prejudice**

Although many political and legal advancements have been made to support a more equitable society in the United States, overt and covert racism, discrimination, and prejudice are phenomena which disproportionately and regularly impact people of color, especially Black people across the U.S (Leitner et al., 2016; Thayer et al., 2020; Williams et al., 2003). It is important to underscore that covert, subtle, and implicit acts of racism, discrimination, and prejudice largely go unaddressed in mainstream conversations about race-relations in the United States, thus making it seem non-existent for individuals outside of groups which are perpetually
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discriminated against. However, there is a plethora of research which suggests that these experiences are in fact occurring, and they are significant predictors of poor emotional, mental, and physical health for those who experience it (Leitner et al., 2016; Thayer et al., 2020; Williams et al., 2003). Efforts are constantly being made by dominant group members (Boutwell, 2017; DiAngelo, 2018) and even by some Black people who cope with racism by internalizing it, avoiding it, or minimizing it, (Brondolo et al., 2009; Lewis, 2005; Watson, 2019; Willis et al., 2021) to deny and the evident patterns of discrimination which inherently stem from a shame-filled and longstanding tradition of denying the lasting effects of racism in the U.S (Bonam et al., 2019; Correspondent, 2020; Grzanka et al., 2020; A. J. Johnson, 2020). This process of denial feeds the flame of White Supremacy (Correspondent, 2020; DiAngelo, 2018; Menakem, 2017). Additionally, when the nation, as a collective, fails to openly acknowledge and reconcile the racist roots and the existing inequities disproportionately impacting Black people in America, Black people are forced to undergo a persistent and psychologically taxing experience of gas-lighting and invalidation (Berenstain, 2020; Davis & Ernst, 2019; Menakem, 2017; Rodrigues et al., 2021; Tobias & Joseph, 2020). This invalidation permeates the Black experience in America at every level and every institution including education, healthcare, criminal justice, housing, and sadly, science (Aronson & Boveda, 2017; Bertrand & Mullainathan, 2004; Gaston et al., 2020; Hoffman et al., 2016; Rodrigues et al., 2021; Tobias & Joseph, 2020; Wingfield, 2020). This unfortunate motif may provide some explanation for the decade’s worth of research and intervention studies which have attempted to treat cardiovascular disease in isolation of the socio-political reality which has led to health disparities in the first place.

For instance, in a study published by Lee and colleagues in 2019, researchers attempted to replicate findings from a previous study published by Boutwell and colleagues (2017, as cited
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in Lee et al., 2019) which suggested that in a large nationally representative sample (N = 14,793) of adults in the United States of America only 25.20% of participants “regardless of race, faced discrimination” (p.2). The single-item likert question used by Boutwell was: “In your day to day life, how often do you feel you have been treated with less respect or courtesy than other people?” with the following ratings (0 = never, 1 = rarely, 2 = sometimes, and 3 = often) (Boutwell et al., 2017). The study methodology involved coding participants responses of “sometimes” or “often” as indicators that participants had been discriminated against and they were asked the follow-up question: “What do you think was the main reason for these experiences?” where participants were able to select one of the following: “1) race/ancestry/skin color; 2) gender; 3) age; 4) religion; 5) height or weight; 6) sexual orientation; 7) education or income; 8) physical disability; and 9) other.” (Boutwell et al., 2017), p. 3). The study findings describe that 75% of participants reported “never” or “only rarely” while those who met criteria for ‘being discriminated against’ mostly selected the ‘other’ option for the reason for those experiences. However, as Lee and colleagues point out in the introduction to their replication study, Boutwell’s study does not capture the phenomenon of racial discrimination, but rather captures the phenomenon of being disrespected -- two things which are not mutually exclusive or synonymous. To emphasize how crucial and sensitive that distinction is, Lee and colleagues describe how an individual could apply for a job or a loan and can be denied that job or that loan simply because of their gender, ability status, race, ethnicity, or skin color, all while receiving that denial in a seemingly polite and amicable way (Lee et al., 2019). This distinction and the examples that Lee and colleagues provide are useful clarifications considering there are decades of research with a variety of study designs which clearly demonstrate a long-standing and significant pattern of discrimination tactics and policies being enacted, albeit passively and
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‘respectfully,’ to deny people jobs, loans, and even equitable education experiences based on perceived or observed race, nationality, gender, sexual orientation, religious affiliation, age, and ability level (Bertrand & Mullainathan, 2004; Kang et al., 2016; Ladd, 1998; Leath et al., 2019; Thakur et al., 2017).

Lee and colleague’s replication study was conducted on a large nationally representative sample (N = 3,631 participants) of adults in the United States. Their findings suggested that when an appropriate measure of discrimination was used (i.e., “Have you ever personally experienced discrimination or been treated unfairly because of your race or ethnicity, or not?) 43.50% of participants reported experiencing discrimination from “time to time” or “regularly” when given the options (1 = Yes, regularly, 2 = Yes, from time to time, 3 = Yes, but only one time/rarely, 4 = No, and 9 = Don’t know/Refused). Additionally, utilizing analyses approaches which paralleled Boutwell and colleagues, Lee and colleagues found that 63.10% of ethnic minority participants reported experiencing racial discrimination, 29.61% of White people also endorsed racial discrimination, and analyses of group level prevalence rates revealed Black participants endorsed the most racial discrimination experiences at 69.45% when compared to Asians (56.59%) and Hispanics (45.01%).

**Focusing on Race-related Stress in Health Outcomes Research**

Not only does this research by Lee highlight the importance of how issues are framed and operationalized within research narratives, public discourse, and social construction, but it also highlights the need for scientists to use more appropriate measures for the questions they are asking and to use appropriate analysis techniques to answer those questions. Being mindful of those concepts supports researchers from misusing participant data, especially data from socially marginalized and vulnerable groups, to make wildly inaccurate claims about the widespread and
well-documented phenomena of being treated differently, unjustly, and with bias (i.e., discrimination) when the available data only speaks to the phenomena of being treated with disrespect or being treated unkindly. Sadly, Boutwell and colleagues’ study is only one of many studies across all scientific fields, which have participated in downplaying the existence of the modern-day forms of racism which undeniably underlie systemic health-inequity and health disparity in observed in America (Wingfield, 2020). Addressing the biopsychosocial repercussions and responses to racism that has been collectively denied, avoided, or, misrepresented may be the missing puzzle-piece to adequately closing the health-disparity gap which contributes to nearly 100,000 Black adults losing their lives to cardiovascular disease in the United States, annually (Carnethon et al., 2017).

With these findings and commentaries in mind, health professionals, scientists, and policymakers should concentrate on addressing and treating the transgenerational, historical, and traumatic effects of racism – because they may be an underlying mechanism which hinders Black people in the United States from reaping the increased health and wellbeing benefits that their non-black counterparts tend to gain and receive with more ease. National organizations such as the American Heart Association (AHA) and the Centers for Disease Control and Prevention (CDC) have published annual statistics for multiple past decades which directly speak of the uniquely high impact that cardiovascular disease has on the mortality of Black people in America. A scientific statement by the American Heart Association titled “Cardiovascular Health in African Americans” was published in the journal, Circulation in 2017 and it described in detail the significant health disparities and racial inequities in outcomes pertaining to CVD risk factors, health behaviors, and biological statuses of health within the context of the socio-cultural environmental factors which likely influence each of those factors (Carnethon et al., 2017).
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In their description of the current burden that cardiovascular diseases and stroke have on the Black community, they cite startlingly concerning findings about racial differences observed in congestive heart failure trends from a study published by Bibbins-Domingo and colleagues in 2009 as part of the Coronary Artery Risk Development in Young Adults (CARDIA) study (Bibbins-Domingo et al., 2009; Carnethon et al., 2017). In their paper titled “Racial Differences in Incident Heart Failure among Young Adults” published in the *New England Journal of Medicine*, analysis was centered on understanding “the incidence of heart failure over a 20-year period” among a sample of (N= 5115) Black and White women and men who were ages 18 - 30 at baseline (Bibbins-Domingo et al., 2009). The National Institutes of Health - National Heart, Lung, and Blood Institute defines heart failure as a chronic or acute condition which emerges because of pre-existing medical conditions which stops the heart from pumping an adequate amount of blood for the body to function. The results of the study revealed that over the 20 years of data-collection, 27 participants ended up experiencing heart failure –with five of the 27 cases resulting in death. Every single participant with heart failure identified as Black, except for one participant who identified as a White woman (Bibbins-Domingo et al., 2009, p. 1181). Of these participants who had incident heart failure, the average age for developing heart failure was 39 years of age, and the likelihood of heart failure occurring in these individuals “was predicted by the presence of hypertension, obesity, chronic kidney disease, and depressed systolic function 10 to 15 years earlier” (Bibbins-Domingo et al., 2009, p. 1185). These findings corroborate a pattern of results observed in the literature suggesting that the health disparities observed between Black individuals in America and individuals from other racial ethnic groups are made more severe by the fact that these health risks “do not originate in adulthood but result from changes in biological processes at earlier stages of development” (Brody, Yu, Chen, Miller, et al., 2013b, p.
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913; Geronimus et al., 2006). The pattern of these results strongly suggests there is a dire need to orient cardiovascular disease prevention efforts intentionally and consistently towards Black individuals in the U.S before they enter adulthood to reduce the likelihood that risk factors for cardiovascular disease develop.

Race-related Stress as Complex & Transgenerational Trauma

The findings from this study possess numerous implications for the ways in which Black people experience cardiovascular risk and cardiovascular disease. First, we see that Black people are overwhelmingly more likely to experience cardiovascular disease and die from a CVD than their white counterparts. Second, we see that Black people are more likely to experience cardiovascular disease at objectively young ages that are not typical of that level of risk or prognosis. Third, we see that the indicators for this cardiovascular disease were identifiable by at least age 25 for most participants who experienced heart failure, which suggests that early prevention efforts are not only preferable, but critical for effectively addressing cardiovascular disease in this population. Most importantly, these findings suggest that young Black people in the U.S are at a uniquely high risk for developing risk factors for cardiovascular disease when compared to their same aged and even older peers from other ethnic/racial groups.

These findings and the trends which define the scope of the issue demonstrate how physically taxing it may be to exist as a Black person in America for CVD risk factors to emerge so early on in life. The stressors of Blackness appear to begin in youth and follow Black individuals throughout their adulthood. When referring to the stressors of Blackness, consider that many instances of racism, prejudice, and discrimination ranging in severity and magnitude occur early on in life for most Black people and they occur consistently over the lifespan (Dulin-Keita et al., 2011; Gee et al., 2012). Black people in America have primary traumatic
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experiences with emotional and physical race-based violence and injustice or secondary experiences through learning about or viewing images of continuous race-based injustice (Figley, 2012; Lowe, Okubo, & Reilly, 2012; Scurfield & Mackey, 2001). Historically, their bodies have been physically abused and countless cases of lynching, police brutality, and sexual violence leave cross-generational wounds – mentally and physically (Brighton, 2018; Hills & Curry, 2015; Norwood, 2018).

These race-based trauma experiences are relevant to Black immigrants to America as well. When examining the experiences of immigrants to the United States who identify as Black, it is noted that they often find themselves relegated to lower-income neighborhoods and low-paying jobs (Bryce-Laporte, 1972) and they are subjected to experiences of racial discrimination while simultaneously experiencing the pressure to assimilate (Foner, 2016; Rong & Brown, 2002). While racism is a global issue, the particularly furtive flavor of American racism that seeps into all systems of care, education, work-fields, law-enforcement, and government is often unexpected by Black immigrants to the U.S, and it inherently works against their efforts to strive in alignment with the lore of the “American Dream.” Consequently, as immigrant families begin to grow generationally in the United States their risk for chronic cardio-metabolic illness increases (Commodore-Mensah et al., 2016). The “triple whammy” of ethnic minority status, immigrant status, and lower-income status makes for an increase in frequency of discrimination-based experiences, or experiences that spark fear that discrimination may take place (Arbona et al., 2010). In a 19-year longitudinal study of health in adults residing in the United States, researchers examined the health effects of perceived discrimination in the context of socioeconomic disadvantage (Fuller-Rowell et al., 2018). From a sample of 6,286 adults, researchers found that the perception of discrimination was a significant mediator in the
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predictive relationship between socioeconomic inequality and poor health outcomes over the lifespan (Fuller-Rowell et al., 2018). Likewise, in a metanalysis published in 2015 by Paradies and colleagues, results from 333 articles published from 1983 to 2013 which examined health outcomes and experiences of racism established that racism was associated with poorer mental health and poorer general health, and poorer physical health.

Coping with Race-related Chronic Stress.

Having the perception that one is experiencing or may be at risk for experiencing racially related discrimination is something that many human beings must grapple with at various points of their existence, but when this perception is chronic, subconscious, and interwoven with the fabric of one’s identity or multiple intersectional identities it may begin to seem unbearable to manage. It is well established in the extant literature that stress is the largest predictor of a variety of acute and chronic illnesses, including cardiovascular disease (Salleh, 2008). These findings apply to diverse types of stress such as emotional stress (Vlastelica, 2008), psychological stress (Dimsdale, 2009), and social stress (Lepore et al., 2006) all of which are deleterious and fatal when experienced chronically and simultaneously (Dimsdale, 2009; Mariotti, 2015; Vlastelica, 2008). This illuminating reality about the impact of stress on the body beckons the need to understand the ways in which Black people may be coping with the stress of myriad of experiences associated with race-related chronic stress. Understanding the characteristics of the cognitive, emotional, and behavioral responses that are produced because of chronic exposure to race-related complex stress and trauma may offer awareness about what other elements must be addressed in a biopsychosocial prevention approach to CVD. In other words, the coping styles and coping mechanisms that Black people in America are using to manage and regulate
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themselves as they endure chronic race-related stress may be a crucial component of reducing the negative impact that cardiovascular disease has on the Black community.

Often, coping is defined in the literature as a psychological, biological, cognitive, or social response to a socially contextualized experience that signifies the occurrence of a change or stressor for which one needs to adapt a response (Compas et al., 2001). Compas and colleagues conceptualize coping through a multi-dimension model which determines that every coping response is either voluntary or involuntary. Voluntary coping involves consciously responding to a stressor with a desired goal or outcome with the intention of alleviating the stressor and rather than involuntary coping responses, which are automatic, spontaneous, and feasible outside of one’s own conscious decision making. Involuntary responses are largely biological and innate at birth and voluntary responses are largely socialized actions (Compas et al., 2001). The psychodynamic perspective of coping coincides with this framework from Compas by asserting that the body’s automatic response to psychopathological stress is an inherent form of involuntary coping (Vaillant, 2011). This view suggests that the central nervous system, which is responsible for neural signaling, and the endocrine system, which is responsible for hormonal signaling, are constantly working in tandem to help individuals respond to and adapt to stress to survive (Vaillant, 2011). In other words, the body works to help individuals cope with external and internal stressors whether they are conscious of it or not which could suggest that different approaches to coping require different levels of consciousness. In instances where individuals seek help and support with a stressor a heightened level of consciousness is required to identify an intention and desired goal – who to ask for help and how will it help? In some instances, individuals may unconsciously stay on high alert to gather information about an existing or potential stressor in anticipation of danger, however an increased conscious awareness is
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required for the individual to utilize that information to rehearse what one may do to protect
themselves if the threat actualizes. However, across any instance of stress, an individual can
unconsciously direct their body’s physiological system to employ any number of homeostatic
responses, which may be unnoticeable, or which may manifest as noticeable symptoms such as a
racing heart, sweaty palms, or abdominal pain to process the stressor or prompt the individual to
remove themselves from the stressor if possible.

The implications of these coping frameworks as they are applied to the current issue, is that
race-related stress is so pervasive, consistent, historical, institutional, widespread, and televised
that Black people in America may be constantly subconsciously engaging in multiple forms of
coping responses, simultaneously, and for prolonged periods. Additionally, race-related stress
does not happen in isolation of typical life stressors which occur across life-span development
such as making friends, getting good grades in school, developing a unique identity, becoming
an emerging adult, finding a job, providing for a family, and so on. This suggests that the
evidence based-components which are predominantly emphasized and disseminated as directives
for maintaining or improving one’s cardiovascular health (i.e., eating a balanced and nutrient
dense diet, partaking in rigorous physical activity and exercise, avoiding harmful pathogens such
as cigarettes and alcohol, and practicing stress reduction) may have less of a positive effect on
the heart health of Black people because they do not take into account the ways in which this
population may be physiologically coping incessantly with race-related stress.

The Complex Coping of Black People in America.

Black people are likely not the only demographic that finds themselves coping without
ceasing as it pertains to race-related chronic stress and complex trauma. Based on extant
literature, it is safe to assume that involuntary physiological coping of some degree is
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experienced by most U.S residents who have been historically oppressed for their race, ethnicity, nationality, gender, sexual orientation, or ability level. However, as described earlier, the current study considers the factors contributing to CVD health inequities in Black people living in the United States due to the overwhelming overrepresentation of this group in prevalence and mortality rates. Likewise, much of the current literature on coping processes have failed to focus on racially, ethnically, and socioeconomically diversified samples who are representative of people who experience chronic stress and complex trauma. Therefore, current stress and coping literature which posit that responding to stressors by ‘reframing the issue’ is better for increasing socio-emotional outcomes than responding to stressors by “avoiding the issue” (Dijkstra & Homan, 2016; Doron et al., 2015; Stanislawski, 2019; Thomassin et al., 2017) are likely unrelatable for individuals who must enlist coping strategies specific to chronic and complex stressors such as systematic oppression and race-based issues.

Culturally Relevant Coping Strategies

Fortunately, there have been some enlightening studies which have attempted to fill in the gaps in the research to better understand the coping processes of Black people across the lifespan. Though this specific scope of research is fewer in number, the findings have powerful implications. Such findings indicate that there are a limited number of culturally relevant coping resources available in Black communities (Ryan-Wenger & Copeland, 1994). For Black individuals living in the U.S who experience a myriad of complex stressors at various societal levels but who also have a well-developed sense of resilience and self-sustainability, a unique set of “complex coping” have emerged, for Black young adults (Ryan-Wenger & Copeland, 1994). These complex coping mechanisms, include things like staying alert, dealing with problems on one’s own, and distracting oneself with sensory soothing stimuli. Although these are not
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typically thought of as ideal coping mechanisms, they were found to be more appropriate,
culturally relevant, and feasible for Black adolescents growing up with stressors such as chronic
community violence, and under-resourced schools with low adult to child ratios (Gaylord-
Harden et al., 2008). These coping mechanisms are likely more effective and feasible for this
population, in addition to being more culturally applicable because they do not require Black
individuals to try to “problem solve” and “reframe” chronic and complex stressors such as
community violence, police-brutality, and institutional racism.

**Spiritually Striving for Resilience and Success**

Black people in America have survived for generations in this country despite perpetually
being at risk of being harmed for the color of their skin. As they have survived, they have also
demonstrated a level of strength that has equipped them not only to endure unfavorable
conditions, but to rise above and overcome them. This ability to overcome has led this group, as
a generalized whole, to a point in which they have been able to achieve far more than what
naysayers and oppressors may have orchestrated for them to achieve. This perseverance and
acquisition beyond what their presumed fate had allotted them, occurred through their incredible
resourcefulness. Generation after generation, Black people in America have reworked,
broadened, and enhanced upon the resources that were available to them, no matter how limited
and insufficient, to make do, create opportunities for themselves, escape danger, and even to
navigate spaces that are not historically safe for them. This resourcefulness has yielded
unthinkable accomplishments, socially, culturally, financially, and even politically (e.g., figures
such as Madame C.J Walker, Oprah Winfrey, Michelle & Barack Obama, Michael Jordan, and
Jay-Z). All of this has taken place despite this group being systematically blocked in their efforts
to do so. Nevertheless, none of this would be possible without the fine-tuned development of a
nearly intuitive level of perception which W.E.B DuBois calls “the double consciousness” in his book published in 1903 titled “The Souls of Black Folk.” DuBois describes this double consciousness as a form of “spiritual striving” (Dubois, 1903, pg.1) that is:

“a peculiar sensation, this double-consciousness, this sense of always looking at oneself through the eyes of others, of measuring one’s soul by the tape of a world that looks on in amused contempt and pity. One ever feels his two-ness, -- an American, a Negro; two souls, two thoughts, two unreconciled strivings; two warring ideals in one dark body, whose dogged strength alone keeps it from being torn asunder. This history of the American Negro is the history of this strife, -- this longing to attain self-conscious manhood, to merge his double self into a better and truer self…He simply wishes to make it possible for a man to be both a Negro and an American, without being cursed and spit upon by his fellows, without having the doors of Opportunity closed roughly in his face” (Dubois, 1903, pgs. 3-4).

Essentially, this double-consciousness is the mechanism which may make it possible for Black people to prepare for, avoid, and overcome the chronic complex stressors associated with Black identity in America, which can take on many forms and range greatly in degree of harm and impact, but are often denied as a reality by the dominant majority.

The many actions, and decisions demonstrating Black people’s application of their double-consciousness have taken place over the course of history through the present-day (e.g., escaping slavecatchers on the Underground Railroad, bearing the responsibility of racially integrating a public school as a child, becoming a multibillion-dollar Media Mogul who builds schools in Africa, and everything in between). Obviously, race relations in the United States of shifted in their form and shape resulting in a seemingly safer climate for Black people and of
course being a Black person in America is not a monolithic ordeal by any means due to the diverse backgrounds, varying magnitudes of assimilation, and the assorted degrees of race consciousness possessed by individual Black people. Nevertheless, there appears to be a common call beckoning all Black people who, at the very least, desire to exist without being “cursed and spit upon by their fellow humans”, to demonstrate a type of gritty resilience that emerges from a devout practice of hypervigilance, striving, and temperamental control. Constantly having to spiritually strive and demonstrate resilience via coping with the chronic stressors of systemic racism through a constant output of effort, conscious self-regulation, and heightened physiological alertness may be especially taxing on the body and representative of an overall complex coping process which may be skin-deep (S. A. James et al., 1987; Miller et al., 2016; Sellers et al., 2012).

**Skin-Deep Resilience Theory**

Integrating this set of complex coping skills likely enhances marginalized Black people’s chances of successfully striving, staying resilient, and ultimately achieving upward mobility at varying levels within American society. Black individuals who demonstrate these qualities are often idealized as the “success stories” of the “American Dream” in a modern “post-racial society” where anyone can “pull themselves up by their bootstraps.” At first glance, these individuals appear to be thriving because of the degree of resilience they appear to embody as evidenced through their adaptive self-management through adverse situations, their pro-social participation within society, their pursuit of scholastic achievement and higher education, their overall low endorsement of psychopathology, and often their trajectory to esteemed careers beyond the station of their family’s origin (Miller et al., 2016, 2020). However, physical health examinations within a substantial subset of these individuals have consistently revealed that a
paradoxical phenomenon called skin-deep resilience is taking place (Brody, Yu, Chen, Miller, et al., 2013b). As a process, skin-deep resilience in Black individuals describes how the endorsement of external metrics of striving, resilience, and upward mobility are observed in tandem with increased physiological risk factors or increased prevalence of various illnesses, diseases, and chronic health conditions (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013a; Chen et al., 2020; Hill et al., 2016). This pattern is peculiar because of the way these external metrics of striving and upward mobility fail to align with extant research which has established these metrics as protective health factors that improve overall health vitality (Braveman et al., 2010; Chen & Miller, 2013).

Therefore, the foundational aspect of skin-deep resilience theory can be understood as a consolidation of findings which consistently demonstrate that Black individuals who consistently strive for upward mobility often experience diminished returns in physical health while their non-black counterparts experience improvements in health outcomes (Farmer & Ferraro, 2005; Miller et al., 2016). While decades of literature have established factors such as resilience, high self-control, academic achievement, and high socioeconomic status as predictors of positive outcomes across various domains including health, these benefits seem to be lessened or entirely counteracted for members of minority groups (Assari, 2018; S. A. James et al., 1987; Mirowsky & Ross, 1998; Monnat, 2014; Tangney et al., 2004).

Black people endorsing skin-deep resilience are specified by external metrics of striving, resilience, and upward mobility categorized by 1) engagement in high effort coping (e.g., hypervigilant self-management, high capacity and application of self-control and high self-regulation skills, psychological resilience,) 2) academic achievement (e.g., receipt of scholastic merit, earning a high GPA, pursuing a college education) and 3) maintaining a higher
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socioeconomic status (e.g., residing in a well-resourced neighborhood, earning a high salary and income, procuring a prestigious career). Skin-deep resilience is especially evidenced in Black emerging adults who appear to be excellent at striving in the face of environmental and economic adversity signified by them growing up within communities and/or families characterized by low SES or even impoverishment (Brody, Yu, Chen, Kogan, et al., 2013; Chen et al., 2015). Though external metrics of resilience and striving are associated with a myriad of positive psychosocial and financial outcomes which support material security, it appears that the potential force which may facilitate the occurrence of skin-deep resilience is the pairing of upward mobility with the ever-present but oversaturated experiences associated with race-related stress via Black identity. The constant adaptation to covert and overt race-related stressors whilst striving to survive may compound and materialize as complex trauma in the body due to the excessive utilization of the autonomic nervous and endocrine system which may eventually deplete the cardio-metabolic health processes (Brody et al., 2013; E. Chen et al., 2019; Miller, Yu, Chen, & Brody, 2015).

*High-Effort Coping as a Metric of Striving and Upward Mobility*

The strategic and subconscious application of hypervigilance and effortful control speaks to the process of high-effort coping, which speaks to one’s capacity to consciously refrain from exhibiting certain externalized behaviors while also participating in externalized behaviors that are likely to be socially lauded and esteemed (Lin et al., 2019). This process requires an enhanced state of sensory sensitivity whose purpose is to detect threat (i.e., hypersensitization, hyperarousal, fight, or flight) (Gaylord-Harden et al., 2017; Hines et al., 2018). Generating effort towards the appropriate response to potential threats naturally follows the high alertness that comprises hypervigilance suggesting a modulated demonstration of one’s true temperament,
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emotions, affect, or personality. This is common for Black people in the U.S who refrain from
demonstrating the full scope of their personalities or individual inclinations in any given moment
simply because they are acutely hyperaware of the lens of scrutiny that is upon them. This type
of self-regulation involves a cognitive task where they must identify and rank a variety of actions
decisions that will make a statement on the behalf of themselves. As they are presenting
themselves to society, they are attempting to keep the doors of opportunity, whatever that might
be from their vantage point, from closing in their faces (DuBois, 1903, pg. 4). In many instances
this type of effortful control is initiated to overcompensate for the actual or perceived
characteristics of their Blackness, to disprove tropes and prejudices, to demonstrate and/or assert
their worthiness in various contexts, and sadly to advocate for their basic human right to live
safely and with agency.

*Academic Achievement & High SES as Proxy Metrics of Striving and Upward Mobility*

It could be implied then, that high-effort coping supports Black people in the United States to
succeed academically and economically in an effort to effectively navigate through a society
which has historically and thus systematically thwarted their efforts to gain the same academic
achievement and a high socioeconomic status as White people. Consider the concepts of “Black
excellence,” and “John Henryism” to further illustrate the implications of and utility of high-
effort coping. Complex coping through “Black excellence” and “John Henryism” calls for Black
individuals, especially Black youth to engage in sustained mental, emotional, and physical labor
in the face of deeply embedded barriers to demonstrate their capacity to accomplish noteworthy
feats of brilliance -- implying extreme exertion is required to navigate structurally racist
institutions and parameters successfully and safely (Brody et al., 2013; Hill et al., 2016; James,
1994, Miller et al., 2016). On a bleak level, academic achievement and financial gains through
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This high effort coping approach has been positioned as critical and essential to help ensure that Black individuals avoid becoming victims of racially motivated and government sanctioned exploitation, violence, and incarceration. It makes sense then why false notions of respectability, also known as “respectability politics,” are concepts which have been integrated into many culturally Black spaces in the U.S, as a way for Black people to protect themselves and each other and retain a tangible blueprint for how they can gain acceptance in society as they navigate a culture that over-values “whiteness” and the lives of white people (Pitcan et al., 2018). Respectability politics is a foundational mythos which is the direct result of racist narratives that tout the idea that Black people can earn equity in the U.S at every level and in every institution simply by regulating every aspect of themselves so that they are more palatable to a colonized and euro-centric society. In exchange for this continuous high-effort coping, they gain the opportunity to expand their horizons through the pursuit of higher education and increase their station in society by securing an esteemed and high paying job, eventually allowing Black individuals to develop widespread generational wealth as other racial ethnic groups in the U.S have. However, this is an intensely demanding emotional, psychological, behavioral, and physiological practice that White people, no matter how counterculture to the dominant representation they appear to be, are not asked to do (Berger & Sarnyai, 2015).

In their 2016 article titled “Resilience in Adolescence, Health, and Psychosocial Outcomes,” Brody et al. proposed that this glorification of Black people’s resilience is harmful because it conveniently ignores that the high levels of active coping needed to survive and attempt to secure wellbeing in society as a Black person in America, overtaxes the physiological processes of the body which leads to accelerated biological aging. One format in which this idea is evident is the idea of “Black Girl Magic” (Morton & Parsons, 2018). Black Girl Magic is a phrase that is
meant to celebrate the numerous notable and phenomenal achievements of Black women in the U.S despite the multiple levels of discrimination they face covertly and overtly. However, when one contemplates the immense effort, it takes to be “magical” in the face of horrific and despicable circumstances it offers contexts to why skin-deep resilience may be a phenomenon driving poor health outcomes for Black people in the United States.

**Implications of Skin-Deep Resilience: The Weathering Hypothesis.**

This process of accelerated mental and physical overexertion may be explained by “the weathering hypothesis.” The weathering hypothesis was initially proposed by Dr. Arline T, Geronimus, after she conducted research that was focused on understanding the physiological deterioration of African American women during early adulthood (Geronimus, 1992). The concept of weathering is essentially that the human body becomes so overburdened by chronic stress; that the physiological processes associated with regulating the endocrine system and keeping the body in homeostasis become burnt out. As a result of becoming burnt out, they no longer function optimally and fail to combat any additional forms of physical stress such as the stress of pregnancy that Dr. Geronimus initially researched, or other acute or temporary health conditions that the human body can typically withstand and recover from. Over the last couple of decades, the concept of the weathering hypothesis has eventually gained some validation by way of research on allostatic load differences among Black and White individuals in the United States (Geronimus et al., 2006; McEwen, 1998). The findings of Geronimus and colleague’s research suggest that the systematically oppressive reality of race-based discrimination are ever present chronic stressors constantly under consideration. This constant consideration is so mentally and emotionally burdensome that they produce elevated physical stress and over-utilize the body’s stress response system, which over time progressively leads to the break down the human body...
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(McEwewn, 1998; Seeman et al., 1997). As a result, the health and wellbeing of many Americans of color is deteriorated and unequipped for the stress of physical illness (Geronimus et al., 2006; Kemeny & Schedlowski, 2007; Powell et al., 2013). Weathering as it is described here has been well documented and established through decades of literature that reiterate how much more likely Black Americans are to have a greater frequency of taxed physiological processes which contributes to atherosclerosis (the build-up of fats, cholesterol, and other bio-debris). This accumulation of taxed physiological processes can indicate accelerated physiological aging that is significantly greater than one’s biological age which increases physiological vulnerability and susceptibility to illness (Liu et al., 2019; McEwen, 1998).

Measures of Weathering

The process of weathering can be measured by calculating several different types of biological data which indicate a highly dysregulated physiological state and/or accelerated epigenetic aging such as allostatic load, DNA methylation patterns, and telomere length. (Chen et al., 2019; Geronimus et al., 2006; Geronimus et al., 2015; Levine et al., 2018; Miller et al., 2015; Seeman et al., 2001). Allostatic load refers to the overstimulation and dysregulation of the various biological systems which contribute to the process of allostasis which is essential for homeostasis to occur (Geronimus et al., 2006; McEwen, 1998). It is identified through the cumulative assessment of 6 to 10 biomarkers (e.g., cortisol levels, epinephrine levels, blood pressure, BMI, cholesterol levels, glucose levels etc.,) where higher scores denote higher levels of weathering (Beckie, 2012; Robinson & Thomas Tobin, 2021). DNA methylation patterns can demonstrate when alterations or disruptions take place in the delicate process of DNA methylation leading to hyper or hypo methylation (Salameh et al., 2020). Hypermethylation occurs when unmethylated gene promoter regions in healthy cells become methylated, while
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hypomethylation occurs when CpG sites in DNA become unmethylated signifying the
dysfunction and malfunction of genes responsible for stopping disease and illness (Brown et al.,
2019; Peinado, 2011). Additionally, using methylation kits (e.g., Infinium MethylationEPIC Kit,
Illumina HumanMethylation 450 Bead Chip, etc.) profiles of combined CpG sites can
mathematically compute different epigenetic clocks, which estimate the biological age of a DNA
source (DNAm age) where older DNA compared to an individual’s chronological age suggests
accelerated epigenetic aging (Horvath & Raj, 2018; Levine et al., 2018; Miller et al., 2015).
Similarly, telomere length is determined by the delicate process of telomerase activity, where
telomeres at the end of chromosomes, that naturally shorten naturally shorten during
chronological aging, appear significantly shorter than an individual’s chronological age suggest
they should be due to a lack of reparative telomerase activity (Adwan-Shekhidem & Atzmon,
2018, p. 5; Marioni et al., 2016); Watson, 2019. Geronimus, a public health researcher by
training and practice, states explicitly that the cornerstone of eliminating racial health disparities
is to observe how the interaction of race and systemic biopsychosocial inequities “exacts a
physical price across multiple biological systems from Blacks who engage in and cope with the
stressful life conditions presented to them” (Geronimus et al., 2006).

Therefore, the weathering hypothesis as it is applied to the health disparities observed with
cardiovascular disease in Black people, could suggest that Black people in America are
particularly at risk of getting and dying from cardiovascular disease, regardless of lifestyle, diet,
physical activity, SES, and education level, because of their skin-deep resilience (Brody, Yu,
Chen, Kogan, et al., 2013). Whether they are conscious or unconscious of it, if a Black person is
compulsively practicing high-effort coping, they are more susceptible to developing the risk
factors for cardiovascular disease, having those risk factors rapidly evolve into cardiovascular
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disease, and then, unfortunately experiencing a fatality following diagnosis (Brody, Yu, Chen, Kogan, et al., 2013; Geronimus et al., 2006; Lohman et al., 2021). This hypothesis has crucial implications for researchers, clinicians, and ultimately all people in American society because it illustrates that chronic exposure to complex race-related stress invites an extreme proportion of high effort coping which may elicit undetectably elevated and overutilized physiological responses. This type of coping represents a nuanced and deeply rooted narrative which exists within the culture of Blackness in the U.S. While it has its material benefits, without some mindful and intentional revisions, this approach may be an unsustainable, counterproductive, and potentially detrimental approach to managing stress, achieving contentment, and ensuring that one lives a healthy, fulfilling, and long life (Allen et al., 2019).

Rationale

In view of the growing body of evidence on the weathering hypothesis, it is reasonable to deduce that the current lifestyle and diet change model of intervention programs and medical treatments typically utilized for cardiovascular disease is insufficient for Black people in America. There is a growing body of literature that suggests that the most successful approaches to interventions are those that contain a biopsychosocial model of health because they are optimal for effective and sustainable promotions of wellness and prevention of disease and illness in society (Hatala, 2012; Lämmle et al., 2011; Zittel et al., 2002). The biopsychosocial model is ideal because it incorporates elements of the mind-body connection with environmental and social factors to produce a contextualized and multi-disciplinary approach to wellbeing (Zittel et al., 2002). In his theory and philosophy-based research article titled, “In praise of paradox: A social policy of empowerment over prevention,” Dr. Julian Rappaport asserts that
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any approach to improving the health outcomes of a community must be done with the goal of social policy in mind (Rappaport, 1981).

Consequently, the only method for which social policy can be enacted by community-based health psychologists, dedicated to reducing health disparities such as the one observed with CVD and Black people in the U.S, is to acknowledge that new policies must not continue to be rooted in existing systems of oppression which fail to accept the dynamic intersectionality of the community approached (Rappaport, 1981). Likewise, accepting the reality of intersectionality is inherently confrontational and requires researchers to “pay attention to the mediating structures of society, i.e., those that stand between the large impersonal social institutions and individual alienated people” (Rappaport, 1981, p. 19) Thus, addressing the root cause of cardiovascular disease –chronic stress, and the disproportionately high rates of CVD risk evidenced in Black individuals living in the U.S, begins with community based prevention which address the complicatedly traumatic and chronically stressful experiences associated with Black identity in the U.S, which demand equally complex and chronic coping processes to ensure some level agency and safety.

Due to a growing pattern of findings that suggest that CVD risk for Black individuals begins as early as adolescence and tracks through adulthood even when these individuals endorse external metrics of success and resilience, it is imperative to consolidate and analyze these findings to develop an effective biopsychosocial prevention approach for CVD risk in this population (Brody, Yu, Chen, Miller, et al., 2013a; Harris et al., 2009; Stice et al., 2006). To date, there has been an increasing number of systematic reviews and metanalyses synthesizing the ways in which race-related stress is deleterious to health outcomes (Paradies et al., 2015; Pascoe & Smart Richman, 2009), the ways in which racial minority identity predicts weathering
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(Beckie, 2012; Forde et al., 2020; Hines et al., 2018), and the types of biological evidence available which corroborate the phenomenon of weathering (Guidi et al., 2021; Mathew et al., 2021). However, there has not yet been a systematic synthesis and analysis of the literature which has attempted to establish skin-deep resilience as a pathway to CVD risk for Black individuals. Understanding how external metrics of resilience endorsed by Black individuals may facilitate accelerated biological aging may prompt public health policies to consider how the systematic weathering of Black individuals in the U.S may be the underlying component driving up the disproportionate CVD outcomes observed in this population.

The first objective of this research is to establish external metrics of striving and resilience as a pathway between Black identity and elevated signs of weathering, thus explaining the phenomenon of skin-deep resilience. The second objective is to clarify the individual, developmental, and situational contexts within which skin-deep resilience is most likely to occur. The third objective is to move public health policy to action by demonstrating that the high prevalence and mortality rates of Black individuals, even at younger ages, suggest that there are other risk factors at play besides lower SES and low education levels – which are often applied through a subconscious and biased belief that to be Black in America; is to be poor and undereducated. This bias is derived from the ways in which systematic racism has informed the narratives repeated often in academic research spaces that are not informed by intersectionality, feminism, critical race theory, cultural competency, or diverse perspectives. educational and research contexts with a subconscious bias that to be Black in America is to be poor and uneducated. there is an over-relied upon attribution of lower socioeconomic status and lower education levels as the underlying reasons for any disproportionately high prevalence and mortality rates of CVD observed in Black people living in the U.S. Findings from a study
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Conducted by Geronimus and colleagues published in 2006 reported results showing that “poor Whites were less likely than nonpoor Blacks to have high scores” on a robust measure of allostatic load utilizing 10 biomarkers (Geronimus et al., 2006). Conducting a systematic review and meta-analysis on the extant literature may provide findings which corroborate that pattern, thus signaling a dire need for a shift in attention and priorities as it pertains to CVD prevention and intervention efforts for Black people. The current study seeks to understand the different patterns of weathering if any among Black people who endorse more elements of striving and upward mobility when 1) compared to Black people with less endorsement of those elements, and 2) when compared to individuals from other racial/ethnic groups.

Paying attention to this potentially potent type of complex coping that Black individuals may consciously and unconsciously rely on to endure through socio-political strife in the absence of a racially just and equitable society, may be a core component for drastically changing the devastating trajectory of CVD in the United States. Not only does understanding the process of skin-deep resilience allow for other biomedical interventions focused on lifestyle changes to become more effective and helpful for this population, but it may reduce the reliance on costly pharmaceuticals and medical procedures which are ineffective due to inaccessibility, low adherence, and their tendency to mask symptoms instead of healing them – sometimes causing other medical issues via side effects in the process. The existing epidemiological research demonstrates the critical need for the development and implementation of effective prevention programs which capture the multifaceted biopsychosocial components contributing to elevated health risks for Black people. Efforts that truly desire to eradicate health disparities in CVD must reorient their focus towards examining “how the levels, timing and accumulation of institutional and interpersonal racism combine with other toxic exposures, over the life-course, to influence
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the onset and course of illness” thus thwarting other efforts designed to boost CVD health outcomes in this population (Williams et al., 2016, p. 406).

Research Aims and Hypotheses

Aim I: Validate the paradoxical process described by the phenomenon of skin-deep resilience by exploring how external metrics of striving, resilience, or upward mobility are associated with physiological indications of weathering among Black individuals living in the U.S.

Hypothesis 1: Physiological indications signifying the occurrence of weathering will be present among Black individuals who endorse external metrics of resilience, striving, or upward mobility.

Hypotheses 1.1: Physiological indications of weathering will be more elevated and/or more prevalent among Black individuals who endorse more external metrics of striving, resilience, or upward mobility when compared to Black individuals who endorse fewer or none of those metrics.

Hypothesis 1.2: Physiological indications of weathering will be more elevated and/or more prevalent among Black individuals who endorse more external metrics of striving, resilience, or upward mobility when compared to non-Black individuals who endorse those same metrics, fewer metrics, or none of those metrics.

Aim II: Determine the overall effect of external metrics of resilience, striving, and upward mobility on physiological indications of weathering in Black individuals living in the U.S.

Hypothesis 2: External metrics of resilience, striving, and upward mobility will have a strong and positive association with elevated Weathering levels.

Aim III: Clarify the individual factors and situational contexts for when skin-deep resilience occurs in Black individuals living in the U.S by identifying covariates which mediate or
moderate the association between external metrics of striving, resilience, or upward mobility and physiological indications of Weathering.

**Hypothesis 3:** The external metrics of high effort coping, and academic achievement will be more positively associated with physiological indications of weathering when Black individuals come from lower socioeconomic backgrounds.

**Hypothesis 3.1:** Black individuals who identify as female/a woman will have greater prevalence and/or increased levels of weathering than Black individuals who identify as male/a/man.

**Methods**

**Literature Search Strategy**

The current study followed the established guidelines for systematic reviews and meta-analyses outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses shown in the PRISMA flow diagram depicted in Figure 1. Each of the studies included in the current systematic literature review was found by searching in the databases PubMed-Medline, EBSCOhost, APA PsychINFO, ProQuest, Academic Search Complete, ERIC, and CINHAL. The search terms and key words used for the search strategy included synonyms and related research terms for the concept of external metrics of resilience such as, but not limited to “effortful-control,” “self-control,” “academic achievement,” “high-effort coping,” “john-henryism” and “high-income.” These terms were combined with synonyms and related research terms for the concept of weathering, such as “allostatic load,” “telomere length,” “epigenetic age,” and “biological aging.” All terms were searched with terms related to Black people in the United States such as, but not limited to “African Americans,” “Black Americans,” and “Black youth.” The specific singular and mesh search terms, keywords, and search strategies that were used for
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Each database can be viewed in detail in Appendix A. Articles included for review were peer-reviewed articles published in scientific journals or dissertations that were published in Proquest to be inclusive of unpublished or non-significant data to account for publication bias.

**Inclusion Criteria**

For a research study to be included in this systematic review and mini meta-analysis, it had to meet the following criteria: (1) Studies must be published between the years of 1992 to 2021 because the year 1992 is when Dr. Geronimus first coined the term weathering. (2) Study samples must include individuals who identify as Black or African American, who live in the United States of America. (3) Studies with multi-racial samples must report outcome data on the variables of interest as they occurred in the Black participants separate from other participants in the sample. (4) The study must examine how variables which map onto the characteristics of external metrics of upward mobility and resilience (i.e., high-effort coping, resilience, self-control, self-regulation, effortful control, John Henryism, high-income, high SES, academic achievement, high education level) are associated with variables of established measures of weathering (i.e., Allostatic Load, DNA Methylation, Telomere Length). (5) Studies are produced in English. (6) Studies are peer-reviewed journal articles, doctoral dissertations, or master’s theses. (7) Studies included in the mini meta-analyses must report results that allow for effect size and direction of effects to be calculated such as bivariate correlation coefficients.

**Exclusion Criteria**

Studies that were not eligible for review in this current study were: (1) Studies published before the year 1992. (2) Studies that did not include a sample of Black individuals who live in the United States of America. (3) Studies that did not measure variables indicating external metrics of resilience as they are associated with weathering. (4) Studies that only measured other
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psychosocial and biological outcomes not of focus (i.e., depression, anxiety, parenting style, birth weight, diabetes, hypertension, BMI, obesity, asthma, sleep patterns, kidney health, etc.) (5) Studies that do not include outcome data which are adequate measurements of weathering: (i.e., biological age, allostatic load, epigenetic aging). (6) Studies that are not produced in English. (7) Studies that are not peer-reviewed journal articles, doctoral dissertations, or master’s theses. (8) Studies which are case studies. (8) Studies which are systematic reviews or meta-analyses. (9) Studies where the association between metrics of resilience and weathering were analyzed indirectly between different study participants (e.g., youth telomere length based on caregiver’s high-effort coping, or caregiver’s salary alone determining youth’s allostatic load.) (9) Studies with duplicate data (i.e., dissertations that published the same data in a peer-reviewed journal on a later date). (10) Studies where significant or insignificant results concerning the variables of interest were described without the statistical notation available. For example, “While AL score distributions differed for race, gender, and IPR subgroups, tests for interactions between NSES and gender, race/ethnicity, and IPR were not significant (analyses not shown)” (Bird et al., 2010, p. 862).

Coding Process and Study Selection

After creating the inclusion and exclusion criteria and establishing the systematic literature search strategy, the author trained two research assistants on how to screen articles using the criteria. The author conducted the initial broad literature search on each of the databases. The initial search in each database filtered the results to include articles published after 1991, peer-reviewed articles or dissertations/master’s theses, articles written in English, and research focused on human subjects. Information from articles pulled from the initial search such as the article titles, DOI numbers, author names, and name of journal published in, were stored in
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an excel database Appendix D. Derived from this initial search, research assistants were given one article that did not meet the inclusion criteria (Allen et al., 2019) and one seminal article that did meet the inclusion criteria (Brody, Yu, Chen, Miller, et al., 2013b) to practice applying the inclusion/exclusion criteria. The author then met with the two research assistants to review their decisions and rationale on the assigned articles to ensure they were competent and effective in their screening abilities. Following that, the research assistants screened the titles and abstracts of the remaining articles in the initial database included by the author. Articles with titles and abstracts which appeared to meet the inclusion criteria were highlighted in the database and notes were provided for the excluded articles. The author then reviewed the excluded article notes and then read the full texts of each highlighted article to determine if they met the inclusion criteria specific to the 1) the operationalization of the variables being examined, 2) the type of outcome data provided in each study, and 3) the study design. The author then created a new database with the articles whose full text appeared to meet the inclusion criteria, along with notes about why each article was accepted or rejected for the systematic review. The author then shared this database with the research assistants to review each accepted study along with the associated notes from the author. Finally, a consensus meeting was held to discuss any discrepancies in the coding decisions between the author and the research assistants and the final articles selected. After the final list of studies was solidified, the author determined which studies would be utilized for a mini-meta-analysis based on which articles provided data which allowed for an effect size to be calculated.

Data Analysis

Data Extraction and Synthesis
The current study extracted data from each article to synthesize the association between variables relating to external metrics of resilience and variables relating to weathering in Black people living in the United States. Data were identified from each article and recorded into a database housed in Statistical Package for the Social Sciences (SPSS) (IBM Corp., 2017). Descriptive statistics were run to analyze and observe the characteristics and features of the data across each study. The data selection, extraction, and organization process for each study included in the systematic review was informed by the Matrix Method developed by Judith Garrard (Garrard, 2020). The database columns were organized by the following information: article citation, title of the manuscript, year of publication, publication source, dataset source (e.g., National Health and Nutrition Examination Survey (NHANES), purpose of the study, study design, geographic location of the sample, demographic characteristics of the participants, number of Black participants analyzed, measures used to assess skin-deep resilience, measures used to assess weathering, analytical approach, and the overall association between variables of skin-deep resilience and variables of weathering.

**Computing Effect Size for the Meta-analysis**

The objective of this synthesized analysis was to examine the relationship between external metrics of resilience, striving, and upward mobility and physiological indications of weathering as exhibited among Black individuals. Therefore, the overall true effect size of the studies included in the metaanalysis, as indicated by \( r \) was used to contextualize the magnitude, strength, and direction of the relationship between variables (Card, 2012; Ellis, 2010). Inclusion in meta-analyses across studies required that results of a study reported data necessary for computing correlation coefficient effect size. Eligible data were entered, computed, and analyzed through the Comprehensive Meta-Analysis Software (CMA) v. 3 (Borenstein, Higgins, &
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Rothstein, 2009; Card, 2012). Due to the novelty of the constructs measured, the different
developmental stages of participants in this review, and the different approaches used to analyze
the association between variables, a random-effects model was applied to account for
heterogeneity. A random effects model considers the varying research design factors and
covariates such as sample size, participant age, education, and gender contributing to effect size,
which may be unknown to researchers (Borenstein, 2009; Cooper, 2022). This approach also
assumes that the effect sizes of each study fall into a normal distribution (Borenstein et al.,
2009). Accordingly, a confidence interval of 95% was applied (Field & Gillett, 2010).

Results describing the relationship between the variables of interest indicated whether
there was a direct or inverse association and the strength of that association. Attention was paid
to the various data arrangements across studies to ensure the accurate computation and
interpretation of the effect sizes used to compute the overall effect size for the meta-analysis.
Generally, results indicating higher levels of weathering among Black individuals who endorsed
more external metrics of resilience, striving, and upward mobility were represented by positive
correlation coefficients, and results indicating higher levels of weathering among Black
individuals with less external metrics of resilience were represented by negative correlation
coefficients. Since the unit of analysis in a meta-analysis is effect size based on levels by study,
power is a lesser problem in this method of research, than in primary research methods (Shadish
& Sweeney, 1991). For that reason, the number of articles needed to conduct this meta-analysis
was not predetermined due to extant research on meta-analyses stating that theoretically, only
two studies are “needed” for a meta-analysis to have appropriate statistical power (Valentine et
al., 2010).
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The scope of the research question and the measurement of the variables examined within this systematic literature review and meta-analysis exhibited a high degree of variability regarding how the different metrics of resilience and weathering were assessed and analyzed. Therefore, to narrow the range of analysis, the decision was made to focus the meta-analysis on external metrics of striving and weathering as observed among Black individuals only and to focus on one physiological indicator of weathering (i.e., allostatic load, telomere length, or DNA methylation patterns). A frequency analysis of physiological indicators across the articles indicated that allostatic load was the most utilized measure represented in 13 different articles and so all eligible data reflecting allostatic load as the primary outcome of weathering were included in the meta-analysis.

Results

Systematic Literature Search Outcome

The initial search of the identified databases was conducted in early June of 2021. After applying the relevant search filters for year of publication, type of publication, articles published in English, and articles focused on human subjects, the search yielded 333 articles. After identifying and removing duplicate articles, the total number of articles whose titles and abstracts were entered into the database was 282 articles. After briefly screening the titles and abstracts of the articles for topical relevancy, the research assistants determined 197 articles were appropriate for deeper screening for inclusion criteria and exclusion criteria. Following deeper screening, the number of articles meeting inclusion criteria that they pulled to be reviewed in full text by the author was 32 articles. While searching for the full text of one article on the LibrarySearch database at DePaul University (the author’s affiliated institution) search results generated from using the article’s title, yielded article titles which appeared to have topical relevancy and
potentially fit the inclusion criteria of the current study. The author sent the results of that search (153 articles) to the research assistants to screen the titles and abstracts for additional articles which might be eligible for full-text review. The research assistants determined that 17 articles from the DePaul University Library database were eligible for full text review. In total, the author reviewed 49 articles in their full text. The final number of articles which the author and research assistants conducted consensus coding on was 21 studies. Of those 21 studies, the coding team determined that 18 studies were eligible for the systematic review. Each article selected for systematic review tested the relationship between predetermined characteristics which assessed the association between skin-deep resilience and physiological indicators demonstrating the evidence and severity of weathering as observed in samples of Black individuals living in America. Articles were excluded from the current study for a variety of reasons including, but not limited to, having samples outside of the United States, not including a comparison group, not measuring a physiological outcome that accurately predicts the process of weathering, not measuring external metrics of resilience or striving, not providing outcomes for Black participants independent of other ethnic minority groups, and for not containing empirical data. A database containing the titles and authors of the studies reviewed in their full text with corresponding reasons for inclusion or exclusion can be found in Appendix E.

**Study and Participant Characteristics.**

*Instruments Indicating Weathering*

Since numerous publications included in this systematic review analyzed participants sourced from the same larger study datasets, the descriptive data described is at the level of the articles, not at the level of the studies. Several articles sourced data from overlapping years from the National Health and Nutrition Examination Survey (NHANES) (N = 4). A few articles
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sourced data from overlapping years from the Strong African American Families Healthy Adult Panel (SHAPE) (N = 3), two articles derived data from the Healthy Environments Partnership (HEP) during overlapping years, and two articles derived data from the National Longitudinal Study of Adolescent to Adult Health. This decision likely indicates that participant data across the 16 studies is counted multiple times which is a limitation of the current study.

The final manuscripts included in the systematic review were published between the years of 2009 - 2021, with most articles being published in 2019 (27.8%), and 2015 (22.2%). Peer-reviewed journal articles reflected most of the manuscripts (83.3%) while the only non-peer reviewed manuscripts were dissertations (16.7%). The smallest sample analyzed across the different studies conducted across the articles was 44 participants and the largest sample was 8,267 participants ($M = 1,577$). Ages of participants at baseline or initial timepoints analyzed ranged from ages 11 - 50 ($M = 22.6$) where the oldest age of a participant at a follow up assessment was 79 years old ($M = 47.9$). At initial timepoints, 44.4% of studies focused on a co-ed sample of adults (ages 18 and up), 11.1% focused on early adolescents (ages 11 - 13), 11.1% focused on older adolescents (ages 14-17), and 16.7% focused on emerging adults (ages 18 - 23). Two of the 16 articles had samples comprised entirely of Black adults identifying as Women, one article had a sample of Black adults identified as men, and two studies focused on elder Black adults over the age of 40. Only one article consisted of an entire sample of participants with an established health condition (HIV +). Across all the Black participants included in this systematic review, Black women ($M = 1,039.63$) were represented more than Black men ($M = 895.35$) across the study samples described in the articles.

Allostatic load (AL) was the most common metric of weathering utilized across studies ($N = 13$), followed by DNA Methylation Levels (DNAmAge) ($N = 3$) and then Telomere Length
SKIN-DEEP RESILIENCE AND WEATHERING (TL) (N = 2). Regarding external metrics of success, higher SES as an adult participant’s endorsement of upward mobility was measured across six of the 18 articles. SES as an indicated by an adolescent participant’s family income, caregiver SES, or neighborhood SES was assessed as a potential mediator or moderator variable, or a main effect or interaction effect variable within five articles and it was assessed as a covariant in adult samples within two articles. For this systematic review, when articles analyzed adolescents and emerging adults, SES was not considered as an individual endorsement of striving, resilience, or upward mobility unless it specified the adolescent’s own earned income. High effort coping and academic achievement were also both measured across six articles respectively, as the external metric of striving and resilience. The association between Higher SES and allostatic load (AL) was evaluated the most times and the association between academic achievement and telomere length (TL) and academic achievement and DNA Methylation patterns indicating epigenetic aging (DNAmAGE) were both assessed the least, equally appearing in one study each, across the 18 articles reviewed. Across the 18 studies, allostatic load scores were calculated by summing anywhere from five to 14 biomarkers. Four studies utilized a summed score of 10 biomarkers in their operationalized assessment of AL (Fazeli et al., 2020; Geronimus et al., 2006, p. 200; Howard, 2014; Robinson & Thomas Tobin, 2021), four studies utilized a summed score of six biomarkers in their measurement of AL (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013b; Chen et al., 2015; Johnson, 2018), two studies summed 14 biomarkers (Geronimus et al., 2020; Merkin et al., 2009) and the remaining studies used nine biomarkers (Wickrama et al., 2016), seven biomarkers (Forrester et al., 2019), and five biomarkers (Sims & Coley, 2019). Overall, the minimum number of biomarkers used was five, the maximum was 14 and the average number of biomarkers used was 8.69 to determine AL.
DNA Methylation Levels as the primary method of measuring weathering, was reflected by three different DNA Methylation epigenetic clocks; DNAmAge (Brown et al., 2019), Levine DNAmAge (Liu et al., 2019), and Horvath’s Clock & Hannum’s Clock. The different mechanisms of each of these epigenetic timekeeping methods are thought to measure the same “latent concept” however they vary in their appropriateness in addressing a “specific study aim” which suggests that best future practices measuring DNA Methylation Levels should be comprised of “multiple [epigentic] clocks” (Liu et al., 2019, p. 19). As for the two studies utilizing telomere length as the primary method of measuring weathering, both studies assessed the length of telomeres where shorter telomeres were indicative of accelerated biological aging, thus signifying weathering.

**Instruments Indicating External Metrics of Resilience, Striving, and Upward Mobility**

Measures which aligned with the operational definition of external metrics of resilience, striving, and upward mobility are those which fell into the categories of either high-effort coping, academic achievement, or higher SES. The various measures used to assess high effort coping across the 18 studies included measures of psychological resilience, problem-solving coping strategies, self-control, self-regulation, John Henryism, and competence. Measures of high-effort coping were primarily self-report, with a few studies utilizing teacher and parent report surveys instead of or in addition to self-report surveys. The proxy variable of socioeconomic status was measured in a variety of ways including financial characteristics of participant’s neighborhood, gross annual income, prestige of job, home ownership status, median household income, or receipt of public assistance.

Most studies represented across the articles reviewed in this study created an index of SES or a composite SES score based on a combination of several variables, except for a few
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studies which only utilized poverty income ratio (PIR) as the singular measure of SES--where being above the PIR was operationalized as Higher SES. Higher SES was reviewed as a variable influencing the association between striving and weathering to contextualize patterns demonstrating when skin-deep resilience occurred and when it did not occur only when it was not described as the main metric of upward mobility within the study, but rather as a covariate or a descriptive of the sample demographic. Measures of the proxy variable of academic achievement were mostly determined by level of education, where academic achievement was usually classified as having a high school diploma, attending college, graduating college, or earning a graduate degree. In a few studies, GPA was utilized as a measure of academic achievement.

Aim I. Validate the paradoxical process of skin-deep resilience

H. 1. Weathering is present among high striving Black individuals

H. 1.1. Weathering is elevated in high striving vs. in low striving Black individuals

The results of the systematic review yielded 15 articles which examined patterns of weathering between Black people who endorsed more external metrics of resilience and upward mobility and Black people who endorsed less metrics of resilience and upward mobility (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013b; Brown et al., 2019; Chen et al., 2015; Fazeli et al., 2020; Forrester et al., 2019; Geronimus et al., 2006, 2015, 2020; Howard, 2014; Johnson, 2018; Merkin et al., 2009; Miller et al., 2015; Robinson & Thomas Tobin, 2021; Watson, 2019). Of note is that the same participants from a larger study were evaluated in several different articles, but across those articles different variables were explored and different analyses were performed, all of which met the inclusion criteria for the current study. Those duplicated participants are over 450 adolescents from rural South Georgia who
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were enrolled in the Strong African American Families Healthy Adult Panel (SHAPE) study who were analyzed in three articles (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013b; Chen et al., 2015) and over 200 adults from Detroit who were enrolled in the Healthy Environments Partnership (HEP) study who were analyzed in two different articles (Geronimus et al., 2015, 2020).

In one of the studies involving the SHAPE participants, published by Brody and colleagues, a latent profile analysis was conducted by evaluating 489 Black adolescents on their allostatic load, their psychosocial adjustment to society, their SES level, their self-regulation skills, and their genotype at the 5-HTTLPR (Brody, Yu, Chen, Kogan, et al., 2013). Five profiles emerged from the data. Profile one had the most membership ($n = 151$) and consisted of adolescents with low SES who endorsed good psychosocial adjustment, and high AL. Profile two consisted of adolescents with low SES good psychosocial adjustment, and low AL ($n = 115$). Profile three had the least membership, ($n = 46$) and consisted of adolescents with low SES, poor psychosocial adjustment, and high AL. Profile four consisted of youth ($n = 63$) with average SES, poor psychosocial adjustment, and low AL. Finally, profile five consisted of youth with higher SES, good psychosocial adjustment, and low AL ($n = 114$). Multinomial logistic regression analyses revealed significant positive associations between membership in profiles one and two and teacher ratings of high levels of self-regulation skills whereas high levels of planful self-regulation skills were not associated with youth membership in profiles three and four. All profiles wherein Black adolescents were rated with high-self regulation skills (profiles one and two) are indicative of adolescents who endorsed external metrics of high-effort coping. All profiles wherein Black adolescents had high allostatic load (profiles one and three) are indicative of adolescents with physiological indications of weathering. Results from this study
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show that the profile with the most adolescents was profile one, which describes a group of youth demonstrating skin-deep resilience \((n = 151)\) indicated by their high self-regulation skills and their allostatic load scores which were significantly higher than profiles two and five. However, there was no distinction between the high AL levels calculated in adolescents from profile one who were low SES, had high self-regulation and good psychosocial adjustment and adolescents from profile three who were also low SES, but had low-self-regulation, and poor psychosocial adjustment. Likewise, of the adolescents who could have demonstrated skin-deep resilience, 43% of them did not, indicated by their low AL scores which were indistinguishable from the low-risk adolescents with higher SES in profile five. Notably, the covariates which contextualized the significantly different AL outcomes between the adolescents in profiles one and the adolescents in profile two was that those adolescents in profile one reported having less social support and their 5-HTTLPR genotype carried the short allele version, which extant literature suggests as being significantly associated with anxious and neurotic psychological traits (Martínez et al., 2020). In another study published by Brody and colleagues containing these same participants, findings provided further context on variations in allostatic load outcomes (Brody, Yu, Chen, Miller, et al., 2013b). While self-regulation and allostatic load had an insignificant and negative correlation, high AL was significantly associated with having low SES and high self-regulation skills, whereby allostatic load was not associated with self-regulation when adolescents were higher SES. In the third study involving this sample conducted by Chen and colleagues, participants were evaluated several years later at age 20, and results revealed that Black adolescents from low SES neighborhoods who ended up attending college displayed significantly higher AL at age 20 than Black adolescents, also from low SES neighborhoods who did not attend college. The results from the third analyses of this cohort
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suggests that skin-deep resilience occurred for Black adolescents endorsing the external metric of academic achievement. The overall results from these three articles which examined this cohort suggest that the process of skin-deep resilience may be more likely to occur in Black emerging adults who practice high effort coping whilst having a genetic predisposition to anxiety and/or having limited social support to rely on outside of their immediate family members. Additionally, skin-deep resilience may occur more often in Black emerging adults who come from neighborhoods or families characterized by lower socioeconomic status, but who engage in high effort coping or attend an institution of higher learning.

In the two articles by Geronimus and colleagues involving the adult participants from Detroit, Michigan enrolled in the Environments Partnership (HEP) study, individuals were analyzed on two different physiological indicators of weathering between the two studies. In the first study published in 2015, base pairs of telomere length were regressed on socioeconomic status. Due to the predominance of poverty in the sample, SES was operationalized as living above or below the poverty income ratio (PIR). Results revealed that for Black individuals, living below the poverty level had a negative, but insignificant association with longer telomere length. Similarly, in the second study of the entire sample of Black participants evaluated, 60% of those who lived below the PIR had clinically high levels of AL compared to only 40% of those who lived above the PIR. Additionally, more Black people who lived below the PIR had higher mean scores of AL than Black people who lived above the PIR. The findings from these studies suggest that skin-deep resilience did not occur within this sample because Black adults with a lower SES presented more signs of weathering, though not statistically significant, as was revealed through their shorter telomere lengths and higher allostatic load mean scores than Black people endorsing the external metric of upward mobility.
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From the 10 remaining articles which examined how external metrics of resilience were associated with physiological indications of weathering among Black people, there were four articles published between the years of 2015 and 2021 which examined variables or striving which aligned with high-effort coping. In 2015, Miller, Chen, and Brody found that the process of skin-deep resilience was represented in Black youth upholding high levels of self-control but only when they endorsed a lower SES background. Secondary analyses supported initial findings by showing that Black youth who had lower socioeconomic statuses and who endorsed high self-control had significantly more accelerated epigenetic aging than Black youth with low or moderate self-control, as was indicated by Horvath and Hannum’s Clock calculations generated through DNA methylation profile values (Miller et al., 2015). In 2019, Brown and colleagues examined how a sample \((n = 120)\) of Black mothers varied in DNA methylation levels based on their preferred coping approach in response to a high accumulation of stress. The coping strategies evaluated in the study were problem-solving, seeking out social support, and avoiding the problem. Based on a brief review of the 33 item Coping Strategy Indicator, the 11-item problem-solving subdomain was designated the best metric of high effort coping. Initially, researchers of this study of Black mothers found the problem-solving response to stress to be significantly associated with 66 /1745 CpG sites across 25 genes of interest but when statistical corrections were applied to account for multiple analyses, no significant associations were found for problem-solving, or any other coping styles evaluated (Brown et al., 2019). Furthermore, no significant associations were found for the problem-solving coping strategy and the methylation patterns of any of the 25 candidate genes. While the results from this study suggest that skin-deep resilience did not occur, the authors describe several methodological limitations regarding their statistical approach –citing that human genomic research conducted as they did is inclined
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to “Type II error, leading to an underreporting of statistically significant associations” (Brown et al., 2019, p. 6).

In 2020 Fazeli and colleagues conducted research with 81 Black participants who were over the age of 40 and who were living with HIV. This is the only article in the systematic review in which the participants analyzed had a documented chronic health condition. Correlation analyses between the construct of psychological resilience, measured by the Connor Davidson Resiliency Scale, and allostatic load, measured by five biomarkers, revealed a significantly negative association between the variables, conveying that less endorsement of psychological resilience was associated with higher allostatic load scores. While these findings do not affirm that skin deep resilience occurs for Black individuals who implement high effort coping through enacting psychological toughness, the correlation coefficient between psychological resilience and allostatic load in this sample was identical to the correlation coefficient between psychological resilience and C-reactive protein (rho = 20.27, \( P = 0.02 \)). Since high C-reactive protein observed in the blood is a sign of inflammation in the body and increased levels of CRP has been found to be significantly associated with an HIV positive status within individuals – HIV status may influence this sample’s AL score just as much as or more than external metrics of resilience do (Lau et al., 2006). Finally, in 2021, Robinson and Thomas Tobin studied 627 Black adults to evaluate how the construct of John Henryism was associated with allostatic load. The study analyzed how participant’s responses to a 12-item self-report measure of John Henyrism were related to allostatic load, as indicated by 10 biomarkers. Results demonstrated that individuals with moderate levels of John Henryism had 25% higher allostatic load scores than individuals with low levels of John Henryism (JH). After adding variables for age, marital status, SES, and gender in model two, the initial findings remained in addition to
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new results signifying 19% higher allostatic load scores among individuals with high JH than among individuals with low JH. Like previously discussed findings, there was a significant interaction effect for John Henryism and socioeconomic status. Moderation analyses revealed that AL scores were highest for those with moderate levels of JH and either low SES or high SES. For individuals falling within an average SES bracket, AL scores were not significantly different across levels of John Henryism. Post-hoc analyses of this model revealed that the indicated that differences in AL by JH and SES level were mostly facilitated by participant education status where college graduates with high JH had the highest AL and those with high school level education or lower were most associated with moderate JH (Robinson & Thomas Tobin, 2021). Overall, two of the four studies support the theory of skin-deep resilience.

Findings also suggest that Black individuals exhibiting high levels of high effort coping experience skin deep resilience the most when they are from low socioeconomic statuses. Across these four studies, weathering was most identified when measured by the physiological indication of allostatic load rather than when measured by DNA methylation patterns.

There were three dissertations included among the studies examining differences in weathering between groups of Black people with and without external metrics of upward social mobility and resilience. In a 2019 dissertation by Watson, which studied the telomere lengths of 44 young Black men ages 18 to 26, attending a prestigious university, 30% of the sample had subjectively shorter telomeres than what is expected of people their age. Based on previously conducted studies on telomere lengths with large national samples, the shorter telomere lengths observed among this sample of collegiates, were equivalent to the telomere lengths of people double their age. Additionally, 16% of the sample exhibited telomere lengths which were even shorter than the telomere lengths of a comparative sample of multi-ethnic women over 40, who
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were breast cancer survivors. The telomere lengths of these Black male participants are notable because of their young adult status and telomere lengths; despite all participants passing a health screener for past and current major illnesses. However, Watson noted that the participants within his study could still be neatly categorized by individuals with relatively shorter telomere lengths (RSTL) and individuals with relatively long telomere lengths (RLTL). The demographic results of the participants revealed that over 50% of the Relatively Shorter Telomere Length (RSTL) group had parental household incomes below the national average ($50,000 annually) compared to only 21% in the long telomere group suggesting that skin-deep resilience is occurring more for high achieving Black men who come from lower income families. The second dissertation was completed by Johnson in 2018 and it examined education levels of Black adults and their odds ratios of having a high allostatic load score. Results showed that there was no statistically significant difference between Black individuals who had gone to college and those who did not. Notably, Black men who had a college degree had a higher mean score for allostatic load than Black women with a college degree did. The third dissertation was from Howard in 2014 where the results revealed that Black people with an undergraduate college degree or higher, had less association with high allostatic load than Black people with only some college, high school diploma, or less than a high school diploma. Therefore, across these three dissertations where academic achievement was evaluated as facilitators of weathering, findings indicated that higher academic achievement only significantly affected weathering levels when individuals came from a lower socioeconomic status background, as demonstrated by Watson’s dissertation results from 2019.

Two of the three remaining articles compared patterns of weathering between Black people by upward mobility examined participants from the National Health and Nutrition
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Examination Survey (NHANES) across different years and waves (Geronimus et al., 2006; Merkin et al., 2009). The variable signifying resilience or upward mobility examined in each of these articles from the NHANES dataset was higher socioeconomic status. The results across each of these articles using NHANES samples of Black individuals indicated that lower SES was associated with higher levels of weathering (allostatic load) suggesting that higher SES did not facilitate skin deep resilience between Black people. The final study utilized a sample of Black participants from the Coronary Artery Risk in Young Adults (CARDIA) study; however, it generated the same conclusions derived from the articles examining samples of Black people from the NHANES dataset (Forrester et al., 2019).

H 1.2. Weathering is elevated in high striving Black individuals vs. non-Black individuals

To further contextualize how the process of skin-deep resilience occurs in Black individuals, results from the articles included in the systematic review were evaluated for differences in weathering status between Black individuals and individuals from other racial/ethnic groups. The results of the systematic review yielded eight articles, which examined patterns of weathering between Black people and their non-Black counterparts who endorsed those same elements (Forrester et al., 2019; Geronimus et al., 2006, 2015, 2020; Howard, 2014; Liu et al., 2019; Sims & Coley, 2019; Wickrama et al., 2016). Of these eight articles, five of them also examined weathering levels between Black individuals according to external metrics of resilience and upward mobility.

Within these eight articles, three of them were published by Geronimus and colleagues. In the 2006 article utilizing the NHANES dataset reflective of a national sample, results of odds ratio analyses revealed that White individuals who lived below the poverty income ratio had less likelihood of having high allostatic load scores than Black individuals who lived above the
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poverty income ratio. Additionally, among Black and White women who lived above the poverty income ratio, Black women had twice the relative odds of having high allostatic load as White women. When non-poor Black women were 55 and older, their odds of high allostatic load increased to five times as likely than that of non-poor White women of the same age rage. Alternatively, among the multi-ethnic sample observed in the (HEP) study, White individuals living in Detroit endorsed the highest rates of allostatic load. when compared to Black and Mexican individuals (Geronimus et al., 2020). Additionally, Black individuals in Detroit had the lowest percentage of high allostatic load overall. Nevertheless, while White individuals had the highest allostatic load rates across ethnic groups in this study, Black people with a higher socioeconomic status had higher mean scores of AL than Mexican individuals with a lower socioeconomic status (Geronimus et al., 2020). In the same sample, when weathering was measured by the physiological indicator of telomere length, results stratified by socioeconomic status revealed that while Black individual’s on average, had shorter telomere lengths than White and Mexican individuals, the differences in lengths were not statistically significant (Geronimus et al., 2015). In fact, the greatest difference in telomere lengths as observed in Geronimus’ examination of Detroit residents was found between lower and higher SES White individuals. In reflection of the weathering patterns observed across the ethnic groups stratified by SES in these three studies, Geronimus and colleagues note that these results may have varied by geographic location. Drawing upon the dramatic contrast in allostatic load scores observed among Black and White individuals within the national sample of the NHANES cohort compared to the Detroit sample from the HEP study, Geronimus asserts that the uniquely pervasive characteristics of poverty experienced by the entire population of individuals in the city of Detroit could and should be considered in these weathering outcomes. Consequently, these variations in
determining what it means to be poor across the U.S directly impacts the way that SES is measured and evaluated within research objectives. In the case of Detroit, Michigan where the determined markers of poverty are dramatically low outliers among the national distribution, radically different definitions of “higher SES” or “lower SES” may emerge thus distorting possible implications. Accordingly, Geronimus and colleagues encourage a critical lens of interpretation where it is understood that the gap between being “non-poor” or “poor” in Detroit may not be that varied environmentally for Black individuals but may indicate vastly different ecological experiences for White individuals.

In Forrester and colleague’s study utilizing CARDIA data, Black participants overall, demonstrated more instances of accelerated biological aging, whereas White individuals overall demonstrated more instances of lower biological aging compared to their chronological age. However, when SES was introduced to the analyses of these variables, Black participants with higher SES demonstrated lower weathering levels than Black participants with lower SES, suggesting that higher SES was a protective factor for the Black individuals in this study and that skin-deep resilience was not endorsed. Alternatively, this significant relationship between SES and weathering was not found for White participants. Discussion of the results included in this article suggest that while these findings contradict the “documented diminished return concept” proposed by the skin-deep resilience theory, further sensitivity analyses indicate that there are possible skews in the data due to the White participants in the sample having a disproportionately higher SES than the Black participants leading to a “threshold effect” for the impact of SES on weathering (Forrester et al., 2019, pp. 6-7). Wickrama and colleagues cosign the implications of these presumed threshold effects as depicted in their findings exploring the relationship between earned income and allostatic load between racial ethnic groups (Wickrama
SKIN-DEEP RESILIENCE AND WEATHERING et al., 2016). They found that Black emerging adolescents earned significantly less income than every other racial ethnic group analyzed and likewise they endorsed statistically significantly higher AL scores than all other racial ethnic groups, suggesting that elevated allostatic load is significantly related to lower SES (Wickrama et al., 2016).

All articles discussed thus far, which examined weathering levels between racial/ethnic groups, analyzed the metric of high SES as the element of upward mobility and resilience. However, the three remaining articles examining this pattern analyzed academic achievement as the external metric of striving and resilience. Results from these three articles indicated that Black individuals who endorsed high academic achievement had significantly more signs of weathering than their non-Black counterparts. In results generated from Liu’s 2019 article which analyzed 1,834 older women, higher education was significantly related to lower epigenetic age, indicated by calculating the DNAmAgeAccel (biological aging after accounting for chronological age) of participants (Liu et al., 2019, pg. 20). However, for Black women (n = 605), there was no reduction in epigenetic age observed. Conversely, for Black women in this study, having a college degree predicted the most accelerated epigenetic aging. Likewise, evaluations of race and education level across ethnic groups showed that being a Black woman was equally as indicative of increased biological age as having a low education level was. Similarly, Sims and Coley’s 2019 study found that while non-Black young adults with college degrees consistently endorsed lower AL than their less educated peers, the same was not true for Black young adults. On the contrary, Black young adults who had a college degree had significantly higher mean scores of AL than non-Black young adults with a college degree. Researchers of this study hypothesized that highly educated participants who came from higher SES backgrounds would demonstrate stronger and more positive associations between their
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education status and their health outcomes. However, results of a three-way interaction test including SES, suggested that Black young adults who achieved higher education across different strata of socioeconomic status all experienced the weathering effects of higher education regardless of whether they were high SES or low SES. Notably, non-Black participants with a college-degree demonstrated a strong and positive association with education and allostatic load. Finally, in Howard’s 2014 dissertation, he noted that the benefits of educational achievement observed in his analyses were capped by race and ethnicity for Black individuals and Mexican individuals. Results of the sample illustrated that among Black, White, and Mexican participants, allostatic load scores were lowest among those who were college educated, however of the college educated participants significant differences in AL emerged—“specifically, AL levels are 38% higher for Mexican Americans and 25% higher for non-Hispanic Blacks, compared to non-Hispanic Whites” (Howard, 2014, p. 72). These findings illustrate that even though Black individuals with a college education did exhibit less weathering than Black individuals with only some college attendance or lower, highly educated Black individuals continued to extract less health benefits than their White counterparts. Perhaps related to that finding is that Howard found individuals from higher income families had significantly lower allostatic load levels than individuals who came from families that reported incomes at or below the poverty level, which was mostly represented by Black and Mexican American participants. While these SES data were not included in the overall analysis model, the results of these three studies suggest that the process of skin-deep resilience may be most potent for Black individuals who pursue scholastic success, specifically those who undertake and complete a college education. Furthermore, achieving a college degree as a Black individual
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from a lower SES background may impact the stressful characteristics of the academic experience and the health returns associated with it.

**Aim II: The overall effect of external metrics of resilience on weathering**

**H. 2. External metrics of resilience are positively associated with elevated weathering levels**

**Mini Meta-analytic review**

Since allostatic load was the most evaluated measure represented across 13 different articles, findings regarding AL and external metrics of striving were the focus of this meta-analysis. Therefore, whenever studies evaluated high effort coping, academic achievement, and higher SES as primary metrics of striving in association with allostatic load they were screened for eligible effect size data. Among the 18 articles included in the systematic review, seven correlation coefficients (r’s) were pulled from six articles (Brody, Yu, Chen, Kogan, et al., 2013; Fazeli et al., 2020; Geronimus et al., 2020; Johnson, 2018; Merkin et al., 2009; Sims & Coley, 2019). Articles were not included in the meta-analysis when they did not yield data that could be transformed into correlation coefficients. Furthermore, only articles which provided data reflecting the association between one external metric of success and allostatic load only. Therefore, values reflecting interaction data which did not examine each variable independently were not entered. Articles consisted of one unpublished dissertation and five published manuscripts. The articles that were included were published between the years of 2013 to 2021. The overall number of participants reported across the analyses was 5,815 Black individuals. Within subject samples across each article ranged from 81 to 4,005. A comprehensive description of the study samples for the articles included in the meta-analysis are displayed in Table 1. Allostatic load outcomes in this meta-analysis reflected data on Black adults (ages 22 – 70) and Black emerging adults (ages 19 - 22).
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To statistically assess whether more signs of weathering occur in Black individuals in the United States who endorse more external metrics of resilience, striving, and upward mobility, eligible data observed in each study were utilized to generate an effect by subgroup--representing each type of external metric of resilience measured (i.e., high-effort coping, academic achievement, and higher socioeconomic status). An overall effect size pooling the effect sizes for each subgroup was generated to represent the effect of external metrics of resilience on allostatic load. The effect size for the association between academic achievement and allostatic load (k = 2, N = 8,595), was $r = 0.227$ (CI: [-0.263, -0.624]). The effect size for the association between high effort coping and allostatic load (k = 2, N = 570), was $r = -0.155$ (CI: [-0.585, 0.343]). The effect size for the association between higher SES and allostatic load (k= 2, N = 4,005) was $r = -0.199$ (CI: [-0.616, -0.624]). The overall effect of external metrics of resilience on allostatic load was $r = -0.038$ (CI: [-0.363, 0.295]). The range of the overall effect confidence interval does not include an $r$ of 1.0, which suggests an increase in external metrics of resilience is not associated with an increase in allostatic load. Likewise, the z-value is -0.217 with a corresponding p-Value of 0.828 which means we fail to reject the null hypothesis, which is that external metrics of resilience are not associated with allostatic load. However, the Q-value is 546.178 with 5 degrees of freedom ($Q (df = 5) = 546.178, p < .001$), which suggests that the true effect size varies from study to study and is not the same in all studies. While these results do not suggest statistically significant results, the effect size for the association between academic achievement and allostatic load had the largest correlation coefficient value and it suggests a weak, but positive correlation.

**Aim III: Covariates affecting the association between external metrics of resilience and weathering.**
**Hypothesis 3: Lower SES effects the associations between weathering and high effort coping and weathering & academic achievement**

While the current meta-analysis did not evaluate moderation and mediation in the analysis to determine other contributors to variance between subgroups, the qualitative data generated from the systematic review provides some evidence that lower socioeconomic status was a covariate for other external metrics of resilience association with weathering. There were several studies which revealed that the process of skin-deep resilience only occurred when high striving Black individuals came from lower socio-economic backgrounds. For example, in Robinson and Thomas-Tobin’s study of John Henryism and allostatic load, they described how the association between variables was modified by socioeconomic status—specifically that the highest AL scores were observed in individuals with either high SES or low SES who endorsed moderate John Henryism. The model showed that as both low SES and high SES individuals endorsed either high or low John Henryism, allostatic load scores decreased (Robinson & Thomas Tobin, 2021). This pattern of findings is such that individuals from either low SES or high SES backgrounds experience an increased physiologically tax represented through allostatic load as they begin to take on the principals of John Henryism. However, these elevated AL scores at moderate levels of John Henryism may be the result of a somewhat steep learning curve that emerges when in pursuit of upward mobility. For that reason, the degree of weathering observed in both high SES and low SES individuals returns to baseline levels once they’ve gained more mastery in their John Henryism skills. Post hoc tests were run to verify the moderating effect that SES had, and results of the analysis indicated that SES and AL associations were driven largely by participant education status where college graduates with high JH had higher AL (Robinson & Thomas Tobin, 2021). As mentioned previously, skin-deep
resilience varies by the family’s SES which was reported by the emerging adults in the SHAPE study (Brody, Yu, Chen, Miller, et al., 2013a; Chen et al., 2015). High AL was significantly associated with having low SES and high self-regulation skills, whereby allostatic load was not associated with self-regulation when adolescents were higher SES. In the third article involving this sample analyzed by Chen and colleagues, results revealed that Black adolescents from low SES neighborhoods who ended up attending college displayed significantly higher AL at age 20 than Black adolescents, also from low SES neighborhoods who did not attend college. Likewise Black adolescents who attended college who did not come from an impoverished neighborhood did not exhibit higher AL. In the 2015 Miller and Chen study assessing self-control and changes in DNA Methylation, results yielded a similar pattern amongst participants. In Watson’s 2019 dissertation on telomere length among a sample of young Black men attending UCLA, descriptive statistics revealed that half of the participants with shorter telomere lengths reported that their family household income was below the national average. This was in stark contrast to only 21% of the participants in the longer telomere length group endorsing a family household income that was just as low. The pattern of findings contradicts the results from Sims & Coley’s study which determined that SES background had no significant interaction effect among Black individuals who attended college with high SES scores as skin-deep resilience was observed across SES quintiles.

**Hypothesis 3.1: High-striving Black women will endorse more weathering than Black men**

To investigate whether female/women identifying Black participants with external metrics of resilience, striving, and upward mobility exhibited more signs of weathering than male/men identifying Black participants, each article was coded for any data descriptions indicating gender as a covariate, or differences in weathering between participants of different
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genders. In samples of homogenous gender groups, gender as a covariate was not able to be
coded. Likewise, when the gender related findings did not parse out results by participant race
and ethnicity, data was not coded. The synthesized evidence observed within the systematic
review yielded mixed results depending on the study sample. In the co-ed sample of Black and
White adults aged 18-64 years old in the 2006 article published by Geronimus and colleagues,
results described weathering differences between Black men and women but did not differentiate
between high striving and low striving men and women. Nevertheless, results describing mean
scores of allostatic load scores showed that Black women demonstrated significantly higher AL
means than Black men. This elevated pattern of weathering observed among Black women held
consistently across external metrics of resilience. To contextualize the pattern of higher AL
overrepresented by Black women within this sample Geronimus states that, “among nonpoor
respondents, Black women of all ages had at least twice the relative odds of high AL scores
compared with White women and non-poor Black women aged between 55 and 64 years had 5
times the odds of high scores compared with their White counterparts” (Geronimus et al., 2006,
p. 829). In the study of resilience and academic achievement with the adolescents participating in
the SHAPE study, Black males were less likely to be represented in profiles of resilient youth
with high self-regulation (Brody, Yu, Chen, Kogan, et al., 2013), however Black male identity
was positively correlated with high allostatic load as well as substance abuse (Chen et al., 2015).
The pattern of findings with this sample specifically, emphasizes that Black males were less
likely to experience weathering by way of the skin-deep resilience theory and more likely to
experience weathering by way of engagement in behaviors which are associated with
maladaptive coping and poor social adjustment. In Johnson’s 2018 dissertation, Black men,
specifically single Black men across all SES groups endorsed higher composite AL scores than Black women across all SES groups (Johnson, 2018).

**Discussion, Conclusions, and Recommendations**

The constant and increasingly deleterious trajectory of cardiovascular disease in the United States of America signifies the need for a radically innovative public health approach. In Dahlberg and Krug’s article on violence as a global public health issue, as referenced in a Centers for Disease Control report on violence prevention, “the focus of public health is on the health, safety, and well-being of entire populations…that strives to provide the maximum benefit for the largest number of people” (Centers for Disease Control and Prevention [CDC], 2022; Dahlberg & Krug, 2006, p. 278). Yet, multiple decades of health data on CVD risk factors, diagnoses, prognoses, treatment outcomes, and mortality trends, suggest the current public health approaches which have been applied thus far to manage, prevent, and treat heart disease have not benefited a majority of the U.S population (CDC, 2022). This incongruency observed in CVD rates in the U.S is likely due to heart health having been characterized as a “purely medical problem” which should be addressed primarily through medicinal, pharmaceutical, dietary, and physical interventions that are often expensive, unsustainable, and difficult for marginalized and oppressed members of society to adhere to with consistency even if they provide some benefit (Dahlberg & Krug, 2006, p. 278). However, the integral component which brings potency to public health approaches for “any problem is [an] interdisciplinary and science-based perspective [which] draws upon knowledge from many disciplines, including medicine, epidemiology, sociology, psychology, criminology, education, and economics. This allows the field of public health to be innovative and responsive with an emphasis on collective action…because each sector has an important role to play in addressing the problem” (Dahlberg & Krug, 2006, p.278).
Therefore, the current study was conducted to provide evidence for the urgent need for a radical reorientation towards a biopsychosocial public health model for CVD which underscores and prioritizes prevention through a health promotion framework that is informed by intersectionality, critical social and race theory, cultural relevancy and competency, and community psychology. Through this reorientation, CVD health disparities and inequities may be confronted more intentionally, adequately, and effectively through a bottom-up approach that intentionally addresses the observable biopsychosocial determinants of poor cardiovascular health among the most vulnerable groups. By prioritizing the most affected individuals within the population, the widespread development of CVD risk factors, CVD diagnoses, and CVD fatalities experienced by most residents, families, and communities in the U.S. will inevitably be reduced. The study design, research questions, and hypotheses of this paper were intentionally and deeply informed by a thorough understanding of factual U.S history, critical race theory, critical social theory, intersectionality, community psychology, and social determinants of health. This deliberate approach was essential because Black identifying residents in the United States, represented by the entire African Diaspora, were the population focused on in this systematic review and mini meta-analysis.

Therefore, to address the public health crisis of CVD adequately and appropriately, as indicated by the extreme health disparities and health inequities disproportionately affecting Black U.S residents, -- an interdisciplinary, racial justice approach was essential for generating conscientious, realistic, and grounded interpretations of the findings reported. Accordingly, the qualitative and quantitative data reviewed and discussed in this paper reflects a public health approach which clearly integrates racial reconciliation efforts into health promotion models to overtly address racism and race-related stress as an ongoing transgenerational and complex
trauma. The extent literature on race-related vigilance consistently describes how experiencing, perceiving, and anticipating stressful race-related events is a form of chronic stress which is linked to a multitude of poor health outcomes (Hicken et al., 2013; Himmelstein et al., 2015; Watson-Singleton et al., 2019; Wilkinson-Alston, 2016). Consequently, Black U.S residents are continuously responding to and processing race-related chronic stressors at a conscious and/or unconscious level (Paradies et al., 2015; Watson-Singleton et al., 2019).

Examining the patterns of weathering observed among Black U.S residents and outlining the probable role of skin-deep resilience in cardiovascular disease trends disrupts the incessant reductive narratives widely applied to rationalize the health inequities disproportionately affecting Black individuals. Narratives which attribute health disparities as stemming from insufficient self-control skills, inadequate levels of education, and under-resourced socioeconomic circumstances, conveniently ignore the foundational contributions of institutional racism and systemic discrimination. While upward mobility and external achievement are certainly relevant factors needed to improve health outcomes and quality of life, they do not account for the substantial subset of the Black identifying population in the U.S who externally exercised self-control and resilience to overcome adverse experiences, pursued and achieved academic advancement and higher learning opportunities, and obtained dependable jobs or prestigious careers which provide higher socioeconomic circumstances. Furthermore, these health disparity attributions are often applied through a subconscious and biased belief that to be Black in America; is to be poor, undereducated, and irresponsible. Notably, when White individuals in the U.S fall into a lower SES bracket, fail to endorse notable self-control skills or resilience through adverse experiences, or display average or below average academic abilities, they consistently exhibit significantly better health outcomes than their Black counterparts and...
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externally successful, well resourced, high striving Black individuals. Accordingly, the results from this systematic review and mini meta-analysis worked to address the unique racially unjust landscape of the United States and the racial health inequities birthed and nurtured over the centuries through the continued avoidance and denial of a need for intentional racially just efforts in all health domains.

While there has been an influx of systematic reviews and meta-analyses focused on the factors related to race-related health disparities and inequities, to date there has not yet been a systematic synthesis and analysis of the literature which has explored the association between the weathering hypothesis proposed by Dr. Geronimus and the skin-deep resilience theory proposed by researchers at the Center for Family Research. Notably, this review attempts to establish the weathering hypothesis as one of the key pathways which facilitates the diminished returns in physical health that define the skin-deep resilience theory, as it has been observed in externally successful Black individuals living in the United States. Through the systematic exploration of qualitative and quantitative information, this study lays the preliminary groundwork needed for future research designs to: a) Affirm skin-deep resilience theory as a legitimate phenomenon evinced by the statistically significant mediating pathway of external metrics of resilience, success, and upward mobility in the direct relationship between Black identity in the U.S and weathering (accelerated epigenetic aging observed specifically among members of marginalized groups). b) Establish skin-deep resilience as a mediating variable in the relationship between Black identity in the U.S and increased risk of CVD. And c) identify and delineate the specific contexts and defining characteristics that are present among skin-deep resilient Black individuals in the U.S to develop, implement, and disseminate a functional framework for promoting better heart health. Ideally, this framework would be practical, economical, and effective in reducing,
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reversing, and treating physiological signs of weathering, which would naturally prevent or provide early intervention for the development of CVD risk factors and diagnoses.

While the endorsement of these external metrics of resilience and success have been established as protective factors of overall health in the extant literature, skin-deep resilience theory has identified a paradoxical pattern of diminished health returns experienced by many Black individuals who do evince these external metrics of resilience. Meanwhile, non-Black identifying individuals, specifically White individuals, tend to be the primary benefactors of the positive health outcomes associated with external metrics of resilience. This study aimed to identify whether the pursuit and/or attainment of external metrics of resilience and success by Black individuals in the U.S is associated with elevated signs of weathering. Weathering, if present and gone unnoticed slowly but surely reduces the physiological vitality of the human body and it thwarts the body’s ability to maintain homeostasis and regenerate from a range of health conditions. Consequently, exhibiting highly elevated signs of weathering may eventually result in the early development of CVD risk factors, the early onset of CVD and more rapid and severe prognoses for CVD.

The current study addressed these objectives through the utilization of a mixed methods approach. Through a systematic consolidation, review, and statistical analysis of empirical research studies found in the current literature, a snap-shot was created showing how much Black individual’s upward mobility and engagement in high striving behaviors determined accelerated biological age. Data patterns among 18 different empirical studies were observed, noted, contextualized, and described in a qualitative synthesis. Studies reporting eligible data on the association between allostatic load as a physiological indicator of weathering and external metrics of striving and upward mobility were examined and qualitative themes around the data
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patterns were extracted. Considering the novelty of the topic that is the focus of this study, the current review modestly only synthesized 18 articles which met the inclusion criteria. Of those 18 articles, seven of them met eligibility criteria to be included in a mini meta-analysis. When qualified variables measuring external metrics of striving (high-effort coping, high academic achievement, and higher SES) were elevated in association with elevated levels of weathering (allostatic load, DNA Methylation patterns, telomere length) then it was noted that the phenomenon of skin-deep resilience had occurred in the participants evaluated. In instances when Black individuals endorsed elevated external metrics of striving and decreased or lower levels of weathering, then it was noted that the phenomenon of skin-deep resilience had not occurred. Overall, the findings of this review extend previous research initiatives focused on the weathering hypothesis, psychological resilience, self-control, John Henryism, and health outcomes related to academic success and socioeconomic status.

The phenomenon of skin-deep resilience among high striving Black individuals

The results of the systematic review yielded 15 articles which examined patterns of weathering between Black people who endorsed more external metrics of resilience and upward mobility and Black people who endorsed fewer external metrics of resilience and upward mobility (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013b; Brown et al., 2019; Chen et al., 2015; Fazeli et al., 2020; Forrester et al., 2019; Geronimus et al., 2006, 2015, 2020; Howard, 2014; Johnson, 2018; Merkin et al., 2009; Miller et al., 2015; Robinson & Thomas Tobin, 2021; Watson, 2019). The results of the systematic review yielded 8 articles which examined patterns of weathering between Black people and their non-Black counterparts (Forrester et al., 2019; Geronimus et al., 2006, 2015, 2020; Howard, 2014; Liu et al., 2019; Sims & Coley, 2019; Wickrama et al., 2016). Overall, the synthesized results of these 18 articles
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supported the first hypothesis through observations confirming that the paradoxical process of skin-deep resilience was present among the Black participants who endorsed one or more external metrics of resilience, striving, and upward mobility. Altogether, 10 of the 18 articles reviewed did not affirm a pattern of skin-deep resilience among the high striving and successful Black participants assessed (Brown et al., 2019; Fazeli et al., 2020; Forrester et al., 2019; Geronimus et al., 2006, 2015, 2020; Howard, 2014; K. D. Johnson, 2018; Merkin et al., 2009; Wickrama et al., 2016). The findings from these articles specified that an increase in external metrics of resilience was associated with no changes or decreases in physiological indicators of accelerated epigenetic aging. Likewise, these findings specified that a decrease in external metrics of resilience was associated with increases in physiological indicators of accelerated epigenetic aging. Only one article not affirming the process of skin-deep resilience was unable to provide a commentary about skin-deep resilience due to all the findings in the study being statistically insignificant (Brown et al., 2019)

Weathering between Black individuals based on external metrics of resilience and success

Among the 15 articles which compared weathering levels between Black individuals with more external metrics of success and Black individuals with fewer external metrics of success, several of them indicated that weathering occurs more often among Black youth, emerging adults, and adults with lower socioeconomic status who manage to achieve academic success and/or engage in high effort coping compared to Black youth, emerging adults, and adults with higher socioeconomic status who achieve academic success and/or engage in high effort coping (Brody, Yu, Chen, Miller, et al., 2013b; Miller et al., 2015; Robinson & Thomas Tobin, 2021; Watson, 2019). In instances where the socioeconomic status of high-striving Black participants was statistically insignificant or indistinguishable but weathering levels were significantly
different, a genetic predisposition to anxiety and a lack of socially supportive relationships were identified as mitigating factors (Brody, Yu, Chen, Kogan, et al., 2013; Brody, Yu, Chen, Miller, et al., 2013b; Forrester et al., 2019). Mapping onto existing patterns previously described in early research, these findings explain how anxiety disorders and a lack of socially supportive relationships are significantly associated with accelerated aging in the body (Hoen et al., 2013; Hood et al., 2017; Simons et al., 2020; Verhoeven et al., 2015). For example, individuals endorsing clinical anxiety disorders were significantly more likely to exhibit accelerated aging in the body three to five years more than their biological age (indicated by shorter telomere lengths) compared to individuals without a history of anxiety or current anxiety symptoms (Verhoeven et al., 2015). The significant differences in telomere lengths were observed while the variables of education levels, lifestyle characteristics, adverse life experiences, and health behaviors were controlled for (Hoen et al., 2013; O’Donovan et al., 2012; Verhoeven et al., 2015). In addition to describing the negative impact that anxiety disorder symptoms have on the central nervous system, endocrine system, and the HPA axis (Verhoeven et al., 2015), these findings highlight how differences in accelerated epigenetic aging may be largely dependent upon exposure to chronic stress, appraisals of stress, and management of anxiety symptoms (O’Donovan et al., 2012).

The role of anxiety and stress management in relation to weathering and skin-deep resilience

Black individuals who are genetically pre-dispositioned to trait anxiety and anxiety disorders, likely exhibit more weathering than their counterparts because of an emotional inclination to “perceive stressors as exceeding the resources available to them to cope effectively,” and anticipating challenging and threatening stressors as inevitable and dangerous events (O’Donovan et al., 2012, p. 573). Specific to the heart health inequities underwriting this current
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study, a growing body of research on stress appraisals suggests that when stressful events are chronically anticipated and stressors are consistently appraised as too challenging and threatening, the physiological coping response initiated within the cardiovascular system is identical to the physiological response that occurs when a harmful, dangerous, and difficult stressor is actually experienced in real time (O’Donovan et al., 2012; Waugh et al., 2010). The direct implications drawn from this growing body of knowledge, is that proper recovery from the constant anticipation of acute and chronic stressors is just as essential as the recovery needed from actually experiencing a stressor (O’Donovan et al., 2012; Verhoeven et al., 2015; Waugh et al., 2010). Developing effective coping skills and stress management strategies for anxiety symptoms stemming from repeated exposures to chronically stressful events may help individuals move away from appraising upcoming events as inherently threatening and difficult, thus facilitating a reversal in physiological markers of accelerated biological aging (Allgulander, 2016; O’Donovan et al., 2012; Verhoeven et al., 2015; Waugh et al., 2010). These results illustrate that high-striving Black individuals who experience the phenomenon of skin-deep resilience may become physiologically weathered because of an increased sensitivity to perceiving future events as potentially threatening, stressful, and too complex to cope with.

Negative race-related events as chronic stressors and anxiety triggers

However, it is important to note that Black individuals with trait anxiety and clinical anxiety symptoms may rely on a threat appraisal in anticipation of stress because of the very real ongoing threat of racial discrimination (Allen, Thomas, et al., 2019; Dolezsar et al., 2014; Watson, 2019). In Watson’s 2019 dissertation on telomere lengths among Black male-identifying undergraduate students enrolled at UCLA, 88% of participants reported having witnessed one or more event of overt racial discrimination on campus. Additionally, 90% of participants reported
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that on one or more occasion before arriving to campus, they consciously anticipated encountering a stressful race-related macro or micro aggression because of their racial identity (Watson, 2019). Therefore, when considering appropriate approaches for preventing CVD risk associated with unreconciled physiological responses to chronic anticipation of threatening stressors -- an intersectional, complex-trauma lens is a core foundational component.

Social supports for Black individuals in Higher Education institutions

One such approach is related to socially supportive relationships. High striving Black individuals who did not exhibit signs of weathering tended to report more social supports compared to high striving Black individuals who did exhibit signs of weathering (Brody, Yu, Chen, Kogan, et al., 2013; Forrester et al., 2019). The extant literature provides a plethora of evidence which reinforces the health benefits of socially supportive relationships whether that be friendships, mentoring relationships, community recreation activities, involvement in spiritual/religious organizations, etc (Ozbay et al., 2007; Reblin & Uchino, 2008; Uchino et al., 2020). Specifically, there is empirical evidence built up that social support for Black individuals is absolutely critical in academic settings not typically designed to empower and represent Black students and faculty (Qin et al., 2020; Rodrigues et al., 2021). It is especially relevant to support Black individuals who demonstrate external metrics of success through their academic engagement and high scholastic achievements because this external metric tended to support the skin-deep resilience theory more than the metrics of higher SES. While the current meta-analysis did not reveal any statistically significant associations between external metrics of resilience and weathering, there was a consistent positive association between academic achievement and allostatic load whereas high effort coping, and higher SES appeared to have negative associations with weathering. Likewise, this pattern was reinforced in the study findings.
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analyzed in the systemic literature review. Including the Watson study which took place at UCLA; this pattern was documented in four studies included in the review (Chen et al., 2015; Liu et al., 2019; Sims & Coley, 2019). While the meta-analysis findings were not statistically significant, the current findings of this mini meta-analysis are in alignment with a growing body of evidence in the extant literature affirming the pattern of diminished health returns among academically successful Black individuals (Assari, 2018; Watson, 2019). This pattern for academic stress was especially potent was Black individuals arrived in institutions of higher learning when they were coming from lower SES neighborhood. Therefore creating intentional spaces for emerging adults to develop socially supportive relationships with other individuals who share in the racial/ethnic identity may increase a “subjective sense of belonging” and provide a safe space to vent, process, and problem solve the adjustment curve associated with pursuing higher education in a space that is culturally different from the place where you grew up (Helms, 1990). Having socially supportive groups or people to engage with specifically in these settings may help increase “a sense of group or collective identity based on one’s perception that he or she shares a common racial heritage with a particular racial group” (Helms, 1990, p. 3). Interestingly, Watson points out that Black students in his study who were able to identify, confront, and process the impact of witnessing negative race-related events on campus tended to be in the group with longer telomere lengths; suggesting that the process of having ones race related stress validated has protective effects against weathering – opposed to race-related stress being denied in a way which facilitates a feeling of being gaslighted (Rodrigues et al., 2021; Tobias & Joseph, 2020; Watson, 2019).

High-Effort coping and John Henryism
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In fact, future research may want to investigate the ways in which engagement in high effort coping as an external metric of resilience and upward mobility may overlap with attendance in these academic experiences which have protective health benefits for other racial ethnic backgrounds; but consistently yield weathering effects for Black individuals. This is especially true for Black individuals coming from lower socioeconomic situations. As previously mentioned, SES appeared to only determine allostatic load for Black individuals when it was related to lower SES. For example, when Black individuals endorsed academic achievement, while also coming from lower SES neighborhoods or families, there was a significant association with weathering (Chen et al., 2020; Miller et al., 2015; Robinson & Thomas Tobin, 2021). The pattern of black individuals who endure the stressors associated with a lower income environment but who continue to strive for upward mobility and achieve external metrics of resilience, is a pattern which affirms the John Henryism theory (Brody, Yu, Chen, Kogan, et al., 2013; S. A. James et al., 1987; Robinson & Thomas Tobin, 2021). Recent literature reviews suggest Black individuals from lower SES backgrounds inherently believe that the pursuit of success inherently involves a need to struggle or endure difficulty over a long period of time (Felix et al., 2019). Not only may this belief encourage Black individuals from lower SES backgrounds to push themselves past physiological thresholds that are healthy; their thresholds may be less intuitive to them or less recognized as valid if they do not appear to yield the same external metrics of upward mobility of those from higher SES backgrounds. This was confirmed in Johnson’s 2018 dissertation where she noted that Black men and women consistently rated their health as better than was indicated by diagnostics assessing their allostatic load (K. D. Johnson, 2018). In other words, Black individuals from lower SES backgrounds who desire upward mobility in some way may feel the need to appear superhuman resulting in a skewed
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awareness of the toll that is being taken on their health and thus yielding lower health outcomes
(Allen et al., 2019; J. B. J. James, 2017.; Woods-Giscombé, 2010). While these findings
reinforce higher SES as a key factor for protecting health, it is important to consider how being
under-resourced in the United States is a uniquely stressful experience beyond the established
details regarding decreased accessibility to high quality health care and nutritious whole food
options (Blumenthal & Kagen, 2002; McMaughan et al., 2020).

Low SES as a chronic stressor facilitating weathering

Endorsing a low socioeconomic status in the U.S altogether is an indicator of chronic
stress in itself because of the lack of infrastructure around social welfare available to mitigate
low SES experiences (Baum et al., 1999). This is emphasized across three studies included in
this review by Geronimus and colleagues which examined weathering patterns among lower and
higher SES adults living in Detroit (Geronimus et al., 2015), weathering patterns among lower
and higher SES adults living in the national population (Geronimus et al., 2006), and
comparisons in weathering levels between the two samples (Geronimus et al., 2020). The results
of those studies emphasized the ways in which the circumstances which characterize the
experiences of “low SES” adults living in Detroit, Michigan-- regardless of racial/ethnic
background are vastly different than the circumstances and experiences which characterize the
experiences of “low SES” adults in other parts of the nation (Geronimus et al., 2020). Black
adults living in Detroit, Michigan which is a place which is historically poorer than many cities
in the United States. Therefore, results showed that Black individuals in Detroit who endorsed a
lower SES consistently had more elevated signs of weathering than those who endorsed a higher
SES (Geronimus et al., 2015, 2020). In the 2006 article utilizing the NHANES dataset reflective
of a national sample, results of odds ratio analyses revealed that White individuals who lived
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below the poverty income ratio had less likelihood of having high allostatic load scores than Black individuals who lived above the poverty income ratio. Alternatively, among the multi-ethnic sample observed in the (HEP) study, White individuals living in Detroit endorsed the highest rates of allostatic load. when compared to Black and Mexican individuals (Geronimus et al., 2020). Black individuals in Detroit had the lowest percentage of high allostatic load overall. In reflection of the weathering patterns observed across the ethnic groups stratified by SES in these three studies, Geronimus and colleagues note that these results may have varied by geographic location. Drawing upon the dramatic contrast in allostatic load scores observed among Black and White individuals within the national sample of the NHANES cohort compared to the Detroit sample from the HEP study, Geronimus asserts that the uniquely pervasive characteristics of poverty experienced by the entire population of individuals in the city of Detroit could and should be considered in these weathering outcomes. Consequently, these variations in determining what it means to be poor across the U.S directly impacts the way that SES is measured and evaluated within research objectives. In the case of Detroit, Michigan where the determined markers of poverty are dramatic outliers among the national distribution of poverty, radically different definitions of “higher SES” or “lower SES” may emerge between populations being analyzed -- thus distorting possible implications. Accordingly, Geronimus and colleagues encourage a critical lens of interpretation where it is understood that the gap between being “non-poor” or “poor” in Detroit may not be that varied environmentally for Black individuals but may indicate vastly different ecological experiences for White individuals.

Weathering differences between Black individuals and non-Black individuals

Although White individuals exhibited the most weathering in the Detroit sample, that was not the case for the rest of the studies included in the systematic review and mini meta-analysis.
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Findings across articles included in this systematic review suggest that high-striving Black individuals often demonstrated higher signs of weathering than their non-black counterparts. There were similarities in high weathering levels observed among Black and Mexican individuals who endorsed external metrics of resilience whereas there were similarities in low weathering levels observed among Asian Americans and White individuals who endorsed external metrics of success (Howard, 2014; Sims & Coley, 2019; Wickrama et al., 2016). In studies observing Black, White, and Mexican individuals in Detroit, Michigan – White individuals surprisingly had the largest proportion of weathering as indicated by higher allostatic load and shorter telomere lengths (Geronimus et al., 2015, 2020). In many instances when academic achievement was associated with increased health outcomes for White and Asian-American individuals, the same health outcomes were diminished for Black individuals. Parallels between Latinx individuals and Black individuals and Asian Americans and White individuals simultaneously affirms the often toxic narrative of the “model minority myth” often placed upon Asian Americans (McGowan & Lindgren, 2006; Museus & Kiang, 2009; Sakamoto et al., 2012) and reflects that Black and Latinx individuals are most affected by racially driven systemic inequities in the United States and the assimilation demands associated with adapting to those inequities (Arbona et al., 2010; Assari et al., 2020; Chen et al., 2019). As mentioned before, academic experiences for Black individuals may be rife with race related stressors such as micro-aggressions and overt or covert discriminative experiences (Sims & Coley, 2019; Watson, 2019). Notably, in Watson’s study examining the telomere lengths of Black men attending a prestigious university, results suggested that Black individuals who were more aware of race-related stressors and discriminative experiences were less likely to have shorter telomere lengths (Watson, 2019). This finding in particular asserts that enduring abnormal stress in academic
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achievement for Black individuals may have more of a physiological toll if they are not aware of the ways in which they are approaching the academic feat from an inequitable playing field from the get-go (Gibbons et al., 2012; Paradies et al., 2015).

Weathering differences by gender/sex identity

There were not clear significant differences in weathering levels observed between high striving Black females and males. While past research on weathering has identified Black women as being particularly physiologically vulnerable to weathering outcomes (Forde et al., 2019; Geronimus et al., 2006), it is essential to note that the current study did not statistically analyze differences between males and females and therefore the current findings are simply an amalgamation of the studies which met the specific criteria of this study. Considering an intersectional lens and a model of cumulative stress; the model of weathering by way of race-related stress presented in this current study suggests that multiple minority statuses held by Black women known as a “double whammy” on top of being high striving may place them at higher risk for allostatic load (Logan & Dudley, 2019; Nkomo & Cox, 1989). Alternatively, Black women are more likely to rely on social supports and vulnerably work through their problems with their peers or be seen as needing more social support than Black men which could leave Black men more vulnerable to weathering (Hood et al., 2017; Qin et al., 2020; Ward et al., 2013)

Limitations and Future Aims

In summary, this systematic review and mini-metanalysis yields several important takeaways: 1) Allostatic Load is the most common measurement for physiological indications of weathering thus far. Future research in this area would experience a boost in integrity if a uniformed measure of allostatic load were developed as many studies included in this current
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systematic review demonstrated that there are a variety of biomarkers included and cut off scores utilized to determine allostatic load, which contributes to inconsistency in outcomes. Relatedly, a total assessment of weathering may best be described by a combination of physiological indicators of weathering (i.e., analyzing DNA methylation patterns, telomere length, and allostatic load altogether. 2) Academic Achievement and high effort coping independent of interactions with SES are external metrics of resilience which have been shown to facilitate the process of skin-deep resilience as indicated by weathering in Black emerging adults to some extent. Future research in this area would experience a boost in integrity if contextual components of academic settings for Black individuals in comparison to White individuals was specifically assessed. Exploration of contextual components include assessment of race-related stressors, minority status among peers in higher learning settings, and racially inequitable characteristics embedded within institutions of higher learning. 3) Low socioeconomic status is a moderator in the degree of skin-deep resilience observed among Black individuals. In alignment with previous research, the current systematic review observed that low SES acted as a compound component along with other external metrics of resilience creating a taxonomy of stress that facilitates the paradoxical process of skin-deep resilience. 4) Higher SES examined on its own is not usually a facilitator of skin-deep resilience for Black individuals. It is well known the literature and public health data collected over the history of this nation that poverty is associated with many stressors and barriers which ultimately contributed to reduced health outcomes, therefore in studies which only assessed whether earning a higher income vs. earning a lower income or living in a more “well-off” neighborhood vs. an impoverished neighborhood, weathering was higher for those with lower SES (Braveman et al., 2010; Chen & Miller, 2013; Monnat, 2014). 5) Black males appeared to be less likely to endorse skin-deep resilience when
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external metrics of academic achievement and high-effort coping were evaluated in association with physiological indications of weathering. Further research on gender and weathering outcomes among Black individuals should consider the ways in which the “double whammy” of Blackness & womanhood adversely affects Black women. Extant literature suggests that Black women experience worse health outcomes overall, but it is important to understand how weathering developed from skin-deep resilience does not necessarily increase health-care providers attention and care to the health needs of Black women, which prevents them from “cashing in” on the benefits of gaining material markers of success (Assari et al., 2020; Monnat, 2014). 6) The paradoxical process of skin-deep resilience occurs as indicated by weathering, but the contexts in which it occurs varies significantly by how upward mobility is measured, by how weathering is measured, the geographical location of participants, and the overall operationalized definition of “academic achievement,” “high-effort coping,” and higher-SES. 7) Weathering by way of skin-deep resilience in Black individuals living in the United States may be mitigated by the development and maintenance of strong social supports. Specifically in emerging adults, social support, present caregivers, and the presence of adults who considered them competent (i.e., teachers) reinforced positive health outcomes even when they came from lower SES backgrounds and demonstrated high effort coping.

Limitations of this study include the fact that higher-SES was highly variable and subjective in its definition across the studies reviewed. While there was some variability in the definition of high effort coping and academic achievement, higher-SES was often measured as the accumulation of multiple variables, sometimes involving education level which conflated the true meaning of SES as a variable. Other limitations were that advanced statistical techniques for carrying out a meta-regression were not feasible and therefore the current study was not able to
assess the statistical difference between the subgroups of resilience in association with allostatic load, therefore while it was observed that the overall effect size was impacted by the type of resilience, it was not clear which type had the most impact on the true overall effect size. The eligible data for the meta-analysis was sometimes reflective of preliminary correlation data and did not include other statistical data reported in the studies which affirmed the process of skin-deep resilience. Additionally, the current meta-analysis was small and not reflective of each physiological indication of weathering explored in the systematic review, therefore future iterations of combined statistical analysis on this topic should reflect as many measures of weathering as possible. Furthermore, the participants represented across the systematic review were not limited by pre-existing health conditions or the endorsement of chronic conditions, (e.g., the 2020 study consisting of HIV + participants by Fazeli and colleagues). Therefore, it cannot be said that some findings of weathering described in the overall review were not confounded by the physiological strain that comes with the endorsement of pre-existing acute or chronic illness. The current systematic review and meta-analysis was also limited in its capacity to examine how the geographical location of study participants may contribute to the fluctuating weathering outcomes observed (e.g., the Detroit population analyzed by Geronimus and colleagues).

This in-depth examination of the current literature regarding the extent to which external metrics of resilience, striving, and upward mobility contributes to the weathering of Black people in America seeks to provide evidence for the urgent need to address the race-related psychosocial and socio-political factors faced by Black people which rapidly increase their development of CVD risk factors and CVD. Findings from this current study provide further context and an undeniable sign that cardiovascular health researchers and policy makers in the United States
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need to address how Black individuals in America cope with the race-related chronic stress to truly close the gap in health outcomes related to this public health crisis. Ideally, future iterations of CVD risk prevention, intervention, screening, and treatment for this population will explicitly address the multifaceted destructive impact that the non-stop response to chronic race-related stress has on an emotional, mental, and physical level, thus leading to more support in these areas and improved health outcomes for all minority groups in the United States. Immediate implications of this research suggest that prevention efforts centering the development of reliable social supports, adaptive problem-solving skills, and empowering self-advocacy skills to combat the myth of respectability politics and the physiologically detrimental outcomes in hearth health associated with over-engagement in high effort coping strategies as a Black individual coming of age and establishing oneself in the United States. Hopefully, the findings from this current study will prompt researchers and creators of public health policies to consider how the systematic weathering of Black individuals in the U.S may be the underlying component facilitating chronic stress management, thus driving up the disproportionate CVD outcomes observed in this population.


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https://doi.org/10.1016/j.socscimed.2004.04.026

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https://doi.org/10.1007/s11524-018-00333-1


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Appendix A

Figure 1. PRISMA Flowchart
Table 1
Characteristics of Studies Selected for Systematic Review

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Manuscript Year</th>
<th>Sample Description</th>
<th>External Metric</th>
<th>Weathing Outcome</th>
<th>Study Design</th>
<th>Geographic Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fazeli et al., 2020</td>
<td>81</td>
<td>2020</td>
<td>Elder Adults with HIV</td>
<td>High-Effort Coping</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>Birmingham, Alabama</td>
</tr>
<tr>
<td>Brown et al., 2019</td>
<td>120</td>
<td>2019</td>
<td>Adult Women</td>
<td>High-Effort Coping</td>
<td>(DNAm)</td>
<td>Cross-Sectional</td>
<td>Southwest &amp; Central Connecticut</td>
</tr>
<tr>
<td>Brody et al., 2013</td>
<td>489</td>
<td>2013</td>
<td>Early Adolescents Adults</td>
<td>High-Effort Coping</td>
<td>Allostatic Load</td>
<td>Longitudinal</td>
<td>Rural South Georgia</td>
</tr>
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<td>Robinson et al., 2021</td>
<td>627</td>
<td>2021</td>
<td>Adult Men</td>
<td>High-Effort Coping</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>Nashville, Tennessee</td>
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<tr>
<td>Brody et al., 2013</td>
<td>489</td>
<td>2013</td>
<td>Early Adolescents</td>
<td>High-Effort Coping</td>
<td>Allostatic Load</td>
<td>Longitudinal</td>
<td>Rural South Georgia</td>
</tr>
<tr>
<td>Chen et al., 2015</td>
<td>452</td>
<td>2015</td>
<td>Emerging Adults</td>
<td>Academic Achievement</td>
<td>Allostatic Load</td>
<td>Longitudinal</td>
<td>Rural South Georgia</td>
</tr>
<tr>
<td>Watson, 2019</td>
<td>44</td>
<td>2019</td>
<td>Emerging Adults</td>
<td>Academic Achievement</td>
<td>Telomere Load</td>
<td>Cross-Sectional</td>
<td>Los Angeles, California</td>
</tr>
<tr>
<td>Johnson, 2018</td>
<td>8,267</td>
<td>2018</td>
<td>Adult Men</td>
<td>Academic Achievement</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>National, U.S, Survey</td>
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<td>Liu et al., 2019</td>
<td>605</td>
<td>2019</td>
<td>Elder Adult Women</td>
<td>Academic Achievement</td>
<td>Levine DNAmAge</td>
<td>Longitudinal</td>
<td>Multi-center National, U.S Study</td>
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<tr>
<td>Sims &amp; Coley, 2019</td>
<td>2,277</td>
<td>2019</td>
<td>Adolescents</td>
<td>Academic Achievement</td>
<td>Allostatic Load</td>
<td>Longitudinal</td>
<td>National, U.S, Survey</td>
</tr>
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<td>Miller et al., 2015</td>
<td>292</td>
<td>2015</td>
<td>Emerging Adults</td>
<td>High-Effort Coping</td>
<td>Horvath's Clock</td>
<td>Longitudinal</td>
<td>Rural South Georgia</td>
</tr>
<tr>
<td>Geronimus et al., 2006</td>
<td>1,340</td>
<td>2015</td>
<td>Adults</td>
<td>High SES</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>National, U.S, Survey</td>
</tr>
<tr>
<td>Howard, 2014</td>
<td>4,039</td>
<td>2014</td>
<td>Adults</td>
<td>Academic Achievement</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>Birmingham, AL; Chicago, IL; Minneapolis, MN; and Oakland, CA. National, U.S, Survey</td>
</tr>
<tr>
<td>Forrester et al., 2019</td>
<td>1,212</td>
<td>2019</td>
<td>Adults</td>
<td>High SES</td>
<td>Allostatic Load</td>
<td>Longitudinal</td>
<td>Detroit, Michigan</td>
</tr>
<tr>
<td>Merkin et al., 2009</td>
<td>4,005</td>
<td>2009</td>
<td>Adults</td>
<td>High SES</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>Detroit, Michigan</td>
</tr>
<tr>
<td>Geronimus et al., 2020</td>
<td>114</td>
<td>2020</td>
<td>Adults</td>
<td>High SES</td>
<td>Allostatic Load</td>
<td>Cross-Sectional</td>
<td>Detroit, Michigan</td>
</tr>
<tr>
<td>Geronimus et al., 2015</td>
<td>114</td>
<td>2015</td>
<td>Adults</td>
<td>High SES</td>
<td>Telomere Length</td>
<td>Cross-Sectional</td>
<td>Detroit, Michigan</td>
</tr>
</tbody>
</table>

Note: Studies from systematic review included in the mini meta-analysis (Brody, Yu, Chen, Miller, et al., 2013a; Fazeli et al., 2020; Geronimus et al., 2020; K. D. Johnson, 2018; Merkin et al., 2009; Sims & Coley, 2019)
Table 2.
*Descriptive Characteristics of Selected Studies (N = 18 articles)*

<table>
<thead>
<tr>
<th>Participant Characteristics</th>
<th>k (n) or Range</th>
<th>% or M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>120 – 4330</td>
<td>1039.63</td>
</tr>
<tr>
<td>Male</td>
<td>44 – 3937</td>
<td>895.25</td>
</tr>
<tr>
<td><strong>Age (Developmental Category)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elder Adults</td>
<td>n = 2</td>
<td></td>
</tr>
<tr>
<td>Adults</td>
<td>n = 9</td>
<td></td>
</tr>
<tr>
<td>Emerging Adults</td>
<td>n = 3</td>
<td></td>
</tr>
<tr>
<td>Adolescents</td>
<td>n = 4</td>
<td></td>
</tr>
<tr>
<td><strong>Age (Years)</strong></td>
<td>11 - 79</td>
<td>40</td>
</tr>
<tr>
<td><strong>Study Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weathering Outcome</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allostatic Load</td>
<td>n = 13</td>
<td>72.2 %</td>
</tr>
<tr>
<td>Telomere Length</td>
<td>n = 2</td>
<td>11.1 %</td>
</tr>
<tr>
<td>DNA Methylation Patterns</td>
<td>n = 3</td>
<td>16.7 %</td>
</tr>
<tr>
<td><strong>External Metric of Success Outcome</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Effort</td>
<td>n = 6</td>
<td>33.3 %</td>
</tr>
<tr>
<td>Coping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>n = 6</td>
<td>33.3 %</td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High SES</td>
<td>n = 6</td>
<td>33.3 %</td>
</tr>
<tr>
<td><strong>Years of Publication</strong></td>
<td>2013 - 2021</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3
*Meta Analysis Effect Sizes*

<table>
<thead>
<tr>
<th>Group by</th>
<th>Study name</th>
<th>Subgroup within study</th>
<th>Outcome</th>
<th>Statistics for each study</th>
<th>Correlation</th>
<th>Lower limit</th>
<th>Upper limit</th>
<th>Z-Value</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Metric of Resilience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic Achievement</td>
<td>Johnson, 2018</td>
<td>Combined</td>
<td>Allostatic Load</td>
<td></td>
<td>-0.032</td>
<td>-0.057</td>
<td>-0.007</td>
<td>-2.538</td>
<td>0.011</td>
</tr>
<tr>
<td>Academic Achievement</td>
<td>Sims &amp; Coley, 2019</td>
<td>Mixed-Genders</td>
<td>Allostatic Load</td>
<td></td>
<td>0.458</td>
<td>0.426</td>
<td>0.488</td>
<td>24.935</td>
<td>0.000</td>
</tr>
<tr>
<td>Academic Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.227</td>
<td>-0.283</td>
<td>0.624</td>
<td>0.905</td>
<td>0.386</td>
</tr>
<tr>
<td>High-Effort Coping</td>
<td>Brody, 2013</td>
<td>Mixed-Genders</td>
<td>Allostatic Load</td>
<td></td>
<td>-0.044</td>
<td>-0.132</td>
<td>0.045</td>
<td>-0.971</td>
<td>0.332</td>
</tr>
<tr>
<td>High-Effort Coping</td>
<td>Fazeli, 2021</td>
<td>Mixed-Genders</td>
<td>Allostatic Load</td>
<td></td>
<td>-0.270</td>
<td>-0.481</td>
<td>-0.056</td>
<td>-2.445</td>
<td>0.014</td>
</tr>
<tr>
<td>High-Effort Coping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.155</td>
<td>-0.585</td>
<td>0.343</td>
<td>-0.595</td>
<td>0.552</td>
</tr>
<tr>
<td>Higher-SES</td>
<td>Geronimus, 2020</td>
<td>Mixed-Genders</td>
<td>Allostatic Load</td>
<td></td>
<td>-0.210</td>
<td>-0.393</td>
<td>-0.011</td>
<td>-2.072</td>
<td>0.038</td>
</tr>
<tr>
<td>Higher-SES</td>
<td>Merkin, 2009</td>
<td>Mixed-Genders</td>
<td>Allostatic Load</td>
<td></td>
<td>-0.188</td>
<td>-0.363</td>
<td>-0.011</td>
<td>-2.080</td>
<td>0.037</td>
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<tr>
<td>Higher-SES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.199</td>
<td>-0.816</td>
<td>0.306</td>
<td>-0.783</td>
<td>0.445</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.038</td>
<td>-0.383</td>
<td>0.295</td>
<td>-0.217</td>
<td>0.828</td>
</tr>
</tbody>
</table>
Figure 2. Forest Plot – External Metrics and Allostatic Load
Figure 4. Weathering Conceptual Model by Geronimus, et al., 2020.
Skin Deep Resilience and Weathering Meta-Analysis Search Strategy

**PUBMED/Medline Strategy**

**Search #1**

**Search #2**

**Search #3**
SKIN-DEEP RESILIENCE AND WEATHERING

On 9.26.2021 In the Query box I typed #1 AND #2 AND #3

- My initial search yielded 136 articles
- I then dragged the year to start at 1992 which gave me 134 articles
- In additional filters I selected “Journal Articles”
- For “MY NCBI FILTERS” I selected English & Humans and that gave me a total of 104 articles
- I downloaded the CSV file with 104 article

Skin Deep Resilience and Weathering Meta-Analysis Search Strategy


- First I logged into my DePaul Library Student account and went to A-Z Databases & Resources
- I clicked on APA PsycInfo. This took me to My EBSCOhost account
- APA PsycInfo was already selected in My EBSCOhost account so I then clicked on “choose databases” to select the following additional databases
  - Academic Search Completed
  - CINAHL Complete
  - Education Research Complete
  - ERIC
  - Health and Psychosocial Instruments
  - Health Source: Nursing/Academic Edition
  - And Social Sciences Abstracts
- And then I pressed Okay. I pressed Show All at the top of the page to double-check that each of the aforementioned databases was correctly selected for the search.

In the section called Search Options I selected the following

- Boolean/Phrase
- Apply related words
- Also search within the full text of the articles
- Apply equivalent subjects
- Scholarly (Peer Reviewed) Journals

Under special limiters for APA PsycInfo I selected

- Peer reviewed journal
SKIN-DEEP RESILIENCE AND WEATHERING

- Peer-reviewed status-unknown
- Dissertation Abstract
- Electronic Collection
- English
- Human Population group
- Abstract collection, dissertation, and journal article under document type

Under special limiters for Academic Search complete I selected

- English for Language
- Abstract and article under document type

Under special limiters for CINAHL Complete I selected

- English Language
- Research Article
- Exclude MEDLINE records to reduce duplications from Pubmed search
- Human
- USA under Geographic subset
- English under language
- Under Publication Type I chose Journal article, Master’s thesis, doctoral dissertation

Under special limiters for Education Research Complete I selected

- Academic journal underneath Publication type
- English under language
- Abstract and article under document type

Under special limiters for ERIC I selected

- Journal article under Journal or document
- Dissertations/Theses (ALL) & Journal Articles under Publication Type
- English under language

Under special limiters for Health and Psychosocial instruments

- I did not select anything

Under special limiters for Health Source: Nursing/Academic Edition I selected

- Academic journal under publication type
- I selected Abstract & Article under Document type

Under special limiters for Social Sciences Abstracts (H.W Wilson) I selected

- Academic journal under publication type
- Abstract & Article under Document type

Search #1 – AB Abstract selected

"Self-Control" OR "Resilience, Psychological" OR "Achievement" OR "Academic Success" OR Resilience OR "skin-deep resilience" OR "skin deep resilience" OR "john henryism" OR "high
SKIN-DEEP RESILIENCE AND WEATHERING

effort coping" OR "high-effort coping" OR "effortful control" OR "effortful-control" OR "effortful coping" OR "high achieve*" OR successful OR "academic* success*" OR "high-income earning" OR "high SES" OR “high socioeconomic status” OR “high socio-economic status” OR "high education level" OR "well educated" OR "educated" OR “striving” OR “highly motivated”

AND

Search #2 – AB Abstract selected

"Allostasis" OR "Stress, Psychological/physiology" OR "Stress, Psychological/physiopathology" OR "Biomarkers/analysis" OR "Aging/physiology" OR "Telomere Homeostasis" OR "Epigenesis, Genetic" OR "Epigenomics" OR "DNA Methylation" OR weathering OR “allostatic load” OR “accelerated age” OR “accelerated aging” OR “cellular aging” OR “biological age” OR “biological aging” OR “telomere length” OR telomer* OR “epigenetic age” OR “epigenetic aging” OR “health eros*” OR “erosi*” OR “cumulative health” or “physiological cost”

AND

Search #3 – AB Abstract selected


I adjusted the results timeline to start at articles published after 1992

Results by Database

- Academic Search complete (26)
- APA Psycinfo (24)
- CINAHL Complete (18)
- Social Sciences Abstracts (12)
- Education Research Complete (7)
- Health Source: Nursing/Academic Edition (4)
- ERIC (2)

93 articles were found across each database searched

- 2 results were excluded because they were reports
- 2 results were excluded because they were magazines
- And 48 results were excluded because they were duplicates from the PubMed search
SKIN-DEEP RESILIENCE AND WEATHERING

I downloaded the CSV with 45 articles

Finally, I logged into Proquest.com through my access provided by DePaul University

I went to advanced search
I selected article and Dissertation/Theses under document type
I selected English under Language
I put 1992 as the start year

Search #1 – AB Abstract selected
"Self-Control" OR "Resilience, Psychological" OR "Achievement" OR "Academic Success" OR Resilience OR "skin-deep resilience" OR "skin deep resilience" OR "john henryism" OR "high effort coping" OR "high-effort coping" OR "effortful control" OR "effortful-control" OR "effortful coping" OR "high achiev*" OR successful OR "academic* success*" OR "high-income earning" OR "high SES" OR “high socioeconomic status” OR “high socio-economic status” OR "high education level" OR "well educated" OR "educated" OR “striving” OR “highly motivated”
AND

Search #2 – AB Abstract selected
"Allostasis" OR "Stress, Psychological/physiology" OR "Stress, Psychological/physiopathology" OR "Biomarkers/analysis" OR "Aging/physiology" OR "Telomere Homeostasis" OR "Epigenesis, Genetic" OR "Epigenomics" OR "DNA Methylation" OR weathering OR “allostatic load” OR “accelerated age” OR “accelerated aging” OR “cellular aging” OR “biological age” OR “biological aging” OR “telomere length” OR telomer* OR “epigenetic age” OR “epigenetic aging” OR “health eros*” OR “erosi*” OR “cumulative health” or “physiological cost”
AND

Search #3 – AB Abstract selected
I ran the search in the 27 databases that were pre-selected

There 104 results

After excluding results from historical newspapers (6), magazines (1), newspapers (1), reports (1), and trade journals (1) I was left with 94 results

I removed documents that were undefined, literature reviews, and information documents and was left with 91 results

I excluded articles published in Portuguese and Spanish and was left with 90 results

Only 79 results appeared in the list of results because 11 of them were duplicates.
Appendix C

Data Screening Codebook/Checklist

Article Details

- Title
- Author
- Year of Publication
- Citation
- Paste Article Abstract Below

Include articles if the answer to the questions in the section below = yes

- Was this study published in English?
- Was the study included in a peer-review journal? OR Is the study a dissertation or a master’s thesis?
- Was the study published after the year 1991?
- Is the study sample from the United States of America?
- Does the study sample include Black people?
  - Are the number of Black people specified separate from the whole sample?
- Does the outcome data from the article include a measure of external metrics of resilience, success, and upward mobility?
- Does the outcome data from the article include a measure of physiological indicator of weathering?
  - If yes, indicate which one(s)
    - Telomere length
    - Allostatic load
SKIN-DEEP RESILIENCE AND WEATHERING

- DNA methylation

- Does the outcome data specify the results for some or all of the Black participants included in the sample?
  - If yes, indicate which one(s)
    - SES
    - Academic achievement
    - Resilience/High-effort coping

Specify What Category the Included Article Falls into

- The article reported external metrics of resilience and physiological indicators of weathering for Black participants only
- The article reported external metrics of resilience physiological indicators of weathering for Black participants and non-Black participants

Study and Sample Characteristics

- How many Black participants were included in the analysis?
- What is the age range of the Black participants included in the analysis?
- How many Black women were included in the analysis?
- How many Black men were included in the analysis?

Measures and Assessments of variables

- How was external metric of resilience/upward mobility measured in this study? Describe how each external metric reviewed was measured.
- How was physiological indicators of weathering measured in this study?

Outcome Data
SKIN-DEEP RESILIENCE AND WEATHERING

• What was the relationship between external metrics of resilience and upward mobility and physiological indicators of weathering?
SKIN-DEEP RESILIENCE AND WEATHERING

Appendix D

[Literature Search Inclusion & Exclusion Database]
https://docs.google.com/spreadsheets/d/1VXU-bUU-0iqBzxh9VUbAs6v0BnufKgQjaqXyRkuXY2Q/edit?usp=sharing