



A decade of studying implicit racial/ethnic bias in healthcare providers using the implicit association test



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ABSTRACT

Disparities in the care and outcomes of US racial/ethnic minorities are well documented. Research suggests that provider bias plays a role in these disparities. The implicit association test enables measurement of implicit bias via tests of automatic associations between concepts. Hundreds of studies have examined implicit bias in various settings, but relatively few have been conducted in healthcare. The aim of this systematic review is to synthesize the current knowledge on the role of implicit bias in healthcare disparities. A comprehensive literature search of several databases between May 2015 and September 2016 identified 37 qualifying studies. Of these, 31 found evidence of pro-White or light-skin/anti-Black, Hispanic, American Indian or dark-skin bias among a variety of HCPs across multiple levels of training and disciplines. Fourteen studies examined the association between implicit bias and healthcare outcomes using clinical vignettes or simulated patients. Eight found no statistically significant association between implicit bias and patient care while six studies found that higher implicit bias was associated with disparities in treatment recommendations, expectations of therapeutic bonds, pain management, and empathy. All seven studies that examined the impact of implicit provider bias on real-world patient-provider interaction found that providers with stronger implicit bias demonstrated poorer patient-provider communication. Two studies examined the effect of implicit bias on real-world clinical outcomes. One found an association and the other did not. Two studies tested interventions aimed at reducing bias, but only one found a post-intervention reduction in implicit bias. This review reveals a need for more research exploring implicit bias in real-world patient care, potential modifiers and confounders of the effect of implicit bias on care, and strategies aimed at reducing implicit bias and improving patient-provider communication. Future studies have the opportunity to build on this current body of research, and in doing so will enable us to achieve equity in healthcare and outcomes.

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1. Introduction

The landmark report *Unequal Treatment* brought increased attention to inequities that exist in healthcare, including racial/ethnic disparities in the incidence, prevalence and complications from hypertension, heart disease and diabetes (Nelson et al., 2003). Despite efforts to reduce such disparities, racial/ethnic minorities (Black, Hispanic, Asian, Pacific Islander and American Indian/Alaska Native) continue to experience poorer healthcare and outcomes. In

an annual disparities report each year since 2003, the Agency for Healthcare Research and Quality has documented that widespread disparities persist in the United States. Through 2013 Blacks, Hispanics, and American Indians/Alaska Natives have continued to receive worse care for 40% of the quality measures assessed and Asians receive worse care for 20% of measures (Agency for Healthcare Research and Quality, 2016). Minorities also have higher incidence, mortality and advanced staging at diagnosis for several cancer types including cervical, kidney, breast, colorectal, lung, and prostate (National Cancer Institute, 2016; Jemal et al., 2017)). For children, disparities in infant mortality rates, chronic disease, quality of care, organ transplantation and leukemia related deaths have also been noted (Flores, 2010).

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Although a large body of literature documenting disparities in health and healthcare exists, little is known about the sources of such disparities. *Unequal Treatment* concluded that “bias, stereotyping, prejudice and clinical uncertainty on the part of health care providers may contribute to racial/ethnic disparities in health care” (Nelson et al., 2003, p. 12). Other research also suggests that health care providers' (HCPs) perceptions of patients vary depending on patient race/ethnicity, suggesting the existence of bias. One study found cardiologists perceived Black patients as less intelligent, likeable, friendly; and more prone to risky behavior and non-compliance compared to White patients (van Ryn and Burke, 2000). Patients' perceptions of discrimination in medical interactions also suggest the existence of provider bias. When compared to White patients, minorities are more likely to believe they would receive better care and more respect from medical staff if they belonged to another racial group (Johnson et al., 2004).

Despite evidence suggesting the presence of provider bias, measuring bias poses methodological challenges. Bias can exist on both explicit and implicit levels, representing two related but independent constructs (Nosek et al., 2007a). Explicit bias encompasses our *conscious* attitudes which can be measured by self-report, but pose the potential of individuals falsely endorsing more socially desirable attitudes. Implicit biases are *unconscious* and involuntary attitudes which lie below the surface of consciousness, but can influence affect, behavior, and cognitive processes. The Implicit Association Test (IAT) is one validated tool used to measure implicit bias (Greenwald et al., 1998). The IAT requires participants to rapidly pair two social groups with either positive or negative attributes. For example, in the race IAT, participants pair photos of Black and White faces with *good* or *bad* words like pleasure or agony. Depending on the latency in response time and frequency of errors, the IAT measures the strength of association of each pairing such that more strongly associated categories are easier to pair, reflected by faster responses and fewer errors. Participants who categorize White faces with positive words more quickly and with fewer errors than when categorizing Black faces have an implicit pro-White bias. Scored using the D algorithm, the average difference in response time across trials yields a continuous measure ranging from -2 to $+2$, which represents an estimate of effect size (Greenwald et al., 2003). Results are categorized into groups with scores from 0 to 0.14 indicating no racial bias; 0.15–0.34, slight pro-White bias; 0.35–0.64, moderate pro-White bias; and >0.65 , strong pro-White bias. Negative scores of the same degree indicate similar categories of pro-Black bias.

Though introduced into psychological literature in 1998, research using the IAT to examine HCP bias was first published in 2007 (Green et al., 2007). The objective of this review was to critically assess and synthesize the current knowledge on the role of implicit bias in healthcare disparities. Specifically, we sought to determine whether implicit bias towards racial/ethnic minorities is present among HCPs; and if so, determine if implicit bias is associated with healthcare outcomes, and if effective interventions exist to reduce implicit bias and its impact on healthcare.

2. Methods

A literature review was performed using a protocol created according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Moher et al., 2015). In consultation with a biomedical sciences librarian, we searched PubMed, PsycINFO, SCOPUS and CINAHL for articles published from 1997 through May 30th 2015. Our search strategy is detailed in Table 1. Search terms were saved in PubMed, with weekly-automated updates for additional articles published through September 30th, 2016.

We used search terms related to HCPs, implicit bias, and race/ethnicity. We defined HCPs, based on the US Department of Health and Human Services (2000) definition of health care, as any individual involved with preventive, diagnostic, therapeutic, rehabilitative, maintenance, or palliative care of a patient. Although several instruments exist for measuring bias, we limited our review to studies using the IAT because it is the most widely known and validated instrument to measure implicit attitudes. Furthermore, the IAT is more reliable than self-report and resistant (though not immune) to deliberate faking (Greenwald et al., 2003, 2009; Nosek et al., 2005, Nosek et al., 2007b). Given our objective to understand the association between implicit bias and racial/ethnic disparities in healthcare, we limited our search to studies that focused on implicit racial/ethnic prejudice or stereotype activation, and excluded studies exclusively evaluating other biases (e.g. disability, gender, weight, religion).

Four members of the research team screened half the articles in duplicate so each article was screened by two researchers using a priori defined inclusion and exclusion criteria, with disagreements resolved by the last author. The initial database search yielded 6249 articles. After duplicate removal, 4934 articles remained. After applying inclusion/exclusion criteria 29 studies remained, with an additional eight studies included from auto-search results (Fig. 1). The quality of the final 37 studies was assessed using a modified version of the Newcastle-Ottawa Quality Assessment Scale (Wells et al., 1999). Included studies were subjected to data extraction including aim, location, setting, design, methods, response rates, sample size, HCP characteristics, patient characteristics, mean IAT scores, and other main results. Each study was independently extracted by two research team members.

3. Results

Details about objectives, location and setting, provider characteristics, patient characteristics, provider IAT scores, and associations between implicit bias with outcomes or effects of intervention for all 37 studies are detailed in the supplemental online Appendix [INSERT LINK TO ONLINE FILE A].

3.1. Study characteristics

Of the 37 studies, 31 were peer-reviewed publications, five were thesis papers (Charles, 2009; Fitzsimmons, 2009; Schaffer, 2010; Steed, 2009; Weinstock, 2012) and one was a published chapter in a book series for an international conference (Rossen et al., 2008). Thirty were primary analyses of original data while seven were secondary analyses of parent studies. The total number of provider participants among all included studies was 10,013; with sample sizes ranging from 13 to 3547. Eight studies included less than 25 providers. Provider response rates ranged from 28% to 90%, with 12 studies reporting a response rate under 60%. Nine studies recruited patient participants with response rates ranging from 21% to 98%.

All studies assessed implicit bias among at least one type of provider, with five studies including more than one provider type. Twenty-three assessed implicit bias among physicians in the fields of family medicine, pediatrics, internal medicine, endocrinology, obstetrics/gynecology, trauma surgery, emergency medicine, and oncology. Ten studies assessed implicit bias among healthcare students in the fields of medicine, counseling, nursing, pharmacy, physician's assistants, and psychology. Providers assessed in the remaining four studies included mental health counselors, nurses, genetic counselors, and occupational therapists. Fifteen studies used multisite/national samples, while 21 sampled participants from a single city including Baltimore, Denver, New York, Detroit,

Table 1

Search strategy for systematic review of research on implicit racial/ethnic/skin-tone bias among health care providers.

Databases

PubMed, SCOPUS, CINAHL, Psycinfo

Search Terms

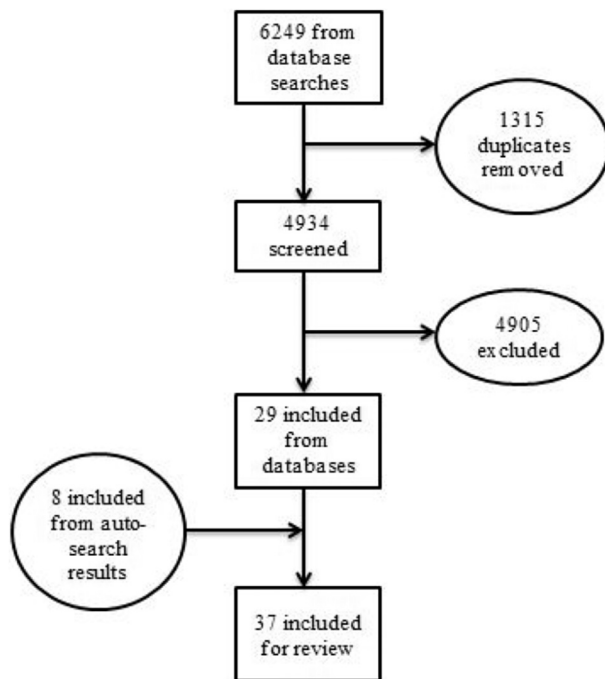
("Health personnel" OR physician* OR nurs* OR "medical student*" OR counselor* OR provider* OR healthcare or "health care" OR doctor* OR pharmacist* OR "physician-patient relation*" OR practitioner* OR therapist* OR "healthcare preprofessionals" OR "primary care provider*") AND ("implicit association test*" OR "IAT" or "implicit attitude*" OR "implicit bias" OR (prejudice AND implicit) OR "attitude* of health personnel" OR "rac* bias" OR "implicit rac* bias" OR "unconscious bias*" OR "implicit preference" OR "nonconscious stereotyping" OR "sequential priming task" OR "pro-white") AND (African Continental Ancestry Group/ethnicity OR black* OR "African American*" OR "Hispanic" OR "Hispanic American*" OR race* OR racis* OR "minority health" OR "anti-Black" OR "anti-hispanic" OR Hispanic)

Inclusion Criteria

- Measures implicit bias using the Implicit Association Test (IAT)
- Uses a race, ethnicity, or skin tone IAT
- Measures bias of HCPs (registered nurses, physicians, physician assistants, pharmacists, psychologists, genetic counselors, respiratory therapists, psychologists, chiropractors and physical therapists) or providers in training (e.g. health professional students, medical residents/fellows)
- Published in English
- Conducted in the United States

Exclusion Criteria

- Only examines explicit racial attitudes
- Does not use the IAT
- Subjects not HCPs
- Not in English
- Not in conducted in the United States
- Published before 1997

**Fig. 1.** Flow chart depicting the study identification and selection process.

Seattle, Pittsburgh, Memphis and Houston.

Of 35 studies reporting sex, females comprised 58% on average (range 7–100%). Thirty-five studies reported provider race/ethnicity, with the majority of participants being White or Asian while only 9% were Black and 3% were Hispanic.

3.2. Presence of implicit bias among HCPs

Implicit provider bias related to race/ethnicity was assessed using 10 types of IATs (Table 2). Thirty-five studies used the Race IAT, which compares bias against Black versus White adults. Of the 31 studies that reported Race IAT means or interpretations, 26 found that most HCPs have some level of pro-White/anti-Black bias ranging from slight to strong bias. Similar results were found in the

one study that used the Black Child Race IAT, which compares bias against Black versus White children ($M = 0.55$) (Johnson et al., 2016b). Four studies featuring the same sample of 13–15 family medicine residents reported no implicit bias using the Race IAT. These providers were primarily Asian foreign medical graduates (89%) practicing at a PCP clinic in the Midwestern US which serves a population of mostly Black and Hispanic patients (Hagiwara et al., 2013, 2016a; Penner et al., 2010). One thesis paper also reported no overall implicit bias using the Race IAT in a sample of 139 predominantly black (73%) medical students, although slight pro-white bias was found among non-Black students in this sample (Weinstock, 2012). The remaining four studies that used the Race IAT did not report IAT D score means.

Three studies (all from the same sample of providers) used the Ethnicity IAT, which compares bias against Hispanic versus White adults. Participants had slight pro-White/anti-Hispanic bias ($M = 0.33$), with 51% demonstrating moderate to strong pro-White/anti-Hispanic bias (Blair et al., 2013a; 2013b, 2014). One study used American-Indian IATs (both adult and child), which compare bias against American Indian versus White adults/children. They found moderate pro-White/anti-American Indian bias overall ($M = 0.54$), and when specifically looking at adults ($M = 0.49$) and children ($M = 0.60$) (Puumala et al., 2016). Among three studies that used the Skin Tone IAT, which compares bias against dark versus light skin, one study did not report mean IAT scores (Gonzalez et al., 2014) while the other two reported means of 0.26 (slight pro-light skin bias) (White-Means et al., 2009) and 0.35 (moderate pro-light skin bias) (Fitzsimmons, 2009).

Three studies used the Race/Compliance IAT and found a slight bias favoring White patients as more compliant than Black patients ($M = 0.25$ – 0.29) (Cooper et al., 2012; Sabin et al., 2008; Sabin and Greenwald, 2012). Two studies used the Race/Medical Cooperativeness IAT, demonstrating that providers were more likely to associate Black patients with reduced cooperativeness with medical care ($M = 0.30$ and $M = 0.23$) (Green et al., 2007; Oliver et al., 2014). One study used the Race/Procedural cooperativeness IAT and found that providers were more likely to associate Black patients with reduced cooperativeness with procedures ($M = 0.22$) (Green et al., 2007). Two studies from a single sample examining the association between quality of care and race found that providers were more likely to associate higher quality of care with Black versus White patients ($M = -0.21$, slight pro-Black bias)

Table 2
Presence of implicit racial bias among HCPs.

Type of IAT Used	IAT Interpretation	Author, year
Race	35 studies total 26 studies demonstrated slight to strong implicit pro-White/anti-Black bias 5 studies demonstrated no implicit anti-Black bias 4 studies did not report mean levels of implicit racial bias.	Blair et al., 2013a, 2013b, 2014; Boysen and Vogel, 2008; Castillo et al., 2007; Charles, 2009; Cooper et al., 2012; Gonzalez et al., 2014; Green et al., 2007; Hagiwara et al., 2013, 2016a, 2016b; Haider et al., 2011, 2014, 2015a, 2015b; Hausmann et al., 2015; Hirsh et al., 2015; Johnson et al., 2016a, 2016b; Katz and Hoyt, 2014; Oliver et al., 2014; Penner et al., 2010, 2016a; Rossen et al., 2008; Sabin et al., 2008, 2009; Sabin and Greenwald, 2012; Schaa et al., 2015; Schaffer, 2010; Steed, 2009; Teal et al., 2010; van Ryn et al., 2015; Weinstock, 2012; White-Means et al., 2009
Black Child	1 study demonstrated moderate implicit bias against Black vs White children	Johnson et al., 2016b
Ethnicity	3 studies demonstrated slight implicit pro-White/anti-Hispanic bias	Blair et al., 2013a, 2013b, 2014
American-Indian Adult	1 study demonstrated moderate implicit pro-White/anti-American-Indian bias	Puumala et al., 2016
American-Indian Child	1 study demonstrated moderate implicit bias against American-Indian vs White children	Puumala et al., 2016
Skin Tone	3 studies total 2 studies demonstrated slight implicit anti-dark skin bias. 1 study did not report levels of implicit skin tone bias.	Gonzalez et al., 2014; Fitzsimmons, 2009; White-Means et al., 2009
Race/Compliance	3 studies demonstrated slight implicit association between compliance and White patients when compared to Black patients	Cooper et al., 2012; Sabin et al., 2008; Sabin and Greenwald, 2012
Race/Medical Cooperativeness	2 studies demonstrated slight implicit association between Blacks and reduced medical cooperativeness	Green et al., 2007; Oliver et al., 2014
Race/Procedural Cooperativeness	1 study demonstrated slight implicit association between Black patients and reduced cooperativeness with medical procedures when compared to White patients	Green et al., 2007
Race/Quality Care	2 studies demonstrated slight implicit association between Blacks and superior quality of healthcare when compared to White patients	Sabin et al., 2008; Sabin and Greenwald, 2012

(Sabin et al., 2008; Sabin and Greenwald, 2012).

When examining IAT scores stratified by provider demographic characteristics, one study found Black physicians had less bias ($M = 0.05$) than White physicians ($M = 0.44$) (Sabin et al., 2009). A thesis paper found Black medical students were less likely to have implicit bias ($M = 0.04$) compared to non-Black students ($M = 0.19$) (Weinstock, 2012). Other studies found similar trends of lower bias among Blacks compared to Whites which were not statistically significant (Cooper et al., 2012; Haider et al., 2014, 2015a). Hispanic and Asian providers had similar levels of bias as White respondents (Cooper et al., 2012; Haider et al., 2011, 2014, 2015a; Sabin et al., 2009; Weinstock, 2012).

When stratified by sex, one study with 2535 physicians reported weaker bias in female versus male physicians ($M = 0.30$ vs $M = 0.45$) (Sabin et al., 2009). Although another study found similar trends (Cooper et al., 2012), eight other studies with smaller sample sizes did not find differences in IAT scores by gender (Fitzsimmons, 2009; Haider et al., 2011, 2014, 2015a, 2015b; Johnson et al., 2016a, 2016b; White-Means et al., 2009).

Few studies explored factors outside of demographic characteristics that influence implicit bias. One study examined factors associated with change in medical students' implicit racial bias from the beginning to the end of medical school. Negative role modeling from faculty members in the form of negative comments about Black patients and unfavorable interactions with African American faculty were associated with increased racial bias. Completing the IAT as part of training, increasing efficacy in caring for African-American patients, and opportunity for and encouragement of interracial relations training were associated with decreased implicit bias (van Ryn et al., 2015). Another study examining the impact of cognitive load in the emergency department on implicit racial bias found cognitive stressors such as patient load and overcrowding were associated with increased bias (Johnson et al., 2016a).

3.3. Association between implicit bias and healthcare outcomes

Twenty-three studies examined the association between implicit bias and healthcare outcomes, of which 12 were vignette-based, two used simulated patients, and nine examined real-world patient care (Table 3). Of the 12 vignette studies, 8 found no association between implicit bias and providers' assessments, treatment recommendations or clinical decisions in the areas of acute care and trauma (Haider et al., 2014, 2015a, 2015b), osteoarthritis (Oliver et al., 2014), pain management (Haider et al., 2011; Hirsh et al., 2015), and pediatric care (Puumala et al., 2016; Sabin et al., 2008). Four found disparities in at least one area of care, but these disparities in treatment recommendations were not associated with IAT scores after adjusting for provider age, gender, and explicit bias (Haider et al., 2014, 2015a, 2015b; Sabin et al., 2008).

The remaining four vignette-based studies did find an association between implicit bias and disparities in care. One thesis paper found that increased implicit bias in resident physicians was associated with fewer follow up recommendations for patients with type II diabetes mellitus, but this effect was found regardless of patient race (Charles, 2009). Among another sample, pediatricians with stronger pro-White bias were less likely to prescribe post-operative narcotics to Black children compared to White children (Sabin and Greenwald, 2012). Higher implicit pro-White/anti-Black bias was also associated with poorer anticipated therapeutic bonds with Black versus White patients among counselors and counseling trainees (Katz and Hoyt, 2014). Another study among internal and emergency medicine resident physicians demonstrated that increased pro-White bias predicted lower rates of appropriate treatment for acute coronary syndrome in Black but not White patients (Green et al., 2007). In this study, researchers found that 23% of providers were aware of the study objectives. These providers were excluded from the final analysis, but when examined separately, increase in bias among physicians aware of study objectives was associated with more thrombolysis

Table 3

Association between implicit bias and outcomes.

Vignette-Based Studies		
Author, year	Outcome Studied	Association between implicit bias and outcome (present or absent)
Charles, 2009	Recommendations for T1DM treatment	Present
Green et al., 2007	Thrombolysis recommendations	Present
Haider et al., 2011	Pain assessment and management	Absent
Haider et al., 2014	Trauma/acute care management	Absent
Haider et al., 2015a	Trauma/acute care management	Absent
Haider et al., 2015b	Trauma/acute care management	Absent
Hirsh et al., 2015	Pain assessment and management	Absent
Katz and Hoyt, 2014	Expectations of therapeutic bonds and patient prognosis	Present
Oliver et al., 2014	Total knee replacement recommendations	Absent
Puumala et al., 2016	Pain and asthma management	Absent
Sabin et al., 2008	UTI, ADHD, and asthma management	Absent
Sabin and Greenwald, 2012	UTI, ADHD, and pain management	Present
Simulation Studies		
Rossen et al., 2008	Provider empathy	Present
Schaa et al., 2015	Patient-provider communication	Present
Real-World Patient Care		
Blair et al., 2013b	Patient provider communication	Present
Blair et al., 2014	Hypertension treatment	Absent
Cooper et al., 2012	Patient provider communication	Present
Hausmann et al., 2015	Social integration, depression and life satisfaction	Present
Hagiwara et al., 2013	Patient provider communication	Present
Hagiwara et al., 2016a	Patient provider communication	Present
Hagiwara et al., 2016b	Patient provider communication	Present
Penner et al., 2010	Patient provider communication	Present
Penner et al., 2016a	Patient provider communication	Present
Interventional Studies		
Author, year	Intervention	Post-intervention decrease in implicit bias (present or absent)
Castillo et al., 2007	Multicultural class	Present
Steed, 2009	Virtual cultural training module	Absent

Abbreviations: T1DM, type II diabetes mellitus. UTI, urinary tract infection. ADHD, attention deficit hyperactivity disorder.

recommendations for Black patients, whereas increase in bias among unaware physicians was associated with fewer thrombolysis recommendations for Black patients.

Two studies used simulated patients and both found an association between implicit provider bias and racial differences in patient-provider experiences. When interacting with Black and Hispanic versus White simulated patients, genetic counselors with higher pro-White implicit bias displayed more negative affect, verbal dominance, and slower dialogue, with less emotionally responsive and content rich communication. This resulted in lower verbal effectiveness ratings from minority versus White simulated clients (Schaa et al., 2015). The other study published as a chapter in a book series found that medical students with pro-White bias demonstrated more self-reported and observed empathy for light-versus dark skinned virtual patients (Rossen et al., 2008).

Only nine studies examined the impact of implicit racial bias on real-world patient-provider interactions. Seven found an association between provider implicit bias and patient-provider communication. Two found that PCPs with greater pro-White bias demonstrated higher verbal dominance (Cooper et al., 2012; Hagiwara et al., 2013). PCPs with higher pro-White bias also used more anxiety related words during visits with Black versus White patients (Hagiwara et al., 2016a). Additionally, Black patients rated providers with higher pro-White bias more poorly on multiple measures including interpersonal treatment, supportive communication, and patient centeredness (Blair et al., 2013b; Penner et al., 2016a). Black patients of physicians with higher implicit bias reported lower satisfaction and confidence in recommended treatments, and greater anticipated difficulty with completing recommended treatments (Penner et al., 2016a).

Although no association has been found between explicit bias alone and healthcare disparities, two studies examined how the combination of HCP explicit and implicit bias affects patient perceptions. The first demonstrated that Black patients had the most negative ratings on measures of HCP warmth, friendliness and satisfaction when interacting with physicians who reported relatively low levels of explicit bias but showed relatively high levels of implicit bias on the IAT, which the authors refer to as 'aversive racists' (Penner et al., 2010). Hagiwara et al. (2016b) had conceptually similar findings, demonstrating that in racially discordant medical interactions physicians classified as aversive racists were rated by observers as showing less positive affect towards Black patients who reported prior discrimination. This study highlights the complexity of when and how implicit bias may impact patient care, revealing a three-way interaction between physician explicit bias, physician implicit bias, and patient perceived discrimination. Specifically, this study further adds to the literature by revealing the conditions under which physician implicit racial bias is most likely to affect racially discordant medical interactions with Black patients. Their findings suggest that the experiences and attitudes that Black patients bring to their healthcare visits and the racial attitudes of racially discordant providers jointly influence the behaviors that each displays during the medical encounter and affects the patient-provider interaction. The authors hypothesized that this may be because black patients with prior experiences of discrimination may have different behaviors during the medical interaction (e.g. expressing more negative feelings) that in turn influence physicians' affect, particularly among aversively racist physicians.

Only two studies examined the effect of implicit bias on real-

world clinical outcomes. One found no effect of PCP implicit bias on treatment intensification, patient adherence or control of hypertension (Blair et al., 2014). The other found that patients with spinal cord injuries, regardless of race, had worse social integration, depression and life satisfaction if their physicians demonstrated higher levels of implicit bias (Hausmann et al., 2015).

3.4. Interventions to reduce implicit bias

Only two studies examined interventions aimed at reducing provider bias. One found that counseling trainees assigned to a multicultural training course showed a 9% decrease in implicit bias when compared to those assigned to a control class (Castillo et al., 2007). Another intervention aimed at occupational therapists used virtual training modules on cultural competency featuring simulated minority clients, but no difference was found between pre- and post-simulation levels of bias (Steed, 2009).

4. Discussion

Our review of the literature reveals four important findings. First, a growing body of research suggests that similar to the general US population, most HCPs across multiple levels of training and disciplines have implicit biases against Black, Hispanic, American-Indian and dark-skinned individuals. Second, we found interesting trends when looking at provider characteristics associated with bias. Most studies suggest Blacks are more likely to demonstrate no implicit bias compared to Whites and other minorities. Third, there is limited research examining the impact of implicit bias on patient care and outcomes. Most studies have been vignette-based and reveal mixed results, with four demonstrating a relationship between implicit bias and patient care/outcomes and eight finding no association. Fewer studies have looked at the impact of bias on real-world patient care but have persistently demonstrated an association between higher implicit bias and poorer patient-provider interactions. Of two studies investigating real-world clinical outcomes, one found an association with implicit provider bias while the other did not. Fourth, only two published intervention studies have investigated methods to reduce implicit bias among HCPs and only one has demonstrated post-intervention reduction in implicit bias.

The findings of our review are significant because racial/ethnic disparities are pervasive in healthcare and provider bias has been cited as an important factor contributing to healthcare disparities (Agency for Healthcare Research and Quality, 2016; Nelson et al., 2003). Our study builds on a previous review of 15 studies performed when the IAT was in its earlier stages of use in healthcare (Hall et al., 2015). Fourteen of the included studies used the IAT and found that overall there were low to moderate levels of implicit anti-Black, Hispanic and dark skin bias among HCPs, similar to what we found in this current review. Additionally, Hall et al. (2015) found that implicit bias had an equivocal effect on treatment decisions and health care outcomes but demonstrated a more consistent effect on patient-provider interactions. Since the publication of their review, 12 new peer reviewed studies using the IAT in HCPs have been published. Furthermore, this review includes 11 articles (6 peer reviewed, 4 thesis papers, 1 book series chapter) that had been published at the time of the Hall et al. review but were not identified. These 23 additional studies using the IAT have expanded our understanding of implicit bias in HCPs in multiple ways including measuring bias in more racially diverse provider populations (White-Means et al., 2009) and among other types of HCPs such as registered nurses, genetic counselors, and mental health counselors/trainees (Haider et al., 2015b; Katz and Hoyt, 2014; Schaffer, 2010; Schaa et al., 2015). Additional studies have

also expanded our knowledge about bias against other minority populations, such as Native Americans, (Puumala et al., 2016), and bias against children (Johnson et al., 2016b; Puumala et al., 2016) which had previously been unexplored. Newly published studies not included in the original review have also further explored the effect of implicit bias on treatment recommendations and patient-provider communication (Penner et al., 2016a; Hagiwara et al., 2016a; Haider et al., 2014, 2015a, 2015b). Two studies added to the IAT methodology by using simulated patients (Charles, 2009; Rossen et al., 2008), two explored potential interventions to reduce implicit bias in HCPs (Castillo et al., 2007; Steed, 2009), and two studies had findings that could help inform potential interventions to reduce implicit bias (Gonzalez et al., 2014; Teal et al., 2010; van Ryn et al., 2015). Finally, several studies investigated factors that moderate implicit bias in HCPs (Boysen and Vogel, 2008; Johnson et al., 2016a; van Ryn et al., 2015) and factors that mediate the relationship between implicit bias and outcomes (Hagiwara et al., 2016b; Hirsh et al., 2015).

4.1. Limitations

The studies included in this review had several limitations. Many had small sample sizes, with nine reporting less than 25 HCPs. This raises the question of whether they were adequately powered to reveal a significant association between provider bias and patient outcomes. The use of convenience rather than representative sampling is another methodological limitation that raises the concern for decreased external validity. Response rates were as low as 28% and 12 studies reported response rates under 60%. Although these response rates are consistent with other survey research among physicians and other professionals, low response rates still raise concerns that non-responding HCPs may systematically differ from those who responded (Price, 2000; Cull et al., 2005; Asch et al., 1997). For example, it is possible that providers with greater bias or those who provide more disparate care chose not to participate. This could result in an underestimation of levels of implicit bias among HCPs and its impact on patient care. Concerns for non-response bias are supported by studies examining why professionals may refuse to participate in surveys, which include lack of interest in the topic, sensitive nature of the topic, and concerns for confidentiality (Sudman, 1985; Fan and Yan., 2010; Cook et al., 2000; Price, 2000).

Most of the studies examining the impact of provider bias on medical decision making did so using vignettes. Vignette-based studies may not accurately assess or activate the mechanism by which implicit bias influences patient care and outcomes. If disparities are driven largely by differences in patient-provider communication and interaction, the reciprocal feedback between a patient and his or her provider would not be testable without either simulated or actual patient-provider interactions. Patients may implicitly respond to providers' non-verbal behaviors, which are influenced by implicit bias, and this could have downstream effects that have not been elucidated by the current studies. Patients who sense increased implicit bias may have reduced trust in their providers, as suggested by the findings of Cooper et al. (2012), leading to decreased adherence and return to care. There are also patient level factors (e.g. education, income, grooming, English proficiency) that may magnify or attenuate the impact of implicit provider bias on care that are not well captured in clinical vignettes. At the level of the provider, implicit bias appears to affect the amount of time providers spend talking relative to the amount of time they spend listening to their patients (Cooper et al., 2012; Hagiwara et al., 2013; Schaa et al., 2015). Implicit bias could also affect the types of questions providers ask, and therefore the information obtained from their patients. These factors cannot be

fully assessed in vignette-based studies where all of the information is given and no face-to-face interaction occurs. Moreover, a large body of evidence documenting racial disparities in care exists but the majority of vignette-based studies found either no or little effect of patient race on treatment decisions. This may be a reflection of the way outcomes were measured and not necessarily an indication that bias did not exist. Vignettes take place in an artificial setting that differs from the actual clinical environment in which providers make decisions. Providing computer or paper-based assessments of how one would act in a situation is different from making actual decisions in a clinical setting. As such, while vignettes assess treatment recommendations, real-world and simulated studies assess treatment decision making and it is unclear whether the treatment recommendations that stem from vignette based studies would actually translate into or represent real world medical decisions. Given that implicit bias is more likely to affect behavior in the setting of increased cognitive load, pressure, fatigue and limited time (Burgess, 2010; van Ryn and Saha, 2011), vignette-based studies, which lack these stressors, may less accurately assess actual behavior.

An additional limitation of studies included in this review is that most used a cross-sectional design, limiting the ability to infer causality. Only one study was a controlled trial (Castillo et al., 2007) and only two studies examined how bias changes over time (van Ryn et al., 2015; Johnson et al., 2016a).

Unmeasured or unaccounted for effect modifiers and confounders represent another limitation of the current research. Among the vignette-based and simulation studies, only one examined how participant awareness affected responses. Participants may become aware of study goals based on the order of presented measures (explicit measures or IAT before vignettes) or by discussing with other participants prior to completing their assessments. Given findings that providers who had some awareness of study objectives provided less biased responses compared to colleagues with similar levels of bias (Green et al., 2007), studies that did not account for provider awareness in their analyses may have underestimated the effects of bias on decision making. Aversive racism and patients' past perceived discrimination are additional factors that may interact with provider bias to affect patient-provider communication, but these variables were only examined in two studies (Penner et al., 2010; Hagiwara et al., 2016b). As some studies suggest that females may have less implicit bias, it is also possible that studies adjusting for gender in their analyses (e.g. Haider et al., 2011, 2014, 2015a, 2015b; Puumala et al., 2016) may have adjusted away an association between implicit bias and patient care that was present.

Further limitations to consider include the fact that most studies examined bias in physicians, with limited research investigating bias among other types of providers such as nurses and counselors. With extensive evidence documenting the pervasiveness of disparities in healthcare, it is important to study implicit bias among other types of providers. Additionally, most studies investigated bias against black adults with limited research on bias against Hispanics, American-Indians, and children, and none examining provider bias against Asian Americans. Also, the single-site studies included were geographically limited to large metropolitan cities. Given that implicit bias shows geographic variation (Mooney, 2014), the lack of studies in rural and suburban settings outside of metropolitan cities is a further limitation. Additionally, the inclusion of five thesis papers and one book chapter published as part of a book series presents another potential limitation. While the inclusion of gray literature helps to overcome publication bias, the readers should use caution when interpreting these non-peer reviewed publications.

Finally, the authors must acknowledge questions that remain

among psychologists about the appropriateness of the IAT as a measure of implicit bias. Some researchers argue that the correlations between scores on the IAT and behavior are weak and similar in effect to correlations between explicit measures of bias and behavior (Oswald et al., 2013). Additional questions remain about whether the accepted cutoffs that indicate magnitudes of bias are meaningful or purely arbitrary (Blanton and Jaccard, 2006), and whether results on the IAT truly predict behavior (Blanton et al., 2009). Despite these concerns raised, a large body of research supports the reliability and validity of the IAT (Greenwald et al., 2003; Nosek et al., 2007b; Kang and Lane, 2010). Research also suggests that the IAT is superior to self-report and other measures of implicit bias in both predictive validity (Greenwald et al., 2009; Ziegert and Hanges, 2005) and resistance to faking (Steffens, 2004). The IAT is further advantageous in research with healthcare providers as it takes less time to complete than other measures of implicit bias.

4.2. Future directions

Despite the acknowledged limitations of the studies in our review, they offer an important foundation for the evidence of implicit bias in healthcare. Understanding the strengths and limitations of existing studies provides a roadmap for a research agenda aimed at examining the impact of implicit provider bias on healthcare outcomes, and identifying strategies to reduce provider bias.

4.2.1. More nationally representative sampling frames

The current literature examines implicit bias in the context of a small subset of provider and patient participants. Future studies should recruit larger, more representative samples, with wider variation in provider characteristics. For example, the finding that Hispanic and Asian providers demonstrated similar levels of anti-Black bias as White providers (Cooper et al., 2012; Haider et al., 2011, 2014, 2015a; Sabin et al., 2009; Weinstock, 2012) suggests that additional research is needed among racially diverse healthcare providers to further explore other characteristics of minority HCPs that impact their racial attitudes. This phenomenon of implicit bias among minorities could be explained by the internalization of cultural biases that occurs through socialization as even members of other minority groups are able to implicitly identify the "more socially valued group" in a pairing (Project Implicit, 2011). Recruiting more racially diverse samples could provide greater insight into the mechanism that accounts for this finding.

Informed by existing research, other characteristics worth examining in a larger sample of HCPs include geographic location, contact with minority populations (e.g. training at medical institutions with diverse patient demographic or growing up in demographically mixed neighborhoods), and prior positive or negative experiences with minority patients/colleagues. These and other provider characteristics might interact with implicit bias to affect behavior or judgment with downstream effects on patient-provider interactions, treatment decisions and, ultimately, patient health outcomes (Blair et al., 2011). Recruiting larger and more diverse samples would allow researchers to stratify results by race, ethnicity, and other characteristics of interest to further explore the interactions between these characteristics, treatment decisions and patient-provider interactions.

4.2.2. Measuring and analyzing potential effect modifiers and confounders

Future studies, particularly those using vignettes, should assess participants' knowledge about study objectives as this may lead to providing socially desirable responses that may bias results

towards the null hypothesis. Future studies should also examine how minority patient characteristics interact with provider bias to affect patient-provider interactions. For example, Penner et al. (2016b) suggest that patients' racial identity, physician mistrust, medical suspicion, experiences of past perceived discrimination and the racial composition of a patient's geographic area may play a complicated role in how patients interact with their providers in racially discordant clinical interactions. Another important interaction to consider is that between provider implicit and explicit biases given that providers who display aversive racism are perceived differently by minority patients compared to providers with high or low levels of both measures of bias (Penner et al., 2010; Hagiwara et al., 2016b).

4.2.3. Investigating bias against the entire spectrum of minority patients

The race, ethnicity and American-Indian IATs used in the included studies assess implicit prejudice against and affective reactions towards Black, Hispanic and American-Indian individuals respectively. While most of the studies examined bias against Black versus White adults, investigating implicit bias against other minority groups for which disparities have been identified, such as Asians, represents an opportunity for future research. Additionally, the current literature also focuses largely on Black patients' perceptions and experiences of care based on implicit bias. Future studies should conduct similar analyses among patients from other racial/ethnic minority groups.

4.2.4. Investigating stereotype activation

The IATs that examined the association between race and compliance, medical cooperativeness, procedural cooperativeness and quality of care explore implicit stereotype activation, which correlates to cognitive reactions to Black versus White patients. The findings from these IATs suggest that providers implicitly associate minorities with certain stereotypes, such as non-compliance and reduced cooperativeness, potentially leading to differential patient treatment based on race/ethnicity. Future studies should investigate whether these and other insidious implicit stereotypes actually lead to differential treatment depending on patient characteristics. One sample of pediatricians was found to associate higher quality of care with Black versus White patients (Sabin et al., 2008; Sabin and Greenwald, 2012), a surprising finding given the wealth of research in health disparities, suggesting that this perception does not reflect the actual care taking place for Black and other minority patients. Since this was the first time the Race/Quality Care IAT was used, Sabin et al. suggest attempting to replicate these findings in order to better understand the potential association between Black race and perceived higher quality of care as found in this sample. If further replicated among additional providers, this finding would suggest that education on health and outcomes disparities for providers is required to reconcile the discrepancy between the perceived and actual quality of care provision for minorities in the US.

Overall, additional studies are needed to assess for both implicit stereotype activation and implicit prejudice as these two related but independent concepts could be contributing to healthcare disparities in different ways.

4.2.5. Understanding factors that may influence bias and how bias changes over time

Cognitive stress can impair providers' ability to self-monitor and regulate expressions of one's implicit bias (Burgess, 2010; Amodio, 2009; Muroff et al., 2007), a concerning fact given the often stressful nature of healthcare provision. Few studies have examined other healthcare system factors that impact bias or how bias

changes over time. Future longitudinal studies should investigate how bias is affected over years of training and with the accumulation of clinical experience.

Among the current studies, those that found no implicit bias featured providers who practiced in clinical settings where patients were mostly Black and Hispanic, suggesting a potential impact of patient demographic on implicit bias. It is possible that providers with less bias self-select to serve minority populations. This finding could also be explained by the contact hypothesis, or the theory that interpersonal contact between members of different social groups leads to reduced prejudice if that contact is positive and meets a certain set of conditions that include common goals and cooperation (Allport, 1954; Cook, 1978; Gaertner et al., 1994). The potential for positive contact to reduce implicit bias is further corroborated by van Ryn et al.'s (2015) finding that medical students who had positive interactions with Black faculty and staff showed decreasing levels of implicit bias over time. Other characteristics of providers and settings associated with less implicit bias should be explored in the future, and may offer insights into potential interventions aimed at reducing implicit bias.

4.2.6. Investigating the impact of implicit bias on real-world patient outcomes

Research investigating the role of implicit provider bias on healthcare has had mixed results. While only 33% of vignette-based studies found some impact of implicit bias on outcomes, 89% of the studies using real-world patients found some effect of implicit bias on patient care. This trend raises the question of whether vignette-based studies have different effects on the decision making process compared to real-world studies which may more accurately identify disparities in care and characterize the influence of bias in care.

Another notable trend revealed in the included studies concerns which areas of care are more likely to be impacted by implicit bias. Areas of care that are algorithm based and more objective, like hypertension, urinary tract infection, asthma and trauma management appear to be less susceptible to the influence of implicit bias. Conversely, studies that examined more subjective and less quantifiable symptoms like pain, were more likely to find an effect of implicit bias. This suggests that implicit bias may be activated more often in clinically ambiguous situations that are less algorithmic, like pain management or assessment (Dovidio and Gaertner, 2000). Additional research is needed before definitive conclusions can be made about the contribution of implicit bias to healthcare disparities and when implicit bias is most likely to influence care.

While research has consistently demonstrated an association between HCP implicit bias and patient-provider communication, further research is needed to explore the downstream effects that this has on patient behavior. Blair et al. (2014) investigated the effect of HCP implicit bias on patients' medication adherence by using pharmacy records but found no effect. Penner et al. (2016a) found an association between oncologists' implicit bias and decreased patient confidence in treatment recommendations and anticipated difficulty with completing the recommended treatment. These findings suggest that future studies should further explore how HCP implicit bias impacts patient behavior during the medical encounter (e.g. information-seeking, assertiveness, disclosure of important health-related information), satisfaction with the medical encounter (e.g. confidence in medical advice given), health-related behavior after the medical encounter (e.g. actual and anticipated adherence to treatment recommendations, and follow-up care), and how these factors may subsequently impact clinical outcomes. This may provide a better understanding of the mechanism through which bias does or does not impact disparities in healthcare and outcomes, which may further guide

intervention studies.

4.2.7. Interventions to reduce implicit bias and its impact on patient care

The identification of successful methods of reducing implicit bias will prove crucial to reducing the disordered interactions between providers and minority patients. The current literature reveals that implicit racial bias is present in healthcare students as early as their first year of training (Haider et al., 2011; Rossen et al., 2008; Weinstock, 2012; White-Means et al., 2009), suggesting that any interventions aimed at reducing the effect of implicit bias on outcomes must begin as early as possible. Though few studies have examined interventions to reduce bias in providers, research suggests that implicit bias is not a fixed trait but is malleable and can be changed with deliberate effort (Blair, 2002). A growing body of research in social psychological literature has identified potential avenues for interventions in the healthcare setting. For example, undergraduate students trained on applying strategies to reduce implicit racial bias in everyday situations demonstrated long-term reduction in implicit racial bias (Devine et al., 2012). One such strategy was individuation, or the process of deliberately obtaining information specific to an individual rather than relying on assumptions based on the individual's membership in a certain social group. Another strategy that has been successful in this and other studies is perspective taking, whereby providers would consciously assess a situation or interaction from the point of view of minority patients (Burgess et al., 2007; Galinsky and Moskowitz, 2000). Other strategies that have been explored with success include emphasis on egalitarian goals, meditation, and blurring the line between ingroup and outgroup by focusing on common identities (Hall et al., 2009; Stone and Moskowitz, 2011; Burgess et al., 2007, 2016; Lai et al., 2014).

Another potential area of future research involves reducing the opportunities for bias to influence patient care by reducing the cognitive stressors that result in greater activation of implicit biases. For instance, identifying methods to decrease patient load may decrease cognitive stress while increasing the time providers can dedicate to each patient. Spending more time with patients may help providers use slow thinking and make decisions informed by individualized assessments rather than heuristics such as bias and stereotyping. Research should also explore how evidence-based guidelines may reduce the influence of implicit bias on healthcare.

5. Conclusion

Overall, this review summarizes the best available evidence on the role of implicit provider bias in healthcare disparities. Future studies have the opportunity to build on this current body of research, and in doing so will enable us to achieve equity in healthcare and outcomes for all.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.socscimed.2017.05.009>.

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