Journal Pre-proof

Development of an Instrument to Measure Awareness and Mitigation of Bias in Maternal Health Care

Kelly M. Bower MSN, PhD , Ms. Briana Kramer MS, MPH , Nicole Warren MSN, PhD , Saifuddin Ahmed MBBS, PhD , Jennifer Callaghan-Koru PhD, MHS , Elizabeth Stierman PhD , Ms. Cheri Wilson MA, MHS , Shari Lawson MD , Andreea A. Creanga MD, PhD

PII: S2589-9333(23)00014-9
DOI: https://doi.org/10.1016/j.ajogmf.2023.100872
Reference: AJOGMF 100872

To appear in: *American Journal of Obstetrics & Gynecology MFM*

Received date: 16 December 2022
Revised date: 3 January 2023
Accepted date: 14 January 2023

Please cite this article as: Kelly M. Bower MSN, PhD , Ms. Briana Kramer MS, MPH , Nicole Warren MSN, PhD , Saifuddin Ahmed MBBS, PhD , Jennifer Callaghan-Koru PhD, MHS , Elizabeth Stierman PhD , Ms. Cheri Wilson MA, MHS , Shari Lawson MD , Andreea A. Creanga MD, PhD , Development of an Instrument to Measure Awareness and Mitigation of Bias in Maternal Health Care, *American Journal of Obstetrics & Gynecology MFM* (2023), doi: https://doi.org/10.1016/j.ajogmf.2023.100872

Development of an Instrument to Measure Awareness and Mitigation of Bias in Maternal Health Care

Kelly M. Bower MSN, PhD[1], Ms. Briana Kramer MS, MPH[2], Nicole Warren, MSN, PhD[1], Saifuddin Ahmed MBBS, PhD[3], Jennifer Callaghan-Koru PhD, MHS[4], Elizabeth Stierman, PhD,[2] Ms. Cheri Wilson MA, MHS[5], Shari Lawson MD[6], Andreea A. Creanga MD, PhD[2,6]

[1]Johns Hopkins School of Nursing

[2]Johns Hopkins Bloomberg School of Public Health, Department of International Health

[3] Johns Hopkins Bloomberg School of Public Health, Department of Population, Family, and Reproductive Health

[4]University of Maryland, Baltimore County, Department of Sociology, Anthropology, and Public Health

[5]Johns Hopkins Medicine, Office of Diversity, Inclusion and Health Equity

[6]Johns Hopkins School of Medicine, Department of Gynecology & Obstetrics

Disclosure. The authors report no conflict of interest.

Corresponding Author. Kelly M. Bower, Johns Hopkins School of Nursing, 525 N. Wolfe St., Baltimore, MD 21215, kbower1@jhu.edu

Acknowledgements. Funding for this study is from the Health Resources and Services Administration (HRSA), Award Number U7AMC337170100. The content is solely the responsibility of the authors and does not necessarily represent the official views of HRSA.

Condensation. We developed a valid and reliable instrument suitable for evaluating implicit bias training that assesses implicit bias awareness and mitigation practices among maternal healthcare professionals.

Short Title. Bias in Maternal Health Care Instrument

AJOG at a Glance.

A. Why was this study conducted?

- Implicit bias among maternal healthcare professionals contributes to racial/ethnic disparities in patient outcomes and mandates for implicit bias training are increasing.
- The evaluation of implicit bias training is hampered by a lack of validated instruments.

B. What are the key findings?

- The *Bias in Maternal Health Care* scale, which contains three subscales that measure bias awareness, bias mitigation practice, and bias mitigation self-efficacy, demonstrated validity, reliability, and discriminating performance among maternal healthcare professionals.

C. What does this study add to what is already known?

- We developed a reliable and valid instrument for measuring awareness and mitigation of bias among maternal healthcare professionals.
- The instrument can be used to evaluate implicit bias training and other bias mitigation interventions in maternal healthcare settings.

Abstract

Background: Implicit bias among maternal healthcare professionals contributes to disrespectful care and racial/ethnic disparities in patient outcomes, and there is growing consensus that implicit bias training is a key component of birth equity initiatives. Implicit bias training requirements for healthcare professionals have become more widespread, but the impact training has is largely unknown, in part due to lack of validated instruments. As a result, there is an urgent need for a psychometrically valid instrument for use in the evaluation of implicit bias training.

Objective. To develop a valid and reliable instrument to assess implicit bias awareness and mitigation practices of maternal care professionals that can be used to evaluate interventions aiming to mitigate such bias in clinical practice.

Study Design. We conducted an instrument development and validation study in three phases. In phase one, *item development*, we generated a 43-item bank from literature and consultation and established content validity with subject matter experts. In phase two, *instrument development*, we administered a revised set of 33 items to 307 nurses and midwives and conducted exploratory factor analysis to demonstrate construct validity and reliability. In phase three, *instrument evaluation*, we confirmed the factor structure and compared the means of implicit bias training-exposed and -unexposed participants to further demonstrate construct validity with a representative state sample of 2,096 maternal healthcare professionals (physicians, midwives, and nurses).

Results. Based on phase two results, we retained 23 items for the *Bias in Maternal Health Care* scale, which showed high internal consistency (Cronbach's alpha = 0.86). We identified three subscales: a nine-item *Bias Awareness* subscale (Cronbach's alpha = 0.86), a seven-item *Bias*

Mitigation Practice subscale (Cronbach's alpha= 0.82), and a seven-item *Bias Mitigation Self-Efficacy* subscale (Cronbach's alpha= 0.81). Validation of the *Bias Awareness and Bias Mitigation Practice* subscales in phase three demonstrated the instrument's high reliability (Cronbach's alpha 0.86 and 0.83, respectively) and discriminating performance among maternal healthcare professionals.

Conclusions. We developed a reliable and valid instrument for measuring awareness and mitigation of bias among maternal healthcare professionals. It can be used to evaluate implicit bias training and other bias mitigation interventions in maternal healthcare settings.

Keywords. Birth equity, disparities, health equity, implicit bias, inequity, maternal health, quality improvement, psychometrics, reliability, validity

Introduction

In response to profound and persistent racial and ethnic disparities in maternal health outcomes in the United States,[1-3] maternal health stakeholders have coalesced around a commitment to health equity for women and childbearing people as a public health priority.[4,5] Although racial and ethnic health disparities reflect a variety of social and institutional factors, many argue that implicit bias, and its impact on patient-provider interactions, is a key driver of these inequities.[11] Implicit biases are the attitudes or stereotypes that affect understanding, actions, and decisions in an unconscious manner.[12] Empirical studies suggest that healthcare professionals exhibit implicit biases based on patient characteristics, especially race and ethnicity.[13-15] Additionally, implicit biases have been associated with disparate treatment decisions, poor quality of care and patient-provider interactions, and adverse patient health outcomes.[13-15]

Increased awareness of bias and racism as contributors to racial and ethnic health disparities has motivated changes in policy and training for health professionals who care for childbearing persons. Leading maternal health professional organizations, including the American College of Obstetricians and Gynecologists, have policy statements that call for maternal health professionals to build awareness of health disparities and their own biases.[16-18] The Alliance for Innovation on Maternal Health recommends that hospitals provide implicit bias training (IBT) for maternal care professionals.[19] Additionally, six states have passed legislation mandating IBT for maternal healthcare professionals.[20]

The evidence base for IBT is limited by a lack of valid and reliable measures and consensus on evaluation methods. To date, there has been no large-scale evaluation of the effect of IBT among healthcare professionals. Three strategies have been utilized to assess the impact of pilot or small-scale implementation of IBT and other bias mitigation interventions: (1) the implicit association test (IAT),[26,27] (2) participant surveys using unvalidated measures,[28-30] and (3) qualitative methods.[31] Qualitative methods and participant surveys using unvalidated measures are not reliable methods for large-scale evaluation of IBT interventions. The IAT has been used most frequently, but also has limitations. [33]It was not developed to assess changes in bias over time, and the developers have recommended caution with repeat measurements because prior experience with the IAT has been associated with lower subsequent scores.[34] In addition, it does not measure the theoretical outcomes of IBT – awareness and mitigation behaviors – but rather the underlying associative process of bias. For example, a clinician may associate a patient from a certain racial group with noncompliance. The purpose of IBT is not to alter that association, but to make the clinician aware of it so that it does not affect their treatment.

Patient experience of care and patient health outcomes have also been proposed to evaluate IBT. These, however, could be impacted by several other factors, making attribution of impact difficult. Given the unfeasibility of connecting these distal outcomes with implicit bias training, there is a need to measure more proximal training outcomes, like bias awareness and mitigation behaviors, along the pathway from clinician bias to patient outcomes .[37]

The Maryland Maternal Health Innovation program, or MDMOM, is a statewide maternal health improvement program offering IBT to all maternal healthcare professionals practicing in Maryland’s 32 birth hospitals. Our team was unable to identify an instrument that had been psychometrically validated to measure proximal outcomes of

IBT to evaluate this intervention. As a result, we aimed to develop and validate a survey instrument that could be administered among Maryland maternal healthcare professionals to evaluate the MDMOM IBT intervention and used by others to evaluate similar training and bias mitigation interventions.

Methods

Design

We utilized a three-phase structured approach for instrument development and validation.[38] Phase one, *item development*, included domain and item identification, content validation by a panel of experts, and item reduction and revision. Phase two, *instrument development*, included administration of the instrument for extraction of latent factors and reliability analysis. Phase three, *instrument evaluation*, included item validation with a representative sample of maternal healthcare professionals. The study was approved by the Johns Hopkins Medicine Institutional Review Board (#00242247).

Phase One: Item Development

Identification of Domains and Items

This phase started with identification of content areas based on Sukhera and Watling's[37] framework to integrate implicit bias recognition into health professions curricula. We identified seven content areas organized around knowledge (i.e., knowledge of the science of implicit bias; knowledge of the effects of bias in maternal health care), attitudes (i.e., self-awareness of bias; awareness of the effects of bias; concern about bias) and practices (self-efficacy for behaviors to mitigate bias; and self-report of behaviors to mitigate bias) domains.[37] We collected and adapted items that measured these domains and content areas from surveys used to evaluate IBT interventions in other fields of medicine.[28,29,39] We also added novel items to ensure sufficient items for each domain and content area. Practice domain items measuring *self-efficacy* and *self-report* for behaviors to mitigate bias were identical except for use of "I am confident that I can," in the self-efficacy items. This process resulted in a 43-item bank for expert review.

Expert Review

Content validation was conducted with experts engaged in research or practice related to implicit bias, healthcare disparities, or patient-provider communication who were invited to participate via email. In an online survey, experts quantitatively evaluated each item for relevance (importance to the instrument), clarity (ease of understanding), and appropriateness (fit to the domain) using a 4-point Likert agreement scale. Experts received a $50 gift card for participation.

Responses to the relevance question were dichotomized and Item Content Validity Index (I-CVI) was calculated. The I-CVI is a quantitative method to evaluate whether items in an instrument represent adequate operationalization of a construct. Following best practice for a sample greater than five, the I-CVI threshold was set at >0.78 for inclusion[41] and items that met this *a priori* threshold were then evaluated using clarity and appropriateness scores, qualitative comments, and suggestions for improvement of each item. Items were revised or eliminated according to this feedback resulting in a 33-item bank.

Phase Two: Instrument Development

We conducted a survey with members of the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the American College of Nurse-Midwives (ACNM). Nurses are a critical audience for IBT since they account for the largest segment of the healthcare workforce, outnumbering physicians three to one.[42] And, both leading maternal health nursing professional organizations have mechanisms to distribute surveys for research purposes.

The recruitment goal was 300 participants, based on sample size recommendations for the internal validation of psychometric scales.[43] We sent recruitment and follow-up emails to all members from the District of Columbia and 17 states in regions proximate to Maryland (Midwest, Northeast and South) but not including Maryland. The survey, which included the expert-validated 33-item bank and demographic questions, was administered via Qualtrics in November 2020 and closed after three weeks. Respondents received a $10 gift card. Seventy-two participants were dropped due to incomplete responses. The characteristics of dropped participants cannot be described because 94% were missing all demographic data. The final sample included 307 participants.

We conducted exploratory factor analysis (EFA) to determine the optimal number of latent factors based on underlying relationships between measured items. Scree plots, eigenvalues, and parallel analysis were used in retaining the number of factors. We reduced redundant and inconsistent items and calculated Cronbach's alpha, a statistical measure of internal consistency, for the derived instrument and subscales.[44]

Phase Three: Instrument Evaluation

To confirm construct validity, we included scale item questions in a second survey administered via Qualtrics to maternal healthcare professionals (physicians, midwives, nurse practitioners, physician assistants, nurses, and patient care technicians) in Maryland, conducted as a baseline assessment for the MDMOM program. Maternity unit leaders sent the survey to all eligible professionals between May and November 2021. The survey remained open for six weeks and reminder emails and flyers were used to promote participation. Respondents received a $20 gift card.

MDMOM planned a minimum three-month interval between IBT completion and re-administering the survey. Given the opportunity to make practice changes, the *Bias Mitigation Practice* subscale was more appropriate than the *Bias Mitigation Self-Efficacy* subscale for this evaluation context, and we administered only the *Bias Awareness* and *Bias Mitigation Practice* subscales to reduce participant burden (Items 1-9 and 17-22 in Table 2). The survey also included questions pertaining to program evaluation, including one on the completion of IBT within the past two years.

After dropping four respondents with missing data, the analytic sample included 2,096 participants. We performed EFA and ascertained internal reliability of the subscales with Cronbach's alpha.[45,46] To examine the utility of the instrument in differentiating patterns of implicit bias awareness and mitigation practices, we examined item and subscale mean scores by self-reported prior completion of IBT. We hypothesized that IBT exposure would increase implicit bias awareness and mitigation practices, such that there would be a significant difference in scores between groups. The score was calculated by coding individual responses numerically (1=strongly disagree to

5=strongly agree). Responses were weighted to adjust for differences in non-response probabilities across professional roles. We tested the equality of means between IBT-exposed and -unexposed participants using linear regression t-tests and all analyses were adjusted for clustering effects at the facility level.

Results

Phase One: Item Development

Eleven experts were invited to participate[40] and seven accepted our invitation: two directors of diversity, equity and inclusion departments within large academic medical centers, the director of a national organization focusing on disparities in women's health, two healthcare disparities researchers, one patient-provider communication researcher, and a cognitive scientist. Five experts were also physicians, and three of these were obstetrician-gynecologists.

Of the 43 items submitted to experts for content validation, eight were dropped based on failure to meet the *a priori* I-CVI threshold, and three more were dropped due to low clarity and appropriateness scores and negative qualitative feedback (Appendix A). Ten items were edited based on expert recommendations. The research team added one novel item in response to feedback that the "concern about bias" domain was not adequately captured by existing items. This process yielded 33 items for testing and evaluation in phase two.

Phase Two: Instrument Development

The majority of the 307 survey respondents were registered nurses (50%), practiced in an inpatient obstetric setting (54%), and had been in practice 11 or more years (48%; Table 1). Fifty-six percent were between 25 and 44 years old and the sample overwhelmingly identified as female (96%) and white (75%).

The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.8705, indicating appropriateness for factor analysis. The EFA with promax rotation supported a two-factor solution based on eigenvalues, scree plot and parallel analysis. Each item only meaningfully loaded onto one factor and items loading onto the same factor exhibited strong conceptual coherence. All 18 items measuring the knowledge and attitudes domains loaded onto factor one, while all 15 items measuring the practices domain loaded onto factor two (Appendix B). Given the single factor loading pattern of the knowledge and attitudes items, we labeled them "bias awareness," pertaining to both knowledge of the theoretical mechanism of bias and acknowledgement of its existence and impact. Factor two items pertained to performance or confidence to perform behaviors to mitigate bias, so we labeled these "bias mitigation."

We grouped the factor one bias awareness items into a single subscale and grouped factor two bias mitigation items into two subscales representing two behavioral components: self-efficacy and practice. Following a process of item reduction guided by factor loading, item-rest correlation and inter-item correlation, we retained nine items in a *Bias Awareness* subscale (Cronbach's alpha = 0.86) and 14 bias mitigation items, seven items for a *Bias Mitigation Self-Efficacy* subscale (Cronbach's alpha = 0.81) and seven items for a *Bias Mitigation Practice* subscale (Cronbach's alpha = 0.82) (Table 2).

Phase Three: Instrument Evaluation

Respondents included registered nurses (73.6%), nursing assistants and technicians (11.2%), physicians (10.2%), and advanced practice nurses or physician assistants (5.1%; Table 1). Most had been in practice 11 or more years (53.2%) and the majority identified as female (95.7%) and white (70.9%). EFA suggested a two-factor solution for the 16 items, corresponding to the two factors identified in phase two (Table 3; Appendix C). Items measuring knowledge and attitude domains primarily loaded onto factor one, while items measuring the practices domain loaded onto factor two. Each item loaded only onto one factor, with two exceptions which had similar loadings on both factors; given strong conceptual coherence, those two items were retained in the *Bias Awareness* subscale. Internal consistency was confirmed for the *Bias Awareness* subscale (Cronbach's alpha = 0.86) and for the *Bias Mitigation Practice* subscale (Cronbach's alpha = 0.83). Weighted mean scores for each subscale are shown in Table 4. All 16 item scores and both mean subscale scores were greater for participants who reported to have been exposed to implicit bias training compared to those who did not, and differences were statistically significant (p-value <0.001).

Comment

Principal Findings

Using a three-phase process, we constructed the *Bias in Maternal Health Care* scale to measure bias awareness and mitigation practices and evaluate IBT among maternal healthcare professionals. The scale demonstrated content and construct validity and strong reliability. The scale is composed of three subscales: a nine-item *Bias*

Awareness subscale and two seven-item bias mitigation scales, *Bias Mitigation Self-Efficacy* and *Bias Mitigation Practice.* Each subscale exhibits a clear factor structure and good internal consistency. The *Bias Awareness* subscale and the *Mitigation of Bias Practice* subscale also demonstrated cross-sample validity. Furthermore, item and subscale means were significantly greater among participants exposed to IBT. Whether this was a result of IBT or a difference in awareness and mitigation practices among participants seeking out IBT, the finding is indicative of the validity of the identified constructs.

Results in the Context of What is Known

While there has been increased interest in recommending or even requiring IBT for healthcare professionals, evidence for its effectiveness is lacking.[22] This is, in part, due to the lack of validated and reliable instruments available for evaluation. Existing evaluations use either the IAT, which measures a construct that is arguably not the target of IBT;[37] surveys, which lack published psychometric assessments;[28-30] or qualitative assessments, which are challenging to implement on a large scale.[31] The *Bias in Maternal Health Care* scale measures dimensions of healthcare professional awareness and practice targeted by IBT training, has demonstrated validity and reliability, and can be deployed on a large scale. Furthermore, it has been noted that simply increasing awareness of bias without also providing concrete behavioral strategies for bias mitigation is likely to be ineffective in reducing the effects of bias on patient care.[25] By incorporating evaluation of both awareness and mitigation practices, the *Bias in Maternal*

Health Care scale is targeted at evaluating evidence-based implicit bias curricula that are responsive to these concerns.

Clinical Implications

Implicit bias is only one of a range of contributors to racial/ethnic disparities in maternal health outcomes. Poor preconception health, lack of access to prenatal care, maternity care deserts, an under-resourced public health system, and underfunding of Medicaid all contribute to racial/ethnic disparities in maternal morbidity and mortality in the United States.[47] Birth equity initiatives that incorporate a holistic or systems-level approach have been outlined, among others, by the Alliance for Innovation in Maternal Health.[19] While these include IBT among a program of interventions, this educational component is nevertheless positioned as a key step in raising awareness, building capacity and momentum for change, and providing more equitable care. Healthcare professional bias has been shown to correlate with lower quality of care, less effective patient-provider communication, and lower patient satisfaction. By building awareness of bias and promoting practice changes that mitigate its effects, IBT has the potential to improve care. This scale captures those critical training outcomes.

Research Implications

Assessment of the relative effectiveness of different types of IBT and similar bias mitigation interventions has been hampered by lack of a consistent, valid, and reliable evaluation approach. This scale enables that comparison. Further validation of all subscales should be performed in state or national samples of maternal care professionals, and with a more diverse study population in terms of gender, race, ethnicity, and nativity. Considering the link between healthcare professional bias and quality of care and patient experience, future studies should also include assessment of associations with patient reported outcomes.

Strengths and Limitations

To our knowledge, this is the first instrument to measure awareness and mitigation of bias among healthcare professionals in the maternal care setting that was developed using a systematic process incorporating content validation, factor analysis and reliability testing. Because the scale was developed in response to an evaluation need, the subscales were conceptualized as flexible tools that could be applied to diverse evaluation contexts and study designs. The *Bias Mitigation Self-Efficacy* and *Bias Mitigation Practice* subscales provide a choice of two measurement approaches. While self-report may be a more accurate proxy for behavioral performance than self-efficacy, it is not suited to all measurement contexts, such as an immediate post-test design or among health professions students who have not had the opportunity to implement practice changes. In those cases, self-efficacy, the perceived capacity to perform a behavior, might be used as a predictor.[48] Conversely, the seven practice subscale items would be appropriate for an evaluation survey administered weeks to months post-training. Finally, though the *Bias in Maternal Health Care* scale was conceptualized as an IBT evaluation method for maternal healthcare professionals providing care in a hospital setting, generalizability was considered, and it is adaptable to a broad range of healthcare contexts.

Our study also had limitations, primarily related to sampling. Respondents in both surveys were predominantly female and white. However, these demographics are characteristic of the largest component of the United States health workforce, registered nurses which, in 2020 was 90.5% female and 80.6% white.[49] Respondents to the instrument development survey also belonged to professional organizations and may have differed from those who do not. Due to sampling methods for both surveys, we were unable to characterize non-respondents. However, while the instrument development survey did not sample the full spectrum of maternal healthcare workforce, the validation sample was professionally diverse and confirmed its findings. Finally, we administered only the *Bias Awareness* and *Bias Mitigation Practice* subscales to the validation sample and were unable to confirm factor structure and reliability for the *Bias Mitigation Self-Efficacy* subscale.

Conclusions

IBT for maternal health professionals is already being widely implemented and there is a critical need to evaluate whether individual training programs have a positive effect on healthcare professionals' bias awareness and mitigation practices. Our instrument presents an opportunity to reliably assess maternal healthcare professionals' bias awareness and mitigation practices and can be adapted for use in other fields of medicine.

References

1. Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. Accessed July 20, 2021. https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm#race-ethnicity

2. Creanga AA, Bateman BT, Kuklina EV, Callaghan WM. Racial and ethnic disparities in severe maternal morbidity: a multistate analysis, 2008-2010. American Journal of Obstetrics and Gynecology 2014;210(5):435.e1-435.e4358. doi:10.1016/j.ajog.2013.11.039

3. Petersen EE, Davis NL, Goodman D, et al. Racial/ethnic disparities in pregnancy-related deaths – United States, 2007-2016. MMWR Morbidity and Mortality Weekly Report 2019;68:762-765

4. Botwinick L, Reid A, Wyatt R, Whittington J. Addressing institutional racism in healthcare organizations. Healthcare Executive 2021 May;36(3):42-43.

5. U.S. Department of Health & Human Services. HHS marks black maternal health week by announcing measures to improve maternal health outcomes. Accessed July 20, 2021. https://www.hhs.gov/about/news/2021/04/12/hhs-marks-black-maternal-health-week-announcing-measures-improve-maternal.html

6. The American College of Obstetricians and Gynecologists. Racial bias: statement of policy. Accessed July 20, 2021. https://www.acog.org/clinical-information/policy-and-position-statements/statements-of-policy/2017/racial-bias

7. Badreldin N, Grobman WA, Yee LM. Racial disparities in postpartum pain management. Obstetrics and Gynecology 2019;134(6):1147-1153. doi:10.1097/AOG.0000000000003561

8. Centers for Disease Control and Prevention. Health equity, racism and health. Accessed July 20, 2021. https://www.cdc.gov/healthequity/racism-disparities/index.html

9. Davis D. Obstetric Racism: The racial politics of pregnancy, labor, and birthing. Medical Anthropology 2018;38(7):560-573 doi10.1080/01459740.2018.1549389

10. Prather C, Fuller TR, Marshall KJ, Jeffries WL 4th. The impact of racism on the sexual and reproductive health of African American women. Journal of Women's Health (Larchmt*)* 2016;25(7):664-671. doi:10.1089/jwh.2015.5637

11. Saluja B, Bryant Z. How implicit bias contributes to racial disparities in maternal morbidity and mortality in the United States. Journal of Women's Health 2021;30(2):270-273. doi:10.1089/jwh.2020.8874

12. Kirwan Institute for the Study of Race and Ethnicity, The Ohio State University. Understanding implicit bias. Accessed July 20, 2021. https://kirwaninstitute.osu.edu/article/understanding-implicit-bias

13. Hall WJ, Chapman MV, Lee KM, et al. Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: a systematic review. American Journal of Public Health 2015;105(12):e60-e76. doi:10.2105/AJPH.2015.302903

14. Maina IW, Belton TD, Ginzberg S, Singh A, Johnson TJ. A decade of studying implicit racial/ethnic bias in healthcare providers using the implicit association test. Social Science and Medicine 2018;199:219-229. doi:10.1016/j.socscimed.2017.05.009

15. Fitzgerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. BMC Medical Ethics 2017;18(1). doi:10.1186/s12910-017-0179-8

16. American College of Obstetricians and Gynecologists. Racial bias: statement of policy. Accessed July 20, 2021. https://www.acog.org/clinical-information/policy-and-position-statements/statements-of-policy/2017/racial-bias

17. American College of Nurse Midwives. Midwives of color committee and clinical standards and documents: position statement: racism and racial bias. Accessed July 20, 2021. *https://www.midwife.org/acnm/files/ACNMLibraryData/UPLOADFILENAME/000000000315/PS-Racism-and-Racial-Bias-26-Apr-18.pdf*

18. Association of Women's Health, Obstetric and Neonatal Nurses. Birth equity. Accessed July 20, 2021. https://www.awhonn.org/birthequity/

19. Howell EA, Brown H, Brumley J, et al. Reduction of peripartum racial and ethnic disparities: a conceptual framework and maternal safety consensus bundle. Journal of Midwifery and Women's Health 2018;63(3):366-376. doi:10.1111/jmwh.12756

20. CA Senate Bill no. 464, pub 10-8-2019 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB464

21. Green TL, Zapata JY, Brown HW, Hagiwara N. Rethinking bias to achieve maternal health equity: changing organizations, not just individuals. Obstetrics and Gynecology 2021;137(5):935-940. doi:10.1097/AOG.0000000000004363

22. Green TL, Hagiwara N. The problem with implicit. Scientific American Mind 2020;31(6)

23. Pritlove C, Juando-Prats C, Ala-Leppilampi K, Parsons JA. The good, the bad, and the ugly of implicit bias. Lancet 2019;393(10171):502-504. doi:10.1016/S0140-6736(18)32267-0

24. Taylor JK. Structural racism and maternal health among black women. The Journal of Law, Medicine & Ethics 2020;48:506-517. doi:10.1177/1073110520958875

25. Hagiwara N, Kron FW, Scerbo MW, Watson GS. A call for grounding implicit bias training in clinical and translational frameworks. The Lancet 2020;395:1457-1460. doi:10.1377/hblog20190625.583781/full

26. Devine PG, Forscher PS, Austin AJ, Cox WTL. Long-term reduction in implicit race bias: a prejudice habit-breaking intervention. Journal of Experimental Social Psychology 2012;48(6):1267-1278. doi:10.1016/j.jesp.2012.06.003

27. Stone J, Zestcott CA, Moskowitz GB, Wolsiefer KJ. Testing active learning workshops for reducing implicit stereotyping of Hispanics by majority and minority group medical students. Stigma and Health 2020;*5*(1):94-103. doi:10.1037/sah0000179

28. Carnes M, Devine PG, Baier Manwell L, et al. The effect of an intervention to break the gender bias habit for faculty at one institution: a cluster randomized, controlled trial. Academic Medicine 2015; 90(2):221-230. doi: 10.1097/ACM.0000000000000552

29. Zeidan A, Tballi A, Woodward M, Bartolo IMD. Targeting implicit bias in medicine: lessons from art and archaeology. Western Journal of Emergency Medicine 2020;21(1)1-3. doi:10.5811/westjem.2019.9.44041

30. Gatewood E, Broholm C, Herman J, Yingling C. Making the invisible visible: implementing an implicit bias activity in nursing education. Journal of Professional Nursing 2019;35(6):447-451. doi:10.1016/j.profnurs.2019.03.004

31. Sherman MD, Ricco JA, Nelson SC, Nezhad SJ, Prasad S. Implicit bias training in a residency program: aiming for enduring effects. Family Medicine 2019;51(8):677-681. doi:10.22454/FamMed.2019.947255

32. Sukhera J, Wodzinski M, Rehman M, Gonzalez CM. The implicit association test in health professions education: a meta-narrative review. Perspectives on Medical Education 2019;8(5):267-275. doi:10.1007/s40037-019-00533-8

33. Greenwald AG, Mcghee DE, Schwartz JLK. Measuring individual differences in implicit cognition: the implicit association test. Journal of Personality and Social Psychology 1998;74(6):1464-1480.

34. Greenwald AG, Nosek BA, Banaji MR. Understanding and using the implicit association test: I. an improved scoring algorithm. Journal of Personality and Social Psychology 2003;85(2):197–216. doi:10.1037/0022-3514.85.2.197

35. Lai CK, Marini M, Lehr SA, et al. Reducing implicit racial preferences: I. a comparative investigation of 17 interventions. Journal of Experimental Psychology *2014*;143(4):1765-1785. doi:10.1037/a0036260

36. Lai CK, Cooley E, Devos T, et al. Reducing implicit racial preferences: II. intervention effectiveness across time. Journal of Experimental Psychology 2016;145(8)1001-1016. doi:10.1037/xge0000179

37. Sukhera J, Watling C. A Framework for integrating implicit bias recognition into health professions education. Academic Medicine 2018;93(1):35-40. doi:10.1097/ACM.0000000000001819

38. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Frontiers in Public Health 2018;6 doi:10.3389/fpubh.2018.00149

39. Zeidan AJ, Khatri UG, Aysola J, Shofer FS, et al. Implicit bias education and emergency medicine training: step one? awareness. Society for Academic Emergency Medicine 2018;3:81-85. doi:10.1002/aet2.10124

40. Polit DF, Beck CT, Owen SV. Focus on research methods: is the CVI an acceptable indicator of content validity? appraisal and recommendations. Research in Nursing and Health 2007;30(4):459-467. doi:10.1002/nur.20199

41. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? critique and recommendations. Research in Nursing and Health 2006;29(5):489-497. doi:10.1002/nur.20147

42. Laughlin L, Anderson A, Martinez & Gayfield A. Who are our health care workers? United States Census Bureau. April 5, 2021. Accessed September 22, 2022.

43. Rouquette A Falissard B. Sample size requirements for the internal validation of psychiatric scales. International Journal of Methods in Psychiatric Research 2011;20(4):235-249. doi:10.1002/mpr.352

44. Stellefson ML, Hanik BW, Chaney BH & Chaney JD. Factor retention in EFA: strategies for health behavior researchers. American Journal of Health Behaviors 2009; 33(5).

45. Horn JL. A rationale and test for the number of factors in factor analysis. Psychometrika 1965; 30: 179-185.

46. Cattell RB. The scree test for the number of factors. Multivariate Behavioral Research 1966; 1:245–276.

47. Noursi S, Saluja B & Richey L. Using the ecological systems theory to understand Black/White disparities in maternal morbidity and mortality in the United States. Journal of Racial and Ethnic Health Disparities 2020. doi:10.1007/s40615-020-00825-4

48. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychological Review 1997;84(2):191-215.

49. Smiley RA, Ruttinger CR, Oliveira CM, et al. The 2020 national nursing workforce survey. Journal of Nursing Regulation 2021;12(1): S1-S96. doi: https://doi.org/10.1016/S2155-8256(21)00027-2

Table 1. Respondent characteristics, scale development and scale validation samples

	Scale development sample (N=307)	Scale validation sample (N=2,096)	
		Unweighted	**Weighted**[4]
Characteristic	**n (%)**	**n (%)**	**n (%)**
Professional Role			
Physician[1]	-	214 (10.2)	437 (20.8)
Advanced Practice Nurse/Physician Assistant	122 (39.2)	106 (5.1)	108 (5.1)
Registered Nurse	174 (55.9)	1,542 (73.6)	1,298 (61.9)
Technician/Certified Nursing Assistant/Other[2]	15 (4.8)	234 (11.2)	253 (12.1)
Years in Practice[3]			
0-5	108 (34.7)	585 (27.9)	605 (28.8)
6-10	53 (17.1)	396 (18.9)	386 (18.4)
11+	150 (48.1)	1,115 (53.2)	1,105 (52.7)
Gender			
Female	299 (96.1)	2,006 (95.7)	1,959 (93.3)
Male	4 (1.3)	61 (2.9)	113 (5.4)
Non-Binary	2 (0.6)	0 (0)	0 (0)
Prefer Not to Say	6 (1.9)	29 (1.4)	28 (1.4)
Race			
Black or African American	49 (15.8)	298 (14.2)	328 (15.6)
White	233 (74.9)	1,485 (70.9)	1,440 (68.6)
Other	19 (6.1)	168 (8.0)	195 (9.3)
Prefer Not to Say	10 (3.2)	145 (6.9)	137 (6.5)

Notes: [1]The scale development sample included members of two nursing professional organizations; [2]Other category included lactation consultants, quality and patient safety specialists, certified medical assistants; [3]Years in practice categories were 0-5, 6-10, and 11+ for the instrument development respondents (n=307), and 0-4, 5-9, and 10+ for the instrument evaluation respondents (N=2,096); [4]Responses were weighted to adjust for differences in response probabilities across providers of different professional qualifications.

Table 2. *Bias in Maternal Health Care* scale

Instructions: The following statements are about unconscious (also called implicit) and conscious (also called explicit) biases, which can be based on characteristics like race, ethnicity, and gender. **Please choose the option that most closely indicates your level of agreement:** Strongly disagree – Disagree – Neither agree nor disagree – Agree – Strongly agree	
Bias Awareness (Cronbach's alpha = 0.86)	
1	Biases can affect our behaviors towards other people based on characteristics like race, ethnicity, or gender.
2	Biases contribute to racial/ethnic disparities in maternal health.
3	I have biases.
4	I could unintentionally behave in biased ways towards patients based on characteristics like race, ethnicity, or gender.
4	The biases of my co-workers could affect patient care.
6	My biases could affect the care I provide to patients.
7	My co-workers should make an effort to prevent their biases from affecting patient care.
8	I should make an effort to prevent my biases from affecting patient care.
9	I am concerned about the effects of bias on patient care.
Bias Mitigation Self-Efficacy (Cronbach's alpha = 0.81)	
10	I am confident that I can identify my own biases while performing patient care.
11	I am confident that I can change my behavior to limit the impact of my biases on patients.
12	I am confident that I can use strategies to recognize thoughts that may have been influenced by my biases.
13	I am confident that I can use strategies to reduce bias in my communication with patients.
14	I am confident that I can speak with my coworkers about bias on our unit.
15	I am confident that I can challenge a clinical decision if I think it was influenced by bias.
16	I am confident that I can intervene if I think a patient is being treated in a biased way.
Bias Mitigation Practice (Cronbach's alpha = 0.83)	
17	I identify my own biases while performing patient care.
18	I change my behavior to limit the impact of my biases on patients
19	I use strategies to recognize thoughts that may have been influenced by my biases.
20	I use strategies to reduce bias in my communication with patients.
21	I speak with my coworkers about bias on our unit.
22	I challenge a clinical decision if I think it was influenced by bias.
23	I intervene if I think a patient is being treated in a biased way.

Table 3. Comparison of exploratory factor analysis results[1] for items retained for the *Bias in Maternal Health Care Awareness and Mitigation Practice* subscales: scale development and scale validation samples

#	Item Label	Scale development sample (N=307)				Scale validation sample (N=2,096)			
		Item-rest correlation[2]	Factor 1 loadings Awareness	Factor 2 loadings Mitigation	Unique-ness[3]	Item-rest correlation[2]	Factor 1 loadings Awareness	Factor 2 loadings Mitigation	Unique-ness[3]
Bias Awareness subscale									
1	Biases can affect our behaviors	0.544	0.593		0.631	0.569	0.595		0.606
2	Biases contribute to disparities	0.618	0.686		0.538	0.638	0.654		0.516
3	I have biases	0.628	0.686		0.543	0.599	0.743		0.509
4	I could unintentionally behave in biased ways	0.666	0.738		0.470	0.679	0.818		0.396
5	Biases of coworkers affect patient care	0.645	0.690		0.492	0.634	0.622		0.563
6	Biases affect care I provide to patients	0.623	0.695		0.526	0.674	0.746		0.455
7	Coworkers should not let biases affect care	0.601	0.650		0.502	0.473	0.293		0.661
8	I should not let biases affect care	0.621	0.657		0.529	0.527	0.373		0.596
9	I am concerned about effects of bias on patient care	0.555	0.600		0.617	0.551	0.438		0.621
	Cronbach's alpha	**0.86 (95% CI: 0.84, 0.89)**				**0.86 (95% CI: 0.85, 0.87)**			
Bias Mitigation Practice subscale									
1	Identify own biases	0.509		0.581	0.669	0.575		0.477	0.520
2	Recognize own biased thoughts	0.608		0.727	0.472	0.713		0.725	0.403
3	Change own behaviors	0.549		0.654	0.545	0.648		0.595	0.439
4	Reduce bias in communication	0.636		0.748	0.455	0.669		0.735	0.460
5	Speak about bias	0.497		0.519	0.714	0.473		0.498	0.749
6	Challenge biased decisions	0.614		0.681	0.546	0.504		0.697	0.604
7	Intervene in biased care	0.577		0.627	0.598	0.449		0.687	0.618
	Cronbach's alpha	**0.82 (95% CI: 0.78, 0.86)**				**0.83 (95% CI: 0.81, 0.84)**			

Notes: [1]Results from 2-factor solutions with promax rotation; [2]Refers to the association of each item with the total score on the other items in each subscale; [3]Refers to the variance that is unique to each item and not shared with the other items in the subscale.

Table 4. Mean response scores for items retained for the *Bias in Maternal Health Care Awareness and Self-Report Subscales,* scale validation sample stratified by previous exposure to implicit bias training

		Scale validation sample[1] (N=2,096)	**Completed implicit bias training[1] (N=606)**	**No implicit bias training[1] (N=1,486)**	**Equality of means[3]**
#	Item Label	Mean (95% CI) score[2]	Mean (95% CI) score[2]	Mean (95% CI) score[2]	p-value
Bias Awareness Subscale					
1	Biases can affect our behaviors	4.15 (4.06-4.25)	4.30 (4.17-4.43)	4.08 (4.00-4.17)	<0.001
2	Biases contribute to disparities	4.04 (3.91-4.17)	4.21 (4.03-4.38)	3.96 (3.85-4.08)	<0.001
3	I have biases	3.07 (2.87-3.27)	3.37 (3.11-3.64)	2.92 (2.76-3.09)	<0.001
4	I could unintentionally behave in biased ways	3.16 (2.98-3.35)	3.43 (3.19-3.67)	3.04 (2.88-3.19)	<0.001
5	Biases of coworkers affect patient care	3.86 (3.76-3.97)	4.05 (3.90-4.20)	3.78 (3.69-3.86)	<0.001
6	Biases affect care I provide to patients	3.22 (3.06-3.38)	3.47 (3.25-3.69)	3.10 (2.96-3.25)	<0.001
7	Coworkers should not let biases affect care	4.42 (4.36-4.48)	4.53 (4.45-4.60)	4.36 (4.30-4.42)	<0.001
8	I should not let biases affect care	4.39 (4.32-4.46)	4.52 (4.43-4.61)	4.33 (4.26-4.40)	<0.001
9	I am concerned about effects of bias on patient care	3.86 (3.73-3.99)	4.04 (3.87-4.22)	3.78 (3.67-3.89)	<0.001
	Subscale total	***3.80 (3.68-3.92)***	***3.99 (3.83-4.15)***	***3.71 (3.61-3.80)***	***<0.001***
Bias Mitigation Self-Report					
1	Identify own biases	3.74 (3.66-3.82)	3.86 (3.73-3.98)	3.68 (3.62-3.75)	<0.001
2	Recognize own biased thoughts	3.84 (3.78-3.90)	4.02 (3.90-4.14)	3.76 (3.71-3.81)	<0.001
3	Change own behaviors	3.89 (3.81-3.96)	4.03 (3.92-4.14)	3.82 (3.76-3.89)	<0.001
4	Reduce bias in communication	3.91 (3.86-3.97)	4.07 (3.95-4.19)	3.85 (3.80-3.89)	<0.001
5	Speak about bias	3.16 (3.05-3.27)	3.40 (3.25-3.56)	3.05 (2.96-3.15)	<0.001
6	Challenge biased decisions	3.75 (3.68-3.81)	3.87 (3.79-3.95)	3.70 (3.63-3.76)	<0.001
7	Intervene in biased care	4.04 (3.99-4.09)	4.15 (4.08-4.22)	3.99 (3.94-4.04)	<0.001
	Subscale total	***3.76 (3.70-3.82)***	***3.91 (3.82-4.01)***	***3.69 (3.64-3.74)***	***<0.001***

Note: [1]Responses were weighted to adjust for differences in response probabilities across providers of different professional qualifications. Four individuals did not respond to the question asking whether they completed any structured, professional training on implicit bias in the past two years. These four responses were excluded. [2]Mean summative score was calculated after coding responses as 1=strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree, and 5=strongly agree. . [3]Simple linear regression models tested for differences in mean implicit bias scores between training group