

Development of a Maternal Equity Safety Bundle to Eliminate Racial Inequities in Massachusetts

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OBJECTIVE: The PNQIN (Perinatal-Neonatal Quality Improvement Network of Massachusetts) sought to adapt the Reduction of Peripartum Racial and Ethnic Disparities Conceptual Framework and Maternal Safety Consensus Bundle by selecting and defining measures to create a bundle to address maternal health inequities in Massachusetts. This study describes the process of developing consensus-based measures to implement the PNQIN Maternal Equity Bundle across Massachusetts hospitals participating in the Alliance for Innovation on Maternal Health Initiative.

METHODS: Our team used a mixed-methods approach to create the PNQIN Maternal Equity Bundle through consensus including a literature review, expert interviews, and a modified Delphi process to compile, define, and select measures to drive maternal equity-focused action. Stakeholders were identified by purposive and snowball sampling and included obstetrician-gynecologists, midwives, nurses, epidemiologists, and racial equity scholars. Dedoose 9.0 was used to complete an inductive analysis of interview transcripts. A modified Delphi method was used to reach consensus on rec-

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ommendations and measures for the PNQIN Maternal Equity Bundle.

RESULTS: Twenty-five interviews were completed. Seven themes emerged, including the need for 1) data stratification by race, ethnicity and language; 2) performance of a readiness assessment; 3) culture shift toward equity; 4) inclusion of antiracism and bias training; 5) addressing challenges of nonacademic hospitals; 6) a life-course approach; and 7) selection of timing of implementation. Twenty initial quality measures (structure, process, and outcome) were identified through expert interviews. Group consensus supported 10 measures to be incorporated into the bundle.

CONCLUSION: Structure, process, and outcome quality measures were selected and defined for a maternal equity safety bundle that seeks to create an equity-focused infrastructure and equity-specific actions at birthing facilities. Implementation of an equity-focused safety bundle at birthing facilities may close racial gaps in maternal outcomes.

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Maternal mortality and severe maternal morbidity (SMM) continue to rise in the United States.^{1,2} Black non-Hispanic (Black) birthing people are more than twice as likely to die in childbirth compared with their White non-Hispanic (White) peers.¹⁻⁴ In Massachusetts, SMM rates are 2.3 times higher among Black birthing people.⁵

Many factors contribute to maternal mortality, SMM, and inequities, including the site of care, timely receipt of care, health insurance type, and preexisting conditions.^{6,7} It is notable that racism, not race, is an important and independent contributor to worse outcomes.^{6,8,9} To address systems factors, AIM (Alliance for Innovation on Maternal Health) publishes maternal safety bundles of evidence-based practices and institutional guidelines.^{10,11} The AIM bundles, implemented through perinatal quality collaboratives, include five domains: readiness, recognition and prevention, response, reporting and systems learning, and, most recently, respectful care.^{12,13} Although they are evidence-based collections of recommendations, they are intended to be adapted to the needs of each collaborative using quality-improvement (QI) methodology.

Maternal safety bundles have successfully improved outcomes and reduced racial gaps through structured, actionable steps for implementing evidence-based practices. In California, maternal mortality rates decreased and SMM racial disparities were reduced after implementation of an obstetric

hemorrhage maternal safety bundle while national rates rose.^{14,15} One health system implemented an equity-focused goal of reducing maternal mortality for Black individuals across five hospital sites by forming a data-driven QI collaborative to address inequities through evidence-based practices.¹⁶ Davidson et al¹⁷ demonstrated a decline in SMM and the SMM racial disparity after data disaggregated by race and ethnicity were presented at department meetings, even before other bundle measures were implemented. These findings suggest that calling attention to racial gaps in SMM activates teams toward improvement, may aid in decreasing racial inequities in maternal mortality and SMM, and emphasizes the importance of defining measures to target improvements.

PNQIN (Perinatal-Neonatal Quality Improvement Network of Massachusetts), the Massachusetts state perinatal quality collaborative, aimed to implement a maternal equity bundle to create an equity-focused infrastructure across birthing facilities in Massachusetts. PNQIN sought to adapt the Reduction of Peripartum Racial and Ethnic Disparities Conceptual Framework and Maternal Safety Consensus Bundle and create a maternal safety bundle to equip teams seeking to address discrimination and racism resulting in maternal inequities with action steps and standardized metrics.¹⁸ This article describes the methodology of creating the PNQIN Maternal Equity Bundle.

METHODS

Our mixed-methods approach to create the Maternal Equity Bundle through consensus included a literature review, expert interviews, and a modified Delphi process with the members of the PNQIN Maternal Equity Bundle work group. We searched published literature to identify potential measures for the bundle and themes for implementing equity-focused QI work. We searched MEDLINE, PubMed, Cochrane Library, and Google Scholar from August 2000 to July 2021. Search terms included QI, maternal health, maternal equity, health equity measures, bundle implementation, racial equity projects, perinatal quality, maternal morbidity, maternal mortality, racism, antiracism, and respectful maternity care. The literature review informed the standardized questions for stakeholder interviews (Appendix 1, available online at <http://links.lww.com/AOG/D315>), the list of experts we sought to interview, and potential measures for the maternal equity bundle.

Stakeholders were selected using purposive and snowball sampling. In stage 1, stakeholders were

identified through literature review with relevant publications on the subject matter and reputation as experts in maternal health equity. These included obstetrician–gynecologist physicians, nurses, midwives, epidemiologists, and scholars in racial equity and maternal–child health. The sample frame was national, but because implementation was meant explicitly for Massachusetts, experts who conducted their work in Massachusetts were oversampled. In stage 2, snowball sampling was used to identify experts because interviewees referred to or suggested other experts. Study participants were contacted by email.

Interviews of expert stakeholders were conducted virtually with Zoom (<https://zoom.us/>). One or two interviewers (A.K. and K.V.) were present for each interview. After participant consent was obtained, interviews were conducted with a standardized guide (Appendix 1, <http://links.lww.com/AOG/D315>) and recorded to Zoom cloud storage, where a transcript was produced the internal transcription program in Zoom. Transcripts were reviewed, edited for accuracy, and uploaded to Dedoose 9.0 (<https://www.dedoose.com/>).

Interviews were used to compile measures based on the Donabedian¹⁹ model for measuring health care quality: structures, processes, and outcomes. The interviews provided insights into possible bundle measures and measures implementation. After the 15th interview, no new themes were generated, and it was deemed that data collection reached saturation. The 10 additional interviews confirmed no new emerging themes.

Using traditional inductive qualitative methodology, we coded interview transcripts and notes with Dedoose 9.0. Codes were generated from the interview transcripts, notes, and interview guide (Appendix 2, available online at <http://links.lww.com/AOG/D315>). Codes were reviewed and organized by root and subcodes by two authors (A.K. and A.R.M.). Root codes created thematic summaries of key findings. This was presented to the Maternal Equity Bundle work group to inform measure selection.

The Delphi phase took place from March to June 2022. The Maternal Equity Bundle workgroup, a self-nominated and knowledgeable group of health care professionals, scholars, and community members, provided continuous review and feedback on bundle measures and implementation processes. This 22-member group was tasked to select the final structure, process, and outcome measures before the bundle launch in September 2022. The modified Delphi rounds were conducted over five 60-minute virtual

meetings with open and anonymous feedback to obtain and synthesize the views of the Maternal Equity Bundle work group members. Members received an introduction to the project, including goals and context, and then were presented with 25 candidate measures (Table 1) and thematic summaries from the expert stakeholder interviews. To reach a consensus on bundle measures, emphasis was placed on perceived acceptability and feasibility among hospital teams and the appropriateness of measures for addressing maternal equity.²⁰ The table of candidate measures was edited after each Delphi meeting to reflect suggested modifications. Themes uplifted during the Delphi process included creating an infrastructure to address equity on labor units, addressing the leading causes of SMM in Massachusetts, and aligning with recent AIM bundles implemented among Massachusetts birth facilities. The first three rounds of meetings led to agreement on 10 proposed structure, process, and outcome measures. Over two subsequent Delphi rounds, work group members further refined the measures and reached consensus. The senior author (A.R.M.) facilitated the discussions of all five Delphi rounds.

IRB approval was not obtained because the investigators determined that this project was exempt on the basis of published federal exemption categories.²¹ This investigator determination was based on expert interviews with human subjects not presenting greater than minimal risk to participants, the focus of the interview questions pertaining to their employment expertise and not their private or personal lives, and the project falling under the federal exemption category of benign behavioral intervention.

RESULTS

Twenty-five interviews were completed with 28 participants from across the United States between May and August 2021. Thirteen states and Washington, DC, were represented, with 9 of 25 participants (36.0%) being from Massachusetts. Other states represented included California, Texas, Oklahoma, Louisiana, Minnesota, Illinois, Georgia, Pennsylvania, Maryland, Rhode Island, and New York.

Seven themes for bundle measures were identified in the expert stakeholder discussion of implementing equity and equity-focused work in maternal health. They included the need for 1) data stratification by race, ethnicity, and language; 2) performance of a readiness assessment; 3) culture shift toward equity; 4) inclusion of antiracism and bias training; 5) addressing challenges of nonacademic hospitals; 6) a life-course approach; and 7) selection of timing of

implementation. Participants also named facilitators and barriers to conducting equity work during interviews (Box 1). Facilitators included supportive leadership, champions within institutions and departments, political will and support, financial incentives and funding, dedicated time, allies, community consultants, and dedicated students. Barriers included lack of buy-in, lack of funding, lack of allocation of resources and time, interpersonal racism, lack of compensation for this type of work, poor data infrastructure, and unsupportive leadership.

Data disaggregated by race, ethnicity, and language was the most common theme, discussed with 23 of 25 of the experts (92.0%), including 60 comments across 25 interviews. Participants described the need for systems to regularly stratify process and outcome metrics by race, ethnicity, language, and insurance status. Recommendations were to regularly communicate these data to staff through clinical data dashboards. Clinical dashboards allow rapid reporting of metrics disaggregated by race, ethnicity, and lan-

guage; demonstrate trends over time; and help identify opportunities for improvement by subpopulation. This functionality allows sites to sustain QI work beyond implementing measures for the statewide project. As part of this theme, the data infrastructure itself was highlighted as necessary for implementation of the equity bundle. It was suggested that each department base its measures on root-cause analyses and stratify its data by race, ethnicity, and language to determine what problems exist in its institution to address them directly.

Participants discussed the value of a readiness assessment conducted on each unit before implementation. Recommendations were to use a tool to assess the unit's baseline culture of addressing racial inequities, leadership support, available resources and time, data access, and team dedication to bundle implementation. Measurement tools suggested by participants include the Atlas Readiness Assessment Tool and the Organizational Readiness for Implementing Change survey, which determines whether

Table 1. Preliminary and Selected Measures for the PNQIN (Perinatal-Neonatal Quality Improvement Network of Massachusetts) Maternal Equity Bundle From Literature Review, Expert Interviews, and Equity Workgroup Review

	Structure	Process	Outcome
Candidate measures	<ul style="list-style-type: none"> • Antiracism statement • Standardized debrief system • Practical PREMs in place* • REaL data dashboard • Mandated antiracism training • Community engagement • Universal SDOH screening • System for reporting racism and discrimination • Equity team 	<ul style="list-style-type: none"> • % of staff trained in bias and respectful care[†] • % of patients screened for SDOH • % of patients administered a PREM at discharge • Frequency of staff review outcomes and dashboard • % of perinatal care standard met by REaL: obstetric hemorrhage risk assessment, quantitative blood loss use, timely treatment for hypertension, coordination and transitions of care, shared decision making 	<ul style="list-style-type: none"> • SMM 2020–2021 rates by REaL²⁸ • PREMs respectful care index (MADM/MORi) by REaL • Exclusive breastfeeding at discharge by REaL • VBAC, NTSV cesarean rates, unexpected NICU admission, newborn mortality, and postpartum readmission rates
Selected measures	<ol style="list-style-type: none"> 1. Equity team 2. Equity goals 3. REaL data collection by self-report 4. Data disaggregation by REaL 5. PREMs 	<ol style="list-style-type: none"> 6. % of staff trained in bias and respectful care[†] 7–9. % of perinatal care standard met by REaL: 1) obstetric hemorrhage risk assessment, 2) quantitative blood loss use, 3) timely treatment for hypertension 	<ol style="list-style-type: none"> 10. SMM 20 and SMM 21 rates by REaL

PREM, patient-reported experience measure; REaL, race, ethnicity, and language; SDOH, social determinants of health; SMM, severe maternal morbidity; MADM, Mothers on Autonomy in Decision Making; MORi, Mothers on Respect Index; VBAC, vaginal birth after cesarean; NTSV, nulliparous, term, singleton, vertex; NICU, neonatal intensive care unit.

* PREMs suggested include the MADM, MORi, Birth Satisfaction Scale, Everyday Discrimination Scale, Discrimination in the Medical Setting Scale, Press Ganey Scale, and Jackson-Hogue-Phillip Scale.

[†] Training suggested includes the Institute of Perinatal Quality Improvement SPEAK UP Against Racism training, National Birth Equity Collaborative training, Harvard Implicit Association Test, Diversity Science, Cultural Maternity Care, March of Dimes, and Office of Minority Health training.

organizations are supportive and have the tools necessary to create change.²² One participant suggested a question on clinician attribution to measure the level of clinician ownership of the work required to successfully address health inequities.²³

Eight participants (32.0%) noted that by implementing structure measures for an equity bundle, one would change the institution's culture toward one that emphasizes equity. This begins by having staff understand the historical context of racial inequities. The expected outcome of shifting culture is improvement in patient-reported experience measures. Patients may feel more integrated as contributing members of their health care team when included in shared decision making and patient huddles.²⁴ An additional goal of this bundle is to set a foundation for further equity work within participating institutions.

The majority of the experts (76.0%) discussed the importance of antiracism and bias training as a measure for the equity bundle. Participants noted a need for increased awareness of bias on individual levels, in both the contemporary and historical context. Participants discussed various training options (Table 1). Several named respectful maternity care as a specific bias training that should be required in the implementation of this bundle. Some suggested specific respectful care policies guided by community input at each institution, such that patients give input on what respectful care means. Although many participants advocated for antibias training, 12.0% expressed concern for the efficacy of bias training.

Nonacademic hospitals need to be involved in toolkit development and buy-in given that they are a large proportion of birthing facilities in Massachusetts. These hospitals have different resources and trainee availability and may serve different communities from academic hospitals. Engaging only with hospitals that have resource-rich settings would skew results and decrease the generalizability of the efficacy of the bundle.

Five participants (20.0%) noted the disconnect between data ascertained during birth hospitalization and peripartum data from the ambulatory setting. They noted that data ascertained during the birth hospitalization were more extensive than in the prenatal period, identifying an opportunity for improvement. They noted that there is a need for better data collection throughout the life course beyond the reproductive periods. Participants also suggested including data on the social context of the birthing person. Suggested scales included the Index of Concentration at the Extremes and the Social Vulnerability Index.^{25,26}

Box 1. Facilitators of and Barriers to Maternal Equity Work

Facilitators

- Supportive leadership
- Allies: champions in institutions and departments
- Timing around 2020 racial uprisings garnering nationwide support and attention
- Funding, financial incentives
- Political will and support from members of Congress
- Dedicated time
- Community consultants
- Dedicated Students

Barriers

- Lack of buy-in from colleagues and leadership
- Lack of funding, lack of compensation for this type of work
- Lack of devotion of resources and time from hospital administration
- Interpersonal racism
- Lack of academic advancement for this type of work
- Silos
- Lack of data systems
- Risk to reputation and litigation
- Previous government administration

The racial justice movements against police violence in 2020 and the health inequities highlighted by the coronavirus disease 2019 (COVID-19) pandemic have brought attention to improving health equity across fields of medicine. Participants reported that this work is more readily accepted now. One participant discussed that enhanced awareness occurred when people were incited by George Floyd's murder, and many organizations donated time and funding to equity work that previously had not. Participants suggested that community partnerships should be at the core of the work and included in each site equity team.

Twenty-six structure, process, and outcome measures were derived from literature review and interviews. The modified Delphi consensus process determined the 10 measures selected for the Maternal Equity Bundle (Table 1). Structure measures, systems needed to implement the QI work to improve inequities, included 1) a formal and diverse equity team with community engagement; 2) equity goals developed and communicated (such as an antiracism statement); 3) collection and availability of self-reported race, ethnicity, and language data; and 4) implementation of a patient-reported experience measure. Patient-reported experience measure scales, the Mothers on Autonomy in Decision Making and Mothers on Respect Index, were discussed and recommended by 10 of 25 experts (40.0%).^{27,28} Participants additionally

suggested a qualitative option for the patient-reported experience measure to yield greater context of the patient experiences.

Selected process measures are the process measures of the two previously implemented PNQIN bundles (severe hypertension and obstetric hemorrhage) with rates disaggregated by race and ethnicity. These include reporting percent of individual medical records with obstetric hemorrhage risk assessment score, percent of births using a quantitative measurement of blood loss, and percent of patients receiving timely treatment for severe hypertension within 60 minutes of a sustained severe-range blood pressure measurement. In addition, a process measure was selected to report the percentage of staff trained in bias and respectful care. Appendix 3, available online at <http://links.lww.com/AOG/D315>, provides full details of the process measures. Comments for selecting these measures highlighted the feasibility of implementing familiar bundle measures with the addition of metrics for subpopulations reported.

The selected outcome measure was SMM (both SMM 20 and SMM 21, which included blood transfusion).²⁹ Considerations for outcome measures included patient health outcomes and subjective experiences with the health care system during the perinatal period. The final measures suggested for implementing the Maternal Equity Bundle are included in Table 1.

Themes from the stakeholder interviews are reflected in selected bundle measures: 1) equity-focused governance with community partnership; 2) antiracism and bias training; 3) demographic data collection by self-report and processes and outcomes stratified by race, ethnicity, and language; and 4) a focus on patient experiences and optimal outcomes for all populations. These findings are presented in the resulting driver diagram depicted in Figure 1. A driver diagram is a visual display that organizes the project goals, proposed activities, and measures, clearly outlining the relationship between the aim of the improvement project and the changes to be tested, implemented, and measured.³⁰

DISCUSSION

We created a Maternal Equity Safety Bundle through a rigorous process of qualitative interviews and through the use of the Delphi method to establish measures from an existing Conceptual Framework and Maternal Safety Consensus Bundle.¹⁸ Several themes, facilitators, barriers, and suggested measures emerged from our process to select and define measures for the PNQIN Maternal Equity Bundle. The most suggested activity for hospital teams to imple-

ment was data disaggregation by race and ethnicity, highlighting broad interest among experts for teams to assess outcomes by subpopulations to target interventions. Reported facilitators and barriers informed the measures implemented, namely the unique barrier of interpersonal racism. The selected measures reflect an expert-recommended intention to shift practice and culture to achieve equity.

In response to a national call to action to address maternal mortality and SMM racial inequities, PNQIN began work to shift practice and culture to achieve equity. In 2019, PNQIN launched the Massachusetts AIM initiative to build a culture of equity in obstetric care delivery and to eliminate the influence of racism on birth experiences and outcomes. Our Maternal Equity Bundle development process sought to provide hospital teams with an infrastructure to improve equity using tools to build awareness, to provide training, and to support measurement of outcomes to assess efficacy. These tools are designed to support teams engaging in informed discussions around racism in medical practice and to dismantle the policies, procedures, and behaviors within their organizations that generate and perpetuate racial inequities.

From our process, we propose the following foundational components equity work: 1) prioritization from leadership; 2) antiracism and bias training; 3) data disaggregation by race, ethnicity, and language; and 4) patient voice and community engagement. First, leadership support of equity as a core principle for the department and an overarching goal for the institution is a necessary step in the implementation of QI projects aimed at reducing racial inequities. Next, advancing bias awareness and training is a step toward changing the culture of the institution to acknowledge implicit bias and the role of structural inequities in the care they provide. Therefore, California has mandated implicit bias training for all perinatal care clinicians practicing in the state.³¹ In a study of Society for Maternal-Fetal Medicine members, 83% surveyed agreed that disparities affect their practice, but only 29% believed that personal biases affect how they care for their patients.³² The importance of training discussed in the interviews was translated into creating a process measure of the percentage of nurses and physicians trained in antiracism and implicit bias. Third, self-report of demographic data collected by health systems is recommended to accurately document and identify outcomes and experiences by patient race, ethnicity, and language.^{33,34} The Massachusetts Department of Public Health created a Racial Equity

Data Road Map as a tool to inform hospitals on best practices for data collection, community engagement, and actionable solutions to improve racial equity.³⁵ Lastly, a focus on patient experiences and outcomes stratified by race and ethnicity allows teams to ensure that respectful care is provided to all populations.³⁶ Patient voice and community engagement are crucial to effecting change.

Experts offered lessons learned from the implementation of equity work. Those who have implemented maternal equity projects in their institutions have reported experiences of defensiveness from colleagues and suggested an appreciative inquiry approach that focuses on what the team was doing well, inquires how the problem has come to exist, and explores data collectively.^{37,38} The equity team leading this group must have staff representation of the populations served by the institution, including leadership in nursing and physician teams, on-the-ground nurses, residents, students, anesthesiologists, and pediatric teams. Members of site implementation teams need support to devote, discuss, and process this work, which requires dedicated time and staffing. The expert stakeholders interviewed suggested a step-wise approach to implementing the bundle, starting with recognition and structure measures.

The strengths of our process include the mixed-method approach and reach of expertise among the stakeholders interviewed, resulting in a wide range of proposed measures and the ability to discuss what existing measures lack. We also incorporated direct feedback from stakeholders regarding the bundle, which made it more feasible to implement.

Limitations of this qualitative approach include the subjective nature of interviewee comments and the consensus process among work group members. Furthermore, the stakeholder interviews did not include representatives of patient advocacy groups, and demographic statistics of the experts interviewed were not collected. Although the Maternal Equity Bundle Work Group includes patient representatives and stakeholders from urban and rural hospitals and academic and community settings, it is difficult to account for the wide variety of experiences in Massachusetts, and geographic variations across the state may not be adequately addressed. The Maternal Equity Bundle created is best suited for implementation in Massachusetts but could be adapted for other states in the United States. However, hospitals and perinatal quality collaboratives should consider the contextual similarities to determine how generalizable the findings will be to their setting.

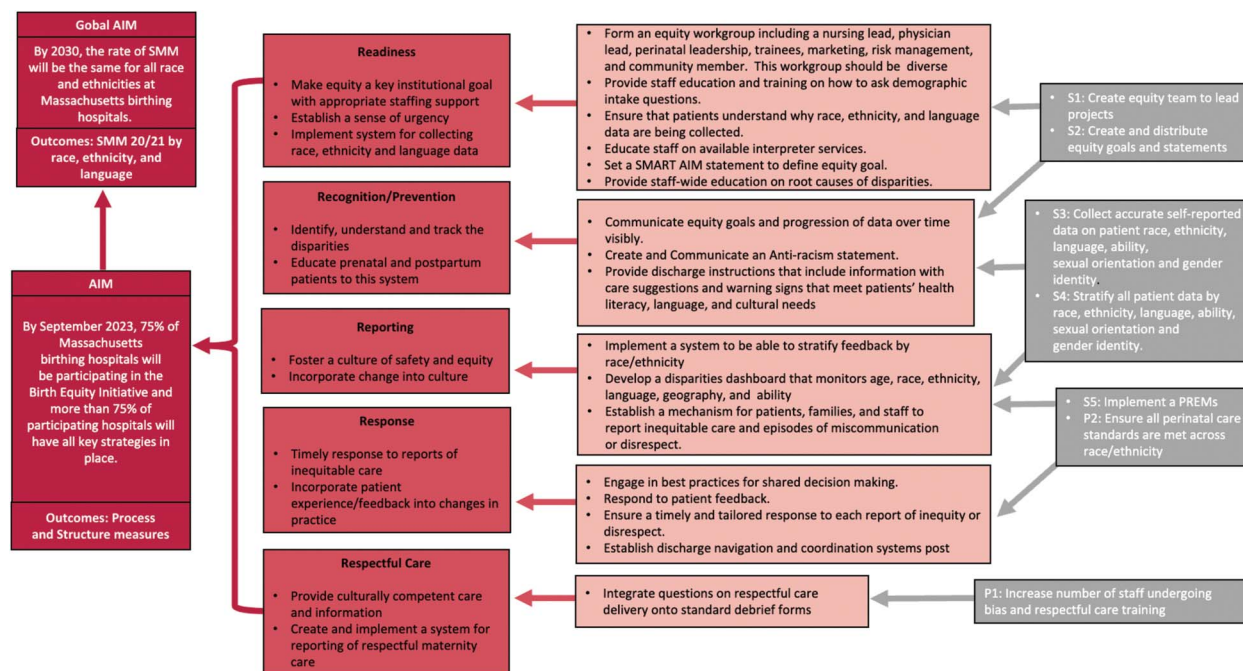


Fig. 1. Driver diagram for the Massachusetts Maternal Equity Bundle. SMM, severe maternal morbidity; SMART, specific, measurable, applicable, realistic, and timely; AIM, Alliance for Innovation on Maternal Health; PREM, patient-reported experience measure.

Keyfets. Maternal Equity Safety Bundle to Eliminate Maternal Health Inequities. Obstet Gynecol 2023.

The PNQIN Maternal Equity Bundle was implemented across Massachusetts in September 2022. Next steps include the evaluation of the efficacy, feasibility, and acceptability of the bundle implementation process, and initial evaluation results will be incorporated into future versions of the equity bundle.

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