STATE STRATEGIES FOR PREVENTING PREGNANCY-RELATED DEATHS:

A Guide for Moving Maternal Mortality Review Committee Data to Action

CDC

ERASE MM

Enhancing Reviews and Surveillance to Eliminate Maternal Mortality

MMRIA

MATERNAL MORTALITY REVIEW INFORMATION APP

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Dedication

This report is dedicated to the memory of Cynthia (Cindy) Jean Berg, MD, MPH, who passed away in March of 2022.

Cindy began her federal career in 1985 as an Epidemic Intelligence Service officer and continued as a medical epidemiologist in the CDC Division of Reproductive Health until her retirement in August 2013. Prior to joining the CDC, Cindy practiced medicine as an OB/GYN. Per her obituary, Cindy found her true calling of "making the world a better place for expecting mothers" while interning in maternity wards in Philadelphia hospitals.

Cindy was an internationally recognized expert in pregnancy health. She enjoyed many collegial partnerships and her research with them resulted in over 90 publications and technical reports. Her service to maternal health through the World Health Organization took her to Africa, South and Central America and Southeast Asia where she promoted perinatal care standards. Referred to as the "Godmother of Maternal Mortality Research" she worked tirelessly to draw attention to the issue of maternal mortality in the US and around the world. Cindy was a key contributor to the development of the first standardized data system to track pregnancy-related deaths, CDC's Pregnancy Mortality Surveillance System (PMSS). Throughout her career, Cindy worked to disseminate PMSS findings widely from the podium and in peer-reviewed literature.

A dedicated public health professional, Cindy led the development of the 2001 CDC monograph, "Strategies to Reduce Pregnancy-Related Deaths", which defined our approaches to maternal mortality surveillance and laid the foundations for jurisdiction-based maternal mortality review in the US. This document drove program improvement and laid the foundation for this very document, *State Strategies for Preventing Pregnancy-Related Deaths: A Guide for Moving Maternal Mortality Review Committee Data to Action*.

In addition to her maternal research work, Cindy shared her love and devotion to mothers and infants. It was very important to her that her son and all children know they are honored. Cindy is described as having a vast patience for those eager to learn from her—whether that person was a health department director, an OB/GYN resident, or a child. She is remembered as being exceedingly generous with her breadth of knowledge.

Cindy especially inspires those who continue her maternal mortality prevention work. Her vision and commitment to women's health are her enduring legacies. Her life's work embodied the best of CDC's commitment to service, and particularly to ending preventable maternal mortality.

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We would also like to acknowledge the Maternal Mortality Review Committees (MMRCs) who work so hard to establish a springboard for the data to action journey. MMRCs across the US have engaged with CDC and our partners to establish standard approaches to review and data collection for at least a decade. The review committee members and the public health staff that support them have an integral role in and provide the very basis for action. Their consistent approach to maternal mortality review makes a difference. For over a century, jurisdictions have used MMRCS to assess maternal mortality data to identify prevention opportunities. These groups worked largely independently, which hindered information-sharing between committees. More recently the groups have joined together via the CDC's Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) initiative. Outcomes of this partnership are already apparent, including commitment to a standard data strategy in the Maternal Mortality Review Information Application (MMRIA). While the US has been challenged in its efforts to decrease maternal mortality, through MMRCs we now have strong, accurate data allowing us to effectively work together to prevent these tragic events for families and communities.

We are grateful for the opportunity to convey our sincere appreciation to all MMRCs in the US and look forward to ongoing collaboration through ERASE MM.

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Executive Summary

Maternal mortality is a devastating tragedy that no family or community should have to endure. Opportunities to eliminate maternal mortality can be best identified by multidisciplinary Maternal Mortality Review Committees (MMRCs) at the state- or jurisdiction-level (hereafter referred to as state), inclusive of representation by clinical and non-clinical experts that serve populations disproportionately affected by maternal mortality. MMRCs provide an understanding of factors that contribute to maternal mortality within the unique contexts of the states and communities where these persons lived. MMRC data can be a driving force for prioritizing recommendations and formulating strategies that can prevent maternal mortality.

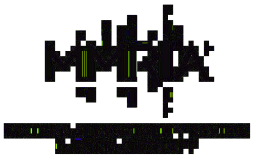
In "Strategies to reduce pregnancy-related deaths: from identification and review to action", Atrash et al. provide guidance to states for strengthening data collection and review. This guidance sets the foundation for strengthening all aspects of a fully functional and sustainable MMRC.[2]

Figure 1. Steps to moving MMRC data to action to reduce maternal mortality

Strategies for eliminating maternal mortality are diverse, multifactorial and multi-level, and success is dependent upon acknowledging state and community context and leveraging available resources. Strategies that work well in one context may not be as successful or relevant in another. In partnership with clinical and public health, and community leadership and organizations, the recommendations from MMRC reviews can inform strategies to prevent maternal mortality within a state's context.

This guide is best used when a MMRC has reached the point of identifying priority recommendations informed by the review of pregnancy-associated deaths and is now ready to translate that knowledge into a focused effort to move MMRC information from data to action. Prioritizing recommendations for action using these data is based on analyses of quantitative and qualitative MMRC data. For example, review committees may select recommendations for prioritization related to the leading causes of deaths, deaths with a high degree of preventability, or those that address disproportionately affected populations. Engagement with public health, clinical and community partners as outlined in this guide further refines the prioritization process for selecting strategies to move recommendations to action.

Moving data to action does not mean that the MMRC takes on implementation of actions, but that the information from the MMRC is used to engage the larger state and local systems addressing maternal mortality of which the MMRC is a part. However, the same agencies responsible for organizing MMRCs may also serve as organizing bodies that help work through the iterative steps to translate data to action. In cases where MMRCs are not the organizational lead for translating data into action, it is still important to use MMRC data to identify the organizations who can implement the prevention recommendations.



In this document, the process of translating data into action is presented as an iterative four-step process, with each step approached through an equity lens and supported by continuous monitoring and review (**Figure 1**). The steps provided here are designed to facilitate implementation of data-informed strategies to prevent maternal mortality:

Step 1. Use data to understand the scope of the problem. Identify and review complementary information from other population-based data sources that relate to a MMRC's prioritized recommendations to address the leading causes of pregnancy-related deaths. Understanding the broader scope of the problem may provide further information for identifying potential actions and associated strategies.

Step 2. Understand the context of the solution. Based on the who, what, and when of prioritized recommendations, assess what is already being done to address the recommendation, organizational and community factors, partnerships with key decisionmakers, and available resources (i.e., human and financial). Understanding this context will help to determine which goals and strategies are most relevant and feasible.

Step 3. Identify potential goals and strategies. Similar to Step 2, this step should be based on the who, what, and when of prioritized recommendations. This section provides potential goals and relevant strategies for states, based on best practices and successful examples. These goals, while not exhaustive, are illustrative and may include: (1) eliminate racial and ethnic disparities in maternal mortality, (2) invest in and partner with communities, (3) ensure access to care for all pregnant and postpartum persons, (4) ensure quality care for all pregnant and postpartum persons, and (5) strengthen maternal mortality data (with the goal of complete, accurate, and timely data on impacted populations). Effective actions will likely require implementing a number of strategies that address multiple goals, including acting on more than one strategy within a goal.

Step 4. Act on your strategies. To implement strategies that will eliminate maternal mortality, it is important for states to assess potential strategies for fit, develop an implementation plan and timeline, and plan for evaluation of these strategies.

Each step highlights key takeaways using illustrative examples of actions implemented by states.

Incorporated into each step

Apply an equity lens. Each step of moving a MMRC's prioritized recommendations to action should integrate equity. This includes strategy selection, implementation, and continuous monitoring and review considering which populations are disproportionately impacted and what partners and approaches may best serve the needs of these communities. An equity lens also includes taking deliberate steps to understand the impacts of historical trauma and the role of inequitable institutional structures. It also underscores the importance of centering patient and community perspectives. Centering patient and community perspectives puts their interests at the center of the process, as opposed to a clinically driven correctional approach.[3] Considering how approach, design, and implementation may impact and benefit disproportionately affected populations and the prioritization of leading causes of pregnancy-related deaths among these populations can help promote equity and eliminate disparities in maternal mortality.

Continuously monitor and review. Throughout the process it is important to systematically examine progress to identify facilitators and barriers to success. Continuously monitoring and reviewing the information gathered for each step, and the strategies selected for action, will help verify that the actions have the intended effect (evaluation), that the effect makes progress toward equity, and to identify additional actions that may be necessary.

There has been increased attention and focus on changing the paradigm of maternal health and addressing persistent and inexcusable health disparities in the United States. MMRCs across the nation are using shared processes and terminology to understand how to prevent maternal mortality. Building upon this momentum, the time is now, to not only continue improving the quality of data collected and reviewed, but to move that data to action. While there is not one approach to eliminating preventable maternal mortality, the goal of this guide is to provide MMRCs with guidance for identifying strategies that achieve the goals of MMRC priority recommendations. By working with partners to establish successful programs that equitably prevent maternal mortality, maternal health can be improved on a population level. The health of our communities and the future of our nation depends on it.

Acronyms

AAFP: American Academy of Family Physicians

AAP: American Academy of Pediatrics

ACOG: American College of Obstetrics and Gynecology

AIM: Alliance for Innovation on Maternal Health

AWHONN: Association of Women's Health, Obstetric and Neonatal Nurses

CDC: Centers for Disease Control and Prevention

CDC LOCATe℠: CDC Levels of Care Assessment Tool

CHW: Community Health Worker

CMCS: Center for Medicaid and CHIP Services

EITC: Earned Income Tax Credit

ERASE MM: Enhancing Reviews and Surveillance to Eliminate Maternal Mortality

HRSA: Health Resources and Services Administration

ICD: International Classification of Diseases

MMRC: Maternal Mortality Review Committee

MMRIA: Maternal Mortality Review Information Application

MMRP: Maternal Mortality Review Panel

NCHS: National Center for Health Statistics

NEMT: Nonemergency medical transportation

PAMR: Pregnancy-Associated Mortality Review

PDMP: Prescription Drug Monitoring Program

PQC: Perinatal Quality Collaborative

PRAMS: Pregnancy Risk Assessment Monitoring System

PRMR: Pregnancy-Related Mortality Ratio

SMFM: Society for Maternal and Fetal Medicine

SMM: Severe Maternal Morbidity

USAID: United States Agency for International Development

WHO: World Health Organization

Key definitions of terms related to maternal mortality

Pregnancy-associated death: the death of a person while pregnant or within one year of pregnancy, regardless of cause (may be related or unrelated to pregnancy)

Pregnancy-associated, but not related, death: the death of a person while pregnant, or within one year of pregnancy, from a cause that is unrelated to pregnancy

Pregnancy-related death: the death of a person while pregnant or within one year of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy

Maternal death: (WHO definition) the death of a person while pregnant or within 42 days of pregnancy, regardless of the duration and site of the pregnancy and from any cause related to or aggravated by the pregnancy and its management, but not from accidental or incidental causes

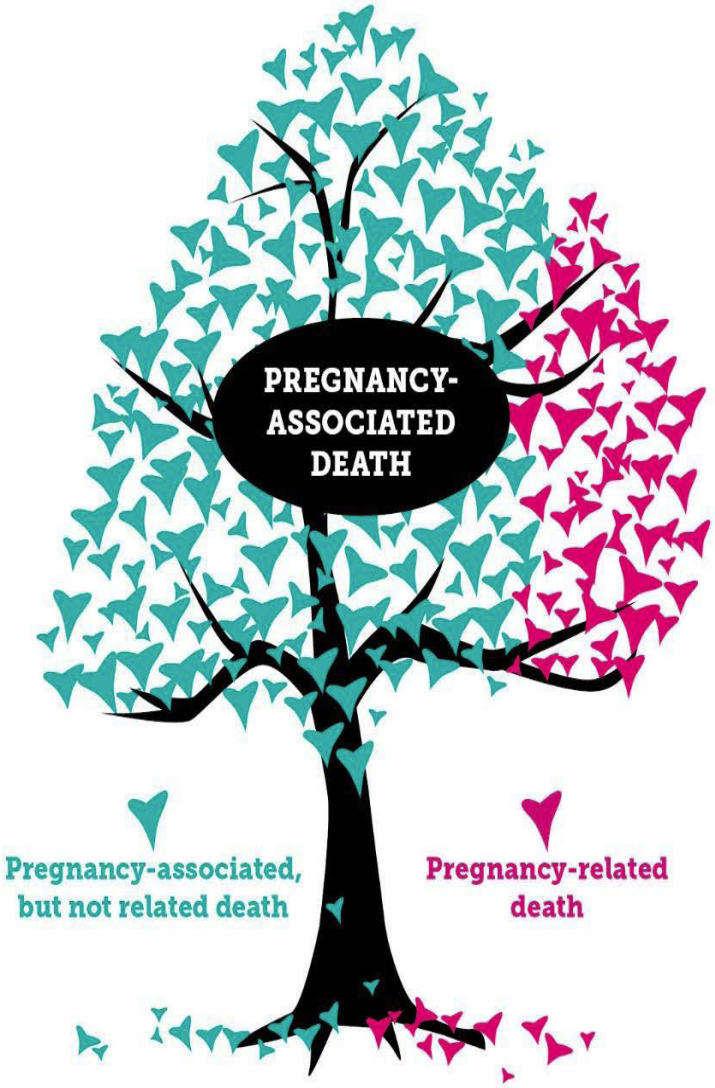


Figure 2. Maternal mortality terminology[1]

Purpose

Because maternal mortality is a rare but tragic event compared to other negative maternal health outcomes, it is possible to comprehensively review and generate actionable recommendations for every pregnancy-related death. The overlap between pregnancy-related deaths and other negative maternal health outcomes indicates that actions taken to address the medical and non-medical contributors to maternal mortality likely have a cascading effect, leading to improved maternal health. Our collective work to prevent maternal mortality can improve maternal health outcomes across the spectrum of severity, decreasing deaths and complications of pregnancy and bolstering overall maternal health.

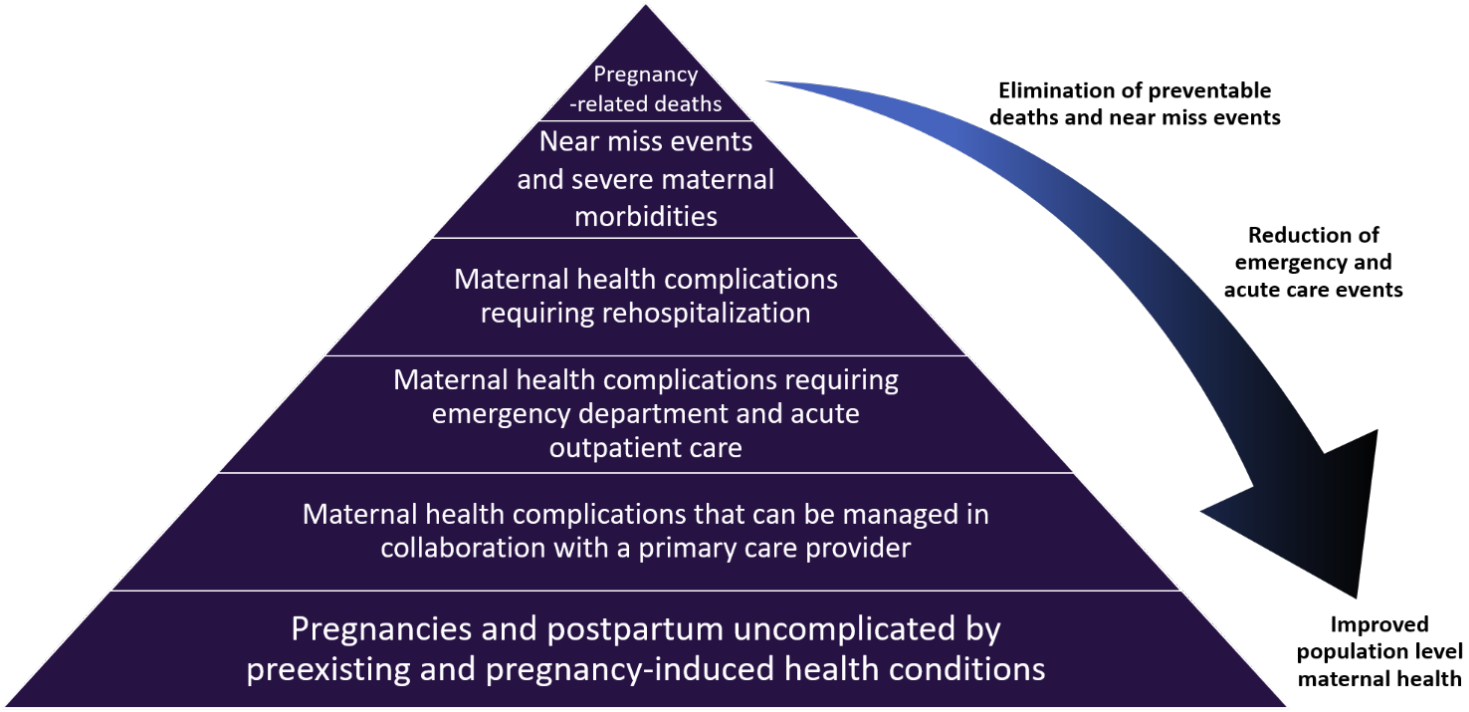


Figure 3. Pyramid of maternal morbidity and mortality outcomes and effects

This guide was developed through a review of available literature and input from subject-matter experts to support MMRCs, clinical, public health, and community leadership and organizations as they work to implement prevention strategies based on MMRCs' data and recommendations. Included in this guide are considerations for moving data to action as an iterative four-step process, one of which includes a menu of strategies for moving MMRC priority recommendations to action. The steps provided here are designed to facilitate state implementation of data-informed strategies to prevent maternal mortality.

The process of moving data to action typically involves use of quantitative and qualitative information from analysis of MMRC data, including leading causes of death, disproportionately affected populations, and contributing factor and recommendation themes. The most frequent underlying causes of death may not be the most preventable, and within those that are the most preventable, there is a range of opportunity for prevention. These considerations help committees to identify the best opportunities for recommended action. Engagement with clinical and public health, and community partners and organizations is an essential step for selecting priority recommendations for action that align with findings of the MMRC. For example, engagement with other maternal and child health programs in the state, such the Title V Maternal and Child Health Services Block Grant Program, which assess needs, set priorities, and provide programs and services, can also help further prioritize MMRC recommendations. This guide includes the following steps to be considered as an iterative process for moving these recommendations to action:

Step 1. Use data to understand the scope of the problem. Identify and review complementary information from other population-based data sources that relate to the MMRC's prioritized recommendations to address pregnancy-related deaths. Understanding the broader scope of the problem may provide further information for identifying potential actions and associated strategies.

Step 2. Understand the context of the solution. Based on the who, what, and when of prioritized recommendations, assess what is already being done to address the recommendation, organizational and community factors, partnerships with key decisionmakers, and available resources (i.e., human, financial, and physical). Understanding this context will help to determine which goals and strategies are most relevant and feasible.

Step 3. Identify potential goals and strategies. Similar to Step 2, this step should be based on the who, what, and when of prioritized recommendations. This guide provides potential goals and relevant strategies for states, based on best practices and successful examples. These goals, while not exhaustive, are illustrative and may include: (1) eliminate racial and ethnic disparities in maternal mortality, (2) invest in and partner with communities, (3) ensure access to care for all pregnant and postpartum persons, (4) ensure quality care for all pregnant and postpartum persons, and (5) strengthen maternal mortality data (with the goal of complete, accurate, and timely data on impacted populations). Effective actions will likely require implementing a number of strategies that address multiple goals, including acting on more than one strategy within a goal.

Step 4. Act on your strategies. To implement strategies that will eliminate maternal mortality, it is important for states to assess potential strategies for fit, develop an implementation plan and timeline, and plan for evaluation of these strategies.

Each section highlights key takeaways using illustrative examples of actions implemented by states.

Recognizing the Need for Data-Driven Action

In an effort to reduce maternal mortality, Mississippi implemented the Alliance for Innovation on Maternal Health's Obstetric Hemorrhage Bundle. However, after an analysis of Mississippi's MMRIA data, the MMRC found that hemorrhage only accounted for 2% of pregnancy-related deaths from 2013-2016. The MMRC's 2013-2016 review highlighted that the leading causes of preventable death in Mississippi were chronic cardiovascular disease and mental health, rather than hemorrhage. This finding led the MMRC to focus on the following question: "How can Mississippi's perinatal quality collaborative (PQC) integrate MMRC findings into action?" Moving forward, Mississippi's MMRC and PQC are working together to bridge the gap between data and action by selecting PQC projects and interventions based upon the leading drivers of maternal death the MMRC identified. Seeing both peripartum severe maternal hypertension as well as delayed cardiovascular deaths due to cardiomyopathy and cardiac arrest as the leading causes of death, MSPQC is currently implementing the AIM Severe Maternal Hypertension Bundle, integrating elements of bundles for cardiovascular disease. Mississippi's MMRC has also focused on integrating both social and economic data as well as family informant interviews as critical components of the review process. Information from family interviews is helping to shape the PQCs approach to family engagement and how equity and community level factors are addressed by the PQCs initiatives. To maximize the impact and effectiveness of initiatives, Mississippi's PQC is using the Mississippi MMRC data to drive their actions, selecting and tailoring initiatives to ensure they are addressing the most needed actions and implementing these efforts in the right places for families and communities who need them most.

Incorporated into each step

Apply an equity lens. Each step of moving a MMRC's prioritized recommendations to action should integrate equity. This includes strategy selection, implementation, and continuous monitoring and review, considering which populations are disproportionately impacted and what partnerships and approaches best serve the needs of these communities. An equity lens includes taking deliberate steps to be sure every mother's life is valued equally, understand the impacts of historical trauma and the role of inequitable institutional structures, and consider patient and community perspectives. The *CDC Health Equity Guiding Principles for Inclusive Communication* highlights using an equity lens with key health equity concepts that can be applied to this work such as:[4, 5]

- Long-standing systemic social and health inequities, including some that have been introduced or exacerbated by federal, state, and local policies, have put some population groups at increased risk of getting sick, having overall poor health, and having worse outcomes when they do get sick.
- Public health programs, policies, and practices are more likely to succeed when they recognize and reflect the diversity of the community they are trying to reach.
- Community engagement should be a foundational part of the process.

Considering how approach, design, and implementation of strategies may impact disproportionately affected populations, in addition to considering how to prioritization of leading causes of pregnancy-related deaths among these populations, can help promote progress toward equity and the elimination of disparities in maternal mortality. Equitable implementation includes considering first the approach to selecting strategies and what co-occurring strategies need to be implemented to ensure the needs and perspectives of disproportionately affected populations are taken into account. In equitable implementation, actions are considered on multiple levels, particularly at the systems-level and community-level; actions implemented on these levels have to be most likely need to address the drivers for disparities. Equitable implementation also means continuous monitoring and review of progress at each step along the way to achieve equitable progress. Applying an equity lens to continuous monitoring and review is essential for successful implementation.

Continuously monitor and review. Throughout the process, it is important to systematically examine progress to identify facilitators and barriers to success. Information gathered for each step informs continuous monitoring and review. For example, data from population-based data sources can be used for process and outcome evaluation. Community and organizational factors and resources may be inputs for the implementation plans. The implementation plans will outline how the strategy's activities are operationalized and can lead to results, and will identify any gaps that could represent potential barriers. Assessing whether the strategies selected for action are having the intended effect (evaluation) contributes to the evidence-base for maternal health programs and identifies additional actions that may be necessary to achieve success. As part of continuous monitoring and review, a health equity lens is applied to ensure that implemented strategies are reaching the families and communities who need them most to move toward equity and eliminate disparities. For example stratifying process evaluation indicators for process evaluations by race-ethnicity (e.g., time to treatment) can identify which factors need directed attention to close the gaps in outcomes.

In moving MMRC data to action, be sure that state-specific MMRC data—as opposed to national data—play a major role in guiding the identification of potential strategies for implementation.

The guide will outline a process to facilitate state and local implementation of data-informed strategies from MMRC data to prevent maternal mortality. It discusses partnering with clinical and public health, and community leaders and organizations to move data to action to equitably prevent maternal mortality and improve maternal health on a population level. While presented as a cycle, it is not necessarily a stepwise process. The work is iterative, and this guide can serve as a reference in the process.

Centering on equity

To build a healthier America for pregnant and postpartum people, we must confront the systems and policies that have resulted in the generational injustices that gave rise to health inequities.[11] As we move MMRC data to action, consideration of the lived experiences of populations disproportionately impacted by pregnancy-related death is essential (**Appendix A, Figure 6**). Strengthening and enhancing community assets are important for achieving population-based prevention and may be particularly crucial for addressing disparities and improving equity because of their help in buffering the historical impacts of racism and discrimination. Centering the prevention of pregnancy-related deaths from a health equity lens ensures that strategies are implemented in the right places for families and communities who need them most.

Health equity is when everyone has the opportunity to "attain their full health potential" and no one is "disadvantaged from achieving this potential because of their social position or other socially determined circumstance."[6] The risk of maternal mortality in the United States varies by race, ethnicity, education, and place of residence.[7] Health equity is the principle underlying the goal to eliminate disparities in health and their determinants, including the social determinants.[8] The social determinants of health are the aspects of the environment in which persons are born, grow up, live, work, and age, as well as the systems put in place to support health and to address illness.[4] To address the social determinants of health, it is important to identify the root causes of inequities, the structural determinants of health, defined as "cultural norms, policies, institutions, and practices that define the distribution (or maldistribution) of the social determinants of health."[9]

By defining the root causes of health inequities, strategies for prevention of pregnancy-related deaths can move away from individual blame and toward addressing the historical, systemic, structural, and political forces that created inequities.[9] While inequities are apparent across race, class, and gender, race in particular has been used historically and contemporarily to shape the distribution of power and resources across the population. Historical trauma is a potential framework to understand the adverse health outcomes seen among disproportionality impacted populations.[10] Historical traumas for American Indian/Alaska Native (AI/AN) persons include forced labor, massacres, displacement, forcible removal of children from their parents, residential schools, environmental destruction, and forced eradication of social, cultural, and spiritual practices.[11] However, it is important to note that these traumas continue to the present day. For example, police killings of unarmed Black Americans have adverse effects on mental health among Black American adults in the general population.[12] To contextualize disparities by race, it is important to acknowledge that race is a social, and not a biological construct, that conditions most aspects of daily life experiences and results in profound differences in the distribution of risks and opportunities in society.[13]

While this guide provides data primarily on the health inequities that impact Black birthing persons given most research on racism and maternal health has focused on this group, it is important to note that AI/AN persons in particular, as well as other people of marginalized groups in the U.S.—including Hispanic and Latino, Asian American, and Pacific Islander persons as well as those identifying with multiple races—have also been the target of health-harming racial discrimination. An intersectional approach acknowledges other overlaying social stratifiers (e.g., disability, immigration status, rurality, sexual orientation, and identity) are interconnected and contribute to systems of discrimination or disadvantage that impact health outcomes.[14]

Developed by Roach in 2016, the Restoring Our Own Through Transformation (ROOTT) theoretical framework (**Figure 4**) elucidates the web of causation between structural and social determinants of Black maternal health—education, income, neighborhood characteristics, housing, access to care, safety, and food stability—and how distribution of these resources have been shaped by structural racism and institutional policies and practices.[4]

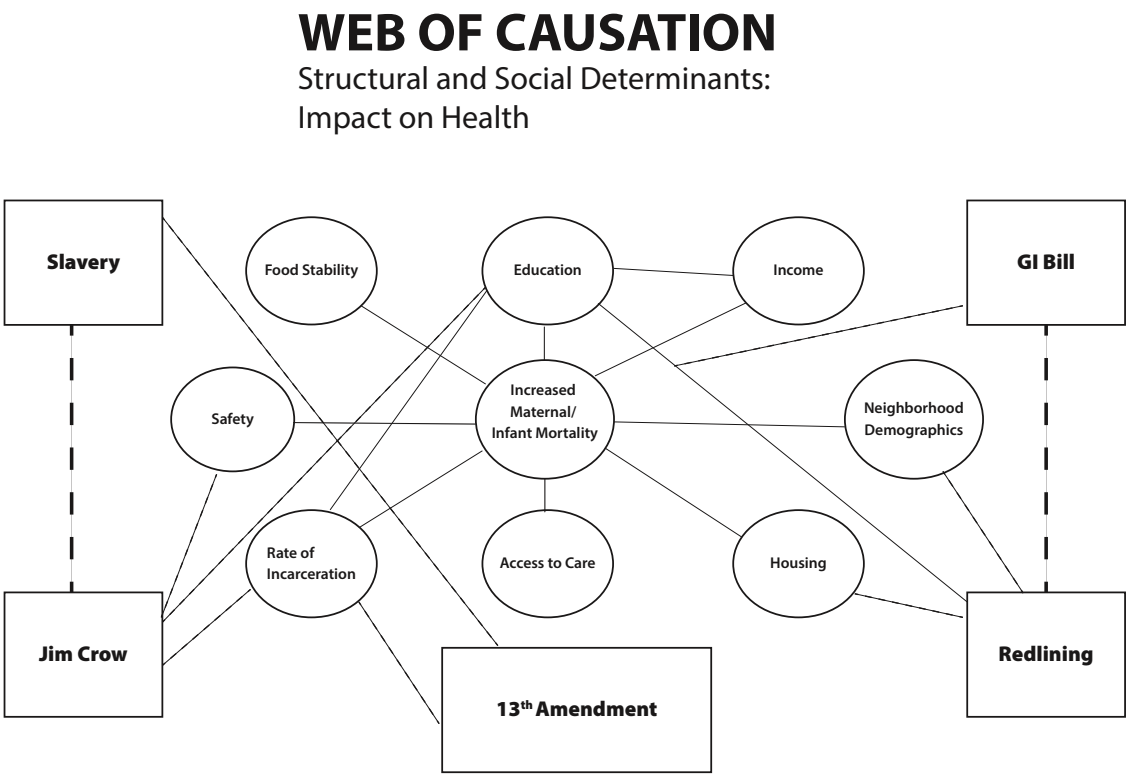


Figure 4. Restoring Our Own Through Transformation (ROOTT) theoretical framework

Bailey et al., define structural racism as involving interconnected mutually reinforcing inequitable systems (e.g., housing, education, employment, earnings, health care, criminal justice,) that in turn reinforce discriminatory beliefs, values, and distribution of resources, which together affect the risk of adverse health outcomes.[15] For example, the ongoing residential segregation of Black Americans, which is associated with adverse birth outcomes,[16] systematically impacts health-care access, utilization, and quality at the individual, provider, health-care system, and community levels.[15] Institutional racism reinforces the interconnected inequitable systems of structural racism.[4] Evidence of discriminatory practices has been documented in multiples sectors such as housing, employment, wages, and criminal justice.[17, 18] These are contributing factors to social disadvantage which impact the health of people and infants across the life span, including low educational attainment, unemployment, and lack of health insurance.[19]

Discrimination and interpersonal racism occurring in the clinical and non-clinical settings can contribute to the inequities we observe in pregnancy-related mortality.[20] In this guide, we use the following definitions for discrimination, interpersonal racism, and structural racism, consistent with the CDC's Maternal Mortality Review Information Application (MMRIA):[21]

Discrimination: Treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication and shared decision-making.[22]

Interpersonal Racism: Discriminatory interactions between individuals based on differential assumptions about the abilities, motives, and intentions of others and resulting in differential actions toward others based on their race. It can be conscious as well as unconscious, and it includes acts of commission and acts of omission. It manifests as lack of respect, suspicion, devaluation, scapegoating, and dehumanization.[23]

Structural Racism: The systems of power based on historical injustices and contemporary social factors that systematically disadvantage persons of color and advantage White persons through inequities in such areas as housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice.[15]

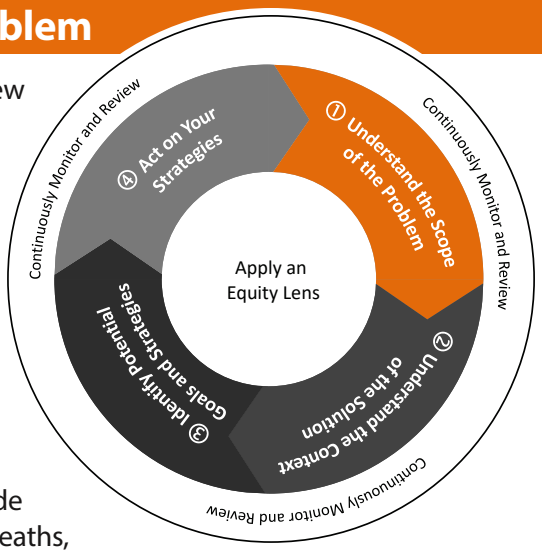
Addressing structural inequities, discrimination and interpersonal racism in health care settings and the broader community, engaging impacted communities in prevention efforts, and supporting initiatives that build upon community assets to increase social support and resiliency would likely improve patient experiences and maternal health outcomes.

Multilevel approaches to addressing drivers of disparities are needed to make progress toward equity.[24] A multilevel approach integrates the individual-level clinical and behavioral causes of maternal mortality with population-level differences in the social and contextual environment, which constrain or positively influence individual behaviors, health access, exposures, and experiences. The community and social environment are the intersection of domains of resources and experiences that contribute to women's health before, during, and after pregnancy. Together these community and social environments, such as discrimination or socioeconomic instability, may influence individual behaviors through accumulated stressors over a person's life course. These stressors may become biologically embodied as suggested by the "weathering" hypothesis, which proposed that Black women experience earlier deterioration of health because of the cumulative impact of exposure to psychosocial, economic, and environmental stressors.[25]

Much of the historical and current work to reduce maternal mortality focuses on clinical interventions at the patient, provider, or facility-level. These initiatives to improve the quality of clinical care for mothers and infants are important, but to address health equity, it is essential to integrate multiple interventions that address both the socio-contextual contributors as well as the biomedical and behavioral causes of pregnanc y-related mortality.[24] Implementing complementary clinical and nonclinical interventions at multiple levels, is necessary for achieving equity. For example, national data has found that hypertensive disorders of pregnancy contributed to a higher proportion of pregnancy-related deaths among Black and American Indian/Alaska Native women.[7] An example of a multi-component strategy may include implementing a maternal safety bundle through a perinatal quality collaborative, while stratifying process and outcome data by race-ethnicity to ensure benefits are equitably delivered. Improving provider education and counseling of pregnant and postpartum persons on urgent warning signs of preeclampsia may be complemented by community level communications campaigns that increase awareness of urgent warning signs in pregnant and postpartum persons and their support systems.[26] Additionally, providing transportation vouchers in communities with high levels of transportation insecurity can address a barrier to participating in prenatal and postpartum care visits.[27] These strategies may be further strengthened, and impacts broadened, by addressing structural gaps that would improve primary care provider availability in underserved communities and support access to quality care through continuity of insurance coverage.

Centering on health equity as a grounding principle for identifying potential goals and related strategies means ensuring the presence of elements that aim to eliminate disparities in maternal mortality. Continuous monitoring and review of implemented strategies, including evaluation of process and outcomes data, is important for tracking progress to ensure implementation is equitable. Tracking equity in outcomes can help ensure that disparities among populations disproportionately impacted by maternal mortality are eliminated.

Step 1: Use data to understand the scope of the problem



MMRC data represent the most accurate identification and comprehensive review of pregnancy-related deaths. That is because information is captured from a variety of sources beyond vital records, including medical records, social service records, autopsy reports, and other clinical and non-clinical data sources, such as medical transport records and police reports.

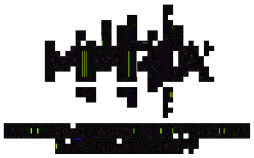
Unlike surveillance systems for maternal mortality that primarily rely on vital records, such as the Pregnancy Mortality Surveillance System and National Vital Statistics System, MMRCs are able to more fully capture and review causes of pregnancy-related deaths.[4, 28-30] This level of review has led to findings such as mental health conditions are a leading cause of pregnancy-related death (including suicide, substance, and other mental health causes) and two-thirds of pregnancy-relateddeaths are preventable.[31] MMRC data include committee determinations of the causal relationship between pregnancy and deaths, underlying cause of deaths, preventability, contributing factors, and recommendations for action informed by the local context. There are other population-based data sources that can enhance the MMRC data and provide complementary information for identifying and adapting potential strategies. This guide will address these data considerations in Step 1.

Placing MMRC priority recommendations in context with population-level health data

MMRCs review data that provide a comprehensive summary of the circumstances surrounding the life and death of persons that have died during pregnancy or within a year of the end of pregnancy, leading to specific MMRC recommendations for prevention of future deaths. While there are many types of data available about the populations that will be impacted by these recommendations, and the providers and systems that serve them, examples of commonly used population-based data sources include the Pregnancy Risk Assessment Monitoring System (PRAMS), CDC Levels of Care Assessment Tool (CDC LOCATe[SM]),hospital discharge data, and Medicaid data.[32, 33, 34, 35] These data sources can yield complementary information to the MMRC data, adding population-level background data and service gaps that can assist with identifying, implementing, and evaluating prevention efforts.

Examples for these commonly used population-based data sources are provided below to illustrate both how these data sources can be used to understand the broader scope of the problem, provide further information for identifying potential actions and associated strategies, and verify that the actions are having the intended effect as outlined in Step 4. If data from Step 1 are used to help determine actions and associated strategies, then tracking those same data over time, as part of continuous monitoring and review and process outcome evaluation, will likely help to understand whether the strategy met its intended goals.

Applying a health equity lens in this step includes applying analytical approaches for looking at data specific to disproportionately impacted populations. Data from these sources are useful for identifying gaps and facilitators of health equity by race, ethnicity, income, education, and place of residence. For example, previous analysis of PRAMS data showed that insurance continuity across the perinatal period varies widely by race-ethnicity.[36] Implementing a strategy related to a goal of ensuring quality care for all pregnant and postpartum persons, without any consideration of this important barrier to accessing care in the perinatal period, may result in benefits of the strategy being realized by persons who have more social advantage, further exacerbating disparities. While this section focuses on population-based quantitative data sources, complementary to MMRC data, other potential ways for gathering complementary data to inform and adapt potential strategies, particularly related to health equity, include collecting and analyzing qualitative data such as key informant interviews and community-led focus groups.



Pregnancy Risk Assessment Monitoring System (PRAMS)

PRAMS is a population-based surveillance project jointly run by CDC and state health departments that collects information on the experiences, behaviors, and attitudes of persons in the United States before, during, and after their pregnancy.[32, 33] Each year, PRAMS samples are drawn from state birth certificate files, and persons who are contacted to participate around 2- to 4-months after their delivery; PRAMS surveillance covers about 81% of live births in the United States. PRAMS data include, but are not limited to, self-reported data about: perceptions of care; content of provider counseling; utilization of care and care received; chronic and acute maternal conditions; and experiences of social stressors and barriers to care. PRAMS data can provide additional context for the MMRC priority recommendations within the context of maternal health in the broader community. For example:

MMRC priority recommendation for action	Use PRAMS data to inform strategy/initiative	Strategy/initiative	Monitor and review/evaluate the strategy/initiative
Health insurers should address bias by prenatal care providers during delivery of care	PRAMS data show that a high proportion of persons reported feeling disrespected during prenatal care	Implement provider training and establish patient reporting systems	Assess changes in the percent of postpartum persons who reported in PRAMS feeling disrespected during prenatal care
The Health Department should address transportation barriers to receipt of a postpartum care visit	PRAMS data show that transportation is the most commonly reported barrier for not attending a postpartum care visit	Implement a non-emergency transportation voucher program	Assess changes in persons reporting transportation as a barrier to receiving a postpartum care visit

Table 1. Using PRAMS data to inform MMRC priority recommendation for action

CDC Levels of Care Assessment Tool (LOCATe)SM

CDC LOCATeSM helps states and other jurisdictions create standardized assessments of levels of maternal and neonatal care.[34, 35] CDC LOCATeSM is based on the most recent guidelines and policy statements issued by the American Academy of Pediatrics (AAP), the American College of Obstetricians and Gynecologists (ACOG), and the Society for Maternal-Fetal Medicine (SMFM).[37, 38] CDC LOCATeSM is designed to create opportunities for informed conversations among key organizations who work in the area of risk-appropriate care. It contains questions about hospital personnel and services, including sub-specialists and their availability, volume of services, drills and protocols for emergent situations, transports, facility-level statistics (e.g., delivery volume, back transport of convalescent neonates, and adult ICU admission during delivery hospitalization), and self-reported levels of neonatal and maternal care. States can use information from CDC LOCATeSM data to help inform strategies based on priority MMRC recommendations related to risk-appropriate care. For example:

MMRC priority recommendation for action	Use CDC LOCATe® data to inform strategy/initiative	Strategy/initiative	Monitor and review/evaluate the strategy/initiative
Hospitals should strengthen transport systems to avoid delays in receiving care due to initial transport to a facility with capabilities that did not match maternal health risks	The percent of facilities in your state or jurisdiction with assessed levels of maternal care and current transport policies and practices is low	Convene representatives of birthing facilities to develop and disseminate a model maternal transport policy	Assess changes in the percent of facilities that have a formal written maternal transport policy for sending and/ or receiving complicated pregnancy and postpartum patients
The perinatal quality collaborative should increase the availability of protocols and implementation of drills for pregnancy and postpartum emergencies	The percent of facilities in your state or jurisdiction that have a protocol and completed drills for pregnancy and postpartum emergencies in the prior year for the implemented strategy	Identify a model protocol that addresses specified pregnancy and postpartum emergency and disseminate to birthing facilities, supported by a mobile drill team	Assess changes in the percent of facilities that have a protocol and completed a drill in the prior year related to the obstetric emergency the implemented strategy was designed to address

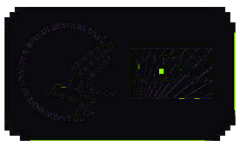
Table 2. Using CDC LOCATeSM data to inform MMRC priority recommendation for action

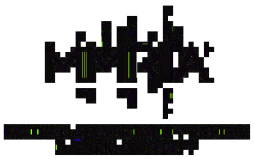
Using CDC LOCATeSM Data in Wyoming

Results from CDC LOCATeSM identified that several Wyoming facilities did not have specific maternal care protocols in place. As a result, the Wyoming Department of Health partnered with the Utah Department of Health to facilitate implementation of the Severe Hypertension in Pregnancy safety bundle, supported by the Alliance for Innovation on Maternal Health (AIM). Wyoming and Utah facilities were invited to participate in online learning offered through an Extension for Community Healthcare Outcomes (ECHO) model. The ECHO model provides a continuous learning system and connected Wyoming facilities to specialist mentors in Utah.

State Medicaid Data

Medicaid was the source of payment for over 40% of US births in 2018, and in 24 states, 50% or more of births are financed by Medicaid.[28, 39] Therefore, Medicaid claims data are an important potential source of other relevant information to determine strategies that can best address priority recommendations. These data provide population-level information on medical services provided to Medicaid participants and on specific diagnoses and procedures in those visits. CMS developed a set of specifications and programming code (https://www.medicaid.gov/medicaid/data-systems/macbis/medicaid-chip-research-files/transformed-medicaid-statistical-information-system-t-msis-analytic-files-taf/index.html) to help researchers who wish to analyze and develop information from this administrative data. Medicaid claims data can be used to gain insight on medical conditions and pregnancy complications experienced by Medicaid participants and on participants' frequency of obtaining medical care during pregnancy, at the time of delivery, and postpartum. For example:





MMRC priority recommendation for action	Use Medicaid data to inform strategy/initiative	Strategy/initiative	Monitor and review/evaluate the strategy/initiative
Providers should reduce risk of hemorrhage in a subsequent pregnancy by decreasing the number of cesarean sections without medical indication	There is wide variation across hospitals and practices in the percent of deliveries financed by Medicaid in your state that were low-risk primary cesarean section deliveries	Require and provide reimbursement for completing standardized patient education and provider protocols before scheduling a primary cesarean section delivery	Assess changes in the percent of low-risk primary cesarean section deliveries and/or vaginal birth after cesarean delivery among deliveries financed by Medicaid by birth facility and practice
Birthing facilities should ensure continuity of care when substance use disorder is identified during pregnancy among deliveries financed by Medicaid.	A low proportion of Medicaid participants in your state that have substance use disorder diagnosed during pregnancy received treatment services beyond the 60-days postpartum	Expand Medicaid coverage through one year postpartum, including treatment services for substance use disorder	Assess changes in the percent of Medicaid participants with substance use disorder diagnosed during pregnancy that continued treatment services beyond 60-days postpartum

Table 3. Using state Medicaid data to inform MMRC priority recommendation for action

State Hospital Discharge Data

Similar to Medicaid data, state hospital discharge data may be an additional source of information about inpatient hospital care, including delivery hospitalizations, to determine strategies that can best address priority recommendations. State hospital discharge data, which is based on International Classification of Diseases (ICD) diagnostic and procedure codes and are inclusive of all payer sources delivered in acute care hospitals. These data can provide information on inpatient care during pregnancy and delivery that can help contextualize the MMRC priority recommendations to address both maternal mortality and near-misses/severe maternal morbidity events. For example:

MMRC priority recommendation for action	Use hospital discharge data to inform strategy/initiative	Strategy/intervention	Monitor and review/evaluate the strategy/initiative
All acute care facilities should implement a patient safety bundle for severe hypertension in pregnancy	The percent of pregnancies complicated by preeclampsia/eclampsia in your state that also have evidence of organ failure (pulmonary edema, acute renal or liver failure, liver hemorrhage, or disseminated intravascular coagulopathy) suggesting a progression to potentially preventable severe consequences	Implement a statewide teleECHO program on recognition and response to hypertensive emergencies, accompanied by unbundling of telemedicine and delivery reimbursements	Assess changes in the percent of deliveries complicated by preeclampsia or severe preeclampsia that also have evidence of organ failure (e.g., pulmonary edema, acute renal or liver failure, liver hemorrhage, or disseminated intravascular coagulopathy)
The state legislature should invest resources in hospitals that are disproportionately impacted by severe maternal morbidity (SMM) events	Wide variations in severe maternal morbidity events are found among delivery hospitals	Assess hospitals and prioritize to receive specific resource allocations (e.g., personnel, equipment, services) to address identified gaps	Assess changes in SMM among delivery hospitals that identified as disproportionately affected by SMM events and participated in a program to address resource gaps

Table 4. Using state hospital discharge data to inform MMRC priority recommendation for action

Clinical sources of data such as hospital discharge and Medicaid claims data also have the opportunity to improve the collection of patients' social needs, and the broader social determinants of health in communities, using the ICD-10-CM Z codes.[40, 41] In addition to measuring social determinants of health on an individual level, considering the social context of communities allows for the assessment of the structural factors that impact inequities in maternal mortality. Commonly used resources for community-level indicators and indices include the American Community Survey and Community Resilience Estimates.[42, 43]

As noted above, while this guide highlights examples for these commonly used population-based data sources, there are many other types of data available about the populations, and the providers and systems that serve them, that these recommendations will impact. This may include monitoring data from social services or public health programs (e.g., Health Resources and Services Administration (HRSA) (https://data.hrsa.gov/), Healthy Start, home visiting, health center program data). For example:

MMRC priority recommendation for action	Use home visiting program data to inform strategy/ initiative	Strategy/intervention	Monitor and review/evaluate the strategy/initiative
All home visiting programs should screen for postpartum depression at screening intake with referral resources delivered at initial visit	The percent of home visit cases that screen positive for postpartum depressive symptoms that are referred for diagnosis and treatment	Implement a statewide perinatal mental health access program to support care providers	Assess changes in the percent of home visit cases that screen positive for postpartum depressive symptoms that are referred for diagnosis and treatment

Table 5. Using social services or public health program data to inform MMRC priority recommendation for action

There are gaps in data availability for population groups such as AI/AN and Native Hawaiian and other Pacific Islander to adequately identify and monitor measures of health and well-being for these including small population size, misclassification of race, and inadequate data collection.[44, 45] There are special considerations to improve public health surveillance in Indian Country regarding data collection, linkages and sharing.[46] American Indian/Alaska Native persons are the only federally recognized political minority in the United States. Tribes hold a unique government to government relationship with the local, state, and federal organizations.[47, 48] It is important to be aware of the history of misusing tribal data that may cause hesitation from tribes sharing data.[49] However, there remains great potential benefits from data partnerships between state and local governments and tribes and tribal serving organizations by entering into Memorandums of Understanding or Intergovernmental Agreements that formalize data sharing partnerships. One example is the IDEA-NW Project (http://www.npaihb.org/idea-nw) led by the Northwest Portland Area Indian Health Board, which focuses on working to reduce misclassification of AI/AN populations in public health data systems and provide Northwest Tribes with local-level health data. The National Indian Health Board provides additional information, through their Working with Tribes Training Project (https://www.nihb.org/public_health/working_tribes_training.php), that can support state and local governments in effectively working with tribes and tribal serving organizations.[50, 51]

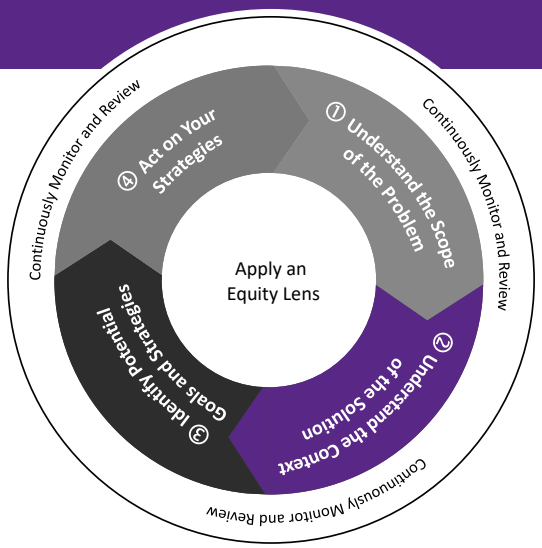
In summary, the data sources above can be used to help provide complementary information for priority MMRC recommendations, including quantifying the burden of relevant health conditions, examining trends over time, identifying populations disproportionately affected, as well as facilitators and gaps to address health inequity. The examples illustrate how these data may be used; other data sources available in a state or jurisdiction can be considered similarly.

After completing Step 4, consider returning to Step 1 and confirming if these same data sources may be used to support the planned evaluation of the selected strategies, particularly to identify the full spectrum of actions needed for strategy success, and to ensure that disproportionally impacted populations are benefitting equitably from implemented strategies. Identify venues to share these data with key partner and community audiences, using modes of data sharing that best support their understanding and with opportunities to receive engaged feedback.

A Step 1 Checklist:

- ☐ Have you identified all relevant population-level data sources for which you have and/or can gain access to help provide complementary information for the priority recommendations from your committee?
  - Pregnancy Risk Assessment Monitoring System (PRAMS) data
  - CDC Levels of Care Assessment Tool (LOCATe℠) data
  - State Medicaid data
  - State Hospital Discharge data
  - Reviewed information about other potential data sources, including sources that could help identify disproportionately affected populations
- ☐ Have you used the additional data sources to fully explore important indicators related to priority recommendations for action from your committee?
  - Quantified the burden of relevant health conditions
  - Examined trends over time
  - Identified disproportionately affected populations and disparities within the context of social determinants of health.

Step 2: Understand the context of the solution



Another important step is considering MMRC priority recommendations in the context of the organization, state, community, and implementing partners. Context influences the success of implementing strategies in states and communities.[52, 53] Approaches that work in one state, community, or setting may not work in another. In Step 2, we describe key community and organizational factors to consider when selecting and implementing strategies that address priority recommendations:

- Identify community strengths and potential barriers
- Collaborate with decisionmakers
- Consider organizational readiness and capacity
- Map human and fiscal resources
- Engage public health, clinical, and community partners

Identify community strengths and potential barriers

Fully recognizing and understanding the unique contexts of a state or community can help appropriately direct selection of strategies for implementation that address MMRC priority recommendations and that ensure they are well-positioned to be successful. Community is defined as a grouping based on a shared sense of place or identity. It ranges from physical neighborhoods to a community that is based on common interests and shared circumstances. A community's context may be influenced by cultural, social, political, and physical characteristics.[54]

A needs assessment can provide a snapshot of the current local landscape, including important information about a state's communities, such as their priority issues, needs, and assets to ensure alignment with selected strategies and to guide their implementation. Talking with others who are working on similar efforts may provide additional information about the communities and the populations impacted and avoid duplicative efforts. Needs assessments can be resource intensive to implement, and it may be that there is information available from existing needs assessments, such as the Title V Maternal and Child Health Block Grant needs assessment, required for states to conduct every 5-years.[55, 56] Annual Title V Reports are available on the Title V Information System (TVIS) (https://mchb.tvisdata.hrsa.gov/).

Knowing the community context may help funders and leadership anticipate barriers and address problems before they arise.[57] Selecting strategies that meet the needs and characteristics of the population who are intended to be reached by the strategies is also important,[58] and identifying the unique needs of intended beneficiaries is associated with positive health changes in communities.[59] Investing and partnering with community members, leaders, and organizations is an important goal outlined later in this document for implementation of MMRC recommendations.

While a needs assessment can help to understand a population's characteristics and anticipate barriers to strategy implementation, assessing the community's assets and strengths will help to build from existing resources and facilitators to implementation. Community assets and strengths include persons, places, and services relevant to maternal mortality prevention strategies. By focusing on assets and strengths, states can emphasize what communities have, rather than what communities lack, and can build on those assets to meet communities' needs to prevent maternal mortality. Community members may conduct community assets and strengths assessments. Questions that frame a community assets and strengths assessment may include:[52, 60]

- What makes you most proud of y/our community?
- What are some specific examples of persons or groups working together to improve the health and quality of life in y/our community?
- What actions, policy, or funding priorities would you support to build a healthier community?

An assets-oriented assessment method contrasts with "needs-based" approaches.[61] An assets orientation allows community members to identify, support, and mobilize existing community resources to create a shared vision of change, and encourages greater creativity and trust when community members do address problems and obstacles. In the process of doing a self-assessment, community members also identify barriers that must be addressed to achieve their vison of a healthy community.[61] A community assets and strengths assessment can provide information on community priorities related to eliminating maternal mortality related disparities.

Community assets are impacted by the distribution of power and resources, which in turn have structural determinants as root causes that require investments in communities.[9] Community assets assessments can reveal gaps in assets and what assets could be enhanced. The review of community asset assessments can help ensure that prevention efforts are aligned with current efforts within communities and that implemented strategies are relevant to the community's context.

Community asset and strength assessments may reveal that the communities served have different understandings of maternal mortality as a public health problem. Community recognition of maternal mortality as a problem is a critical step in prevention, and stewards of MMRC data play a crucial role in informing communities. Members of the public may not generally know the activities and terms used in maternal mortality review processes, so careful attention is needed to create clear and compelling information products.[2] States can employ diverse communications and data visualization techniques to ensure their information products are clearly understood and compelling to lay audiences. CDC's Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) initiative provides guidance and training on such techniques.[62, 63] States can use their MMRC data and other complementary data sources to craft dissemination and outreach plans for information products that include sharing findings with communities representing persons most affected by adverse pregnancy outcomes, hosting focus groups and listening sessions for input from those communities and supporting community coalitions.

Key Principles of Working with Communities:

- Acknowledge resources have not been equally shared
- Identify gate keepers
- Support community access to and use of data
- Advocate for community resources
- Focus on the priorities of the community
- Ensure shared leadership
- Address power dynamics
- Identify shared (and other values); establish expectations for equitable engagement
- Establish mechanisms for accountability
- Compensate (adequately) individuals for their engagement

When faced with different community priorities, there may be an opportunity to facilitate connections with other organizations and agencies who have efforts that align with the community's current priorities and build relationships that can foster future collaboration. It may also be necessary to identify those that may not be fully supportive of the planned efforts and consider how to engage them. Being knowledgeable of differing views and working to find areas of common purpose can help build support for the planned efforts.[64] Thoughtful ongoing community engagement can ensure prevention efforts are aligned with communities' desires and expectations.[59, 65]

Additional Resources

Assessing community context is a key component of public health planning. There are several tools and resources that may help to conduct a needs assessment and better understand the community context.

- **Community Toolbox**
  (https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/describe-the-community/main)
- **CDC Community Needs Assessment Framework**
  (https://www.cdc.gov/globalhealth/healthprotection/fetp/training_modules/15/community-needs_pw_final_9252013.pdf)
- **Considering community readiness**
  (https://tec.colostate.edu/wp-content/uploads/2018/04/CR_Handbook_8-3-15.pdf)
- **Conduct an initiative inventory to gather information on current related initiatives**
  (https://nirn.fpg.unc.edu/sites/nirn.fpg.unc.edu/files/imce/documents/Initiative%20Inventory%2010.12.18_0.pdf)
- **Understanding community need using a root cause analysis**
  (https://nirn.fpg.unc.edu/sites/nirn.fpg.unc.edu/files/imce/documents/RCA%20Resources_11.7.18_0.pdf)
- **Conducting an Environmental Scan for Resources and Partners**
  (https://www.fordham.edu/info/26625/conducting_an_environmental_scan)

Collaborate with decisionmakers

The degree to which decisionmakers in government, community, and clinical and non-clinical organizations understand and support planned strategies can influence public health outcomes.[66] Community leaders and other decisionmakers have the ability to adopt or renew initiatives, appropriate resources, and shift public opinion. Identifying and educating decisionmakers or other key leaders may increase the likelihood of implementing strategies that successfully address your priority MMRC recommendations.[67] Organizations may consider researching what issues local opinion leaders and decisionmakers have publicly supported in the past or are currently supporting, and identify common interests upon which to build strong partnerships.[66] To cultivate strong partnerships with key decisionmakers, leaders may need additional background and information on maternal mortality and on the value and benefit of investing in maternal mortality prevention in the community. Building collaborative partnerships with decisionmakers involves ensuring common understanding of the problem, agreeing that the problem requires action, and supporting actions for strategy implementation to achieve the desired outcome.[68] Presenting the science to inform, while understanding other factors that influence decision-making in communities, and selecting the right messages for effective engagement, are important factors in building relationships with key decisionmakers.[67] Partnerships with decisionmakers, built on common understanding, values, and interests, may result in resources and other required supports to successfully coordinate the initial and sustained implementation of public health strategies.[64]

While educating decisionmakers and community leaders on maternal mortality prevention is important, also be mindful of the importance of engaging the public. Lack of public awareness and engagement may be a barrier to strategy implementation and can impact outcomes.[69] Increased awareness of the burden of maternal mortality, related health inequities, and the benefits of public health programs can generate and increase support among key decisionmakers and community leaders as well as community members.[64, 66]

Questions to consider when assessing opportunities for collaboration and garnering support:[70]

- Have you identified community leaders and decisionmakers in your community with whom you intend to collaborate?
- Have you provided data to decisionmakers and community leaders on the impact of maternal mortality in your state?
- Do decisionmakers have a common understanding of the public health problem and agree the problem requires action? Have there been similar public health approaches implemented in your community? Who were the supporters? What were the different views related to the program/policy?
- Has a health equity lens been applied to deciding who the key decisionmakers and community leaders are to ensure the right partners are engaged and important perspectives are heard?
- Does a sufficient set of decisionmakers and community leaders intend to support the strategy?

Additional Resources

Understanding political will among community leaders and decision makers is an important consideration for identifying a strategy that will be accepted and supported.

- **Educating Policymakers About Public Health Issues** (http://r4phtc.org/educating-policymakers-about-public-health-issues/)
- **A Sustainability Planning Guide for Healthy Communities** (https://www.cdc.gov/nccdphp/dch/programs/healthycommunitiesprogram/pdf/sustainability_guide.pdf)

Consider organizational capacity and readiness

It is important to consider the knowledge, skills, resources, competencies, and infrastructure necessary for implementing an intervention, as well as the degree to which an organization and their implementing partners are motivated, willing, and prepared to act in addressing a public health issue. Organizational capacity is "the ability of an organization to fulfill its mission through a blend of sound management, strong governance, and a persistent rededication to assessing and achieving results."[71, 72] Organizations that will implement strategies based on your MMRC's priority recommendations need the capacity to plan, implement, and evaluate their efforts. Capacity building involves a series of action steps that support organizations and implementing partners to achieve identified goals.[73] Capacity building increases adoption and implementation of interventions and can impact successful implementation of maternal mortality prevention recommendations.[68] Aspects of organizational capacity include leadership, operational, management, and adaptive capacities.[72]

Leadership capacity: ability of leadership to develop a vision, set priorities and inspire others to achieve organizational mission

Operational capacity: ability to obtain and maintain resources, including human resources, to conduct activities

Management capacity: ability to use resources in an effective and efficient manner

Adaptive capacity: ability to monitor and assess activities and respond to changes in the organization and the community

Capacity is an important component of organizational readiness, or the extent to which an organization is both willing and able to implement a strategy.[74] Organizational readiness is a key factor when bridging the gap between planning and implementing a strategy in practical settings; your organization's motivation, capacity, and capability to implement your selected strategy impacts the strategy's outcomes and success.[75, 76] Organizations tasked with implementing recommendations from MMRCs may consider routinely assessing and increasing their organizational readiness and that of their implementing partners to better affect program or policy changes. This includes organizational capacity to advance health equity and provide culturally competent and congruent care.[77, 78] Questions to consider when assessing organizational readiness and capacity may include:

- Is your organization able to interact with the community in a culturally congruent manner that honors the community's voice?
- Does leadership support your program/intervention/strategy?
- Is leadership/management focused on results and impact?
- Is your organization able to clearly communicate and monitor defined goals and objectives?
- Does the organization have enough staff to implement the program/intervention/strategy?
- Are staff supportive of strategy and/or initiative?
- Are staff adequately trained and have expertise to fulfill roles?
- Do you have the financial resources available to support implementation?
- Are necessary systems in place to support implementation (i.e., communication, information technology, administrative, personnel, governance and decision making)?
- Has there been an assessment of the organizational capacity of implementing partners?

Additional Resources

Assessing readiness and capacity is important to identify the degree to which an organization and their implementing partners are motivated, willing, and prepared to act in addressing a public health issue and what capacity building may still need to take place to be successful.

- **National Council of Nonprofits**
  (https://www.councilofnonprofits.org/tools-resources/organizational-self-assessments)
- **A Practitioner's Guide for Advancing Health Equity: Community Strategies for Preventing Chronic Disease: Building Organizational Capacity to Advance Health Equity**
  (https://www.cdc.gov/nccdphp/dnpao/state-local-programs/health-equity-guide/pdf/health-equity-guide/Health-Equity-Guide-sect-1-1.pdf)
- **Increasing Organizational Capacity for Health Equity Work: A Literature Review for Health Nexus**
  (https://resources.beststart.org/wp-content/uploads/2019/01/J34-E.pdf)

Map human and financial resources

Maternal mortality prevention initiatives require personnel and funding to support implementation, evaluation, and sustainability. It is also important to understand all the costs and resources (e.g., financial, personnel, and material) associated with implementing a strategy, or set of strategies, and potential funding sources available. Competitive funding opportunities may be available from federal agencies, national organizations, and foundations interested in maternal health. Aligning with priorities of different funding agencies (e.g., public health, clinical, and community organizations) who are stewards of funding opportunities, such as block grants (e.g., Title V Maternal and Child Health Services block grant), categorical (e.g., perinatal quality collaboratives) or other, facilitates "braiding" or "blending" sources of financial, personnel, and material resources to support an initiative. It may also be possible to combine public and private resources, forming public-private partnerships, to increase support of implementation and sustainability for initiatives.

Approaching this assessment with a health equity lens requires an acknowledgement that the distribution of power and resources have structural determinants that leave disproportionately impacted communities and the community level organizations that serve them with less financial resources.[15] Barriers to financial and personnel resources include low reimbursement for community health workers,how funding is distributed for implementation (e.g., direct funding versus subcontracting) and organizational capacity to manage the requirements of government funding.[79, 80] When assessing human and financial resources it is important to recognize these structural issues and consider pathways such that resources for community-based strategies are assessable by organizations that directly serve the community.

Questions that may help you consider your human and financial resources include:

- Do I understand the cost breakdown of implementing the strategy or initiative?
- What existing staffing and financial resources does your organization and implementing partners have that might contribute?
- What new staffing is needed?
- Is new funding needed?
- What may be some other sources of financial resources (e.g., foundation, upcoming competitive opportunities, etc.)?
- What staffing and financial resources are needed to address structural barriers to health equity? In particular, what investments are needed in communities?
- How may I diversify funding sources to move toward long-term sustainability?
- What is the evidence that investments will have societal and economic benefits?

Additional Resources

Assessing fiscal requirements of strategies, together with available funding is important for identifying strategies that can be implemented and sustained.

- **Federal Funding Opportunities**
  (https://www.grants.gov/)
- **The University of Kansas, Center for Community Health and Development, The Community Tool Box for applying to grants**
  (https://ctb.ku.edu/en/applying-for-grants)
- **Economic Evaluation of Public Health Programs**
  (https://www.cdc.gov/policy/polaris/economics/index.html)

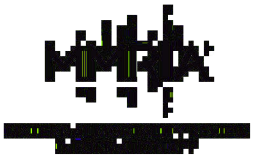
Engage public health, clinical, and community partners

To successfully implement strategies for preventing maternal mortality, collaboration is essential. Engaging collaborators across disciplines, sectors, and institutions can change the way states and communities consider and solve problems, as well as enhance implementation of innovative strategies.[64, 66] Engaging diverse public health, clinical, and community partners allows your prevention actions to benefit from their expertise and experience, and to identify new ideas and possible challenges to implementation.[81] Sharing human and fiscal resources across collaborators and combining expertise enhances the opportunities and likelihood for achieving positive health outcomes.[82]

Further, leveraging the skills and resources of collaborators for planning and implementing policies and programs may increase effeciveness.[83] Partners can supplement available human or financial resources and support and undertake critical activities.[64] In particular, identifying and engaging "champions" within partner organizations that span diverse spheres of representation can be important for implementing large scale interventions. Attributes to consider in identifying a champion include their ability to influence others' opinions and behaviors, their feeling of ownership for the desired change, their ability to be physically present in places/meetings related to the desired change, and their ability to engage with other perspectives. In addition, learning from organizations that have implemented similar interventions and partnering with organizations in your state or community with a similar mission (e.g., to improve maternal health and quality care) can inform your efforts.[84] Identifying key leaders and partners from the communities that will be served by your efforts helps ensure patient and community perspectives are taken into account, and creates buy-in. Community and patient-centered organizations are key partners for achieving health equity. Community engagement should be a foundational part of the process and is particularly important for understanding the context of maternal health in communities. It is important to be aware of power dynamics, and ensure partnerships are equitable (e.g., equal weight in decision making).

Questions for you to consider to help identify key public health, clinical, and community entities to engage:85

- What are the relevant organizations?
- Who are the relevant leaders and influencers in the relevant organizations?
- Who has been involved in similar situations in the past?
- Who or what is frequently associated with relevant topic areas?
- Who has been left out of previous leadership and partnership engagements?
- Who will be affected by what we are doing or proposing?



Additional Resources

Comprehensively assessing engagement of the community and other partners is important for identifying opportunities for leveraging existing efforts and resources that could enhance selected strategies.

- **Collaboration Multiplier from the Prevention Institute** (https:\www.preventioninstitute.org\tools\collaboration-multiplier)
- **Principles of Community Engagement** (https://www.atsdr.cdc.gov/communityengagement/pdf/PCE_Report_508_FINAL.pdf)
- **SC CTSI: Resource for Integrating Community Voices into a Research Study: Community Advisory Board Toolkit** (https://sc-ctsi.org/uploads/resources/CommunityAdvisoryBoard_Toolkit.pdf)
- **SC CTSI: Toolkit for Developing Community Partnerships** (https://sc-ctsi.org/uploads/resources/DevelopingCommunityPartnerships_Toolkit.pdf)
- **Nexus Community Partners: Community Engagement Assessment Tool** (https://www.nexuscp.org/wp-content/uploads/2017/05/05-CE-Assessment-Tool.pdf)
- **Collective Impact Forum: Confronting Power Dynamics and Engaging the Community's Voice in Collective Impact** (https://www.collectiveimpactforum.org/resources/confronting-power-dynamics-and-engaging-communitys-voice-collective-impact)

Information gathered about the context of organizations, states, communities, and implementing partners can be valuable for understanding facilitators and barriers to successful implementation. It can inform indicators for assessment as part of continuous monitoring and review. Information about changes in community and state context and in organizational capacity can inform implementation challenges and suggest ways to address or avoid those challenges. Public health, clinical, and community partners who are identified and engaged in Step 2 can be important to gathering, reviewing and summarizing data from sources identified in Step 1. These partners may also be important when considering goals and strategies outlined in Step 3 and should continue to be engaged throughout the process outlined in Step 4, including providing feedback on strategy selection and partnering on implementation and evaluation.

Continuous monitoring and review of these domains can facilitate the timely identification of barriers and facilitators, and ultimately make implementation of maternal mortality prevention strategies more successful, whether implemented alone or as a suite of strategies within a broader initiative. Continuous monitoring and review can also improve strategy implementation to achieve desired outcomes. Ensuring partner and community engagement in evaluation planning increases buy-in and common understanding of the strategy/initiative goals.

An assessment of an organizational-level health equity intervention aimed at enhancing capacity to provide equity-oriented care in health care clinics found that the impact of the intervention was enhanced by involving staff from all job categories (including funding and leadership), developing narratives about the socio-historical context of the communities and populations served, and feeding data back to the clinics about key health issues (e.g., levels of depression).[86] Assessing the capacity of collaborating organizations to recognize and address health inequities and their root causes, and to engage with impacted communities in culturally congruent ways is important in increasing equity and reducing disparities. It is important that financial and human resources are distributed in an equitable fashion to ensure that the most-impacted populations are positioned to benefit from implemented strategies such that disparities are not worsened. Identification of key leaders, organizations, and partners should be performed using an equity lens to ensure that relevant key partners and the communities most impacted have a seat and voice at the table where strategies and initiatives are considered, and financial and human resource plans are made. This can better assure that investments strengthen communities.

Community Champions in New York City

In 2015, New York City's Department of Health formed a Sexual and Reproductive Justice Community Engagement Group to engage community members and provider champions in advocating for respectful care at birth, and to support the use of community-led initiatives and accountability to communities. The Department connected with advocates such as Birth Justice Defenders and continues to join with the New York City Department of Health to inform citywide initiatives. The Department's website contains video and discussion guides to help lead conversations on reproductive health within New York City communities.

In 2017, the NYC Department of Mental Health and Hygiene (NYC Health Department), in collaboration with the Fund for Public Health in New York City, received a grant from Merck for Mothers to implement the Reducing Inequities and Disparities in Preventable Severe Maternal Morbidity in New York City Project. Between 2017 and 2020, this Project worked with clinical and community partners to improve maternal outcomes, promote health equity, and reduce racial/ethnic disparities in SMM in NYC. This grant enabled the NYC Health Department to engage with the community on the topic of maternal health. Project staff collaborated with staff across the agency to develop a coherent message and strategy to connect with the public on social media platforms, including using external social media influencers to increase the reach of the SMM Project. The Project also conducted a "Data-to-Action Road Show"—a series of presentations in community-based settings (government, business, and nonprofit) designed to bring information about maternal health complications to a diverse lay audience. Read the full report of this work on the DOHMH website here: Innovative Strategies for Community Engagement: Raising Awareness to Reduce Severe Maternal Morbidity

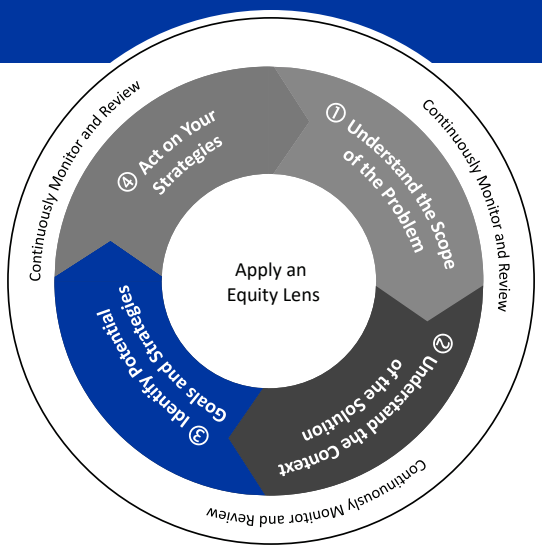
*https://www1.nyc.gov/assets/doh/downloads/pdf/csi/strategies-for-community-engagement-raising-awareness-severe-maternal-morbidity.pdf

Listening to Disproportionately Affected Communities in New Jersey

In 2018, the New Jersey Department of Health conducted a root-cause analysis of the state's maternal and infant mortality disparities. The analysis included focus groups in communities that are disproportionately impacted. The focus groups revealed daily social stressors that those who are most at risk for adverse outcomes were experiencing at much higher levels than the general population. These findings led to the redirection of existing funds to focus on the racial-ethnic and geographic groups of those at greatest risk of maternal mortality via the Healthy Women, Healthy Families Initiative. Findings from the focus groups led the Department of Health to invest $450,000 in a pilot program to train community-based doulas in high-needs areas.*

*Krisberg K. Programs work from within to prevent black maternal deaths: Workers targeting root cause — Racism. The Nation's Health. 2019;49(6):1-17.

Step 3: Identify potential goals and strategies



This section describes potential goals and strategies to help states address the priority recommendations from a MMRC as part of the iterative process, using data and information gathered in previously described steps. Below is a summary of five potential goals. These five goals were identified by CDC from experiences supporting state and local MMRCs, including analyzing contributing factors and recommendations from MMRC data. There are a number of activities that are appropriate and may be implemented to address maternal mortality. The goals and associated strategies provided here are illustrative and are not exhaustive. These strategies are at minimum, evidence informed. The five goals used in Step 3 are:

1. Eliminate racial and ethnic disparities in maternal mortality
2. Invest in and partner with communities
3. Ensure access to care for all pregnant and postpartum persons
4. Ensure quality care for all pregnant and postpartum persons
5. Strengthen maternal mortality data

Critical to the success of these strategies is ensuring that they align with the who, what, and when of the priority recommendations for action. Examples of who, what, and when for priority recommendations that should be considered in selecting strategies are included in Table 6.

Who	What	When
State Health Department	Expand home visitation program access to more communities	During pregnancy and postpartum period
Perinatal Quality Collaborative	Implement obstetric safety bundle in birthing facilities	Labor and delivery hospitalizations
Health Systems	Develop a policy for hospitals to refer pregnancy-associated deaths to state Medical Examiner or Coroner	Upon pregnancy-associated death
Emergency Department personnel	Hospital protocol to ask every person of reproductive age whether they are or have been pregnant in the past year	At intake for emergency department visit
State Health Department	Provide communities with opportunities for increased awareness of safe syringe programs	On demand from a safe syringe initiative website
Community grant funders	Include community members with relevant patient perspectives and lived experiences into programming processes	During development of community grant programs

Table 6. Who, what, and when considerations for implementing MMRC priority recommendations

One overarching grounding principle to identifying potential goals and related strategies is ensuring elements are integrated that aim to improve equity and eliminate disparities in maternal mortality. Applying an equity lens is important in selecting goals and associated strategies, ensuring improvements in outcomes and decreased disparities among populations disproportionately impacted by maternal mortality. Continuous monitoring and review of strategy implementation, together with evaluation of outcomes, are important for tracking progress to ensure implementation is equitable.

Goal 1: Eliminate racial and ethnic disparities in maternal mortality

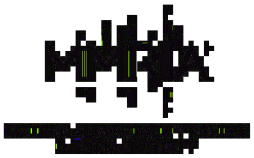
Because of the magnitude of maternal mortality disparities related to social, demographic, and geographic factors, reducing disparities is integral to reducing maternal mortality rates. Multiple factors contribute to racial/ethnic disparities, including differences in access to quality care; continuity of care, especially for management of chronic conditions; and community-level determinants of health, such as provider shortages, inadequate housing, and lack of access to transportation.[20] Black persons with a college degree are more likely to die from pregnancy-related causes than White persons with less than a high school education, reminding us that differences in traditional protective factors for health cannot explain disparities in maternal mortality.[7] Addressing implicit bias and interpersonal and institutional racism in healthcare and community settings, engaging communities in prevention efforts, and supporting community-based programs which build upon community assets to increase social support and resiliency, will likely improve patient-clinician interactions, health communication, and health outcomes.[20, 87] Structural racism impacts distribution of community-and individual-level determinants of health. Considerations of the context in Step 2 may identify opportunities to address structural determinants of health and the impacts of racism through factors such as engagement of decision makers and equitable resource allocation implementing partners. As noted as part of the efforts to improve MMRC data, discrimination, interpersonal racism, and structural racism can each be documented as a contributing factor in MMRIA.

Black and AI/AN women are two to three times as likely to die from a pregnancy-related death than white women.[7] Preventability does not differ by race-ethnicity.[88] To overcome racial and ethnic disparities, it is necessary to prioritize addressing the leading causes of maternal mortality for Black and AI/AN persons. Nationally, cardiomyopathy and hypertensive disorders of pregnancy contributed to a significantly higher proportion of pregnancy-related deaths among Black persons than among White persons.[7] Hemorrhage and hypertensive disorders of pregnancy contributed to a higher proportion of pregnancy-related deaths among AI/AN persons than among White persons. Black persons are more likely to die in late postpartum period (43–365 days) compared with White persons.[7, 88] MMRCs can work with state and community partners to prioritize prevention strategies that address the leading causes of maternal mortality among Black persons and AI/AN persons to close the disparities gap, while also decreasing maternal mortality overall.

Strategy 1.1: Recruit and retain a diverse workforce

Workforce development, including increasing the diversity of the workforce and training on implicit bias, may improve the quality of care and promote a commitment to patient-centered care that ultimately improves outcomes.[87] A diverse health care workforce, where providers are the same racial-ethnic background as the patients they serve, is associated with improved access to care for disproportionately impacted communities, increasing both patient choice and satisfaction with care.[89] A more diverse workforce can also remove barriers to health care access in medically underserved areas, and leads to more cultural competence among health care providers.[87, 90]

There are a number of barriers to increasing workforce diversity including historical impacts of structural racism and discrimination impacting educational attainment, lack of financing for college and graduate school, lack of mentors with similar experiences, and difficulties acclimating to majority culture that governs traditional medical education.[91] Many of these barriers may be addressed through the implementation of pipeline and population-focused recruitment healthcare workforce programs, where there has been success in increasing AI/AN, Black, and rural healthcare workforce representation.[91-100]



Strategy 1.2: Implement tools and trainings to address discrimination and interpersonal racism in health care settings

Discrimination, interpersonal racism, and structural inequities directly impact maternal health outcomes. American Indian/Alaskan Native, Asian/Pacific Islander, Black, and Hispanic populations often receive lower quality health care than their White counterparts, even with the same insurance and socioeconomic status.[101, 102] Health care settings can implement tools and training to address bias in their institutions.

Clinicians' bias

Clinicians' implicit bias may contribute to the disparities in care quality and treatment, as bias may affect the way clinicians treat and counsel patients.[15, 103, 104] Implicit bias negatively impacts patient-clinician interactions, treatment decisions, treatment adherence, and patient health outcomes.[87] Qualitative data have demonstrated women experienced difficulties engaging in early care, and understanding and communicating with their providers, with some reporting they felt as if they were being treated differently because of Medicaid insurance and race.[87, 89, 105, 106] A curriculum highlighting health disparities incorporated into medical education is likely insufficient by itself. Potentially critical companion efforts include adding disproportionately impacted populations in foundational medical education and service-learning experiences.[107-109]

Consider the following strategies to decrease individual bias to address disparities in health care delivery:

- Interventions that achieve primary prevention for medical students and continuing education for clinicians already working with patients[87]
- Trainings for clinicians on diversity, shared decision making, cultural competency, and implicit bias[15, 110, 111]
- Revisions of professional ethics and practices[15]
- Participation in strategies such as cognitive, behavioral, and mindfulness interventions[112, 113]

Institutional bias

Implicit bias may also exist at the hospital- or institutional-levels.[114] Evidence suggests that hospital and systems level strategies combined with provider-level strategies may be an effective approach to promote cultural competency in healthcare institutions.[90] Potential interventions to address institutional racism include: "1) educating students and staff about bias and the importance of minimizing disparities; 2) making a diverse, multicultural staff an institutional priority; and 3) using change management and quality improvement principles to change the institutional culture to promote a culture of respect."[114]

The National Standards for Culturally and Linguistically Appropriate Services in Health and Health Care (The National CLAS Standards https://thinkculturalhealth.hhs.gov/assets/pdfs/EnhancedNationalCLASStandards.pdf) aim to improve health care quality and advance health equity by establishing a framework for organizations to serve the nation's increasingly diverse communities.[115] "The National CLAS Standards were developed and endorsed by numerous engaged parties, advisory boards, and accrediting agencies, including the US Department of Health and Human Services, Institute of Medicine, National Quality Forum, and the Joint Commission with a principle standard of "providing effective, equitable, understandable and respectful quality care and services that are responsive to diverse cultural health beliefs and practices, preferred languages, health literacy and other communication needs."[115]

Addressing Bias and Racism in New York

The New York State Department of Health (NYSDOH) is committed to improving obstetric outcomes for all birthing people, especially those disproportionately impacted by racism and structural inequities. NYSDOH has been working to center anti-racism and anti-bias work in many of its obstetric care improvement initiatives for the past several years. Beginning in 2018 with the New York State Task for Maternal Mortality & Disparate Racial Outcomes* and a series of community listening sessions with Black women,** NYSDOH worked to center the voice of Black birthing people in developing new strategies to improve obstetric care and address racism. NYSDOH continued to invest considerable financial and institutional resources in ongoing work focused on improving maternal health including: establishing a NYSDOH Maternal Mortality Review Board and a collaborating Maternal Mortality & Morbidity Advisory Council, work on a comprehensive perinatal health data warehouse, expansion of community health worker programs across the state, and the creation of an Expert Panel on Postpartum Care.***

Work to address racism in obstetric care has included several different projects such as more direct collaboration with obstetric hospitals across the state. In 2018, ACOG District II, the Healthcare Association of New York State, and the Greater New York Hospital Association hosted the "Symposium on Racial Disparities and Implicit Bias in Obstetric Care"**** to identify and recommend strategies to reduce racial disparities in New York. The Symposium focused on strategies that can be implemented in the hospital setting and convened 50 multidisciplinary healthcare providers. The strategies detailed by Symposium participants included the following: (1) conduct implicit bias trainings in healthcare; (2) enhance hospital and community partnerships, support, and trust; (3) improve communications and cultural competency training; and (4) initiate a multi-pronged approach to address system issues.

The NYSDOH's multi-pronged approach to addressing bias and racism in obstetric care now includes several ongoing initiatives of the New York State Perinatal Quality Collaborative (NYSPQC), a program of the NYSDOH Division of Family Health. The NYSPQC seeks to provide the best, safest and most equitable care for pregnant and postpartum people and infants in NYS. This is achieved by leading a learning collaborative which includes birthing hospitals, perinatal care providers, professional organizations, and other key partners to prevent and minimize harm through the translation of evidence-based guidelines into clinical practice. One such learning collaborative is the New York State Birth Equity Improvement Project.***** The Department continues to collaborate with external partners including ACOG, the Healthcare Association of New York State, and the Greater New York Hospital Association on several of these projects.

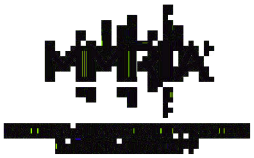
*https://www.health.ny.gov/community/adults/women/task_force_maternal_mortality/#:~:text=To%20improve%20maternal%20outcomes%2C%20the,Mortality%20and%20Disparate%20Racial%20Outcomes.&text=The%20Taskforce%20is%20charged%20with,outcomes%20for%20women%20of%20color.

**https://www.health.ny.gov/community/adults/women/task_force_maternal_mortality/docs/2021-01_expert_panel_on_postpartum_ care_final_report.pdf

***https://www.health.ny.gov/community/adults/women/task_force_maternal_mortality/docs/2021-01_expert_panel_on_postpartum_care_final_report.pdf

****https://health.ny.gov/community/adults/women/task_force_maternal_mortality/docs/meeting3/SymposiumonRacialDisparitiesandImplicitBiasinObstetricalCareDec2018.pdf

***** https://www.albany.edu/cphce/nyspqcbirthequity_public/index_birth_equity.shtml



Massachusetts General Hospital's Approach to Addressing Structural Racism

Evidence of disparities at the national level motivates efforts to monitor equity of care at Massachusetts (Mass) General Hospital. In November 2020, Mass General Hospital announced a blueprint for addressing overt and structural racism within the institution, building on many years of diversity, equity, and inclusion work.1 Within the department of Obstetrics and Gynecology at the Massachusetts General Hospital, the focus on health equity includes systematic review of outcome data (such as cesarean delivery, hemorrhage, and readmission rates), stratified by maternal race-ethnicity, preferred language, and insurance status. This allows for review of care quality for all populations and seeks to highlight inequities the healthcare system must address. Similarly, as adverse events are presented and reviewed in Quality Assurance and Morbidity and Mortality conferences, patient demographics are presented as a part of the case review, to allow listeners to consider how these factors may have influenced the care or outcomes. In particular, Mass General Hospital's Annual Report on Equity in Health Care Quality 2020 presented evidence of disparities in NTSV Cesarean section rates, with Black women having Cesarean deliveries at twice the rate of White women. This variation cannot be entirely explained by clinical factors. In fiscal year 21, the hospital plans to conduct qualitative interviews with NTSV C-Section patients to explore their childbirth experience and the care they received at Mass General. These interviews will help the hospital understand the contributing factors and root causes that underlie the disparity and allow us to design and implement effective improvement plans.* Understanding the magnitude of inequities in care provision will allow for further investigation into potential etiologies and solutions.

* Massachusetts General Hospital. Annual Report on Equity in Health Care Quality 2020. 2021. https://www.massgeneral.org/assets/MGH/pdf/quality-and-safety/Equity_Report_2020.pdf

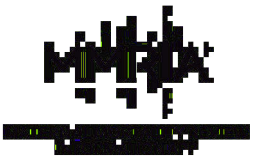
Strategy 1.3: Implement policy changes to address inequitable distribution of the social determinants of health

While many interventions to improve quality of care may be at the provider or hospital level, community and state-wide policies can also be very important to address the disparate allocation of resources created by structural racism over time. Policies that address the Black-White wealth gap may have significant impacts on maternal outcomes and the reduction of disparities. State-level earned income tax credit laws had larger improvements in birth outcomes when they provided higher tax credits, and when comparing Black and White mothers, there were generally larger beneficial effects for Black mothers.[116] In addition to financial resources, policies that can ameliorate stressors, advance environmental justice, reproductive justice, and address other social determinants of health are also important to consider.

Some policies that are associated with decreasing disparities in maternal and infant outcomes include:

- *Expand insurance coverage:* When comparing maternal mortality ratios between Medicaid expansion and non-Medicaid expansion states, researchers have found significant associations between reduction in maternal mortality and Medicaid expansion status. When examined by racial and ethnic subgroups, the effect size was greatest among non-Hispanic Black mothers.[117]

- *Paid family leave policies:* Paid leave often varies by type of job, education level, and race-ethnicity. Paid family leave is associated with maternal health benefits, though there is variation based on the length of leave.[118] As states implement paid family leave policies, evidence is increasing on the short- and long-term benefits to maternal health.[119] For example, in New Jersey, the policy was associated with improvements in women's physical health, especially among single mothers and those of lower socioeconomic status.[120] The impact of expanding statewide access to paid leave through temporary disability insurance on low birth weight was greater for Black women than White women.[121]



- *Smoke free laws:* Communities of color are more likely to have secondhand smoke exposure, but less likely to have comprehensive smoke free laws.[122, 123] State smoke-free laws were associated with a reduction in racial/ethnic disparities in preterm or low birth weight delivery hospitalizations.[122] While the current evidence focuses on infant outcomes, these outcomes are often linked to maternal health and wellbeing (e.g. reductions in second hand smoke exposure, increased tobacco cessation).[124]

- *Earned Income Tax Credit (EITC):* Working families struggling to make ends meet on low wages can lead to poor health outcomes. Mothers who receive the largest EITC increases have greater improvements in their own health, including decreased high blood pressure and inflammation.[125] EITCs decrease poverty and improve health outcomes, particularly for infants and mothers.[126]

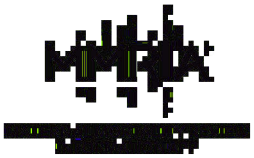
San Francisco Launches Pilot Program to Provide Basic Income to Black and Pacific Islander Women During Pregnancy and Postpartum

San Francisco Mayor and Expecting Justice announced the launch of the Abundant Birth Project in 2020, a pilot program that provides targeted basic income to women during pregnancy and after giving birth. The pilot will provide an unconditional monthly income supplement of $1,000 to approximately 150 Black and Pacific Islander women in San Francisco for the duration of their pregnancy and for the first six months of their baby's life, with a goal of eventually providing a supplement for up to two years post-pregnancy. Expecting Justice, a collective impact initiative at the San Francisco Department of Public Health and supported by the Hellman Foundation and the University of California San Francisco California Preterm Birth Initiative, will study the resulting health impacts of the pilot program, which is the first of its kind in the United States.

Strategy 1.4: Actively engage organizations that are community–based and that serve disproportionately impacted populations

Achieving equitable outcomes requires actively engaging communities disproportionately impacted.[59] While CDC strongly encourages community representatives as members of MMRCs, additional community involvement is vital to bringing community and culturally appropriate prevention recommendations into reality. Organizations that are community–based and that serve disproportionately impacted populations are uniquely poised to ensure that educational messages, trainings, tools, and other resources reflect the culture, values, preferences, barriers, and language of the populations they serve; however, opportunities to leverage these strengths may not be fully realized without additional investment in these organizations.[59, 127] Engagement with community partners and organizations is an essential step for selecting priority recommendations for action that align with findings of the MMRC.

Organizations that are community–based and that serve disproportionately impacted populations have the networks and the audience to lead activities and make critical decisions for successfully initiating and conducting health initiatives in their communities. These organizations are key partners, including serving as hubs for community coalitions. Organizations that are community–based and that serve disproportionately impacted populations are community assets as described in Step 2. Incorporating their perspectives on addressing disparities into maternal mortality prevention strategies is a key action to complement the implementation of other goals and strategies. Engagement of community-based and minority-serving organizations can inform interpretation of data from MMRCs and complementary data sources, continuous monitoring and review of strategy implementation, and evaluation of outcomes. Efforts are needed to enhance the resources available to build community-based capacity for improving maternal health. The sustained and effective delivery of culturally relevant approaches for eliminating maternal mortality can best be achieved by local leadership development and promoting collaborations and partner engagement.[128-131]



Strategy 1.5: Implement initiatives that improve standardization of care, quality, and coordination in health care facilities that serve disproportionately impacted communities

Decades of structural racism in housing policy and practice, that include redlining and denying government-backed mortgages to majority Black neighborhoods, have resulted in residential segregation. Communities with high levels of residential segregation may have less resourced health care facilities, less experienced clinical providers, and rely disproportionately on publicly funded health care systems such as community health centers or safety net hospitals.[132] For indigenous populations, issues such as rural location, isolation, poverty and communication barriers all contribute to disparities in health care.[133]

While much recent attention has been paid to closing of rural obstetric facilities, urban communities also experienced a loss of community hospitals and a positive association was found between hospital closure and the percentage of Black residents in the community.[134, 135] The result is that disproportionately impacted pregnant persons delivery in different and lower quality hospitals than White persons.[136-138] These differences in quality care may contribute to racial and ethnic disparities in maternal mortality.[139] In addition, racial and ethnic differences in care quality received during childbirth within individual hospitals may contribute to disparities in maternal mortality.[111, 140] Thus, preventing maternal mortality related to clinical causes likely requires quality improvement efforts implemented in hospitals that serve disproportionately affected communities. Factors identified as adversely influencing care quality at the hospital level include limited experience with obstetric emergencies, lack of appropriate personnel or services, or lack of protocols or tools to help ensure quality care provision.[88, 141-143]

These data suggest that investing in health care facilities that serve disproportionately affected communities and ensuring their participation in networks for risk-appropriate care and quality improvement initiatives like safety bundles, obstetric early warning systems, and protocols and checklists may help address differences in care quality and reduce disparities in maternal mortality.[20, 111] Promising practices that could help reduce disparities include implementing obstetric emergency simulation training for emergency department and obstetric staff, quality improvement toolkits, engaging patients and families in quality improvement, and establishing telemedicine or teleECHO programs for facilities with no obstetric provider on-site.[88, 144-147]

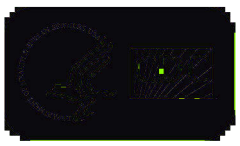
Preventing Type 2 Diabetes Among Women with a History of Gestational Diabetes in Ohio

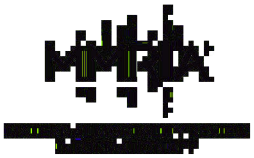
Women diagnosed with gestational diabetes mellitus (GDM) during pregnancy are more likely to develop type 2 diabetes (T2DM), with up to 60 percent developing T2DM in the 10 years following pregnancy. In 2010, the Ohio Department of Health (ODH) formed the Ohio GDM Postpartum Care Learning Collaborative* to prevent or delay T2DM among women with a history of GDM. The collaborative team consisted of members from Ohio's Division of Family and Community Health Services, Office of Healthy Ohio, and the ODH Epidemiology Office. Partnering with Ohio Medicaid, the collaborative team worked together and pooled resources to a develop a public health program with a lifespan approach to improve long-term health outcomes among women diagnosed with GDM. The team's key objectives focused on enhancing the understanding of the epidemiology of GDM and T2DM within Ohio women of reproductive age, ensuring health care practitioners in Ohio provide preconception, postpartum, and ongoing care for women to prevent GDM and T2DM, and ensuring all women of child-bearing age in Ohio are educated about the risks of GDM and T2DM and have access to preventive and treatment services to reduce their risk of developing T2DM.

To accomplish these objectives, the GDM collaborative implemented a quality improvement (QI) program to increase the number of women who receive post-partum screening and education for type 2 diabetes so that health risks are addressed early and effectively. The primary goals of the QI program were to test best practices for improving diabetes screenings, and provide quality prenatal and post-partum care for women diagnosed with GDM, implement a patient and provider focused toolkit into practice, identify and engage in care coordination strategies, and promote clinical interventions to improve health outcomes for women with a history of GDM. As a result of the successful implementation of this QI program, an increase in the administration of prenatal education on the topics of postpartum family planning (from 63% to 90%), tobacco cessation (from 40% to 85%), postpartum T2DM screening (from 67% to 100%) and the risk and impact of T2DM (from 67% to 88%) was seen among Medicaid patients of participating providers in Ohio.

*http://ohiogdm.com

These data also support the need to improve care in non-hospital healthcare facilities that serve disproportionately impacted communities to improve delivery of quality prenatal and chronic disease management. For example, quality improvements in health care in Federally Qualified Health Centers may reduce disparities by supporting access to comprehensive, patient-centered health care.[148] Improving standardization of care, quality of care, and coordination of care in healthcare facilities that serve minority communities facilitates cultural competency, and ability to leverage other community-based services while enhancing trusted sources of care.[149] Quality improvement initiatives in primary care settings and in medically underserved settings have shown improvement in postpartum diabetes screening, contraception access, and hypertension control.[150-152] Healthcare information technology may be leveraged to support quality improvement in community health centers and to disaggregate data by race-ethnicity to ensure equitable improvements.





Goal 2: Invest in and partner with communities

As discussed in Step 2, investing in and partnering with community members, leaders, and organizations is an important goal for implementation of MMRC recommendations. Key principles of working with communities include understanding their context and incorporating their priority issues, needs, and assets into strategies and initiatives, which can help ensure alignment that leads to the greatest impacts. Planning of initiatives need to include community members, and community participation strengthens MMRC committee membership. This facilitates the consideration of the cultural, social, political, and physical characteristics of the communities being served. Similarly, it is critical that actions to prevent maternal mortality include investments within communities to strengthen existing assets and build new systems that can best serve pregnant and postpartum persons and their families. A focus on working within communities encourages the sustainability of efforts, increases community participation and acceptability, prevents duplication of efforts, and fosters resilience and social connectedness.[153]

Identifying and strengthening community assets is integral to population-based health improvements. While strengthening and enhancing community assets are important for all population-based efforts, it is particularly crucial when working to address health inequities because community assets can help buffer the historical impacts of racism. Community assets are impacted by the distribution of power and resources, which in turn have structural determinants as root causes that require investments in communities.[9] Continuous monitoring and review include documenting the community context and assets that may be necessary for achieving your prevention goals equitably. Strategies which amplify community assets are outlined below for consideration. These strategies may be considered in concert with the strategies from other goals to coordinate and enhance efforts.

Strategy 2.1: Increase funding and support for community-based organizations in communities disproportionately impacted by maternal mortality

Resources for local organizations that support maternal health and well-being are extremely limited, making the provision of mother-to-mother support, other birth supports, community advocacy, patient navigation, and outreach efforts difficult. In 2016, more than one in three of all public charities were human services organizations, but they represented only 12% of public charity revenues. For the funding received, flexibility to use fiscal resources in ways that support organizations' operations, overhead costs, and programs is a factor associated with organization sustainability.[154] This greater discretionary or unrestricted funding is especially useful for organizations during times of emergencies so organizations can decide how best to direct funds.[155] Community-based organizations are uniquely poised to ensure that educational messages, training, tools, and other resources reflect culture, values, preferences, and language of the populations they serve. However, new or smaller organizations may not have the same awareness of or relationships with funders as larger or more established organizations with staff dedicated to competing for limited funds.[156] Community-based organizations have varying levels of capacity to respond to funding announcements. Sometimes the same organizations are funded year after year because of a limited pool of eligible organizations or because outreach is limited to "known" organizations that have been previously funded or are within the state's network.[157] However, providing resources to community-based organizations to support community coalitions and implement community-based strategies is important individually or in concert with other efforts.

Strategy 2.2: Connect pregnant and postpartum persons with community health workers who can provide support and help meet their needs

A community health worker (CHW) is a frontline public health worker who is a trusted member or has a particularly good understanding of the community served.[158] CHWs serve as a bridge between communities, healthcare systems, and state health departments.[159] CHWs can be particularly impactful because they live and work in the community and may have a deeper understanding of the community context, resources, and the lived experience of being a community member. This allows CHWs to serve as a link between health and social service programs and improve the quality and cultural competence of service delivery.[160] Perinatal CHWs address social risks and can provide pregnant and postpartum people with support, information, and links to services, improving perinatal health outcomes.[161, 162]

Doulas providing culturally appropriate support

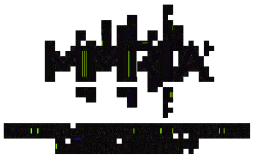
Doula programs are gaining attention as an emerging approach to providing culturally appropriate support to women of color. In Asheville, North Carolina, through the SistaCaring4Sistas* program, doulas are working to support women of color in western North Carolina. The program, founded by women of color, is "committed to eliminating health disparities in mothers and infants." SistaCaring4Sistas services provided include childbirth education, attending prenatal visits with women, assisting with birth planning, providing support during labor and delivery, providing breastfeeding support, making home visits after the baby is born, helping women to access medical and community resources, and advocating on behalf of their clients. The state is conducting a statewide landscape analysis of doula services in NC with intended completion by the end of 2021.

* https://mahec.net/patient-information/ob-gyn-care/doula-services

Doulas are trained professionals who provide continuous, emotional and informational support during the perinatal period. Studies show that doula care is associated with lower epidural use and cesarean delivery rates, shorter labors, higher rates of spontaneous vaginal birth, and higher levels of satisfaction.[128, 163-166] Low-income women and women disproportionately impacted populations, who have the highest risk of poor birth outcomes, are also the most likely groups to report wanting, but not having, access to doula services.[166] Doula support for mothers during pregnancy, delivery, and postpartum, can influence the pathways between social determinants of health, and play a role in improving health outcomes, closing disparities, and advancing equity in maternity care.[131,167] Having a doula as part of the birth team encourages mothers to communicate with their providers and inform mothers of their birth options. By providing continuous support and information, mothers feel more confident and empowered. Black, publicly insured or uninsured birthing persons had higher odds of desiring but not having doula support.[166] In 2018 and 2019, a small number of states, including Illinois, Minnesota, New Jersey, and Oregon, began to expand Medicaid coverage for doula care.[168, 169, 170] Implementation challenges include sufficient reimbursement to doulas, coverage for an adequate number of visits for mothers, defining training needs, certification standards, and improving awareness of covered services among women, doulas, medical providers, healthcare delivery systems and managed care organizations.[171-173]

There are a variety of other programs that have CHWs that interface with pregnant and postpartum persons and their support systems, including home visitation, visitation programs such as the Maternal, Infant, and Early Childhood Home Visiting program, Healthy Start, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and intimate partner violence prevention programs. Often these programs provide evidence-based screening for leading causes of maternal mortality like substance misuse and mental health conditions and can further assess eligibility for programs that offer needed care. Leveraging these programs to support pregnant and postpartum persons is a natural extension of the other functions these programs provide and contributes to the common goals of improving the health and well-being of families.

For example, in Healthy Start program settings, frequent, culturally sensitive, and linguistically appropriate support is provided by case managers trained to listen and connect families to resources available in their community. Community-based care sites with funding aimed at preventing maternal morbidity and mortality provide targeted services to pregnant and postpartum persons coping with high-risk health conditions and other concerns for which they cannot find affordable care. These services are especially helpful for those who lose pregnancy-related Medicaid insurance coverage at 60 days postpartum and have no other affordable insurance options. Case workers can provide links to services such as free laboratory tests and home visiting with wraparound care provided by community-based nurses.

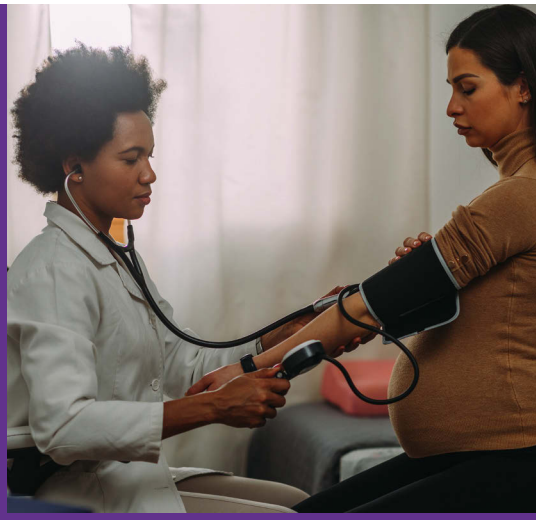


Similarly, partnering with other community-based service providers who serve pregnant and postpartum persons, such as WIC, may also provide opportunities to provide referrals and support.[174] Research shows that WIC participants are more likely to receive adequate prenatal care.[174] In a recent study, researchers found that mothers who received WIC had a reduced prevalence of both preeclampsia and excessive gestational weight gain.[175] WIC staff can play an important role in establishing these partnerships, thereby creating lasting relationships that positively impact referral rates. State and local coordination among WIC, Medicaid, and the Special Supplemental Nutrition Assistance Program (SNAP) is another way to reach many potentially eligible participants.[176]

Strategy 2.3: Build and support community-centered approaches to care

Community-centered approaches to care can ensure that pregnant and birthing people get care where they are comfortable in their community. Programs that anchor the support and care people receive within their community during pregnancy have been shown to improve a variety of birth outcomes and may also reduce maternal mortality. These programs can serve pregnant and postpartum people by building systems of care in their communities. For example, the maternity medical home model can improve perinatal care by ensuring coordination of fragmented social, behavioral, and health services; moving beyond a purely medical approach to pregnancy care toward a patient-centered care approach that incorporates broader health management needs. In addition, clinicians and health systems can improve their knowledge of available community services and ensure seamless referrals and linkages to these programs.

North Carolina's Pregnancy Medical Home Program



Community Care of North Carolina launched the Pregnancy Medical Home (PMH)* program in 2011, to enhance access to comprehensive care for pregnant Medicaid beneficiaries and to improve birth outcomes. The PMH program promotes evidence-based, high-quality maternity care in more than 400 practices across the state. PMH practices represent 95% percent of prenatal care providers who serve the Medicaid population.

The PMH program supports practices by providing quality improvement support and consensus driven "best practice" pathways. Meaningful practice-level quality and performance measures drive the implementation of improvement strategies. Initiatives have included improving timeliness to prenatal care, risk screening rates, postpartum visit rates and access to long-acting reversible contraceptives. Since the inception of the PMH program population-based quality metrics indicate a modest increase in first trimester onset of prenatal care and a substantial increase in the postpartum visit rate. The 52.4% unintended pregnancy rate in 2012 declined to 44.5% by 2019.

Care Management for High-Risk Pregnancies (CMHRP) is a community-based care coordination model for NC Medicaid patients at risk of preterm birth provided by county health department nurses and social workers. These care managers partner with prenatal care providers; many are embedded in the prenatal care setting, enabling effective integration with the care team and face-to-face interaction with patients. Women who are likely to benefit most from care management are identified using the Pregnancy Risk Screening Form** and the Maternal Infant Impactability Score (MIIS),*** an internally developed identification strategy that guides where care management resources can be applied to achieve the greatest effectiveness. Experience with this strategy indicates that very high-risk women, who receive regular face-to-face contact with a care manager over the course of their pregnancies, are approximately 30% less likely to have a low birth weight infant than women of similar risk who do not receive this support. Results are similar for both White and Black women.

Nationally, there has been significant focus and progress in recent years on strategies to reduce in-hospital maternal mortality and morbidity. The PMH model is a promising community-based approach for improving maternal and infant health outcomes.

* https://www.communitycarenc.org/sites/default/files/2020-03/CCNC-Inc_OneSheeter_PMH_032020_0.pdf
**https://files.nc.gov/ncdma/documents/Transformation/caremanagement/CMHRP-Pregnancy-Risk-Screening-Form-English.pdf
***https://www.communitycarenc.org/what-we-do/clinical-programs/pregnancy-medical-home

Community-based models of care may leverage community-based assets, particularly when centered within communities that are disproportionately impacted, and can address the needs of pregnant and postpartum persons in culturally competent ways. Such community-based models of care can meet the needs for peer support, mutual self-help, and education that are outside of the scope of a typical prenatal or postpartum visit with a clinician and have been shown to improve some perinatal outcomes among those at-risk.[177-179]

For example, group prenatal care and parenting programs allow pregnant and postpartum persons to share the common experience of pregnancy, birth, and family care. Participants are better prepared for labor, delivery, and to care for their infant with improved understanding of what is normal during pregnancy and postpartum, and what is cause for concern. Group prenatal care and peer-to-peer education can increase knowledge, patient readiness for labor and delivery, and patient satisfaction. These models demonstrate increased satisfaction with prenatal care and potential reductions in preterm birth among Black birthing people.[180, 181] As an alternative to the individual prenatal care model, group prenatal care is designed to improve patient engagement and provide opportunities for social support, while maintaining the physical assessment aspects of one-on-one prenatal care. This model brings patients with similar needs together for health care encounters and facilitates peer-to-peer education.

Equitable and Culturally Relevant Reproductive Healthcare in New Mexico

The Changing Woman Initiative* in New Mexico is a Native American midwife-led health collective providing equitable and culturally relevant reproductive health care for American Indian/Alaska Native women. The initiative fills gaps in care for Native women in New Mexico, many of whom travel long distances to reach prenatal care providers and birth hospitals. New Mexico's birth center regulations** established Medicaid reimbursement paths that allow the Initiative to provide midwifery services and to build the country's first Native-led birthing center and midwifery fellowship program.

*http://www.changingwomaninitiative.com
**https://www.srca.nm.gov/parts/title07/07.010.0002.html

While state-specific scope-of-practice laws on nurse midwifery vary, they are another way to support community-centered approaches to care. Midwives practice in hospitals, freestanding birth centers, and homes.[182, 183] In 2017, 9.1% of all US births were attended by a certified nurse-midwife (CNM) or certified midwife (CM), far below the reported 50% to 75% in other developed countries.[182, 183] CNMs are nurses who also are trained as midwives, whereas CMs are not trained as nurses. However, both are educated in a program that is accredited by the Accreditation Commission for Midwifery Education. Certified Professional Midwives enter the profession through various routes including apprenticeship programs or educational programs accredited by the Midwifery Education Accreditation Council. States with regulations that support autonomous midwifery practice, or the ability for midwives to practice independent of a physician's direct supervision, have a larger nurse-midwifery workforce.[184, 185] A summary of state midwifery laws is available here: (https://mana.org/about-midwives/state-by-state). Medicaid coverage of maternity services from nonphysician providers such as midwives, and out-of-hospital births such as at freestanding birth centers, varies by state and is dependent on licensure and credentialing laws.[186] Financially sustainable models that link the midwifery-led model to the Medicaid population, such as freestanding birth centers within Federally Qualified Health Centers,[187] may improve access among disproportionately impacted communities.

Access to diverse types of birth care providers has been recognized in Black and AI/AN communities in the US as an important strategy for addressing racial inequalities in maternal health.[188, 189] For example, among AI/AN populations, CNM attended births have lower cesarean section rates.[190] In addition to formal healthcare systems, direct care midwives supporting out-of-hospital births and functional medicine practitioners are traditionally important in many communities, including communities of color.[191] Such community-based care can meet needs that are outside of the scope of a typical prenatal or postpartum visit with a medical provider, and have improved some perinatal outcomes among those at-risk.[177, 179, 192]

Strategy 2.4: Integrate maternal care services with other sectors of the community

Understanding and encouraging models that bring together a range of partnerships with sectors other than clinical and public health can better serve pregnant and postpartum people and their families. Assessing what pregnant and postpartum people need and where they interact with other sectors, such as places of employment, social service providers (e.g., housing) or interactions with the justice system, are important and necessary. Also important to integrating maternal care services with other sectors is identifying where there are already community-based approaches to delivering services that may reach pregnant and postpartum people (even if not focused solely on pregnant and postpartum people)

and what kinds of information and connections might help to better link pregnant and postpartum people to information, resources, and clinical services. There is growing interest in using collaborative approaches to improve population health by embedding health considerations into decision-making processes across a broad array of sectors.[193] Looking for opportunities to connect maternal health through all services can mitigate the social determinants of health that impact maternal mortality. Identification of indicators of the community vital signs through the MMRC review process may highlight sectors to partner with for addressing the social and community contexts in which women live.[24] Places of employment may be one place to consider the needs of pregnant and postpartum people, such as employers offering paid family leave, flexible work schedules, or access to high-quality childcare.[194] Places of employment can ensure to establish and maintain comprehensive, high-quality lactation support programs for their employees and expand the use of programs in the workplace that allow lactating mothers to have direct access to their babies .[195] Employers can negotiate with health insurers for robust maternal care coverage and can create workplace programs to improve the health of all persons through fitness facilities, healthy food options, tobacco-free environments, health screenings, and education.[196] It may also be beneficial to for local, state, and federal governments to provide employers assistance in building worksite wellness programs that can support pregnant and postpartum people.[197]

New York City—Connecting with Nonprofits in the Justice Sector

The Bronx Defenders, a nonprofit public defense organization located in the South Bronx, serves low-income New Yorkers facing legal issues. These legal struggles (including criminal, immigration, child welfare, and housing) and their myriad consequences all create high levels of stress in the lives of pregnant and birthing people and contribute to inequities in maternal health. The Bronx Defenders provides holistic, client-centered advocacy that includes robust case management; thus, staff regularly witness and support clients through medical and social issues that can worsen maternal health. As part of the Merck for Mothers-funded Severe Maternal Morbidity Project, the NYC Health Department team collaborated with the Bronx Defenders to conduct a panel presentation for more than 20 staff at their headquarters. Sharing information with attorneys, social workers, and other Bronx Defenders staff about the nuances of maternal health made it possible for them to better serve clients who are pregnant or in the postpartum period.*

*New York City Department of Health and Mental Hygiene. Innovative Strategies for Community Engagement: Raising Awareness to Reduce Severe Maternal Morbidity. 2020. https://www1.nyc.gov/assets/doh/downloads/pdf/csi/strategies-for-community-engagement-raising-awareness-severe-maternal-morbidity.pdf

Goal 3: Ensure access to care for all pregnant and postpartum persons

An individual's access to care is dependent on how insurance coverage, availability and accessibility of care, and care coordination are present and working together. As outlined in Goal 4, availability and access includes opportunities for quality, respectful patient-centered care. Applying a health equity lens acknowledges drivers of disparities in access to care including disparities in health insurance coverage, provider shortages in disproportionately impacted communities,and strategies to address structural drivers like access to transportation.[198,199] Because maternal health outcomes are dependent on access to care across a person's life course – including pre-pregnancy, prenatal, labor and delivery, emergency obstetric, and postpartum health and care in the interconception period – issues of access are complex and can differ depending on the timing of care.[200] Public health, clinical, and community organizations can reduce barriers for accessing care by pregnant and postpartum persons to support their health and well-being throughout pregnancy and beyond, bolstering overall maternal health.

Strategy 3.1: Improve prenatal and postpartum healthcare coverage

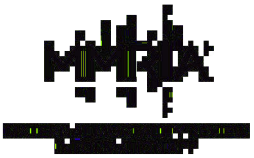
Insurance coverage before pregnancy is associated with earlier initiation of prenatal care, which may enhance maternal outcomes.[201, 202] Racial and ethnic disparities exist in prenatal care initiation among persons with and without health insurance; however, being insured improves prenatal care initiation and adherence among all racial and ethnic groups.[203] States can work with community partners, such as Healthy Start, and managed care organizations to promote prenatal care initiation, adherence, and awareness about Medicaid eligibility criteria and benefits for pregnant persons and reproductive age persons who could become pregnant, increasing the number of eligible persons receiving services. Reducing administrative burden for individuals using process changes such as auto-enrollment and consumer awareness were associated with significant enrollment increases in a state Medicaid program.[204]

Like with prenatal care, there are challenges to coverage for postpartum care, with many persons experiencing inconsistent insurance coverage during the postpartum period that can result in difficulty accessing the recommended postpartum services.[36, 205-208] States generally allow a higher income eligibility limit for Medicaid for pregnant persons, but this income eligibility limit usually decreases after 60 days postpartum, resulting in loss of coverage.[209] The American College of Obstetrics and Gynecology (ACOG) issued a *Committee Opinion on Redefining the Postpartum Visit*, which recommends all persons have initial contact with their obstetrician–gynecologist or other obstetric care providers within their first 3 weeks postpartum, followed by ongoing care as needed, and concluding with a comprehensive postpartum visit no later than 12 weeks after delivery.[210] This change in scope to better support maternal health and overall well-being, and to meet the needs of persons with underlying conditions that may increase the risk of maternal morbidity and mortality after delivery, requires reimbursement policies that support an ongoing process of postpartum care, rather than one isolated visit.[210] Some MMRCs have identified prevention recommendations addressing Medicaid coverage for one year postpartum. States use waivers and state plan amendments to expand coverage; however, the services offered under these expansions vary by state.[211-213] States can work with healthcare systems and public health, clinical and community organizations to increase awareness of coverage among eligible postpartum persons.[211] States can also increase referrals and resources for healthcare facilities that offer low- or no-cost healthcare, including federally-qualified health centers and community health centers.

Strategy 3.2: Increase availability and accessibility of care

Availability of providers and facilities in or near communities is a key aspect of access to care. Rural areas, in particular, may offer limited availability to childbirth providers and perinatal critical care services.[214, 215] To increase the maternity care workforce in locations facing shortages, states can leverage federal loan forgiveness programs that encourage providers to practice in under-resourced areas, or broaden the scope of practice for advanced practice nurses, including certified nurse midwives.[214, 215] While persons in rural areas are disproportionately impacted by healthcare workforce shortages, persons in urban and suburban areas also face barriers to availability of services. Providers may be more available in urban settings, but there may be fewer providers that accept new patients with public insurance, resulting in lower availability.[216, 217]

While availability addresses the 'supply' of care, there is a need to improve accessibility of services and remove barriers to uptake. Barriers to care include limited transportation options, limited office hours, a lack of interpretation services, lack of paid parental leave, and a lack of childcare availability.[105, 214, 218-220]



Nonemergency Medical Transportation Coverage

Transportation can be an important barrier to healthcare for pregnant people. Some states, including Arizona, Georgia, Michigan, Missouri, Tennessee, and Virginia, have opted to cover nonemergency medical transportation (NEMT) through their Medicaid programs by partnering with a ride share company. Currently, the Centers for Medicare & Medicaid Services provides a toolkit for implementing NEMT* as a benefit for beneficiaries with no means of transportation. In states without Medicaid coverage of NEMT, private companies like Ride Health** have partnered with transportation services to offer NEMT services through healthcare organizations.

* https://www.cms.gov/Medicare-Medicaid-Coordination/Fraud-Prevention/Medicaid-Integrity-Education/nemt
** https://www.ridehealth.com

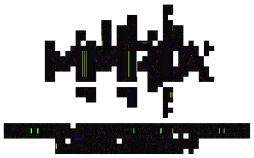
For example, to address transportation barriers, states can partner with organizations that represent public and private transportation systems to strengthen and build affordable transportation systems serving communities most impacted, or improve the availability of vouchers for transport to medical appointments.[88] Efforts can include coordinating referrals for pregnant and postpartum persons participating in Medicaid who may qualify for transportation benefits, including transportation vouchers for nonemergency medical transportation.[221] Initiatives to provide these benefits include partnerships between digital transportation network companies (e.g., Lyft, Uber) and managed care organizations, providing patients with ride-share transportation. States can implement and expand telehealth programs to help expand the availability and accessibility of care to prenatal and postpartum care, especially for persons in rural areas.[222-224] Expanded office hours can provide an opportunity for pregnant and postpartum persons to easily schedule appointments at a time compatible with their work and childcare schedules. Recommendations from MMRCs and a 2017 literature review suggest mobile health vans and home visiting services may increase access to care and provide hands-on care to those with trouble accessing health services, resulting in earlier initiation of prenatal care.[88, 225]

As noted in Goal 2, building and supporting community-centered approaches to care and other changes to the way health care services are delivered can also increase availability and accessibility of care. States can explore strategies to increase access to and sustainability of culturally concordant, community-rooted midwifery-led care such as freestanding birth centers.[186] Freestanding birth centers provide a cost-effective alternative to hospital deliveries for low-risk births, with a strong evidence base for better outcomes and higher rates of satisfaction.[186, 226, 227]

Strategy 3.3: Establish and maintain strong systems for care coordination

To truly ensure access to care, coordination of care is essential for pregnant and postpartum persons, especially for access to specialty care (e.g., mental health, cardiology referrals and treatment) and access to community and social resources (e.g., programs that address food insecurity). Recommendations for clinical preventive services such as mental health screening and postpartum visits, also include timely follow-up and ongoing coordination of care to improve outcomes.[228, 229] Coordination of care, including personal (e.g., in-person, telehealth) transfers of care between providers with clients and family, is an important component of access because care coordination ensures that persons receive the care they need in a timely manner.

Improving quality of care provided by clinicians and health facilities, should occur in concert with care systems providing pregnant and postpartum persons access to a spectrum of care services that can prevent maternal mortality.[200, 228] Care providers and health facilities, forming networks of coordinated care, can help ensure that during transitions of care, persons are not lost from care systems and are receiving timely care by informed care providers. Systems of referral and coordination are often needed, especially to ensure that referrals and appropriate follow-up services are received. Referrals to social and community services addressing social determinants of health and health inequities are as important as referrals to specialty medical services. Community health workers are an important component of health systems supporting referral and follow-up services or otherwise coordinating care.[230] State and local programs that have implemented case-management models to improve coordination of care for birthing persons at higher risk of poor outcomes.[231, 232]



The ACOG *Committee Opinion on Redefining the Postpartum Visit* highlights coordination with other providers, including transitions from inpatient to outpatient and from postpartum to ongoing well-person care; ensuring that persons with chronic and pregnancy-induced health conditions identified during pregnancy, such as hypertensive disorders and substance use disorders, continue to receive coordinated care.[228] Reimbursement policies that treat postpartum care as an ongoing process rather than a single visit can help support the implementation of care coordination strategies during the year postpartum.[139, 228] In addition, AIM developed two postpartum care bundles to provide facilities and healthcare systems with the tools for pursuing comprehensive care of people from the end of pregnancy through well-woman care, to ensure that every postpartum person receives adequate care.[159]

Strategy 3.4: Establish and strengthen systems of maternal risk-appropriate care

Implementing state-wide regionalized plans for critical maternity care services ensures persons in labor or who are postpartum have timely access to needed specialty care.[233, 234] Risk-appropriate care provisions support receiving care in a facility staffed with personnel and equipment that matches the health needs. Initial systems for classifying hospitals focused primarily on neonatal levels of care.[235] However, with rising concerns about maternal mortality in the United States, there has been increased attention toward standardizing an integrated system of risk-appropriate care related to maternal health.[38, 236-238] Facilities are classified into maternal levels based on functional capabilities and organized within a tiered, regionalized system of maternal care.[239]

States are at different points of establishing policies and systems for monitoring and/or regulating levels of maternal care among facilities in their state, including through state legislation or administrative change.[240] Establishing levels of maternal care, which can provide a common understanding of facility care capabilities among providers and families, is the first step in ensuring that all mothers receive risk-appropriate care. Most importantly, persons with complications during pregnancy that place the mother or fetus at risk should deliver at the facility that can best meet the needs of both the mother and the fetus.[241] Transport agreements, clarifying processes for transferring delivery care from less specialized hospitals to hospitals with appropriate critical care services, regardless of hospital system, are an important consideration in functional systems of risk appropriate care. However, transport agreements may have limited impacts if they are not accompanied by complementary and reinforcing reimbursement policies.[242] Further, this organized system of care supports the identification of level III and IV facilities, which provide education, training, and consultation to lower-level facilities.[241] This consultation can also increase access to care, especially for families located in rural areas.

Definitions and monitoring of levels of maternal and neonatal care vary widely among states.[240, 243] To address this issue, CDC developed the CDC Levels of Care Assessment Tool (LOCATe)℠ (https://www.cdc.gov/reproductivehealth/maternalinfanthealth/cdc-locate/index.html).[35] CDC LOCATe℠ helps states and other jurisdictions create standardized assessments of levels of maternal care aligned with ACOG and the Society for Maternal and Fetal Medicine (SMFM); and neonatal care aligned with the American Academy of Pediatrics (AAP) guidelines.[34, 37, 244, 245] States can implement CDC LOCATe℠ to gauge service and provider availability throughout the state and to facilitate conversations among partners in strengthening risk-appropriate care. Because LOCATe℠ provides a point in time snapshot of levels of care, there may be a need to reimplement periodically to keep information up to date.

Goal 4: Ensure quality care for all pregnant and postpartum persons

Improvements in care quality may reduce maternal mortality by as much as half.[246] Quality care for pregnant and postpartum people is characterized by being safe, effective, patient-centered, timely, efficient, and equitable.[22] Quality of care issues include failure to diagnose, delays in diagnosis, lack of appropriate referrals and care coordination, incomplete documentation of conditions in medical records, and insufficient or delayed communication. Initiatives that promote timely, appropriate, standardized care during pregnancy and through the postpartum period foster a culture of providing people the right care at the right time. Quality care is measured not only metrics to related to clinical processes, but also patient-centered quality outcomes.[247] Being patient-centered means "providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions." Addressing domains related to health literacy, language access, and cultural competence measures improves patient-centered care.

By ensuring complications that arise in the pregnancy and postpartum period are diagnosed and treated in a timely manner, it is possible to reduce severe complications that can lead to significant short- and long-term consequences to health.[248-250] Strategies and initiatives for reducing maternal mortality may include implementing systematic approaches that improve patient safety throughout pregnancy and the postpartum year. These approaches may include developing specific hospital protocols, including check-list based protocols, and mandatory online education modules for maternal care providers.[251-253] There can be unintended consequences associated with implementing patient safety initiatives, including the introduction or exacerbation of disparities if activities are implemented in well-resourced facilities.[254] Ensuring that patient safety initiatives include facilities that are most likely to serve disproportionality impacted populations is important. There are documented disparities in quality-of-care measures broadly, further emphasizing the need for equitable implementation and continuous monitoring and review.[157]

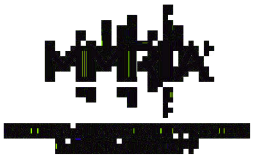
Strategy 4.1: Ensure respectful, client-centered care for all pregnant and postpartum persons

An emerging global strategy for eliminating maternal mortality is ensuring provision of respectful maternity care.[255] People from racial and ethnic minority populations report receiving disrespectful and abusive maternity care at higher rates than people from non-minority populations.[103] Disrespectful and abusive maternity care includes a range of clinician behaviors such as shouting at or scolding patients, treatment without full consent, or neglectful treatment.[103]

Disrespectful and abusive maternity care can have short- and long-term impacts, such as post-traumatic stress disorder, fear of delivery, planned unattended home births, and reduction in future care-seeking behavior.[103] Strengthening patient-clinician relationships and improving the experiences of maternity care by ensuring mothers are listened to, valued, and engaged through client-centered approaches can facilitate informed and shared decision-making that optimize outcomes.

To promote respectful care, states can consider pursuing:[103]

- Training for care providers in promoting respectful care
- Revision of professional ethics and practices
- Strengthening of facility quality improvement systems for monitoring, reporting, addressing, and resolving disrespect and abuse cases
- Mentorship and on-the-job role-modeling by identified champions within the facility as part of routine continuous professional education has been demonstrated to shift team culture



USAID's Respectful Maternity Care Toolkit

In 2013, USAID's Maternal and Child Health Integrated Program (MCHIP) launched their Respectful Maternity Care (RMC) Toolkit* to provide clinicians, trainers, managers and other partners involved in the provision of maternity care with the tools necessary to begin implementing RMC in their area of work or influence. The toolkit includes resources such as surveys and briefs on experiences in 19 countries (including the United States), training materials, assessment tools, job aids, and resource lists. Training materials include a Learning Resource Package,** which provides materials necessary for a one-day respectful maternity care workshop for clinicians. The toolkit can help change and develop attitudes in clinicians and among colleagues and other partners in the care of pregnant and postpartum people and their newborns. The goal of this toolkit is to empower frontline health workers to provide RMC, allowing people and their families to experience better maternity care and to choose to deliver with a skilled provider at home or, preferably, in a health facility. The ultimate impact of more women using skilled birth services during childbirth will be reduced newborn and maternal deaths.

*https://blog.usaid.gov/2013/06/maternity-care-toolkit/
**https://toolkits.knowledgesuccess.org/toolkits/respectful-maternity-care/learning-resource-package

Strategy 4.2: Promote standardized management of clinical situations

Processes to ensure that patients with similar clinical scenarios receive the same evidence-based care may also address inequities in quality of care. ACOG recommends using protocols and checklists for guiding management of clinical situations, and engaging obstetrician-gynecologists to foster buy-in and create consensus.[245] Clinicians' lack of knowledge is cited as a barrier to accurately managing clinical situations; integrating protocols and checklists into practice may address this barrier. Periodic drills and simulation exercises may improve clinician and facility readiness for obstetric emergencies.[256] It is important for all maternal care providers, including midwives and family medicine physicians, to remain aware of current practice recommendations and protocols to provide the best evidence-based care to patients. ACOG, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), and the American Academy of Family Physicians (AAFP) develop documents such as Practice Bulletins/Briefs, Committee Opinions, Position Statements/Papers, and Patient Safety/Practice Improvement Checklists that support the standardization of care and improvements in the delivery of quality care.

In addition, ACOG developed the Alliance for Innovation on Maternal Health (AIM) maternal safety bundles, which provide standard guidelines for clinicians to put into practice.[257] The AIM Program, funded by HRSA, is a national maternal safety and quality improvement initiative focused on implementation of maternal safety bundles, also known as patient safety bundles.[257] The safety bundles are designed to assist clinicians, hospitals, and health systems in improving readiness, recognition, response, and review/reporting.[110] Currently, AIM supports seven primary maternal safety bundles (https://safehealthcareforeverywoman.org/council/patient-safety-bundles/maternal-safety-bundles/), including bundles for obstetric hemorrhage, severe hypertension in pregnancy, obstetric care for women with opioid use disorder, and safe reduction of primary cesarean birth, which are adaptable to the local context of a hospital or hospital system.[110, 257, 258] Health equity is an important consideration when assessing success of standardized clinical management tools like the AIM maternal safety bundles. The Louisiana Perinatal Quality Collaborative launched the Reducing Maternal Morbidity Initiative to address preventable maternal mortality and morbidity related to hemorrhage. Based on recommendations from the AIM Reduction of Peripartum Racial/Ethnic Disparities and other best practices, strategies for applying a health equity lens included addressing implicit bias in their facilities and stratifying process and outcome data by race and ethnicity. The final report summarized findings that while non-Hispanic Black birthing persons are still more likely to experience SMM among hemorrhage, the rate decreased almost 50% from baseline compared to a 15.7% decrease among non-Hispanic White birthing persons, reducing disparities.

Strategy 4.3: Partner with Perinatal Quality Collaboratives to improve and standardize clinical care and community linkages

Perinatal quality collaboratives (PQCs) are state or multi-state networks of hospital teams working to improve the quality of care for mothers and babies. PQCs identify health care processes that need improvement and use the best available methods to affect rapid change. PQCs can cultivate hospital "buy-in," helping to mobilize hospitals for quickly adopting best practices, supporting large-scale systematic care quality improvement.[259] Broad provider participation in state-based PQCs can foster an iterative cycle of development, implementation, and evaluation of clinical protocols that improve care quality.[138] The CDC provides technical assistance to states in developing and sustaining PQCs (https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pdf/Best-Practices-for-Developing-and-Sustaining-Perinatal-Quality-Collaboratives_tagged508.pdf).[260] Maternal safety bundles are often first developed and tested within PQCs; these collaboratives are often the infrastructure that support implementation of AIM maternal safety bundles.

PQCs have been successful in reducing negative maternal and neonatal health outcomes. For example, the Illinois PQC reduced severe maternal morbidity by 41% among persons with hypertension at delivery through a two-year quality improvement process to implement protocols for recognizing, preventing, responding, and learning from severe maternal hypertension events.[261] The New York State PQC reduced scheduled deliveries without a medical indication by 98% by developing policies and practices related to scheduled deliveries, system changes, and staff education.[262] The Northern New England Perinatal Quality Improvement Network improved care for women with opioid use disorder, increasing access to medication-assisted treatment (26% to 36%) over a 13-month time period.[263] PQCs are a key partner for implementing the clinical prevention recommendations of MMRCs to improve maternal health outcomes in hospitals and across health facility networks. In addition, continuous monitoring and review of data is a critical component of the PQCs. PQCs have reported success in improving the quality of vital statistics data that can inform action to improve maternal health broadly. For example, the Ohio PQC developed and disseminated tools to define and record important birth registry variables to improve the data available on the health of birthing persons and newborns and reduce the "unknown" information.

PQCs, through improved data collection on race and ethnicity, and the use of that data in quality dashboards, have opportunities to help monitor where disparities in intervention impact are occurring.[264] In addition, PQCs can increase hospital engagement in quality improvement initiatives, with a focus on including low-resourced and minority-serving hospitals. By engaging patients and families in quality improvement initiatives, as part of hospital teams and during the initiative design process, PQCs and hospitals can incorporate the patient perspectives that can increase the success of quality improvement initiatives.[144, 265] In addition, increasingly, PQCs are working to also improve clinical-community linkages to improve care for the pregnant and postpartum people they serve.[260]

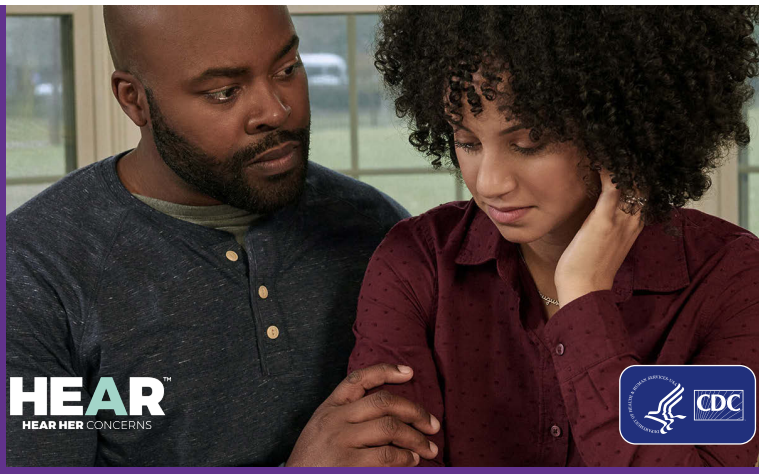
Strategy 4.4: Educate patients, their support networks, and clinicians about warning signs

Broadly increasing awareness about the signs and symptoms associated with the most common causes of maternal mortality is an important prevention strategy. Efforts to increase awareness should focus on not only patients and their support networks but also non-maternity clinicians who may provide medical care for pregnant and postpartum persons.

Knowing which signs to be concerned about during pregnancy and after delivery can better prepare pregnant and postpartum persons and their families to identify when and how to seek medical attention. The need to educate pregnant and postpartum persons and their families about these warning signs is supported by recommendations from MMRCs and professional medical associations (e.g., AWHONN, ACOG, SMFM).[266-268] Education about warning signs most often occurs postpartum when leaving the delivery hospital.[268, 269] Therefore, an important intervention target may be to improve how providers communicate with their patients about warning signs during prenatal care, at or before discharge from the hospital, and during postpartum visits. Tools, such as the AWHONN Post-Birth Warning Signs tool, are available to help providers educate their patients on potential complications and warnings signs in a manner that is easy to understand and actionable, so that patients know when and how to seek care.[205, 268] In addition to provider communication, MMRCs have recommended the use of public education campaigns and other community-based efforts tailored specifically to signs and symptoms of common complications.[88]

Pregnant and postpartum persons may receive medical care in non-maternity settings such as primary care offices, family practices, emergency departments, and by first responders. Increasing knowledge of warning signs among healthcare providers in non-maternity settings, who may care for pregnant and postpartum persons, can improve accurate and timely diagnoses of complications.[268] Ensuring that healthcare providers in these non-maternity settings are aware of the warning signs and that they ask persons in their care who could become pregnant if they were recently pregnant (up to a year postpartum) is critical to their receiving timely and appropriate care.[270]

CDC's Hear Her Campaign



In August 2020, CDC launched Hear Her,* a national campaign that brings attention to pregnancy-related deaths and raises awareness of potentially life-threatening warning signs during and after pregnancy. Hear Her empowers pregnant and postpartum people to speak up when something does not feel right. The campaign encourages partners, friends, family, and healthcare providers to listen and engage in important conversations with pregnant and postpartum people when they express a concern.

Recognizing urgent maternal warning signs** and getting an accurate and timely diagnosis can save lives during pregnancy and up to a year after delivery. The campaign features compelling personal stories from women of diverse backgrounds who experienced severe pregnancy-related complications.

* http://www.cdc.gov/hearher

** https://www.cdc.gov/hearher/maternal-warning-signs/index.html

Implementing obstetric early warning systems in all hospitals, including lower resourced hospitals, can standardize timely recognition of and response to potential complications and potentially reduce both negative outcomes overall and disparities within those outcomes.[20, 111] The Maternal Early Warning Criteria, a list of abnormal parameters that indicate the need for a clinician's urgent evaluation, is a practical tool that can prevent maternal mortality by facilitating timely recognition and response to serious complications as they are developing.[88, 270] Another obstetric early warning system tool, the Maternal Early Warning Trigger is designed to help clinicians identify and respond to the four leading causes of maternal morbidity.[271]

Goal 5: Strengthen maternal mortality data

Accurate and timely maternal mortality data are essential for understanding the burden and informing prevention efforts at the individual, provider, facility, system, community, state, and national levels. Strengthening maternal mortality data ensures you have complete and accurate data on impacted populations to fully understand how contributing factors and recommendations may differ by characteristics (e.g., race/ethnicity/geography). Evaluating efforts to strengthen maternal mortality data are part of a continuous cycle of improvement that advances prevention recommendations and informs the selection of potential implementation strategies.

Systematically strengthening the identification, abstraction, and review of pregnancy-associated deaths will help identify disproportionately affected populations and provide robust information on contributing factors and MMRC recommendations for prevention. This will ensure that when disparities are identified, relevant recommendations to address them are also available. As new prioritized recommendations become available, revisiting the scope of the problem in Step 1 and context of the solution in Step 2 can identify new opportunities for strategy selection and successful implementation.

Strategy 5.1: Strengthen identification of pregnancy-associated deaths through quality assurance and improvement of death record data

Death records are central to the identification of pregnancy-associated deaths but have known issues in the accuracy of data on pregnancy status, leading to both under- and over-identification of pregnancy-associated deaths based on death record information alone.[272] Because maternal mortality is a relatively rare event, small mistakes on death records can have substantial impacts on measurement and quality. Under-ascertainment of deaths means that MMRCs miss some deaths in their reviews, potentially providing an incomplete picture of the opportunities for preventing pregnancy-related deaths. Over-ascertainment of deaths can result in wasted resources spent on pursuing the abstraction of medical and non-medical records for deaths that were not associated with pregnancy (i.e., false positives).

States can improve maternal mortality data quality by conducting quality assurance processes on death records by verifying that deaths with indication of a relationship to pregnancy on the death record were reported accurately and by training certifiers to improve completion of death records.[272, 273] Since MMRCs already link death records with applicable birth or fetal death records to identify pregnancy-associated deaths, states can focus their quality assurance processes for verifying pregnancy status on deaths identified solely based on death record information (i.e., deaths that do not link to a birth or fetal death record). An example of this quality assurance process is provided in **Figure 5.**

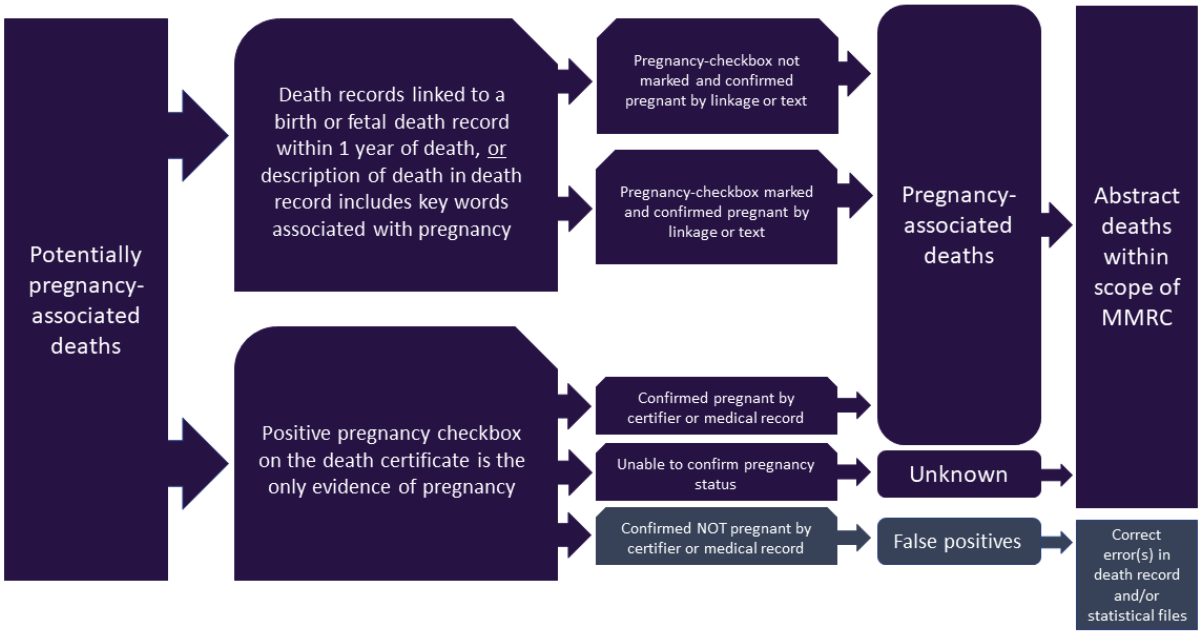


Figure 5. Example of quality assurance process for verifying pregnancy status on deaths identified solely based on death record information. Adapted from Catalano, et al[272]

Representatives of four states participated in a year-long pilot to improve death record data used to identify pregnancy-associated deaths. They identified the following opportunities for other jurisdictions in considering similar quality assurance processes for verification of pregnancy status on deaths identified solely based on death record information:[273]

- Providing a concise, standard training to certifiers on the completion of death records can prevent errors and reduce the burden of validating data
- Raising awareness of the pregnancy checkbox among certifiers and health departments can elevate attention to data quality, prompt more careful completion of death records, and increase support for quality assurance projects
- Conducting timely verification follow-up, within 1 to 3 months of the death, preserves certifier memory and ensures better accuracy
- Build on existing relationships between state Vital Records Offices and Maternal and Child Health Programs can facilitate better responses from certifiers when conducting follow-up to confirm cases
- Sending clearly written query letters when requesting information about a death record may provide timely responses from certifiers

Strategies for improving death record information used by the MMRC include improving the accuracy of the timing of death in relation to pregnancy reported in a death record. The death record pregnancy checkboxes capture information on pregnancy status of persons at the time of death and one year prior to the death. If the decedent was pregnant in the last year, the death certifier can indicate the timeframe in which they were pregnant (i.e., at the time of death, within 42 days,

Impacts of Implementing Death Record Quality Assurance Processes

In 2016, four state health departments (Georgia, Louisiana, Michigan, Ohio) implemented a pregnancy checkbox quality assurance pilot to improve accuracy of the pregnancy checkboxes on death records and resultant state maternal mortality estimates.[267] Of the deaths identified as being associated with pregnancy in these 4 states based on the pregnancy checkbox information, 21% were confirmed to not have been pregnant through the quality assurance process. Further, for those without linkage of birth nor fetal deaths within the year of death, 46% were confirmed to not have been pregnant.[267] These four states were able to develop achievable best practices in validation of pregnancy status for timely confirmation or correction.[268]

between 43 days and 1 year). Because the timeframe is used to determine the appropriate ICD coding, it is important for certifiers to correctly identify the pregnancy status of a decedent. Some states are currently implementing and evaluating edits to their state electronic death registration systems, which will trigger a confirmation request of the death certifier at the time they input the pregnancy checkbox information, helping to reduce pregnancy-checkbox errors.

Another example is improving the descriptive Cause of Death section by providing instructions for medical examiners, coroners, and other death certifiers on how to complete a death record when a death occurs during or within a year of pregnancy. The Cause of Death section of the death record, Parts I and II, is where the medical certifier documents the Causes of Death (Part I) and Other Significant Conditions (Part II). These are used together with the pregnancy checkbox information in the death record to help identify and code deaths associated with pregnancy. If pregnancy caused or contributed to the death directly or indirectly, words associated with pregnancy should appear in the Cause of Death description and/or the description of Other Significant Conditions. By providing death certifiers examples of words that clarify an association with pregnancy that can be a part of the Cause of Death or Other Significant Conditions descriptions, it can help with the identification of pregnancy-associated deaths. Examples of modifying words that death certifiers can use include delivery/delivered, ectopic, gestational age, obstetric, and pregnancy/pregnant.

Strategy 5.2: Improve MMRIA data through expansion of available data sources for abstraction

MMRC data can be the most comprehensive source of data for informing population-level prevention opportunities to reduce maternal mortality.[274, 275] High-quality MMRC data begins with the quality of data abstracted into the Maternal Mortality Review Information Application (MMRIA). These data describe each person's life and the events that led to their death, enabling MMRCs to understand the circumstances surrounding each death and develop recommendations for action that will prevent similar deaths in the future.[276] Keys to generating high-quality MMRIA data include accessing a variety of medical and non-medical records relevant to each individual death and entering data accurately into relevant MMRIA fields.[277-279] Amount and types of available records vary across individual deaths, as does relevance of specific MMRIA fields. One strategy to improve overall quality of MMRIA data focuses on expanding types of data sources that a MMRC attempts to access for abstraction.

Lacking specific sources or types of information can present barriers to formulating comprehensive narratives, committee decision making, and/or analyzing MMRC data. Commonly lacking data sources include specific types of medical records, such as emergency transport records, or non-medical records sources such as informant interviews and interaction with social services or law enforcement. For example, not accessing emergency transport reports may limit the MMRC's ability to determine whether a person was transported quickly and appropriately and the role that this played in contributing to their death; these records can also provide key contextual information that is not always provided in other records. Some data sources such as death records may be accessed by a MMRC under existing statutes, but others may require specific changes to rules or statute or establishment of a formal agreement (e.g., data sharing agreement, memorandum of understanding). Access to a range of data sources is crucial for understanding factors before, during, and after pregnancy that may have contributed to a death.

Tennessee's use of Prescription Drug Monitoring Program Database

Tennessee began using the Prescription Drug Monitoring Program (PDMP) database as a record source for pregnancy-associated overdose deaths, but quickly expanded to now looking up controlled substance prescriptions on all pregnancy-associated deaths regardless of cause or manner of death. This additional data source widely informs committee deliberations and provides information to further consider in some of the deaths where substance use screening was not utilized. Also, Tennessee searches the PDMP database for each death during the abstraction process to identify their medical providers in order to request records for MMRC reviews.

Autopsy reports

Information from an autopsy report can be critical in understanding the medical contributors to a death. Autopsies provide objective information based on internal and external physical examinations and laboratory testing to check for the presence of infectious diseases and substances. Increasing the availability and quality of autopsy information can be helpful in ensuring that complete information is accessible to a MMRC. However, states vary in terms of rules and statutes governing which deaths require referral for a forensic autopsy, including pregnancy-related deaths.[280] In the United States, an autopsy is conducted for an estimated 64% of pregnancy-associated deaths.[281] In addition, states may not have the funding or staffing to fully implement forensic. By comparison, in the United Kingdom an autopsy is conducted for 80% of pregnancy-associated deaths.[282] Other reasons for not performing an autopsy include lack of funding for the costs of autopsy services and refusal by the decedent's family.

Efforts to Increase Maternal Autopsy Numbers and Quality in Washington State

After conducting its first review of maternal mortality from 2014-2015, the Washington State Department of Health Maternal Mortality Review Panel (MMRP) found that pregnancy-related deaths were not consistently being referred to local coroner and medical examiner offices. In addition, when referred, pathologists did not always perform autopsies for referred deaths and the quality of completed autopsies varied, causing pathologists to miss causes and contributing factors for death. The Washington MMRP identified lack of quality autopsy information as a barrier to committee decision making that help the state's MMRP identify strategies for improving maternal health.

To improve the number and quality of maternal autopsies, Washington passed a law requiring birthing hospitals and centers to refer the deaths of women who are pregnant, or have been pregnant within 42 days of death, to the local coroner or medical examiner's office; and provided a funding source for these autopsies.* Once referred, local medicolegal systems have to conduct a full death investigation, with autopsy strongly recommended, using the Department's guidelines for maternal death autopsy.** Information from improved death investigation quality will facilitate a deeper understanding of the underlying factors contributing to maternal mortality and help the state improve health systems and policies for prevention.

* Maternal mortality review panel—Duties—Confidentiality, testimonial privilege, and liability—Identification of maternal deaths—Reports—Data-sharing agreements, RCW 70.54.450 (2016).

**https://www.doh.wa.gov/Portals/1/Documents/Pubs/350-030-MMRAutopsyGuidelines.pdf

Informant interviews

While MMRCs have access to a variety of both clinical and non-clinical data sources, many times these do not capture the full lived experiences of the person and their close family or friends. Informant interviews offer rich qualitative data to complement existing data sources and assess the contributing factors to each death to make more detailed recommendations for prevention. However, few MMRCs currently conduct informant interviews as part of their abstraction and review processes. These interviews may be especially important for documenting missed opportunities for diagnosis and care or experiences of discrimination. experiences of discrimination.[283]

Incorporating Informant Interviews into the Georgia MMRC Process

To gain information that tells a more complete story than available in records alone, Georgia added a part-time licensed clinical social worker to the MMRC staff to conduct informant interviews on pregnancy-associated deaths. Vital records and/or medical records are used to identify an informant, such as a family member or close contact of a decedent. Outreach and informed consent are completed via mail and phone. All interviews are completed by phone. In follow-up, a 'thank you' letter and resource guide are shared with the informant by mail. A written summary of the interview is included in the case narrative presented to the MMRC. Georgia's approach was developed based on the CDC Informant Interview Guide.*

The additional information gained from informant interviews helps to understand barriers to accessing and adhering to care, experiences of discrimination in care, structural inequities, use of community resources and services, and feelings, supports, and stressors that were part of the individual's life during pregnancy and postpartum. This facilitates a more comprehensive case review with enhanced learning of factors that contribute to pregnancy-associated death, and more effective recommendations for preventing future deaths. Some examples from the Georgia MMRC experience that informed case decisions include:

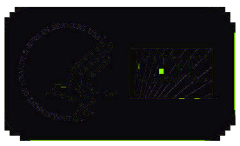
- Decedent experienced postpartum depression leading up to her suicide. This information assisted the MMRC in determining pregnancy-relatedness of the death.
- Decedent lost her insurance and could not afford her prescriptions, and so she and her sister (affected by the same condition) would share medication.
- Decedent has a personal defibrillator for her heart condition but was not wearing it as directed because she was scared it would shock her newborns when she was holding them.
- Decedent was in an abusive relationship. While documentation of intimate partner violence was absent from her medical records, the informant shared that the police were called 7 days before the death. The MMRC staff then accessed the police records, including the lethality screen, to more fully understand the decedent's story.

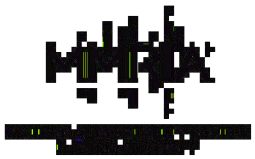
"I want to tell you how much I appreciate being able to have this conversation. On behalf of my whole family, it's important for us to know that Georgia really does care." – Informant

*https://www.cdc.gov/reproductivehealth/maternal-mortality/docs/pdf/MMRC-Informant-Interview-Guide_tagged_508c.pdf

Strategy 5.3: Improve MMRC data through comprehensive review of pregnancy-associated deaths and complete documentation of committee decisions

Comprehensive review of pregnancy-associated deaths ensures your committee is making specific and accurate decisions, including recommendations that address contributing factors to each death. An aggregate report of MMRC data from 9 states, found only 2% of factors identified by MMRCs as contributing to pregnancy-related deaths were community level factors.[266] There are opportunities to improve MMRCs' abilities to identify community-level contributors, such as expanding committee membership, adding interviews, expanding on the data sources collected or identifying community-level contributors by integrating socio-spatial information into case discussions. During the process of analyzing and using your MMRC's data to identify priority recommendations, you may have found a need to improve the quality of recommendations made by the committee, either in documentation and/or content.





Reexamining MMRC representation

Comprehensive review requires a breadth of disciplines and perspectives for ensuring factors surrounding a death are fully understood and considered as your committee makes its decisions. Members who can provide perspectives on the person's community context are important. As such, MMRCs across the country are recruiting individuals and organizations that represent communities most affected by maternal mortality in the state. Community-based representatives can offer a unique perspective in MMRCs due to their knowledge of lived experiences in the communities where they work, including structural and social determinants of health and make connections to prevention recommendations based on community resources that could have a role in preventing future deaths. Without a broad spectrum of members, an MMRC may miss the chance to understand the contexts of the death and to document key prevention recommendations.[284]

Having members who can provide broader clinical and non-clinical insight on maternal health, such as maternal mental health professionals, and representatives from public and social services from across the state is useful. For example, committee decisions include whether substance use disorder or mental health conditions contributed to a death. If there is no formal diagnosis of substance use disorder, a subject matter expert (e.g., psychiatrist, psychologist, or licensed counselor) on the review committee could make this determination based on information present in the record that is consistent with the criteria for substance use disorder. Without this expertise, some committee decisions may need to be left blank or 'unknown', limiting the completeness and utility of data.

CDC's Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) program provides guidance that jurisdictions maintain a 60-40 split of clinical to non-clinical active MMRC members, and that the full committee membership work in and represent diverse communities. Members with clinical expertise might include many different disciplines or specialties such as cardiologists, obstetricians, nurse midwives, mental health providers, social workers, and forensic pathologists, while members with non-clinical expertise might include Healthy Start, state Medicaid, and violence prevention agency representatives, community advocates, clergy, and law enforcement.

Some signs that your MMRC may have gaps in committee membership include:

- Committee members struggling with decisions within specific causes or manners of death, often resulting in overly long discussions and frequently documenting decisions such as "possibly" and "unknown"
- Often repeating the same contributing factors and recommendations within specific causes or manners of death and across levels of patient/family, provider, facility, system, and community
- Committee membership not being reflective of the racial and geographic diversity of the jurisdiction, or the communities within the jurisdiction that are most affected by maternal mortality
- Lack of representation from populations or individuals who can speak to the lived experiences of those most impacted by preventable pregnancy-related mortality

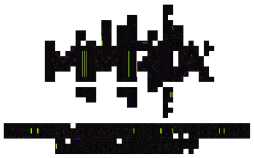
Expanding the range of expertise on a MMRC may lead to fundamental adjustments in the approach to review. The team may need to expand its view beyond a strictly patient-provider lens to the broader context of persons' lives during and after pregnancy, and beyond the hospital setting such as state Medicaid representation. These adjustments are an important step in achieving quality data from the review process and providing transparency and fostering a positive group dynamic. Even when non-clinical representative membership is present on the committee, if the expertise of non-clinical members is not equally recognized during the review discussions it is equivalent to a gap created from the absence of their membership. A MMRC's authorizing language may have requirements for committee membership which limit the ability to expand representation. In these situations, it can be helpful to explore the ability of the committee to use consultants for addressing identified gaps in expertise and perspective.

Documenting MMRC contributing factors and recommendations

Detailed contributing factors and committee recommendations, documented in MMRIA, offer specific opportunities to move data to action. Guidance on facilitating a successful committee review (https://reviewtoaction.org/national-resource/maternal-mortality-review-committee-facilitation-guide), including documenting contributing factors and formulating comprehensive recommendations, is on the Review to Action website.[260] Each recommendation for prevention should address a specific contributing factor identified by the committee. A complete contributing factor specifically defines what and how a factor contributed to a death. A complete recommendation is detailed and actionable and addresses the specific components of contributing factors, including details on who, what, and when. Complete recommendations, built on detailed contributing factor descriptions, can most successfully guide the identification of priority recommendations from the MMRC. This ultimately informs the process of selecting the strategies that can address the drivers of maternal mortality in your community. Examples of complete contributing factors at the facility level and committee recommendations are provided below:

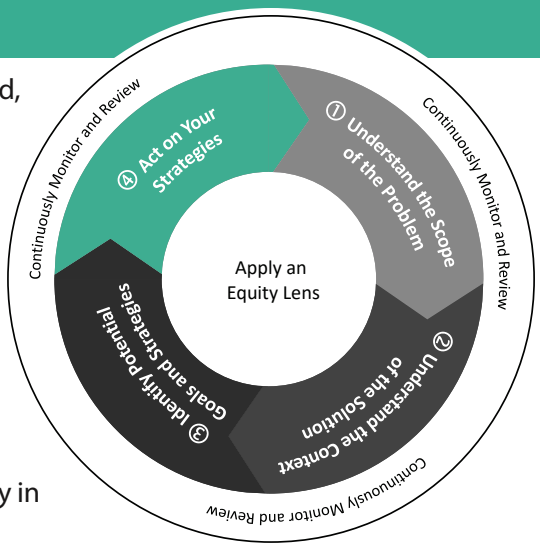
Contributing Factor Level	Contributing Factors	Description of Issue	Committee Recommendations [Who?] should [do what?] [when?]
Facility	Continuity of care/ care coordination	Delay in transferring patient to higher level of care at regional trauma center and cardiac catheter and transplant evaluation	Facilities should implement and adhere to policy/procedures for referrals to subspecialty care for patients within the first year postpartum
	Quality of care	The diagnosis of cardiomyopathy/congestive heart failure was delayed. Autopsy not performed	Facilities should implement and adhere to a policy to review of signs/symptoms of peripartum cardiomyopathy with patients during pregnancy and in the postpartum period and should provide the information in postpartum discharge instructions Facilities should refer the deaths of persons who are pregnant, or have been pregnant within 42 days, to the medical examiner for autopsy and full death investigation
	Policies/procedures	Interpretive services were not provided – family member provided limited interpretation/ translation	Facilities should implement and adhere to use of official translation services Facilities should implement and adhere to a policy of cultural competency and introduce Culturally and Linguistically Appropriate Services to all staff

Table 7. Examples of complete contributing factors at the facility level and committee recommendations



Documenting contributing factors related to drivers of health inequities are particularly salient. For example, MMRIA supports MMRCs in documenting discrimination, interpersonal racism, and structural racism in health care settings and the broader community. The Community Vital Signs indicators can also help MMRCs identify structural contributors to inequities. These community-level indicators can reflect disparate structures based on historical and contemporary social factors that systematically disadvantage certain groups.[6, 73] To illustrate this relationship, a preliminary analysis demonstrated an association between indicators of neighborhood deprivation and excess deaths per 100,000 live births among Black women.[285] Additionally, the use of the discrimination and racism fields on the MMRIA Committee Decisions Form help MMRCs to document discrimination, interpersonal racism, and structural racism as contributing factors to a pregnancy-related death based on key words, phrases and situations identified in records specific to a death. For example, progress notes that focus on past drug use rather than participation in treatment programs, unjustified assumptions about the person, lack of referrals and supports when justified, and repeated dismissiveness of signs and symptoms communicated by a person. More robust documentation of these contributing factors may lead to MMRCs developing recommendations that specifically address health disparities.[286, 287]

Step 4: Act on your selected strategies



Now that the scope of the problem and the context of the solution is understood, and potential strategies are identified, it is time to finalize selection of strategies for implementation based on an assessment of the fit of these strategies with the identified goals and with the context in which they will be implemented; to develop an implementation plan and timeline; and to plan for evaluation of these strategies.

Assessing strategies for fit

During the process of completing the previous Steps, a set of strategies may have been clearly identified as candidates for implementation. Assessing the overall fit and alignment of these strategies may help finalize selection of strategies. Answering these questions can help assess the overall fit of a strategy in alignment with equity goals:[288]

- Appropriate: Based on stakeholder knowledge of the state's MMRC data and context, are the strategies capable of addressing the prioritized issue to an extent that is satisfactory to pregnant and postpartum persons and to communities that need them? Are the strategies evidence-informed or evidence-based?
- Acceptable: Based on stakeholder perceptions of the context and on MMRC data, are the strategies compatible with the needs of the population and welcomed by the communities of focus?
- Feasible: Based on stakeholder perspectives of available funding, personnel, and resources, can the strategies be successfully implemented in the given contexts?
- Cost effective: Are there less costly ways to implement your strategy? Does the strategy need to be implemented in stages? Creating early wins may help generate more resources/partnerships for more costly interventions.

To more explicitly review the selection of strategies for implementation through an equity lens, it may be helpful to consider the following:[289]

- Equity in access: Do the strategies address issues impacting access in disproportionately affected communities, considering physical, organizational, or other structural barriers for accessing care/services?
- Equity in utilization: Do the strategies remove interpersonal and cultural barriers to utilizing care/services for pregnant and postpartum persons at greatest need?
- Equity in resource allocation: Do the strategies place resources where they are needed most or address existing issues related to clustering and maldistributions of care/services?
- Equity in quality: Do the strategies provide resources and change policies to support the adoption of new, high-quality care/services by lower-resourced care/service facilities and organizations, particularly in communities that need them most?
- Equity in health: Do the strategies focus resources and effort to reduce inequalities that contribute to health disparities?

Revisit Step 2 and consider reassessing contextual factors that can influence implementation of strategies such as community and organizational factors, and available resources (i.e., human, financial), and public health, clinical, and community partners. It may be helpful for this process and may involve collecting additional information. Some potential ways for gathering this qualitative data include conducting key informant interviews, focus groups, and/or community meetings. Some questions might be answered with structured questionnaires distributed through web-based survey platforms. Key partners from a variety of organizations as described above in this guide, including community representatives, will ideally be

involved in answering these questions to ensure a diverse perspective is part of the decision-making process. Understanding contextual factors also can be useful as part of the evaluation process to understand the extent to which the strategies were successfully implemented and had the desired impact.

Implementation plan and timeline

With the strategies for implementation identified, the next step is to develop an implementation plan, logic model, and timeline for the strategies selected. Successful implementation begins with considerations of goals and objectives, performance measures, role for partnerships, community and partner engagement, budget and resources needed, and plan for evaluation. The logic model development process can be a mechanism for helping communities and partners and engage in defining goals, objectives, and performance measures. Logic model discussions can facilitate clarifying partnership roles, people impacted, and required resources. As part of the implementation plan it is equally important to develop a plan that includes (1) evaluating the implementation of your intervention to help you identify and address barriers to implementation (process evaluation), and (2) evaluating the intended outcomes (outcome evaluation). Including a timeline for implementation provides a common understanding of milestones and dependencies between activities and can identify places where efforts need to be redirected.

The implementation plan may reflect multifaceted actions packaged together within a strategy. For example, if the strategy focuses on a quality improvement initiative at the health care facility-level, discrete actions to implement that strategy may include:[290]

- *Partner with patients/consumers and family members who can provide context:* Engage patients/consumers and families during the planning and implementation of an AIM bundle
- *Assess facilities organizational capacity to understand readiness and identify barriers and facilitators:* Assess various aspects of health facilities to determine their degree of readiness to implement, barriers that may impede implementation, and strengths that can be used in the implementation
- *Develop protocols to standardize care and educational materials that reinforce and support the desired improvements in quality of care:* Develop and format manuals, toolkits, protocols, and other supporting materials in ways that make it easier for health facilities, health care systems, and other partners to learn about the innovation and for clinicians to learn how to deliver the clinical innovation

When considering which strategies to include in your implementation plan, consider those that address contributing factors across multiple levels - patient, provider, facility, community, and system.[288]

Evaluation plan

The overall evaluation of a strategy or initiative provides an opportunity to both improve activities undertaken to reduce risks of maternal mortality and morbidity, and to assess the impacts of those activities. Continuous monitoring and reviewing that occurs iteratively across steps is important for assessing factors associated with implementation of the selected strategies to improve both implementation and verifying that your actions are having the intended effect. One of the most common approaches for doing this is the Plan-Do-Study-Act Method (http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx).[159] In this approach, organizations develop a Plan for what they want to implement or change, carry out the activity or change (Do), assess whether efforts are being implemented as planned using metrics that are easy to collect (Study) (and if not, why?) and then act on what they learned to quickly improve their efforts.[291, 292]

When designing the evaluation, there are opportunities to include equity through the steps of defining aims, establishing measures, and defining how measures will be stratified for reporting. Ensuring partner and community engagement in evaluation planning increases buy-in and common understanding of aims and objectives of a strategy. Community and organizational factors and resources may be inputs for the implementation plans that lay out how the strategy's activities are operationalized and lead to results. Identified barriers to equitable implementation may be addressed by activities within selected strategies and progress evaluated as a short-term outcome. Use of accurate data with relevance to the community to assess intended outcomes supports acceptability.[293] Data stratification by intended outcomes is also essential to ensure

that disproportionally impacted populations are benefitting equitably from implemented strategies.[294] Identify venues to share these evaluation data with key partner and community audiences, using with opportunities to receive continuous engaged feedback.[295] Ongoing engagement with relevant partners, such as community organizations, patients, and families during the design of the review and evaluation approach, then feedback throughout implementation can help ensure timely and appropriate adaptations are tailored to patient and family needs.[296]

The CDC provides a framework and associated tools (https://www.cdc.gov/eval/approach/index.htm) that can be used to assist in designing and carrying out a step-by-step evaluation:[297]

1. Engage communities and partners in planning the evaluation
2. Describe the intervention
3. Focus the evaluation on topics that communities and partners feel are most important
4. Gather credible evidence
5. Justify conclusions by connecting them to the data that was gathered
6. Make sure that what is learned is used to improve the program and is shared with communities and partners

Some organizations and programs, such as smaller community-based organizations, may lack the expertise and financial resources to fund independent evaluations, though the results of such evaluations can identify barriers to implementation and ensure that effective programs are appropriately scaled to benefit pregnant and postpartum persons and their families state-wide.[298] Evaluation data provide the evidence for what strategies work, for whom they work, and in what context. States can play an important role in funding such evaluations and then scaling effective programs. As discussed in Step 2, understanding the organizational capacity, available resources, and partners that can contribute to planning and conducting an evaluation can be valuable in scaling effective programs.

Consider implementing an economic evaluation that includes information about how overall population health gains may be achieved through a proposed strategy or initiative when making the case for investment in selected strategies. It may be helpful to demonstrate a return on investment, such as reductions in medical costs and societal benefits such as increased productivity. Learning from previous economic evaluations, or planning to conduct your own, can provide you with data to help you determine if your strategy or initiative is cost-effective.[299, 300] Economic evaluations that assess cost-effectiveness consider potential gains from implementing prevention strategies which can support discussions about resource allocation.

Ensuring the Sustainability of Program Operations through Braided Funding in Missouri

In 2019, the Missouri Pregnancy Associated Mortality Review (PAMR) program at the Missouri Department of Health & Senior Services determined that using funding from multiple sources would promote longer term sustainability of staffing for PAMR operations. Prior to 2019, the PAMR program staffing was fully funded through Title V Maternal and Child Health Block Grant program resources. When new resources became available under the CDC's Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) opportunity, Missouri program leadership decided to maintain the Title V investment in PAMR but also to augment with the additional resources. Overall, this approach of 'braided' funding from multiple sources for core MCH investments in Missouri increases the resources for this important program.

Table 8 below offers a summary of the different types of economic evaluations to consider which may be most appropriate:[299]

Economic Evaluation	Description	Measures	Considerations
Cost-effectiveness analysis (CEA)	Compares different strategies designed to impact the same outcomes	Cost-effectiveness ratio	Am I deciding between two different strategies that affect the same health outcome to choose the most cost-effective option? Do I know the total cost savings of implementing potential strategies and their relative effectiveness on the outcome of interest?
Cost of illness analysis	Disease economic burden	Net cost ($)	Will understanding the total economic burden of the outcome influence decision makers and policy?
Program cost analysis	Net program cost	Net cost ($)	What is the distribution of costs associated with implementing prevention strategy or initiative? Will understanding the cost breakdown of implementing a strategy impact how we allocate resources?
Cost-benefit analysis	Compares different strategies with different outcomes	Benefit-cost ratio	Will the benefits of the strategy or initiative implemented exceed the costs? Can I quantify total benefits and costs into monetary units?

Table 8. Summary of different types of economic evaluation

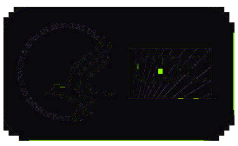
A key aspect of planning to implement a strategy is the development of a mechanism to define goals, objectives, and performance measures. While logic models help with development and implementation of a strategy or initiative, they are also important for continuous monitoring and review and evaluation purposes, providing an organized way to identify the activities, outputs, and outcomes that an evaluation can assess.[85] A logic model depicts how a strategy's activities are operationalized to lead to specific, direct results.[301] Short-term outcomes are the immediate desired impacts of your strategy or the strategies in your initiative. Long-term outcomes are downstream impacts achieved in years to decades by the initiative overall. Intermediate term outcomes are relevant milestones between the short- and long-term outcomes.[301]

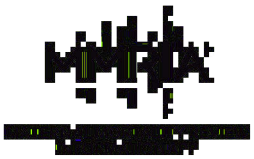
As part of focusing the evaluation, determine what question(s) the evaluation is poised to answer. One important aspect of evaluation planning focuses on identifying process indicators related to the implementation of the selected change strategy or initiative. This type of data is used on an ongoing basis to improve strategy implementation. If a strategy does not achieve the expected outcome, it is important to be able to determine whether this might be because of a problem related to a component of implementation. For example, a provider training that leads to no change in provider practices may simply be an ineffective training. However, if the evaluation indicated that training did not cover all topics because there was not enough time, or if only a small percentage of providers completed the training, then those conducting the program have valuable information for improving the program and increasing effectiveness.

Table 9 below defines 8 common implementation outcomes and possible methods to measure them.[288, 302] Assessment of these outcomes allow continuous monitoring and review of the implementation process.

Implementation outcome	Definition	Other terms used	Assessment	Ways to measure
Acceptability	Perception among the community that the intervention is agreeable or satisfactory	Satisfaction with various aspects of the intervention (e.g., content, delivery, credibility)	Based on the community's knowledge of or direct experience with the content and context	• Surveys • Interviews • Focus groups • Community meetings
Adoption	Intention, initial decision, or action to try or employ an intervention	Uptake, utilization, initial implementation, intention to try	Based on stakeholder perspectives	• Observation • Surveys • Interviews
Appropriateness	Perceived fit, relevance, or compatibility of the intervention for a given setting, population, or problem	Suitability, usefulness	Based on stakeholder perceptions of context	• Surveys • Interviews • Focus groups • Community meetings
Feasibility	Extent to which the intervention can be successfully used or carried out within a given setting	Actual fit or utility, suitability	Based on stakeholder perspectives	• Surveys • Interviews • Focus groups
Fidelity	Degree to which an intervention was implemented as intended by its developers	Adherence, integrity, quality of program delivery	Compare original intervention or program with the implemented intervention or program	• Observation • Checklists • Self-report
Implementation Cost	Cost impact of an implementation effort	Marginal cost, cost-effectiveness, cost-benefit	Calculate true cost of implementing, based on strategies used and location	• Administrative data
Penetration	Integration of an intervention within a setting or system	Level of institutionalization, spread, service access	Calculate the number of persons affected by the intervention divided by the total number of persons expected to be eligible for the intervention	• Case audit • Checklists
Sustainability	Extent to which the intervention is maintained or institutionalized over time	Maintenance, continuation, durability, incorporation, integration, institutionalization, sustained use, long-term viability	Based on level of incorporation (e.g., transition from temporary to permanent funding, integration into all subsystems of an organization)	• Case audit • Interviews • Checklists • Questionnaires

Table 9. Terminology of implementation outcomes[288]





A subsequent set of considerations for evaluation planning focuses on determining whether the selected strategy has the expected impact. The short-, intermediate-, and long-term outcomes identified in the logic model help to clarify appropriate measures for monitoring and evaluation. In the provider training example, the evaluation might examine whether outputs, such as provider practices, improved or whether outcomes, such as earlier treatment of a specific maternal health condition, were achieved. Discussions with partners, others that have implemented similar strategies, and consideration of available evaluation resources help organizations specify which outcome evaluation questions to ask. As noted in Step 2, it may be helpful to demonstrate a return on investment, such as reductions in medical costs, and societal benefits, such as increased productivity.

Results from the evaluation need to be reviewed as part of an on-going, intentional process to determine needed improvements so the implementation of the strategy is more effective.[303] Guidance for use of the CDC evaluation model recommends that interim evaluation findings and provisional interpretations be provided continuously to partners, and that a plan for follow-up meetings with partner is in place. The goal of these efforts is to increase the likelihood that evaluation conclusions influence actions and decisions associated with the initiative.[304]

In conclusion: moving data to action

Preventing pregnancy-related deaths will have lasting impacts for both families and for society as a whole, saving lives, halting the intergenerational effects of maternal mortality, and strengthening maternal health throughout the nation. Centering on equity and amplifying the voice of the disproportionately impacted communities are critically important when taking actions to prevent maternal mortality. Success hinges on maximizing use of the states' maternal mortality data, prioritized MMRC recommendations, and assessing the context for implementing strategies to address the priority recommendations. Once the strategies have been selected, considering appropriate fit, creating an implementation plan and timeline, and continuous monitoring and review of implementation and evaluating impacts are how states bring data to action.

The best strategy for one state is not necessarily the best for another; there is no "one size fits all" approach. State MMRC data represent the most comprehensive data source to inform prioritizing policies, processes, clinical care practices, or public health actions best suited for a state's context. Other data sources, such as PRAMS, Medicaid, hospital discharge data, or listening sessions with pregnant and postpartum persons and their families can provide additional information to better understand the factors that may be influencing key aspects maternal health and wellbeing. Assessing state and community context, organizational capacity, financial implications, and public health, clinical and community partners will also help states chart a path forward that is best poised for success.

This guide provides goals and strategies for consideration to achieve equitable outcomes, but successful actions to prevent pregnancy-related deaths require broad efforts addressing multiple strategies tailored to the communities most impacted. Continuous review and evaluation of the initiative and its implementation and outcomes can help states and public health, clinical, and community partners course-correct to strengthen processes, identify gaps, and if need be, try different approaches.

The death of a person during pregnancy, at delivery, or in the year afterward is a tragedy for their family, community, and society as a whole. Sadly, approximately 700 pregnant or postpartum persons die each year in the United States as a result of pregnancy or delivery complications.[305] There is no acceptable level of maternal mortality, and nationally, the United States has not seen improvements in recent years.

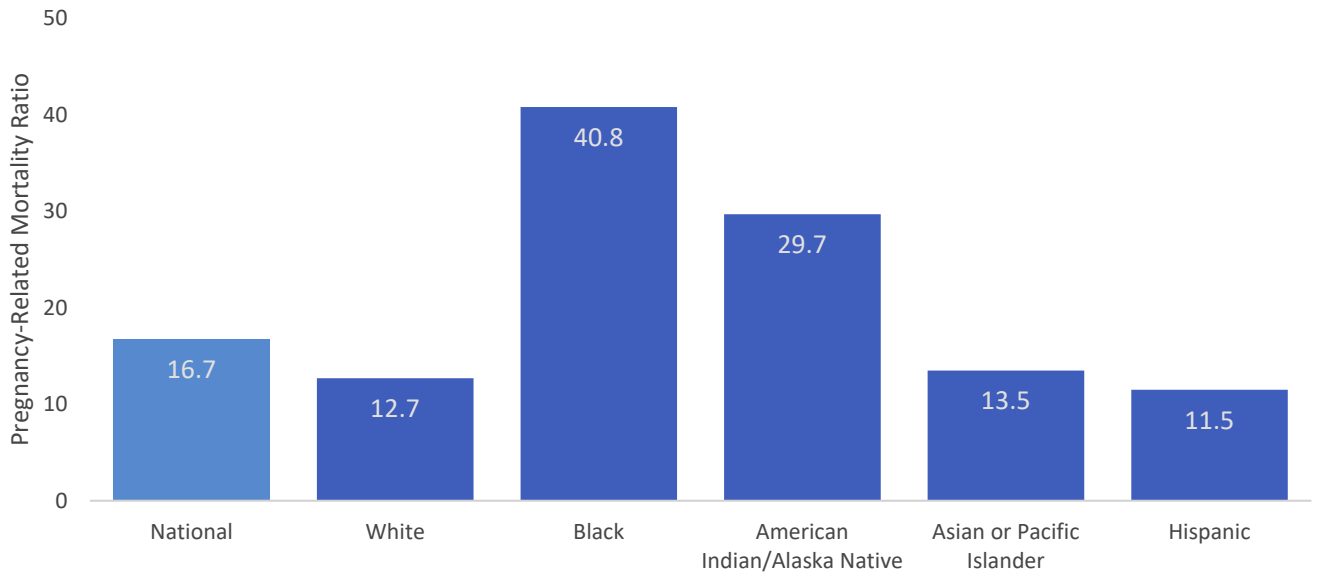
The Pregnancy Mortality Surveillance System (PMSS) defines a pregnancy-related death as the death of a person while pregnant or within 1 year of the end of pregnancy from any cause related to or aggravated by the pregnancy. PMSS is used to calculate the pregnancy-related mortality ratio (PRMR), an estimate of the number of pregnancy-related deaths for every 100,000 live births. The PRMR, and leading causes of pregnancy-related death, have not changed appreciably from 2007–2016.

The PRMR was 16.0 deaths per 100,000 live births in 2006–2010 and 17.2 deaths per 100,000 live births in 2011–2016.[29] It is unclear how changes in population risks for pregnancy-related deaths, such as increases in maternal age and chronic conditions, and/or changes in the identification of pregnancy-related deaths influenced the observed trends in the PRMR.[272] Leading causes of death were unchanged over a similar time period. In 2006–2010 and 2011–2016, heart disease caused nearly 1 in 4 pregnancy-related deaths; other leading causes of death included infection, hemorrhage, and embolism.[305, 306]

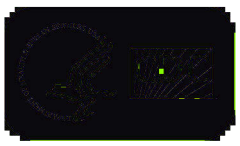
Disparities in pregnancy-related mortality

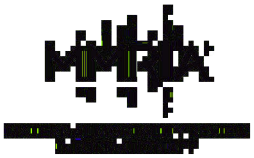
Pregnancy-related mortality ratios among non-Hispanic Black persons (PRMR of 40.8) and non-Hispanic American Indian/Alaska Native persons (29.7) were the highest from 2007–2016. The PRMR for Black persons was 3.2 times that of non-Hispanic White persons, and for American Indian/Alaska Native persons 2.3 times that of White persons (**Chart 1**).[88]

Chart 1. Pregnancy-Related Mortality Ratio by Race-Ethnicity, 2007-2016[7]



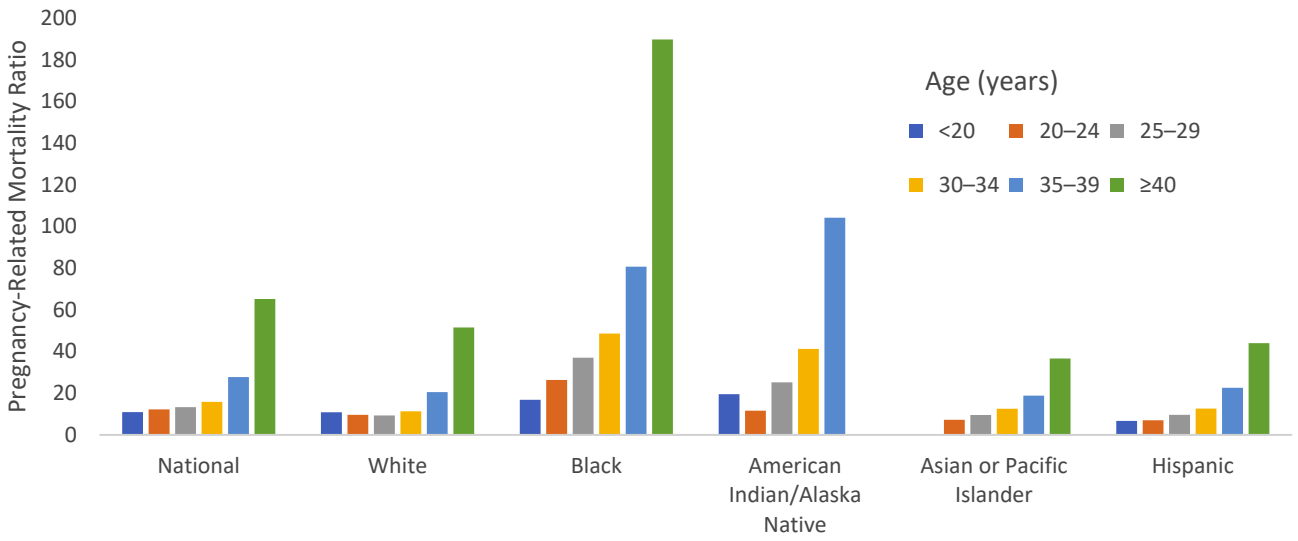
Note: Black, White, American Indian/Alaska Native, and Asian or Pacific Islander persons were non-Hispanic; Hispanic persons could be of any race.





In 2007–2016, the PRMR increased with increasing age, nationally, and among all racial and ethnic subgroups; however, the PRMR rose with increasing age at a higher rate among non-Hispanic Black and American Indian/Alaska Native persons than was observed for other racial/ethnic groups (**Chart 2**).[7]

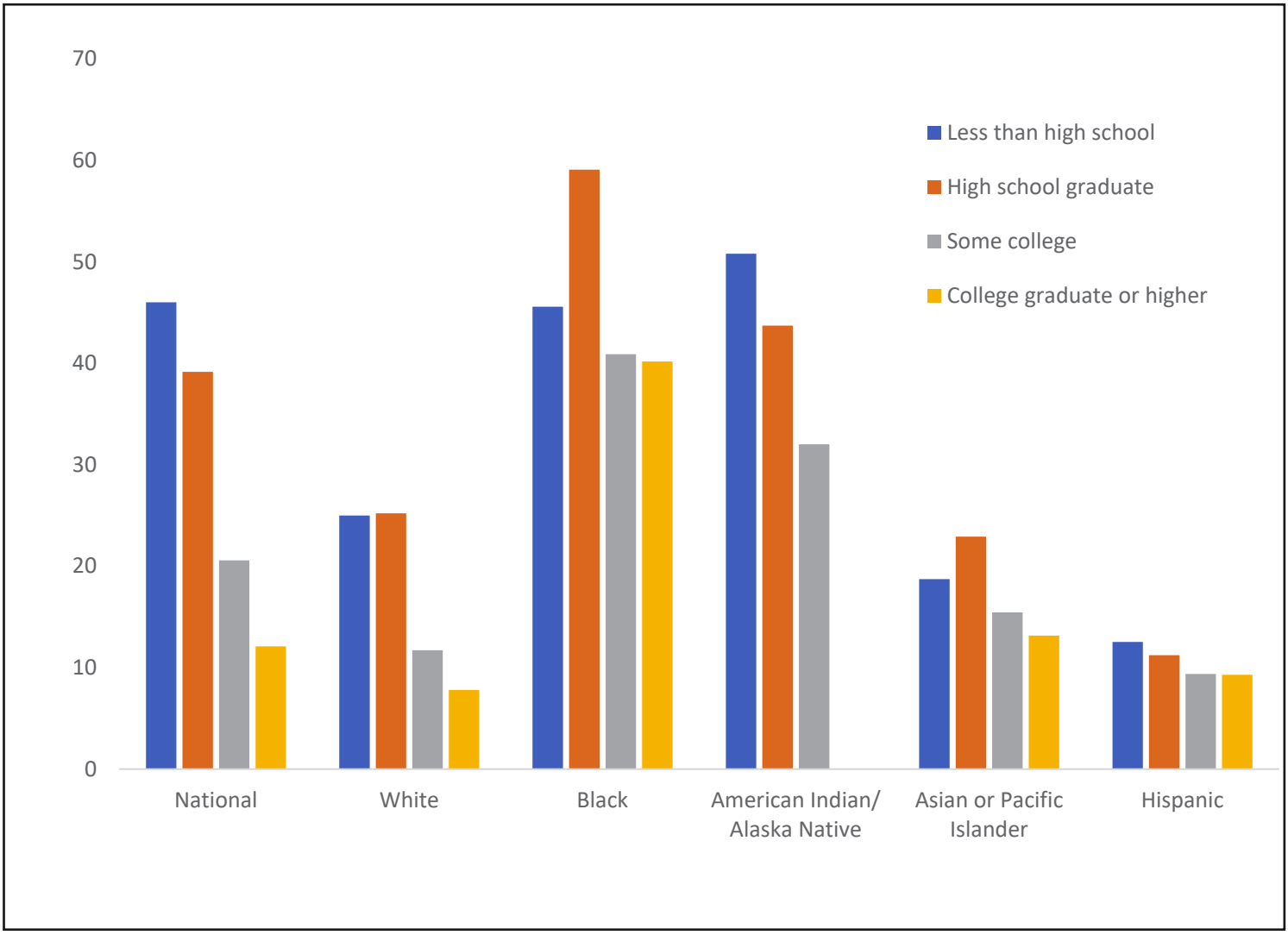
Chart 2. Pregnancy-Related Mortality Ratio by Race-Ethnicity and Age, 2007-2016[7]



Note: Black, White, American Indian/Alaska Native, and Asian or Pacific Islander persons were non-Hispanic; Hispanic persons could be of any race.
Note: PRMR was suppressed when there were fewer than 10 deaths/age group, affecting reporting of a PRMR for American Indian/Alaska Native persons.

Nationally, the PRMR decreased with educational attainment beyond high school graduation (**Chart 3**). Among White persons who completed a college education, the PRMR was approximately half that of persons with less than a high school education. This level of variation was not observed for any other racial/ethnic group. In addition, the risk of pregnancy-related mortality is higher among Black persons and American Indian/Alaska Native persons who completed college than it is among White persons with less than a high school education.[7]

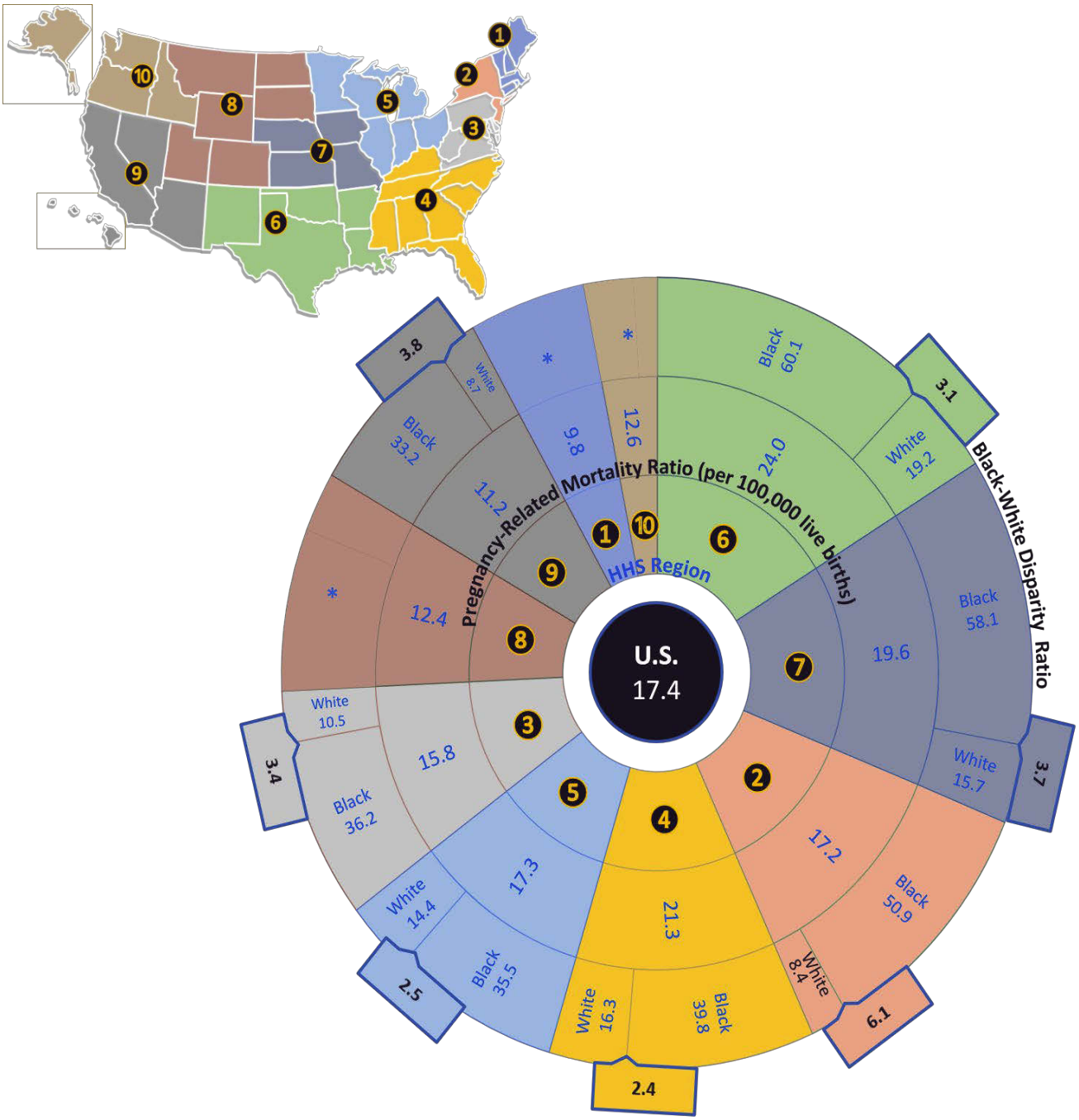
Chart 3. Pregnancy-Related Mortality Ratio by Race-Ethnicity and Education, 2007-2016[7]



Note: Black, White, American Indian/ Alaska Native, and Asian or Pacific Islander persons were non-Hispanic; Hispanic persons could be of any race.

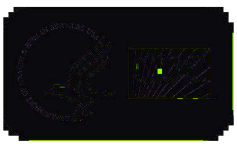
Note: PRMR was suppressed when there were fewer than 10 deaths per category, affecting reporting of a PRMR for American Indian/Alaska Native persons whose educational attainment was college graduate or higher.

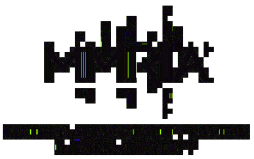
There is a wide range in the pregnancy-related mortality ratio (PRMR) between HHS regions,and a wide range of black-white disparities ratios as well (**Figure 6**).[307] We see the largest disparity in HHS Region 2 where the pregnancy-related mortality ratio among Black pregnant and birthing people is six times that of White pregnant and birthing people. The disparity ratio is high because it has a very high Black pregnancy-related mortality ratio, and a very low White PRMR - the lowest PRMR of all the regionalized and racialized data shown here. While HHS Region 6 has a disparity ratio half that observed for HHS Region 2, Region 6 has both the highest pregnancy-related mortality ratio among Black pregnant and birthing people, and also the highest pregnancy-related mortality ratio among White pregnant and birthing people.



*Note: *Race specific ratios and disparity ratio suppressed because at least one numerator count was <8.*

Figure 6. Pregnancy-Related Mortality Ratio by U.S. Dept of Health & Human Services Region. Black-White Disparity Ratio, CDC Pregnancy Mortality Surveillance System 2014-2016.





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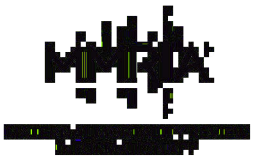

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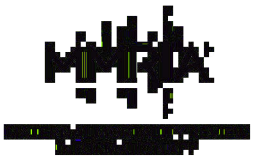

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Committee Data to Action

Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
Division of Reproductive Health

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