Society for Maternal-Fetal Medicine
High-risk pregnancy experts

SMFM Statement

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Executive summary: Workshop on social determinants of health and obstetrical outcomes, February 1–2, 2022, cosponsored by the Society for Maternal-Fetal Medicine, the Commonwealth Foundation, and the Alliance for Innovation on Maternal Health, with support from the Society for Women's Health Research

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Introduction

Addressing systemic racism and barriers posed by adverse social determinants of health (SDOH) is centrally important to improving obstetrical outcomes and eliminating health disparities. In this context, obstetrical outcomes refer to outcomes of an individual during pregnancy and outcomes that reverberate through their and their children's life course. Systemic and structural racism refer to the totality of ways in which societies foster racial discrimination, whether through housing, education, employment, healthcare, or criminal justice.[1] Systemic racism is a fundamental cause of health disparities.[2,3] The World Health Organization defines SDOH as "non-medical factors that influence health outcomes." Such factors include "where people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life."[4] Despite initiatives and investigations that have sought to better understand the intersecting factors that result in inequity in obstetrical outcomes, the optimal methods by which systemic racism and SDOH are defined and quantified, the pathways by which SDOH impact health within and across generations, and the most effective means to combat this impact continue to be developed and understood.

To address the relationship between SDOH and obstetrical outcomes, leaders from multiple disciplines, including obstetrics, pediatrics, epidemiology, health services, health equity, community-based research, and systems biology, gathered for a 2-day workshop held during the Society for Maternal-Fetal Medicine (SMFM) 2022 Annual Pregnancy Meeting. Entitled "Social Determinants of Health and Obstetric Outcomes," this workshop was cosponsored by SMFM, the Commonwealth Foundation, and the Alliance for Innovation on Maternal Health, and received support from the Society for Women's Health Research. The goals of the workshop were to discuss the state of the science with regard to extant research and approaches, identify best practices and evidence gaps, and recommend next steps. Specifically, the goals were:

- To review the current evidence on the relationship between SDOH and obstetrical outcomes
- To discuss approaches to and research opportunities for the epidemiologic analysis of SDOH in obstetrical settings
- To discuss approaches to and research opportunities for measuring how SDOH manifest their effects physiologically (eg, epigenetically)
- To discuss approaches to and research opportunities for interventions and strategies to mitigate the detrimental effects of adverse SDOH and improve obstetrical outcomes

This executive summary presents a condensation of the main discussions that occurred during the workshop. A manuscript that elaborates on this summary and presents more detailed information and directions for future research will be published at a later date.

Background

The rising rates of maternal morbidity and mortality in the United States have been well documented, and there has been significant attention directed toward the approaches needed to reverse these deleterious trends. One key aspect of any improvement is the reduction of health disparities, which are rooted in systemic racism and

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SDOH. Research on obstetrical outcomes has aimed to identify the populations at risk, the exposures that are most contributory, and the outcomes and care that are disparate. Attempts have also been made to identify types of interventions that minimize risk and eliminate disparities. Nevertheless, evidence presented at the workshop demonstrated that multiple knowledge gaps remain. Continued high-quality research and interventions are needed to better understand the relationship between SDOH and obstetrical outcomes and the approaches that can be used to achieve equity.

The workshop began by detailing the current evidence surrounding the relationship between SDOH and obstetrical outcomes in the United States. First, some emblematic metrics that demonstrate the disparities were described:

- Between the years 2014 and 2017, the US pregnancy-related mortality rate showed a wide gap when stratified by race. Black women were 3 to 4 times more likely to die from pregnancy-related causes than White women, and American Indian and Alaska Native women were 2 times more likely to die from pregnancy-related causes than White women.[5]
- Between the years 2016 and 2017, non-Hispanic Black women were twice as likely to experience severe maternal morbidity compared with non-Hispanic White women.[6]
- The cesarean delivery rate for Black women between 2018 and 2020 was 35.8%, which was higher than the rate of the overall population (31.8%).[7]
- In 2019, Black and American Indian and Alaska Native infants were more than twice as likely to die within the first year of life compared with White infants.[8]

The "Anti-Racism in Public Health Act," created in 2021 to help further research surrounding public health and the effects of structural racism and other barriers on health, clarifies the relationship between structural racism and the adverse SDOH that obstruct the achievement of optimal health and health equity.[8] Accordingly, and with the above disparities in mind, presenters detailed a variety of social factors that underlie health inequity. A partial list for illustrative purposes is presented here, although it is worth noting that these are only a few of the many existing examples:

- Reduced access to economic resources is a well-established risk factor for adverse obstetrical outcomes. In 2019, the poverty rates for individuals who identify as Black and Hispanic were 18.8% and 15.7%, respectively, both of which were above the US average of 10.5%.[9] Similarly, in 2020, the median income for households led by Black individuals was $20,000 less per year compared with households led by non-Hispanic White individuals.[10]
- Health insurance helps provide improved access to care during the preconception, gestation, lactation, and postpartum/interpregnancy periods. Between the years 2010 and 2019, Black, Indigenous, and People of Color (BIPOC) individuals had higher rates of being uninsured compared with their White counterparts.[11]
- Approximately 85% of the land mass of the United States is considered rural. Within rural communities, 34.8% of adults have multiple chronic health conditions, and access to healthcare is often reduced because of dearth and distance of services.[12]

Key findings and preliminary recommendations

Workshop participants were invited to 1 of 3 breakout groups to discuss the following issues in greater depth: (1) epidemiology of SDOH and obstetrical outcomes; (2) biological embedding of SDOH; and (3) interventions and strategies to address SDOH and improve obstetrical outcomes. The following sections summarize the findings and recommendations of each breakout group.

Approaches to and research opportunities for the epidemiologic analysis of social determinants of health

Anchoring our inquiry in the epidemiology of SDOH, workshop participants started with a reflective exercise to learn how positionality can influence research. Positionality describes how a researcher's social and political context shapes their identity in terms of race, class, gender, sexuality, and ability status, and how this identity may influence the practice and production of research. Such reflection is an essential component of an antiracist research approach.

A best practice that can be used to study inequities in health outcomes is to use theoretical frameworks as a foundation for the development of research plans. Theoretical models are integral to ensuring that measurements of SDOH constructs and goals of the research project are being conceived correctly and account for the complexities that exist in the relationship between SDOH and health outcomes. Although many theoretical models exist and the choice should ultimately align with the research question of interest, presenters in this workshop highlighted several that have been foundational in improving clarity of research inquiry in this area. In particular, the social-ecological model, life course theory, fundamental cause theory, ecosocial theory, and reproductive justice framework are all theoretical lenses that anchor the inquiry of SDOH within multilevel, context-dependent, and temporally dynamic realities of how SDOH mechanistically operate within structurally marginalized "health disparity" populations. By selecting one or more of these frameworks, study-specific conceptual models can be developed to serve as an anchor not only for measurement and methods but also for accountability in driving research toward improving health and reducing health inequities.

Beyond the centrality of theoretical clarity in any research endeavors on SDOH, this workshop discussed best practices in incorporating race and racism into maternal-fetal medicine (MFM) research. Rigor is needed to improve the equitable use of race and ethnicity variables in research, both in terms of how these variables are conceived and how they are used in analytical approaches. Race and ethnicity must be understood and operationalized as social (not biological) constructs and should be incorporated into any analysis accordingly. Of paramount importance is the understanding that health differences result from racism and its consequences in structures and interpersonal interactions, not race and/or ethnicity per se. Examples of measuring racism presented included approaches for measuring racial discrimination, which can be thought of as the behavioral manifestation of structural racism, either by measuring differences in receipt or quality of care by race, or by asking about patient experiences. A second example cited was Slaughter-Acey's[13] research using the lens of colorism, seeking to understand how skin tone captures a phenotype-based system of oppression that distributes opportunity and resources on the basis of skin hue. Furthermore, clarity is needed in measuring the specific racialized mechanisms that transduce the social reality of race into embodied consequences of poor health for BIPOC populations through racism.

Presenters emphasized the importance of incorporating lived experiences through community-engaged research and incorporation of qualitative methods in epidemiologic research regarding obstetrical outcomes. In particular, work by Chambers et al[14] exhibited the critical gains in refining our understanding of measurable constructs of structural racism that can be achieved by leveraging qualitative research with Black women across the childbearing window. They developed a conceptual framework based on focus group data that included 9 domains: negative societal views, housing, medical care, law enforcement, hidden resources, employment, education, community infrastructure, and policing of families. Although many of these domains reinforced the ways in which structural racism had been operationalized in other frameworks, this work identified at least 2 domains—policing of families and hidden resources—that have been underconceptualized in existing models. Complementing this exemplar of how to improve the incorporation of lived experience within the epidemiologic investigation of SDOH, community-engaged participatory research was discussed with regard to its importance in elucidating narratives of how SDOH operate to facilitate, or more often constrain, the well-being of Black birthing people. The use of narrative-based medicine to better understand the context in which BIPOC women were experiencing "maternal near-misses" was discussed as an integral tool to shift clinical practice and inform policy. Overall, the insights provided by these examples of qualitative and mixed-methods research demonstrate how investigators can better understand and evaluate SDOH that impair obstetrical health outcomes and better conceive of policies that can improve these outcomes.

Researchers also discussed approaches to incorporate research on family and community SDOH into MFM research. Intimate partner violence is associated with adverse pregnancy outcomes and maternal morbidity and mortality.[15] Screening tools available through the Centers for Disease Control and Prevention (https://stacks.cdc.gov/view/cdc/44660) are also recommended for use in SDOH research. Finally, the importance of community-level exposures, including the social, built, and ambient environment was discussed. For example, at the community level, the disproportionate experience of physical contaminants such as air pollution may act synergistically with community psychosocial stress to produce deleterious effects on obstetrical outcomes.[16] In discussion, these examples of family and community-level SDOH were tied back to foundational concepts of structural racism and disadvantage.

Discussion on approaches to and research opportunities for measuring how social determinants of health are biologically embedded

In this session, participants reported and discussed which biological alterations in the fetus in response to maternal conditions can explain how exposure to deleterious SDOH during very early development can have long-lasting impact on later health and disease risk (ie, the concept of developmental origins of health and disease risk or fetal programming).[17]

A diverse range of suboptimal maternal sociodemographic, psychosocial, behavioral, biophysical, and clinical states and conditions have been implicated in intergenerational transmission of the effects of maternal exposure to social disadvantage.[18–21] Conceptual frameworks and empirical studies converge to strongly implicate chronic stress and stress-related biobehavioral processes as the major effector of the causal pathways linking upstream SDOH and health disparities.[17] Presenters proposed to focus on stress-related maternal and fetal gestational biology as the proximate transmission pathway in the context of transmitting maternal experiences to the developing fetus. Stress-related psychobiological processes underlie the effects of most factors that represent SDOH and health disparities therein.[22] In terms of fetal programming, stress-related biological processes represent a major pathway through which many (perhaps most) suboptimal conditions exert their effects. There are no direct vascular or neural connections between the maternal and fetal compartments; all exchange and communication are mediated by biological processes that interface with and through the placenta. Biomarkers of the endocrine (eg, cortisol), immune/inflammatory (eg, interleukin 6), and metabolic systems (eg, insulin) are responsive to perturbation or stress, and are also known to play obligatory roles in the initiation, maintenance, and progression of normal gestation, fetal development, and birth. Furthermore, they can mediate the

effects of different intrauterine perturbations on fetal physiology.[23]

Biological embedding refers to the phenomenon by which exposure to chronic stress "gets under the skin" to generate stable alterations in biology that produce its enduring, long-term effects.[24] Elucidation of the "where" and "how" of biological embedding has broad significance for risk identification, prevention, early diagnosis, and treatment. Processes implicated in biological embedding discussed during this session by Dr Kieran O'Donnell referred to epigenetic changes (changes in the regulation of gene activity and expression that are not dependent on gene sequence) such as DNA methylation. A 2021 comprehensive review summarizes the epigenetic effects of social disadvantage.[25] Another participant (Dr Pathik D. Wadhwa) explained that the effects of maternal exposures may already be present in fetal stem cells because the lifespan of most differentiated cells is significantly shorter than the temporal duration of the long-term effects of social disadvantage. Although differentiated cells are continuously replenished, their replenishment does not occur from already differentiated cells, but *only* from stem/progenitor cells. Dr Stacy Drury highlighted the role of fetal telomeres (noncoding tandem DNA repeats at the ends of eukaryote chromosomes that form a protective cap) as another potential target of programming and showed evidence that telomere length, and its programming, is related to SDOH within and across generations.[26,27] Gyllenhammer et al[28] discussed intercellular processes related to mitochondrial biology as a potential mechanism underlying the phenomenon of developmental programming of health and disease risk.

Considerations and challenges were then discussed regarding research on biological embedding and intergenerational transmission of SDOH. These included the issue of inferring causality; in human studies, it is not possible to randomize pregnant people to stressful or disadvantaged conditions, and observational studies are limited in terms of causal inference. Furthermore, the effect of any given exposure on biological pathways and outcomes is not independent but is conditional upon other exposures/states (eg, there are interactive effects between stress and nutrition or stress and infection). The choice of biomarker depends on the research question of interest. Most consistent associations have been reported between SDOH and inflammatory states in pregnant individuals and nonpregnant individuals, including children.[29] However, because stress-responsive biological transmission pathways/systems are interrelated, approaches have been developed that integrate markers of multiple systems. One example is the allostatic load measure, which represents a biological indicator of chronic, cumulative stress exposure.[30] It includes biomarkers of the endocrine, autonomic nervous/cardiovascular, immune/inflammatory, and metabolic systems. Allostatic load is related to several sociodemographic, psychosocial, and behavioral factors.[31] It has been used in the context of pregnancy and is associated with pregnancy, birth, and child outcomes.[32]

Recommendations that resulted from our session are:

- To initiate biological data collection in intervention trials, implementation work, and epidemiologic studies
- To create a standard template and systematize routine collection of biological samples; this has been developed in the context of telomere research (eg, Telomere Research Network, https://trn.tulane.edu)
- To include relevant developmental periods (ie, preconception, gestation, birth, lactation, childhood) in studies of biological pathways
- To include measures (including SDOH and biological samples) of the father in evaluations of SDOH and perinatal outcomes
- To develop screening tools for early detection of vulnerability and previous/ongoing adverse exposures to diagnose very early in life those at heightened risk, who therefore may benefit from behavioral or social interventions

Deeper understanding of the biology of the embedding of SDOH has several merits. The first lies in the opportunity to develop biomarkers of the health effects of SDOH, to be used for individuals and for populations. The second key benefit is the development and testing of postnatal interventions to mitigate the consequences of developmental programming and help ameliorate intergenerational effects. The third key benefit of a deeper biological understanding is to provide a tangible proof of concept demonstrating that social factors exert demonstrable and direct health effects—a point that can help to communicate the relevance of SDOH not as an epiphenomenon, but as a proximal and addressable contributor to disparities.

Discussion on approaches to and research opportunities for interventions and strategies to mitigate the detrimental effects of social determinants of health and improve obstetrical outcomes

Central to the goal of achieving perinatal health equity and improving obstetrical outcomes is developing person-centered, community-engaged, and equity-focused interventions that address SDOH. Participants stressed the importance of several action steps when attempting to create and study an intervention designed to mitigate adverse obstetrical outcomes related to the barriers posed by adverse SDOH. Participants discussed the use of models such as the social-ecological model to develop and refine an intervention. Important questions to consider include where one sees themselves in the model, which level of influence is most underserved in the community of interest, and what differential resources are needed to intervene at the "micro" vs "macro" level. Interventions commonly function across

multiple levels, and the use of models such as those discussed in the epidemiology group can help frame multiple stakeholders' perspectives and needs.

One crucial step in creating an intervention is identifying the intervention's ultimate goal and reflecting on whether this goal can be achieved ethically, effectively, and sustainably. Key solution-based processes for intervention development include targeting the unique processes involved in maternal healthcare, establishing clear and measurable SDOH goals, and centering the maternal and family experience. Another key component is identifying the specific factors that are potentially at the root of the health issue being addressed. Some social and economic factors that drive health outcomes include economic stability, neighborhood and physical environment, education, food security, violence, social support, and healthcare access. These factors, moreover, do not exist in isolation but may intersect with one another to result in outcome differences. Participants reflected on addressing social drivers with a multilevel perspective that acknowledges the intersectionality of SDOH in the development of an intervention.

Another important consideration when creating interventions directed at SDOH is that the population of interest is involved in the planning stages of the intervention to ensure that the goals align among all involved parties. Equitable implementation—or attentiveness to culture, history, values, and needs of the community—is a necessary step to achieve equitable outcomes.[33] Participants discussed several examples of community-engaged interventions and strategies to engender trust when working with communities.

Even after the scope of the problem and the goals of the intervention are established, there should be further reflection about the multiple challenges that may arise in the development and implementation of a successful SDOH-focused intervention. Examples of such questions include the following:

- How do we make maternal-child health a central point of population health initiatives?
- How do we break down silos between and within organizations, including between academic and community spheres, to optimize health and equity?
- How do we evaluate SDOH in a respectful manner that emphasizes allyship and avoids voyeuristic implications or punitive consequences?
- How do we scale and plan for sustainability of interventions so that they exist beyond initial research or quality improvement project stages?
- How can we ensure that equitable implementation is a part of intervention development from the beginning, and not an afterthought after determining intervention efficacy?

Conclusion and research gaps

Workshop participants proposed many recommendations and key points for addressing systemic racism and SDOH in the context of obstetrical care and outcomes. They also noted many research gaps that still exist in the evidence for best practices in determining how SDOH are best measured, how they exert their effects within and across generations, and how their deleterious effects on obstetrical health can be best mitigated. Issues proposed for further research and consideration include the following:

- Development of an evidence-based approach to define the most salient measures of structural racism and SDOH
- Focus not only on the adverse SDOH that may hinder achievement of health equity, but also the salutary aspects (eg, resilience or social support) that may enhance it
- Best practices to integrate community-based participatory methods into MFM research and program development
- Strategies to expand dissemination and implementation science in MFM research so that the gap between evidence and practice begins to narrow
- Best practices to allow for interventions to undergo iterative growth and change because population and community needs change while acknowledging the rigidity of factors such as institutional culture and funding
- Initiation of biological data collection in trials, implementation work, and epidemiologic studies
- Optimal strategies to incorporate SDOH into types of biomedical research, such as clinical trials or translational research, that have typically ignored social drivers
- Creation of a standard template and systematized routine collection of biological samples; this has been developed in the context of telomere research (eg, Telomere Research Network, https://trn.tulane.edu)
- Inclusion of relevant developmental periods (ie, preconception, gestation, birth, lactation, childhood) in research about SDOH
- Inclusion of measures (on SDOH and biological samples) of the father
- Development of screening tools for early detection of vulnerability and previous/ongoing adverse exposures to diagnose very early in life those at heightened risk, who therefore may benefit from behavioral or social interventions

It is hoped that this workshop will serve as a catalyst for further development of evidence-based approaches to understand the relationship between SDOH and obstetrical outcomes, and to help guide the construction and implementation of interventions that can result in better outcomes and equity.

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The Society for Maternal-Fetal Medicine (SMFM) recognizes that obstetrical patients have diverse gender identities and is striving to use gender-inclusive language in all of its publications. SMFM will be using terms such as "pregnant person/persons" or "pregnant individual/individuals" instead of "pregnant woman/women" and will use the singular pronoun "they." When describing study populations used in research, SMFM will use the gender terminology reported by the study investigators.

Reprints will not be available.

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