Creating an Infant Mortality "Prescription" for Nashville

Report from Infant Mortality Expert Panel Meeting
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Executive Summary

Rationale:
Vanderbilt University's Department of Health Policy convened an expert panel to advise NashvilleHealth on infant mortality interventions in four domains: healthcare, media, community, and policy. The goal of this panel was to create a "prescription" specifically for Nashville that took into consideration 1) lessons learned in other communities, 2) existing programs and policies in Nashville, 3) the political landscape of Nashville and Tennessee, and 4) scientifically-supported evidence on best practices and programs.

Expert Panel: Nine (9) national experts in research and implementation of infant mortality policies and programs were identified using literature searches and through referral by Maternal and Child Health experts.

- Panelists were chosen to achieve balance along several dimensions, including domain of expertise, race, gender, and geographic location.
- The panel was conducted using a modified Delphi technique, in which panel members were asked to provide input before, during, and after the meeting.
- Pre-meeting work included feedback on literature searches and pre-ranking of intervention options in each of the four identified domains.
- During the panel meeting, experts were asked to discuss their pre-meeting rankings and then re-rank options within each domain by coming to consensus (this yielded 11 recommendations).
- Then, panel members were asked to rank these options across domains, given hypothetical time and resource constraints.
- Using the resource constraints, the panel recommended six (6) short-term strategies, two (2) long-term strategies and among these, (3) high priority strategies.

Recommendations: The final sets of recommendations for implementation are below.

Short-Term Strategies (< 12 months)

- **Develop systems improvements to make it "easy" to order and deliver 17-alpha hydroxyprogesterone caproate (17P):** Panelists recommended that system issues (e.g. barriers to provider payment, pre-authorization requirements) that limit access and affordability of 17P should be ameliorated.

- **Create/begin community (broadly defined) dialogue on the role of racism and bias:** Panelists recommended fostering engagement geared towards addressing the impact of racism and implicit bias on birth outcomes and infant mortality. For example, panelists suggested diversity/inclusion audits of public and health care institutions with follow-up training.

- **Increase participation in an enhanced pre- and post-natal care programs:** Expert panel members recommended increasing the proportion of women that participate in enhanced programs. These programs emphasize care coordination/comprehensive care, social/group care, home visits, focus on self-efficacy, and include linkages to traditional care.

- **Promote use of existing media interventions/resources and innovative media:** The panel recommended the use of existing media resources (e.g safe sleep campaigns and smoking cessation campaigns such as "one tiny reason to quit") along with innovative media (e.g. direct-to-consumer media such as Text4baby and "what to expect") that should be tailored for Nashville and directed towards high-risk groups.

- **Expand insurance coverage:** Expansion of insurance coverage (up to 138% FPL) was recommended by expert panel members as integral to family planning and interconception care. Currently in TN, family planning services are covered through the local health department for low-income individuals (up to

100% FPL and on a sliding scale thereafter) but there may be a lack of awareness of these services. Given this, coverage for interconception care may pose a greater challenge in TN.

- **Create a broader policy environment in which programs are more likely to succeed (with an emphasis on a "health in all policies" approach)**: Panelists recommended that a public health lens be applied across sectors (e.g. city planning, transportation and public housing). This environment would also foster continued support for existing perinatal regionalization, advocate for medical education to include additional training around care of disadvantaged populations, increase funding/staff for a robust maternal and child health infrastructure and advocate for preconception health.

Long-term strategies (12-60 months)

- **Develop and create buy-in for a preconception health standard of care for both men and women**: These efforts would integrate family planning into routine care among a wide range of providers and involve specific strategies that acculturate families to the importance of preconceptional health as essential to healthy births.

- **Address unintended pregnancies**: The panel suggested this may be done best through interventions including the "One key question" strategy applied as the screening standard of care (i.e. universal – and should apply to men and women). This strategy should be followed up with a reproductive life plan /contraception plan based on the specific needs of the patient.

Introduction

Across the United States, communities are considering collective impact initiatives to address health challenges and improve the health of their citizens. Using published evidence from other communities, national efforts, and previous local efforts, collective impact organizations have created and implemented programs to address health challenges.

Vanderbilt University's Department of Health Policy convened an infant mortality expert panel to advise it's partner local nonprofit, NashvilleHealth, on interventions in four domains: healthcare, media, community, and policy. The goal of this panel was to create a "prescription" specifically for Nashville that took into consideration lessons learned in other communities, existing programs and policies in Nashville, the political landscape of Nashville and Tennessee, and scientifically-supported evidence on best practices and programs. Based on extensive discussion and subsequent consensus, the panel recommended 1) six (6) short term strategies, 2) two (2) long term strategies, 3) three (3) high priority strategies, and 4) suggested underlying principles and strategies applicable across all domains.

Pre-Meeting

Identification of Experts
Nine (9) infant mortality experts were chosen to provide a balanced perspective and expertise in one of four intervention domains (healthcare, media, community, and policy).

- Deborah Allen, ScD - Director of Child, Adolescent, and Family Health, Boston Public Health Commission Board Chair, CityMatCH
- D'Yuanna Allen-Robb, MPH - Director of the Division of Child and Adolescent Health at the Metro Public Health Department of Nashville/Davidson County
- Joel Bradley, MD - Chief Medical Officer/ Health Plan Medical Director UnitedHealthcare Community Tennessee Plan
- Deborah Frazier, RN - Chief Executive Officer, National Healthy Start Association
- Maxine Hayes, MD, MPH - Former State Health Officer, Washington. Associate Professor, School of Public and Community Medicine, University of Washington
- Arthur James, MD - Associate Clinical Professor, Department of Obstetrics and Gynecology The Ohio State University Wexner Medical Center
- Paul E. Jarris, MD, MBA - Senior Vice President, Maternal and Child Health Program Impact and Deputy Medical Officer, March of Dimes
- DeWayne M. Pursley, MD - Former Chair, AAP Section on Neonatal Perinatal Medicine. Vice President, AAP Massachusetts Chapter. Associate Professor of Pediatrics Harvard Medical School. Chief, Department of Neonatology Beth Israel Deaconess Medical Center
- Kimberlee Wyche –Etheridge, MD, MPH (chair) - Assistant Director, Public Health Initiatives, Tennessee State University

Detailed biographies of each of these panel members can be found in the **Appendix A**.

Literature Review
Prior to the panel meeting, the infant mortality experts were asked to provide feedback on literature searches conducted by staff at Vanderbilt. Search terms and criteria for the literature review can be found in **Appendix B**. Each panel member was assigned to at least one domain and asked to respond to four questions for each domain to which they were assigned:

1. What literature, either gray or published, is missing?
2. Should we be aware of any ongoing, unpublished work?
3. Which of these articles is most definitive?
4. Which 4-5 articles should be most heavily emphasized in a one-page summary of the literature?

Using panel member feedback on the literature in each domain, Vanderbilt staff compiled one-page literature summaries for each domain. These summaries can be found in **Appendix C**.

Environmental Scan and Pre-Rankings
Prior to the convening of the expert panel, NashvilleHealth conducted informal interviews with local stakeholders to identify existing programs and resources in Nashville and Tennessee related to infant mortality. Using this information and other resources, NashvilleHealth complied a comprehensive environmental scan of Nashville's infant mortality related programs and policies in each of the four domains (healthcare, media, community and policy). Using the NashvilleHealth environmental scan and evidence from the literature reviews, Vanderbilt staff developed several potential interventions in each domain and requested that expert panel members pre-rank these interventions.

In-Person Meeting

On August 12, 2016, members of Vanderbilt's Department of Health Policy, NashvilleHealth, and the expert panel met in Nashville, TN to devise a set recommendations for reducing infant mortality in Nashville. The meeting was led by an expert panel chair and a panel facilitator. The role of the panel chair was to clarify points of confusion, facilitate meaningful discussion, answer questions from panel members, and keep panel members on task. The facilitator's role was to make real-time updates to the electronic version of the pre-meeting recommendations, facilitate re-ranking, and answer questions from panel members.

Meeting Details
The meeting began with NashvilleHealth providing a brief overview of its mission and strategic goals. Vanderbilt's Department of Health Policy provided background information on Nashville, including information on the demographic characteristics, rates of infant mortality, poverty, insurance status and smoking prevalence. See **Appendix D** for this information.

Introductions and background information were followed by discussion of the pre-ranked options by domain (healthcare, media, community and policy). For each domain, the most highly pre-ranked options were discussed and subsequently re-ranked by consensus among the expert panel. Intervention options not included in the most highly pre-ranked options were discussed if expert panel members suggested their relevance. The results of the within-domain ranking process can be found in **Appendix E**.

After within-domain rankings were complete, the panel ranked options across domains. Panel members were given hypothetical time and budgetary constraints and asked to rank the recommendations based on what was most feasible and would have the highest impact, given the political, economic, and programmatic landscape of Nashville and Tennessee. Eight (8) options were ranked highly across domains: six (6) were recommended for initial implementation, two (2) were recommended for long-term implementation and among these, three (3) were recommended as high priority strategies. The results of the across-domain ranking are below.

Recommended Strategies

SHORT TERM STRATEGIES (< 12 MONTHS)

Develop systems improvements to make it "easy" to order and deliver 17-alpha hydroxyprogesterone caproate (17P) for all at-risk pregnant women

The panel agreed that 17P was highly effective and should be administered to women at risk for pre-term births. Panelists discussed ways to increase access to 17P outside of traditional clinical settings and the issues associated with late entrance to prenatal care (17P is most effective when initiated between 6 and 20 weeks). It was then noted by several panelists that although access is problematic, system issues are the major obstacle that limits the potential of 17P and should take priority. Panelists believed that these system based and supply chain challenges (e.g. provider payment, pre-authorization, requirement for patients to pay up-front for 17P) affect access and timely administration and should be ameliorated.

Create community (broadly defined) dialogue and engagement to recognize and address the role of racism and bias in birth outcomes and infant mortality

Panelists recommended fostering engagement geared towards addressing the impact of racism and implicit bias on birth outcomes and infant mortality. Part of this conversation should involve understanding the unique burdens associated with minority status (irrespective of socioeconomic advancement) and emphasize the goal of health equity. Panelists acknowledged that conversations about racism and implicit bias are highly complex, require through planning, the use of proven tools (e.g. Kellogg foundation racial equity tool, unconscious bias testing) and should be done in ways that elicit specific action. Further, panelists suggested diversity/inclusion audits of public and health care institutions with follow-up training as integral parts of this process.

Increase participation in an enhanced pre- and post-natal care programs

There was general consensus among panel members regarding the utility of enhanced pre- and post-natal care programs. Consensus was largely driven by the understanding that social support garnered from developing relationships with others who share a similar collective experience is an important tool to improve birth outcomes. Panel members characterized enhanced pre- and post-natal care programs as programs that emphasize care coordination/comprehensive case management, provide social/group care, home visits, focus on self-efficacy, and importantly, create and sustain essential linkages to traditional care.

The need for funding mechanisms to support enhanced programs was also discussed by panel members. This was largely because enhanced care models may not be adequately paid for by insurance, and the true costs to providers to establish and maintain the group model have not been well researched. Panelists suggested that increase funding could support services that demonstrate improvements in outcomes and that policies that encourage insurers and MCOs to cover enhanced care services should be supported.

Promote use of existing media interventions/resources and innovative media

The panel agreed that media campaigns can be cost prohibitive and that use of existing media resources would be a suitable strategy to limit cost e.g. augmenting safe sleep campaigns by including messaging to all caregivers, use of existing smoking cessation campaigns such as "one tiny reason to quit", or facilitating development of a pregnancy script for the existing tobacco quitline. Panelists also suggested advertising in traditional media outlets such as newspapers that circulate in African American and Hispanic communities. These newspapers could communicate personal stories related to infant mortality and should avoid images or messaging that reinforce racial stereotypes or confer full responsibility to individual action.

In addition to these more traditional media resources, the need for an innovative media approach to infant mortality was considered essential. Direct-to-consumer media such as Text4baby was discussed as an option for women with limited access to health information. But other pregnancy apps that are more interactive such as

"What to Expect" and "ovia pregnancy" may also be useful resources. Innovative media approaches could also include non-traditional partners to encourage public discourse (e.g. the performing arts community). All media interventions/resources (traditional or innovative) should be tailored for Nashville and directed towards high-risk groups.

Expand insurance coverage:
There as broad panelist support for highly strategic efforts that facilitate expansion of insurance coverage up to 138% FPL. Panelists deemed insurance coverage as integral to ensuring access to family planning and disease management during interconception. Currently in TN, family planning services are covered for low-income individuals (up to 100% FPL and on a sliding scale thereafter) but there may underutilization of these services because of lack of awareness. Lack of insurance coverage for interconception care may pose greater challenges associated with limited universal access to services and to specialty care.

Create a broader policy environment in which programs are more likely to succeed (with an emphasis on a "health in all policies" approach)
Panelists recommended that a public health lens be applied across sectors. Referred to as a "health in all policies" approach, these efforts would, for example, involve city planning, transportation, access to FQHCs/safety net providers and public housing as key stakeholders in all public health related decision making. Panelists also discussed that the creation of an amendable policy environment involves the continued support for existing perinatal regionalization, advocating for medical education to include additional training around care of disadvantaged populations, increase funding/staff for a robust maternal and child health public health infrastructure and advocating for preconception health.

LONG TERM STRATEGIES (1-5 YEARS)

Develop and create buy-in for a preconception health standard of care for both men and women
There was general consensus among the panel members about the importance of encouraging women to be healthy at all life stages. Panelists suggested the importance of leveraging provider patient interactions to shift the generally accepted focus on prenatal health to also include preconception health. These efforts would integrate family planning into routine care among a wide range of providers (e.g. obstetricians, gynecologist and family practitioners and *internists*) and involve specific strategies that acculturate families to the importance of preconceptional health as essential to healthy births. Additionally, panelists considered the importance of involving men and boys in these conversations.

Address unintended pregnancies
The panel suggested this may be best accomplished through interventions including the "One key question" strategy applied as the screening standard of care (i.e. universal – and should apply to men and women). This strategy gives the provider an opportunity to begin the conversation around pregnancy intent and assure that women who seek to become pregnant can achieve optimal health, that women who seek to avoid pregnancy get access to contraceptive care, and that women who express ambivalence receive appropriate counseling based on their individual concerns.

Screening for pregnancy intent needs to be followed by a specific action e.g. completion of a reproductive life plan/contraception plan. In addition to better birth outcome, screening and subsequent provision of reliable contraception could result in reductions in teen pregnancy and abortion. It was also recommended that automating an Electronic Health Record question at approximately 26 weeks postpartum about pregnancy intent would be a possible way to engage mothers about contraception and healthy timing and spacing of pregnancies.

HIGH PRIORITY STRATEGIES

Across both short-term and long-term strategies panelists signified (through voting) three (3) strategies that may potentially be most effective at improving rates of infant mortality. These three strategies included:

- **Create community (broadly defined) dialogue and engagement to recognize and address the role of racism and bias in birth outcomes and infant mortality**
- **Increase participation in an enhanced pre- and post-natal care programs**
- **Address unintended pregnancies**

LOWER PRIORITY STRATEGIES

The following options were highly ranked within domain, but were not highly ranked across domains either as a short-term (within 1 year) or long-term (1-5 years) strategies.

Build culture of women's health prior to pregnancy and supportive system of community resources
Panelists emphasized the importance of making preconception health a community priority as opposed to solely a clinical priority. Questions were raised around how to promote cultural change regarding health before pregnancy i.e. how do we acculturate women and communities to how preconception health matters. Panelists suggested that the message might be most easily relayed through building outreach capacity within communities. This would present opportunities to educate women about their risk for infant mortality, low-weight or pre-term infants and build a repository of knowledgeable community members.

Create a traditional media campaign that highlights the rate of infant mortality in Nashville and racial disparities (to elevate issue with general public, political leaders)
The panel members discussed how messages about infant mortality are relayed to the public and the potential challenges to garnering genuine interest and community investment in a topic that is thought of as an individual problem. A number of panelists highlighted the significance of framing of messages that would challenge consumers to critically think about infant mortality, question its assumed correlates and send inspirational messages to groups most affected.

Promote healthy pregnancy through workplaces – create case by informing businesses about the costs of adverse birth outcomes
There was agreement among panelists that workplace interventions that promote healthy pregnancy may be a feasible avenue for engaging women and expecting mothers. Support for such initiatives potentially could be structured similarly to existing health and wellness programs widely adopted in work settings. Panelists considered this as suitable strategy because individuals spend a large portion of their time at work but also because there is an economic argument that would engender business support. Businesses could be provided with data on costs associated with poor birth outcomes (e.g. insurance costs, employee performance /productivity, absenteeism) and be encouraged to educate employees around healthy pregnancy. Panelists suggested this strategy as two–pronged: 1) engage businesses as community leaders in the overall movement and 2) promotion of optimal practices within business settings e.g. lactation rooms.

UNDERLYING PRINCIPLES AND STRATEGIES ACROSS DOMAINS

During the discussion of potential options the expert panel members introduced several ideas as essential to any effort to improve rates of infant mortality. These ideas have been used to generate a set of three (3) key guiding principles and three (3) key strategies. These principles provide the foundation that should inform all recommendations regardless of domain, and the strategies provide broad ways to adhere to the three key principles.

KEY PRINCIPLES

Health Equity

Health equity refers to the attainment of the "highest possible standard of health for all people and giving special attention to the needs of those at greatest risk of poor health, based on social conditions"[1]. Among panel members there was consensus that efforts to improve rates of infant mortality should incorporate strategies to challenge the normative societal entrenchment of race. Useful strategies would question how group based differentials in infant mortality are driven by avoidable and unjust conditions that limit full and equal access to opportunities that foster health. For example, the panelists discussed the creation and compounding of disadvantage associated with the impact of ongoing gentrification in Nashville which isolates high risk groups from needed social services. Panelists emphasized the need to have deliberate coordination between entities (e.g. urban planning and the health department) and have a "health in all policies" approach, considering how decision-making across sectors impact health.

Comprehensive Approach to Health

The World Health Organization defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."[2] This definition requires that health be conceptualized more comprehensively and as a harmonious continuum of varying factors. In relationship to infant mortality panelists highlighted the importance of comprehensive care models that incorporated wellness and mental health. Impassioned panelists noted that "mother's health and her emotional well-being is so important to the child and the next generation" and that neglecting the mental health and wellness needs of women directly impacts emotional disengagement of mothers and their ability to care for an infant.

Social Determinants of Health

Panelists pointed out that the majority of infant deaths occur in the post-neonatal period. This is significant because it indicates the need to focus on the environment and the social and economic factors inextricably bound to infant mortality. For example, factors associated with poverty and concentration of poverty are important drivers of differential health outcomes among groups and contribute to a cascading sequelae of risk. Disparities in birth outcomes between whites and African Americans may be most effectively addressed efforts focusing on factors such as housing, neighborhood context, residential segregation, discrimination, wages and the built environment. These factors act as social stressors and structure lived experience and unequal exposures to adverse conditions among different racial and ethnic groups. Panelists agreed that programing directed to improving infant mortality matters, but that circumstances that require that families need such programs so be addressed. Further, we cannot depend on programming (e.g. home visits and group Centering) to provide a comprehensive set of solutions.

KEY STRATEGIES

Practice based evidence vs. evidence based practice

Practice based evidence refers to high-quality scientific evidence that is developed, refined, and implemented first in a variety of real-world settings.[3] The idea behind this strategy is that among certain populations groups there may be a need to tailor evidence based programs to be most effective among these groups. Panelists suggested that the sustained racial disparities in infant mortality require innovative approaches. Such approaches could include practice based evidence that is rigorously implemented and documented.

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[1] Braveman P. What Are Health Disparities and Health Equity? We Need to Be Clear. Public Health Reports. 2014;129(Suppl 2):5-8.

[2] Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

[3] Hellerstein DJ. Practice-Based Evidence Rather Than Evidence-Based Practice in Psychiatry. The Medscape Journal of Medicine. 2008;10(6):141.

Sustained Public Health infrastructure
The success of efforts to improve rates of infant mortality can be most effective when there is a sustained public health infrastructure. Healthy People 2020 highlights that the key components of any public health infrastructure include 1) a capable and qualified workforce; 2) Up-to-date data and information systems and 3) agencies capable of assessing and responding to public health needs. These components create a foundation for planning strategies targeting infant mortality, delivering effective programming to high risks groups and evaluating success.

Engage the voices of women and families as an additional source of data to inform programming
Entities working to improve rates of infant mortality should not neglect the value of qualitative data from populations they are trying to impact. Panelists stressed that data sources that give voice to the person experiencing pregnancy, their partner or a family member in households experiencing pregnancy is important. Panelists agreed that targeted populations need to be asked how they can be helped and that no policy or program should be implemented without input from a representative of the group/groups affected by that policy or program - "No more about us without us."

Post-Meeting

After the in-person meeting concluded, NashvilleHealth and Vanderbilt worked together to collate notes taken during the in-person meeting. Vanderbilt staff compiled an initial report that was sent to panel members to ensure fidelity of the information included in this report. In the next phase of this process we will present the findings to NashvilleHealth's infant mortality working group to gather local feedback on the panel's recommendations. Based on local feedback about the feasibility of the proposed interventions for Nashville, the expert panel members may be asked to re-evaluate their recommended strategies.

Appendix A. Detailed Biographies of Panel Members

Dr. Deborah Allen - Dr. Deborah Allen directs the Bureau of Child, Adolescent and Family Health at the Boston Public Health Commission. Bureau programs include Boston's perinatal health and early childhood mental health programs, school-based health centers, school health education, youth development, and community and domestic violence prevention programs. Bureau programs take a holistic approach, addressing mental as well as physical health. Like other units of the Boston Public Health Commission, they emphasize elimination of health inequities.

Prior to the Commission, Dr. Allen was on the Maternal and Child Health faculty of the Boston University School of Public Health. For 13 years before that she served as the Title V Children with Special Health Care Needs Director for Massachusetts. Dr. Allen has served on the boards of many MCH organizations: she currently chairs the Board of Directors of CityMatCH, a national organization of urban MCH leaders, and is chair-elect of the MCH Section of the American Public Health Association. Dr. Allen has master's degrees in Health Policy and Management and Maternal and Child Health, and a Doctor of Science in MCH from the Harvard School of Public Health.

D'Yuanna Allen-Robb - Ms. D'Yuanna Allen-Robb, MPH, leads local and national strategic program and policy initiatives to ensure the replication of culturally relevant program models to improve the health status of women. She previously served as the Interim Executive Director of Birthing Project USA (BPUSA), a global non-profit organization dedicated to improving the health status of women of color through mentorship before, during and after pregnancy. During her tenure at BPUSA, she was responsible for generating and managing over $800,000 in program and operational funding in a 2-year period as well as managing a 4-state regional program office. She serves as a member of the National Association of County and City Health Officials (NACCHO) Adolescent Health Infrastructure Project Expert Panel, working to increase the capacity of local health departments to improve adolescent health as a strategic priority. D'Yuanna has published and presented numerous abstracts at national public health and academic conferences focused on reproductive health and youth engagement in public health practice. She currently serves as the Director of the Division of Child and Adolescent Health at the Metro Public Health Department of Nashville/Davidson County, overseeing the local and evidence-based home-visiting programs, the Fetal Infant Mortality Review, and Adolescent Healthy Futures programs with program budgets exceeding $4.0 million.

Ms. Allen-Robb is a 2010 HRSA MCHB Maternal and Child Health Public Health Leadership Institute (MCH-PHLI) Fellow at the UNC Gillings School of Global Public Health, University of North Carolina at Chapel Hill. She is also an inaugural CityMatCH CityLeaders fellow as well as a CityLeaders mentor. Her Board service includes CityMatCH Board of Directors (present), the YWCA of Middle Tennessee Project Implementation Board (Member, 2009-2012) and the Nashville Chamber of Commerce Health Partnership Council (Chair, 2011-2012). Her research and implementation interests are rooted in her early Maternal Child Health (MCH) career experiences, largely influenced by the CityMatCH leadership and legacy to continue to support rising MCH leaders and to advance health equity, eliminate disparities and improve perinatal outcomes.

Dr. Joel Bradley - Dr. Bradley is a native Tennessean , a general Pediatrician, and the Chief Medical Officer of United Healthcare's Tennessee Community Plan serving half a million Medicaid , Long Term Care, and Special Needs' populations in the TennCare program. He has been with United Healthcare for ten years, and holds the title of Sr. Medical Director. He received a BS in Pre-Medicine from Davidson College in 1973 and his medical degree from Wake Forrest Bowman Gray School of School of Medicine MD in 1977. He then completed an internship and residency in Pediatrics at the Fitzsimons Medical Center in Denver, CO in 1980, serving in the US Army from 1980 until 1984.

In 1984, Dr. Bradley began pediatric practice with the Children's Clinic of Clarksville TN, and participated in the Tennessee Medicaid Program through 2007. In 2002, Dr. Bradley became the Medical Director for the

Cumberland Pediatric Foundation and Independent Practice Association in Nashville TN, and served on the Board of Vanderbilt Children's Hospital where he maintains the position of Associate Clinical Professor. In 2004 he was named the AAP Tennessee Pediatrician of the Year.

He has also served on the American Medical Association and American Academy of Pediatric national panels and committees including the CPT Editorial Panel and RBRVS Update Committee (RUC), AAP Committee on Coding and Reimbursement, Editorial Board Pediatric Coding Newsletter , as well as being the Past Editor of the book Coding for Pediatrics.

Professional interests include improving the health of special populations, pediatric vaccine financing, and innovation in patient centered clinical models. Family includes a daughter and two sons who all live in Tennessee. Personal interests include spending time with grandchildren and enjoying most all outdoor activities including fishing, gardening, and hiking trails near and far.

Deborah Frazier - Deborah Frazier is a Registered Nurse who has spent 30 years of her professional career in public health, primarily in maternal child health (MCH), community based programs and health management. She has worked in several leadership capacities at the Arkansas Department of Health; serving as Chief of Staff, Director of the state's Child and Adolescent Health Services, Coordinator of the state's Sudden Infant Death Programs, Director of one of the original SPRANS funded Fetal Infant Mortality Review Programs and Director of the state's first federally funded Abstinence Education Program.

During her tenure as Director of Child and Adolescent Health, she authored and managed a community-based CISS (Community Integrated Service System) federal grant to improve health outcomes to families in three rural counties in Arkansas. The work of this grant was recognized and it was the recipient of the National Healthy Mothers and Healthy Babies Award. Ms. Frazier has also served as Executive Director of Great Expectations Foundation, Inc. in New Orleans, a non-profit organization that housed several programs including the city's Healthy Start Program.

Ms. Frazier lent her expertise and knowledge as a consultant to several organizations including: The American Academy of Obstetricians and Gynecologists, developing and implementing their National Fetal and Infant Mortality Review Program; the Bureau of Maternal and Child Health to evaluate community based programs and to the National School Health Workgroup to develop national standards and policies for school health programs. She has provided consultation to community based programs across the country involving the development of strategic plans, needs assessments and designing programs and services to meet those needs.

In October 2001, Arkansas Gov. Huckabee (R) appointed Ms. Frazier as Director of the Arkansas Health Services Permit Agency. She remained in this position under subsequent Governor, Mike Beebe (D). In this position, she was responsible for the administration of the Health Planning and Permit of Approval (POA) program for long term care, the state's Certificate of Need Program which is required for the construction, expansion or alteration of assisted living facilities, nursing homes, residential care facilities, home health services, hospice services and facilities, intermediate care facilities for the intellectually disabled and residential psychiatric facilities for children and adolescents as well as oversight of the Governor's Developmental Disabilities Council and program.

Ms. Frazier has served on the National Healthy Start Board (NHSA) as the Association's Co-Chair of the Development Committee where she worked with the NHSA President to identify and secure funding that aided in the expansion of the organization's activities including funding for the Partnership grant, which provided a vehicle to assemble three of the leading MCH organizations to focus on work to improve quality of life for women and children. Other funding included the Healthy Start Leadership Training Institute, which supported member sites with training and technical assistance and lastly, funding was secured for regional conferences, to approximately 105 federal Healthy Start member sites. Ms Frazier has served on the Secretary's Advisory Committee on Infant Mortality (SACIM) and the Executive Board of the American Health Planning Association.

Locally, she has served on the Boards of United Way, National Conference for Community and Justice (formerly National Conference of Christians and Jews), The Links, Inc. Arkansas Women's Leadership Forum and other civic and service organizations.

In 2012, Ms. Frazier assumed the position of CEO of NHSA , the membership organization of the federally funded Healthy Start programs. She is working with the Board to chart long range planning, organizational development and a strategic plan and direction for NHSA. The organization has a presence in 34 states and the District of Columbia. On behalf of NHSA, the CEO works with national federal and foundation partners to address issues impacting vulnerable and disparate populations. The national Healthy Start programs now boast an infant mortality rate of 4.6 compared to the national rate of 5.9, despite infant mortality rates of at least 1.5 times the national rate to qualify for a Healthy Start grant. The CEO works to maintain national and other relationships as well cultivate new relationships that bring value to the organization and enhance its mission, vision and priorities. The CEO also works to strengthen ties with existing funders, identify new funding opportunities, and oversee the management of the organization, serving as chief spokesperson, representing and promoting NHSA as a leader in community based programs that work with the voices of the community to improve birth outcomes, reduce disparities, and assure equitable access to a continuum of affordable quality health care and community services for families.

Dr. Maxine Hayes – Dr. Hayes has dedicated her life to teaching and public service, focusing her efforts on disease prevention. "We could save time and work more efficiently in health care if we put more focus on actually preventing diseases, rather than only treating them." She has received numerous awards for her accomplishments, including the prestigious public health award from American Medical Association, the 2002 Dr. Nathan Davis Award for Outstanding Government Service.

Maxine Hayes earned her bachelor's degree in biology at Spelman College in Atlanta, Georgia, after two years as a Merrill Fellow at the University of Vienna, Austria. After graduating from Spelman with honors, she attended the State University of New York School of Medicine in Buffalo. Her post-graduate training was in pediatrics at Vanderbilt University Hospital in Nashville, Tennessee, and at the Children's Hospital Medical Center in Boston, Massachusetts. She earned a Master of Public Health degree at Harvard University. While at Harvard, Dr. Hayes also worked as a consultant to Project COPE, a program sponsored by the University of Massachusetts at Worcester to offer pediatric health care information to mothers of infants born in prison.

Dr. Hayes took a teaching position at the Department of Pediatrics of the University of Mississippi Medical Center in 1977, and, from 1978, also served on the Center for Disease Control's Advisory Committee for Immunization Practices.

In 1985, she joined the faculty of the University of Washington School of Medicine, and she became medical director of the Odessa Brown Children's Clinic, which serves a predominantly low-income population in central Seattle. She was also appointed to the Physician's Task Force on Hunger in America, alongside many prominent physicians, health experts, academic, and religious leaders.

Dr. Hayes has worked for the Washington State Department of Health since 1988 and was appointed State Health Officer in 1988. She works closely with local health officials and the medical community statewide, and advises the governor and the state's Secretary of Health on health emergency responses, prevention of childhood diseases, and other public health issues. At the University of Washington, she continues to educate the next generation of health care professionals as an Associate Professor at the School of Public and Community Medicine, and as a faculty member of the Department of Maternal-Child Health in the School of Public Health.

Dr. Arthur James - Born and raised in Watts, Calif., Dr. James earned his medical degree from Washington University in St. Louis. He completed residency training in pediatrics at the Nationwide Children's Hospital and

the University of Texas-Houston, and in obstetrics and gynecology at the University of Texas-Houston.

He moved from Houston to Kalamazoo, Michigan in 1988 to join a practice in obstetrics and gynecology at Bronson Methodist Hospital. While at Bronson, Dr. James expanded prenatal care services for underserved women, teens and women with pregnancies complicated by HIV and substance abuse. He later moved to Borgess Medical Center where he established and led Borgess Women's Health Center, again expanding services. Between 1992 and 1999, he led a community-wide effort in Kalamazoo County that reduced black infant mortality from 29.7 to 10.2 deaths per 1,000 black births, thereby helping Kalamazoo, Mich. become only one of a few counties in the United States to accomplish the Healthy-People 2000 goal of 11 deaths per 1,000 live black births.

Throughout his career, Dr. James has built healing partnerships, not only with women and families, but with whole communities, in the belief that the sources of poor pregnancy outcomes arise in the community, and thus require community-based interventions. He calls this "Community Oriented Obstetrical Care," based on Dr. H. Jack Geiger's model of "Community Oriented Primary Care." This approach begins by engaging the community to identify problems and resources, and then collaborating with multiple organizations to address the root causes of poor pregnancy outcomes in three dimensions: vertical (along levels of care), horizontal (across providers of multiple services), and longitudinal (over time). His mission, in his own words, is to move people and agencies with shared goals "… from coexistence to communication, to coordination, and finally to full collaboration … through conviction, commitment, and persistence" to reduce perinatal and infant morbidity and mortality and to eliminate the racial disparity in the rate at which black babies die.

Dr. Paul Jarris - Paul E. Jarris, MD, MBA is Senior Vice President, Maternal and Child Health Program Impact and Deputy Medical Officer at the March of Dimes. He leads March of Dimes' Maternal and Child Health Program Impact department, with overall responsibility for the March of Dimes Prematurity Campaign, which seeks to reduce the rate of preterm birth, the number one cause of death among babies in the United States.

Dr. Jarris, a nationally known expert in national healthcare policy, clinical quality initiatives, disease prevention and wellness, among other areas, previously served as Executive Director of the Association of State and Territorial Health Officials (ASTHO). One of his many achievements at ASTHO was partnering with the March of Dimes to challenge all 50 states, the District of Columbia and Puerto Rico to lower their preterm birth rates.

Dr. Jarris has a distinguished career spanning 20 years leading policy and care initiatives to improve public health at the local, state and national levels. Prior to his role at ASTHO, Dr. Jarris served as Commissioner of Health for the State of Vermont, where he led healthcare policy matters and championed new public health initiatives, addressing access to care, prevention, and the factors that impact population health. In addition, he has held a number of health insurance executive-level positions, including President and CEO of Vermont Permanente Medical Group. Throughout his career, Dr. Jarris has received numerous prestigious awards and honors, and has served as a member of many health-related boards and committees.

Dr. Jarris received his BA from the University of Vermont, his MD at the University of Pennsylvania School of Medicine, and an MBA from the University of Washington.

Dr. DeWayne Pursley - Dr. Pursley is a board-certified pediatrician and neonatologist. He is chief of Neonatology and director of the Klarman Family Neonatal Intensive Care Unit (NICU) at Beth Israel Deaconess Medical Center (BIDMC) and a member of the Division of Newborn Medicine at Children's Hospital Boston (CHB). He is an Associate Professor of Pediatrics at Harvard Medical School. He earned his medical degree from Harvard Medical School and completed his post-graduate training in pediatrics at CHB and in neonatology in the Harvard program at BIDMC, Brigham and Women's Hospital, and CHB.

Dr. Pursley is the former chair of the Section on Neonatal Perinatal Medicine at the American Academy of Pediatrics and is the current Vice President of the AAP Massachusetts Chapter. His interests include NICU quality improvement, resource utilization, and racial and social disparities in infant outcomes.

Dr. Kimberlee Wyche-Etheridge (panel chair) - Dr. Wyche-Etheridge has a strong interest in prenatal and perinatal health outcomes/disparities and health equity, especially as they relate to infant mortality, and child wellbeing. After practicing pediatric and adolescent medicine in a health service shortage area outside of Boston, MA, she expanded her influence by completing a Minority Health Fellowship at Harvard School of Public Health while fulfilling the requirements for her Masters. She joined the Metropolitan Nashville /Davidson County Public Health Department in 2001, where she worked for 12 years as the County's Maternal Child Health Expert. During her years at the health department, she oversaw multiple programs, ranging from federal, state and local home visiting programs to adolescent /youth development initiatives. She introduced programs to address at-risk pregnant teens and to promote community health screenings, as well as educational and maternal health programming through area faith-based institutions. She initiated a program for high school students to learn the basics of public health, and established Lentz University, an internal employee public health 101 program to guide the health department towards accreditation. She served as interim chief medical officer for the department, as well as co-director from Sept 06-July 07. In 2003, she founded the Nashville chapter of the Birthing Project, an international infant mortality reduction initiative, and now serves as the medical director for Birthing Project USA, with chapters in 80 cities and 5 countries. In addition Dr. Wyche Etheridge completed service as the longest sitting chair of the board of directors for CityMatCH, the only national urban maternal child health organization. She works closely with the Local School System, chairing multiple school health committees. She also served on the Board of Directors for the National Healthy Start Association, along with multiple advisory boards and commissions. An accomplished grant writer, Dr. Wyche Etheridge has successfully spearheaded the application and receipt of over $10,000,000 in grants for program expansion benefiting women, children and families.

In 2014, Dr. Wyche Etheridge was recruited to assist in the development of a Public Health Practice agenda at Tennessee State University where she now works closely with the Dean of the College of Health Sciences to create public health experiences for students and faculty, as well as creating a public health niche in the community for this Historically Black University.

Outside of work Dr. Wyche Etheridge founded The Wyche Effect LLC in order to further spread her passion for public health practice and training. She is sought after to speak and train groups and organizations nationally. Her passion has led her to continue to work in her free time. She developed a Tweens to Queens Program, working longitudinally with preteen girls as an upstream preconception health model. She also has developed, and conducts Puberty Parties for small groups of mothers and daughters to provide accurate information on human physiology, development and age appropriate sexual health while strengthening communication and goal setting.

She is committed to improving the quality, access, and acceptability of care for underprivileged, underserved children, teens, and families, and to changing the systems that perpetuate the inequities. She participates actively in community advocacy and outreach initiatives, and uses the media to spread health messages throughout the community. She has worked to change clinical practice by teaching medical students and master's students to practice culturally and economically-competent primary care and public health. In addition she has brought to light the importance of recognizing the effect of race and racism stress on birth outcomes. Dr. Wyche-Etheridge sees the transition of health policy into practice at the level of the community as the key to improving health and wellness. She has received numerous local and national awards, including being named the prestigious 2015 Nashville Athena recipient. She has also received honors as an outstanding clinician of the year, and was named one of the top 40 under 40 by the Tennessean newspaper. In addition to the numerous mentorship awards, she received the Albert Schweitzer award from Harvard University, and was named as one

of Nashville's 20 Freedom's Sister in 2010. She is recognized and sought after for her lectures both locally and nationally, and has had multiple abstracts, posters, and presentations accepted at national public health meetings across the country.

Dr. Wyche-Etheridge received her medical degree from the University of Massachusetts Medical School in Worcester, MA in 1993, and completed her pediatric internship and residency at the Children's National Medical Center in Washington, D.C. in 1996. She received her Masters of Public Health in 2000 from the Harvard School of Public Health while completing a Commonwealth Fund Harvard University Fellowship in minority health policy.

Although accomplished in her chosen field, her number one priority is her family, and raising her two children ages 8 and 10.

Appendix B. Literature Review Search Terms and Criteria by Domain

Healthcare

Timeframe:	Last ten years
Search fields:	Search of all fields
Search terms:	Infant mortality safe sleep; preventing infant(s) death; infant mortality interventions systematic review; infant mortality prevention; infant mortality medication; infant mortality provider intervention; contraception and infant mortality; infant mortality clinical interventions; infant death clinical interventions

Media

Timeframe:	Last ten years
Search fields:	Search of all fields
Search terms:	Infant mortality media promotion; infant mortality campaigns; safe sleep campaigns; safe sleep mass media; media outreach infant mortality

Community

Timeframe:	Last ten years
Search fields:	Search of all fields
Search terms:	Infant mortality community interventions; Infant mortality community programs; Infant mortality safe sleep; Preventing infant mortality; Infant mortality programs systematic review; Infant mortality public health systematic review; Infant mortality prevention community; Nurse-Family partnerships; prenatal home visiting; safe sleep interventions; infant mortality safe sleep interventions; high risk pregnancy infant mortality

Policy

Timeframe:	Last ten years
Search fields:	Search of all fields
Search terms:	infant mortality Medicaid; Infant mortality prevention policy; policies to reduce infant mortality; policy impact infant mortality; infant mortality reduction policies

Appendix C. Literature Summaries

Healthcare

U.S. health care interventions to reduce infant mortality typically place an emphasis on prenatal care and reducing preterm and low birth weight births. Potential health care interventions to improve antenatal outcomes include:
1. Increasing access and adherence to 17P
2. Reducing early elective deliveries
3. Improving maternal and paternal pre-conception care

1. Increase access and adherence to 17P regimens
17-alpha hydroxyprogesterone caproate (17P) is shown to prolong pregnancies for women at high risk for preterm birth. However, the 17P regimen is arduous and expensive to maintain: the regimen consists of a shot that must be given by a health care professional approximately once a week for several weeks.[1] Additionally, prior to 2011, 17P was produced in compounding pharmacies because there was not an FDA-approved form of the drug, which increases the price and decreases the likelihood of physician prescribing due to safety and liability.[2] A survey of physicians also found that other barriers, including financial cost to patients and logistical administration of the treatment, kept physicians from prescribing 17P to eligible patients.[2]

In Mississippi's Medicaid program, fewer than half of eligible pregnant women initiated 17P in the recommended gestational window: nearly 20% of pregnant women who initiated a 17P regiment voluntary discontinued the treatment.[3] Additionally, there are racial disparities in initiation and continuation of 17P. Intermediate outcomes of 17P use suggest that racial disparities exist,[4] despite conflicting evidence regarding racial differences in birth outcomes for women who have taken 17P.[1,4] For example, African American women tend to start a 17P regimen later than their Caucasian counterparts and have higher rates of voluntary discontinuation.[4] Additional evidence suggests that duration of the 17P regimen (number of shots) is more important to deterring pre-term birth than gestational age of initiation.[5] Given this evidence, racial disparities in intermediate outcomes for 17P use may suggest that additional attention should be placed on ensuring adherence to a full 17P regimen, especially for African American women.

Although there is limited evidence regarding interventions to improve treatment compliance, pairing 17P administration with additional services, such patient education, weekly home visits, and 24-hour telephonic nurse access, may increase treatment compliance in the Medicaid population and potentially the commercially insured population.[3]

2. Reduce early elective deliveries (EEDs)
Early elective deliveries (EEDs) are associated with higher rates of infant mortality: in Mississippi, early elective births (those before 39 weeks gestational age) had an infant mortality rate three times higher than births at 39 weeks gestation.[6] Despite these risks, a significant portion of births in the United States are elective deliveries between 36-38 weeks.[7,8] Reasons for EEDs are unclear but likely are the result of both patient and provider preferences.[7] States, quality assurance agencies, insurers, and hospital systems have implemented programs and policies in order to curb rates of EEDs. For instance, hospitals in North Carolina engaged in a Health Care 1peer-to-peer intervention to lower the rate of EEDs. Hospitals shared data, resources, and lessons learned regarding their attempts to lower rates of EEDs: the initiative reduced EEDs, increased clinical indications for early deliveries, and decreased the proportion of elective deliveries among all early deliveries.[8] Indeed, systematic reviews have found that interventions that provide additional provider education; "soft stops", where physicians face peer review or disciplinary action for scheduling EEDs; or "hard stops", where physicians are not permitted to schedule EEDs, are effective in reducing EEDs by nearly 45% with "hard stops" being most effective.[7]

Additionally, some state Medicaid programs have stopped reimbursing physicians for elective deliveries without a medical indication (Texas, South Carolina), and the federal Medicaid program may enforce penalties on institutions that continue to have high rates of EEDs.[7]

3. Improve maternal and paternal pre-conception care

One of the key drivers of pregnancy and postnatal outcomes is prenatal health. Despite the importance of prenatal care, there is little evidence to evaluate prenatal care interventions and produce evidence-based practices. The CDC's Preconception Care Work Group identified four goals aimed at improving preconception health, which includes ensuring that all women of childbearing age receive preconception care services.[9] Preconception care services may include screening for risk factors, such as stressors, tobacco use, or substance abuse; but these services may also include chronic disease management and health promotion interventions.[9] One potential way to implement this strategy in health care settings is to create an Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) measure for preconception care. Universal implementation and execution of this strategy may improve pregnancy and birth outcomes while simultaneously reducing disparities for women who may become pregnant.

An area of preconception care that is often overlooked is improving the health, well-being, and pregnancy preparedness of men.[10] Despite the CDC's goal of improving the preconception health for both men and women, there remain substantial barriers to providing preconception care to men, including amending health care delivery and financing systems to accommodate men as significant contributors to preconception health of a woman and birth outcomes of a child.[9,10]

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Media

Media campaigns have been used to promote positive health behaviors at all stages of pregnancy. Prior to conception, media and technology-based interventions have been used to avoid unintended pregnancy. During pregnancy, media campaigns can be used to increase knowledge regarding pregnancy symptoms, improve prenatal attitudes and preparedness, and promote healthy actions. Post-partum, media campaigns have been used to increase vaccination rates, adherence to safe sleep positions, and rates of smoking cessation. Evidence for specific media interventions to promote pregnancy-related health behaviors can be categorized into the two mediums:

1. Innovative media outlets, including mobile platforms
2. Traditional media outlets

1. Innovative media outlets, including mobile platforms

As access to technology proliferates, women are soliciting advice and information regarding their pregnancy from the Internet, social media platforms, and mobile health platforms. However, there is limited evidence to support the efficacy of interventions using online interventions and social media outlets. Multiple sources of evidence have a sought to understand how online information is accessed and by whom, but few studies have looked downstream to understand the impact of these information sources and interventions on pregnancy outcomes and infant mortality. Reviews of individuals seeking online information has revealed that women with higher levels of education are more likely to seek information than women with less than a high school education.[1] Additionally, a cross-sectional study suggests that minority women are less likely to use mobile and online services to find others with similar concerns, when compared to white women.[2] Despite limited evidence of downstream effects, there is at least one ongoing randomized controlled trial to test the efficacy of online pregnancy-related weight gain interventions, but this study is in early stages with no reportable results.[3]

Similar to information sought online, mobile health platforms are a rapidly growing method of improving health outcomes via mobile applications and text message reminders. These applications have been used to improve chronic disease management,[4] help promote smoking cessation,[5] and promote healthy behaviors during pregnancy. One of these applications for pregnancy, text4baby[6], is a text message-based service that provides pregnancy and post-partum education and appointment reminders to the user at no cost. In randomized controlled trials, text4baby has demonstrated a change in attitudes toward parenting preparedness,[7] the importance of prenatal vitamins and seeing a healthcare provider during pregnancy,[8] and alcohol consumption.[7,8] Text4baby also appears to improve post-partum health outcomes for the mother and infant. High exposure to the intervention reduces post-partum, self-reported alcohol consumption[9] and increases rates of influenza vaccination during flu season.[10] Despite its demonstrated efficacy, there are limitations to text4baby. Although text4baby reduces risk factors that may be correlated to adverse birth outcomes and infant mortality, there is no evidence to suggest that text4baby improves rates of pre-term birth, low birth weight, or infant mortality.

Moreover, text4baby may not be reaching women and families with the greatest need for intervention. Self-enrollment and the likelihood of uninterrupted messages in the text4baby intervention were correlated with increased health literacy, educational attainment, and income.[11,12] Additionally, a quarter of low-income women who report mobile phone use for pregnancy-related information change phone numbers 2 or more times in year, which may disrupt the continuity of a text-based program like text4baby.[2] Finally, survey results suggest that women of childbearing age are less willing to participate in a mobile platform intervention compared to an Internet intervention that could be accessed from a computer: these differences in preference are greater in older women and women with children.[13]

Although text4baby is intended for pregnant women and mothers with children <1 year of age,[6] other mobile applications have been developed to prevent unintended pregnancies, a risk factor for infant mortality. Of the 218 unique apps reviewed, only 12 scored 15 points (out of 21) for contraceptive information and pregnancy

prevention best practices.[14] In fact, of the 129 (59%) apps that mention at least one modern method of contraception, fewer than 50% of these provide information on how to use the contraception method.[14] The magnitude of these missed opportunities in mobile applications is underscored by the individuals who tend to use pre- pregnancy and pregnancy-related apps. Women who seek information through mobile health applications, such as text4baby, tend to be younger, in their first pregnancy, and feel less healthy than women who seek pregnancy-related information from the Internet.[15] Women who obtained information from pregnancy-related mobile applications were also more likely to be influenced by the information they received.[15]

2. Traditional media outlets

Despite the widespread acceptance of traditional safe sleep campaigns, including "Back to Sleep" and the "ABCs of Safe Sleep", there is little evidence to evaluate these campaigns' success in reducing sleep-related and sudden infant deaths. Rather, evidence regarding traditional media campaigns to reduce infant mortality focus on identifying and addressing racial disparities. A social marketing campaign in San Francisco canvassed the city using public transportation ads, radio spots, and posters/cards in likely settings for parents (clinics, daycares, social service agencies).[16] These campaigns focused on the existence of infant mortality disparities; actions to reduce these disparities; and safe sleep practices.[16] Exposure to the racial disparities campaign increased knowledge and awareness of the disparity, but exposure to the safe sleeping campaign did not produce a significant increase in knowledge about safe sleeping position.[16] Likewise, a traditional media smoking cessation campaign, called "One Tiny Reason to Quit", targeted pregnant women who smoke.[17] The campaign drove an increase in calls to the quitline, especially among African American women.[17]

Similar efforts in both innovative and traditional media outlets might be undertaken in Nashville. Caution should be taken to ensure that media campaigns use images consistent with standard medical guidelines. These conflicting images cause confusion and misguide pregnant women and new mothers regarding proper perinatal practices, including sleeping position. For instance, one-third of pictures of sleeping infants in magazines are in inappropriate sleep positions and two thirds of pictures are not consistent with the guidelines from the American Academy of Pediatrics.[18]

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Community

Community-based strategies to reduce infant mortality have taken varied approaches to enhance the health and well being of women, infants, and their families. Broadly, these initiatives address social and environmental factors that contribute to poor birth outcomes by focusing on pre- and inter-conception health, prenatal care, and postpartum health. Community-based interventions have particular potential to reduce existing infant mortality disparities and reach populations in resource-limited settings. Existing community based strategies emphasize interventions that: 1) address the potential cumulative impact of experiences in early life and throughout an individual's life on later life outcomes;[1,2] 2) provide home visiting services;[3,4,5] 3) supply culturally-appropriate health education;[6,7] 4) include incentives for pregnant women;[8] 5) are multi-prong;[7,4,14,15] and 6) and incorporate education on safe sleep practices.[9,10,11,12] Across potential community based strategies two main themes emerge:

1. Attention to preconception health: environmental factors and family planning
2. Partnerships between families, health care providers and community liaisons

In community-based interventions, special attention is often placed on high-risk populations and the racial inequity in infant mortality. Compared to non-Hispanic whites, African Americans are disproportionately affected by poor birth outcomes. Such disparities are well documented and persist despite socioeconomic achievement or access to health or social services.[16,17,18,19,20,23] These disparities are reflected in multiple health outcomes, including rates of infant mortality, low birth weight, and preterm birth (two key indicators of risk for infant mortality).[21,22]

1. Attention to preconception health: environmental factors and family planning

Preconception health among reproductive-aged women impacts both fertility and pregnancy outcomes. Preconception education interventions that address adequate nutrition, smoking cessation, and folic acid intake are effective in improving pregnancy outcomes and producing positive behavioral change. Further, preconception interventions that target multiple risk factors are more effective than interventions that target one risk factor.[24] In a sample of low income women, participation in an intensive 12-week education program on preconception health and well-being was associated with beneficial attitudinal and behavioral changes in nutrition, physical activity, stress management, and perceived control of birth outcomes. Moreover, participation in more educational sessions was associated with better outcomes.[25]

Because a large part of preconception health can be affected by environmental factors (e.g. second hand smoke, access to healthy food, inadequate housing) place-based strategies may be especially well suited to improving preconception health. Place-based interventions concentrate efforts and resources in specific areas and: 1) provide targeted outreach that addresses more distal social determinants of health; 2) incorporate partnerships with organizations in a variety of sectors; 3) seek to cultivate a culture of health by developing resident leaders; 4) increase understanding of the connections between community conditions and birth outcomes. Such efforts also typically provide case management activities to coordinate multiple services.[1,2,23]

Family planning allows individuals to avoid unintended pregnancies and adhere to clinically- suggested spacing between pregnancies. Reduction in unintended pregnancies is associated with lower risk of preterm birth, low birth weight, and births that are small for gestational age.[26,27,28] Further, unintended pregnancies are associated with delayed initiation of prenatal care, reduced likelihood of breast feeding, postpartum depression, and an increased risk of physical violence during pregnancy, among other adverse outcomes for parent and child.[29, 30, 31,32] Through preconception interventions, families can be supported in pregnancy planning or screened for pregnancy intendedness using "reproductive life plans" or the "one key question" strategy.

2. Partnerships between families, health care providers and community liaisons

Community-level programs that focus on delivery of care outside of traditional clinical settings improve

maternal and newborn health outcomes, particularly for families who are difficult to engage in services. Such efforts include home visiting programs, which offer vital support to expecting and new parents challenged with competing priorities. These programs usually involve a health care provider or community health worker building trust with expecting or new parents, providing health education (e.g. safe sleep practices), and providing referrals to needed social service resources. Home visitation significantly improves antenatal care, immunization coverage, referral and early initiation of breast-feeding, decreases cesarean section rates, increases birth spacing, improves maternal morbidity, neonatal mortality and perinatal mortality.[33,37,38,39] For example, Nurse-Family Partnership is a home visiting program for first time low-income mothers. Home visits are done by registered nurses and span throughout pregnancy until the child turns two years old. The goal of the partnership is to educate and support parents about what is needed to have a healthy pregnancy, provide responsible and competent care for their children, and becoming more economically self-sufficient. Current evaluation data and projected outcomes of the Nurse-Family Partnership programs find that Nurse-family partnerships reduce smoking during pregnancy, pregnancy complications, childhood injuries, and use of subsidized child care; improve language development; increase breast-feeding; increase interpregnancy interval; and raise compliance with immunization schedules.[34,36] Further, for high risk first time mothers, more sessions of prenatal home visiting are associated with reduced likelihood of pre- term birth and small for gestational age births.[35]

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Policy

It is estimated that in 2005, the annual social and health cost of pre-term and low birth weight births in the U.S. was at least $26.2 billion[1] Policies at the national, state, or local level can be directed to shape factors affecting birth outcomes. For example, policy related interventions proposed to reduce poor birth outcomes and infant mortality include increasing the minimum wage,[2] enhancing Medicaid prenatal care programs [3,4] expansion of Medicaid,[5,6] increases in excise taxes on cigarettes and alcohol,[7-10] reducing the rate of elective delivery before 39 weeks gestation,[11] tobacco cessation pre and postpartum,[12,13] extended maternity leave,[14] and increasing access to progesterone supplementation.[23,24] Policy interventions can be considered under two main themes:
1. Direct interventions related to improving the knowledge of the parent(s) and the care of the parent(s) or child.
2. Indirect interventions related to social determinants of health

1. Direct interventions related to improving the knowledge of the parent(s) and the care of the parent(s) or child.

The effectiveness of Medicaid for reducing infant mortality has often been debated by researchers and policymakers. Some evidence suggests that increased Medicaid eligibility and participation improves outcomes for low-income women and rates of infant mortality, while others find little or no effect on infant mortality.[5,15-18] More consistent findings show that Enhanced Medicaid prenatal programs are associated with decreased odds of preterm births and very low birth weight births,[3,4] and more prenatal care sessions are associated with better birth [outcomes] and increased health care utilization. However, beneficial outcomes are largely dependent on timing of entry into a care setting as some research shows that Medicaid enrollment has little or no association with the timing or number of prenatal care visits.[5]

Among pregnant women with prior pre-term births, the use of 17-alpha hydroxyprogesterone (17P) prolongs pregnancy, reducing the chance of having a pre-term birth[23] and reduces the likelihood of several complications for infants (necrotizing enterocolitis, intraventricular hemorrhage, and need for supplemental oxygen).[25] Among providers, the use of 17P has steadily increased. Between 2004-2005, subspecialists and obstetrics/gynecology providers reported a progressive increase in 17P use from 35-67 percent and up to 74 percent in 2007.[26,27] However, despite provider uptake, evidence suggests that there are issues associated with to access and adherence.[30,31] Other policy related interventions have focused on limiting reimbursement for elective deliveries by either induction or cesarean section. Such deliveries and are associated with longer hospital stays for both mothers and an increased risk of maternal and neonatal morbidity, as compared to deliveries occurring between 39 and 40 completed weeks gestation.[11] Policy interventions have also addressed the impact of family leave policies. One such study finds that adding one month to the length of paid leave prevents about 8 infant deaths per 1,000 live births, equivalent to a 13% reduction in mortality.[14] Moreover, extended maternity leave is associated with lowered risk of postpartum depression.[19]

2. Indirect interventions related to social determinants of health

Indirect policy interventions focus on "fundamental causes" [20] that influence risk factors for infant mortality. For example, empirical work shows that increases in state minimum wage above the federal minimum are associated with a 1% to 2% decrease in low birth weight births and a 4% decrease in post-neonatal mortality.[1] Poverty is an important driver of differential health outcomes among groups and contributes to a cascading sequelae of risk. Disparities in birth outcomes between whites and African Americans may be most effectively addressed through public policies focusing on housing, neighborhood context, residential segregation, discrimination, and the built environment.[21] Such factors structure lived experience and unequal exposures to adverse conditions among different racial and ethnic groups (e.g. access to goods and services, access to primary care physicians and obstetricians, availability of recreational opportunities, and crime rates).

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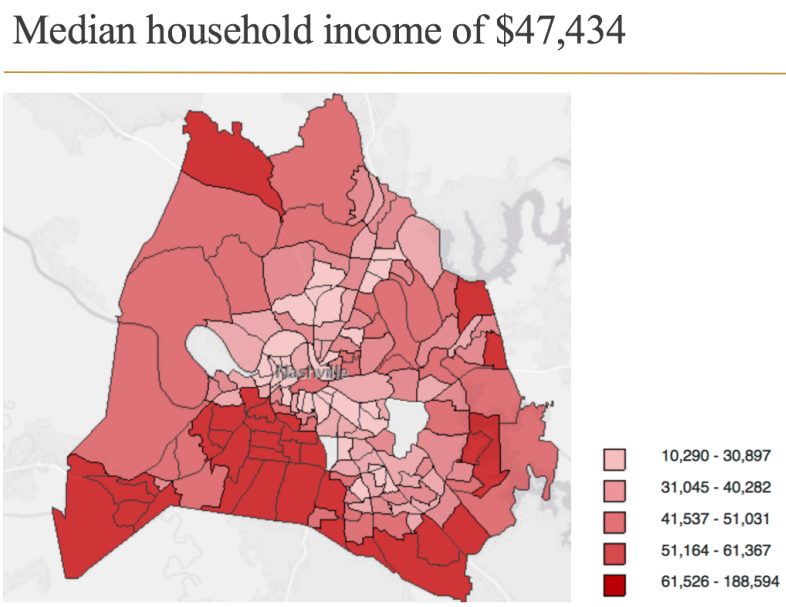
Appendix D. Nashville Characteristics

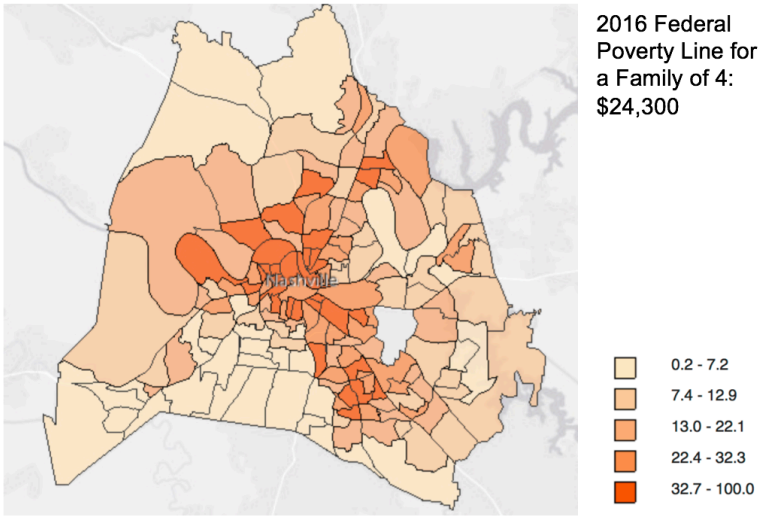
Demographic Characteristic	Nashville
Total Population	648,048
Median Age	34
Percent over age 18	78%
Median Household Income	$47,434
Percent Living in Poverty	19%
Percent Covered by Medicaid	18%
Percent African-American	28%
Percent Hispanic/Latino	10%
Percent with High School Diploma	86%
Rate of Infant Mortality[2]	6.8%
Median Gross Rent	$859
Smoking Prevalence	21.4%

Sources: 2010 - 2014 5-year ACS estimates [2] Office of Healthcare Statistics, Division of Policy, Planning & Assessment, TN Dept. of Health



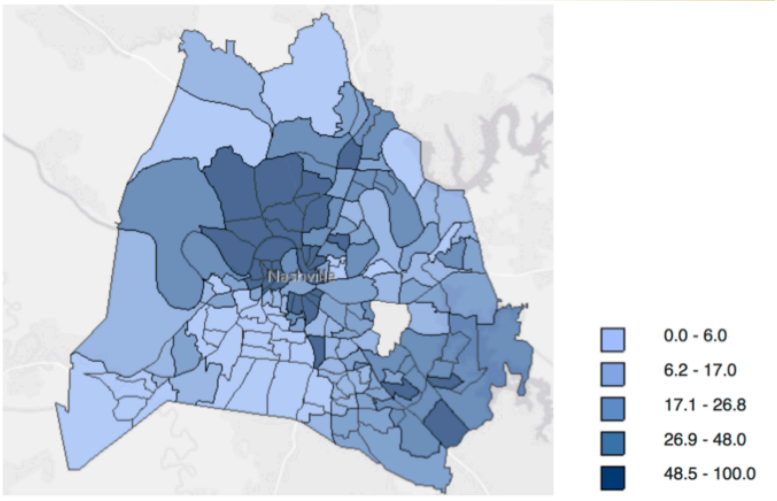
Source: 2010 - 2014 5-year ACS estimates

19% of households live below poverty line



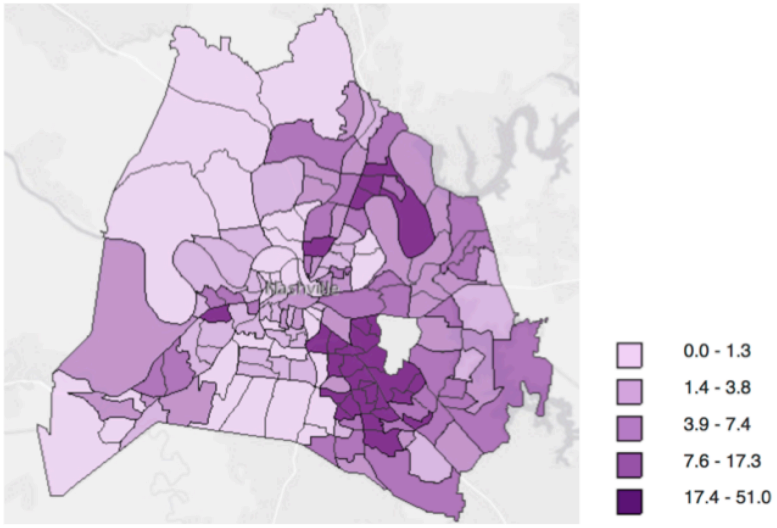
Source: 2010-2014 ACS estimates

28% of residents are African-American



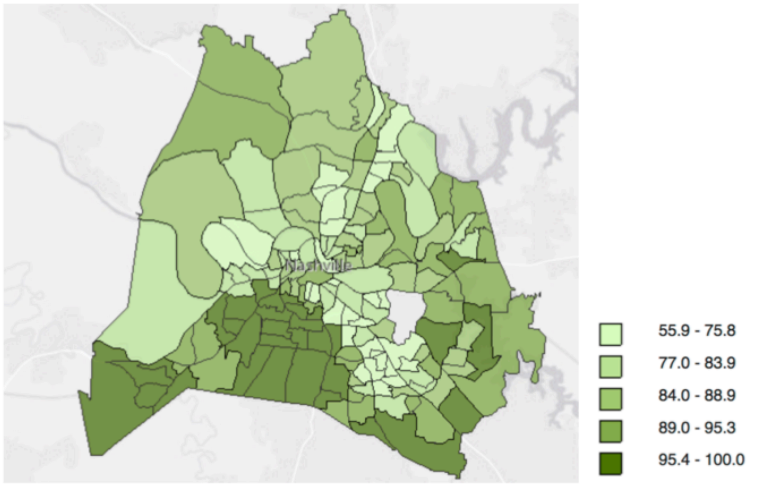
Source: 2010-2014 ACS estimates

10% of residents are Hispanic or Latino



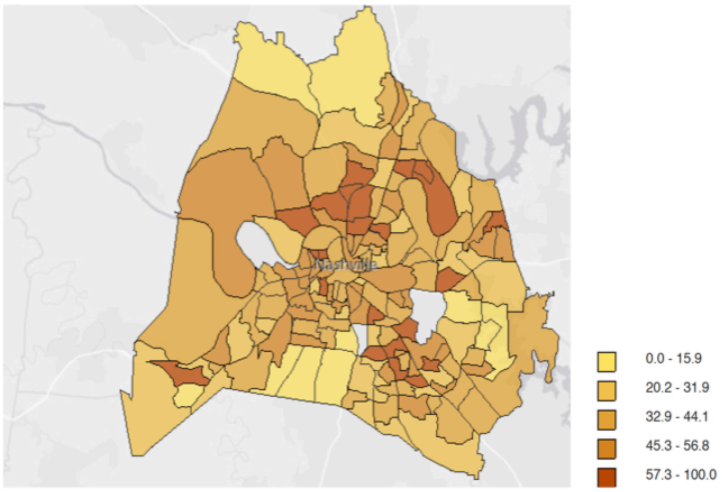
Source: 2010 - 2014 5-year ACS estimates

86% of adults have a high school diploma



Source: 2010 - 2014 5-year ACS estimates

42% of households' gross rent is more than 35% of household income



Source: 2010 - 2014 5-year ACS estimates

Appendix E. Recommendations and within-domain rankings from in-person meeting

Healthcare:
1. Develop and create buy-in for a preconception health standard of care for both men and women
2. Address unintended pregnancies through interventions including "One key question" as a screening standard of care (i.e. universal – and should apply to men and women) -- follow-up with life plan and contraception plan
3. Develop systems improvements to make it "easy" to order and deliver 17P for all at-risk pregnant women

Media:
1. Promote use of existing interventions and resources e.g. safe sleep, smoking cessation campaigns, "one tiny reason to quit"
- Use multiple innovative media outlets
- Tailor for TN/Nashville audience
- Promote use of direct-to-consumer media, e.g. text4baby program, especially among low-income minority communities
2. Create a traditional media campaign that highlights the rate of infant mortality in Nashville and racial disparities (to elevate issue with general public, political leaders)
3. Promote healthy pregnancy through workplaces – create case by informing businesses about the costs of adverse birth outcomes

Community:
1. Create community dialogue and engagement to recognize and address the role of racism and bias in birth outcomes and infant mortality . "Look in the mirror first" – conduct diversity/inclusion audit and follow-up training within public and health care institutions.
2. Increase proportion of women participating in an enhanced pre- and post-natal care program. Such programs should emphasize care coordination, social/group care, and home visits, be focused on self-efficacy, and include linkages to health care.
3. Build culture of women's health prior to pregnancy and supportive system of community resources
- Inter-conceptional home visiting
- Media/public awareness

Policy:
1. Expand insurance coverage for women.
-Expand postpartum emergency Medicaid and pregnancy coverage
- Apply for a family planning waiver to allow for coverage of selected services for more than 60 days post-partum
- Elect to expand coverage for those uninsured up to 138%FPL
2. Create broader policy environment in which programs are more likely to succeed, including:
- Maintain programs supporting perinatal regionalization
- Medical education reforms emphasizing care for high-risk patients and for preconception health in internal medicine
- Increase funding/staff for robust MCH public health infrastructure