



Indiana Perinatal Quality Improvement Collaborative

Addressing Infant Mortality in Indiana

A Report to the IPQIC Governing Council

The Quality Improvement Committee

Endorsed by the IPQIC Governing Council, March 26, 2014

2014

Table of Contents

Executive Summary..... 4

List of Tables..... 6

List of Figures 6

List of Acronyms..... 6

Introduction 7

 Brief Review of US and Indiana Infant Mortality..... 7

Complexity of Addressing Infant Mortality..... 8

 Complexity of Perinatal Care That Influences Health and Outcomes..... 9

 Data Complexity 12

 Implementation as a Complex Science 13

 Complexities of Securing and Allocating Resources 15

Evidence-Based and Successful State Models to Address Infant Mortality..... 15

 Best Practice Models: Perinatal Quality Collaboratives..... 15

 Best Practice Models: Perinatal Periods of Risk (PPOR) Model 19

Strengths and Gaps in Indiana MCH Resources 20

 Strengths 20

 Gaps..... 21

Benefit to Indiana..... 22

Recommendations for a Comprehensive Perinatal Quality Collaborative 23

 Recommended Next Steps..... 24

Conclusion..... 25

Appendix 1 - IHI Breakthrough Series..... 29

Appendix 2 - TIPQC Project for Development 30

Appendix 3 - Organizational Charts for Three Perinatal Quality Collaboratives..... 31

Appendix 4 - Results of IPQIC’s Environmental Scan of Indiana’s Current MCH Resources 32

Appendix 5 - Impact on Indiana by Cause if IMR is Reduced to the US IMR (2011)..... 40

Appendix 6 - Impact on Indiana by Race/Ethnicity if IMRs are Reduced to US IMRs (2011)
..... 41

The following individuals were involved in the development of this reports:

| Name | Agency | Role |
|---|--|---|
| Ann Alley | IN State Department of Health | Office of Primary Care |
| Bill Engle, MD | Riley Hospital for Children | Neonatologist |
| Karen Greuter | Dupont Hospital | NICU Team Specialist |
| Ken Herrmann, MD | Deaconess Hospital | Neonatologist |
| Dawn Kackley, MSN, WHNP, RNC | Terre Haute Regional Hospital | Clinical Coordinator Women & Children Services |
| Julie Kathman, MSN, RN, CNS-BC | I.U. Health Bloomington Hospital | Women and Children's Services Clinical Nurse Specialist |
| Joanne Martin, DrPH, RN, FAAN | Goodwill Industries of Central Indiana | Director, NFP Implementation Planning |
| Phil Morphew | IN Primary Health Care Association | Executive Director |
| Renee Stratton, MS, MPH Lead Author | Riley Child Development Center | LEND Fellow |
| Nancy Swigonski, MD, MPH Committee Chair | Children's Health Services Research | Pediatrician |
| Louis Winterheimer, MD | Raphael Health Center | Medical Director |

Special thanks to Kelsey Gurganus and the Epidemiology team at ISDH for supporting the data needs for this report.

Executive Summary

Background

For more than 100 years, Indiana has had one of the highest infant mortality rates (IMR) in the nation. In 2013, reducing this infant mortality rate became the top priority for the Indiana State Department of Health (ISDH).¹ Infant mortality reflects the health of a population at large and serves as a key indicator of a community's health and care resources. Addressing infant mortality may have a positive health impact that goes beyond infant health and in fact, could provide a model program for improving a wide array of health outcomes for all Indiana residents. Indiana currently has some existing strengths and resources for addressing infant mortality; however they are not coordinated or focused under a comprehensive model or strategic plan and lack financial support for expansion.

Purpose

In this paper, we analyze the resources and gaps impacting Indiana's infant mortality rate and develop recommendations for addressing it. We provide an overview of IMR statistics and review the challenges that IMR presents due to the complexity of issues which affect it. The Indiana State Department of Health called on maternal child health (MCH) professionals to, "learn from successes in other states". As a result, review of other state programs to reduce infant mortality rates shows that the development and operation of an infrastructure of evidence based policies and clinical best practices – generally termed Comprehensive Perinatal Quality Collaboratives and the use of Perinatal Periods of Risk (PPOR) analyses have been successful in focusing their efforts and is making a positive impact. We discuss how similar programs might benefit Indiana and provide actionable recommendations for decreasing Indiana's infant mortality rate.

Recommendations and Next Steps

The Indiana Perinatal Quality Improvement Collaborative (IPQIC) Quality Improvement Committee recommendation to ISDH to address Indiana's high infant mortality rate is to build a Comprehensive Perinatal Quality Collaborative. Specifically to:

- a) **Improve data timeliness, data linkages (birth certificate, death certificate, birth defects registry, immunization, etc.) and analysis systems to identify the causes and contributing factors associated with infant mortality and to track outcomes over time.** A model (e.g., PPOR model) for identifying causes and factors is needed in Indiana. Birth certificate data is currently two years in arrears and fails to reflect the current state of infant mortality in Indiana. An improvement project to improve birth certificate accuracy and timeliness would assist Indiana to focus efforts on reducing infant mortality where needed most. It is also necessary to augment birth and death certificate data by incorporating additional sources of data.
- b) **Work with the current IPQIC structure, existing champions and organizations to formalize priorities and develop strategic aims** to address infant mortality. Improvement

aims or goals will ideally be guided by a life-course perspective, informed by data and coordinated with regional and national efforts to reduce infant mortality.

- c) **Define/develop organizational structure(s) to carry out IPQIC initiatives** including expertise in clinical content, team development, data collection and reporting, benchmarking and QI processes. The organizational structure(s) will formulate strategies to carry out high priority perinatal quality improvement projects and support local QI teams by providing quality improvement experts, tools, and measures. The organizational structure(s) will provide a process for trend analysis with real-time data and feedback to support rapid cycle improvement and ensure that processes are resulting in improvements. Public reporting of data will ensure transparency and development of a learning community to share best practices.

We recommend that IPQIC and ISDH sponsor a day long retreat with state QI experts, infant mortality experts, data experts and current members from each of the IPQIC committees to:

- Leverage existing relationships with improvement partnerships to engage national consultant's knowledge and experience to facilitate the retreat
- Prioritize and set time specific, measurable aims or goals;
- Define the contribution of each IPQIC sub-committee to achieving the priority goals;
- Delineate the organizational structure(s) necessary to support the implementation QI processes to achieve priority goals;
- Determine resources including feasible funding necessary to implement priority improvement projects.
- Provide resources and funding to pilot the Comprehensive Perinatal Quality Collaborative priority project over the next 9-12 months.

List of Tables

Table 1. Examples of Birth and Death Certificate Data Use 12
 Table 2. 2011 Infant Mortality Indicators..... 22
 Table 3. 2011 Indiana Indicators by Race/Ethnicity..... 23
 Table 4. Impact on Indiana by Cause if IMR is Reduced to the US IMR (2011)..... 40
 Table 5. Impact on Indiana by Race/Ethnicity if IMRs are Reduced to US IMRs (2011) 41

List of Figures

Figure 1. Percent Contribution of Two Components to Decline in US IMR 2005-2009, by Race/Ethnicity 7
 Figure 2. Continuum of Services from Prior to Pregnancy to Birth Needed to Improve the Health of Women and Birth Outcomes 10
 Figure 3. Continuum of Services Following Birth Improve Infant Health and Survival 11
 Figure 4. Implementation “How/When” Matrix 13
 Figure 5. 2002 Meta-Analysis..... 14
 Figure 6. PDSA Cycle Example and PQC’s Locations in US 16
 Figure 7. "Driver Diagram" for Improving OH Birth Data Accuracy 18
 Figure 8. Example of Effectiveness and Estimated Cost Savings for NICU Infections by State Collaborative Project 18
 Figure 9. Ohio Perinatal Collaborative - "Run Chart" Example..... 19
 Figure 10. PPOR Matrix 19
 Figure 11. PPOR Helps Communities Move from Data to Action 20

List of Acronyms

- ABP - American Board of Pediatrics
- AMCHP - Association of Maternal & Child Health Programs
- CHIP-IN - Indiana’s Child Health Improvement Partnership
- CoIIN - Collaborative Improvement and Innovation Network
- CSHCS - Children's Special Health Care Services
- ECS - Every Child Succeeds
- FIMR - Fetal Infant Mortality Reviews
- IMR - Infant Mortality Rate
- IPQIC - Indiana Perinatal Quality Improvement Collaborative
- ISDH - Indiana State Department of Health
- MCH - Maternal Child Health
- NCHS - National Center for Health Statistics
- NFP - Nurse Family Partnership
- NIH - National Institutes of Health
- PDSA - Plan-Do-Study-Act
- PPOR - Perinatal Periods of Risk
- PQCs - Perinatal Quality Collaboratives
- PRAMS - Pregnancy Risk Assessment Monitoring System
- QI - Quality Improvement
- SACIM - Secretary’s Advisory Committee on Infant Mortality
- SIDS/SUID - Sudden Infant Death Syndrome/Sudden Unexpected Infant Death
- VCHIP - Vermont Child Health Improvement Program
- WIC - Women Infants and Children

Introduction

In November 2013, Indiana held its first infant mortality summit to present a “state of the State” and serve as a networking event for maternal child health (MCH) professionals and others concerned about the State’s high infant mortality rate. The State Health Commissioner, Dr. William C. VanNess II, identified reducing the State’s infant mortality rate (IMR) as the Indiana State Department of Health’s (ISDH) number one goal for the next four years.¹ Analysis of the most recent United States (US) data found that Indiana had the seventh highest infant mortality rate (2010 Indiana IMR=7.5).^{2,3} Indiana Governor Mike Pence spoke at the summit offering encouragement to the audience while calling upon attendees to not simply focus on “reducing the number of deaths, but also reducing heartbreak”.

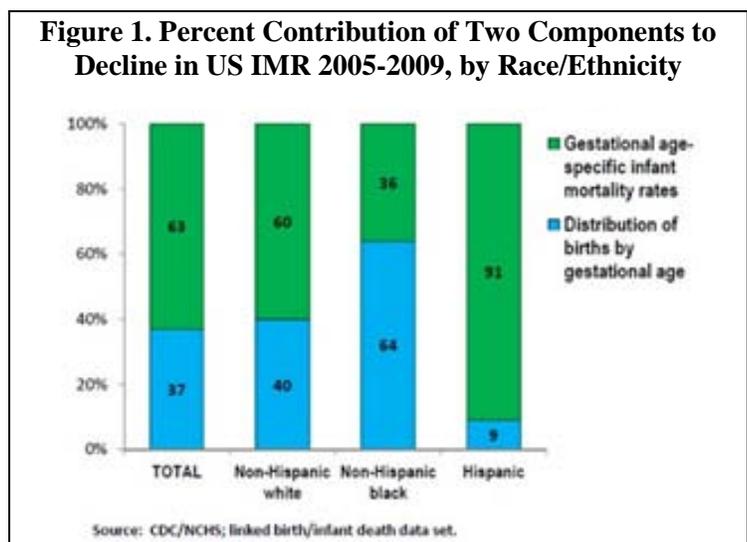
The purpose of this paper is to:

- 1) Provide a brief review of national and Indiana infant mortality rates;
- 2) Describe the complexity of addressing infant mortality;
- 3) Examine examples of successful state approaches to infant mortality;
- 4) Give an overview of Indiana’s strengths and gaps to address infant mortality;
- 5) Show the benefits to Indiana if the state’s IMR was decreased to the US IMR; and
- 6) Provide rationale and recommendations to address Indiana’s high infant mortality rate.

Brief Review of US and Indiana Infant Mortality

In 2005, the latest available year for international rankings, the US ranked 30th in the world in infant mortality, behind most European countries, Canada, Australia, New Zealand, Hong Kong, Singapore, Japan, and Israel.⁴ The lowest IMRs (i.e., ≤ 3.0) were found in Scandinavian countries (i.e., Sweden and Finland) and East Asian countries (i.e., Japan, Hong Kong, and Singapore).⁴ By comparison, the rate in the US was 6.86 in 2005.⁵ There are some differences in the reporting of live births between countries that may have an impact when making individual comparisons of infant mortality, however, the US and 14 of 19 European countries are required to report all live births at any gestational age or birth weight so comparisons to other developed countries are generally valid.

After a five year plateau, the US IMR declined 12% from 2005-2011. Changes in the overall infant mortality rate can be analyzed by examining two key components: 1) distribution of births by gestational age and 2) gestational age-specific infant mortality rates. Using a linked birth/infant death data set, the Centers for Disease Control and Prevention/National Centers for Health Statistics (NCHS) analyzed the decline in US infant mortality rate 2005-2009 by race and ethnicity (see Figure 1). For Black women, 2/3 of the 2005-2009 IMR



decline was due to declines in preterm births. For White and Hispanic women, the majority of their infant mortality declines were due to declines in gestational age-specific IMRs. This method of examining two key components in the changes in the overall infant mortality rate by 1) the distribution of births by gestational age; and 2) gestational age-specific infant mortality rates is called the Kitagawa method and is the foundation for the Perinatal Periods of Risk approach to infant mortality. It allows states and communities to better address the root causes and disparities of infant mortality. For example, in non-Hispanic blacks where the distribution of births by gestational age accounts for 64% of mortality, there is a need to focus on preventing preterm births. For Hispanics, distribution of births by gestational age only accounts for 9% of the mortality (i.e., there are fewer preterm births) so focusing efforts on access to high quality birth and infant care are likely to garner the greatest impact.

Historically, Indiana has had higher infant mortality rates than other states. The state has reported an $IMR \geq 6.9$ for over a century.¹ Recent findings indicate that both higher Black as well as White IMRs contribute to Indiana's excess* infant mortality when compared to other states.^{6,7} Indiana also has documented racial disparity in infant mortality. In 2011, the difference in IMR between Blacks and Whites was nearly double (Black $IMR=12.3$ versus White $IMR=6.9$).⁸ Preterm-related causes contributed the most to the mortality disparity between Black and White infants.⁷ In 2010, Indiana ranked *last* (35th of 35) among the states that had sufficient numbers of Black births to meet statistical reporting requirements for infant mortality and *last* (33rd of 33) among states with sufficient numbers of Hispanic births to report.⁹

In 2011, 643 Indiana babies died from preterm-related causes (n=294, 45.7%), congenital anomalies (n=169, 26.3%), sudden infant death syndrome/sudden unexpected infant death (SIDS/SUID)/accidents (n=100*, 15.6%), assault/neglect (n=9*, 1.4%), and all other causes (n=71, 11%).¹ The 2013 Region V infant mortality report supports the state's findings for causes of death. Specifically, the report cited preterm-related causes (53%), congenital anomalies (19%), and injuries (14%) as the primary causes of the excess mortality.⁷ Not surprisingly, Indiana has higher rates of risk factors (e.g., late prenatal care and tobacco exposure) associated with infant mortality than other states. Approximately one-third of Indiana mothers (31.9%) do not receive prenatal care in their first trimester.¹ Almost one-fifth of pregnant women in Indiana are smokers, which is about twice the national average (Indiana~17% versus US=9.1%).¹⁰ Only eight states have higher proportions of pregnant women who smoke.⁶ Indiana is ranked 8th in the nation for obesity.¹¹ As a risk factor, obesity is associated with preterm births (obese=25%, morbidly obese=33%).¹ The negative health outcomes associated with preterm births can also be risk factors for mortality and include low/very low birth weights, respiratory distress, and feeding issues.¹²

Complexity of Addressing Infant Mortality

The complexity of infant mortality and morbidity as a public health problem cannot be overstated. There is no one approach robust enough to address the problem. Given Indiana's poor historic and current IMR, a different approach to preventing infant deaths and poor outcomes is warranted. "A comprehensive approach to improving birth outcomes and reducing

* In these instances, excess mortality is the "simple difference in infant mortality rates between a given state/region and all other regions (positive numbers indicate greater mortality and negative numbers indicate lower mortality).

infant mortality follows a life course approach, acknowledging and accounting for the interplay of biological, behavioral, psychological, social, economic and environmental influences on one's health across the course of their life".¹³ To meet the challenge, four areas of complexity in addressing IMR are presented: 1) perinatal care that influences health and outcomes, 2) data, 3) implementation, and 4) resource securement. For this paper, "perinatal care" is defined as "interventions extending from preconception services into postpartum period, and even infancy and toddlerhood".¹⁴

Complexity of Perinatal Care That Influences Health and Outcomes

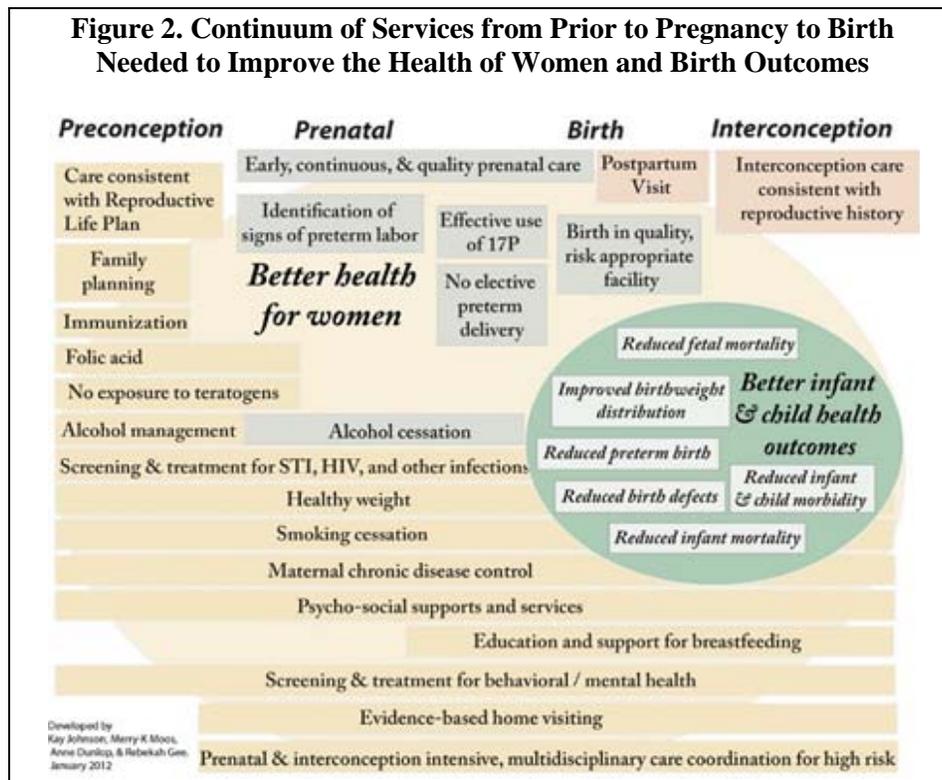
Four types of services affect maternal and newborn outcomes over a life course. As defined by the Secretary's Advisory Committee on Infant Mortality (SACIM), service types are preconception, prenatal, birth, and interconception (see Figure 2).¹⁴ The emotional, behavioral and physical health of women before, during, and after pregnancy impacts birth outcomes. Prenatal care is necessary, but on its own, it is not sufficient to ensure optimal outcomes. Preconception and interconception care are important for all women and essential for women with chronic health conditions or who previously experienced poor pregnancy outcomes.

- 1) *Preconception services.* Preconception is the period of time in the life course before a woman of child bearing age becomes pregnant. It encompasses a wide range of care from reproductive health to emotional wellbeing. Emerging research in the field of epigenetics demonstrates that events during this period impact not only an infant's immediate well-being, but also has life-long and generational impacts on health. For example, the Hunger Winter Famine study assessed the effects of maternal nutrition status on the life course of their offspring by monitoring the children's health for over 60 years. Maternal nutrition was found to correlate with infant and adult health through *two* generations.¹⁵

Preconception health of women and their offspring is dependent on a woman's access to primary care and wellness services, adequate nutrition, maternal illness and treatments (e.g., diabetes, hypertension), avoidance of toxins (e.g., tobacco, herbicides) and negative effects caused by physical, emotional, and behavioral stress. Addressing the health status of women of child bearing age prior to pregnancy positions them to begin pregnancy in optimal health. This is important because in the first 4 weeks of pregnancy, before many women know they are pregnant, the rapidly dividing fetal cells have already formed the heart and the initial development of the brain, spinal cord, and gastrointestinal tract has begun.¹⁶ Poor maternal health during this period increases the risk of pregnancy complications and birth defects related to these and other body systems.

- 2) *Prenatal services.* Prenatal care describes the care/services that a woman receives during the three trimesters of pregnancy (i.e., duration~40 weeks). Necessary for all pregnancies, both mother and fetus benefit from this care by: monitoring overall maternal health and appropriate fetal development, screening for risks/problems, and identifying resources facilitating a healthy pregnancy. Prenatal care is the frontline strategy for preventing and identifying risks for preterm births, which is the primary cause of infant deaths nationally and in Indiana. Eliminating barriers to accessing and using quality prenatal care has proved challenging. Examples of such barriers include a lack of financial resources, availability of

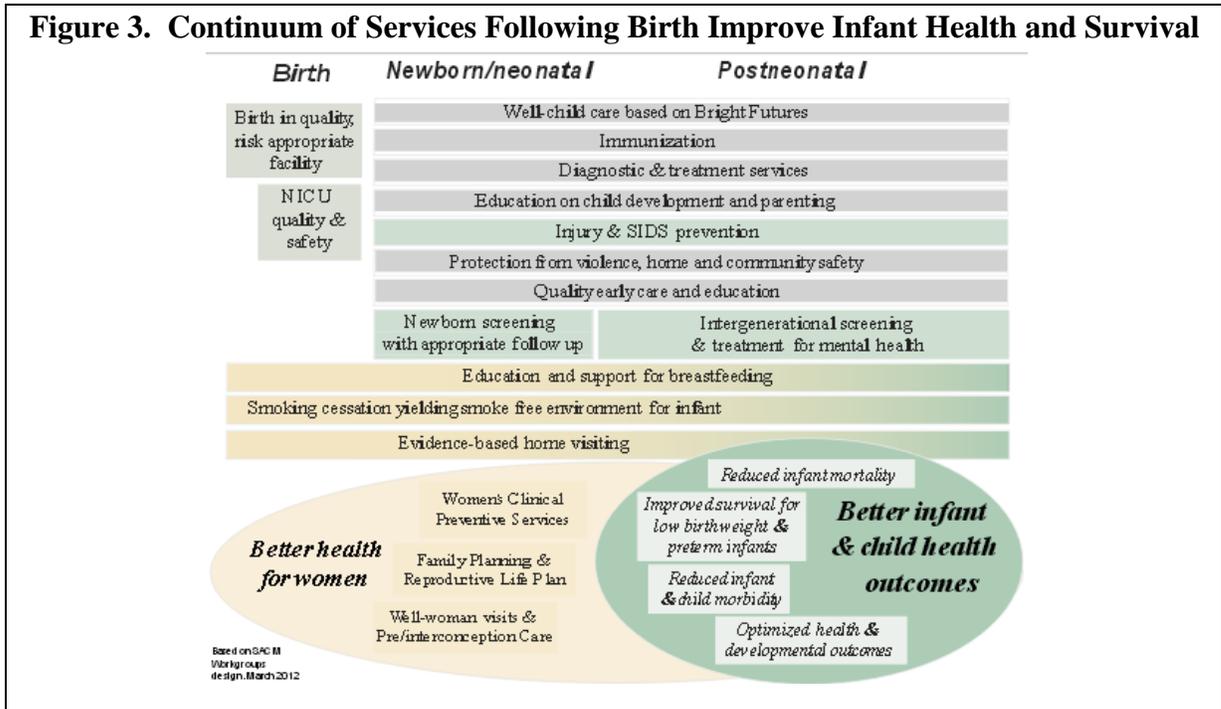
skilled providers, motivation to obtain care and adopt healthy behaviors, and knowledge of the impact of prenatal and preconception care on future health of the mother and her offspring.



- 3) *Birth services.* Birth includes the following stages: labor, delivery, and newborn care (see Figure 2). Inherent in each stage are varying levels of risk to mother and child. Provider assessment and monitoring throughout these stages reduces risk of fetal/infant mortality, decreases likelihood of complications, and improves ability to transition after birth¹⁴. For high risk labor, deliveries, and newborns, initial stabilization at community delivering facilities and timely transport of sick mothers and ill/preterm infants to a higher level care facility (i.e., regionalized care) are critical to obtaining positive health outcomes. Existing examples of beneficial programs that support maternal and infant health include maternal and neonatal transport services, NICU outreach education, and provider skill building programs.
- 4) *Interconception services.* Interconception care is provided to women of reproductive age between pregnancies. This care begins with postpartum care and addresses specific health and other risk factors that may have contributed to previous poor pregnancy outcomes. Additionally, interconception services ensure that conditions and behaviors which may pose maternal and infant risks are identified and managed proactively.¹⁷

Furthermore, health and outcomes for infants are generally divided into 3 types of services. SACIM identified these services types as birth, newborn/neonatal and postneonatal (see Figure 3).

- 1) *Birth services.* The focus of care for the newborn during the birth process is safe transition to extrauterine life. This includes access to facilities that can support the labor, delivery, and neonatal stabilization. Identifying appropriate facilities to provide care is based on risk and physical location of mother. Appropriate training for care providers in the initial stabilization, identification of complications, and need for higher level of care and structures for transferring care to appropriate providers adds complexity to this service.
- 2) *Newborn/Neonatal services.* Provisions needed for ongoing care to newborns depends upon their gestational age, presence of complications related to intrauterine exposures and development, birthing process, and the availability of appropriate personnel and support services. This care is complex because it spans from micro-prematurity (i.e., babies weighing <1000 grams) and congenital anomalies that often require months of hospitalization, to healthy term infants who transition quickly to extrauterine life after a few days of hospitalization.¹⁸ The neonatal mortality rate (deaths that occur between birth and 28 days) typically accounts for two-thirds of the infant mortality rate.
- 3) *Postneonatal services.* This encompasses care provided to the infant from 28 days to one year after birth. The postneonatal mortality rate typically accounts for one-third of the infant mortality rate. Due to rapid development during this time, frequent monitoring via wellness visits is essential to the optimal health of this population. The focus is on reaching developmental milestones, maintaining nutritional status and growth, and protection from harm by immunization, safe sleep, car safety seat use, and parenting guidance. This focus applies to typical newborns and those with special health care needs, which adds to care complexity.



Data Complexity

Two different types of data systems are needed for a comprehensive Perinatal Quality Improvement Collaborative. Data is essential to 1) understand the causes of infant mortality and evaluate outcomes over time after the implementation of new policies and programs and 2) to provide “real time” data and feedback mechanisms that are needed to inform and enact timely and ongoing quality improvement efforts.

A wide range of data may be used to better understand reproductive and infant health by describing the extent, causes, and contributors to infant mortality and poor birth outcomes.¹⁹ Birth and Death Certificate Data can be used to establish relationships between risk factors and outcomes, monitor risk factors and track outcomes (see Table 1).

| Table 1. Examples of Birth and Death Certificate Data Use | |
|---|--|
| Birth Certificate Data Uses | Death Certificate Data Uses ²⁰ |
| <ul style="list-style-type: none"> • Establish relationship of smoking and adverse pregnancy outcomes. • Determine caesarean delivery rates and vaginal births after a caesarean delivery. • Monitor teenage births trends. • Determine LBW risks. • Measure racial disparities in pregnancy outcomes. | <ul style="list-style-type: none"> • Monitor perinatal and infant mortality. • Track progress/regress in reducing IMR from the leading causes of death. • Document racial disparities. • Provide information for programmatic interventions. |

Developing a comprehensive picture of infant mortality may require working with a range of agencies and partners to share data across and within systems and programs. Comprehensive data systems may include linkages with claims data from Medicaid and other health insurers, vital statistics, chronic disease programs, birth defects registries, newborn screening (e.g., blood spot), immunization registries, and the Women Infants and Children (WIC) program.¹⁹ Other important data that are not used in Indiana include Pregnancy Risk Assessment Monitoring System (PRAMS) which incorporates AMCHP’s recommended Life Course Indicators (postpartum depression, stressors during pregnancy, diabetes during pregnancy, racial discrimination during pregnancy) and Fetal Infant Mortality Reviews (FIMR) which are available in only a few sites and can be used to identify local clinical and community factors contributing to deaths.

Data sources and the “human factor for error” in the collection of data (e.g., person-level: postpartum woman, researcher; facility-level: doctor’s office, medical records department) complicates the use of data. Data collection techniques vary (e.g., paper/pencil, electronic) and can be used discretely or in combination. Opportunities for inaccuracies exist when data is transferred from paper to electronic systems. Data entry/input quality as well as how the data is “cleaned” in preparation for analysis factor into its validity and reliability.

Analysis and interpretation of data is complicated by unfamiliar terminology and variable definitions. For example, gestational age can be determined by at least two different statistical

methodologies. Also, there have been recent changes in the uses of designations (e.g., near term births, late preterm births) and even categories of term births.²¹ Using consistently defined and agreed upon variables is critical to ensuring correct data analysis and interpretation. If clinicians, researchers, and decision makers are unsure of whether they are discussing the same problem or asking the right questions, designing hypotheses for examination or aims (goals) for quality improvement will prove challenging.

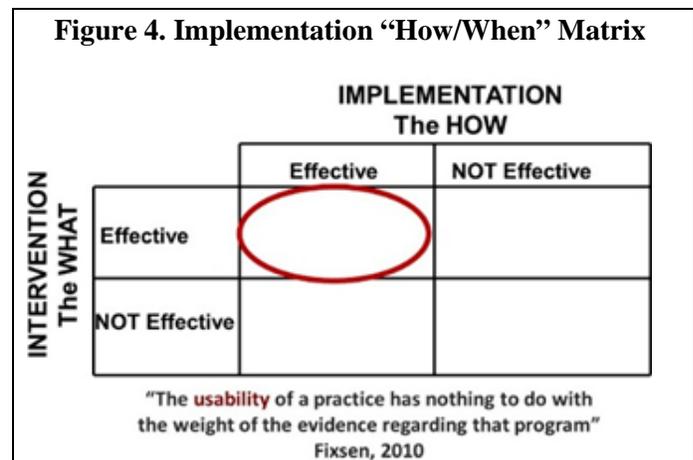
The second type of data needed is “real time” data and feedback mechanisms to inform and enact timely and ongoing quality improvement efforts. Hospitals, community-based agencies and health care providers as part of QI need to engage in data collection, interpretation, feedback into activities and benchmarking of data. Rapid improvement cycles feed process change that is tracked over time with weekly or monthly data points. Benchmarking (i.e., practice protocol comparison) of performance metrics, or outcome measures to best practices or results from other programs/hospitals/states is complicated by the variety of care models used at different facilities. Benchmarking provides a way to improve care process, set priorities, and identify best practices on which to focus QI activities. It is important that the indicators used are defined in the same manner by all the facilities and sites or when comparing the progress of different programs or states. If the measures are aligned, then all participating organizations can hold each other accountable and evaluate successes and failures along the way. A learning community is formed as regular reports are disseminated to stakeholders on progress of QI efforts and best practices are shared.

Implementation as a Complex Science

Implementation of evidence based policies and best practices into health care is complex. This complexity is geometrically multiplied when implementing statewide programs across vastly different health systems, geographies, and populations. Policies, procedures, techniques, or technologies must be designed to be flexible and scalable to allow implementation into multiple settings with different cultures and resources. Best policies or evidence based interventions, no matter how strong the evidence or wise the process, are not effective without sound implementation.

Implementation science is a relatively new field of research that focuses on the “how” rather than on “what” to implement (evidence of effectiveness) (see Figure 4).²² The National Institutes of Health (NIH) define implementation science as:

“...the study of methods to promote the integration of research findings and evidence into healthcare policy and practice. It seeks to understand the behavior of healthcare professionals and other stakeholders as a key variable in the sustainable uptake, adoption, and implementation of evidence-based interventions.”²³



We have long known that there is lengthy lag time between the development of recommended policies or evidence based interventions and their implementation into practice.²⁴ Implementation science recognizes that the smallest practice or largest government department are composed of micro and macro systems and relying on a single person or a single group of people without accounting for complexity rarely works.²⁵ Hence, education alone is likely to be ineffective in advancing change. In a 2002 meta-analysis, Fixen and colleagues reviewed the evidence for various means of training including 1) education & discussion regarding theory, 2) education plus demonstration, 3) education plus demonstration and practice with feedback during training and 4) education plus coaching *in the actual setting* (see Figure 5). Only education along with coaching in actual setting resulted in true change and use.²⁶ Hence, effective change occurred when coaches were in the actual setting to address system barriers and give real time advice and facilitate problem solving. The old adage “education is necessary but not sufficient for behavior change” continues to be true but is frequently ignored.²⁷

Figure 5. 2002 Meta-Analysis
% of Participants Who Demonstrate Knowledge, Demonstrate New Skills in a Training Setting, and Use New Skills in Actual Setting

| TRAINING COMPONENTS | Knowledge | Skill Demonstration | Use in the Actual Setting |
|--------------------------------------|-----------|---------------------|---------------------------|
| Theory and Discussion | 10% | 5% | 0% |
| ...+ Demonstration in Training | 30% | 20% | 0% |
| ...+ Practice & Feedback in Training | 60% | 60% | 5% |
| ...+ Coaching in Actual Setting | 95% | 95% | 95% |

Joyce and Showers, 2002

The American Board of Pediatrics (ABP) has developed a model as the optimal means to improve pediatric health outcomes. The model’s key components are ²⁸:

- A common aim to improve care;
- Prospective collaborative improvement efforts;
- Reducing unnecessary variation by identifying, adopting, and testing best practices;
- Shared, valid, high-quality real-time data;
- Infrastructure support to apply improvement science; and
- Public sharing of outcomes to identify best practices.

Many states have developed an infrastructure to address challenges surrounding the reduction of infant mortality and put into practice the ABP model’s key components. These “improvement partnerships” have successfully addressed a variety of challenges, including those associated with infant mortality (described in the “Best Practice Models: Perinatal Quality Collaboratives” section, page 15).

Complexities of Securing and Allocating Resources

Securing resources to reduce infant mortality can be difficult. Resources vary from state to state, county to county, city to city, hospital to hospital, and practice to practice. In Indiana, more than 50% of births are currently paid by Medicaid which pays more poorly than private insurance.²⁹ Over time, the number of births paid for by Medicaid has steadily increased. Between 2003-2009, Medicaid covered births increased 5.72% (n=6,219).³⁰ Although Indiana has recently developed policies of best practices (e.g., presumptive eligibility), implementation barriers and problems in the system have limited the state's success.³¹

Additionally, identification of resources and funding is time consuming. As with data collection and analysis, earmarking personnel and time resources is often an afterthought or an added responsibility for those doing the work of caring for the patient. Assuming funding can be secured, decision makers must determine how to allocate funds. Funding at the federal, state, local, and facility levels can be inconsistent based on political influence and payment issues.

Perinatal Quality Collaboratives vary in costs. Costs are driven by the size and scope of the collaborative, including the number of hospitals/community sites involved and the number of initiatives or services provided by the collaborative. Initial investment requires financial resources to pay for staff and training, data infrastructure and management, direct support to hospitals/sites engaged in the collaborative and external QI consultant support. A recent report by the Avalere group to the Congress of Obstetricians and Gynecologists estimated a range between \$1 million (Michigan) to \$1.7 million (Ohio) to develop a collaborative. Annual operating costs are required beyond the initial upfront development. These costs include ongoing administration, data management, staff training, stakeholder engagement, and expansion of best practices to other sites. Ongoing costs also vary depending on a number of factors such as the level of provider engagement, scope of services, and availability of data. Estimated annual operating costs are between \$500,000 (Ohio) to \$975,000 (North Carolina) to continuously improve maternity and perinatal care.³²

Evidence-Based and Successful State Models to Address Infant Mortality

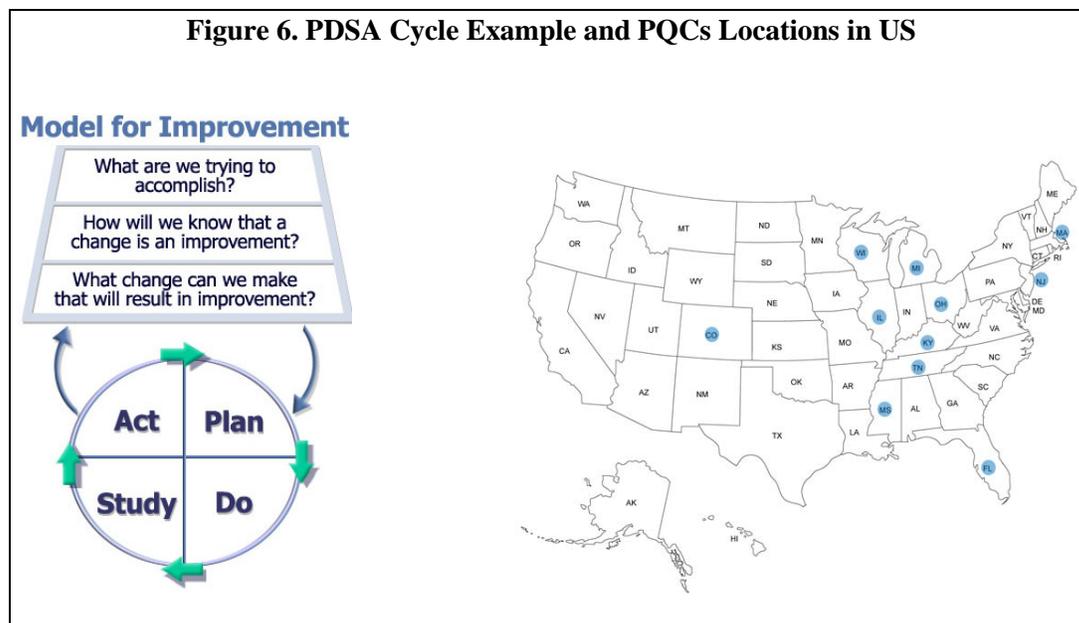
ISDH has called on MCH professionals to, “learn from successes in other states”. After a comprehensive literature review and identification of other states’ best practices, two major commonalities were observed in states that have successfully lowered their infant mortality rate: 1) development and operation of an infrastructure of evidence based policies and clinical best practices – generally termed Perinatal Quality Collaboratives, and 2) the application of the Perinatal Periods of Risk (PPOR) Model.

Best Practice Models: Perinatal Quality Collaboratives

State Perinatal Quality Collaboratives (PQCs) are networks of perinatal care providers and public health professionals working to improve pregnancy outcomes for women and newborns by advancing evidence-based clinical practices and processes. PQCs include hospitals, pediatricians and neonatologists, obstetricians and maternal-fetal medicine specialists, midwives, nurses, state

health department personnel, and other MCH professionals. Members come together as part of learning collaboratives to address specific processes of care. An infrastructure that supports the baseline and ongoing collection of data is imperative.³³ Collaborative members implement changes in clinical practices according to evidence-based guidelines. “Rapid improvement cycles” then feedback real-time data and analysis to participants in the collaborative to evaluate whether or not the change resulted in improved outcomes.

The Model for Improvement is a frequently used framework to organize improvement efforts. The Model for Improvement starts with a specific, time delineated and measurable statement of the aim or goal of the project.³⁴ Other elements of an improvement model include identifying the “drivers” or ideas of what needs to improve to accomplish the Aim. The drivers are generally generated from review of the literature, evidenced-base and local experts. The next steps include developing change ideas, benchmarking and gathering baseline outcome data, and then implementing repeated cycles of process changes through Plan-Do-Study-Act (PDSA) improvement cycles (Figure 6).³⁵ An IPQIC-created map indicates states that are successfully using PQCs: California, Massachusetts, North Carolina, Ohio, Tennessee, Illinois, New Jersey, Colorado, Mississippi, Wisconsin, Michigan, Florida, and Kentucky (see **Error! Reference source not found.**).³⁶



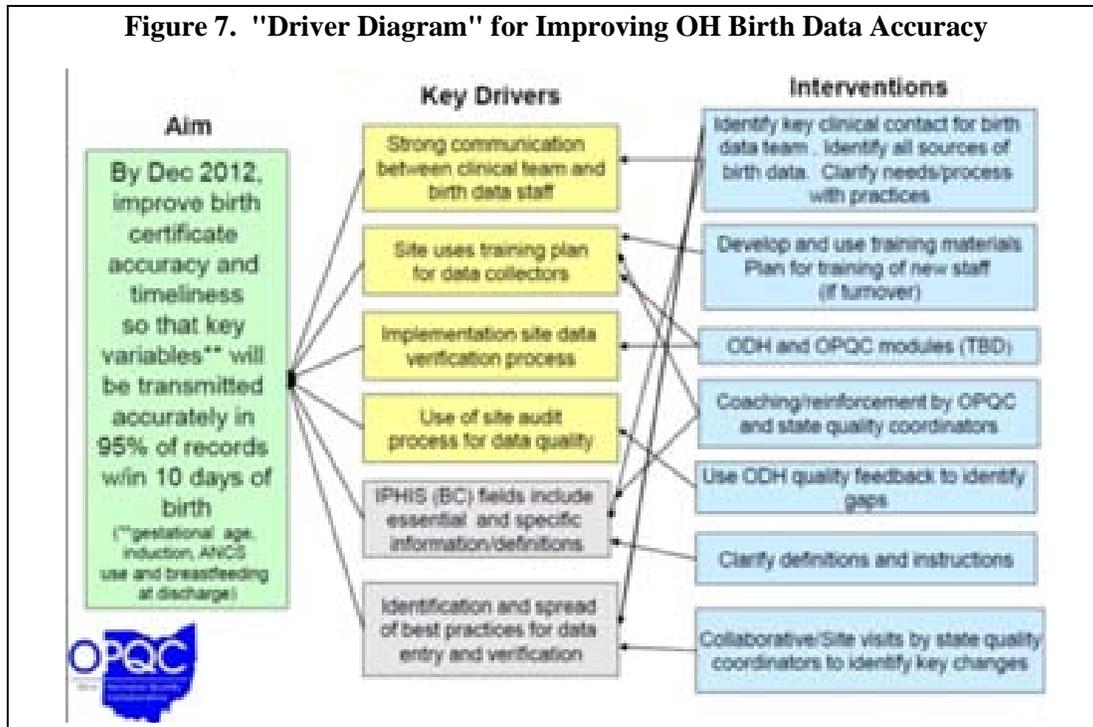
California, Tennessee, North Carolina and Ohio’s PQCs have been leaders in the field and serve as examples of collaboratives with multidisciplinary groups and payors. Common features of these leading collaboratives include:

- *Perinatal Quality Improvement administrative team* with expertise in quality improvement, data collection, data reporting, literature review, and biostatistics that is responsible for oversight, training and supporting the teams who are carrying out the projects. PQCs may be administered by academic medical centers, state health departments, or non-profit entities set up for that purpose. Core staffing includes a program manager, data manager,

quality improvement experts, content experts and administrative support (Appendix 3, page 31).

- *Responsive, timely, risk-adjusted perinatal data system* to identify targets and monitor public health effects of interventions and system changes, over time. Data sets frequently include linked birth and death records, immunization, Medicaid claims and birth defects registry.
- *Toolkit or change package development with training of stakeholders and staff in quality improvement methods.* On-site coaching and technical support using rapid improvement cycles are needed as they are the grassroots foundation for all of the quality improvement work.
- *Real-time data feedback loops with benchmarking against local, state and national metrics.* Weekly / monthly feedback with annotation as rapid improvement cycles are tested allow monitoring of responsiveness to change and displaying of results over time in trend charts to ensure that improvements are maintained.
- *Networks of public and private hospitals, key community partners, payors, and policy makers.* All stakeholders and key partners are engaged: parents, families, providers (e.g., obstetric, neonatal, pediatric, private and academic), departments of health, hospital associations, public and private payors (e.g., Medicaid, Blue Cross and Blue Shield, United Health Care), business groups, legislators, nongovernmental advocacy groups (e.g., March of Dimes, Perinatal networks), and professional organizations (American Academy of Pediatrics, American College of Obstetrics and Gynecology, and perinatal/neonatal nursing organizations).
- *Funding sources who share a common vision of improving perinatal outcomes and reducing health care costs through collaborative quality improvement.* Funding is essential for PQCs to be successful. Examples of commonly involved sources of funds are state government funds, state department of health funds, Medicaid, private payors, and state hospital associations. California has had sustainability success by linking Medicaid reimbursement to participation in PQCs for many years. Grants from state and national sources have also been instrumental in quality improvement collaboratives but such funds are not usually sustainable.

In the following paragraphs we give examples of some of the initiatives, tools (driver diagrams, run charts) and outcomes from PQCs. One of the first improvement projects for many PQCs is to improve birth certificate accuracy and timeliness. A “driver diagram” for Ohio’s improvement project outlines the goal (or Aim), the key drivers (or what it would take to accomplish the Aim), and the interventions or activities that will drive the PDSA cycles for rapid improvement (see Figure 7). Improving the accuracy and timeliness of birth certificate data then allows the data to be reliably used to follow responses to changes in the systems and track outcomes over time.

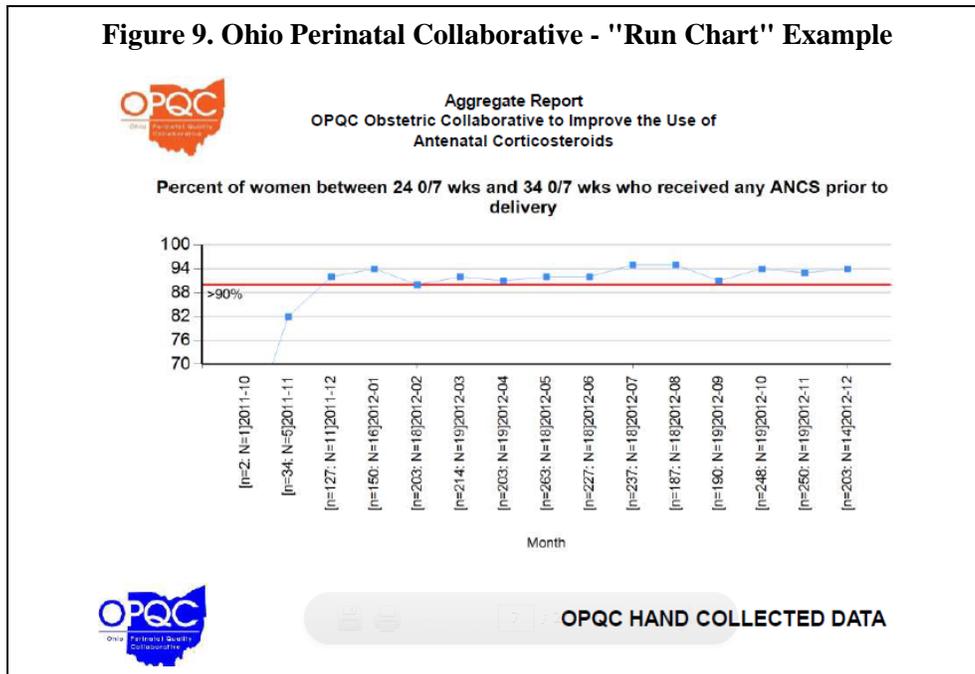


Other examples of quality collaborative projects with proven successes include: central line associated infections, necrotizing enterocolitis, promotion of mothers own milk for preterm infants, antenatal corticosteroids, postnatal corticosteroids, late preterm infants, reduction of elective inductions, or deliveries before 39 weeks of gestation, and smoking cessation (Appendices 1-2, pages 29-30). The results (effectiveness and estimated cost savings) of five Perinatal Collaboratives who addressed infections in the neonatal intensive care unit are shown in Figure 8.³²

Figure 8. Example of Effectiveness and Estimated Cost Savings for NICU Infections by State Collaborative Project

| <i>Measure</i> State (Collaborative) | Effectiveness | Estimated Cost Savings |
|---|---|----------------------------|
| <i>NICU Infections</i> | | |
| CA (CPQCC) | 19% decreased risk of nosocomial infections | NA |
| NC (PQCNC) | 50% reduction | \$1.2M |
| OH (OPQC) | 18.2% to 14.3% | Per case savings estimates |
| TN (TIPQC) | 75% reduction | \$2M/yr. |
| VT (VON) | 0.74% to 0.40% | Per case savings estimates |

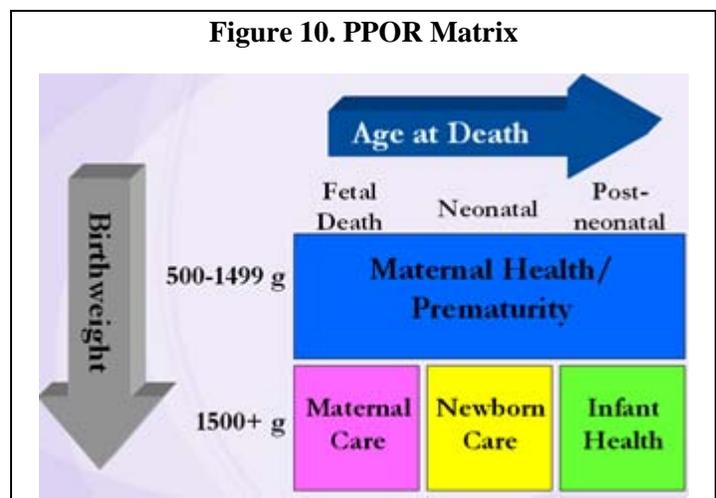
The example below demonstrates a frequently used data tool i.e., a “run chart” demonstrating the increase in antenatal corticosteroid administration from a baseline of 82% to 94% through the work of Ohio’s Perinatal Collaborative (see Figure 9).



Other opportunities exist to implement community practices in Indiana that have proven successful in supporting mothers and infants. Every Child Succeeds (ECS) and Nurse Family Partnership (NFP) are two home visiting programs that the Association of Maternal & Child Health Programs (AMCHP) has evaluated as “Best Practices” on Infant Mortality & Improving Birth Outcomes. In greater Cincinnati counties, ECS achieved a 60% reduction in the infant mortality rate by enhancing home visiting models (NFP and Healthy Families America). There is a CenteringPregnancy pilot in Indiana, another evidence-based practice that has the potential for expansion and opportunities for future financial sustainability.

Best Practice Models: Perinatal Periods of Risk (PPOR) Model

When applied to linked birth and death records, the PPOR model creates a matrix of fetal and infant deaths by birth weight and age at death, with an overlay of care categories for each of the created cells (see Figure 10).^{37,38} There are two birth weight categories comprising the table rows (500-1499 g and 1500+ g). Babies born at < 500 grams and/or < 24 weeks gestation are included in the fetal death category. These criteria are designed to exclude possible definition variability, allowing the focus to be put on problem

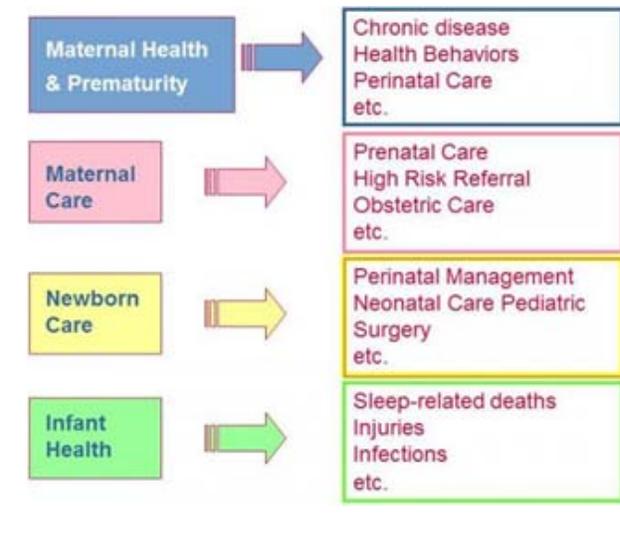


identification and solution implementation opportunities. The three columns are when the death occurred (i.e., fetal, neonatal, or postneonatal). The cells, derived from the intersection of the rows and columns, define 4 root cause categories: Maternal Health and Prematurity (i.e., 500-1499 grams), Maternal Care (i.e., ≥ 1500 grams, stillbirths), Newborn Care (i.e., ≥ 1500 grams, ages 0-27 days), and Infant Health (i.e., ≥ 1500 grams, ages 28-365 days).³

PPOR is highly valued for its ability to provide an overall picture of infant mortality, from antenatal to postneonatal periods. The fetal-infant death rate corresponds to each of the cells and can be calculated (i.e., number of fetal & infant deaths in cell divided by total # of live births and fetal deaths in population then multiplied by 1000). Each cell combines deaths that have common sets of causes and risk factors. Categories have been statistically validated by CityMatch³⁹. Community comparison is possible and “excess mortality” can be targeted (see Figure 11).³⁹ Within the risk periods indicating excess mortality, CityMatch recommends taking the following steps⁴⁰:

- Identifying causal pathways or biologic mechanisms for excess mortality
- Estimating prevalence of risk and preventive factors by type of mechanism
- Estimating the impact of the risk and preventive factors.

Figure 11. PPOR Helps Communities Move from Data to Action



Of note, the PPOR model cannot be applied to a dataset if the records are not accurate and linked. It also requires a minimum dataset of sixty death records within a five year period.³⁸

Strengths and Gaps in Indiana MCH Resources

Strengths

IPQIC sampled its MCH expert panel for an environmental scan of Indiana’s current resources that could be tapped to address infant mortality. Results of the sampling found quality improvement initiatives, ongoing quality collaboratives, capacity building projects/organizations, form/guideline/toolkit resources, and over 30 community resources (Appendix 4, page 32).

- 1) *Quality improvement initiatives/expertise.* Initiatives primarily focus on quality improvements in clinician guideline development and maternal/newborn care. Examples include monitoring quality assurance metrics, hard stops on elective inductions/cesarean sections before 39 weeks gestation, and placental transfusion in preterm infants. Expertise is available within the Indiana School of Medicine as well as the Indiana Hospital Association.

- 2) *Quality Collaboratives.* Quality collaboratives in Indiana are comprised of a variety of partnerships and focus on an array of child health topics. Projects undertaken by the collaboratives include creation of a training program delivering/stabilizing preterm and term neonates precipitously delivered at a critical access facility, a learning collaborative linking providers and patients to improve first trimester care, and linkages with other states with well-developed QI systems for outcomes. For example, CHIP-IN for Quality (Indiana’s Child Health Improvement Partnership) works with 18 states in the National Improvement Partnership Network. Indiana is also participating in the MCH Region V Collaborative Improvement and Innovation Network (CoIIN) initiative to lower infant mortality. The initiative is just starting and provides expertise in data and PPOR analyses, quality improvement including building driver diagrams to focus activities and shared learning.
- 3) *Capacity Building.* Capacity building within the state occurs through many efforts of hospitals, academic institutions, public health and community-based organizations. Examples include recruitment and training of family medicine residents in rural areas, hospital-wide support of March of Dimes’ annual fundraiser, and the development of operational capacity to manage projects and grants. Also, the IU Fairbanks School of Public Health and IU School of Medicine are joining together to form an “implementation science special interest group” for shared learning.
- 4) *Form/Guideline/Toolkit Resources.* Existing resources are being used to improve care. Resources range from a patient safety checklist to standardized scheduling, guidelines for medically and elective inductions of labor, toolkits for standardized clinical pathways, techniques for measuring processes and outcomes, and clinical and patient education resources.
- 5) *Community Resources.* With over 30 resources, this category is the most diverse of Indiana’s resource strengths. Examples of the resources identified include nonprofit organizations (e.g., March of Dimes), governmental agencies (e.g., WIC), neighborhood health clinics, community/patient education classes (e.g., preparing for childbirth, infant CPR), lactation support, car safety seat inspections, care coordination, and family support advocates.

Gaps

The MCH expert panel also identified the most *important gaps* in the infrastructure that is necessary to support successful quality improvement collaborative processes in Indiana as:

- 1) *Lack of timely and accurate birth certificate data or an agreed upon system to identify causes and factors leading to infant mortality.* The IPQIC data committee, Indiana Hospital Association, local health departments, and other partners have identified that Indiana birth certificate data are not timely and often incomplete. This hinders efforts to identify causes and factors leading to infant mortality. Some local communities have tried the PPOR process, but have found the birth certificate data to be incomplete and/or the numbers too small to perform the analysis. A goal is to have a statewide PPOR analysis that is updated annually with the most recent data possible.

- 2) *Lack of an organization responsible for carrying out IPQIC identified priorities.* There is no mechanism for setting priorities or carrying out perinatal quality improvement projects. Local QI teams require support from quality improvement experts to provide tools, define core components or best practices, measure progress, and provide feedback loops. Identifying an administrative organization to focus on implementing a small number of high impact priorities is needed.

- 3) *Absence of real time data collection and feedback systems to fuel rapid improvement cycles.* Currently earmarking personnel and time resources to do a QI project is often an afterthought or an added responsibility for those doing the work of caring for the patient. These personnel rarely have adequate training in QI processes or data collection, are not able to analyze data or develop run charts, and do not have a basis for setting benchmarks. To implement quality improvement processes, participants must be able to report data to a central administrative team and receive quick feedback to see if the change is having an effect. Real time feedback systems usually include graphing of results in “run charts” so the results can be visualized, tracked over time and easily compared to benchmark success rates.

- 4) *Absence of funding partnerships or innovative strategies with payors to support system change through improvement science.* A comprehensive Perinatal Quality Collaborative requires dedicated staff to implement QI training and consultation, organize and staff an executive steering committee, implement the real time data system to give quick feedback to participants, and procure ongoing additional funding.

Benefit to Indiana

In the following paragraphs, we calculate the number of babies who could be saved if Indiana’s infant mortality decreased to the national level. Preliminary analysis of 2011 infant mortality data by the National Center for Health Statistics (NCHS) found the US IMR=6.048.⁴¹ If Indiana’s IMR (IMR=7.67) were decreased to this national rate, our state’s IMR would be reduced by about one-fifth (21.23%).⁴² This would result in 137 more babies surviving in Indiana each year. Closer examination of the causes of death indicate Indiana’s areas of excessive IMR compared to the US are: perinatal risks, congenital malformations, SUIDS, other accidents, and assaults (see Appendix 5, page 40). Refer to Table 2 for a comparison of infant mortality indicators for Indiana and the US.⁴²⁻⁴⁵

| | IN | US | % Difference, IN vs. US |
|---|------|------|-------------------------|
| Low Birthweight (%) | 8.1 | 8.1 | 0.0 |
| *Preterm (%) | 11.6 | 11.7 | -0.9 |
| Smoking during Pregnancy (%) | 16.6 | 9.1 | 45.2 |
| Early Prenatal Care (%) | 68.1 | 73.7 | 8.2 |
| Teen Birth Rate (per 1,000) | 34.8 | 31.3 | 10.1 |
| Obesity Among Women of Childbearing Age (%) | 28.7 | 24.6 | 14.3 |
| Births on Medicaid (%) | 45.9 | 40.0 | 12.9 |

*National preterm rates are only available using the date of last menstrual period (LMP).
 Notes: Low birthweight is less than 2500 grams. Preterm birth is less than 37 weeks gestation. Early prenatal care is within the first trimester. Teen birth rate corresponds to women aged 15-19 years. Obesity among women of childbearing age only includes women from 18-44 years due to the data source.

Although the US has had an observable decrease in its IMR over the past decade, disparities in race and ethnicity still exist.⁴⁶ The 2011 preliminary IMR for Blacks in the US is 11.42 compared to 5.11 for White infant.⁴¹ This finding mirrored ISDH results for Indiana (Black IMR=12.31 [neonatal=7.57, postneonatal=4.74]; White IMR=6.91 [neonatal=4.72; postneonatal=2.19]).⁴² If lowered to US rates, more Indiana babies of both races would survive. Using information provided by ISDH (Appendix 6, page 41) lowering the Black IMR in Indiana to the national rate would result in nine more infants surviving each year (IMR decrease= 7.25%, neonatal=1, postneonatal=8). Lowering the White IMR in Indiana to the national rate would result in 125 more babies surviving each year (IMR decrease=26%, neonatal=88, postneonatal=37). Survival rates among Hispanics infants in Indiana would also improve if IMR was lowered to the US rate (more infants surviving=11/year, Hispanic IMR decrease=19.95%) (See Appendix 6, page 41).

Reaching these national rates for race would be an improvement; however to be a model for other states, Indiana needs go even further. Recent analyses from ISDH indicate priority risk factors associated with infant mortality by race and ethnicity. Prioritizing evidence-based smoking cessation/abstinence programs for whites, early prenatal care access for blacks and prevention of teen pregnancy in Blacks and Hispanics are likely to lead to improved outcomes (see Table 3).⁴²

| Table 3. 2011 Indiana Risk Factors by Race/Ethnicity | | | | |
|---|-------|-------|-------|----------|
| | White | Black | Other | Hispanic |
| Low Birthweight (%) | 7.4 | 13.3 | 7.2 | 8.1 |
| *Preterm (%) | 9.6 | 13.5 | 8.4 | 10.5 |
| Smoking during Pregnancy (%) | 17.9 | 13.3 | 3.2 | 5.1 |
| Early Prenatal Care (%) | 70.3 | 56.1 | 59.3 | 57.3 |
| Teen Birth Rate (per 1,000) | 31.2 | 54.5 | 57.6 | 49.7 |
| * Indiana preterm rates are typically reported using the obstetric estimate due to increased accuracy of the measure compared to LMP. Notes: Low birthweight is less than 2500 grams. Preterm birth is less than 37 weeks gestation. Early prenatal care is within the first trimester. Teen birth rate corresponds to women aged 15-19 years. | | | | |

Recommendations for a Comprehensive Perinatal Quality Collaborative

The IPQIC QI committee concurs with SACIM’s report and affirmation of the need for investment in infrastructure that ensures access, quality, safety, and accountability for outcomes across a continuum of prevention and intervention services to improve the health and well-being of women, infants, and families. To improve infant/maternal outcomes, Indiana needs to build on existing strengths and resources and fill the most important gaps in the quality improvement collaborative processes. The foundation for reducing infant mortality (or any other health outcome) is continuous quality improvement. Real-time data and analysis systems, development and implementation of evidenced-based strategies to address factors contributing to infant mortality, and continuous assessment of metrics targeting such factors is crucial to reducing infant mortality. California, Ohio, North Carolina, and Tennessee have implemented successful

perinatal quality collaboratives and provide valuable resources for the construction of a similar collaborative in Indiana[†].

The IPQIC QI Committee recommends that the ISDH build a robust Comprehensive Perinatal Quality Collaborative that will decrease infant mortality and serve as a model to address other key public health issues that impact the health of all people in Indiana. Specifically:

- a) **Improve data timeliness, data linkages (birth certificate, death certificate, birth defects registry, immunization, etc.) and analysis systems to identify the causes and contributing factors associated with infant mortality and to track outcomes over time.** A model (e.g., PPOR model) for identifying causes and factors is needed in Indiana. Birth certificate data is currently two years in arrears and fails to reflect the current state of infant mortality in Indiana. An improvement project to improve birth certificate accuracy and timeliness would assist Indiana to focus efforts on reducing infant mortality where needed most. It is also necessary to augment birth and death certificate data by incorporating additional sources of data.
- b) **Work with the current IPQIC structure, existing champions and organizations to formalize priorities and develop strategic aims** to address infant mortality. Improvement aims or goals will ideally be guided by a life-course perspective, informed by data and coordinated with regional and national efforts to reduce infant mortality.
- c) **Define/develop organizational structure(s) to carry out IPQIC initiatives** including expertise in clinical content, team development, data collection and reporting, benchmarking and QI processes. The organizational structure(s) will formulate strategies to carry out high priority perinatal quality improvement projects and support local QI teams by providing quality improvement experts, tools, and measures. The organizational structure(s) will provide a process for trend analysis with real-time data and feedback to support rapid cycle improvement and ensure that processes are resulting in improvements. Public reporting of data will ensure transparency and development of a learning community to share best practices.

Recommended Next Steps

We recommend that IPQIC and ISDH sponsor a day long retreat with state QI experts, infant mortality experts, data experts and current members from each of the IPQIC committees to:

- Through existing relationships with improvement partnerships, engage national consultant's knowledge and experience to facilitate the retreat
- Prioritize and set time specific, measurable aims or goals;
- Define the contribution of each IPQIC sub-committee to achieving the priority goals;
- Delineate the organizational structure(s) necessary to support the implementation QI processes to achieve priority goals and
- Determine resources including feasible funding necessary to implement priority improvement projects.

[†] For more information, go to www.cdc.gov/reproductivehealth/MaternalInfantHealth/PQC.htm

- Provide resources and funding to pilot the Comprehensive Perinatal Quality Collaborative priority project over the next 9-12 months.

Conclusion

The death of a child violates the societal accepted, natural order of the maternal child health life course. Infant deaths reveal more about a community than simply how babies are dying – infant mortality serves as a prime epidemiological indicator of health. Addressing the complex issue of infant mortality entails several factors including: understanding the life course continuum of care that influences maternal and infant health and outcomes; understanding resources and resource allocation; recognizing the need for different levels of data - from complex linked data to local quality improvement data - and the complexity of implementing policies and best practices with fidelity to ensure that change is being measured and resources wisely spent. Several states have been successful in their approaches to infant mortality by using comprehensive Perinatal Quality Collaboratives and Perinatal Periods of Risk analyses to focus the implementation work. Indiana has existing strengths and resources but they are not coordinated or focused under a model or strategic plan and lack financial support to expand their efforts to scale. A well-supported infrastructure that utilizes a comprehensive Perinatal Quality Collaborative framework and PPOR analyses will allow Indiana to make positive strides in decreasing infant mortality and morbidity and develop a model program for improving health outcomes for all Hoosiers.

References

1. *Infant Mortality Summit*. Indianapolis, IN2013.
2. Murphy S, Xu J, Kochanek K. *Deaths: Final data for 2010*. Hyattsville, MD: National Center for Health Statistics;2013.
3. Gurganus K. RE: Revised White Paper for 1.22 IPQIC QI call. In: Ganser J, Greer M, Stratton RM, eds. Email communication regarding IN's IMR. ed2014:1.
4. MacDorman M, Mathews TJ. Behind International Ranking of Infant Mortality: How the US Compares with Europe. *NCHS Data Brief*. 2009;23:1-8.
5. MacDorman M, Mathews TJ. The Challenge of Infant Mortality: Have We Reached a Plateau? *Public Health Rep*. 2009;124(5):670-681.
6. Kids Count 2013.
7. Schempf A. Infant Mortality Data Resource Sheets for Region V - March 2013. Paper presented at: Region V Infant Mortality Summit 20132013; Chicago, IL.
8. Caine VA. Why Should We Care About Health Disparities in Infant Mortality? . Paper presented at: Indiana Infant Mortality Summit2013; Indianapolis, IN.
9. MacDorman M, Mathews T. *Recent trends in infant mortality and infant mortality risk factors*. April 25, 2013 2013.
10. Spitznagle M. Reduced tobacco use = Reduced infant mortality. Paper presented at: Indiana Infant Mortality Summit2013; Indianapolis, IN.
11. Indiana - Obesity. 2012; <http://www.americashealthrankings.org/IN/Obesity>. Accessed December 15, 2013.
12. Hess N. Healthy babies are worth the wait. . Paper presented at: Indiana Infant Mortality Summit2013; Indianapolis, IN.
13. Forging a comprehensive initiative to improve birth outcomes and reduce infant mortality: policy and program options for state planning (draft). *HRSA Region IV and VI Infant Mortality Summit: Association of Maternal & Child Health Programs*; 2012:72.
14. *Report of the Secretary's Advisory Committee on Infant Mortality: Recommendations for Dept of HHS Action and Framework for a National Strategy*2013.
15. Lumey LH, Stein, A. D., Kahn, H. S., van der Pal-de Bruin, K. M., Blauw, G. J., Zybert, P. A., & Susser, E. S. Cohort profile: the Dutch Hunger Winter families study. [Research Support, N I H , Extramural]. *Int J Epidemiol*. 2007;36(6):1196-1204.
16. 3.5 week fetus: A.D.A.M.; 2013.
17. Inter-conception Care Defined. *Pre-conception / Inter-conception Care Training Curriculum 2* n.d.; <http://www.dhs.state.il.us/page.aspx?item=51247>. Accessed January 16, 2013.
18. Alexander F, Smith A. Mortality in micro-premature infants with necrotizing enterocolitis treated by primary laparotomy is independent of gestational age and birth weight. *Pediatr Surg Int*. 2008/04/01 2008;24(4):415-419.
19. Forging a Comprehensive Initiative to Improve Birth Outcomes and Reduce Infant Mortality: Policy and Program Options for State Planning, July 2012, Washington, D.C. Paper presented at: Association of Maternal and Child Health Programs2012; Washington, DC.
20. MORE BETTER FASTER Strategies for Improving the Timeliness of Vital Statistics. Paper presented at: National Association for Public Health Statistics and Information Systems2013; Silver Spring, MD.

21. ACOG Committee Opinion No 579: Definition of term pregnancy. *Obstet Gynecol.* 2013;122(5):1139-1140.
22. Schroeder J. Integrating Implementation Science, Practice, and Policy. Paper presented at: Rosalynn Carter Institute Annual Summit; Oct 5-7, 2011, 2011; Georgia Southwestern State University, Americus, GA.
23. Frequently Asked Questions about Implementation Science. 2013; <http://www.fic.nih.gov/News/Events/implementation-science/Pages/faqs.aspx>. Accessed January 17, 2014.
24. Crossing the quality chasm: A new health system for the 21st century. In: Medicine Io, ed. Washington, DC: National Academy Press; 2001.
25. McGlynn EA, Asch SM, Adams J, et al. The Quality of Health Care Delivered to Adults in the United States. *New England Journal of Medicine.* 2003;348(26):2635-2645.
26. Mangione-Smith R, DeCristofaro AH, Setodji CM, et al. The Quality of Ambulatory Care Delivered to Children in the United States. *New England Journal of Medicine.* 2007;357(15):1515-1523.
27. Nichols JL. Changing public behavior for better health: is education enough? *Am J Prev Med.* 1994;10(3 Suppl):19-22.
28. Lannon C, Peterson L. Pediatric Collaborative Improvement Networks: Background and Overview *Pediatrics.* 2013;131(Suppl 4):S189-S195.
29. FSSA. Presumptive Eligibility - a program for pregnant women. In: Indiana So, ed.n.d.
30. Number of Births Financed by Medicaid - Indiana. *State Health Facts* n.d.; <http://kff.org/medicaid/state-indicator/total-medicaid-births/?state=IN#graph>. Accessed January 17, 2014.
31. Medicaid Medical Advisory Cabinet Report. 2013.
32. Chapman R, Munevar D, Manry B, Hoban N. *Maternity & Perinatal Care Collaboratives: Evidence of Effectiveness and Costs: Avalere Health Report to American Congress of Obstetricians & Gynecologists*;2013.
33. Perinatal Quality Collaboratives. *Reproductive Health* 2013; <http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/PQC.htm>. Accessed January 22, 2014.
34. Langley G, Nolan K, Nolan T, Norman C, Provost L. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance (2nd Edition)*.. San Francisco, CA: Jossey Bass; 2009.
35. Model for Improvement: Associates in Process Improvement; 2014.
36. Jones B. United States of America. Free US and World Maps.com2009:Vector map of the United States.
37. Lanza JJ. *Maternal and Child HealthData Analysis 2002-2005 with Perinatal Periods of Risks*n.d.
38. Analytic Approach. n.d.; <http://www.citymatch.org/perinatal-periods-risk-ppor/analytic-approach>. Accessed November 7, 2013.
39. PPOR helps communities move from data to action: CityMatch. n.d.; <http://www.citymatch.org/perinatal-periods-risk-ppor-home/what-ppor>. Accessed November 20, 2013.
40. PPOR/How to/Content. n.d.; <http://www.citymatch.org/PPOR/HowTo/Content/PHAS2IH.doc>. Accessed November 13, 2013.

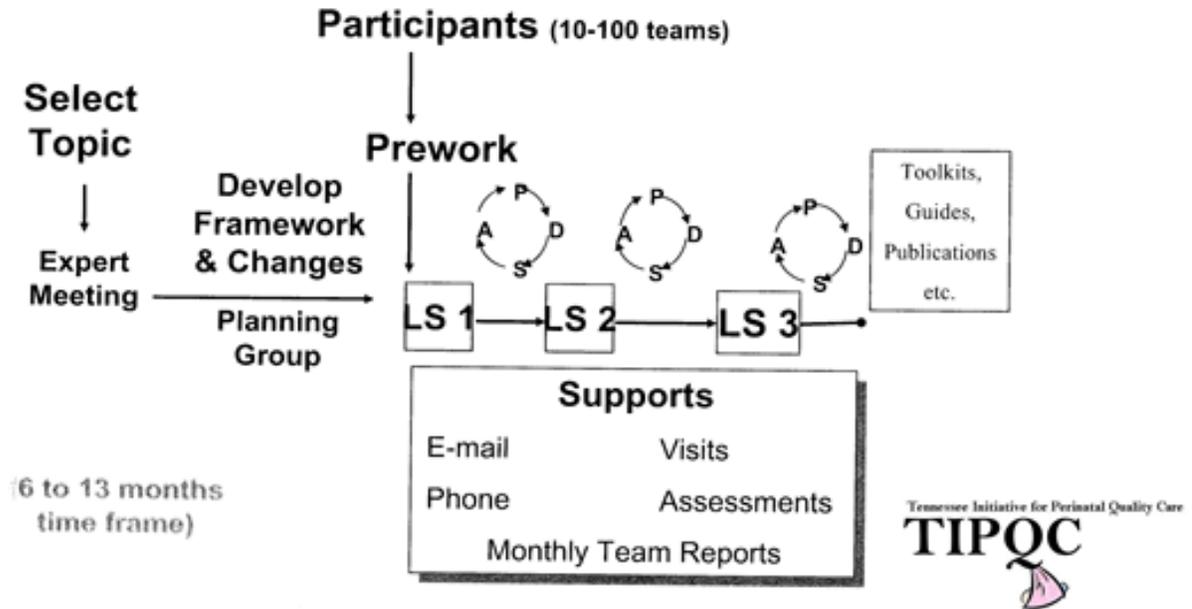
41. Hoyert D, Xu J. Deaths: Preliminary data for 2011. Vol 61. Hyattsville, MD: National Center for Health Statistics; 2012.
42. Gurganus K. Indiana Data Source: Indiana State Department of Health-Maternal and Child Health Epidemiology Division 2014.
43. Martin J, Hamilton B, Ventura S, et al. Births: Final data for 2011. Vol 62. Hyattsville, MD: National Center for Health Statistics; 2013.
44. Natality public-use data 2007-2011 United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics; 2013.
<http://wonder.cdc.gov/natality-current.html> Accessed February 20, 2014.
45. Behavioral Risk Factor Surveillance System (BRFSS). In: National Center for Chronic Disease Prevention and Health Promotion DoPH, ed: United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC); 2011.
46. MacDorman MF, Mathews TJ. Understanding Racial and Ethnic Disparities in U.S. Infant Mortality Rates. *NCHS Data Brief* 2011;
<http://www.cdc.gov/nchs/data/databriefs/db74.htm>. Accessed January 16, 2014.

Appendix 1 - IHI Breakthrough Series

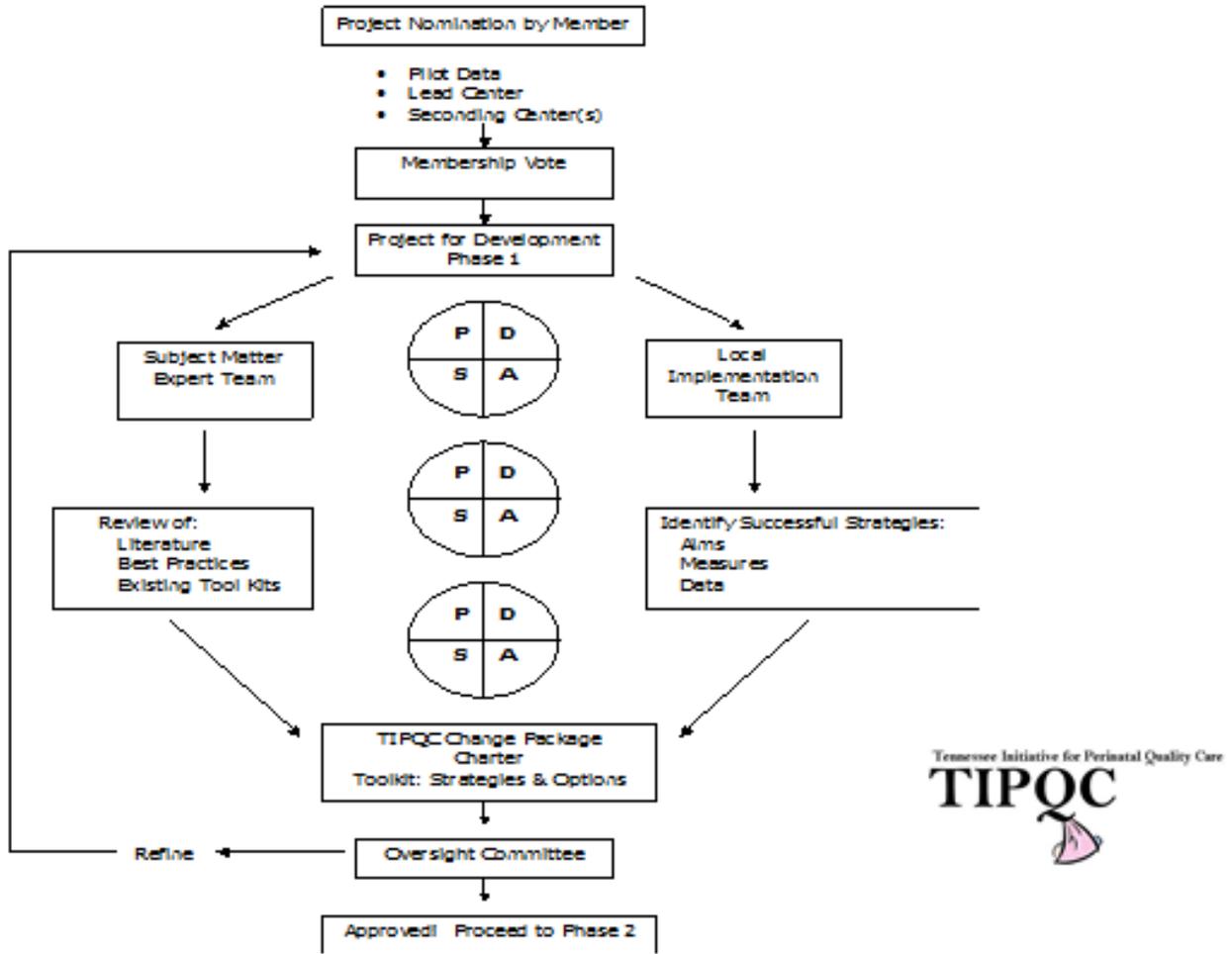


IHI Breakthrough Series

An improvement method that relies on spread and adaptation of existing knowledge to multiple settings to accomplish a common aim



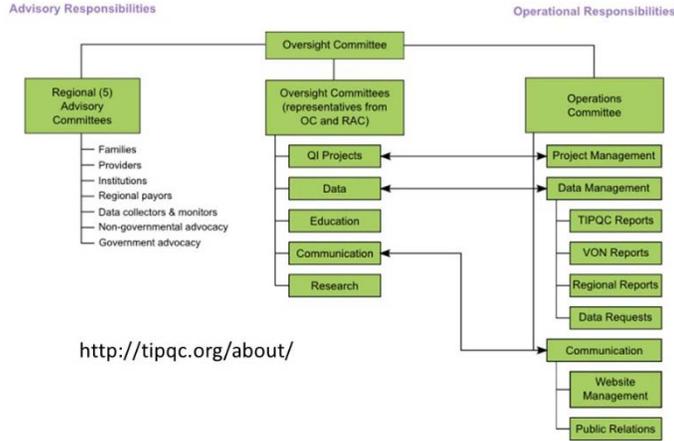
Appendix 2 - TIPQC Project for Development



Appendix 3 - Organizational Charts for Three Perinatal Quality Collaboratives

Tennessee Initiative for Perinatal Quality Care

Organizational Chart



Florida Perinatal Quality Collaborative

FPQC Organizational Chart



<http://health.usf.edu/publichealth/chiles/fpqc/governance.htm>

Illinois Perinatal Quality Collaborative

ILPQC Structure



http://www.ilpqc.org/docs/bootcamps/20131216/Welcome_ABorders.pdf

Appendix 4 - Results of IPQIC's Environmental Scan of Indiana's Current MCH Resources

Quality Improvement Initiatives in Indiana

- Indiana Medicaid has a Neonatal Quality Committee which meets quarterly. The committee (e.g., managed care entities, external stakeholders) addresses quality concerns related to the health of the mother and child.
- Union Hospital completed the March of Dimes 39+ week quality improvement initiative. Outcroppings include a new policy and placement of hard stops to prevent any elective inductions prior to 39 weeks, with the chief of obstetrics to enforce. After project completion, the hospital kept its policy of no elective inductions/cesarean sections under 39 weeks (as of March 2013) and continues the provided scheduling form. Data collection for future analysis is underway.
- Indiana Vermont Oxford Network Quality Collaborative (IVONQC)
 - Outgrowth of the statewide Medical Directors Quarterly meetings (teleconference for those outside Riley hospital) sponsored by the Section of Neonatal-Perinatal Pediatrics.
 - Breast Milk Use/Necrotizing Enterocolitis-2009: collaborative formed and initiated a project to demonstrate feasibility of a collaborative network in Indiana, increase mothers own milk use in NICUs, and reduce the morbidity and mortality associated with necrotizing enterocolitis. VON Database fields are used for outcomes analysis were integral to project completion.
 - Placental Transfusion in Preterm Infants project: Following the success of the 2009 QI project, the group agreed to engage our obstetric and maternal-fetal medicine colleagues in implementing the practice of placental transfusion in preterm infants by umbilical cord clamping 30-60 seconds after birth or cord milking. The approach is a quality improvement approach with 11 participating sites. A grant to reduce infant mortality has been submitted to ISDH.
- Guideline Development Group, Section of Neonatal-Perinatal Pediatrics (Section), IUSM
 - The Section has committed time resources for development of Clinical Guidelines to reduce variation in care practices. Systematic reviews are performed, guidelines implemented, and quality improvement metrics monitored. Eight guidelines have been developed and implemented. Such guidelines can be used in statewide QI efforts to improve care and reduce infant mortality incrementally.

Quality Collaborations

- CHIP-IN for Quality (Child Health Improvement Partnership – Indiana) is a partnership with family organizations, professional organizations, public insurers, academic medical center and ISDH CSHCS to implement quality initiatives around child health. CHIP-IN provides on-site coaching for system changes, community environmental assessment and linkage of resources, real-time data feedback for rapid cycle improvement.
- Union Hospital worked with the Rural Health Improvement Collaborative to create a community program designed to help train staff at critical access hospitals how to deliver, stabilize, and preterm/ term neonates precipitously delivered at their facility. Two of the hospital's NICU nurses have become STABLE instructors. The hospital also has a Neonatal Resuscitation Program comprised of regional trainers/instructors.

- Terre Haute Regional Hospital (THRH) has had a hard stop policy on inductions at 39+ weeks since November of 2011 and has been 100% since that time as reported to The Joint Commission. It is a Hospital Corporation of America initiative of which THRH is a part
- Neonatal Outreach Program of the Section of Neonatal-Perinatal Pediatrics, Department of Pediatrics; Indiana University School of Medicine provides an Outreach Simulation Program affiliated with Riley Hospital for Children using hands-on clinical scenarios as well as adjunct didactic education to train multiprofessional resuscitation teams in their own environment. The goal of the program is to improve the outcomes of newborns requiring resuscitation and stabilization at birth hospitals throughout Indiana. A foundation for these training sessions is the Neonatal Resuscitation Program (NRP) of the American Academy of Pediatrics. Through such programs, neonatal mortality caused by intrauterine asphyxia and complications related to prematurity are reduced. Furthermore, these programs focus on initial performance in the delivery room which is critical to short and long term neonatal outcomes in this vulnerable population. The Neonatal Community Outreach Simulation Program has reached nearly two thousand learners in Indiana who have been trained in advanced neonatal resuscitation. Technical skills emphasized include providing positive pressure ventilation, troubleshooting ineffective ventilation, coordination of chest compressions with ventilation, endotracheal intubation, and decompression of pneumothoraces. During the educational sessions, learners practice skills associated with the thermoregulation of premature infants, diagnosis and treatment of pneumothoraces, stabilization of neonates with unexpected congenital anomalies, and the proper use of resuscitation medications. In addition, the program provides interactive didactic sessions emphasizing recognition and management of neonatal abstinence syndrome and the use of non-invasive neonatal respiratory support. The simulation format is ideal for reinforcing effective team communication in a crisis situation as well as identifying latent safety threats.
- This year, 27 of Indiana's state-sponsored community health centers are participating in primary care learning collaborative to ensure planned care, patient self-management, and links with community resources are practiced by providers and patients in conjunction with improving prenatal care of patients in their first trimester. The participating centers have 14,088 women patients of ages 14 – 44 whose preconception health and prenatal care are one of the focal points of the collaborative. Having initiated a collaborative and data reporting infrastructure within the community health center network, the State hopes to expand and refine a future learning collaborative focused on preventing infant mortality at the local level.
- CoIIN is a public-private partnership to reduce infant mortality and improve birth outcomes. Participants learn from one another and national experts, share best practices and lessons learned, and track progress toward shared benchmarks. CoIIN is using the science of quality improvement and collaborative learning to reduce infant mortality. It builds on the success of multiple public and private investments to improve birth outcomes. In Region V, following the 2013 Infant Mortality Summit, five priorities to reduce infant mortality and improve birth outcomes were selected:
 - Reduce elective delivery at less than 39 weeks of pregnancy;
 - Expand access to interconception care (between pregnancies) through Medicaid;
 - Promote infant safe sleep practices;

- Improve perinatal regionalization (a geographically-targeted approach to assure risk-appropriate care for mothers and infants); and
- Reduce racial disparities in perinatal outcomes.

ISDH's Maternal and Child Health Division is participating in the Region V CoIIN and has also included the reduction of the percentage of pregnant women who smoke as a priority. The CoIIN project helps identify opportunities for leveraging resources and maximizing investments across federal and state programs, identify needs and provide technical assistance through a variety of vehicles to state MCH programs, and define an organizational framework for continued collaboration.

- Indiana has relationships with leadership in other states with state-wide QI collaboratives (e.g., California, Tennessee, North Carolina, Ohio, and Illinois).
 - Consultation from states with well-developed QI systems for outcomes improvement is readily available, specifically Tennessee and North Carolina. Sandra Hoesli, MD, Faculty in Neonatology at IUSM participated in the Tennessee collaborative while a faculty member at Vanderbilt University School of Medicine. Ken Herrmann, MD and William Engle, MD, Faculty at the IUSM, have participated in the state collaborative meetings during Vermont Oxford Network national meetings.
- IU Health's delivering facilities collaborated to eliminate elective deliveries prior to 39 weeks gestation, and availability and guidelines for use of 17 α -hydroxyprogesterone caproate.

Capacity Building

- The Department of Obstetrics and Gynecology at Indiana University School of Medicine (IUSM) has a new fellowship training program that was accredited in May of 2012 by the American Board of Obstetrics and Gynecology (ABOG). Additional Maternal-Fetal Medicine (MFM) practitioners are needed to fill a regional shortage of perinatologists and arm them with the necessary skills to independently care for pregnant women with multiple medical and obstetrical problems in the rural communities of the mid-West.
- Union hospital recruits and trains family medicine residents.
 - They seek out opportunities to hire providers to practice within the Union Hospital Health Group.
 - The OB staff support the March of Dimes and participate in its annual fundraiser. The hospital is also a corporate sponsor of March of Dimes.
- Indiana funds 45 community health centers, including 20 Federally Qualified Health Centers that also receive federal funds to provide health care to all individuals regardless of a patient's ability to pay. Collectively the centers see approximately 500,000 individuals. The centers also represent an informal network of primary care providers and offer an opportunity to impact significant numbers of child-bearing age women. Most importantly, community health centers are frequented by women whose access to prenatal care is further complicated by lack of transportation, lack of social support, and whose pregnancies are often unplanned.
- The Indiana Perinatal Network's mission is to lead Indiana to improve the health of all mothers and babies. They accomplish their mission by providing high quality provider education, raising consumer awareness and spearheading sound public policies. Since its' founding in 1998, IPN has demonstrated a proven ability to bring together competing

health systems, diverse disciplines and public and private organizations to reach consensus on how to address complex issues affecting the health of women, infants, and children in our state. Some of the issues they address impacting infant mortality include breastfeeding promotion, promoting policies to increase access to care, reducing unplanned pregnancies, reducing substance use during pregnancy, safe sleep practices and perinatal mood disorders. IPN's strengths and resources that could be utilized to build QI perinatal infrastructure in the state include the following:

- Statewide network of nearly 3,000 multidisciplinary perinatal providers and human service professionals;
- Statewide network of more than 40 community-based, grassroots breastfeeding coalitions and drop-in centers;
- Reputation for serving as a neutral, convening organization;
- Expertise in providing or coordinating high quality professional education at a statewide or regional level;
- Expertise in working with elected and state agency officials to develop and implement policies to improve perinatal care;
- Organizational and operational capacity to manage projects and grants

Form/Guideline Resources

- *Scheduling Induction of Labor* – The American College of Obstetricians and Gynecologists (ACOG) created a patient safety checklist form that helps facilities standardization their scheduling process. The healthcare provider completes the checklist; the hospital reviews the information to determine appropriateness of the procedure. The form information: Scheduling induction of labor. Patient Safety Checklist No. 5. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2011; 118:1473–4.
- *Northern New England Perinatal Improvement Network Guidelines for Medically Indicated Induction and Elective Labor Induction* – The Northern New England Perinatal Improvement Network Guidelines provide suggestions for medically and elective inductions of labor. Guideline information: www.nnepqin.org/Guidelines.asp
- *State Title V Program Approaches to Improving Birth Outcomes Lowering Non-Medically Indicated Deliveries* – Issue brief by Association of Maternal Child Health Programs (AMCHP) http://publish.amchp.org/Policy-Advocacy/health-reform/Documents/AMCHP_Kellogg_NMI%2039%20week%20Issue_Brief%20FINAL.pdf

Toolkit Resources

- *Policy Toolkit to Support Reduction of Early Elective Delivery* – The Midwest Health Initiative Innovators Council and Maternal, Child, and Family Health Coalition (located in St. Louis, MO region) developed this toolkit. It includes drafts of policy components, sample consents, and sample scheduling forms. Toolkit information: *Policy Toolkit to Support Reduction of Early Elective Delivery*. Midwest Health Initiative (n.d.) Retrieved from http://www.midwesthealthinitiative.com/upload/media/FINAL_TOOLKIT5.pdf
- *March of Dimes Elimination of Non-medically Indicated (Elective) Deliveries Before 39 Weeks Gestational Age; Quality Improvement Toolkit* – The toolkit provides methods to identify opportunities of improvements and outlines techniques for measuring process

and outcomes. It is a collaborative effort between the March of Dimes, California Maternal Quality Care Collaborative, and California Department of Public Health, Maternal, Child, and Adolescent Health Division. Toolkit information:

<https://www.prematurityprevention.org/portal/server.pt>

- *40 Weeks of Pregnancy Every Week Counts Provider Toolkit* – The Indiana Medicaid Hoosier Healthwise developed a toolkit for providers. The toolkit includes clinical resources and patient education resources.
- *Go the Full 40-* Association for Women’s Health, Obstetric and Neonatal Nurses’ (AWHONN) campaign to reduce early elective deliveries. This website offers women and families advice from nurses about the importance of delivering at term. This site also provides guidance on other areas of perinatal health.
http://www.health4mom.org/a/40_reasons_121611
- *Assessment and Care of the Late Preterm Infant Implementation Toolkit:* AWHONN developed a toolkit for purchase which includes clinical resources and patient education resources. <http://www.awhonn.org/awhonn/lpitoolkitresources/home.jsp>
- *March of Dimes Preterm Labor Assessment Toolkit* – The toolkit help medical providers establish a standardized clinical pathway for the assessment and disposition of women with suspected preterm labor. Better identification of women in preterm labor will not only provide timely and appropriate interventions; it will also promote effective management to improve neonatal outcomes. The development of the toolkit was collaborative effort of Sutter Medical Center, Sacramento Maternal –Fetal Medicine Medical Group, Inc., Santa Clara Valley Medical Center, Hospital Corporation of America, and March of Dimes Foundation. Toolkit information:
<https://www.prematurityprevention.org/portal/server.pt>

Evidence-based Home Visitation to Improve Birth Outcomes

The Affordable Care Act includes funding for Maternal Infant Early Childhood Home Visiting (MIECHV). The more common national home visiting models funded under this initiative are Healthy Families America, Nurse Family Partnership and Early Head Start. Indiana received funding for Healthy Families Indiana (HFI) to expand services in Marion County and other selected counties and to initiate Nurse Family Partnership (NFP) in Marion County. In addition, HFI receives funding from Family and Social Services Administration to provide home visiting services in each Indiana county.

In Indiana, NFP is implemented by Goodwill Industries of Central Indiana and has the capacity to serve 600 families in Marion County. NFP serves low-income mothers who are expecting their first baby. This evidence-based nurse home visitation model is designed to improve pregnancy outcomes, child health and development economic self-sufficiency of the family. NFP home visiting begins as early as possible during pregnancy (at least by 28 weeks gestation) and continues until the child is two years old. Each home visitor is a baccalaureate-prepared registered nurse with a caseload of 25 families. NFP has 30 years of research that demonstrates effectiveness, including David Olds’ randomized trials with diverse populations. Because NFP home visiting always begins during pregnancy, it has demonstrated success in improving pregnancy and birth outcomes. Impressive results related to reducing infant mortality and morbidity include: a 79% reduction in preterm birth for women who smoke, 35% reduction in hypertensive disorders of pregnancy, 39% fewer injuries among children birth to age 2,

statistically significant reductions in smoking, fewer second pregnancies within 24 months and increased initiation of breastfeeding.

CenteringPregnancy®

CenteringPregnancy is a model of group prenatal care that integrates three major components of care: health assessment, education, and support. These components provide facilitated discussions of pregnancy, birth and newborn care as well as overall health, and stress management within a supportive and collaborative environment to share pregnancy and experiences.

A 2007 multi-site randomized controlled trial conducted by Yale and Emory researchers found that participation in CenteringPregnancy care reduced the risk of premature birth by 33 percent compared to traditional prenatal care. Researchers concluded CenteringPregnancy care “resulted in equal or improved perinatal outcomes at no added cost.” The CenteringPregnancy model has been demonstrated to improve several key outcomes for pregnancy in sample population studies not only increasing breastfeeding rates and duration of breastfeeding but decreasing preterm birth rate.

The Center for Medicare & Medicaid Innovation (CMS Innovation Center) has recognized the CenteringPregnancy model as one of three evidence-based maternity care service approaches that enhance the current care delivery. Through the Strong Start for Mothers and Newborns initiative the CMS evaluates CenteringPregnancy as an enhanced prenatal care intervention to reduce the rate of preterm birth, improve the health outcomes for pregnant women and newborns and decrease the anticipated total cost of medical care during pregnancy, delivery and over the first year of life for children born to mothers in Medicaid or CHIP.

In Indiana, CenteringPregnancy has been implemented at over 22 sites within 14 health care systems since 2005 according to the Centering Healthcare Institute. March of Dimes, in partnering with WellPoint Foundation, has actively involved in CenteringPregnancy implementation in majority of the sites by providing grants for start-up trainings, advanced trainings, and site approval to ensure quality continuation of the care. CenteringPregnancy also has opened opportunities to serve pregnant women with diverse risks. Physicians at Eskenazi Health recognized CenteringPregnancy as a model to provide prenatal care to pregnant women who may need long-term management of chronic health conditions and implemented CenteringPregnancy for Hispanic women with gestational and type II diabetes. St. Vincent Hospital Primary Care Center not only has provided CenteringPregnancy to teen pregnant women but is currently reviewing efforts to provide CenteringPregnancy to pregnant women with obesity. According to March of Dimes, through their chapter grant program in 2012 CenteringPregnancy was provided to a total of 378 pregnant women at 4 different sites. The rate of preterm birth among CenteringPregnancy participants was 7.1% compare to overall state preterm birth rate of 11.7% (2012).

Community Resources

- March of Dimes
- WIC

- Allen county: Healthy Families, The Hope Center, Tobacco Free Coalition, Neighborhood Health Clinic
- Northeast Indiana Perinatal Collaborative
- Lutheran Health Network
 - Participation in Vermont Oxford Data Collection
 - Dupont Hospital: 24 hour OB stat coverage
 - Dupont Hospital: Host for 2014 Regional Perinatal Education
 - Dupont Hospital: Perinatal Classes for Community
 - Preparing for Childbirth
 - Trimester Series (Trimester #1, Trimester #2, Trimester #3, and Postpartum Class [Trimester #4])
 - Newborn Class
 - Infant Safety/CPR
 - Breastfeeding Basics
 - Breastfeeding and Returning to work class
 - Grandparents Class
 - Car Seat Education Class
 - Sibling Class
 - Breastfeeding and Mom to Mom Support Group
 - Preconception and Multiples Classes planned for 2014
 - Outpatient Lactation Support Services with our IBCLC's
 - Mood Changes
 - Inpatient car seat inspections as well as outpatient inspections through our fitting station
 - The Mad Anthony's Children's Hope House
- St Joseph Hospital
 - Perinatal Classes for the Community, in the Community
 - Classes include During Pregnancy, Postpartum Care, Care of Newborn, Breastfeeding, Gestational Diabetes, Sibling Class
 - Collaboration with Neighborhood Health Clinic-new program that all patients will be enrolled in classes at beginning and at approximately 25 weeks. They will also attend gestation diabetes education as regular part of their plan of care
 - Classes offered at the patient's convenience to encourage participation for the inner city population we serve.
 - All classes available in any language with interpreter services.
 - Beginning in 2014, a designed to give every patient in-depth education on Safe Sleep before discharge.
 - Providing classes at The Hope Center in 2014
- IU Health Bloomington Hospital
 - Perinatal classes for the community in Bloomington and Martinsville
 - Star Bright Beginnings Classes:
 - Four week series or one day class
 - Sibling Preparation
 - Toddler
 - Sibling 3-5 years
 - Grandparents Class

- Breastfeeding Basics and Breast Pumps
- CPR for New Parents
- Period of Purple Crying implementation to prevent Shaken Baby Syndrome
- Family Support Advocates (a collaboration with Bloomington Area Birth Services and IU Health-Bloomington Hospital) provide free in-hospital emotional support to the entire family, and help moms and babies get breastfeeding and bonding off to a good start. FSAs volunteer for 24-hour on-call shifts, and can spend anywhere from a couple of hours to most of a day with a family.
- See <http://bloomingtonbirth.org/after-baby/support/family-support-advocates/> for more resources.
- Collaboration with Lactation Consultants across the community including IUHB inpatient, Riley Physicians at Southern Indiana Physicians, WIC, and Bloomington Area Birth Services.
- Care coordination with Riley Physicians at Southern Indiana Physicians and IU Health Children's Therapy Center for Special Care Follow-up at well child checks.

Appendix 5 - Impact on Indiana by Cause if IMR is Reduced to the US IMR (2011)

| Table 4. Impact on Indiana by Cause if IMR is Reduced to the US IMR (2011) | | | | | |
|--|---------------------------|----------------------|--|--|---------------------------------------|
| 41,42 | | | | | |
| Cause of Death | INDIANA IMR (per 100,000) | US IMR (per 100,000) | Rate Difference Between IN and US Rate | % IN IMR Decline if Lowered to US Rate | Increased number of infants surviving |
| Perinatal Risks ¹ | 351.0 | 299.6 | 51.4 | 14.64% | 43 |
| Congenital Malformations ² | 201.8 | 126.1 | 75.7 | 37.53% | 63 |
| SUIDs ³ | 97.9 | 65.1 | 32.8 | 33.52% | 27 |
| Other accidents ⁴ | 20.3 | 7.7 | 12.6 | 62.00% | 11 |
| Assaults ⁵ | 7.2 | 4.5 | 2.7 | 37.47% | 2 |
| Infections ⁶ | 7.2 | 14.0 | -6.8 | -93.92% | 0* |
| All Other Causes | 82.4 | 87.8 | -5.4 | -6.55% | 0* |
| Total | 767.8 | 604.8 | 163.0 | 21.23% | 137 |

Notes:

- Cause of Death Category ICD-10 Codes: ¹[P00-P96]; ²[Q00-Q99]; ³[R95, R99, W75-W77, W81-W84, Y06-Y07, Y20]; ⁴[V01-W74, W78-W80, W85-W99, X00-59, Y86]; ⁵[X85-X99, Y00-Y05, Y08-Y09]; ⁶[A00-B99]
- Infant Mortality Rates are typically displayed per 1,000 live births; however, this table uses per 100,000 live births due to low numbers when sorting deaths by specific cause category.
- (*) indicates categories in which Indiana fairs better than the nation. The rows for increased infants survived equals zero. Thus, if added together, the Increased Number of Infants Surviving column does not equal the total number of infants survived.

Appendix 6 - Impact on Indiana by Race/Ethnicity if IMRs are Reduced to US IMRs (2011)

| Table 5. Impact on Indiana by Race/Ethnicity if IMRs are Reduced to US IMRs (2011) 41,42 | | | | | | |
|---|---------------|----------------------|----------------------|-------------------|--|---|
| | | IN IMR (per 1000) | US IMR (per 1000) | IMR Difference | % IN IMR Decline if Lowered to US IMR | Increased Number of Indiana Infants Surviving |
| Black ¹ | Total | 12.31 | 11.42 | 0.89 | 7.25% | 9 |
| | Neonatal | 7.57 | 7.45 | 0.12 | 1.58% | 1 |
| | Post-Neonatal | 4.74 | 3.97 | 0.77 | 16.23% | 8 |
| White ² | Total | 6.91 | 5.11 | 1.80 | 26.00% | 125 |
| | Neonatal | 4.72 | 3.45 | 1.26 | 26.82% | 88 |
| | Post-Neonatal | 2.19 | 1.66 | 0.53 | 24.23% | 37 |
| Hispanic ³ | Total | 6.54 | 5.23 | 1.30 | 19.95% | 11 |
| | Neonatal | 4.69 | 3.65 | 1.04 | 22.11% | 8 |
| | Post-Neonatal | * | 1.58 | - | - | - |
| Total | Total | 7.68 | 6.05 | 1.63 | 21.23% | 137 |
| | Neonatal | 5.19 | 4.04 | 1.16 | 22.31% | 97 |
| | Post-Neonatal | 2.48 | 2.01 | 0.47 | 18.97% | 39 |

¹Total Black

²Total White

³Includes all persons of Hispanic origin of any race

*Rates are unstable