

County of Sonoma

Department of Health Services

Public Health Division

Maternal, Child & Adolescent Health Program

## **Fetal Infant Mortality Review (FIMR)**

**Five-Year Report: 2003-2008**

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Prepared by:

Karen Clark, Senior PHN

Jenny Mercado, MPH, Epidemiologist

Rebecca Munger, MCAH Coordinator

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## Executive Summary

The Sonoma County Fetal Infant Mortality Review Five Year Report describes the work of the Fetal Infant Mortality Review (FIMR) program from 2003 through 2008. The purpose of this report is to explain in detail what was learned and what actions were taken from review of selected fetal and infant deaths occurring during the second five years of the program. The goal of FIMR is to examine social and health systems factors associated with fetal and infant deaths through individual case review and to develop and implement interventions that enhance the wellbeing of all women, children and families. Since the Sonoma County Fetal Infant Mortality Review (FIMR) program began, there have been more than 300 fetal and 250 infant deaths in our community. If they had lived, these babies would have grown to fill more than 25 kindergarten classrooms. In the ten years since it began, Sonoma County FIMR has reviewed 197 of these deaths.

During the second five years of the FIMR program, five issues were identified as having a significant impact on perinatal outcomes and amenable to community action:

- Women of childbearing age lack preconception and interconception care to address chronic medical conditions, including obesity, which are known to adversely impact pregnancy outcomes if left untreated.
- Use of tobacco, alcohol, and drugs by women before, during, and after pregnancy is associated with fetal and infant deaths.
- Unaddressed maternal depression and other mental health disorders can negatively impact pregnancy outcomes and parenting.
- Failed communication between medical providers and families about the cause of a fetal or infant death can complicate grieving and limit families' compliance with medical evaluations and behavioral changes important to future pregnancies.
- Unsafe infant sleep environments are associated with potentially preventable deaths.

Interventions and activities planned and implemented by the FIMR team during the second five years included:

- Continuation of FIMR projects from the first five years, including the Children's Memorial Grove, the Prenatal Care Missed Appointment Project, My Pregnancy Record, and FIMR representation on the Perinatal Alcohol and Other Drug Action Team.
- Providing education to health care providers on issues identified during case review, including trainings on minor consent law and confidentiality, identifying and addressing family violence, integrating preconception care into family planning, counseling pregnant and postpartum women on nutrition and weight gain, care of diabetes during pregnancy, supporting clients who are experiencing perinatal loss and reducing the impact of perinatal alcohol and other drug exposure.
- Development and distribution of brochures on when to call the doctor for medical evaluation of a sick infant, choosing a childcare provider who will provide safe and developmentally appropriate care, and suppressing lactation after perinatal death.

- Participation in the Matrixed Analytical Training for Reproductive, Infant, and Child Health Service (MATRICHS), the Healthy Weight Initiative Action Learning Collaborative, and the Perinatal Mood Disorders Working Group.

The Sonoma County Maternal, Child and Adolescent Health Program will continue to implement a community-based FIMR program based on the guidelines provided by the California Department of Public Health. The Perinatal Periods of Risk framework will be applied to select cases for review that will help uncover issues contributing to disparities in perinatal outcomes within our population. FIMR team members will be engaged to identify factors that contribute to preventable deaths and to make recommendations for change. The entire community will be enlisted to implement activities that have potential to improve the health of all Sonoma County.

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# 1. Introduction

The National Fetal and Infant Mortality Review (NFIMR) Program was established in 1990 as a collaborative effort between the federal Maternal and Child Health Bureau and the American College of Obstetricians and Gynecologists (ACOG). A year later, California established the first state-directed Fetal Infant Mortality Review (FIMR) Program. There are currently FIMR projects in sixteen counties in California with Federal Title V funding provided by the California Department of Public Health Maternal, Child and Adolescent Health (MCAH) Program. More information on the California FIMR programs is available at: [www.cdph.ca.gov/programs/FIMR/Pages/default.aspx](http://www.cdph.ca.gov/programs/FIMR/Pages/default.aspx).

The Sonoma County FIMR program began in January 1998. In the 10 years since FIMR was implemented there have been 557 fetal and infant deaths of which 197 deaths, more than half, have been reviewed. The Sonoma County Five Year Report, covering the period of 1998 through 2002, was compiled and distributed in 2003 and is now available at [www.sonoma-county.org/MCAH](http://www.sonoma-county.org/MCAH). Its findings have contributed to the last two cycles of the Sonoma County Title V MCAH Needs Assessment process and informed program planning and decision making on maternal child issues throughout the county.

The purpose of the Sonoma County Fetal Infant Mortality Review Five-Year Report: 2003-2008 is to share the local FIMR process, findings, and actions during the second five years of the program. The FIMR team reviewed 100 of the 270 fetal and infant deaths that occurred from 2003 through 2007. (Refer to Table 1.) This report describes the issues that were identified, the recommendations that were made, and the actions that were taken during this period.

**Table 1. Number/Type of Cases Reviewed by Sonoma County FIMR Team**

<b>Fetal &amp; Infant Deaths 2003–2007 Cases Reviewed by FIMR Team/PPOR Analysis</b>	<b>Total<sup>1</sup></b>	<b>Reviewed by FIMR<sup>2</sup></b>	<b>In PPOR Analysis<sup>3</sup></b>
Fetal	155	61	144
Infant	115	39	118
Total	270	100	262

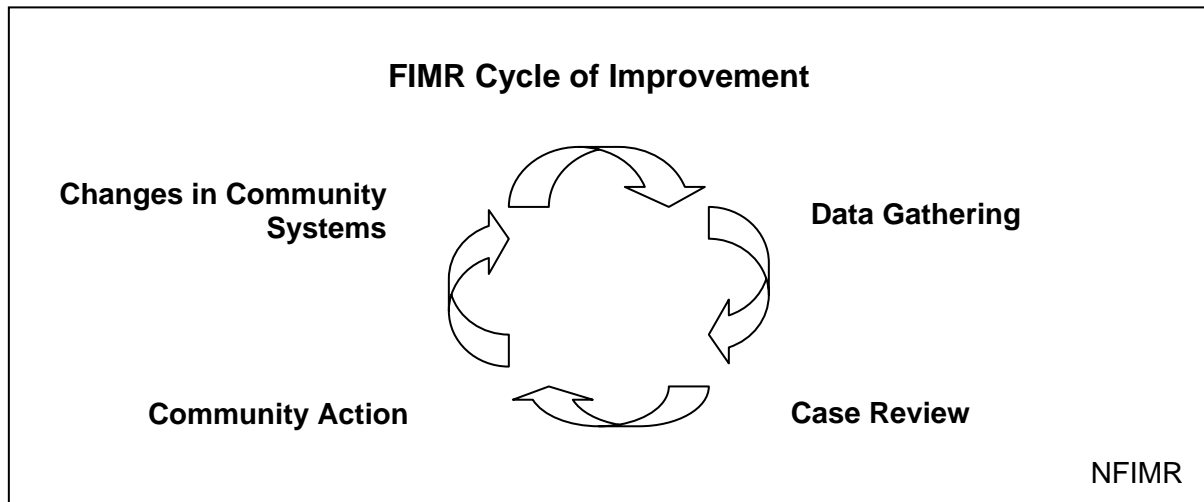
<sup>1</sup>Deaths occurred during period 2003–2007

<sup>2</sup>Deaths reviewed during period 2003–2007

<sup>3</sup>Deaths occurred to children < 1 year who were born during period 2002–2006

## 2. What is Fetal Infant Mortality Review?

“Fetal and Infant Mortality Review (FIMR) is an action-oriented community process that continually assesses, monitors, and works to improve service systems and community resources for women, infants, and families. A fetal or infant death is the event that begins the process.” (NFIMR)



The purpose of FIMR is to gain insight and provide a mechanism for community involvement and community change. Objectives for FIMR programs include:

- Examination of the social, economic, cultural, safety and health systems factors associated with fetal and infant deaths through a review of individual cases.
- Development of interventions to address these factors and improve services and resources.
- Participation in the implementation of interventions.
- Evaluation of the progress of interventions.

FIMR serves as a warning system that sheds light on the functioning of the health care delivery system. It is also a means to implement continuous quality improvement (CQI) and carry out the core public health functions of needs assessment and quality assurance. FIMR is not a fault-finding process, and it is not epidemiological research.

“Although FIMR focuses on the worst outcomes, the community interventions that result from FIMR are also effective in reducing infant morbidity and improving services to all infants, mothers and their families.” (NFIMR)

The FIMR process involves gathering information from birth and death certificates, coroner reports, and medical and social service records. A maternal or family interview is conducted if the mother wishes to participate. The maternal interview allows communities to gain insight into the experiences of parents as they negotiate health and human services. Sometimes, the maternal interview is the first and only opportunity a woman has to talk about her baby and her loss.

“FIMR represents the silent partner, the mother who has lost an infant. FIMR gives her a voice and shares her perception of local services and resources.” (NFIMR)

Once the information has been gathered, names of family, medical providers and institutions are removed. The story of the baby’s death is summarized and anonymously reviewed by a team of professionals and community members. Team members may include doctors, nurses, social workers, bereavement counselors, hospital representatives, mental health and drug treatment counselors, and parents.

The review process focuses on identifying issues and recommendations for community change. Interventions are developed from these recommendations which are implemented by the FIMR program in coordination with community partners. The FIMR team monitors the effectiveness of interventions and progress toward improving the community system for perinatal care.

“Unique among all health outcomes, the death of an infant has always been viewed as a sentinel event that serves as a measure of a community’s overall social and economic well-being as well as its health. It is also a measure of the organization and abilities of its local health and human services and the robustness of community resources.” (NFIMR)

### **3. Organization of Sonoma County FIMR Program**

#### **FIMR Team Process**

The Sonoma County FIMR program utilizes a combined Case Review Team/Community Action Team. The combined team approach enables all FIMR team members to participate in the case review process and in deciding which recommendations are priorities for intervention.

The FIMR team meets monthly to review cases, identify issues, and make recommendations for community action. A Tracking Log is used to record issues, recommendations, and the status of interventions to enable the team to recognize trends over time. FIMR team members work together, individually in their own work setting and with community partners to implement and evaluate interventions. At any point in time, a number of interventions are in process.

#### **Team Membership**

A multi-disciplinary FIMR team is convened drawing members from multiple agencies throughout Sonoma County. The team has nurses and physician members as well as social workers, parent educators, and program managers from local hospitals, the Public Health Department, hospice services, and other community-based organizations (See Appendix A for membership list). In addition there are representatives from the District Attorney's office and Child Protective Services. This group meets monthly to carry out the review process. The FIMR coordinator is responsible for recruiting and orienting new members as needed. Each member signs a confidentiality agreement.

#### **Case Selection**

The Sonoma County FIMR team reviewed 20-24 fetal and infant deaths each year for ten years. Case selection criteria were examined and revised annually by the FIMR team. The case selection process began with receipt and review of death certificates. Fetal death certificates are indicated when a fetus is 20 weeks gestational age or older and dies before birth. Infant death certificates are completed when a baby is born alive and dies before the first birthday. All cases selected for review are Sonoma County residents. Deaths that occur outside of Sonoma County are not generally reviewed because records are not consistently available. The manner in which cases were selected has been modified since the program began in 1998. During the first year of the program, all deaths were reviewed. Due to time constraints, starting in 1999 deaths were stratified by age at death (fetal, neonatal, and post neonatal) and every third death was reviewed. From July 2000 through March 2004, cases were randomly selected after stratifying for maternal race/ethnicity and age at death. The team also reviewed all SIDS deaths and deaths with special circumstances identified either by the Child Death Review Team (CDRT) or the FIMR Coordinator.

Since April 2004, case selection has been based on findings from *Perinatal Periods of Risk* (PPOR) analyses. PPOR is a tool used to examine birth and death data to determine if there are preventable deaths in a community. It identifies when interventions will be the most effective in reducing these losses and if there are populations disproportionately affected. Sonoma County birth data has shown that deliveries funded by Medi-Cal experience a higher rate of fetal and infant death and that prevention efforts should be directed toward improving maternal and infant

systems of care. For a more detailed explanation of *Perinatal Periods of Risk* and its application in Sonoma County, see Appendices B & C.

## **Data Collection/Case Summary Preparation**

Data sources included birth and death certificates, prenatal and postpartum care records, hospital and emergency department records, infant ambulatory care records, coroner's investigative report and autopsy, child protective services records, Maternal Child Health Field Nursing records, and Women, Infants, and Children (WIC) records. Providers of alcohol and other drug treatment declined to participate in record abstraction due to more restrictive confidentiality requirements. Records abstraction was done by the FIMR Coordinator. Mothers who consented were interviewed by the bilingual FIMR Coordinator using the NFIMR Home Interview tool. All data collection forms can be reviewed at the NFIMR website:

<http://www.acog.org/departments/nfimir/dataAbstractionBook.pdf>.

Collected data was prepared in summary form by the FIMR Coordinator. All identifying information is removed, including names of the family, medical providers, and institutions. Comprehensive, anonymous case summaries are mailed to FIMR team members before the monthly case review meeting and collected and shredded after the meeting.

## 4. Issues and Recommendations

The case review phase of the FIMR process identifies issues and opportunities for intervention. Summarized here are key findings and recommendations. Case studies were created to illustrate the process and do not include patient specific information.

### Issue I

**Women of childbearing age with chronic health conditions do not receive care before conception that could significantly improve the outcome of a future pregnancy.**

#### Case Study

Sra. \_\_\_\_ is a 34-year-old, married, Hispanic woman, born in Mexico. She completed eight years of education. She has lived in the U.S. for six years. She is a homemaker. This is her fifth pregnancy. Her first pregnancy resulted in a term birth, and she has a 12-year-old daughter. Since Sr. and Sra. \_\_\_\_ decided to have another child two years ago, she has had two spontaneous abortions and a fetal demise. She is obese and has a history of high blood pressure that has been inconsistently treated. She has dental caries and has not been to the dentist for years. Although Sra. \_\_\_\_ saw her health care provider after the prior losses, no plan for her chronic health conditions was documented.

Sra. \_\_\_\_ started prenatal care, funded by Medi-Cal, at 12 weeks of gestation. Her blood pressure was elevated, and she was started on medication. Gestational diabetes was diagnosed, and she was referred to Sweet Success. The prenatal record did not note if she had enough money for food. Sra. \_\_\_\_ was referred for dental care, but did not make an appointment.

At 22 weeks of gestation, Sra. \_\_\_\_ reported low back pain and a pinkish discharge starting the day before. Preterm labor was diagnosed, and the baby was stillborn later that day. The placental pathology report was significant for chorioamnionitis. The fetal death certificate said fetal demise, cause unknown. No complications of pregnancy were coded on the death certificate.

#### Key Findings

- In 41 of the 100 cases reviewed, women had one or more chronic health conditions prior to becoming pregnant.
- The most frequently occurring chronic conditions were dental caries; hypertension; glucose intolerance, including prior gestational diabetes, current diabetes, and metabolic syndrome; bladder and/or kidney conditions; asthma; cardiac conditions; and thyroid disorders.
- More than half of the women with chronic conditions were also obese or overweight. The majority of these cases had no documented nutritional assessment in the prenatal record.
- While almost half of women with chronic health conditions planned their pregnancy, few had any preconception care documented in the prenatal record.

- Almost half of the women with chronic health conditions had one or more prior pregnancy loss.

## **Recommendations**

- Increase health care professionals' awareness of the importance of preconception and interconception health through grand rounds, conference and Comprehensive Perinatal Services Program (CPSP) trainings.
- Support planned pregnancies by increasing the availability and use of contraceptives including emergency contraception.
- Integrate preconception and interconception health care into routine health care and family planning visits. Start interconception health promotion at postpartum visits by including information about folic acid, immunizations and child spacing.
- All women of childbearing age should be encouraged to reach a normal weight before pregnancy and gain an optimal amount of weight during the pregnancy.
- Chronic conditions, including diabetes or pre-diabetes, should be monitored to help women achieve normal blood sugars before conception.

## **Issue II**

### **Use of tobacco, alcohol, and drugs by women before, during and after pregnancy is associated with fetal and infant deaths.**

#### **Case Study**

Ms. \_\_\_\_ is a 24 year old white, non-Hispanic pregnant woman who completed 11years of education and has her GED. She has a five-year-old daughter and had a therapeutic abortion earlier in the year. She lives with the father of this baby and does not have a job. This pregnancy was not planned.

Ms. \_\_\_\_ applied for Medi-Cal and began prenatal care with an obstetrician in a private practice setting at 12 weeks gestation. At the intake appointment, she disclosed tobacco and alcohol use prior to knowing she was pregnant. She also admitted to methamphetamine use "years ago" and occasional marijuana use to control pregnancy-related nausea. The obstetrician cautioned her against substance use, but did not document any referrals or further assessments. Ms. \_\_\_\_ was compliant with her prenatal care. At 26 weeks, Ms. \_\_\_\_ called her obstetrician complaining of intense abdominal pain. The obstetrician directed her to go to the hospital where an ultrasound was done revealing a placental abruption. Ms. \_\_\_\_ began to have strong contractions, and her baby was stillborn a couple of hours after admission. The pathology report was significant for placental abruption. A toxicology screen was not done.

Ms \_\_\_\_ was quite tearful, and then became very subdued. The obstetrician reassured Ms. \_\_\_\_ that it was very unlikely that the same thing would happen with a future pregnancy. The social worker assisted with final arrangements and offered a referral for grief support, which Ms. \_\_\_\_ declined. Her boyfriend and her mother were present and supportive. She was discharged later

that day and told to call for a postpartum appointment in six weeks. Ms. \_\_\_\_ did not schedule a postpartum appointment. Staff from the obstetrician's office tried to reach her, but her phone had been disconnected.

## **Key Findings**

- In one-quarter of the FIMR cases reviewed, significant maternal substance use was a factor. Alcohol was the most frequently used substance but use of multiple drugs was common. Many women also smoked tobacco.
- In four cases, alcohol and/or other drugs were identified as being directly associated with the death by contributing to parental neglect.
- Documented prenatal care provider follow-up was inconsistent when women admitted to substance use. The introduction of the Drug Free Babies universal screening tool resulted in more consistent provider follow-up. In prenatal care sites that participated in Drug Free Babies Program, more women were referred for comprehensive substance use assessments.
- Co-existing mood disorders, including anxiety and depression, impacted more than half of the women with who used alcohol and other drugs.
- Intimate partner violence was associated with cases involving maternal alcohol and other drug use.
- The majority of the women who used alcohol and other drugs did not plan their pregnancy. More than half had one or more prior therapeutic abortions.
- While substance use was more common in white women, other races and ethnicities were also identified as using alcohol and other drugs.
- Referrals to the Public Health Maternal Child Health Field Nursing Program were not always made when multiple psychosocial issues, including alcohol and other drug use, were identified.

## **Recommendations**

- Support the development and implementation of a county-wide program to ensure that all pregnant women are asked and educated about the risks of tobacco, alcohol and other drug use during prenatal care and assisted to access treatment and cessation services.
- Advocate for the development of a universal screening and referral tool for use in pediatric health care sites.
- Advocate for universal substance use screening and referral in family planning sites.
- Pregnant and parenting women with psychosocial issues and substance use should be encouraged by providers to accept a referral to the Public Health Maternal Child Health Field Nursing Program. The Maternal Child Health Field Nursing Program should periodically conduct outreach to private providers and clinics reminding them of their services and how to make a referral.

- Communication and coordination between Family, Youth and Children’s Services (Child Protective Services), prenatal care providers, and hospital emergency and maternity departments throughout the county is needed to protect infants of women who continue to use.

### **Issue III**

#### **Unaddressed maternal depression and other mental health disorders can negatively impact pregnancy outcomes and parenting.**

##### **Case Study**

Sra. \_\_\_\_ is a 17 year old Hispanic, born in the U.S. She and her boyfriend live with her parents and other family members. She completed 10th grade but left school at age 16 when she got pregnant. That pregnancy ended in a miscarriage. Sra. \_\_\_\_ was pregnant again within three months.

Sra. \_\_\_\_ applied for Medi-Cal and started prenatal care at a community clinic at 10 weeks of gestation. Significant history in the prenatal records included occasional alcohol use since early teen years and a history of family violence. Sra. \_\_\_\_ told the CPSP worker that she was depressed because she let her family down by dropping out of school and let her boyfriend down by having a miscarriage. She said she frequently got mad at her boyfriend for no reason. No follow-up was documented.

Sra. \_\_\_\_ was compliant with prenatal care. She had four appointments and saw the same doctor at each visit. The doctor always asked her if she had any questions, but she kept her feelings of depression to herself. At 28 weeks of gestation, Sra. \_\_\_\_ told her doctor that she hadn’t felt her baby move for two days. Sra. \_\_\_\_ was sent to the hospital. Fetal demise was confirmed by ultrasound. Labor was induced. After the delivery, Sra. \_\_\_\_ told the social worker that the baby’s death was her fault because she got mad at her boyfriend. She declined a referral for grief support.

Sra. \_\_\_\_ was seen at the clinic two weeks after the delivery. She was noted to be depressed and offered antidepressants and a referral for counseling. She did not schedule a counseling appointment, and she did not return for the six-week postpartum exam. Attempts to reach her by phone were unsuccessful.

##### **Key Findings**

- In almost half of the cases reviewed, women experienced depression or mood disorders. For most women, the onset was before the pregnancy.
- In almost one third of the cases, there was no or minimal documentation of mental health screening and/or follow-up when mental health issues were noted. Preconception screening for mental health disorders is even less common.

- Half of the women with mental health issues also had alcohol or other drug use documented in the medical record.
- Fewer than half of women with mental health disorders had planned their pregnancies.
- Lack of affordable mental health services for women of childbearing age impacts treatment options and may impact providers' willingness to screen women for mental health disorders.

## Recommendations

- Women of childbearing age need to be routinely screened for mental health disorders at primary care, family planning, prenatal and postpartum care visits.
- Develop a list of mental health resources and share it with prenatal care sites. Work with Comprehensive Perinatal Services Program (CPSP) providers and health educators to increase awareness of mental health resources for pregnant and postpartum women.
- Train *promotoras* (community health workers) who work in the community with pregnant and parenting women in techniques for empowering women with low self-esteem.
- Advocate for community clinics to offer the "Centering Pregnancy" option for group prenatal care.
- Advocate for more community resources for women experiencing perinatal mood disorders and a system of care that links women with these resources.
- All perinatal providers need to be educated about the safety and efficacy of antidepressant therapy.

## Issue IV

**Failed communication between medical providers and families about the cause of a fetal or infant death can complicate grieving and limit families' compliance with medical evaluations and behavioral changes impacting the outcome of future pregnancies.**

### Case Study

Sra. \_\_\_\_ is a 24 year old, married, Hispanic woman with a high school diploma. She has lived in the U.S. since childhood. This is her first pregnancy. The pregnancy was planned. Sra. \_\_\_\_ got Medi-Cal and started prenatal care at a community clinic during the first trimester. She had regular appointments with the doctor and the health educator.

At 20 weeks of gestation, fetal anencephaly was discovered on a routine ultrasound. The doctor told Sr. and Sra. \_\_\_\_ that their baby did not have a brain and would die at birth or before. An appointment was scheduled at a Prenatal Diagnostic Center, but Sra. \_\_\_\_ did not go since her doctor had told her nothing could be done to save her baby's life. She continued to see the clinic doctor, but visits with the health educator stopped. At 30 weeks of gestation, Sra. \_\_\_\_ reported decreased fetal movement. An ultrasound confirmed fetal demise. After the delivery, Sra. \_\_\_\_

held her baby for a long time. Her baby looked normal to her, which made her wonder if what the doctor said was true.

At the postpartum visit two weeks later, Sr. and Sra. \_\_\_\_ understood the doctor to say their baby's problem might have been because of her blood sugar or bad genes or because she didn't take vitamins. They didn't understand how that could be true since her blood sugar had been normal and she always took her prenatal vitamins. The doctor ordered blood tests and scheduled an appointment with a genetic counselor.

Sra. \_\_\_\_ became more and more depressed trying to understand why her baby died. She forgot about the blood tests and the genetics appointment. The clinic called when she failed the genetics appointment, but her Medi-Cal was only good for two months after the delivery, and it was too late to reschedule.

### **Key Findings**

- Families who experienced a fetal or infant death were sometimes uncertain of the cause of death or if they were at risk for a future loss.
- Women uncertain of the cause of death were less likely to complete the medical workup recommended by their physician and more likely to experience prolonged grieving.
- Lack of access to funded services interfered with some women completing the medical workup.
- Comprehensive postmortem maternal and fetal medical workups were infrequently seen in case reviews.

### **Recommendations**

- Offer FIMR-sponsored trainings for doctors, nurses, and health educators on best practices in helping women following fetal or infant death.
- Coordinate with hospital social workers to develop a FIMR-sponsored card to assist women in talking with their doctor about their baby's death.
- Encourage physicians to document findings following a fetal death by developing a checklist with narrative space to document the presence or absence of abnormalities on postmortem physical exam.
- Encourage physicians to conduct maternal and fetal evaluations following an unexplained fetal demise by developing a checklist of appropriate tests.
- Encourage perinatal providers to refer women who have experienced a prior fetal loss to a specialist for consultation.
- Advocate for public health nursing case management following fetal or infant death through the Public Health Maternal Child Health Field Nursing Program.

- Encourage CPSP health educators to continue to support women after a lethal diagnosis and following a fetal or infant death.
- Advocate for resources to fund diagnostic services for women without medical coverage.

## **Issue V**

### **Unsafe infant sleep environments are associated with potentially preventable deaths.**

#### **Case Study**

Ms. \_\_\_\_ is a 22-year-old, single, white, woman with a high school education. She has had one therapeutic abortion and one live birth. She lives with her boyfriend who is the father of her baby. She does not work.

Ms. \_\_\_\_ had prenatal care with an obstetrician in a private practice setting, funded by private insurance. She told her doctor that she smoked, but had cut down to one or two cigarettes a day. She admitted to weekend alcohol use before she knew she was pregnant. No follow-up was documented. The pregnancy and birth were uncomplicated. SIDS education was documented in the hospital record, but the content was not specified.

Ms. \_\_\_\_ breastfed her baby for the first month, then switched to formula. She took him to the pediatrician for well-baby exams and immunizations. The pediatric notes indicated that she was surprised by how much attention a baby needed. SIDS risk reduction education was documented, including sleep position and safe cribs.

Baby \_\_\_\_ died at age two months and 14 days. The coroner's report stated that Mr. and Ms. \_\_\_\_ put their baby to sleep between them on their bed as usual after his last bottle at 10:30 PM. Ms. \_\_\_\_ woke up at 5 AM and saw that he was not breathing. She screamed, awakening Mr. \_\_\_\_ who called 911. The coroner's report noted that the mattress had a pillow top and was very soft and that there were empty beer bottles and a partially filled ash tray in the living room. Mr. and Ms. \_\_\_\_ denied any alcohol or drug use. The autopsy did not reveal any possible cause of death and the toxicology screen was negative. The death certificate was completed with SIDS as the cause of death.

#### **Key Findings**

- Unsafe sleep environments were a factor in almost ten percent of the FIMR cases reviewed.
- Co-sleeping was the most frequently identified unsafe sleeping environment. In all but one co-sleeping cases, the woman had a history of alcohol or other drug use.
- Unsafe sleep environment was a factor in deaths that occurred in childcare settings.
- SIDS risk reduction was almost always documented in the medical record, but the specific content was not specified.

## **Recommendations**

- Postpartum education on SIDS prior to hospital discharge should include specific information on safe sleep environments and the risks of co-sleeping, especially after using alcohol or other drugs.
- Universal alcohol and other drug screening should be integrated into pediatric health care.
- Develop a brochure to assist parents in selecting safe and nurturing childcare; include safe sleep guidelines.

## 5. Insights from Maternal Interviews

Quotes from maternal interviews offer valuable insights into the importance of comprehensive and coordinated care. Understanding the mother's perspective and experience helps to identify gaps in the perinatal system of care and recommendations for improvement.

### **Every woman should be screened for medical and behavioral issues that can adversely impact pregnancy before conception.**

Preconception and interconception care were rarely documented in the prenatal record. Women participating in maternal interviews did not report preconception or interconception care. Some women had never heard of going to a doctor before getting pregnant.

“Women need to know how to take care of themselves before pregnancy. At the clinic, they always asked me if I was planning to get pregnant. When I said I was, they just told me to go ahead. No one told me how to take care of myself.”

### **Women who experience a fetal or infant death should have access to appropriate medical evaluations.**

Women with fetal demise rarely had a comprehensive future pregnancy plan documented in the prenatal record, even after two or more pregnancy losses.

“When I think back, I think of how there were three babies, and I am alone.”

“The doctor said he didn't know what went wrong. We want to have another baby, but we're afraid the same thing will happen again.”

“No one was able to explain why our baby died. Some tests were recommended, but I haven't gotten them done. I believe the death was our spiritual destiny.”

“It would help if the specialists who can help figure out why my babies die could come here. I couldn't get to San Francisco before I lost my Medi-Cal.”

### **Women whose babies die as a result of congenital anomalies should have access to genetic counseling.**

Most of the deaths associated with congenital anomalies had minimal documentation about future pregnancy risks in the medical record. Few women understood the complex factors associated with their baby's death and the implications for future pregnancies.

“My baby's brain didn't develop. I think it was because there was an eclipse and I didn't know, so I didn't protect myself.”

“We as parents and patients need to be well informed, so we know what to ask the doctor.”

## **Every woman should be screened for domestic violence at prenatal visits.**

Many of the prenatal records failed to document whether women had been asked about intimate partner abuse and family violence.

“I had trouble getting to appointments because my husband would threaten not to take me and I don’t know how to drive or take the bus. I didn’t miss any appointments, but I endured a lot of anger.”

“I’m afraid of my husband because sometimes he loses control when he’s mad.”

“I didn’t start prenatal care because my father was around and I was afraid of what he would do if he found out I was pregnant.”

“We fought all during the pregnancy. I think that’s why my baby died. I’m going to move out because he got mad again and threw water in my face.”

“My husband is very controlling and doesn’t allow me any independence. I told them at the clinic, but my doctor didn’t have any advice for me.”

## **All pregnant women need to be taught how to recognize signs and symptoms that need immediate medical attention.**

Essential prenatal education about warning signs of pregnancy, preterm labor recognition, and monitoring fetal movement were not documented in the majority of prenatal records. Even when prenatal education was documented, women delayed reporting possible complications because they did not recognize them or realize how critical it was to be evaluated right away. Sometimes, women were reassured rather than told to come in or go to the hospital to be evaluated.

“The only education I got was pamphlets.” “The doctor never told me anything about preterm labor.”

“They gave me a book to read, but I don’t remember it saying anything about contractions that come early not hurting as much.”

“I thought my baby was moving, but they told me it was really contractions.”

“They told me to call the clinic if my baby stopped moving, but I waited five days. I felt guilty because I was fighting with my husband.”

“I saw a sad movie, and my baby started moving a lot more than usual. The next morning, she wasn’t moving at all. I called the clinic and they told me babies sleep sometimes and to try putting a cold, wet towel on my abdomen.”

“When I woke up in the morning, I saw that I was bleeding. I called the clinic and the receptionist said that maybe I had an infection and I should drink juice and water or I could go to the hospital.”

**Pregnant women need individualized guidance on eating to support healthy pregnancy outcomes. Routine prenatal care should include a nutritional assessment that asks about families' access to healthy foods. Those that need assistance should be directed to the Women, Infant, Children (WIC) program and other food programs.**

Food insecurity is closely tied with the quality of food eaten and the incidence of overweight and obesity. Frequently prenatal records made no reference to a woman's diet or access to foods.

"There were times during the pregnancy and now when I don't have enough to eat because I don't have enough money."

"Finances were an issue. We only had enough money for food because we used credit cards."

"I skipped meals sometimes because I didn't have enough money to buy food."

"We were more or less short of money during the pregnancy, and I had more or less enough food to eat. I knew about food stamps, but I was afraid to apply because of immigration."

## **6. Community Action**

Interventions of the FIMR team from 2002 through 2007 are described in this report. Projects that began in the first five years of the FIMR program and still in operation are included with an update on progress achieved during the second five years.

### **Children's Memorial Grove (1999 to Present)**

The Children's Memorial Grove came about from the recognition that families still grieve long after their infants' death. This project was a way to offer something back to parents for their willingness to share their stories. The County of Sonoma Board of Supervisors approved the establishment of the grove in August 1999. Funds were raised, the ground was graded, an irrigation system was installed and trees were planted. The Children's Memorial Grove Project was featured in the winter 2004 issue of Unified Response, the national publication of the Inter-Agency Council on Child Abuse, as an example of a joint effort between a FIMR team and a Child Death Review Team. A presentation on the Children's Memorial Grove project was given at the Inter-Agency Council on Child Abuse and Neglect (ICAN) regional training for Child Death Review Teams (CDRT) in 2005. A ceremony was held in October 2009 to acknowledge the significance and loss of child death to families and the community ([http://www.sonoma-county.org/parks/foundation/child\\_mem\\_grove.htm](http://www.sonoma-county.org/parks/foundation/child_mem_grove.htm)).

### **My Pregnancy Record (2000 to Present)**

My Pregnancy Record is a purple, multi-fold, bilingual (Spanish and English) card that fits into a plastic sleeve the same size as an immunization record. It is a tool to ensure access to vital obstetrical information when records may not be available. Women are given the card at their first prenatal care appointment and encouraged to carry it with them through pregnancy, bringing it to prenatal appointments and to the hospital for emergency care or in labor.

My Pregnancy Record was developed to address the following recurring issues:

- Inadequate prenatal assessment and referrals for substance use, domestic violence, and food and/or shelter.
- The need for increased prenatal education on warning signs of pregnancy, preterm labor recognition, and fetal movement monitoring.
- Discrepancies between medical records and vital records regarding entry into prenatal care and the number of prenatal appointments.

The current revision of My Pregnancy Record includes information on warning signs and resources for pregnant and parenting women, medical and/or obstetric risks recorded by the prenatal care provider, and a record of prenatal care and the birth recorded by the women. To date, more than 5000 purple cards have been distributed by community clinics, private medical offices and public health nurses.

## **The Prenatal Care Missed Appointment Project – PC-MAP (2000 to Present)**

PC-MAP is implemented in the Public Health Maternal Child Health Field Nursing Unit. Prenatal care providers are asked to refer pregnant women who have missed prenatal care appointments and/or been lost to care. Bilingual community health workers contact the women by phone or make a visit to the home to assess the issues impacting prenatal care access. Depending on the issues, a PHN may become involved and continue to visit the woman throughout the pregnancy. In June of 2004, a letter was sent to perinatal providers reminding them of this service. A letter was also sent to diabetes and pregnancy program sites inviting staff to refer pregnant women who were missing their “Sweet Success” appointments.

## **Perinatal Substance Use (2002–present)**

FIMR members participated in formation of the Sonoma County Perinatal Alcohol and Other Drug Action Team (PAODAT). This group has met quarterly for the past six years to build a system of care to reduce perinatal AOD exposure. The Action Team’s accomplishments include:

- Hosting a conference in the fall of 2003 attended by approximately 200 people entitled “The Impact of Drugs and Alcohol Use on Pregnancy and Parenting – Adopting a Community Response to Perinatal Substance Abuse”.
- Development and implementation of the Drug Free Babies program which uses a five-question screening tool for tobacco, alcohol and other drug use and training staff at prenatal care sites around the county in the use of the tool. Providers are asked to implement universal screening at the first prenatal visit. The program established the Perinatal Placement Specialist (PPS) position in the Alcohol and Other Drugs Division of the Department of Health Services. The PPS assists medical providers by conducting an assessment of women identified as being at risk for perinatal tobacco, alcohol and other drug use and assisting women to access appropriate treatment.
- Support for the Smoke Free Babies program that provides tobacco cessation services for pregnant and parenting women and their families.
- Collection of data from prenatal providers on the prevalence of substance use in order to advocate for increased funding for treatment services.

The FIMR Coordinator participated in the Matrixed Analytical Training for Reproductive, Infant, and Child Health Service (MATRICHS)—a nine-month, online, analytical training program for public domain teams working in maternal and child health. The MATRICHS team worked on the policy issue of substance use among women of childbearing age in Sonoma County. In November 2005, the training culminated with the MATRICHS team presenting their work to the local community.

## **Support for Women Experiencing Fetal or Infant Death (2002 to Present)**

FIMR cases have shown the value of bereavement support for women and families who experience the death of a baby. In 2004, a FIMR team member presented “Follow-up Care for Families

Experiencing Fetal Loss” at Sutter Hospital OB/Gyn Grand Rounds, describing the role of the prenatal care provider after a fetal demise. In 2005, FIMR past and present members from Sutter VNA and Home Hospice and Santa Rosa Memorial Hospice presented information about their services to the Law Enforcement Chaplaincy Program, which provides grief support when infant deaths are investigated by the coroner’s office.

In November 2006, a FIMR team member who is a bereavement counselor presented “Best Practices for Clients Experiencing Perinatal Loss” to nurses, social workers, community health workers, and hospital staff who see women following a perinatal loss. A bereavement resource list was developed and distributed at the training.

Historically, a different procedure was used to offer grief support services to English and Spanish-speaking women. Grief counselors made the initial contact only with Spanish-speaking women. As a result of feedback from FIMR, a local Hospice agreed to make the initial call to bereaved English-speaking women if a health care provider made the referral and stated that the woman had given permission and requested that a grief counselor call her. This procedural change has made it easier for all Sonoma County women to access grief support services.

### **Trainings on Minor Consent Law and Confidentiality (2004)**

Several FIMR cases highlighted the lack of provider knowledge about minor consent and confidentiality laws. Between 2004 and 2006, four trainings were conducted - at Grand Rounds for two area hospitals, for the family practice residents and for public health staff. Ninety percent of the hospital attendees rated the program as outstanding or good, and more than eighty percent said the program contained a new concept they would be willing to try. Reference materials were made available on the MCAH website for reproductive health providers: <http://www.sonoma-county.org/health/ph/mcah/providersref.htm>.

### **Promoting Preconception and Interconception Care (2004)**

Many FIMR cases highlight the need for education about preconception health behaviors. A FIMR team member worked with Family PACT providers to integrate preconception content into the forms used at routine family planning visits and developed a ‘preconception pad.’ The pad, which is designed to resemble a prescription pad, has preconception health behaviors listed along with a space for the provider to check the ones that are appropriate for a particular woman.

In October 2004, FIMR findings relevant to preconception and interconception health were shared at the Latino Health Forum through a presentation entitled “Integrating Preconception Care into Family Planning Visits.”

The FIMR Coordinator was interviewed on Spanish-speaking radio and spoke about the importance of preconception care in addition to early and continuous prenatal care during Bi-national Health Week.

Emergency Contraception brochures and ordering information were provided to Public Health home visiting programs, including the Maternal Child Health Field Nursing, the Teen Parents Connections, and Families First.

### **Develop and Distribute Two Brochures in Response to Review of Cases in the Infant Health Prevention Area (2005)**

“Is My Baby Sick?, When Should I Call My Healthcare Provider?” was developed as a tool for parents to insure that they contact their health care provider promptly when babies have signs and symptoms of potentially serious health conditions. It is divided into a section for babies up to age three months and for babies from age three months to a year and includes a list of signs and symptoms that require medical evaluation and instructions on how to take a temperature.

“Selecting a Childcare Provider” is a simple brochure with a checklist to use when evaluating a childcare site to insure that babies are safe, their emotional, physical, and intellectual development is fostered, and parents are supported, including their desire to continue breastfeeding while using childcare. Childcare resources, parenting resources, and the MCAH toll-free line are included. Brochures are available in English and Spanish and have been distributed through Public Health Nursing, Teen Parent Connections, Families First Home Visiting Program, WIC, Community Child Care Council (4Cs), local hospitals, and community clinics. Both brochures are available for download and reproduction on the MCAH website: <http://www.sonoma-county.org/health/ph/mcah/providersed.htm>.

### **Healthy Weight Initiative Action Learning Collaborative and Related Actions (2006)**

FIMR case review findings documenting the prevalence of overweight or obesity with poor pregnancy outcomes prompted Sonoma County participation in the City Match/AMCP Healthy Weight in Women Action Learning Collaborative. This group worked with national experts to identify new ways to promote healthy weight in women of childbearing age. Promotoras (community health workers) incorporated messages about the importance of healthy weight before pregnancy, physical activity and healthy food choices into their meetings with young families. Training was provided to perinatal providers on best practices for counseling pregnant and postpartum women on nutrition and weight gain including use of motivational interviewing techniques. In addition, teen cooking classes and a health-fitness fair were offered as demonstration projects in Southwest Santa Rosa.

“Best Practices in the Care of Diabetes During Pregnancy” was presented to nurses and community health workers who interact with pregnant women in response to FIMR findings indicating the benefit of training on diabetes in pregnancy.

### **Maternal and Fetal Assessments after Perinatal Death (2006, 2007)**

The FIMR team supported the development of two hospital forms to be used following perinatal death. One is a checklist, which can be used as physician’s orders, for maternal and fetal

evaluations following an unexplained fetal demise. The other, Perinatal Loss Post-mortem Examination, is a checklist with narrative space to document the presence or absence of abnormalities on postmortem physical exam. Both of these forms are tools for gathering information to inform subsequent prenatal care.

## **Handout on Suppressing Lactation (2007)**

Lactation suppression education was not provided or not documented in many FIMR cases. Women told the maternal interviewer that no one had told them what to expect or how to deal with breast engorgement and pain that developed after hospital discharge. A FIMR team member developed a handout entitled “Suppressing Lactation After a Newborn Loss” and shared it with hospitals and perinatal providers.

## **Domestic Violence (2007)**

Domestic violence assessments were not consistently documented in FIMR cases when domestic violence was suspected or known. “Identifying and Addressing Family Violence in CPSP” was presented to staff in the Comprehensive Perinatal Services Program (CPSP) in June of 2007 to increase their understanding of mandated reporting laws when cases involve intimate partner abuse and/or child abuse. At that training, practitioners requested more information on cases that involve substance abuse. In September 2007, training was provided entitled “Protecting the Unborn and Children When there is Parental Alcohol and Other Drug Use”.

## **Ensuring Access to Prenatal Care for Women without Health Insurance**

Access for Infants and Mothers (AIM) is a State program for uninsured or underinsured pregnant women who are not eligible for Medi-Cal. Eligibility for the AIM program has been restrictive as applications are not accepted after 30 weeks’ gestation, and some women learn that they are over-income for Medi-Cal only after the cut-off date.

The FIMR coordinator drafted a letter asking the Managed Risk Medical Insurance Board (MRMIB) to consider changing their policy to accept the application date for Medi-Cal to be used for AIM eligibility. The letter was shared via e-mail with FIMR coordinators and Perinatal Services Coordinators across the state, and they were invited to add their signatures. By April 2008, all responses were received and the letter was mailed.

## **7. Future Directions**

The Sonoma County Maternal, Child and Adolescent Health Program will continue to implement a community-based FIMR program based on the guidelines provided by the California Department of Public Health. The Perinatal Periods of Risk framework will be applied to select cases for review that will help uncover issues contributing to disparities in perinatal outcomes within our population. FIMR team members will be engaged to identify factors that contribute to preventable deaths and to make recommendations for change. The entire community will be enlisted to implement activities that have potential to improve the health of all Sonoma County.

## **Appendix A. Sonoma County FIMR Team Members**

### **Current Members**

Tracie Barrow, RD, Women, Infant, Children, Sonoma County Department of Health Services (DHS)  
Hallie Ann Beacham, MD, Obstetrician/Gynecologist  
Robin Bowen, Executive Director California Parenting Institute  
Karen Clemmer, PHN, Perinatal Services Coordinator, DHS  
Wendy Colgan, RNC, Sutter Medical Center Santa Rosa  
Barbara Dutcher, RN, Santa Rosa Memorial Hospital  
Maria Herмосilla, Comprehensive Perinatal Services Program, Petaluma Health Center  
Emely Hernandez, PHN, Public Health Field Nursing, DHS  
LeAnn James, CNM, Petaluma Health Center  
Douglas Jimenez, MD, Family Physician, Southwest  
Rebecca Jones-Munger, CNM, MCAH Coordinator, DHS  
Muftiah Martin, MFT, Grief Counselor, Memorial Hospice  
Joan Risse, Deputy District Attorney  
Lauren Sloan, PHN, Public Health Field Nursing, DHS  
Mark Sloan, MD, Pediatrician, Santa Rosa Kaiser Permanente  
Robin Smith, Family, Youth & Children's Services, Sonoma County Human Services Department  
Abraham Wachsberg, MD, Pediatrician

### **Past Members**

Deborah Applegate, Alcohol & Other Drug Services (AODS), DHS  
Bobbi Berens, DHS  
Alice Black, Sutter Medical Center of Santa Rosa  
Yolanda Briscoe, M.Ed., Memorial Hospice  
Karen Clark, PHN, DHS - Public Health Division  
Cindy Crandall, Parent  
Norma Ellis, MPA, Director of Public Health Nursing, DHS  
Aurora Fuero-Thompson, Sutter Medical Center of Santa Rosa  
Tom Garrett, MD, Obstetrician  
Beverly Gaitán, MD, Pediatrician, Santa Rosa Kaiser Permanente  
Howard Gordon, MD, Perinatologist  
Ana Gray, AODS, DHS  
Nancy Hauser, AODS, DHS  
Maggy Howell, Parent  
Denise Hunt, RN, Mental Health Resource Team, DHS  
Greg Jacobs, District Attorney's Office  
Kara Jacobs, Sonoma County Human Services Family, Youth & Children  
Carol Kronberg, RD, WIC, DHS  
Suni Levi, DHS - Redwood Children's Center  
Bonnie Lyon, MFT, AODS, DHS  
Dorothy Magasis-Escobar, Santa Rosa Memorial Hospice  
Jose Morales, MD, Pediatrician, Santa Rosa Kaiser Permanente

Crystal Morris, Santa Rosa Kaiser Permanente, Obstetrics  
Kathleen Powers, Sutter Medical Center Santa Rosa  
Pauline Richardson, DHS - Public Health Division  
Rose Rivera, NP, DHS  
Maryann Ryan, MFT, AODS, DHS  
Michael Ulloa, LCSW, DHS - Youth and Family Services  
Valerie Waidler, Sutter Medical Center of Santa Rosa, VNA & Home Hospice  
Sharon Youney, PsyD, RAS, AODS, DHS  
Janice Young, RN, Health Plan of the Redwoods

## Appendix B. Sonoma County Fetal Infant Death Statistics

**Table A 2-1. Distribution of Fetal Infant Deaths and Live Births by Maternal Characteristics and Birth Outcomes-Sonoma County 2002-2006**

	Fetal infant deaths	Live births
<i>Age of mother (yrs)</i>		
<15	0.0%	0.1%
15-17	6.6%	2.3%
18-19	4.1%	5.3%
20-29	47.6%	48.0%
30-39	36.5%	40.4%
40+	5.2%	4.0%
<i>Mother's birthplace</i>		
United States	60.3%	60.7%
Mexico	31.3%	30.0%
Other country	8.5%	9.3%
<i>Mother's race/ethnicity</i>		
White, non-Hispanic	47.4%	50.0%
Hispanic	41.9%	40.3%
Asian/Pacific Islander	5.1%	5.1%
African American	2.9%	1.2%
Other	2.6%	3.5%
<i>Mother's education</i>		
< 8 yrs	16.9%	13.8%
9-11 yrs	12.4%	16.0%
12 yrs	28.4%	26.4%
13 + yrs	42.3%	43.9%
<i>Birth weight</i>		
<1500g	57.6%	0.9%
1500-2499 g	16.4%	4.5%
2500-3999 g	24.5%	82.5%
4000+ g	1.5%	12.1%
<i>Expected pay source for delivery</i>		
Private Insurance	51.1%	59.7%
MediCal	42.6%	38.3%
Other/Unknown	4.8%	1.2%
Self-Pay	1.5%	0.9%
<i>Trimester prenatal care initiated</i>		
1st	84.5%	86.3%
2nd	11.7%	11.0%
3rd or no care	3.8%	2.7%
<i>Gestational age</i>		
<32 weeks	53.6%	1.1%
32-36 weeks	16.5%	5.8%
37+ weeks	29.9%	93.1%

# Appendix C: Perinatal Periods of Risk (PPOR)

## I. Background

Perinatal Periods of Risk (PPOR) is a framework to examine fetal infant mortality. Five major steps are involved, each building on the previous step.

- Engage community partners early to gain consensus and support.
- Map fetal infant mortality by birth weight and age.
- Focus on reducing the overall fetal infant mortality rate.
- Examine potential opportunity gaps between population groups.
- Target further intervention and prevention efforts.

Mapping fetal infant mortality (refer to Figure 2) by birth weight and age involves assigning deaths into one of four categories: Maternal Health and Prematurity, Maternal Care, Newborn Care and Infant Health. Each of these categories suggests the primary preventive direction for deaths in that group.

**Figure 2. Perinatal Periods of Risk Approach to Fetal Infant Death**

		Age at death		
		Fetal	Neonatal	Post-neonatal
Birth weight	<1500 g	Maternal Health and Prematurity		
	1500+ g	Maternal Care	Newborn Care	Infant Health

The PPOR approach includes two phases. Phase One involves computing fetal infant mortality rates for specific populations of interest and for a reference group. Comparisons to a reference group allow for calculation of excess mortality in each of the four prevention areas.

The second phase involves using results from Phase One to identify causal pathways or biologic mechanisms for excess mortality, to estimate preventive and risk factors, and to evaluate the impact of these preventive and risk factors.

## II. Perinatal Periods of Risk Applied to Sonoma County

### Phase One Analysis

#### 1. Methodology

Linked birth-death (birth cohort) data were used for the 2002-2006 analysis. A birth cohort consists of all the births in a calendar year in addition to deaths occurring to any birth in the cohort where the infant was less than 1 year old. Fetal deaths were also included for the calendar year in which they occurred.

Methodology for the PPOR approach limits inclusion of fetal deaths to those with gestational age greater than or equal to 24 weeks and live births with birth weights greater than or equal to 500 grams due to variations in reporting across states. All births and fetal infant deaths that had a death certificate were included in the analysis of Sonoma County data. Missing gestational ages were imputed when birth weights were available and missing birth weights were imputed where gestational ages were known. Of the 29,151 records used in the analysis, 1,248 (4.3%) had imputed values.

Birth weights and gestational ages were also evaluated to ensure they were consistent with one another. Values where either gestational age or birth weight were improbable (N=37 or 0.1%) were set to missing and not included in the analysis.

After exclusion of fetal infant deaths with missing or invalid values (N=10), 262 cases were available for use in the analysis. Table 2 displays fetal and infant deaths by birth weight and age at death. Note that 53 deaths (20%) were less than 500 grams. These cases would not be included in the analysis using the conventional PPOR approach.

**Table 2. Fetal Infant Deaths by Age at Death and Birth Weight  
Sonoma County Birth Cohort, 2002–2006**

	Fetal	Neonatal	Post-neonatal	Total
<500 g	41	12	0	53
500-1499 g	51	38	5	94
1500+ g	52	27	36	115
Total	144	77	41	262

#### 2. Trend

Since the initial PPOR analysis using linked data from the birth cohort (1999–2003), the total fetal infant mortality rate decreased slightly from 9.5/1,000 to 9.0/1,000. A significant decrease in the fetal infant death rate for Newborn Care was the primary factor contributing to this decrease as there was little change in rates for the other prevention areas.

### 3. Results

Of the 262 cases used in the analysis, 144 (55%) were fetal deaths, 77 (29%) were neonatal deaths (infant less than 29 days) and 41 (16%) were post-neonatal deaths (infant 29 days to 364 days).

Deaths were mapped according to PPOR guidelines and fetal infant death rates were calculated for each of the four prevention areas. Refer to Figure 3. Of the 262 fetal infant deaths (total fetal infant mortality rate = 9.0/1,000 live births + fetal deaths) 56% fell in the Maternal Health and Prematurity area, 20% in Maternal Care, 10% in Newborn care, and 14% in Infant Health. Comparing these rates to rates for a reference group will highlight where “excess deaths” occurred.

**Figure 3. Fetal Infant Mortality Map  
Sonoma County Birth Cohort, 2002–2006**

		Age at death		
		Fetal	Neonatal	Post-neonatal
Birth weight	<1500 g	147 (5.0/1,000) Maternal Health and Prematurity		
	1500+ g	52 (1.8/1,000) Maternal Care	27 (0.9/1,000) Newborn Care	36 (1.2/1,000) Infant Health

The reference population is a subset of the total population for which birth outcomes are best. In Sonoma County, White, non-Hispanic women who are 20 years and older with more than 12 years education have the best birth outcomes. The fetal infant mortality rates for the reference population represent the best case scenario (lowest fetal infant mortality rate) that under optimal circumstances should be achievable for all women. Fetal infant mortality rates above the rates for the reference population are considered excess death rates.

The four populations that were selected for analysis, in addition to the total population, were (births to) Hispanics, (births to) White, non-Hispanics, Medi-Cal deliveries and deliveries paid by private insurance. Total fetal infant mortality rates and those of the study groups and the reference population are presented in Table 3.

**Table 3. Fetal Infant Mortality Rates by PPOR Area and Population  
Sonoma County Birth Cohort, 2002–2006**

	Maternal Health & Prematurity	Maternal Care	Newborn Care	Infant Health	Total
All fetal infant deaths	5.0	1.8	0.9	1.2	9.0
Hispanic	5.3	1.7	1.2	1.0	9.2
White, non-Hispanic	4.8	2.0	0.7	1.2	8.7
Medi-Cal	5.5	1.8	1.2	1.2	9.7
Private Insurance	4.4	1.6	0.7	1.1	7.9
Reference	4.3	1.8	0.7	0.5	7.4

To calculate the excess rates in each prevention category the reference group rates were subtracted from rates in the study populations. The portion of the rate that remains is an excess rate. Refer to Table 4. If the excess rate is negative then the study population had a lower fetal infant mortality rate for the PPOR prevention area than the reference population.

**Table 4. Excess Fetal Infant Mortality Rates by PPOR Area and Population  
Sonoma County Birth Cohort, 2002–2006**

	Maternal Health & Prematurity	Maternal Care	Newborn Care	Infant Health	Total
All fetal infant deaths	0.7	0.0	0.2	0.7	1.6
Hispanic	1.0	-0.1	0.5	0.5	1.8
White, non-Hispanic	0.5	0.2	0.0	0.7	1.3
Medi-Cal	1.2	0.0	0.5	0.7	2.3
Private Insurance	0.1	-0.2	0.0	0.6	0.5

### All Excess Fetal Infant Deaths

The total excess mortality rate for all fetal infant deaths was 1.6 per 1000 -- or approximately 47 fetal infant deaths that were potentially preventable. The prevention areas with the highest excess rates were Maternal Health and Prematurity and Infant Health each contributing to about 44% of the total excess.

### Excess Hispanic Fetal Infant Deaths

The total excess mortality rate for the Hispanic population was 1.8 per 1000. The excess rate was highest for the Maternal Health and Prematurity area. Compared to the reference population, Hispanics had lower fetal infant mortality in the Maternal Care area.

### Excess White, non-Hispanic Fetal Infant Deaths

The excess mortality rate for the White, non-Hispanic population was 1.3 per 1000, more than half of which was due to excess death in the Infant Health area.

## **Excess Medi-Cal Fetal Infant Deaths**

The excess mortality rate for Medi-Cal deliveries was 2.3 per 1000, the highest of all the populations studied. Almost half of all excess death for this population could be attributed to the Maternal Health and Prematurity area. The excess death rate in the Maternal Health and Prematurity area was over ten times higher than the rate for deliveries paid by private insurance.

## **Excess Private Insurance Fetal Infant Deaths**

The excess mortality rate for private insurance deliveries (0.5 per 1000) was the lowest excess rate of all the study populations. Almost all of the excess could be attributed to deaths in the Infant Health area. There was a lower infant mortality rate in the Maternal Care area for deliveries paid by private insurance than for the reference population.

## **Summary of Excess Fetal Infant Deaths**

Total excess fetal infant mortality rates were highest for deliveries paid by Medi-Cal and lowest for deliveries paid for by private insurance. The prevention areas with the highest excess mortality were Maternal Health and Prematurity (for total population, the Hispanic population and for deliveries paid for by Medi-Cal) and Infant Health (for the White, non-Hispanic population and for deliveries paid for by private insurance). The prevention area with the lowest excess fetal infant death rate is Maternal Care. Only the White, non-Hispanic population had an excess death rate above zero in this area (the other populations performed as well or better than reference population).

## **4. Conclusion**

Based on the findings using the PPOR approach, two main prevention areas warrant further focus—Maternal Health and Prematurity (especially among deliveries paid for by Medi-Cal) and Infant Health.

## **Phase Two Analysis**

### **Maternal Health and Prematurity**

Since the first PPOR analysis was performed for Sonoma County fetal infant deaths more than five years ago, Maternal Health and Prematurity has consistently been the prevention area with the greatest excess death rate for the total population, the Hispanic population and deliveries paid by Medi-Cal. In 2007 further analysis was performed to explore reasons for excess Maternal Health and Prematurity deaths. High death rates for this prevention area were found to be due to a higher frequency of very low birth weight (VLBW) births rather than a higher mortality rate among babies born VLBW. This suggests that maternal risk factors are more of a contributing factor to these deaths than perinatal care (care that VLBW infant receives in the hospital). Prevalence of risk factors associated with VLBW births was examined for the 2001–2005 birth cohort for total population, the Hispanic population, and for deliveries paid by Medi-Cal. These rates were compared to prevalence rates in the reference population. Compared to the reference population, the study populations had the following:

- A lower proportion of births to women with 16 or more years education
- A lower proportion of births that were multiples
- A higher proportion of births with less than adequate prenatal care
- A higher proportion of high parity births
- A higher proportion births to mothers diagnosed with pregnancy anemia
- A higher proportion of births to mothers who used tobacco during pregnancy (except for Hispanic births)
- A higher proportion of births to mothers diagnosed with a sexually transmitted disease during pregnancy

Next, the impact of risk factors for delivering a VLBW infant was estimated. Of the seventeen factors that were evaluated, five in each study population were found to be associated with a significantly higher risk for a VLBW birth. Refer to Table 5. The risk ratio in Table 5 represents the likelihood of each factor to produce a VLBW birth. For instance, for the total population, preterm births were 441 times more likely to be VLBW than term births. The population attributable risk represents the proportion of the problem (VLBW) that could be eliminated if the risk factor was eliminated.

**Table 5. Risk Ratio and Population Attributable Risk for Factors with Significant Risk for VLBW  
Sonoma County Birth Cohort, 2002–2006**

	Risk Ratio*	Population Attributable Risk
<b>Total Population</b>		
Preterm birth	441.2	97.2%
Multiple birth	8.7	19.6%
Chronic hypertention	5.3	1.8%
Pre-eclampsia	3.4	7.5%
Mom <19 years	1.5	3.7%
<b>Hispanic</b>		
Preterm birth	339.1	96.2%
Multiple birth	6.9	10.6%
Pre-eclampsia	6.6	12.7%
Mom >35 years	1.7	6.9%
Previous fetal loss	1.6	8.9%
<b>Medi-Cal</b>		
Preterm birth	223.8	95.0%
Multiple birth	9.9	14.8%
Chronic hypertention	6.2	2.3%
Pre-eclampsia	4.4	9.2%
High parity	3.1	3.7%

\*Significant, p < 0.05

When maternal factors were taken into consideration (adjusted for), preterm birth, and to a much lesser degree, multiple birth were the risk factors that were significantly associated with VLBW in Sonoma County.

Since preterm birth was established as the primary risk factor for VLBW, descriptive analysis was performed for Sonoma County (2002–2006 birth cohort) to determine factors associated with preterm birth in the population. Preterm births were categorized into very preterm birth (VPT) which includes births with less than 32 weeks completed gestation and preterm births (PT) with gestational ages 32 to 36 completed weeks. Since the focus of the previous analysis was on VLBW births, VPT births were examined (most likely to be < 1500g). Compared to term births (> 37 weeks) in Sonoma County during the time period, VPT births were more likely to be the following:

- To teen mothers
- To mothers born outside the United States
- To non-White, non-Hispanic mothers
- To mothers with less than 13 years education
- To have no first trimester prenatal care
- A multiple birth
- A first birth
- To mothers who had had a previous preterm birth

## **Infant Health**

From 2002 to 2006 there were 35 post-neonatal infant deaths born greater than 1500 g (criteria for inclusion in the PPOR prevention category of Infant Health).

The majority of deaths (N=30) were due to natural causes -- congenital anomalies (10) and Sudden Infant Death Syndrome (5) were causes for half of these deaths. Other deaths by natural causes included infection, cancer, diseases of the nervous system, respiratory diseases, diseases of the digestive system and “other ill defined and unknown causes”. External causes of death were responsible for five post-neonatal infant deaths. Deaths in this category included unintentional and intentional injuries.

Maternal and birth characteristics of post-neonatal deaths and live births (both with birth weights > 1500 g) were also examined. Refer to Table 6. A higher proportion of deaths than births were low birth weight (1500–2499 g) and preterm (< 37 weeks gestation) suggesting that even in heavier infants that live more than 28 days, birth weight and gestational age are related to survival.

**Table 6. Post-neonatal Infant Deaths and Live Births by Maternal and Birth Characteristics  
Sonoma County Birth Cohort, 2002–2006**

	Postneonatal deaths*		Live births*	
	Number	Percent	Number	Percent
Race/ethnicity				
White, non-Hispanic	18	51.4%	14366	50.0%
Hispanic	12	34.3%	11568	40.3%
Other	5	14.3%	2790	9.7%
Mother's birthplace				
United States	26	74.3%	17434	60.7%
Other country outside US	9	25.7%	11290	39.3%
Pay source for delivery				
Private insurance	20	57.1%	17133	59.6%
Medi-Cal	14	40.0%	10993	38.3%
Birthweight				
1500-2499 g	12	34.3%	1306	4.5%
>2500 g	23	65.7%	27418	95.5%
Gestational age				
<37 weeks	10	28.6%	1738	6.0%
37+ weeks	25	71.4%	26959	93.9%

\*with birth weight  $\geq 1500g$

## **Appendix D. Quality of Vital Records**

The Fetal Infant Mortality Review process found discrepancies between the vital statistic records and medical records in 83 of 100 cases. While some discrepancies were minor, others had the potential to impact data on the adequacy of prenatal care and the prevalence of congenital anomalies in Sonoma County.

Vital records are relied upon to identify local problems, improve systems, and measure change. Efforts to ensure accurate and complete birth and death certificates are therefore an investment in perinatal health. Sonoma County Department of Health Services will continue interventions to improve the reliability of vital records such as providing ongoing training to clerks that record birth data and orienting physicians on completion of birth and death certificates.