# Michigan Maternal Mortality Surveillance (MMMS)

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# Example of Public Health Functions and Activities related to Women's Health

| Public Health Function/Activity | Perinatal Care |
|---|---|
| Assess & Monitor Health Status | Use vital statistics data to study birthweight-specific infant mortality and **to monitor rates of maternal mortality.** |
| Diagnose & Investigate Health Problems & Hazards | **Extend and maintain existing initiatives**, such as the Pregnancy Risk Assessment and Monitoring System, study of the rise in congenital syphillis from unidentified and/or untreated maternal syphillis, and **Maternal Mortality Reviews**, which uncover woman specific and system factors contributing to poor pregnancy outcomes. |

"Charting a Course for the Future of Women's and Perinatal Health"/ HRSA March 1999

# Healthy People 2010

- 16-4 Reduce maternal deaths (3.3/100, 000 live births)
- 16-5 Reduction in maternal illness and complications

16-5a Maternal complications during hospitalized labor and delivery (24/100 deliveries)

16-5b Ectopic pregnancies

16-5c Postpartum complications, including postpartum depression

# Michigan Maternal Mortality S….. (MMMS)

- Past - Maternal Mortality Study (MMMS)
- Present - Maternal Mortality Surveillance (MMMS)

# Public Health Surveillance

- Definition: The ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health.

- Public health surveillance systems have been developed to address a range of public health needs.

CDC / MMWR: July 27, 2001 / 50(RR13);1-35

# Public Health Surveillance (cont.)

- Activities are generally authorized by legislators and carried out by public health officials.

- Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses.

CDC / MMWR: July 27, 2001 / 50(RR13);1-35

# Maternal mortality surveillance is needed to:

- Systematically collect comprehensive information related to deaths circumstances
- Analyze the data
- Disseminate the findings
- Develop targeted prevention strategies with greater population impact

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# Maternal mortality: One of the basic health indicators that reflect a nation's health status

## Common measures of maternal mortality

| Measure | Interpretation | Computation |
|---|---|---|
| Pregnancy related mortality ratio; Maternal mortality ratio (MMR) | Likelihood of death per pregnancy; case fatality rate for pregnancy. | $\frac{\text{Number of pregnancy-related deaths in a year}}{\text{Number of live births in a year}}$ x 100,000<br>$\frac{\text{Number of maternal deaths in a year}}{\text{Number of live births in a year}}$ |
| Pregnancy-related mortality rate | Frequency of maternal death among reproductive-age women | $\frac{\text{Number of pregnancy-related deaths in a year}}{\text{Number of women of reproductive age}}$ x 100,000 |

# Classification Scheme of Maternal Mortality

| Investigative Groups | Definitions | Problems with Both Classifications |
|---|---|---|
| Centers for Disease Control and Prevention–American College of Obstetricians and Gynecologists (Maternal Mortality Study Group) | Pregnancy-related: death occurring during pregnancy, or within 1 year after delivery and resulting from pregnancy-specific complications<br>Pregnancy-associated: death occurring during pregnancy, or within 1 year after delivery regardless of etiology | • Causality often difficult to establish<br>• Death certificates may not specify duration of time between pregnancy and death<br>• A small proportion of deaths related to pregnancy may occur more than 1 year after delivery, given life-sustaining technology<br>• Deaths from first trimester complications may not be properly recorded<br>• No universal and comprehensive data collection system |
| *International Classification of Diseases, Tenth Revision* | Maternal death: death occurring during pregnancy, or within 42 days of delivery from pregnancy-specific complications<br>Late maternal death: death between 42 days to within 1 year of delivery regardless of cause | |

Adapted from Atrash HK, Alexander S, Berg CJ. Maternal mortality in developed countries: not just a concern of the past. Obstet Gynecol 1995;86:700–5 *and* World Health Organization (WHO). Report of the International Conference on International Classification of Diseases. In: International Classification of Diseases and Related Health Problems, Tenth Revision. Vol. 1. Geneva: WHO, 1992 *and* Hibbard BM, Milner D. Maternal mortality in Europe. Eur J Obstet Gynecol Reprod Biol 1994;56:37–41.

# Sources of Maternal Mortality data

Autopsy reports

Medical records

Maternal and fetal death certificates

Vital statistics records

Linkage of death certificates to infant birth and death certificates

Maternal mortality committees

Interviews with family members

Individual health care providers

Federal, state, and local natality statistics and reports

Questionnaires

Scientific publications

Adapted from Atrash HK, Alexander S, Berg CJ. Maternal mortality in developed countries: not just a concern of the past. Obstet Gynecol 1995;86:700–5 *and* Fikree FF, Gray RH, Berendes HW, Karim MS. A community-based nested case-control study of maternal mortality. Int J Gynaecol Obstet 1994;47:247–55.

**Best data sources**

- Comprehensive death certificates
- Linkage to vital records
- Case review

# Michigan Maternal Mortality Background

***Michigan Maternal Mortality Study (MMMS) Initiated in 1950*** as a collaborative effort among:

- Michigan Department of Community Health,
- Committee on Maternal and Perinatal Health of the Michigan State Medical Society and
- Chairs of the Departments of Obstetrics and Gynecology of the Medical Schools in Michigan

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***Currently*: *Michigan Maternal Mortality Surveillance (MMMS)*** *is:*

- Michigan Department of Community Health (MDCH)'s program
- Bureau of Epidemiology and Bureau of Family, Maternal and Child Health share the responsibilities
- Committee on Maternal and Perinatal Health of the Michigan State Medical Society - committed and strong partner

# Case Definitions (used by Michigan)

**Pregnancy-associated death** = the death of a woman while pregnant or within 1 year of termination of pregnancy, *irrespective of cause*

- **Pregnancy-related death** = the death of a woman while pregnant or within 1 year of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes

- **Not-pregnancy-related death** = the death of a woman while pregnant or within 1 year of termination, due to a cause unrelated to pregnancy

# Case identification

- Cases identified and reported to MDCH by:
  - Hospitals
  - Medical examiners
  - Office of Vital Statistics

# Data sources

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  - Hospitals
  - Medical examiners
  - Office of Vital Statistics

- **New electronic maternal mortality linked file** of 1999-2002 deaths was created in 2003: recently updated with 2004 data

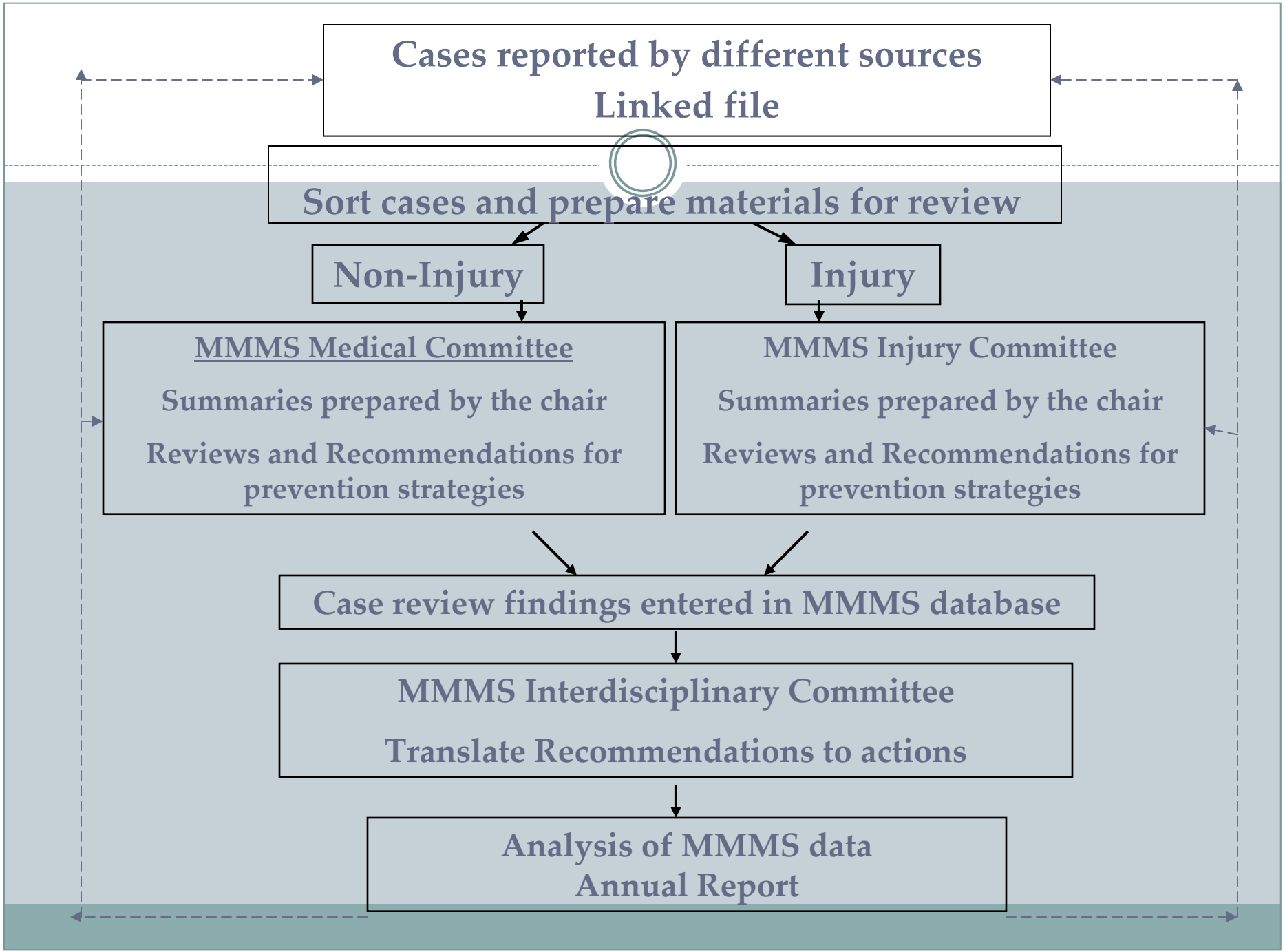
# Maternal mortality linked file

- Death certificates of women of reproductive age (10 to 45 years) were linked to live births certificates

- Added records:

  - Maternal deaths for which pregnancies ended in a fetal death were identified from the hospital reporting to MDCH

  - Pregnancy-related deaths not identified by previously mentioned sources, such as deaths due to ectopic or molar pregnancies, were identified by using ICD10 “O” codes from death certificates


Cases reported by different sources
Linked file
Sort cases and prepare materials for review
Non-Injury
Injury
MMMS Medical Committee
Summaries prepared by the chair
Reviews and Recommendations for prevention strategies
MMMS Injury Committee
Summaries prepared by the chair
Reviews and Recommendations for prevention strategies
Case review findings entered in MMMS database
MMMS Interdisciplinary Committee
Translate Recommendations to actions
Analysis of MMMS data
Annual Report

# Results

# Numbers and Maternal Mortality Ratio (MMR) by year of death

| Year of death | Number of cases | MMR |
|---|---|---|
| 1999 | 74 | 55.5 |
| 2000 | 61 | 45.7 |
| 2001 | 70 | 51.4 |
| 2002 | 66 | 49.5 |
| 2003 | 69 | 52.8 |
| 2004 | 84 | 64.8 |
| 2005 | 98 | 76.8 |
| 2006 | 95 | 74.5 |
| 2007 | 77 | 62.4 |

# Numbers and Maternal Mortality Ratio (MMR by race and by year of death

| | White | | Black | | Black:White |
|---|---|---|---|---|---|
| **Year** | **Number** | **MMR** | **Number** | **MMR** | **MMRs ratio** |
| **1999** | 50 | 47.7 | 21 | 88.1 | 1.8 |
| **2000** | 34 | 32.3 | 25 | 103.9 | 3.2 |
| **2001** | 41 | 38.9 | 28 | 119.2 | 3.1 |
| **2002** | 35 | 34.0 | 28 | 125.9 | 3.7 |
| **2003** | 37 | 36.3 | 23 | 102.8 | 2.8 |
| **2004** | 41 | 40.7 | 41 | 182.5 | 4.5 |
| **2005** | 52 | 52.5* | 35 | 156.4 | 3.0* |
| **2006** | 50 | 50.7 | 40 | 174.9 | 3.4 |
| **2007** | 38 | ** | 34 | ** | ** |

# Maternal deaths (numbers and MMR) by maternal characteristics – 1999-2005 MMMS Report

| | | White | | | Black | | | Black:White | |
|---|---|---|---|---|---|---|---|---|---|
| | | Percent | MMR | (95%CI) | Percent | MMR | (95%CI) | MMRs Ratio | (95%CI) |
| **Smoking** | | | | | | | | | |
| | **Yes** | 26.9 | 68.3 | (51.5, 85.0) | 18.7 | 144.2 | (93.4, 194.9) | 2.1 | (1.2, 3.0) |
| ⇨ | **No** | **52.9** | **25.1** | **(20.7, 29.5)** | **62.0** | **82.1** | **(66.2, 97.9)** | **3.3** | (2.4, 4.1) |
| **Prenatal Care Began** | | | | | | | | | |
| ⇨ | **1st trimester** | **59.2** | **11.4** | **(9.5, 13.2)** | **47.6** | **77.8** | **(60.6, 94.9)** | **6.8** | (5.0, 8.7) |
| | **2nd trimester** | 12.6 | 22.8 | (14.6, 31.0) | 15.7 | 88.5 | (54.5, 122.5) | 3.9 | (1.8, 5.9) |
| | **3rd trimester** | 8 | 80.1 | (44.1, 116.1) | 15.7 | 391.3 | (240.9, 541.8) | 4.9 | (2.0, 7.8) |
| | **None** | 2.5 | 56.9 | (11.4, 102.4) | 7.2 | 292.5 | (127.0, 457.9) | 5.1 | (0.1, 10.2) |
| **Preterm** | | | | | | | | | |
| | **<31 weeks** | 3.4 | 89.3 | (27.4, 151.3) | 7.2 | 214.0 | (92.9, 335.1) | 2.4 | (0.3, 4.5) |
| | **32-36 weeks** | 11.3 | 52.3 | (32.6, 72.0) | 13.9 | 134.7 | (79.7, 189.8) | 2.6 | (1.1, 4.0) |
| ⇨ **Term** | **37+ weeks** | **58.4** | **26.3** | **(21.9, 30.7)** | **45.8** | **74.7** | **(57.9, 91.5)** | **2.8** | **(2.0, 3.6)** |
| **Interval to death** | | | | | | | | | |
| ⇨ | **<=42 days** | **22.3** | **8.6** | **(6.2, 10.9)** | **26.5** | **31.8** | **(22.4, 41.1)** | **3.7** | **(2.2, 5.2)** |
| | **43-365 days** | 60.1 | 23.1 | (19.3, 26.9) | 60.2 | 72.2 | (58.0, 86.3) | 3.1 | (2.3, 3.9) |

The cases with missing information are not included and thus the percentages may not add up to 100.

# Maternal deaths by main causes – 1999-2005 MMMS Report

| | Number | Percent |
|---|---|---|
| **Pregnancy-related (ICD10 'O' codes)** | | |
| Obstetric embolism (O881, O882) | 15 | 15.2 |
| Amniotic fluid embolism (O881) | 11 | 11.1 |
| Obstetric blood-clot embolism (O882) | 4 | 4.0 |
| Hypertension during pregnancy (O141, O149, O152, O159) | 13 | 13.1 |
| Cardiomiopathy in puerperium (O903) | 13 | 13.1 |
| Haemorrhage (O469, O678, O721) | 7 | 7.1 |
| Other specified diseases and conditions complicating pregnancy, childbirth and puerperium (O998) | 7 | 7.1 |
| | | |
| **Violent deaths** | | |
| Accidents (V01-X59) | 89 | 57.4 |
| Motor vehicle accidents (V03, V28-V29, V-40-V49, V50-V59, V86-V87) | 82 | 52.9 |
| Assaults (X85-Y09) | 43 | 27.7 |
| Intentional self-harm (X60-X84) | 17 | 11.0 |
| | | |
| **Other health conditions** | | |
| Cardiac diseases (I20-I52) | 37 | 24.3 |
| Cardiomiopathy (not pergnancy related) (I42) | 11 | 7.2 |
| Malignant neoplasms (C00-C97) | 35 | 23.0 |
| Mental and behavioral disorders due to substance use (F10-F19) | 12 | 7.9 |

# Maternal mortality surveillance is needed to:

- Systematically collect comprehensive information related to deaths circumstances
- Analyze the data
- Disseminate the findings
- **Develop targeted prevention strategies with greater population impacts**

# Recommendations

# Injury Committee

| Recommendation | Update |
| --- | --- |
| • Develop a brief report on the pregnancy outcomes of maternal deaths that meet the criteria for surveillance that would be used as a white paper for future study and recommendations. (i.e., review the cause/effect or association between maternal deaths and fetal/infant deaths and look at possible sharing of information with Infant Mortality Coalitions, FIMR and other interested groups in the near future). | • Dr. Grigorescu completed an analysis of 1999-2005 maternal and infant deaths linkages.<br>• Findings: 39 infant deaths of mothers who died between 1999-2005<br>• Presented at the MMMS Medical Committee and shared with FIMR<br>• Further analysis will be performed |

# Injury Committee (cont.)

## Recommendation

- Convene subcommittee to review the issues of substance abuse, domestic violence, mental health services and data collection in maternal deaths.
- Evaluate the substance abuse, domestic violence and mental health information that is already available from existing data sources such as PRAMS; seek additional information from other data sources: and provide information to other groups that may interact with pregnant and postpartum women.
- The subcommittee will provide feedback to both the Medical and Injury Committee at their first meetings in 2008.

## Update

- Enter data in MMMS database
- Review of the domestic violence, substance abuse, and mental health questions on the Injury Committee and abstract developed
- Abstract revised to capture the information that members requested.
- The Injury Committee recommends additional emphasis and work on these issues for next year.

# Medical Committee

## Recommendation

- Review existing depression screening questionnaires/tools, their validity and frequency of use.
- Examine programs using the screening questionnaires/tools and based on these findings make additional recommendations.

## Update

- Undertaken by the Junior Fellows from the Michigan Section of ACOG who will be coming up with a program that will identify women at risk for depression and suicide in the antenatal period.
- Currently the focus has been on the post partum period. There is concern that accidents that occur in the first trimester in some women may be more intentional due to being distraught over learning that they are pregnant.
- The proposed idea is to come up with a program that institutes the screening in the first trimester to identify these women at risk of suicide. The Junior Fellows will work with some of Section members who are well versed in this issue (as advisors).
- Dr. Welch from ACOG current Council has also volunteered to help the Junior Fellows with the project.
- The Committee referred this information to the Subcommittee on Depression. Dr. Sokol will also give Dr. Walsh a call about the project.

# Medical Committee (cont.)

## Recommendation

- Find and evaluate alternative funding sources for submission of a proposal for the Cardiac Disease Registry project

## Update

- A proposal was submitted to MSMS by Dr. Mariona in collaboration with Dr. Ansbacher and Dr. Grigorescu
- Dr. Ansbacher responsible to follow up with MSMS
- First proposal was turned down by MSMS
- Another proposal will be submitted in October and Dr. Ansbacher promised to follow up

# Medical Committee (cont.)

## Recommendation

- Send information to ACOG from the Ectopic Pregnancy Maternal Mortality Study in Michigan with the following recommendations:
  - Access to prenatal care should be available to all women at the first sign of pregnancy, i.e., after the first missed menses or if any suspicion of pregnancy.
  - Education about early pregnancy complications, such as ectopic pregnancy, should be provided to all medical care providers.
  - Screening tests for ectopic pregnancy, i.e., serial beta HCG's and vaginal ultrasounds, should be available to all who provide care to women in their reproductive years.

## Update

- Dr. Ansbacher shared with the ACOG chapter.
- The Committee agreed that they would like to see the Ectopic Pregnancy Recommendations remain one of the issues for the Interdisciplinary Committee to review.

# Medical Committee (cont.)

| Recommendation | Update |
| --- | --- |
| • Send reprints of the Anesthesia Study to each hospital department of obstetrics and anesthesia in the state. Include a questionnaire developed by MMMS with the journal reprint. | • Rose Mary Asman distributed copies of the article to the Departments of Obstetrics and Anesthesiology at every birthing hospital in Michigan. |

# Medical Committee (cont.)

| Recommendation | Update |
| --- | --- |
| • Review a percentage of maternal cancer deaths to understand or determine any patterns in diagnosis and treatment. | • Has been accomplished in 2009.<br>• Majority of cases with no insurance beyond pregnancy and late diagnostics. |

# 2009 Recommendations

- Increase early screening, diagnosis, and referrals to specialists & relevant community resources for follow up among women (preconception, during pregnancy, postpartum and interconception) who *screen positive* or have *known history* of mental health, substance abuse, and/or domestic violence.
- Match injury-related MMMS case reviews to the decision/policy makers from local community or state agencies to advise about current ordinances, regulations, and/or policies – *for example*: *Fire Marshall, housing authority for apartment buildings, human services, health plans, court systems, etc. related to issues identified.*
- Utilize existing data sources: MMMS, PRAMS, BRFSS, SAMSHA to identify the *highest-risk* populations who have most significant correlations between mental health, substance abuse, domestic violence and maternal mortality.
- Develop a two-track jointly sponsored communication campaign with MSMS, ACOG, and CNM organizations:
  - Track #1: Professional communication/academic detailing to increase healthcare provider knowledge in Michigan.
  - Track #2: Public Service Announcement (PSA) to raise general public awareness.

- Complete retrospective hemorrhage-related study of maternal mortality in Michigan: 1985-2005.
- Develop methodology to utilize MI-PPCM database for all cardiomyopathy case reviews beginning FY 09-10.
- Develop a series of MMMS slides in collaboration with MDCH – include appropriate acknowledgements such as state staff contact names
- Work with State of Michigan Cancer Registry to ensure:
  - All maternal deaths w/cancer diagnosis are reported.
  - Analyze all cancers deaths for women of reproductive age (?12-44 years *or* 15-44 years)

Thank you!!!