Michigan Sheds Light on Causes of Maternal Death

Michigan's Maternal Mortality Surveillance (MMMS) began in 1950 and continues to work to improve the health of Michigan mothers. Recent MMMS research found staggering disparities in maternal death rates in the state and identified major causes of pregnancy-associated deaths.

The Michigan Department of Health and Human Services (MDHHS) Michigan Maternal Mortality Surveillance (MMMS) Project began in 1950, when MDHHS and the Committee on Maternal and Perinatal Health of the Michigan State Medical Society (MSMS), as well as department chairs in obstetrics and gynecology at Michigan medical schools, partnered to review cases of maternal deaths.[i] The effort was initially organized as the Michigan Maternal Mortality Study. In 2004, it evolved into the current organization, which includes staff from MDHHS's Bureau of Family Health Services, Division of Maternal and Infant Health; the Bureau of Epidemiology and Population Health's Maternal and Child Health Epidemiology Section; and the Bureau of Epidemiology and Population Health's Vital Records and Health Statistics Division. The MMMS project views maternal deaths as "sentinel cases" that require review to identify the underlying "policy, system, provider, community and patient factors that may have affected the outcome." [ii]

- The MMMS Project found the following to be the most common cases of pregnancy-associated deaths from 2005-10:
  - All obstetric causes – 30 percent
  - Accidents – 23 percent
  - Medical, not obstetric – 16 percent
  - Assaults – 7 percent
  - Suicide – 4 percent
- Cardiac diseases, cardiomyopathy in the puerperium and other causes of cardiomyopathy, resulted in 24 percent of pregnancy-related deaths.
- Maternal deaths varied substantially by age, with those in the older than 40 years age group experiencing a maternal mortality ratio (MMR) of 170 per 100,000, compared to 60.9 for 30-39 year-olds and 45.7 for 20-29 year-olds.
- The MMR was significantly higher for those with less than a high school education—an MMR of 82.4 per 100,000, compared to 34.7 for those with greater than 16 years of education.

Steps Taken:

- The MMMS project is composed of two separate review committees focused on medical and injury causes of death. The two committees meet regularly in an interdisciplinary committee that has the responsibility of translating review findings into recommendations and actions.[iii]
- The medical committee includes obstetricians-gynecologists, maternal-fetal medicine specialists, an obstetric intensivist, midwives, pathologists, anesthesiologists, and nurses.
- The injury committee is comprised of experts in social work, domestic violence, substance abuse, motor vehicle safety and injury prevention, homicide investigation, public health nursing, Medicaid policy, as well as clinical care.
- In 2004, the MMMS project began the review of non-medical causes of death. These deaths include those due to suicide, homicide, drug overdose, motor vehicle accidents, and other accidental causes of death. These reviews identify substantial issues related to mental health and substance abuse.
- In order to focus on comprehensive case ascertainment, the MMMS project adopted a linked file methodology that matched death certificates of females aged 10-55 years with live birth and

fetal death certificates. Prior to this approach, they estimated that less than half of the maternal death cases were identified by voluntary hospital reporting.

- In 2003, a pregnancy check box was added to the Michigan death certificate when it was discovered through the maternal mortality review process that many cases were being missed by identification through the cause of death code.
- In 2015, Michigan joined the Alliance for Innovation on Maternal Health, a national data-driven maternal safety and quality improvement initiative focused on improving maternal safety and reducing maternal morbidity and mortality in Michigan through implementing patient safety bundles in hospitals statewide.[iv]
- In an effort to improve data quality and emphasize the importance of maternal deaths, Michigan passed a mandatory maternal death reporting law, effective April 2017, which requires physicians or individuals in charge of health facilities to report the death of a woman who was pregnant at death or within 365 days prior to death.[v]

Results:

- The MMMS project reviews documented substantial racial and ethnic disparities in outcomes, including:
  - Between 1999-2010, black women experienced a pregnancy-related mortality rate of 50.8 per 100,000 live births, compared to 16.6 for white women, a ratio of 3.1.
  - Black and white maternal mortality ratios were 3-4 at all ages and levels of education.
  - The timing of death also varied by race. Thirty-two percent of black women died within 24 hours of delivery, compared to 21 percent of white women.[vi]
- The review findings have increased awareness of the impact of chronic illness and co-occurring mental and substance use disorders, as well as domestic violence.
- The MMMS project identified a particular issue related to injury deaths, 53 percent of which were due to motor vehicle accidents. Furthermore, the MMMS project reviews indicated that two-thirds of pregnant women killed in car crashes were not wearing seatbelts, compared to a state rate of seatbelt use of 94.5 percent for women.[vii] Prompted by these findings, the Michigan Department of Transportation partnered with the Michigan Section of the American Congress of Obstetricians and Gynecologists (ACOG) in 2007 to develop educational outreach materials promoting proper and consistent use of seatbelts by women of reproductive age. This effort was repeated in 2010, and the MMMS believes it is related to a subsequent decrease in motor vehicle accident deaths of pregnant women associated with not wearing seatbelts.
- The MMMS project also identified substance abuse as an important cofactor in many of the deaths reviewed. To address this issue, the MMMS developed a partnership with the Michigan Drug Control Program, which oversees the Michigan Automated Prescription System (MAPS). This program involves education of providers regarding the importance and benefits of this voluntary monitoring system that helps to identify potential drug diversion by prescribers, pharmacies, or patients. The MMMS project has shared deidentified data with the MAPS program to convey the impact of substance abuse on pregnancy-related deaths.
- The MMMS Project has used case reviews to identify potential gaps in services in cases of women with significant medical issues for whom there was no documentation of referral to the state home visiting program or other appropriate services. MMMS staff followed this finding with an October 2013 presentation to the Michigan ACOG to highlight the opportunities to connect pregnant women with home visiting programs and related mental health services. They also developed a factsheet and disseminated a package of educational materials to providers on Medicaid policies related to mental health services.

- The MMMS project shares the themes of its findings widely, including through its dedicated team members who present to healthcare students, medical residents in training, and other related professions.
- From the earliest stages, the MMMS project demonstrated a strong emphasis on prevention. Both the medical and injury committees specifically link their reviews to developing actionable recommendations with opportunities for intervention. In addition, they developed a guideline entitled, "MI Framework for Preventability: Recommendation Development Process to Promote Community-Based Public Health Actions for Maternal Mortality Reduction". The framework is a tool that helps the user determine if a maternal death was preventable and then guides the user to develop recommendations for prevention. The MMMS project disseminated the MI Framework with local public health officials at the Michigan Association for Local Public Health annual conference. The MMMS project organizes its recommendations into the following categories:
    - Primary prevention – actions that avoid the development of a condition, focused at the policy level.
    - Secondary prevention – activities aimed at early detection, focused on the healthcare system, including quality and appropriateness of care.
    - Tertiary prevention – actions to reduce the negative impact of an existing condition, focused on the healthcare system, including quality and appropriateness of care.

Lessons Learned:

- Maternal mortality reviews need a strong infrastructure and leadership to be successful. This infrastructure should include policies and procedures that support the function and sustainability of the review system.
- The full integration of the state health department is a crucial part of a successful statewide review process. MDHHS provided support of the review committees and appointment to the committees requires the approval of the directors of the epidemiology and maternal child health divisions. MDHHS also cites the strategic use of its Title V funding to support this effort.
- The MMMS project cites strong collaborations with partners, within and outside of the MDHHS, as a contributor to their success. They note that they have worked with the Michigan Department of Transportation, the Medicaid Services Administration, and the Bureau of Health Care Services (within the Department of Licensing and Regulatory Affairs). Within MDHHS, the Bureau of Family Health Services, the Bureau of Epidemiology and Population Health, as well as the Injury and Violence Prevention Unit have been involved.
- The leadership of the MMMS project have committed to developing and implementing the statewide maternal mortality database, which allow for analyses that enable the committees to identify and respond to underlying social factors contributing to pregnancy-related mortality and inform the public and stakeholders of issues regarding causes of maternal death.

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