AHRQ Quality Indicators

Frequently Asked Questions (FAQs) on the Maternal Health Indicators (MHI) Beta Software, v2025

Prepared for:
Agency for Healthcare Research and Quality
U.S. Department of Health and Human Services
5600 Fishers Lane
Rockville, MD 20857
https://qualityindicators.ahrq.gov/

Contract No. 75Q80119C00008

August 2025

Table of Contents

Maternal Health Indicators (MHI) Beta Software v2025 Product Information 1
Methodology 2
Severe Maternal Morbidity Measures 2
Behavioral Health Measures 5
Using MHI Beta Software 10
Appendix A - Differences between the SMM MHIs and the CMS SOC measure with the CDC/HRSA/AIM SMM measure as the reference 14

Maternal Health Indicators (MHI) Beta Software v2025 Product Information

1. What is the purpose of the Maternal Health Indicators module (MHI)?

The Maternal Health Indicators module aims to address healthcare quality in the domain of maternal health during the delivery stay and postpartum period. The intent of the module is to allow users to leverage hospital-based claims data to generate area-level measures of maternal health, including severe maternal morbidity (SMM) and behavioral health.

The v2025 release includes measures of SMM and maternal deaths associated with the delivery hospitalization and through 42 days postpartum, and behavioral health disorders identified during the delivery hospitalization and in inpatient and emergency department encounters through 42 days postpartum. There are six measures of SMM and five measures of behavioral health events. Measures are calculated via hospital discharge data from delivery as well as postpartum emergency department visits and inpatient readmissions. The measures can be used for population-level analysis, surveillance, quality assurance, and research purposes. The MHI module is not intended to be used for accountability purposes or for comparison between hospitals. For additional guidance on suggested use, limitations, and interpretation of the measures, refer to the Scientific Rationale and Empirical Testing for Postpartum Severe Maternal Morbidity and Maternal Behavioral Health Measures for more information:
https://qualityindicators.ahrq.gov/Downloads/Resources/v2025_MHI_Scientific_Rationale_and_Empirical_Testing.pdf

2. What indicators are included in the MHI Beta Software?

The v2025 MHI measures are geographic area-level rates of SMM, mortality, mental health, and substance use disorders that could potentially be prevented by high quality health care.

The MHI Beta software now includes 11 measures, plus two sub-indicators. MHI 01 – MHI 03 were included in v2024. MHI 04 – MHI 11 are new to v2025.

- MHI 01 – Inpatient Severe Maternal Morbidity Rate, at Delivery (20 Indicators)
- MHI 02 – Inpatient Severe Maternal Morbidity Plus In-Hospital Mortality Rate, at Delivery (20 indicators plus in-hospital mortality)
- MHI 03 – Refined Inpatient Severe Maternal Morbidity Plus In-Hospital Mortality Rate, at Delivery, Beta (20 indicators plus in-hospital mortality)
- MHI 04 – Inpatient Mental Health and Substance Use Disorders Rate, at Delivery, Beta
- MHI 05 – Inpatient Severe Maternal Morbidity Rate, Delivery through 42 Days Postpartum, Beta (20 indicators)
- MHI 06 – Inpatient Severe Maternal Morbidity Plus In-Hospital Mortality Rate, Delivery through 42 Days Postpartum, Beta (20 indicators plus in-hospital mortality)
- MHI 07 – Refined Inpatient Severe Maternal Morbidity Plus In-Hospital Mortality Rate, Delivery through 42 Days Postpartum, Beta (20 indicators plus in-hospital mortality)

- MHI 08 – Emergency Department and Inpatient Mental Health and Substance Use Disorders Rate, Days 1 to 42 Postpartum, Beta
- MHI 09 – Emergency Department and Inpatient Encounters for Intentional Self-Harm Rate, Days 1 to 42 Postpartum, Beta
- MHI 10 – Emergency Department and Inpatient Substance Use Disorders and Accidental Overdose Rate, Days 1 to 42 Postpartum, Beta
  - MHI 10A – Emergency Department and Inpatient Substance Use Disorders Rate, Days 1 to 42 Postpartum, Beta
  - MHI 10B – Emergency Department and Inpatient Accidental Overdose Rate, Days 1 to 42 Postpartum, Beta
- MHI 11 – Emergency Department and Inpatient Perinatal Mood and Anxiety Disorders Rate, Days 1 to 42 Postpartum, Beta

Please refer to Appendix A in the MHI Beta Software Announcement document for more information on the measures.

3. Do the MHIs incorporate post-delivery discharge events?

MHIs 05, 06, and 07 calculate SMM rates at delivery and through 42 days postpartum. MHIs 08, 09, 10, and 11 calculate mental health and substance use disorder rates days 1 to 42 postpartum.[1] The ability to link inpatient data through 42 days postpartum is required to calculate the MHI 05, 06, and 07 numerators. The ability to link emergency department and inpatient data through 42 days is required to calculate the MHI 08, 09, 10, and 11 numerators.

Methodology

Severe Maternal Morbidity Measures

4. What conditions and diagnoses are included in the severe maternal morbidity (SMM) measures?

The SMM MHIs (MHI 01 – MHI 03 and MHI 05 – MHI 07) include the following maternal health conditions that are identified by International Classification of Diseases, Tenth Revision, Clinical Modification/Procedure Coding System (ICD-10-CM/PCS) diagnosis and procedure codes and administrative discharge disposition data:

[1] Day 0 is the date of the delivery based on procedure date, and dates of readmissions are based on admission date. Behavioral health events occurring on the same discharge as the delivery are not included in the numerators of MHI 08 – MHI 11.

- Acute myocardial infarction
- Aneurysm
- Acute renal failure (with and without refinement)
- Acute respiratory distress
- Amniotic fluid embolism
- Cardiac arrest/Ventricular fibrillation
- Conversion of cardiac rhythm
- Coagulopathy (including disseminated intravascular coagulation) (refined definition for MHI 03 and MHI 07)
- Eclampsia
- Heart failure/Arrest during or following surgery or procedure
- Puerperal cerebrovascular disorders
- Pulmonary edema/Acute heart failure
- Severe anesthesia complications
- Sepsis
- Shock
- Sickle cell disease with crisis
- Air and thrombotic embolism
- Hysterectomy
- Temporary tracheostomy
- Respiratory ventilation
- In-hospital mortality (MHI 02, MHI 03, MHI 06, and MHI 07 only)

Technical specifications including a list of specific conditions can be found at the following website: https://qualityindicators.ahrq.gov/measures/MHI_TechSpec.

5. Are any of the SMM MHIs the same as the SMM measure used by Centers for Disease Control (CDC) and the Health Resources and Services Administration (HRSA)?

MHI 01 replicates the SMM measure used by the CDC, HRSA and HRSA's Alliance for Innovation on Maternal Health (AIM) (excluding blood transfusion). Note that MHI 01 (as well as all of the SMM measures) does not include the use of MS-DRGs in the denominator logic and utilizes only ICD-10-CM/PCS codes (*DX_Delivery* and *PR_Delivery*) for denominator identification, in contrast to the CDC/HRSA/AIM SMM measure.[2] The removal of MS-DRGs is inconsequential and allows some users who do not have MS-DRGs in their data to calculate the measure.

6. Are any of the SMM MHIs the same as the Centers for Medicare & Medicaid Services' (CMS) Severe Obstetric Complications (SOC) measure?

The SMM measures that incorporate in-hospital deaths (MHI 02 and MHI 03) are intended to align more closely with the CMS SOC measure, which includes in-hospital mortality. (MHI 06 and MHI 07 also include in-hospital deaths during delivery and during any readmission within 42 days after delivery, expanding the SOC measure to the postpartum period). However, unlike the CMS SOC measure, they do not allow for risk adjustment using laboratory or other clinical data since they are constructed exclusively with claims data. By constructing these SMM MHIs with claims data, users without access to non-claims data

[2] CDC measure information is here: https://www.cdc.gov/maternal-infant-health/php/severe-maternal-morbidity/icd.html. The full measure specification and logic is available from the Federally Available Data Resources, here: https://mchb.tvisdata.hrsa.gov/Admin/FileUpload/DownloadContent?filename=FadResourceDocument.pdf&isForDownload=true&year=2023

sources can still use their data to generate area-level SMM rates. In addition, the CMS SOC measure limits deliveries to greater than or equal to 20 weeks gestation, while these SMM MHI measures do not have this restriction.[3] Appendix A summarizes the differences between MHI 01, 02, and 03 and the CMS Severe Obstetric Complications measures.

7. Are these measures intended to be used for accountability?

No, these measures are designed for population-level analysis, surveillance, quality assurance, and research purposes. The measures are developed at the area-level and can generate observed rates overall and by several strata, including race/ethnicity, payer, state, poverty category based on ZIP Code, year, and a custom user-specified stratum. Users should consider known coding variation across states and regions when using the MHI Beta Software for surveillance.[4][5] For users seeking an accountability measure, the CMS Severe Obstetric Complications measure was developed and designed for hospital-level accountability and comparison purposes. Please see the specifications for more details, here: https://ecqi.healthit.gov/ecqm/eh/2023/cms1028v1?qt-tabs_measure=measure-information.

8. Why is blood transfusion not one of the SMM MHI (MHI 01 – MHI 03 and MHI 05 – MHI 07) components?

ICD coding of blood transfusion varies widely across facilities and regions and over time. There is general clinical consensus that transfusion of 1 unit of blood products does not in itself constitute SMM. However, current ICD coding cannot distinguish how many units of blood products were transfused. Blood transfusions account for the greatest proportion of patients identified as having an obstetric complication, but patients for whom this is the only identified numerator event represent a less severe outcome experience.

9. Why do the post-delivery discharge SMM measures (MHI 05 – MHI 07) only include encounters through 42 days postpartum?

The majority of post-delivery discharge SMM events identified by the 20 indicators occur within 42 days postpartum. Further, measurement of several SMM indicators includes the use of obstetric codes (O- codes), which are only to be used during pregnancy and through 6 weeks postpartum based on ICD-10-CM coding guidance.

[3] Versions 2023, 2024, and 2025 of the CMS Severe Obstetric Complication measure excluded patients with a COVID diagnosis and either a COVID-related condition or procedure, while the SMM MHIs do not. In version 2026, the CMS Severe Obstetric Complications measure no longer excludes patients with a COVID diagnosis and either a COVID-related condition or procedure.
[4] Hirai AH, Owens PL, Reid LD, Vladutiu CJ, Main EK. Associations Between State-Level Severe Maternal Morbidity and Other Perinatal Indicators. *JAMA Netw Open*. 2022;5(7):e2224621. doi:10.1001/jamanetworkopen.2022.24621
[5] Roemer M, Schaefer MB, Pickens GT, Barett ML. Estimating state-specific population-based hospitalization rates from in-state hospital discharge data. *Health Serv Res.* (2023). 1–14. DOI: 10.1111/1475-6773.14216

Behavioral Health Measures

10. Why do the post-delivery discharge behavioral health measures (MHI 08 – MHI 11) capture 1 to 42 days postpartum?

The maternal behavioral health measures start at day 1 after delivery because behavioral health coding at delivery may reflect morbidities that have existed pre-pregnancy or in pregnancy rather than behavioral health events that require active treatment at the time of delivery. Further, AHRQ reviewed coding practices for specific behavioral health events and found differences in reporting between delivery and follow-up. The two measurement timeframes used (MHI 04, which measures behavioral health conditions at delivery and MHI 08 – MHI 11, which measure behavioral health conditions 1 to 42 days postpartum) help to distinguish the rate of behavioral health conditions coded at delivery, which may reflect the rate of these conditions in and outside of pregnancy, from the rate of active behavioral health conditions in the postpartum period.

AHRQ conducted testing which showed that the rate of mental health and substance use disorders continues to increase through 365 days postpartum; however, the most dramatic increase occurs in the first 42 days. After the initial 42 days postpartum, individuals may be more likely to move out of state, receive care across state lines, or lose or change insurance coverage and any follow-up care might not be linkable to the index delivery. Further, those who lose insurance coverage may be disincentivized from seeking follow-up care. Since AHRQ relies on Healthcare Cost and Utilization Project (HCUP) data for measure development, many of these concerns could bias a measure including a longer postpartum period.[6] Due to these potential data limitations, the maternal behavioral health measures in the beta MHI module include events through 42 days postpartum only.

AHRQ also provides a research tool for behavioral health events 1-365 days postpartum that is available on the AHRQ QI website at: https://qualityindicators.ahrq.gov/measures/MHI_TechSpec?tag=exploratory-measures. Behavioral health issues occur at significant rates throughout the first postpartum year, with important behavioral health events, including suicides, occurring between 43 and 365 days postpartum.[6] AHRQ testing revealed that the rate of mental health and SUD are over 3 times as high at 365 days postpartum. AHRQ will continue to explore the possibility of linking patients beyond 42 days using HCUP data in future versions of the MHI module.

Please refer to the Scientific Rationale and Empirical Testing for Postpartum Severe Maternal Morbidity and Maternal Behavioral Health Measures for more information: https://qualityindicators.ahrq.gov/Downloads/Resources/v2025_MHI_Scientific_Rationale_and_Empirical_Testing.pdf

[6] For example, HCUP data are only able to link encounters that occur within the same state, so areas with cross-border care-seeking behavior would miss follow-up events occurring in other states.

11. Why are behavioral health diagnosis codes listed in any position on the claim included in the behavioral health MHIs?

The maternal behavioral health indicators include specified behavioral health diagnosis codes listed in any position on the claim in the numerator, rather than only diagnoses listed in the principal position. The inclusion of relevant diagnoses appearing in any position is based on feedback from clinical experts who supported the idea that behavioral health diagnoses coded in any position, not just the primary position, were clinically important and could indicate important mental health and SUD events.

Additionally, coding guidance dictates that an O- code should be used in the principal position in the 42 days following delivery. O- codes related to mental health are non-specific (e.g., O99.354 – other mental disorders complicating the puerperium) and do not provide the specificity needed to identify whether an event should be considered SUD, accidental overdose, intentional self-harm, or a perinatal mood and anxiety disorder. Since the postpartum behavioral health MHIs (08 – 11) include events up to 42 days post-delivery, they would likely undercount behavioral health events if only the principal diagnosis were included.

Finally, the principal or first listed diagnosis indicates the primary reason for the ED visit or inpatient admission; however, ICD-10-CM coding guidance does not include general guidelines dictating the sequencing order of secondary diagnosis codes, other than specific "code first" or "use additional code" instructions. Therefore, the sequencing of secondary diagnoses does not necessarily reflect relative severity. By including diagnoses in any position, our goal is to broadly capture these conditions when reported; however, there is a potential that the measure may overestimate the rate of serious mental health events.

12. What conditions are included in the umbrella behavioral health measures MHI 04 and MHI 08 and how were they chosen?

The list of diagnoses included in the behavioral health MHIs was developed using clinical expert feedback, literature reviews, review of the Clinical Classifications Software Refined (CCSR), and existing maternal mental health measures. MHI 04 Inpatient Mental Health and Substance Use Disorders Rate, at Delivery, Beta and MHI 08 Emergency Department and Inpatient Mental Health and Substance Use Disorders Rate, Days 1 to 42 Postpartum, Beta capture rates of inpatient admissions and ED visits for a broad range of maternal behavioral health diagnoses, including mental health conditions that may worsen during the postpartum period but do not necessarily reflect incident conditions.[7] Specifically, MHI 04 and MHI 08 include:

[7] Nacev, E.C., Martinez Acevedo, A.C., Kaufman, M., Fuerst, M.F., Knapp, J.M., & Rodriguez, M.I. (2024). Differences between rural and urban residence in the detection and treatment of perinatal mood and anxiety disorders. *AJOG Global Reports, 4(2)*, 100351. https://doi.org/10.1016/j.xagr.2024.100351

- perinatal mood and anxiety disorders
- schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders
- dissociative and somatoform disorders
- intentional self-harm, and
- substance use disorders and accidental overdose.

MHI 04 and MHI 08 include diagnoses such as depression, anxiety, bipolar disorder, schizophrenia, obsessive compulsive disorder, and post-traumatic stress disorders, as these conditions are captured by measures of perinatal mental health conditions developed by AIM[8] and often included in the literature.[9,10] MHI 04 and MHI 08 also include diagnoses of intentional self-harm, substance use disorders, and accidental overdose, as these measures are intended to be comprehensive measures of behavioral health events. MHI 04 and MHI 08 do not include personality disorders and adjustment disorders. Personality disorders were not included in the AIM measure or in literature identifying postpartum mental illness.[11,12] Adjustment disorders are excluded as they are often coded by clinicians who may recognize the potential for a behavioral health diagnosis but would defer to the judgement of psychiatrists and/or other mental health professionals to provide such a diagnosis.[11]

Informed by expert clinical input, AHRQ acknowledges that many patients with substance use disorder will not have a formal substance use disorder diagnosis. Accidental overdose events are included in the measures to increase the likelihood of identifying this population. Accidental overdose is measured using "accidental/unintentional" and "undetermined" poisoning codes of substances that can be abused. Since not all patients with accidental/unintentional or undetermined poisoning codes have a substance use disorder, the measure concept is defined as 'substance use disorders and accidental overdose.' For a complete list of ICD-10 codes included for MHI 04 and MHI 08, please see the MHI Technical Specifications.

13. How do the MHIs handle multiple SMM event or multiple behavioral health events in the post-partum period?

The MHI indicators include only the first instance of any one of these conditions; if a patient has more than one inpatient admission or emergency department visit coded with one or more of the included conditions, they are counted and included in the numerator only once. (See the "Scientific Rationale and Empirical Testing for Postpartum Severe Maternal Morbidity and Maternal Behavioral Health Measures").

[8] https://saferbirth.org/wp-content/uploads/Revised_AIM_PMHC_DCP.pdf
[9] Ahrens, K.A., Palmsten, K., Lipkind, H.S., Pfeiffer, M., Gelsinger, C., & Ackerman-Banks, C. (2023). Mental Health Within 24 Months After Delivery Among Women with Common Pregnancy Conditions. *Journal of Women's Health (2002), 32(7)*, 787–800. https://doi.org/10.1089/jwh.2022.0367
[10] Attanasio, L., Jeung, C., & Geissler, K.H., (2024). Association of Postpartum Mental Illness Diagnoses with Severe Maternal Morbidity. Journal of Women's Health (15409996), 33(6), 778–787. cul. https://doi.org/10.1089/jwh.2023.0244
[11] Strain, J.J. & Diefenbacher, A. (2008). The adjustment disorders: the conundrums of the diagnoses. *Comprehensive Psychiatry, 49(2)*, 121–130. https://doi.org/10.1016/j.comppsych.2007.10.002

14. What stand-alone measures for specific conditions are included the MHI module and how were they chosen?

AHRQ also developed standalone measures for specific types of behavioral health encounters, including encounters for intentional self-harm (MHI 09), substance use disorder and accidental overdose (MHI 10), and perinatal mood and anxiety disorders (MHI 11) in inpatient or ED settings. To define MHI 09, AHRQ used CCSRs related to self-harm and toxic effect codes indicating self-harm and relevant codes from the AIM measure.[12,13] MHI 09 also includes undetermined poisoning codes from substances associated with self-harm, as recommended by clinical experts and the literature.[14] MHI 10 was developed from feedback from clinical experts and the literature and includes SUD diagnoses denoted by F- codes,[15] all accidental or unintentional overdose codes, and undetermined poisoning codes for substances with high potential for abuse/misuse (e.g., illicit drugs and benzodiazepines). For a complete list of ICD-10 codes included for MHI 09, 10, and 11, please see the MHI Technical Specifications.

15. What mental health conditions are included in the definition of perinatal mood and anxiety disorders for MHI 11?

The definition of perinatal mood and anxiety disorders includes depression, anxiety, anxiety-related disorders, obsessive-compulsive disorder, bipolar disorder, and post-traumatic stress disorder. For a complete list of ICD-10 codes included for MHI 11 Emergency Department and Inpatient Perinatal Mood and Anxiety Disorders Rate, Days 1 to 42 Postpartum, Beta, please see the MHI Technical Specifications.

16. Why does MHI 11 include both mood and anxiety disorders?

Research has demonstrated an increase in the rate of perinatal mood and anxiety disorders from 18.4 to 40.4 per 1,000 delivery hospitalizations from 2006 to 2016,[16] with increased risks to maternal and infant morbidity and mortality.[17] Less than 30 percent of women with

[12] Admon, L.K., Dalton, V.K., Kolenic, G.E., Ettner, S.L., Tilea, A., Haffajee, R.L., Brownlee, R.M., Zochowsku, M.K., Tabb, K.M., Muzik, M., & Zivin, K. (2021). Trends in Suicidality 1 Year Before and After Birth Among Commercially Insured Childbearing Individuals in the United States, 2006-2017. JAMA Psychiatry, 78(2), 171–176. https://doi.org/10.1001/jamapsychiatry.2020.3550

[13] Yoon, J., Masoumirad, M., Bui, L.N., Richard, P., & Harvey, S.M. (2024). Prenatal opioid use as a predictor of postpartum suicide attempts among reproductive-age women enrolled in Oregon Medicaid. *BMC Women's Health, 24(1)*, 196. mdl. https://doi.org/10.1186/s12905-024-03019-w

[14] Zhong, Q.-Y., Karlson, E. W., Gelaye, B., Finan, S., Avillach, P., Smoller, J. W., Cai, T., & Williams, M. A. (2018). Screening pregnant women for suicidal behavior in electronic medical records: Diagnostic codes vs. Clinical notes processed by natural language processing. *BMC Medical Informatics and Decision Making*, *18*(1), 30. https://doi.org/10.1186/s12911-018-0617-7

[15] Stocks, C., Lander, L. R., J Zullig, K., Davis, S., & Lemon, K. (2024). Pre-COVID Trends in Substance Use Disorders and Treatment Utilization during Pregnancy in West Virginia 2016-2019. *Journal of Women's Health (2002)*. https://doi.org/10.1089/jwh.2023.0888

[16] McKee K, Admon LK, Winkelman TNA, Muzik M, Hall S, Dalton VK, Zivin K. Perinatal mood and anxiety disorders, serious mental illness, and delivery-related health outcomes, United States, 2006-2015. BMC Womens Health. 2020 Jul 23;20(1):150. doi: 10.1186/s12905-020-00996-6. PMID: 32703202; PMCID: PMC7376899.

[17] Association of Women's Health, Obstetric and Neonatal Nurses. AWHONN Position Statement: Perinatal Mood and Anxiety Disorders. Journal of Obstetric, Gynecologic, and Neonatal Nursing. 2022 July;51(4), E1-E4

perinatal mood and anxiety disorders seek or receive treatment.[13] One of the leading drivers of perinatal mood and anxiety disorders is postpartum depression. In a 2020 study conducted by the Centers for Disease Control and Prevention, approximately one in eight women reported postpartum depressive symptoms.[6] In response to this situation, and to requests from governments, state hospital associations, and health systems for measures of maternal mental health, AHRQ has developed a measure of perinatal mood and anxiety disorders. The measure is a representation of perinatal mood and anxiety disorders severe enough to result in ED visit or inpatient admissions and should not be interpreted as the overall rate of this composite mental health concept.

17. Why is there no measure of postpartum depression?

MHI 11 Emergency Department and Inpatient Perinatal Mood and Anxiety Disorders Rate, Days 1 to 42 Postpartum, Beta captures hospitalizations and emergency department visits that include a diagnosis code for depression, anxiety, anxiety-related disorders, obsessive-compulsive disorder, bipolar disorder, and post-traumatic stress disorder. The decision to develop a measure of perinatal mood and anxiety disorders rather than a measure of solely postpartum depression was informed by expert clinical input suggesting that the signs and symptoms of mood and anxiety disorders often overlap, can be difficult to distinguish during brief clinical interactions, and often receive similar treatment.

18. Are suicide deaths that occur outside the hospital captured in MHI 09: Emergency Department and Inpatient Encounters for Intentional Self-Harm Rate, Days 1 to 42 Postpartum, Beta?

No. Deaths by suicide that occur outside the hospital are not captured in MHI 09. The MHIs are calculated based on emergency department encounters and inpatient admissions only. The MHIs do not incorporate data from non-hospital data sources that include death, such as death certificate data from state vital statistics offices. It is important to keep in mind this limitation when interpreting these measures.

19. How should the sub-indicators for MHI 10 (MHI 10A and MHI 10B) be interpreted?

MHI 10: Emergency Department and Inpatient Substance Use Disorders and Accidental Overdose Rate, Days 1 to 42 Postpartum, Beta includes two sub-indicators: MHI 10A: Emergency Department and Inpatient Substance Use Disorders Rate, Days 1 to 42 Postpartum, Beta and MHI 10B: Emergency Department and Inpatient Accidental Overdose Rate, Days 1 to 42 Postpartum, Beta. Sub-indicators are not mutually exclusive. If a patient has two emergency department visits or inpatient discharges, one for substance use disorder and one for accidental overdose, each of those encounters will be included in the respective indicators. However, MHI 10 will only include the first emergency department or inpatient encounter. Therefore, the numerator of MHI 10 may be less than the sum of the numerators of MHIA 10A and MHI 10B.

20. Why do post-discharge SMM measures (MHI 05 – MHI 07) not include emergency department data but the post-discharge behavioral health measures (MHI 08 – MHI 11) do?

The aim of the SMM measures is to capture severe cases of maternal morbidity. AHRQ tested rates of SMM at delivery and through 42 days postpartum with and without the inclusion of emergency department data. Testing demonstrated that the inclusion of emergency department data only slightly increased rates of postpartum SMM (See the "Scientific Rationale and Empirical Testing for Postpartum Severe Maternal Morbidity and Maternal Behavioral Health Measures"). Further, emergency department visits with evidence of SMM coding that did not result in admission were presumed to represent less severe cases of SMM. Therefore, the SMM measures at delivery and through 42 days postpartum are calculated solely using inpatient data.

In contrast, behavioral health events that are identified during the ED visit may represent significant mental health conditions, including suicide attempts and intentional self-harm, even if they do not result in inpatient admission or are not the primary diagnosis. Additionally, the Healthcare Cost and Utilization Project (HCUP) data that are used to develop the MHIs do not include data from freestanding psychiatric hospitals or residential substance use treatment facilities. Therefore, patients who visit the emergency department with a behavioral health condition and are transferred to a psychiatric treating facility not included in the HCUP data would not be included in inpatient data captured by post-discharge MHIs and excluding these emergency department encounters would underestimate the burden of more severe postpartum behavioral health conditions. Behavioral health conditions treated in the emergency department are more likely to represent a severe condition since most postpartum behavioral health issues are managed in the ambulatory setting.

Using MHI Beta Software

21. What year of data do the SAS QI and CloudQI v2025 MHI Beta Software support?

The v2025 MHI Beta Software supports Fiscal Year (FY) 2025 (October 2024 to September 2025) data. The software is backward compatible, meaning that it supports visits classified under International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Coding System (ICD-10-CM/PCS) retroactively through October 2015. Backward compatibility ensures users can analyze trend data/multiple years of data from 2015 forward, with a single version of the software.

22. What inputs are needed to use the MHI Beta Software?

The data required for measuring the MHIs come from hospital inpatient and emergency department discharge abstracts or billing claims (administrative data), which are readily available from many state data organizations and state hospital associations. MHI 01 – MHI 04 require inpatient data. MHI 05 – MHI 07 also require inpatient data, but with the extra

requirement that patients can be linked through time. MHI 08 – MHI 11 require both inpatient and emergency department data that can link patients across time and setting.

23. How are the MHI denominators defined?

The denominators for the eleven MHIs are delivery discharges for patients between the ages of 12 and 55 delivering stillborn or live births defined using ICD-10-CM/PCS diagnosis and procedure codes. Only patients residing in the same state as the hospital associated with the delivery are included.

24. What levels of stratification are included in the MHI Beta Software and what is the custom stratum option?

The MHI Beta Software generates observed rates overall and by race/ethnicity, payer, state, year, poverty category based on ZIP Code, and a custom stratum.[18] The custom stratum allows users to specify a user-designated identifier for the software to generate stratified observed rates; for example, users can specify a particular regional variable or sociodemographic factor to produce stratified rates for research and surveillance.

25. Is the AHRQ MHI Beta Software v2025 risk adjusted?

No, the MHI Beta Software is not risk adjusted at this time.

26. Does the MHI Beta Software consider social determinants of health?

As with all AHRQ QIs, the software modules allow for those interested in examining differences by race/ethnicity, payer, state, year, and poverty category based on ZIP Code to calculate measures stratified by these characteristics. In addition, the MHI Beta Software module allows users to stratify by a user-defined variable, which could be a health-system or region-specific variable.

27. Where can I download the v2025 AHRQ MHI Beta Software?

The Windows version of the MHI Beta Software can be downloaded from the AHRQ QI website by visiting the CloudQI page.

The SAS version can be downloaded from the SAS QI page.

28. Can I install the Windows version of MHI Beta Software on my desktop that also has WinQI installed?

Yes, the Windows version of the MHI Beta Software (CloudQI) can be installed alongside the WinQI Software. If you have a previous version of CloudQI (v2023 or v2024.0.3) installed, you will receive a notification to upgrade to the latest version, v2025, when you launch the application. The installation guide for the software can be found on the AHRQ QI website.

[18] The MHI Beta Software outputs rates by state of hospitalization. However, users have the option to specify patient state as the custom stratum.

29. Do I need any additional software to run the Windows version of the MHI Beta Software?

The only additional software needed is an internet browser, such as Google Chrome, Firefox, or Edge. Google Chrome is recommended, but any modern browser can be used.

30. What data do I need to import to compute MHIs in SAS QI and CloudQI?

To compute MHI 01 – MHI 04 in SAS QI and CloudQI, you may import the same inpatient discharge data file used for calculating the Patient Safety Indicators (PSIs).[19] The only difference is that the "Hospital State" field is recommended on the input file for MHIs to stratify area-level reports. While this field is not required, if your inpatient discharge file contains it, rates can still be computed without any issues. In other words, if you import the inpatient discharge file once with/without the "Hospital State" field included, you can us that same file to compute rates for both PSIs and MHIs.

To compute MHI 05 – MHI 07 in SAS QI and CloudQI, you will need to import at least one year and one quarter of linked inpatient discharge data. MHI 05 – MHI 07 require a 42-day follow-up period from the index delivery to identify SMM events that occur in the postpartum period. Therefore, users will need one year of data to identify index deliveries and an additional quarter of data to identify all SMM events occurring 42 days post-delivery discharge.[20] Inpatient discharge data must be able to link patients through time.

To compute MHI 08 – MHI 11 in SAS QI and CloudQI, you will need to import at least one year and one quarter of linked inpatient and emergency department data. MHI 08 – MHI 11 require a 42-day follow-up period from the index delivery to identify behavioral health events that occur in the postpartum period. Therefore, users will need one year of data to identify index deliveries and an additional quarter of data to identify behavioral health events occurring 42 days post-delivery discharge. Inpatient and emergency department discharge data must be able to link patients through time and setting.

31. What if I do not have emergency department data? Can I still calculate MHI 08 – MHI 11?

The MHI Beta Software assumes that users will have linked inpatient and emergency department discharge data to calculate MHI 08 – MHI 11. Users who do not have access to emergency department discharge data can still calculate MHI 08 – MHI 11 using linked inpatient discharge data by creating an indicator variable that identifies all discharges as inpatient. However, national benchmarks for MHI 08 – MHI 11 published by AHRQ are

[19] The PSIs are a module of the AHRQ QIs that provide information on potentially avoidable safety events that represent opportunities for improvement in the delivery of care. More information on the PSIs, including software instructions, is available on the AHRQ QI website.
[20] Although the follow-up period for MHI 05 – MHI 11 is 42 days, HCUP data only allow for quarter as the most granular date. Including one year and one quarter of data will ensure that all 42 days of the follow-up period are captured.

produced using both inpatient and emergency department data, so rates calculated with only inpatient data will not be comparable.

More information is included in the MHI Beta Software instructions:

- SAS QI Software Instructions Document
- CloudQI Software Instructions Document

32. Since some MHIs and the PQIs use the same inpatient discharge file, can I generate combined rates for both in CloudQI?

No, currently, CloudQI allows you to generate rates for only one module at a time. Combined reports for MHIs and PQIs are not available at this time.

33. What types of reports are generated for MHIs in CloudQI?

CloudQI provides Area-level and Patient-level reports for MHIs. The software provides delivery discharge-level reports for MHIs 01-04 to allow users to analyze cases that are flagged for each SMM indicator and sub-indicators. For MHIs 05-11, the software provides patient delivery-level files.

34. Does the MHI Beta Software generate observed rates for the individual indicators (such as rates of individual SMM indicators) that comprise the MHIs?

The v2025 MHI Beta Software only calculates observed rates for the MHIs, including sub-indicators of MHI 10 (MHI 10A and MHI 10B). Users can analyze the individual indicators (such as rates of individual SMM indicators) by reviewing the output of the MHI_MEASURE.sas program for SAS QI or the data export report in Cloud QI. Note, CloudQI users must enable “Temporary Flags” to output the individual indicators.

35. Is technical assistance available for users of the AHRQ MHI Beta Software v2025?

Yes, users may submit questions or feedback to QISupport@ahrq.hhs.gov.

Appendix A - Differences between the SMM MHIs and the CMS SOC measure with the CDC/HRSA/AIM SMM measure as the reference

Measure Component	CDC/HRSA/AIM SMM Measure	MHI 01	MHI 02	MHI 03	MHI 05	MHI 06	MHI 07	CMS Severe Obstetric Complications (SOC)
Numerator: 20 indicators	Includes: 1. Acute myocardial infarction 2. Aneurysm 3. Acute renal failure 4. Acute respiratory distress 5. Amniotic fluid embolism 6. Cardiac arrest or ventricular fibrillation 7. Conversion of cardiac rhythm 8. Coagulopathy (including disseminated intravascular coagulation) 9. Eclampsia 10. Heart failure or arrest during or following	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	• Refines acute renal failure to require dialysis • Removes codes from coagulopathy • Fiscal year updates to codes	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	• Refines acute renal failure to require dialysis • Removes codes from coagulopathy • Fiscal year updates to codes	• Removes codes from coagulopathy • Adds codes to puerperal cerebrovascular disorders

Measure Component	CDC/HRSA/AIM SMM Measure	MHI 01	MHI 02	MHI 03	MHI 05	MHI 06	MHI 07	CMS Severe Obstetric Complications (SOC)
	surgery or procedure 11. Puerperal cerebrovascular disorders 12. Pulmonary edema or acute heart failure 13. Severe anesthesia complications 14. Sepsis 15. Shock 16. Sickle cell disease with crisis 17. Air and thrombotic embolism 18. Hysterectomy 19. Temporary tracheostomy 20. Respiratory ventilation							
Numerator: includes in-hospital mortality	No	No	Yes	Yes	No	Yes	Yes	Yes
Numerator: includes transfusion	Optional incorporation of transfusion	Does not incorporate transfusion	Does not incorporate transfusion	Does not incorporate transfusion	Does not incorporate transfusion	Does not incorporate transfusion	Does not incorporate transfusion	Stratifies numerator by transfusion

Measure Component	CDC/HRSA/AIM SMM Measure	MHI 01	MHI 02	MHI 03	MHI 05	MHI 06	MHI 07	CMS Severe Obstetric Complications (SOC)
Numerator: includes postpartum period	No	No	No	No	Yes	Yes	Yes	No
Denominator	Inpatient hospitalizations for patients between 12 and 55 delivering stillborn or livebirth	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	(Same as CDC/HRSA/AIM)	Inpatient hospitalizations for patients between 8 and 65 delivering stillborn or live birth with >= 20 weeks, 0 days gestation completed
Denominator exclusions	Ectopic pregnancy, hydatidiform mole, other abnormal products of conception, spontaneous abortion,	Spontaneous or elective abortions	Spontaneous or elective abortions	Spontaneous or elective abortions	Spontaneous or elective abortions	Spontaneous or elective abortions	Spontaneous or elective abortions	None[21]

[21] Versions 2023, 2024, and 2025 of the CMS Severe Obstetric Complication measure excluded patients with a COVID diagnosis and either a COVID-related condition or procedure. In version 2026, the CMS Severe Obstetric Complications measure no longer excludes patients with a COVID diagnosis and either a COVID-related condition or procedure.

Measure Component	CDC/HRSA/AIM SMM Measure	MHI 01	MHI 02	MHI 03	MHI 05	MHI 06	MHI 07	CMS Severe Obstetric Complications (SOC)
	complications following induced termination of pregnancy, complications following ectopic and molar pregnancy							
MS-DRG included in denominator criteria	Yes	No	No	No	No	No	No	No
Measurement level	Area	Area	Area	Area	Area	Area	Area	Hospital
Risk adjustment	No	No	No	No	No	No	No	Yes
Risk stratification	No	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race/ethnicity, poverty category based on ZIP Code, state, year, payer, and custom stratum	Yes, by race and ethnicity

MHI=Maternal Health Indicators; CMS=Centers for Medicare & Medicaid Services; SOC=Severe Obstetric Complications; CDC=Centers for Disease Control and Prevention; HRSA=Health Resources and Services Administration; AIM=Alliance for Innovation on Maternal Health; SMM=Severe Maternal Morbidity.