

The Show-  
Me State  
Progress in  
Maternal  
Mortality



# Outline

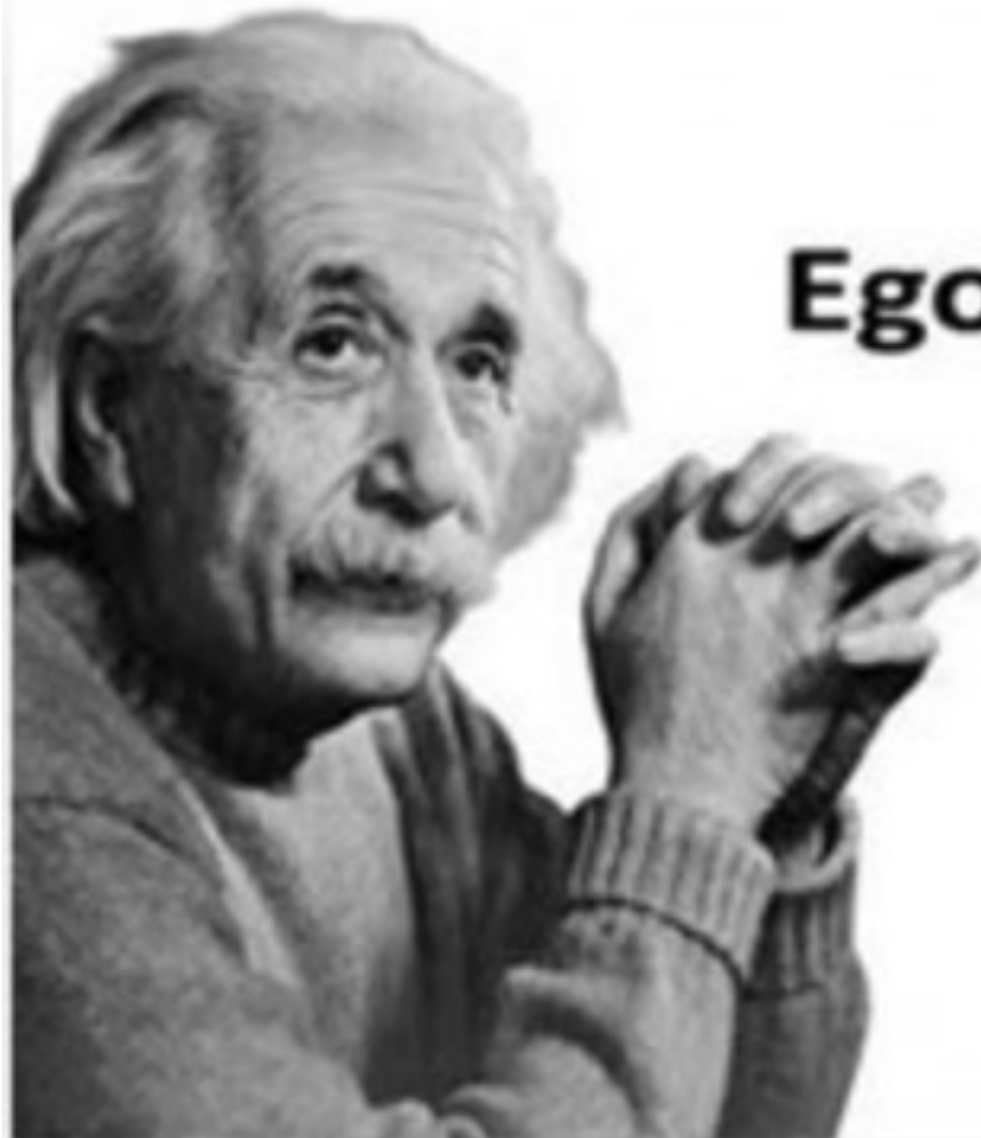
- ***What makes the Missouri PAMR and PQC so unique?***
  - WHO (people and participants, PAMR and PQC partnership)
  - WHERE (MHA, state-wide participation)
  - WHAT and WHY (data to action)
  - HOW (AIM hypertension implementation and Missouri Cuff Kit Project)



# What makes The Show-Me PAMR so unique...WHO

Respectful care for  
PATIENTS starts with  
respect for your TEAM  
MEMBERS





$$\text{Ego} = \frac{1}{\text{Knowledge}}$$

*"More the Knowledge  
Lesser the Ego,  
Lesser the Knowledge  
More the Ego..."*

**-Albert Einstein.**

# What makes The Show-Me PAMR so unique....

## WHO

Respect for all members



Varied backgrounds and expertise

Collaborative and inclusive nature

Deep desire by all to make a difference

Eagerness to reach out to and collaborate with other MMRCs

# What makes the Show-Me PAMR so unique....HOW

- Learn from other MMRCs
  - Utilization of the Texas discrimination toolkit
  - Frequently used recommendations
- No subcommittees or separate groups
- Adjudicate ALL deaths through 365 days
  - Lessons learned from both pregnancy-related and pregnancy-associated deaths



**YOU HAVE THE  
CAPACITY TO LEARN  
FROM YOUR  
MISTAKES.**

*You will learn a lot today.*

# What makes The Show-Me PAMR so unique...WHO



MISSOURI DEPARTMENT OF  
**HEALTH &  
SENIOR SERVICES**

Pregnancy-Associated Mortality Review



**SHOW-ME ECHO**  
EXTENSION FOR COMMUNITY HEALTHCARE OUTCOMES

**Missouri Moms and Babies**



**MEET OUR HUB TEAM**

**Amanda Stephens, MD**  
Maternal-Fetal Medicine  
Independent Contractor

**Anjali Anders, MD**  
Neonatology  
University of Missouri Health System

**Karen Lynn Florio, DO, MPH**  
Maternal-Fetal Medicine  
Saint Luke's Health System

**Alicia Forinash, PharmD**  
Pharmacist  
University of Health Sciences and Pharmacy

**Eboni January, MD**  
Obstetrics and Gynecology  
Independent Contractor

**Bobbi Lakin, MD**  
Family Medicine, Obstetrics Primary Care  
Family Care Health Centers

**Shannon Lenz, PhD**  
Perinatal Psychologist  
Washington University

**Laura Vricella, MD**  
Maternal-Fetal Medicine  
Mercy Health System

**Alison Williams, MBA-HCM, RN, BSN, CPHQ, LSSGB**  
Vice President, Clinical Quality Improvement  
Missouri Hospital Association

**IMPROVING PERINATAL CARE**  
Show-Me ECHO and the Missouri Hospital Association are focusing their efforts to address maternal mortality in Missouri. The MO Moms and Babies ECHO team will share information about evidence-based practices, innovative resources, and community networks. Healthcare professionals interested in improving care and outcomes for mothers and babies throughout Missouri can join these interactive virtual sessions every 2nd and 4th Wednesday of the month from 12 to 1 p.m. at no cost to participating sites or individuals.

**TOGETHER WITH A MULTIDISCIPLINARY TEAM, PARTICIPANTS WILL:**

- Increase knowledge base of the key contributors to morbidity and mortality to MO birthing population.
- Practice evidence-based management of pre-conception, antepartum, intrapartum, postpartum, and neonatal care, through collaboration among multiple disciplines and specialties.
- Use local resources and incorporate awareness of social determinates of health to deliver care in a patient-centered holistic manner.

**MATERNAL MORTALITY FOCUS TOPICS:**

- Intro to MO Maternal Mortality Focus
- OB Hemorrhage
- Severe Hypertension in Pregnancy
- Cardiac Conditions in OB Care
- Sepsis in OB Care
- Care for OB Patient with Mental Health Disorders

REGISTER NOW  
SHOWMEECHO.ORG

"It's time to MAKE TIME for MOMS & BABIES."

Missouri Telehealth Network | MHA | ECHO



**Baby & me**  
Tobacco Free



**PROMISE 1000**  
Home Visiting Collective

The Initiative for Healthy Babies & Families

**FLOURISH**  
STL

A collaborative effort to save babies' lives.



**BOOTHEEL BABIES & FAMILIES**

The Difference a Bloom Network Makes  
racially equitable outcomes for our Community




**Nurture KC**



**GenerateHealth**  
Champions of Family and Community

**BoRN**

BOOTHEEL RESOURCE NETWORK

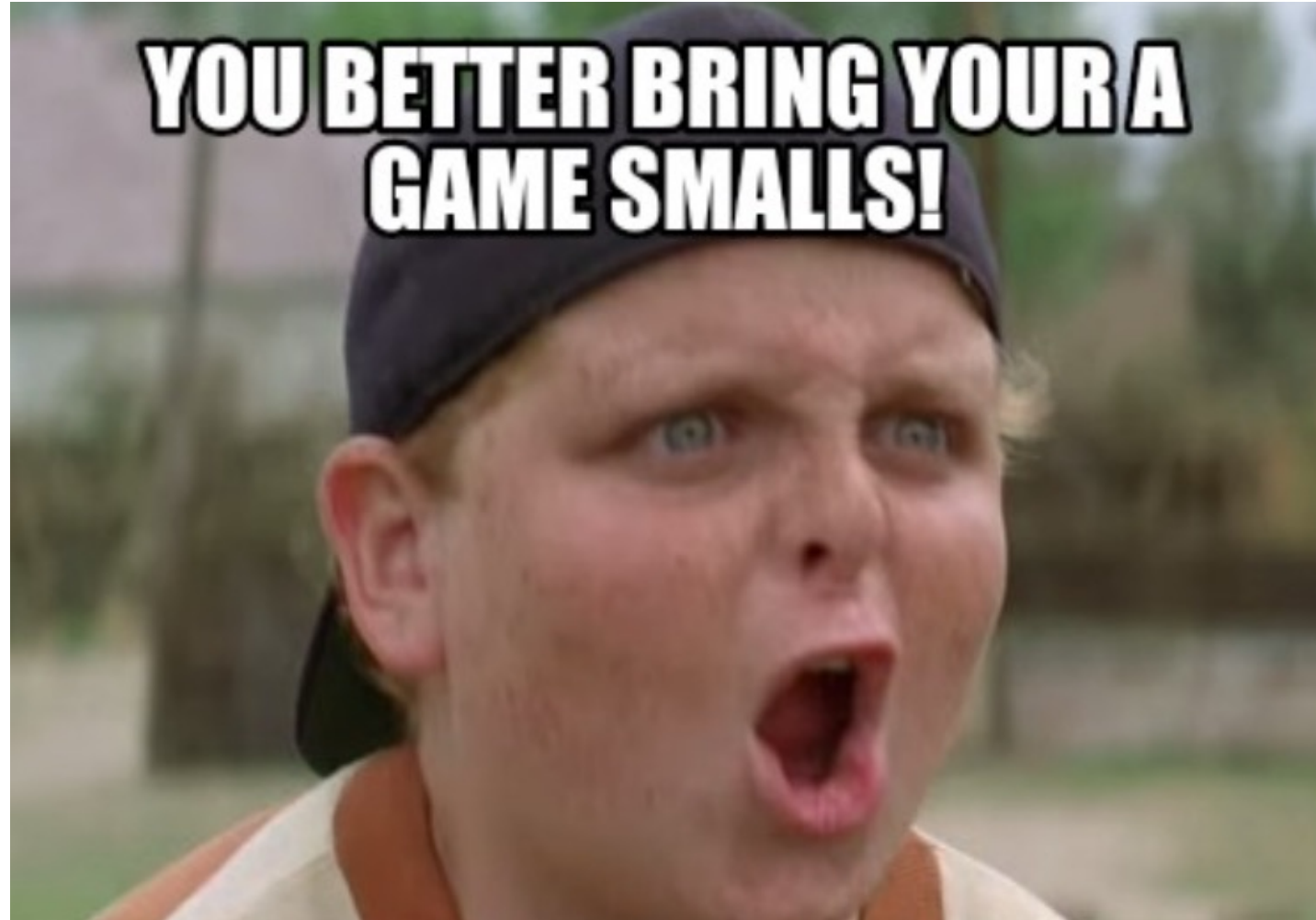
**bppn**

Bootheel Perinatal Network

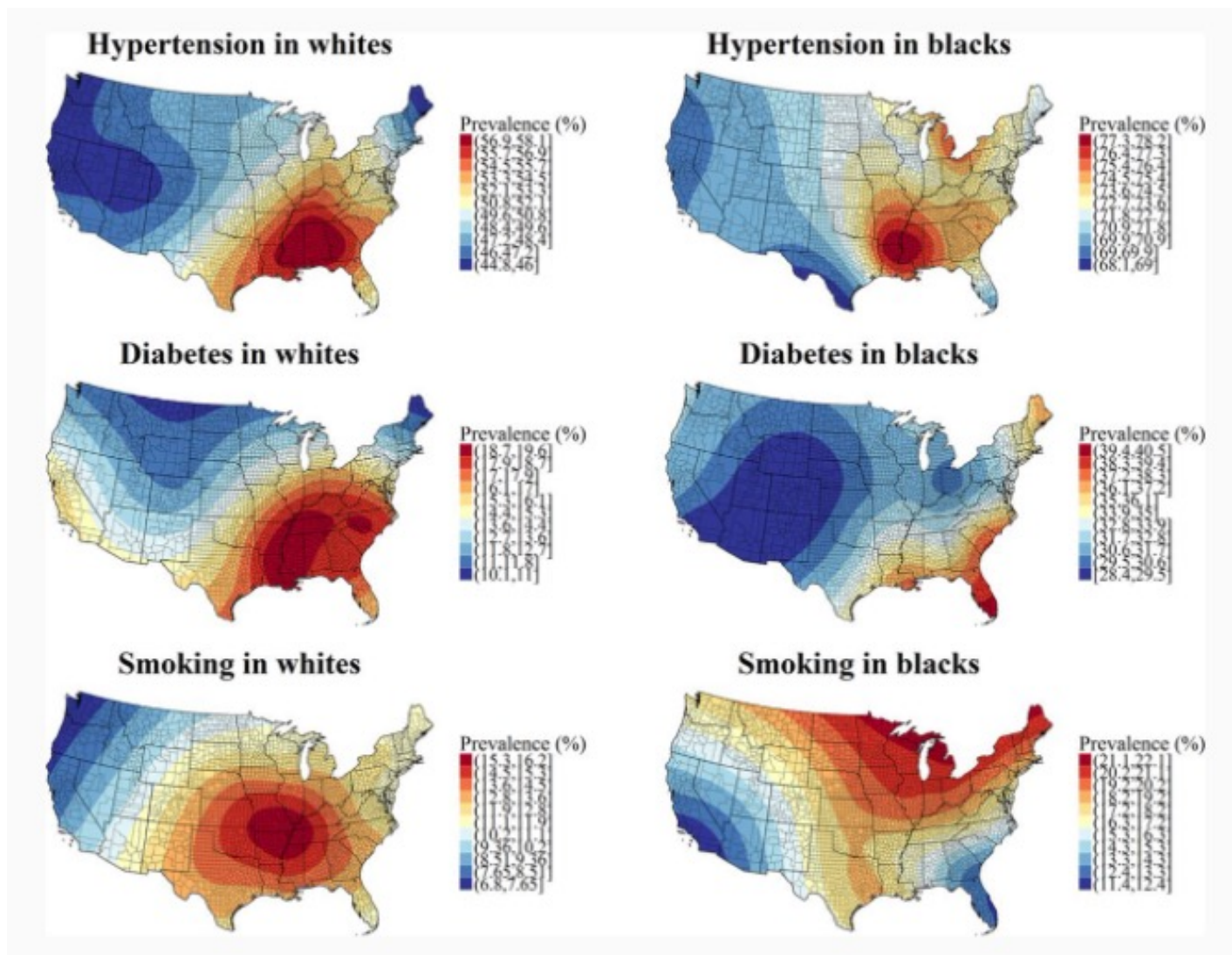
What makes The Show-Me PAMR collaboration so unique....WHO



What makes the Show-Me PAMR so  
unique...HOW

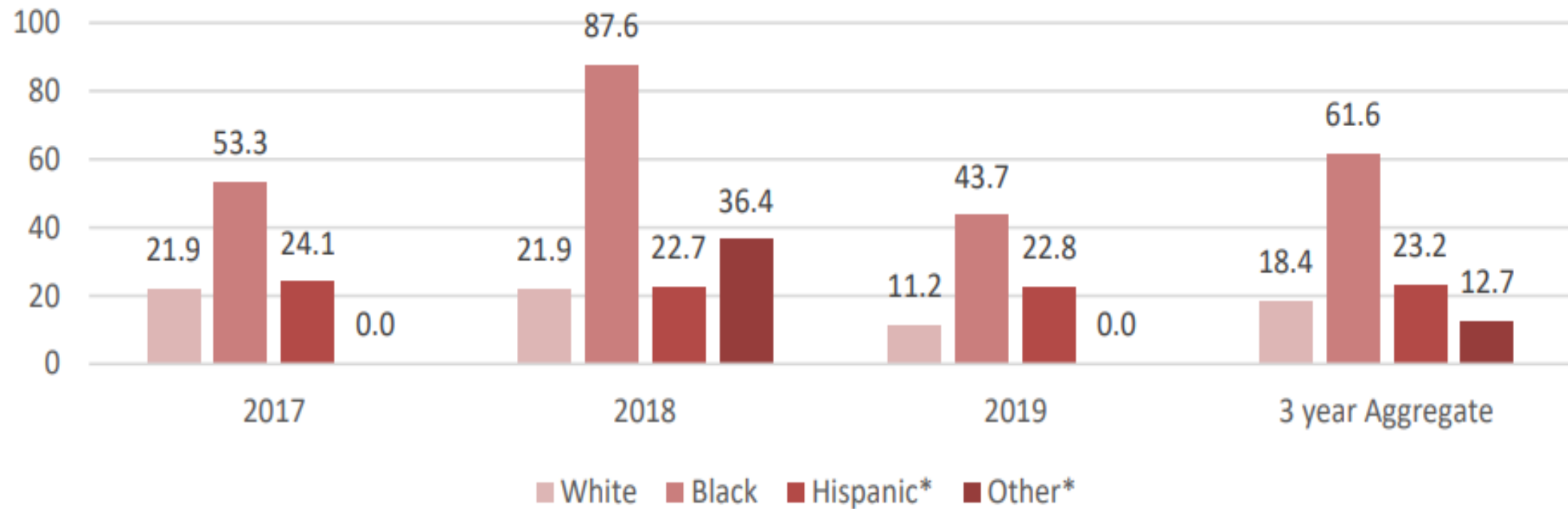


Why are we seeing rising rates of SMM and MM??



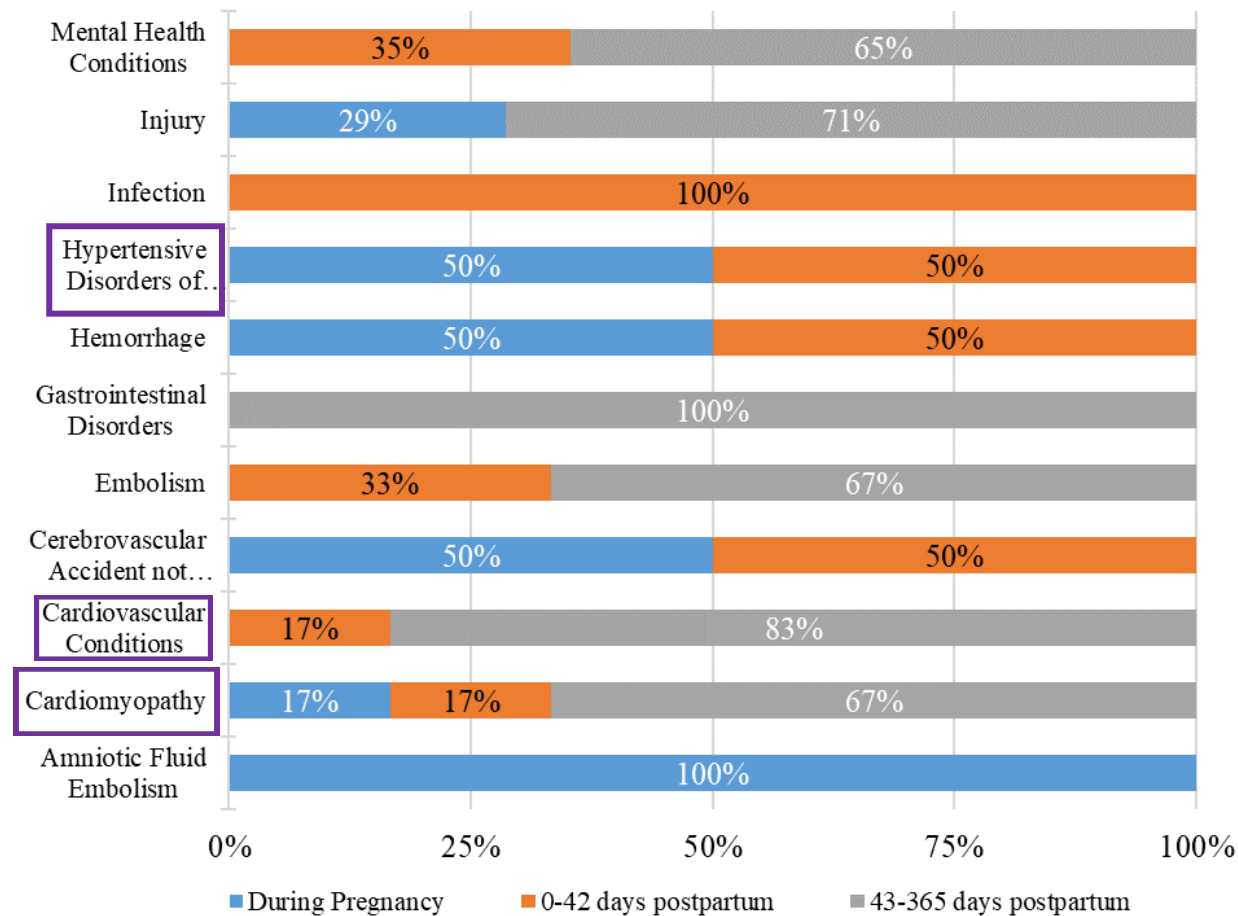
# Taking Our Data to Action: WHAT we do

**Figure 16: Pregnancy-Related Mortality Ratio per 100,000 Live Births by Race**



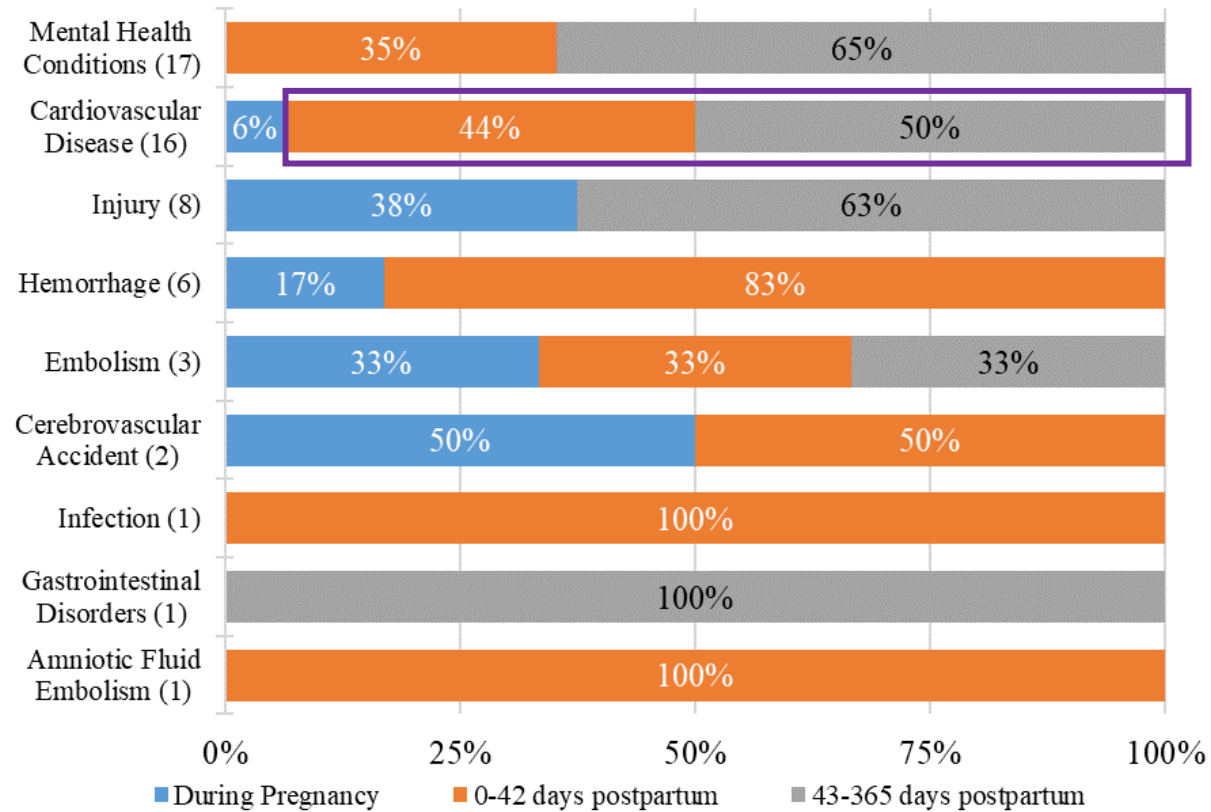
# Taking Our Data to Action: WHAT we do

Timing of Leading Underlying Causes of Pregnancy-Related Deaths, 2017-2019



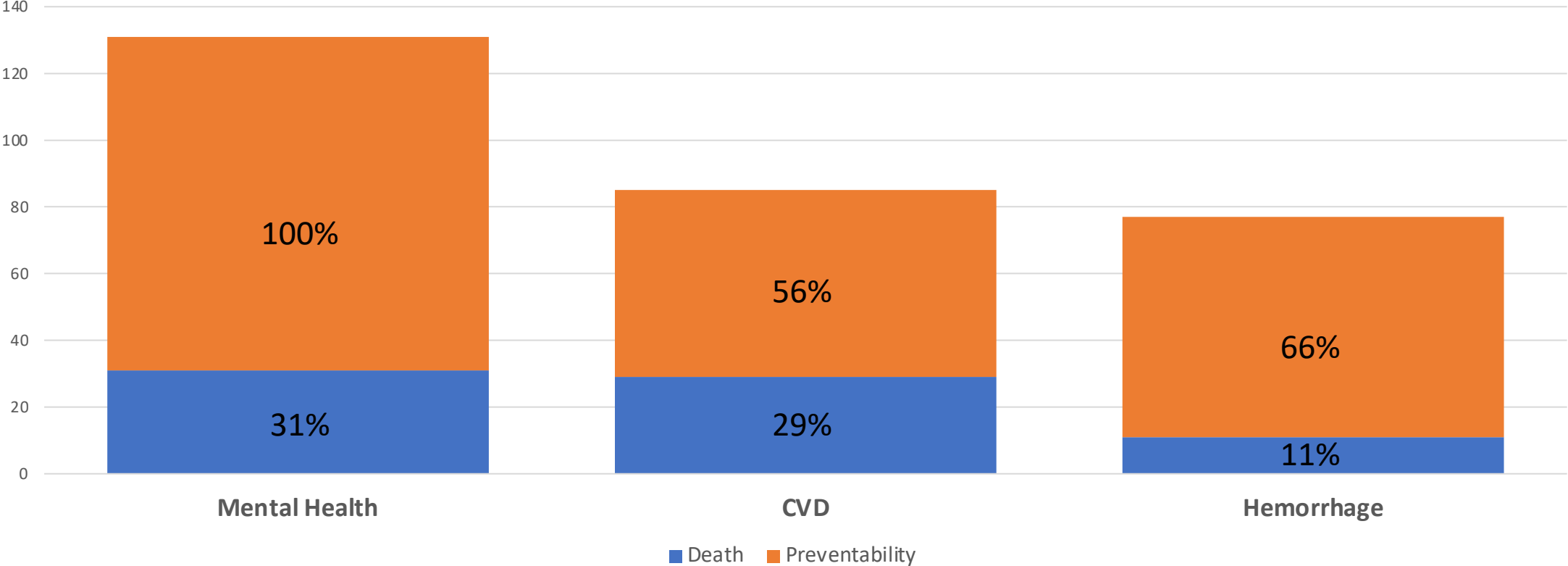
# Taking Our Data to Action: WHAT we do

**Figure 22: Timing of Leading Underlying Causes of Pregnancy-Related Deaths, 2017-2019**



# Taking Our Data to Action: HOW we do

Maternal Mortality and Preventability by Cause



# GOVERNOR PARSON ANNOUNCES NEW INVESTMENT, PARTNERSHIPS TO REDUCE MATERNAL MORTALITY IN MISSOURI

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## *Missouri Maternal Quality Care Protocols*

DHSS is partnering with the Missouri Perinatal Quality Collaborative (MO PQC), led by the Missouri Hospital Association, to develop and implement standardized evidence-based protocols for maternal-fetal health care with toolkits including a collection of best practice tools and articles, care guidelines, a hospital-level implementation guide, and professional education materials.

## *Maternal Care Workforce*

DHSS and MO PQC are developing standardized maternal care provider trainings on trauma-informed, responsive, culturally congruent, and linguistically appropriate care, including screening, referral, and treatment of mental health conditions and substance use disorder during and after pregnancy as well as cardiovascular disorders, gestational diabetes, and other endocrinology disorders associated with pregnancy.

## *Optimize Postpartum Care*

DHSS and MO PQC are developing a standardized Postpartum Plan of Care to include an assessment for depression and anxiety, universal screening for substance use disorder, and (as appropriate) referrals to mental health professionals, social workers, community health workers, nurse-led home visiting programs, and substance use disorder treatment programs.

## *Maternal Health Access Project*

DHSS is working with the University of Missouri Health System to develop and implement a hub-and-spoke model Perinatal Health Access Collaborative, inclusive of perinatal mental health. The Collaborative will provide same-day specialized consultation, patient referral to community services, over-the-phone follow-up care coordination, and access to ongoing training and education for rural healthcare providers and other providers without this specialized expertise.

## *Improved Maternal Health Data*

DHSS is establishing a maternal-child health dashboard to advance data quality and accessibility.

# Cardiovascular-Related Deaths

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- Contributing Factors
  - Access/financial
  - Assessment
  - Continuity of Care/Coordination of Care
- Recommendations
  - Expand access through Medicaid expansion
  - Education of providers (i.e. emergency room)
  - Create best practice alerts for pregnant or recently pregnant patients
  - Autopsy
    - Disagreed with underlying cause 20%





# Focus on Cardiovascular-related Deaths

- Became AIM state in 2018 and established PQC
- Started with implementation of AIM HTN bundle (CVD-related)
  - PQC-led directive
- Voluntary participation of hospitals
  - 36 of the 62 hospitals participated
- Data tracking for 18 months
- Decided upon 2 metrics
  - Time to treatment
  - Follow-up
- Education campaign

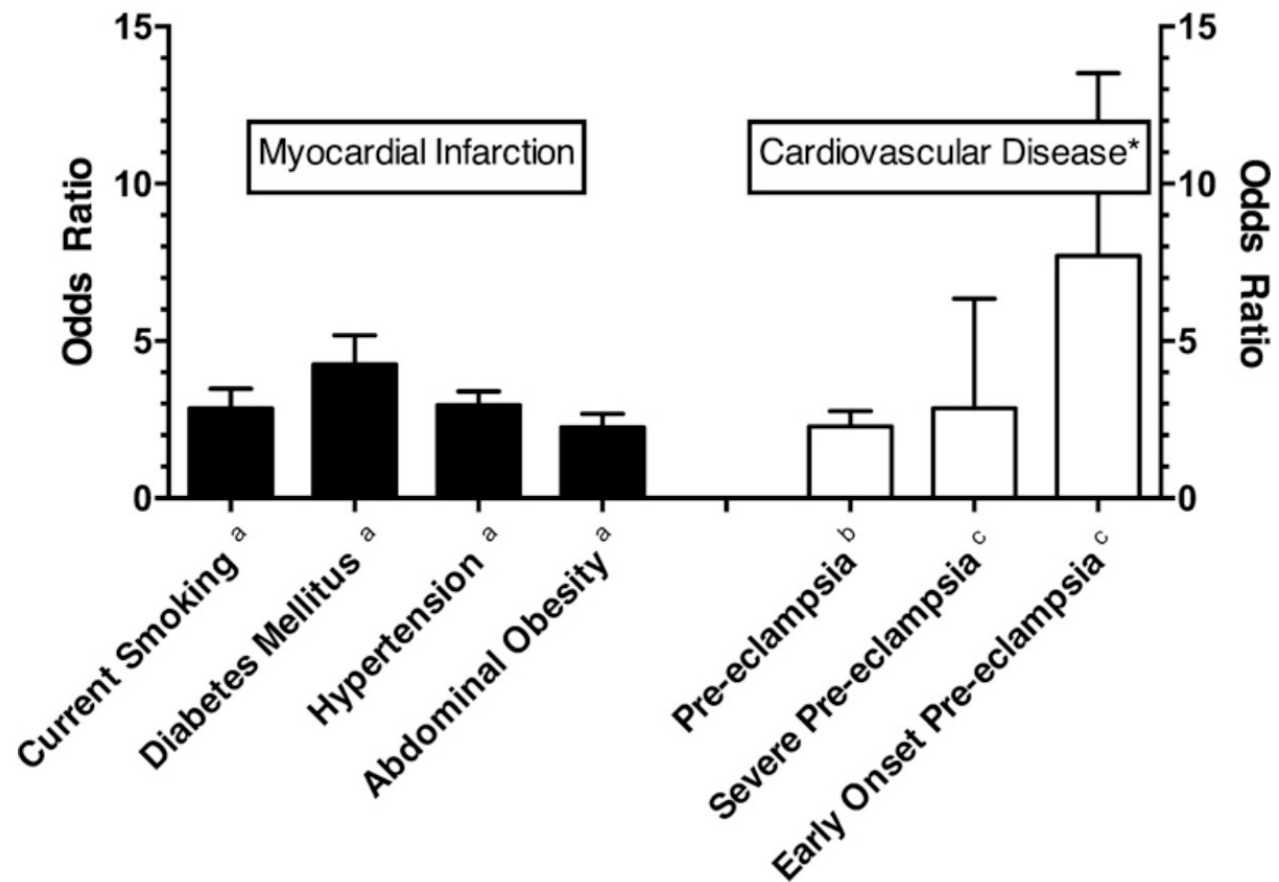


# WHY: CVD-related: Long-term Maternal Risks

- Cardiovascular disease
  - Preeclampsia predictive of future cardiovascular and cerebrovascular disease up to 9-fold
    - Risks are equal to that of ***smoking or obesity***
    - Can occur as early as 3-5 years after delivery
  - Related to both severity and number of episodes
    - Higher with early onset, severe disease or associated growth restriction (***similar risk to someone with diabetes***)
    - **Permanent** arterial changes
  - Lifestyle interventions after preeclampsia can reduce risk by 4-13%, *but never back to baseline*

# Long-term Maternal Risks

### Risk factors and Cardiovascular Morbidities



Preeclampsia and future cardiovascular health: A systematic review and meta-analysis  
*Wu P et al. Circulation Outcomes 2017*

**Table 1. Sensitivity Analysis With Regard to Duration of Follow-Up**

| Outcomes                     |            | <1 y                  | 1–10 y                 | >10 y                 |
|------------------------------|------------|-----------------------|------------------------|-----------------------|
| Cardiovascular disease death | Adjusted   | ...                   | 2.30 (1.65–3.20), n=1  | 2.21 (1.73–2.81), n=3 |
| Coronary heart disease       | Adjusted   | 3.10 (1.56–6.15), n=1 | 3.78 (0.43–77.30), n=2 | 1.46 (0.95–2.25), n=3 |
|                              | Unadjusted | ...                   | ...                    | 2.09 (1.64–2.66), n=3 |
| Coronary heart disease death | Adjusted   | ...                   | ...                    | 2.10 (1.25–3.51), n=4 |
| Heart failure                | Adjusted   | 4.10 (2.90–5.80), n=1 | 8.42 (4.39–16.17), n=2 | 1.60 (0.73–3.50), n=1 |
|                              | Unadjusted | ...                   | 4.27 (2.09–8.71), n=1  | 2.73 (1.30–5.74), n=2 |
| Stroke                       | Adjusted   | 2.22 (1.73–2.85), n=2 | 3.56 (0.52–24.28), n=2 | 1.18 (0.95–1.46), n=2 |
|                              | Unadjusted | ...                   | ...                    | 1.60 (1.47–1.74), n=1 |

Values are represented as risk ratio (95% CI). CI indicates confidence interval.

## Severe Hypertension in Pregnancy



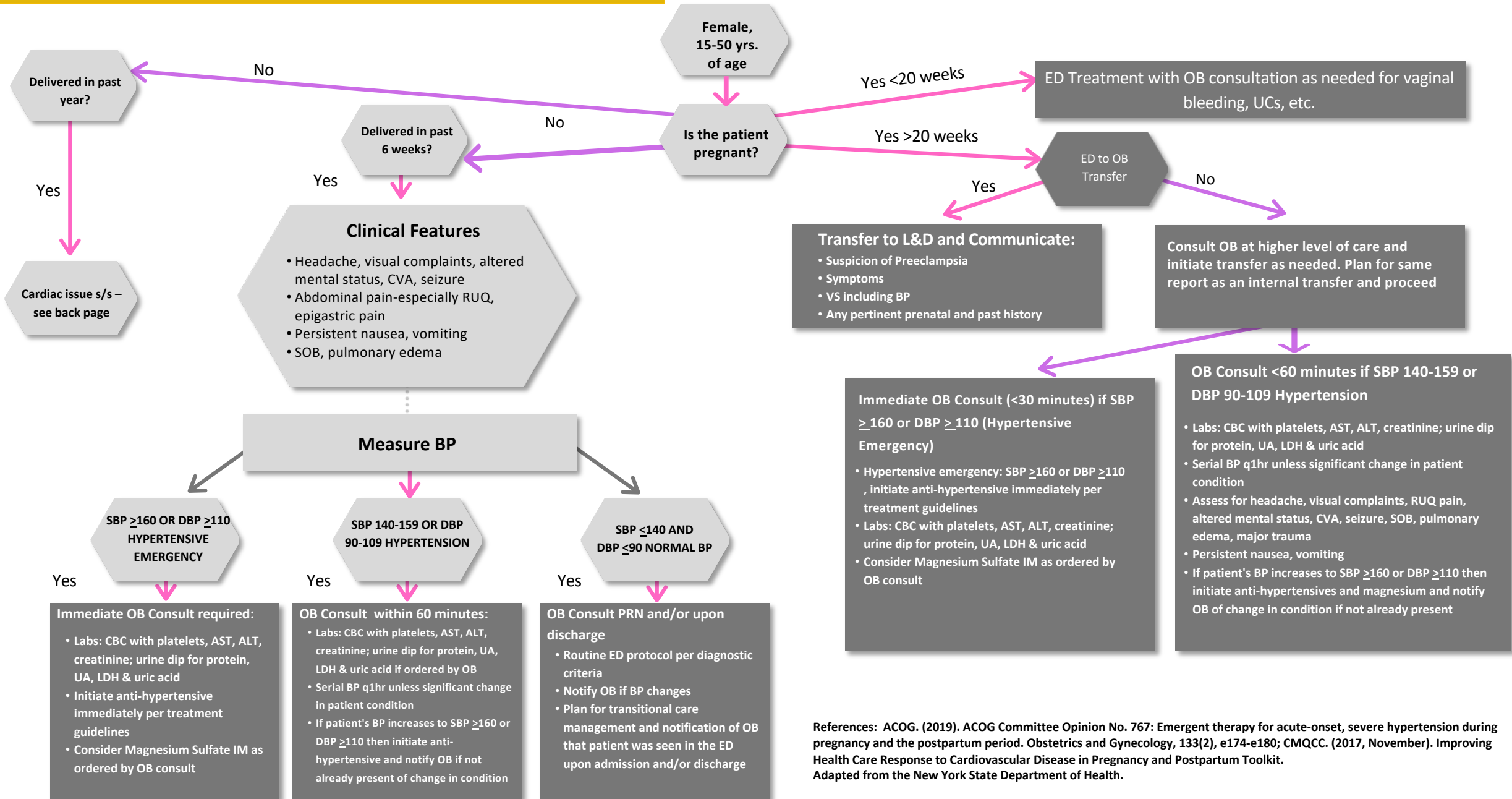
### Resources

- [Safety Bundle Registration Form](#)
- Implementation Support
  - [Safety Bundle Program Resources](#)
  - [Maternal ED Flowchart](#)

### Webinars

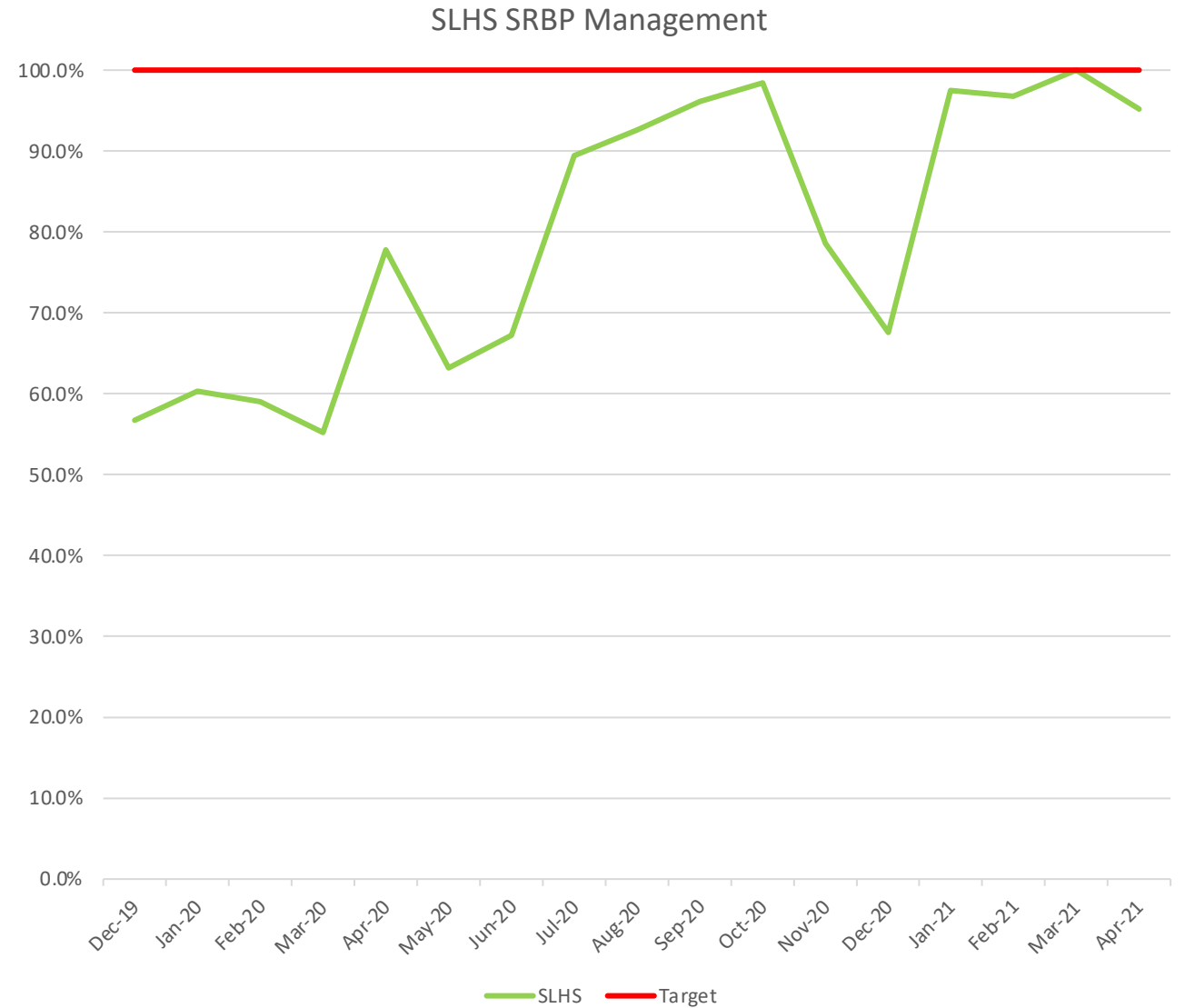
- AIM Severe Hypertension in Pregnancy Bundle Implementation — [Recording](#)
  - Cardiac Disease in Pregnancy — [PowerPoint](#) | [Recording](#)
  - EleVATE Women Collaborative IHN — [PowerPoint](#) | [Recording](#)
  - Hypertensive Disorders in Pregnancy — [PowerPoint](#) | [Recording](#)
  - Severe Hypertension in Pregnancy Case Studies and Lessons Learned — [PowerPoint](#) | [Recording](#)
  - Simulation in Obstetrics — [PowerPoint](#) | [Recording](#)
-

**Maternal Hypertension Protocol: Clinical Algorithm for EDs**



References: ACOG. (2019). ACOG Committee Opinion No. 767: Emergent therapy for acute-onset, severe hypertension during pregnancy and the postpartum period. *Obstetrics and Gynecology*, 133(2), e174-e180; CMQCC. (2017, November). Improving Health Care Response to Cardiovascular Disease in Pregnancy and Postpartum Toolkit. Adapted from the New York State Department of Health.

# Example Hospital in MO AIM HTN Bundle

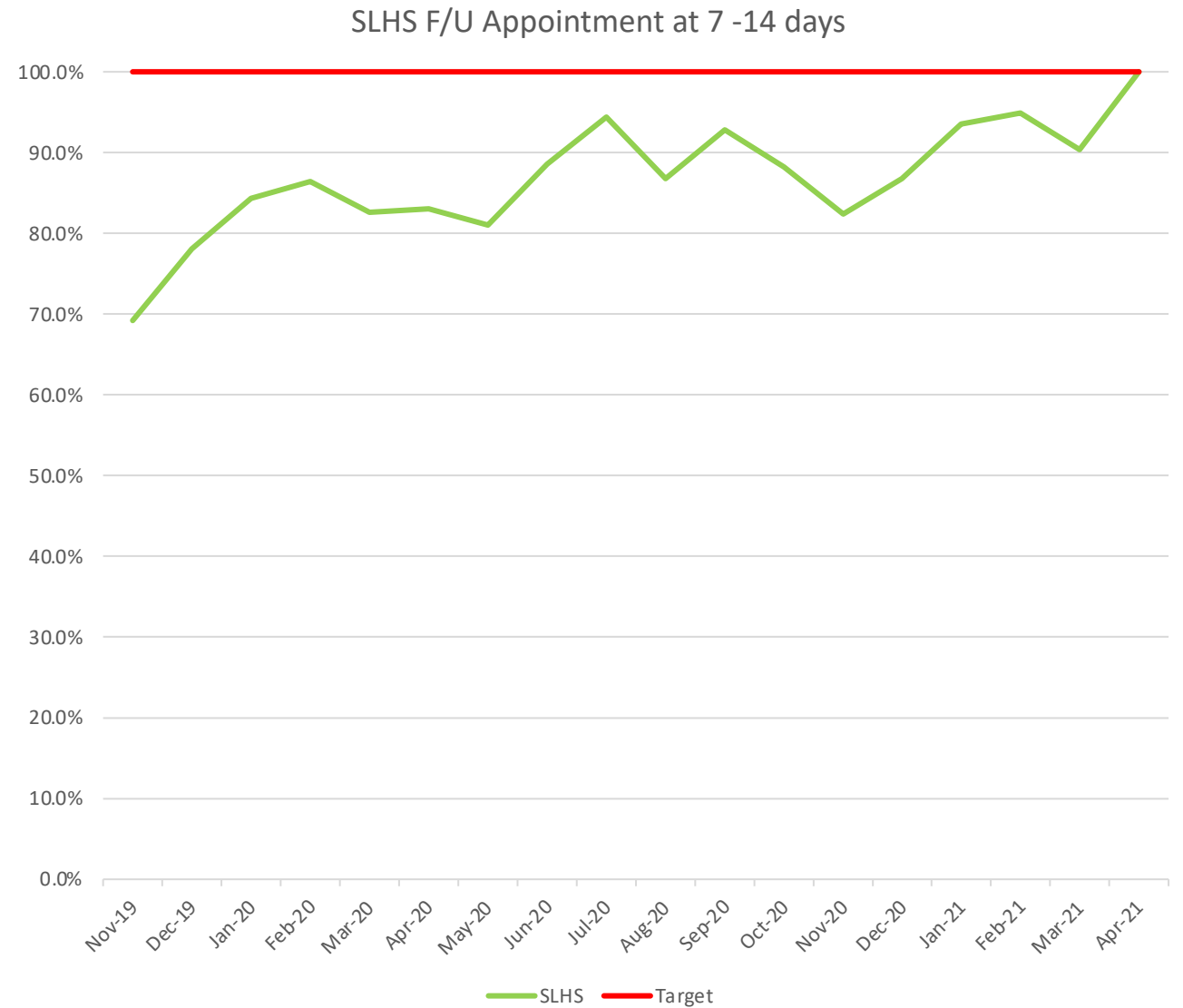


# Severe Blood Management Data

|      | Nov-19 | Dec-19 | Jan-20 | Feb-20 | Mar-20 | Apr-20 | May-20 | Jun-20 | Jul-20 | Aug-20 | Sep-20 | Oct-20 | Nov-20 | Dec-20 | Jan-21 | Feb-21 | Mar-21 | Apr-21 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| SLH  | 37.0%  | 69.4%  | 75.0%  | 62.2%  | 63.9%  | 78.2%  | 80.5%  | 66.7%  | 90.0%  | 97.5%  | 100.0% | 100.0% | 100.0% | 72.0%  | 100.0% | 97.4%  | 100%   | 88.9%  |
| SLE  | 25.0%  | 33.3%  | 26.3%  | 40.0%  | 30.8%  | 60.0%  | 66.7%  | 47.4%  | 83.3%  | 70.0%  | 100.0% | 100.0% | 64.7%  | 55.6%  | 92.3%  | 94.1%  | 100%   | 100%   |
| SLN  | 100.0% | 0.0%   | 0.0%   | 83.3%  | 62.5%  | NP     | 25.0%  | 100.0% | 100.0% | 100.0% | 100.0% | 83.3%  | NP     | NP     | 100.0% | 100.0% | 100%   | 100%   |
| SLS  | NP     | 0.0%   | 100.0% | 0.0%   | NP     | 100.0% | NP     | 66.7%  | 100.0% | 100.0% | NP     | NP     | 100.0% | NP     | 66.7%  | 100.0% | NP     | NP     |
| HMC  | 75.0%  | NP     | NP     | NP     | 0.0%   | NP     | NP     | NP     | NP     | 100.0% | 0.0%   | 100.0% | NP     | NP     | NP     | NP     | NP     | 100%   |
| SLHS | 40.0%  | 56.7%  | 60.3%  | 59.0%  | 55.2%  | 77.8%  | 63.2%  | 67.2%  | 89.4%  | 92.6%  | 96.1%  | 98.4%  | 78.6%  | 67.6%  | 97.5%  | 96.8%  | 100%   | 95.2%  |



# Example Hospital in MO AIM HTN Bundle



# Follow up Appointment Data

|      | Nov-19 | Dec-19 | Jan-20 | Feb-20 | Mar-20 | Apr-20 | May-20 | Jun-20 | Jul-20 | Aug-20 | Sep-20 | Oct-20 | Nov-20 | Dec-20 | Jan 2021 | Feb-21 | Mar-21 |      |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|--------|--------|------|
| SLH  | 67.5%  | 83.7%  | 91.7%  | 94.7%  | 97.0%  | 96.0%  | 93.2%  | 97.1%  | 97.9%  | 100.0% | 97.8%  | 91.9%  | 89.5%  | 93.3%  | 90.5%    | 97.4%  | 97.5%  | 100% |
| SLE  | 75.0%  | 71.4%  | 63.2%  | 73.7%  | 82.1%  | 90.0%  | 70.8%  | 92.6%  | 92.3%  | 80.0%  | 84.2%  | 100.0% | 83.3%  | 87.5%  | 100.0%   | 100.0% | 85%    | 100% |
| SLN  | 50.0%  | 100.0% | 100.0% | 50.0%  | 27.2%  | 100.0% | 66.7%  | 40.0%  | 60.0%  | 37.5%  | 100.0% | 50.0%  | 25.0%  | 100%   | 87.5%    | 87.5%  | 100%   | 100% |
| SLS  | 0.0%   | 50.0%  | 100.0% | 100.0% | 100.0% | 40.0%  | 0.0%   | 100.0% | 100.0% | 100.0% | 100.0% | 33.3%  | 66.7%  | 50.0%  | 75.0%    | 66.7%  | 66.7%  | NP   |
| HMC  | 83.3%  | 50.0%  | 88.9%  | 100.0% | 75.0%  | 100.0% | 100.0% | 100.0% | 100.0% | 66.7%  | 86.7%  | 100.0% | 80.0%  | 75.0%  | NP       | 100.0% | 50%    | 100% |
| SLHS | 69.2%  | 78.1%  | 84.3%  | 86.4%  | 82.6%  | 83.0%  | 81.0%  | 88.6%  | 94.4%  | 86.8%  | 92.8%  | 88.2%  | 82.4%  | 86.8%  | 93.5%    | 94.9%  | 90.4%  | 100% |

# Overall Results from AIM Implementation

- 29 organizations met minimum reporting criteria for HTN bundle
  - Median time to treatment for severe HTN improved by 25%
  - 91% of bundle elements were implemented
  - 90% of structure elements were implemented





Now what.....



# GOVERNOR PARSON ANNOUNCES NEW INVESTMENT, PARTNERSHIPS TO REDUCE MATERNAL MORTALITY IN MISSOURI

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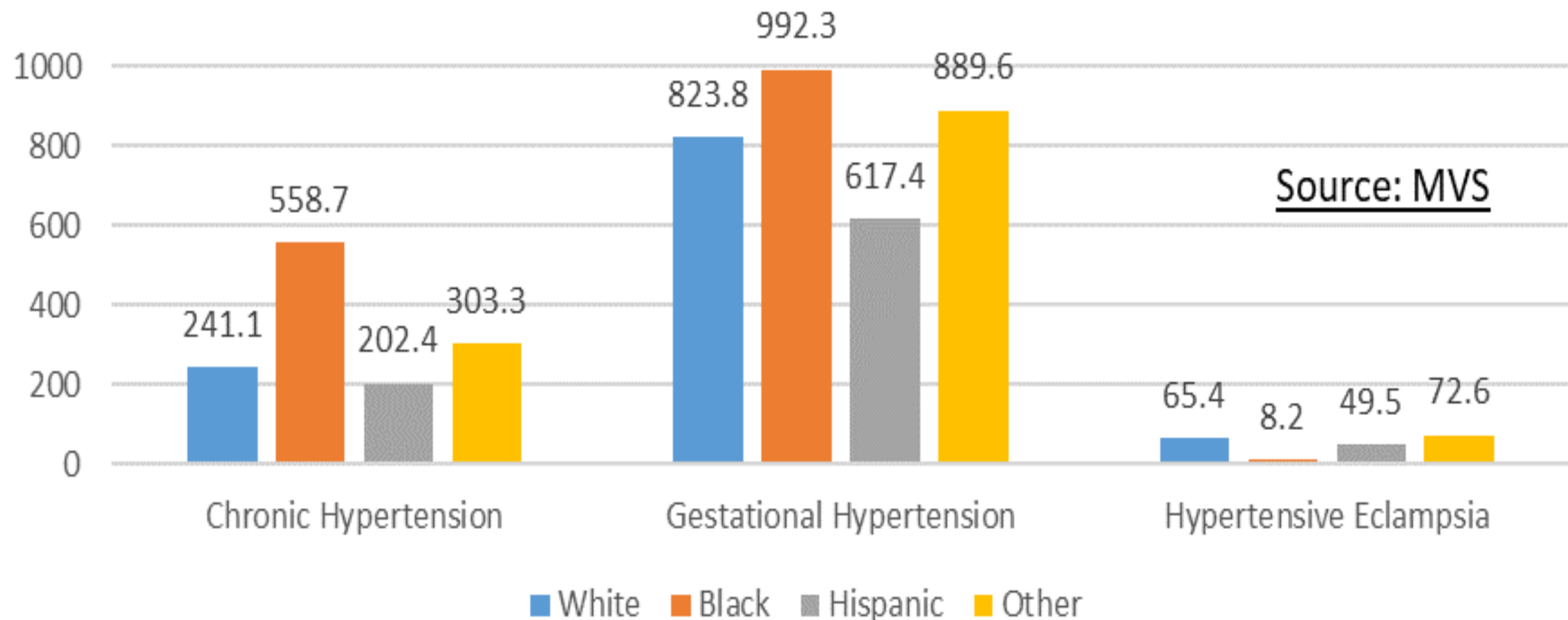
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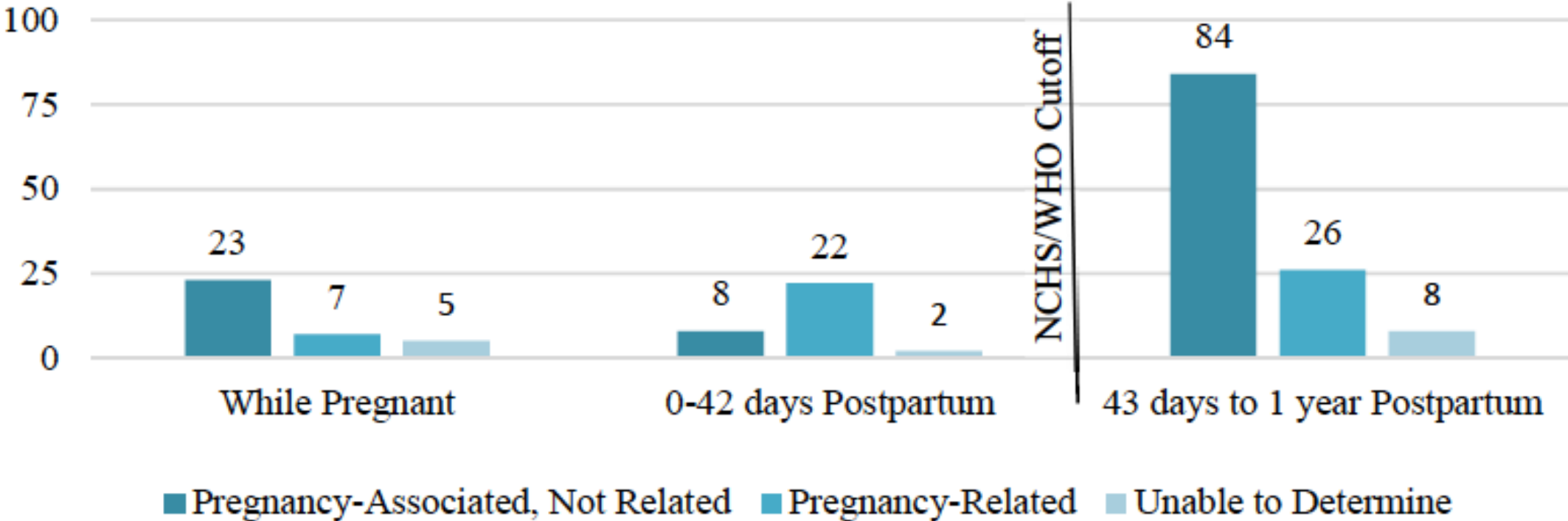
*Improved Maternal Health Data* | DHSS is establishing a maternal-child health dashboard to advance data quality and accessibility.

**Figure 5: Hypertension During Pregnancy by Race  
Ratio per 10,000 2017-2019**



# Focus on Postpartum Hypertension

Figure 10: Timing of Death by Relationship to Pregnancy, 2017-2019





# HBPM Postpartum

**TABLE**

**Outpatient outcomes in telehealth vs standard outpatient care participants**

|  | Telehealth<br>( <i>n</i> =214) | Standard<br>outpatient<br>care ( <i>n</i> =214) | <i>P</i> value | RR (95% CI)      | Adjusted<br><i>P</i> value | Adjusted<br>RR (95% CI) |
|--|--------------------------------|---|----------------|------------------|----------------------------|-------------------------|
| Healthcare utilization through 6 wk  |                                |   |                |                  |                            |                         |
| Hypertension-related hospital readmissions <sup>a</sup> , <i>n</i> (%)                   | 1 (0.5)                        | 8 (3.7)   | .037           | 0.13 (0.02–0.99) | .045                       | 0.12 (0.01–0.96)        |
| Hypertension-related emergency or triage room visits <sup>a</sup> , <i>n</i> (%)         | 11 (4.6)                       | 13 (6.0)  | .831           | 0.76 (0.38–1.85) | .808                       | 0.81 (0.36–1.80)        |
| Number of blood pressure reviews within 10 days of delivery <sup>a</sup> , <i>n</i> (%)  | 202 (94.4)                     | 129 (60.3)                                      | <.001          | 1.56 (1.39–1.76) | <.001                      | 1.59 (1.36–1.77)        |
| 6 wk study endpoint  |                                |   |                |                  |                            |                         |
| Number of participants on antihypertensive treatment regimes <sup>a</sup> , <i>n</i> (%) | 57 (26.6)                      | 37 (17.3)                                       | .027           | 1.54 (1.06–2.23) | .866                       | 1.03 (0.74–1.44)        |

Data are expressed as mean, median (interquartile range), or *n* (%).

CI, confidence interval; RR, relative risk; SD, standard deviation.

<sup>a</sup> Adjusted for the delivery mode, insurance status, antihypertension medication use at the time of hospital discharge, and the total number of postpartum admission days.

Hoppe. Telehealth with remote blood pressure monitoring for postpartum hypertension. *Am J Obstet Gynecol* 2020.

# Compliance with SMBP

WHEN THE READINGS ARE RANKED AS "GREEN", THE SOFTWARE INDICATES THAT « YOUR BLOOD PRESSURE IS WITHIN NORMAL RANGE ». WHAT DO YOU THINK OF THE SOFTWARE'S ANALYSIS?  
N = 82

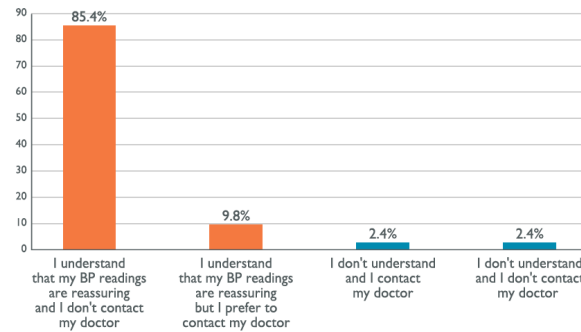


Figure 6 Participants' reaction toward green ranked readings.

"THE SOFTWARE HELPS ME TO BETTER MONITOR MY BLOOD PRESSURE"  
N = 82

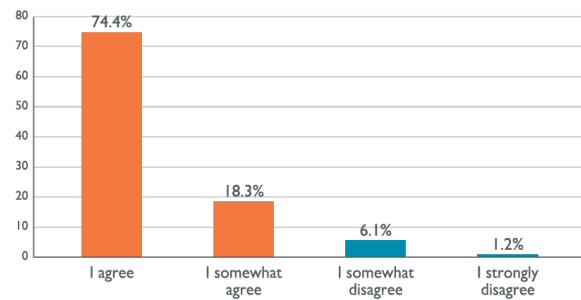


Figure 5 Women's opinions regarding the Hy-result system's usefulness.

Postel-Vinay et al

Dovepress

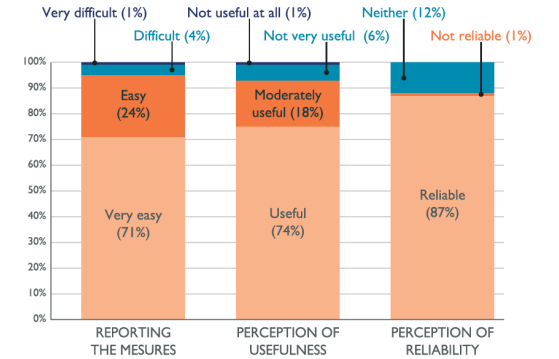


Figure 4 Experience and comprehension regarding the Hy-Result system.

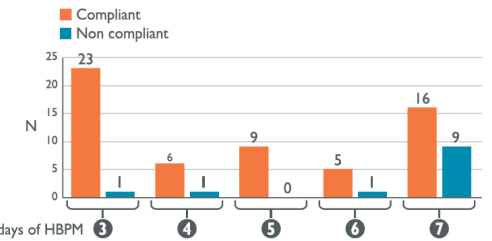


Figure 3 Compliance according to the consecutive number of days of HBPM.

# Patient Satisfaction with SMBP

**Table 3** Univariate logistic regression results

| Domain                | Question  | Variable                             | Odds Ratio (OR)  | Standard Error (SE) | 95% CI    |
|-----------------------|---|--------------------------------------|------------------|---------------------|-----------|
| <b>Burden of care</b> | To what extent do you prefer going to the hospital or clinic instead of using the mHealth technology at home? | No significant variables             |                  |                     |           |
|                       |   | Gestational hypertension             | 12               | 17.4                | 0.71–204  |
|                       | How much would you recommend the mHealth technology to other women in your situation?                         | Preeclampsia without severe features | 36*              | 54.7                | 1.86–701  |
|                       |   | All other preeclampsia               | 24*              | 31                  | 1.9–294   |
|                       |   | Starting medication after discharge  | 4.1*             | 2.9                 | 1.0–16.4  |
|                       |   | Non-Hispanic White                   | 7.6 <sup>+</sup> | 7.1                 | 1.2–47.4  |
| <b>Satisfaction</b>   | How enjoyable are the mHealth devices to use?   | All other preeclampsia               | 12.7*            | 13                  | 1.7–94.2  |
|                       |   | Chronic hypertension                 | 8.8 <sup>+</sup> | 11                  | 0.77–101  |
|                       |   | All other preeclampsia               | 19*              | 26                  | 1.3–283   |
|                       | Overall how satisfied are you with the mHealth devices?   | Maternal BMI                         | 0.94             | 0.03                | 0.88–0.99 |
|                       |   | Infant discharging with mother       | 4.4 <sup>+</sup> | 3.48                | 0.90–21   |
|                       |   | Starting medication after discharge  | 3.1 <sup>+</sup> | 1.9                 | 0.94–10   |

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , + $p < 0.1$

# Cost Effectiveness of SMBP

Table 3. Summary of reviewed studies.

| Study                           | Time                  | Conditions  | Intervention vs control   | Cost-effectiveness                         |
|---------------------------------|-----------------------|---|---|--|
| Ahmed et al <sup>30</sup>       | Prenatal              | HDP   | Tight control vs less tight control of HDP  | +  |
| Barton et al <sup>31</sup>      | Prenatal              | HDP   | Outpatient monitoring vs antepartum hospitalization   | +  |
| Brooten et al <sup>32</sup>     | Prenatal              | HDP   | Half of prenatal care in home by nurse specialists vs usual prenatal care   | +  |
| Buysse et al <sup>33</sup>      | Prenatal              | HDP   | Telemonitoring vs in-hospitalized monitoring  | +  |
| Drost et al <sup>34</sup>       | Postpartum            | History of HDP  | Annual hypertension screening in primary care vs usual care   | +  |
| Dunlop et al <sup>35</sup>      | Prenatal              | HDP   | Day care management vs inpatient care   | +  |
| Harrison et al <sup>36</sup>    | Prenatal              | HDP   | In-home care vs in-hospital antenatal care  | -  |
| Kim et al <sup>37</sup>         | Postpartum            | History of GDM  | screening strategy for preventing T2DM  | + (if used less frequent screening)        |
| Kolu et al <sup>38</sup>        | Prenatal              | Risk factors for GDM including history of GDM               | gestational lifestyle intervention during pregnancy vs routine care   | -  |
| Lagerweij et al <sup>39</sup>   | Postpartum            | History of HDP  | Early preventive cardiovascular disease risk screening followed by risk-based lifestyle interventions vs no screening   | -  |
| Laanssens et al <sup>40</sup>   | Prenatal              | HDP   | Remote monitoring vs conventional care  | +  |
| Mallampati et al <sup>41</sup>  | Prenatal              | Risk factors for pre-eclampsia including history of HDP     | Low-dose aspirin prophylaxis program vs routine care  | +  |
| Marseille et al <sup>42</sup>   | Prenatal + postpartum | Risk factors for GDM including history of GDM and found GDM | Screening followed by antenatal care (diet and exercise counseling, glucose control medications and monitoring) and postpartum care (metformin or lifestyle management) vs routine care | +  |
| Moss et al <sup>43</sup>        | Prenatal              | GDM   | Treating mild GDM vs routine pregnancy care   | + (in high-income countries)               |
| Ohno et al <sup>44</sup>        | Prenatal              | GDM   | Treating mild GDM vs routine pregnancy care   | +  |
| Poncet et al <sup>45</sup>      | Prenatal              | Risk factors for GDM including history of GDM               | Screening high-risk women with 50 g OGTT vs screening all pregnant women with 50 g or 75 g OGTT   | +  |
| Simon et al <sup>46</sup>       | Prenatal              | HDP   | Administration of magnesium sulfate vs placebo  | + (in low gross national income countries) |
| Todorova-Ananieva <sup>47</sup> | Postpartum            | History of GDM  | Prophylactic program (advice of dietary regimen, reduction of body weight and lifestyle alteration) for preventing T2DM   | +  |
| van Baaren et al <sup>48</sup>  | Postpartum            | History of HDP  | Preventive screening on cardiovascular risk factors followed by subsequent antihypertension medication vs no follow-up  | +  |
| Vijgen et al <sup>49</sup>      | Prenatal              | HDP   | Induction of labor vs expectant monitoring  | +  |
| Werner et al <sup>50</sup>      | Prenatal              | Risk factors for pre-eclampsia including history of HDP     | Low-dose aspirin prophylaxis program vs routine care  | +  |
| Xydopoulos et al <sup>51</sup>  | Prenatal              | HDP   | Home blood pressure monitoring vs traditional monitoring  | +  |

Figure 1. Study framework



Note. "+" means cost-effective and "-" means not cost-effective.  
GDM indicates gestational diabetes mellitus; HDP, hypertensive disorders of pregnancy; OGTT, oral glucose tolerance test; T2DM, type 2 diabetes mellitus.

# The Cuff Kit Project

- Grant #1 from the Missouri Foundation for Health
  - Focus on equity, decreasing disparities and elevating the community voice
  - Must also partner with community organizations (not just hospitals)
  - Distributed ~3000 cuff kits to vulnerable, at-risk maternal populations
- Grant #2 from MO DHSS COVID-19 Health Equity Funding
  - Distributed ~4400 cuff kits to vulnerable, at-risk maternal populations
  - Research on efficacy underway
- Partnership with the Preeclampsia Foundation
- Distribution of blood pressure kits to postpartum birthing people with pre-eclampsia



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## The Cuff Kit™ Project Resources



### Webinars

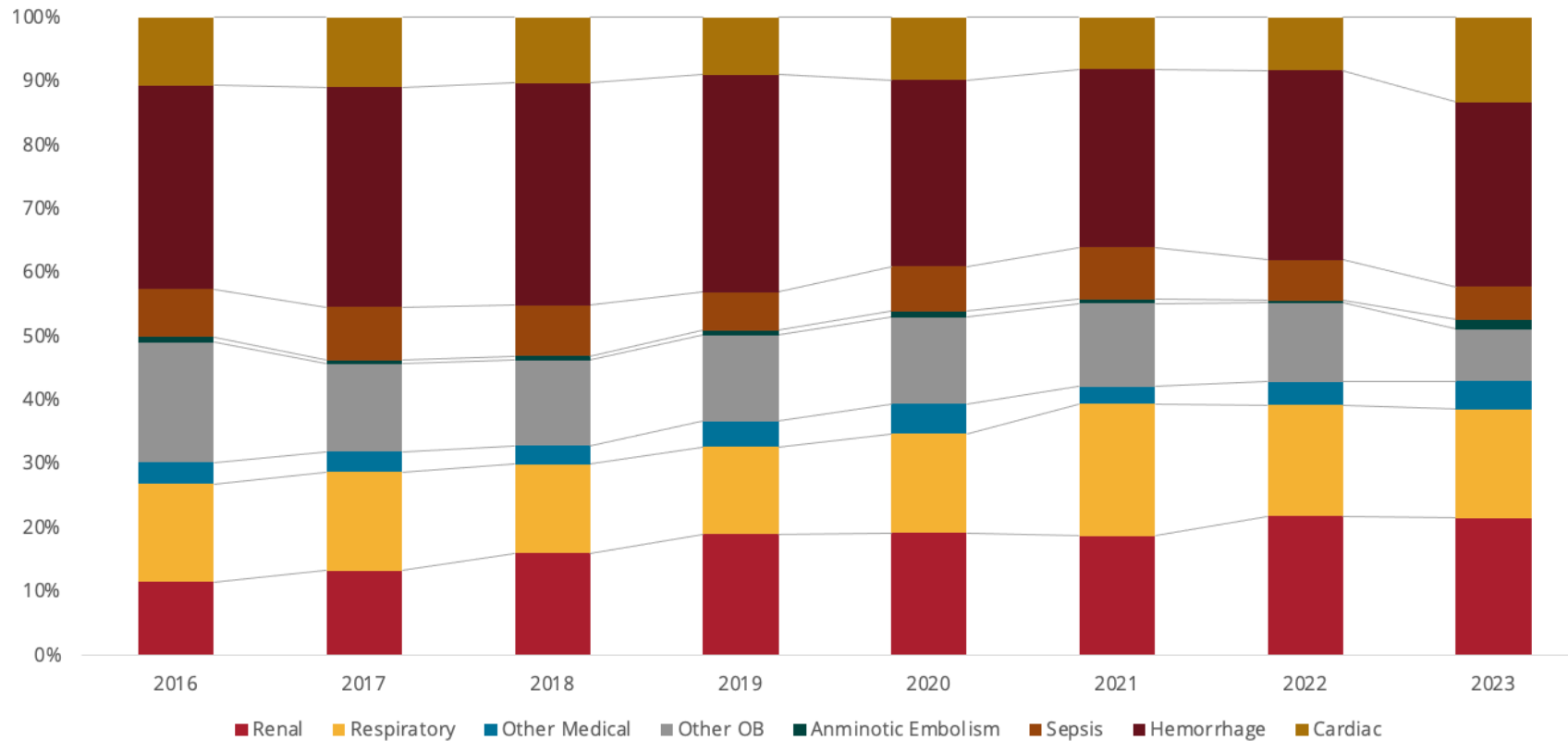
- Cuff Kit™ Connection Monthly Technical Assistance and Peer Learning Series
  - Jan. 18, 2023 — [PowerPoint](#) | [Recording](#)
  - Feb. 15, 2023 — [PowerPoint](#) | [Recording](#)
  - March 15, 2023 — [PowerPoint](#)
  - April 19, 2023 — [PowerPoint](#) | [Recording](#)
  - May 17, 2023 — [PowerPoint](#) | [Recording](#)
- Maternal Cardiovascular Disease — [PowerPoint](#) | [Recording](#) (May 22, 2023)
- Utilization of Self-Monitored Blood Pressure Kits to Support Perinatal Hypertension Management — [PowerPoint](#) | [Recording](#) (April 24, 2023)
- The Cuff Kit™ Project Logistics/Data Meeting — [PowerPoint](#) | [Recording](#) (Dec. 1, 2022)
- The Cuff Kit™ Project Informational Meeting — [PowerPoint](#) | [Recording](#) (Sept. 13, 2022)

### Resources

- [MHA CK Data Collection Spreadsheet](#) (Revised January 2023)
  - [FAQs](#) (Revised February 2023)
  - [Self-Measured Blood Pressure CPT Coding](#)
-

# SMM Events by Complication Group

SMM Events by Complication Group as Percent of Total



- 2022 Represents**
- 21% increase in overall SMM Incidence since 2016
  - Driven by
    - 130% increase in Renal
    - 37% increase in Respiratory
    - 30% increase in Other Medical

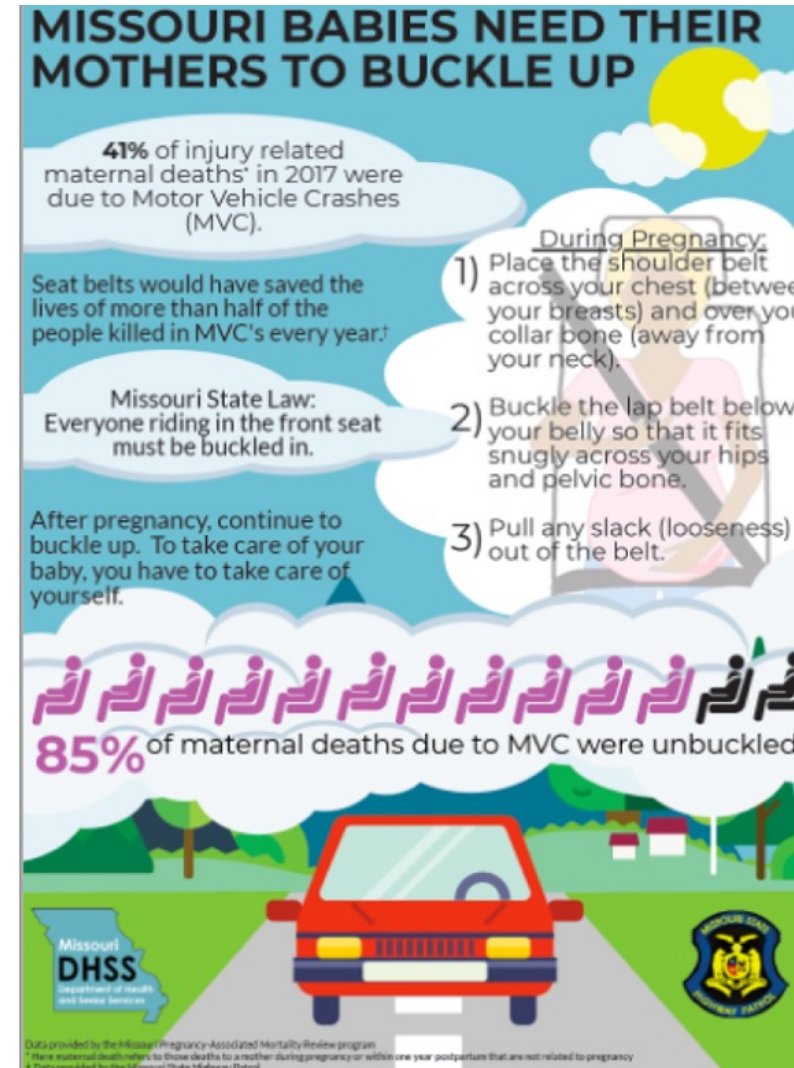
# Lessons Learned.....

- Started with low hanging fruit
- Realized quickly that we brought our own bias

**Table 4:** Question Assessing Visualization of Department of Health and Senior Services Campaign for Pregnancy-Associated Deaths due to Car Accidents

| Question                           | Answer<br>(n=1509) |
|------------------------------------|--------------------|
| Have you seen this poster before?  | 178 (11.8)         |
| If yes, at what location?          |                    |
| Online advertisement               | 57 (32.0)          |
| Billboard                          | 25 (14.0)          |
| Health center or health Department | 109 (61.2)         |
| Doctor's office                    | 101 (56.7)         |
| Bus stop                           | 23 (12.9)          |
| Other                              | 10 (5.6)           |

All data is presented in counts and percentages (%).





**Table 2**

| Question   |  | Count   | Percentage  |
|--|--|---|-------------|
| What health problems do you think can happen as a result of being pregnant (check all that apply)? | High blood pressure  | 1364 (78.5)   |             |
|  | Diabetes   | 1039 (59.8)   |             |
|  | Heart disease  | 525 (30.2)  |             |
|  | Thyroid disease  | 514 (29.6)  |             |
|  | Depression or anxiety  | 1384 (79.6)   |             |
| Are you due to   |  | Mental health problem such as addiction                     | 863 (49.7)  |
| Do you in Miss states?   |  | Blood clots   | 1098 (63.2) |
| Do you as a re   |  | Stroke or clot in brain                                     | 674 (38.8)  |
| If ye that preg  |  | Complications from surgery                                  | 1058 (60.9) |
| Do you group t pregna  |  | Infections  | 1127 (64.8) |
|  |  | Violence  | 588 (33.8)  |
|  |  | Self-inflicted  | 631 (36.3)  |
|  |  | None  | 72 (4.1)    |
|  | Which 2 conditions listed do you believe are most commonly connected with a pregnancy-related death? | Severe bleeding   | 989 (56.9)  |
|  |  | COVID-19 infection  | 68 (3.9)    |
|  |  | Infections (other than COVID)                               | 276 (15.9)  |
|  |  | Blood pressure problems                                     | 758 (43.6)  |
|  |  | Heart disease   | 67 (3.9)    |
|  |  | Blood clots   | 361 (20.8)  |
|  |  | Stroke  | 106 (6.1)   |
|  |  | Complications from surgery                                  | 359 (20.7)  |
|  |  | Accidents   | 68 (3.9)    |
|  |  | Violence  | 135 (7.8)   |
|  |  | Self-inflicted  | 110 (6.3)   |
|  |  | None of the above (do not believe any of these cause death) | 79 (4.5)    |

ity in Missouri.

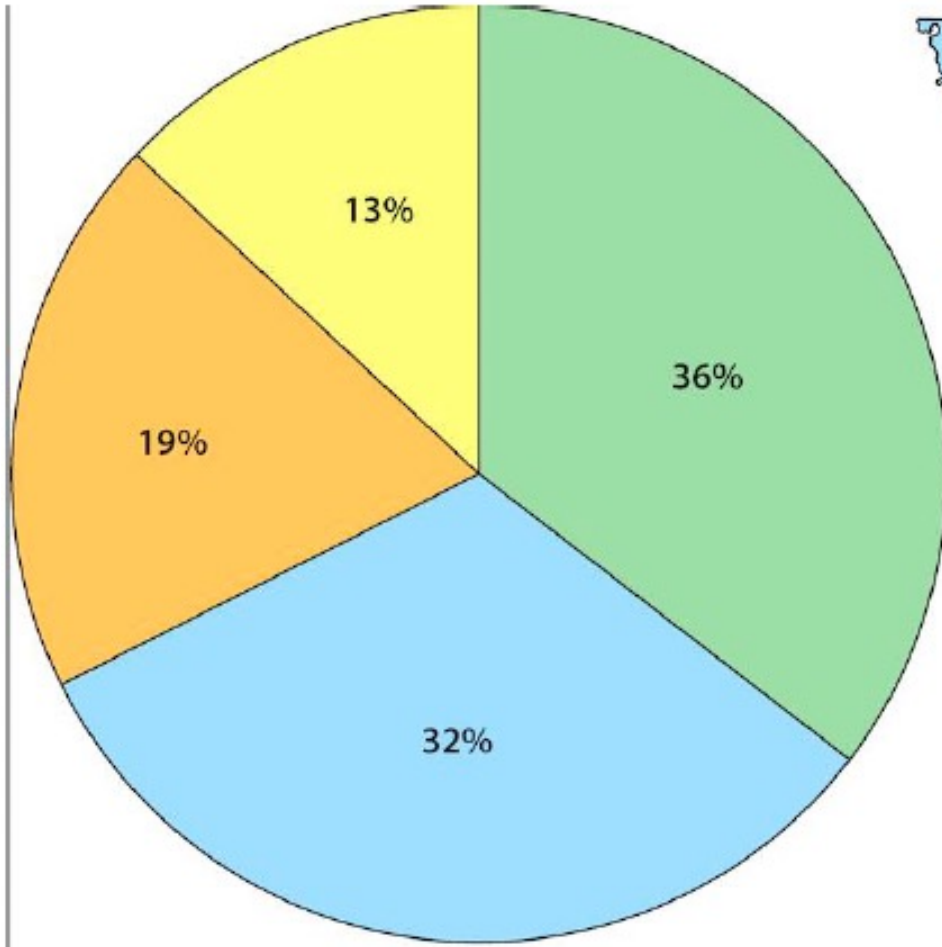
percentage)

.2)

2)

7)

.4)



| Question                                 | Age              |                  |                  |                  |                | p-value    | Race             |                   |                                  |                 |       | p-value       | Region        |               |               |       | p-value |
|--|------------------|------------------|------------------|------------------|----------------|------------|------------------|-------------------|----------------------------------|-----------------|-------|---------------|---------------|---------------|---------------|-------|---------|
|  | 18-24<br>(n=221) | 25-34<br>(n=373) | 35-44<br>(n=390) | 45-54<br>(n=289) | 55+<br>(n=235) |            | Black<br>(n=260) | White<br>(n=1353) | Am<br>In/Pac<br>Island<br>(n=30) | Other<br>(n=95) | 1     |               | 2             | 3             | 4             |       |         |
| <b>Are you aware of maternal deaths?</b> | 193<br>(87.3)    | 289<br>(77.5)    | 278<br>(71.3)    | 219<br>(75.8)    | 174<br>(74.0)  | <<br>0.001 | 208<br>(80.0)    | 1056<br>(78.0)    | 25<br>(83.3)                     | 65<br>(73.9)    | 0.583 | 441<br>(79.5) | 249<br>(74.6) | 491<br>(80.4) | 170<br>(75.2) | 0.112 |         |
| <b>Do you think deaths are high?</b>     | 129<br>(66.8)    | 162<br>(56.1)    | 158<br>(56.8)    | 101<br>(46.1)    | 90<br>(51.7)   | <<br>0.001 | 126<br>(60.6)    | 608<br>(57.6)     | 16<br>(64.0)                     | 38<br>(58.5)    | 0.801 | 251<br>(56.9) | 132<br>(53.0) | 314<br>(64.0) | 89<br>(52.4)  | 0.006 |         |
| <b>Do you know someone?</b>              | 50<br>(22.6)     | 58<br>(15.5)     | 46<br>(11.8)     | 28<br>(9.7)      | 22<br>(9.4)    | <<br>0.001 | 47<br>(18.1)     | 187<br>(13.8)     | 9<br>(30.0)                      | 12<br>(13.6)    | 0.038 | 78<br>(14.1)  | 37<br>(11.1)  | 96<br>(15.7)  | 43<br>(19.0)  | 0.056 |         |
| Family member                            | 17<br>(34.0)     | 12<br>(20.7)     | 16<br>(34.8)     | 4 (14.3)         | 5 (22.7)       | 0.419      | 11<br>(28.9)     | 40 (27.0)         | 1<br>(12.5)                      | 2<br>(20.0)     | 0.114 | 10<br>(18.5)  | 15<br>(45.5)  | 22<br>(27.2)  | 7<br>(19.4)   | 0.511 |         |
| Friend                                   | 16<br>(32.0)     | 20<br>(34.5)     | 15<br>(32.6)     | 7 (25.0)         | 6 (27.3)       |            | 14<br>(36.8)     | 39 (26.4)         | 6<br>(75.0)                      | 5<br>(50.0)     |       | 19<br>(35.2)  | 6<br>(18.2)   | 25<br>(30.9)  | 14<br>(38.9)  |       |         |
| Acquaintance                             | 8 (16.0)         | 17<br>(29.3)     | 11<br>(23.9)     | 10<br>(35.7)     | 7 (31.8)       |            | 6 (15.8)         | 46 (31.1)         | 0 (0.0)                          | 1 (10)          |       | 14<br>(25.9)  | 9<br>(27.3)   | 19<br>(23.5)  | 11<br>(30.6)  |       |         |
| Public Figure                            | 3 (6.0)          | 1 (1.7)          | 0 (0.0)          | 0 (0.0)          | 1 (4.5)        |            | 2 (5.3)          | 3 (2.0)           | 0 (0.0)                          | 0 (0.0)         |       | 1<br>(1.9)    | 1<br>(3.0)    | 3<br>(3.7)    | 0<br>(0.0)    |       |         |
| Other                                    | 4 (8.0)          | 7 (12.1)         | 2 (4.3)          | 6 (21.4)         | 3 (13.6)       |            | 4 (10.5)         | 17 (11.5)         | 0 (0.0)                          | 1 (10)          |       | 8<br>(14.8)   | 2<br>(6.1)    | 9<br>(11.1)   | 3<br>(8.3)    |       |         |
| None of above                            | 2 (4.0)          | 1 (1.7)          | 2 (4.3)          | 1 (3.6)          | 0 (0.0)        |            | 1 (2.6)          | 3 (2.0)           | 1<br>(12.5)                      | 1<br>(10.0)     |       | 2<br>(3.7)    | 0<br>(0.0)    | 3<br>(3.7)    | 1<br>(2.8)    |       |         |

**Table 3: Perceptions on Maternal Death by Race, Age and Region**

| Were you concerned about dying during pregnancy?                       | Age           |               |               |               |             | p-value | Race          |                |                         |              |       | p-value    | Region     |            |           |       | p-value |
|--|---------------|---------------|---------------|---------------|-------------|---------|---------------|----------------|-------------------------|--------------|-------|------------|------------|------------|-----------|-------|---------|
|  | 18-24 (n=221) | 25-34 (n=373) | 35-44 (n=390) | 45-54 (n=289) | 55+ (n=235) |         | Black (n=260) | White (n=1353) | Am In/Pac Island (n=30) | Other (n=95) | 1     |            | 2          | 3          | 4         |       |         |
| Not at all   | 57 (25.8)     | 104 (27.9)    | 131 (33.6)    | 127 (43.9)    | 146 (62.1)  | 0.001   | 94 (36.2)     | 516 (38.1)     | 10 (33.3)               | 32 (36.4)    | 0.037 | 219 (39.5) | 119 (35.6) | 223 (36.5) | 89 (39.4) | 0.878 |         |
| A little   | 58 (26.2)     | 115 (30.8)    | 117 (30.0)    | 80 (27.7)     | 38 (16.2)   |         | 65 (25.0)     | 379 (28.0)     | 11 (36.7)               | 20 (22.7)    |       | 143 (25.8) | 98 (29.3)  | 173 (28.3) | 60 (26.5) |       |         |
| Somewhat   | 49 (22.2)     | 79 (21.2)     | 80 (20.5)     | 57 (19.7)     | 35 (14.9)   |         | 52 (20.0)     | 263 (19.4)     | 4 (13.3)                | 19 (21.6)    |       | 110 (19.8) | 60 (18.0)  | 122 (20.0) | 44 (19.5) |       |         |
| Very   | 33 (14.9)     | 42 (11.3)     | 32 (8.2)      | 16 (5.5)      | 12 (5.1)    |         | 19 (7.3)      | 117 (8.6)      | 5 (16.7)                | 12 (13.6)    |       | 47 (8.5)   | 34 (10.2)  | 49 (8.0)   | 23 (10.2) |       |         |
| Extremely  | 24 (10.9)     | 33 (8.8)      | 30 (7.7)      | 9 (3.1)       | 4 (1.7)     |         | 30 (11.5)     | 78 (5.8)       | 0 (0.0)                 | 5 (5.7)      |       | 36 (6.5)   | 23 (6.9)   | 44 (7.2)   | 10 (4.4)  |       |         |
| <b>What time period do you believe has the highest risk for death?</b> |               |               |               |               |             |         |               |                |                         |              |       |            |            |            |           |       |         |
| Early pregnancy  | 25 (11.3)     | 36 (9.7)      | 50 (12.8)     | 48 (16.6)     | 37 (15.7)   | 0.042   | 31 (11.9)     | 155 (11.5)     | 5 (16.7)                | 12 (13.6)    | 0.805 | 55 (9.9)   | 41 (12.3)  | 74 (12.1)  | 32 (14.2) | 0.191 |         |
| Mid pregnancy  | 9 (4.1)       | 18 (4.8)      | 25 (6.4)      | 14 (4.8)      | 15 (6.4)    |         | 18 (6.9)      | 59 (4.4)       | 2 (6.7)                 | 3 (3.4)      |       | 26 (4.7)   | 15 (4.5)   | 25 (4.1)   | 16 (7.1)  |       |         |
| Late pregnancy   | 22 (10.0)     | 36 (9.7)      | 43 (11.0)     | 32 (11.1)     | 31 (13.2)   |         | 22 (8.5)      | 151 (11.2)     | 2 (6.7)                 | 11 (12.5)    |       | 63 (11.4)  | 35 (10.5)  | 58 (9.5)   | 29 (12.8) |       |         |
| During labor (before pushing)  | 21 (9.5)      | 44 (11.8)     | 43 (11.0)     | 34 (11.8)     | 17 (7.2)    |         | 26 (10.0)     | 134 (9.9)      | 3 (10.0)                | 7 (8.0)      |       | 61 (11.0)  | 22 (6.6)   | 60 (9.8)   | 26 (11.5) |       |         |
| During delivery (while pushing)  | 107 (48.4)    | 166 (44.5)    | 174 (44.6)    | 121 (41.9)    | 86 (36.6)   |         | 118 (45.4)    | 565 (41.8)     | 15 (50.0)               | 35 (39.8)    |       | 225 (40.5) | 162 (48.5) | 264 (43.2) | 81 (35.8) |       |         |
| After delivery in the hospital   | 17 (7.7)      | 40 (10.7)     | 34 (8.7)      | 14 (4.8)      | 25 (10.6)   |         | 26 (10.0)     | 146 (10.8)     | 2 (6.7)                 | 10 (11.4)    |       | 71 (12.8)  | 25 (7.5)   | 68 (11.1)  | 20 (8.8)  |       |         |
| After discharge from hospital  | 1 (0.5)       | 10 (2.7)      | 3 (0.8)       | 5 (1.7)       | 7 (3.0)     |         | 5 (1.9)       | 56 (4.1)       | 0 (0.0)                 | 2 (2.3)      |       | 22 (4.0)   | 9 (2.7)    | 24 (3.9)   | 8 (3.5)   |       |         |
| After postpartum visit   | 2 (0.9)       | 4 (1.1)       | 5 (1.3)       | 5 (1.7)       | 0 (0.0)     |         | 1 (0.4)       | 24 (1.8)       | 0 (0.0)                 | 2 (1.7)      |       | 10 (1.8)   | 7 (2.1)    | 7 (1.1)    | 2 (0.9)   |       |         |
| None of the above  | 17 (7.7)      | 19 (5.1)      | 13 (3.3)      | 16 (5.5)      | 17 (7.2)    |         | 13 (5.0)      | 63 (4.7)       | 1 (3.3)                 | 6 (6.8)      |       | 22 (4.0)   | 18 (5.4)   | 31 (5.1)   | 12 (5.3)  |       |         |

MOTTO

Let the welfare  
of the people be  
the supreme law

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