Dynamics of pregnant people's trust in providers on maternal health outcomes in Northern Plains Native American communities

Georgia (Ning-Yuan) Liu[1], Jose Cruz Medina[2], Erin Stringfellow[1], Mohammad S. Jalali[1], Arielle R. Deutsch[2]

[1] Institute for Technology Assessment, Massachusetts General Hospital, Harvard Medical School

[2] Avera Research Institute

Abstract

Maternal Morbidity remains a significant public health challenge in the United States, with disproportionally high rates among marginalized populations, including Native Americans and Black communities, and low-income, underserved, and rural areas. While previous research focused on increasing availability and access to care, trust in providers remains a critical key determinant when it comes to seeking prenatal care and engagement with the healthcare systems. In this study, we follow a community-based system dynamics approach to clarify specific ways that trust is a necessary central component for promoting perinatal care utilization and quality, considering pregnant people, providers, and health systems. Using a stock-and-flow model we identify six key feedback loops that drives the level of pregnant people's trust in providers over time. Implications for the drivers of maternal health outcomes, improved maternal care access, and future research are discussed.

Introduction

The United States continues to have the highest rates of Maternal Morbidity(MM; unexpected pregnancy and childbirth-related conditions and outcomes resulting in short or long-term negative health consequences among comparable high-income countries (Declerq & Laurie, 2021). Within the U.S. poor maternal outcomes are disproportionately higher for racial/ethnic minority groups (e.g., Native American or Black communities) (Howell, 2018; Somer et al., 2017), people in poverty / underinsured or uninsured (Geddes-Barton, 2025; Tipre, 2022), people living in rural, remote, or deprived communities (Dimes & Dimes, 2020; Kozhimannil, 2019). These challenges are often clustered to create a complex matrix of barriers for people that who experience multiple intersections of disadvantage (Interrante, 2022). The consensus clear that gaps in perinatal healthcare availability, accessibility, and quality play important roles in explaining and maintaining existing MM rates and disparities (Alper et al., 2021; Carmichael, 2022; Filippi, 2018). Although the rise of a multitude of social determinants of health that contribute to MM (Neerland, 2024; Wang, 2020), efforts to address MM have predominantly focused on improving perinatal healthcare (House, 2022; Katon et al., 2021; Office of the Surgeon General (OSG), 2020). Specifically, this involves strategies to increase pregnant people's access to and use of perinatal healthcare (Shah et al., 2018; Walton, 2021) and improve the quality of the healthcare they receive (Ahn, 2020; Collier & Molina, 2019; Haley & Benatar, 2020).

Issues surrounding pregnancy and maternal healthcare are contextualized by a unique time period that includes rapid and evolving changes in one's health and health needs. Medical recommendations for adequate prenatal healthcare includes both early initiation of prenatal care

(prior to 4 months),and at least 8 prenatal visits over the course of one's pregnancy (Peahl & Howell, 2021) (for low-risk pregnancies – i.e., pregnancies that involve no active complications that may increase risk of adverse pregnancy outcomes). A consistent schedule of prenatal visits is important to address maternal health issues that can arise during pregnancy, such as unexpected onset of adverse outcomes (e.g., sepsis), and chronic adverse conditions (e.g., gestational diabetes). Unfortunately, 25% of pregnant people do not attain adequate prenatal care in the US (Peristats, 2024), although this number greatly obscures disparities in which the populations at disproportionately higher risk for MM are have proportionately lower rates of adequate prenatal care (Howell, 2018).

A variety of barriers have been identified as important for initiation and continuation of prenatal care use across pregnancy (e.g., transportation/distance care (Holcomb, 2021; Maldonado, 2020; Phillippi et al., 2014), competing obligations (Johnson, 2011; Kitsantas et al., 2012), quality of health insurance (Meyer, 2016; Phillippi et al., 2014), knowledge of pregnancy (Grand-Guillaume-Perrenoud et al., 2022)). Although the majority of barriers discussed are "external" (barriers that reduce availability and access to care), maternal health trust (e.g., distrust and mistrust) is a commonly discussed barrier (Conteh, 2022) that is "internal". Trust also plays multiple roles as a prenatal care barrier. Not only does distrust/mistrust reduce motivation and desire to seek prenatal healthcare (regardless of availability or access) (Phillippi & Roman, 2013), but it also inhibits pregnant people from actively engaging in the prenatal care process (e.g., communicating, confiding, and being vulnerable with providers about personal health, health needs, and care preferences) (Dalton, 2021).

Trust as a barrier is especially relevant for the populations that are at disproportionate MM risk, as these populations often experience systemic and structural marginalization and mistreatment. For example, racial/ethnic minority pregnant people experience poorer care quality (Ibrahim, 2022; Katon et al., 2021; Vedam, 2019; Wishart, 2021), including higher coercion and negative, biased and discriminatory patient-provider interactions (Attanasio & Kozhimannil, 2015; Howell, 2018; Logan, 2022), lower shared decision making (Attanasio et al., 2018), and negative health consequences due to poorer care (e.g., untreated medical conditions due to providers ignoring patient needs (Vayo, 2025)). Furthermore, health care experiences for marginalized and stigmatized groups often intersect with other institutions that are mired in systemic oppression, such as child welfare, criminal-legal, or social service institutions (Bellerose et al., 2022; Stone, 2015). Finally, mistrust may be longstanding and intergenerational. Many historically oppressed groups such as Native American communities harbor well-justified mistrust of medical institutions (particularly those associated with government-related care) given a considerable history of reproductive mistreatment (e.g., forced sterilization as recently as the 1970's (Conteh, 2022; Torpy, 2000)), enduring discrimination and oppression (Findling, 2019), and historical trauma (Maxwell, 2022). The unique contexts of Native American healthcare also play a role in further reducing trust and promoting mistrust for providers, health systems, and policies, given additional tribal/federal policies add complexity for navigating services on and off-reservation lands, and a chronically underfunded and under-resourced Indian Health Service system (Kruse, 2022; National Academies of Sciences, E. and Medicine, 2022; Rights, 2021).

Taken together, these experiences manifest into trust as a barrier that reduces people's motivation to seek and actively engage with prenatal care (Phillippi & Roman, 2013; Vayo, 2025). Efforts to increase pregnant peoples' trust in providers and prenatal care have emphasized the importance of each prenatal visit as an "opportunity to build trust" (Nijagal, 2021), especially

for pregnant people who do not regularly engage in healthcare for their personal health (e.g., wellness visits). Enhancing these opportunities has involved perinatal workforce improvement, e.g., increasing education for providers to reduce bias and increase culturally appropriate care (Haley & Benatar, 2020), and increasing perinatal workforce diversity to better reflect the racial, ethnic, geographic, and lived experience of pregnant people seeking care (Conteh, 2022). Other initiatives have focused on improving quality of care in ways that facilitate trust, such as person-centered approaches (Nijagal, 2021) and enhancing midwifery, doula, and patient advocacy models (Grand-Guillaume-Perrenoud et al., 2022; Haley & Benatar, 2020; Vayo, 2025).

However, understanding these approaches often ignores the broader contexts in which each prenatal visit between a provider and a pregnant person is nested within time; utilization of care can be an ongoing and dynamic behavior over the duration of a person's pregnancy, as both initiation and continuation of prenatal visits are important. Further, discussion of these efforts can often ignore the critical contexts of both the healthcare institution (clinic, system) itself, and the community of which the healthcare institution is a part of. The current study uses a community based system dynamics approach (Hovmand, 2014) to illustrate an important aspect of trust beyond individual visits; building trust between a provider and a pregnant person over time via continuity of the relationship. This aspect is crucial for. Our model emphasizes a community and an area for which this trust is crucial; Native American communities across a high-rural and underserved area in the Northern Plains, in which the few options for prenatal care (maternal health deserts) are often marked by high provider turnover and shortages.

Materials and Methods

The current model was developed as part of an ongoing community-based system dynamics project to address maternal morbidity disparities for Native American and low socioeconomic status communities within a Northern Plains region of the United States that includes both a small metropolitan area and neighboring rural towns and Native American reservations. The project focuses on identifying key barriers and facilitators as leverage points to improve utilization and quality of perinatal health care. The study includes an iterative synthesis approach to model building through multiple strategies for data collection and validation that involves formal community model building sessions (interviews, group-based modeling sessions), monthly meetings with two community-specific advisory boards, and informal community conversations with key informants.

The current model is based on transcriptions of a group-based modeling session and follow-up interview, and 6 additional interview sessions. The modeling session included 6 local community members with personal or professional experience in maternal and perinatal care (e.g., perinatal health care providers, culturally grounded maternal health / healthcare advocates, maternal home visiting providers), while interviews included people with experience in prenatal healthcare, managers of social service programs for maternal health, maternal health-focused nonprofits, and culturally-grounded home visiting program providers. Formal modeling and interview sessions involved modelers visually diagraming the responses of interviewees or conversation between group members as a strategy for facilitating additional prompts for developing feedback loops.

These sessions involved identifying barriers and facilitators affecting maternal healthcare access and exploring their impact on maternal health outcomes. Participants discussed the lived experiences of pregnancy and shared perspectives on navigating the maternal healthcare system,

the role of social support networks, and the broader cultural and structural factors shaping their healthcare experiences. Providers and professionals shared their perspectives on navigating the maternal healthcare system from a professional standpoint, describing the challenges they encountered when assessing and treating patients. Their insights provided a deeper understanding of systemic constraints, such as workforce limitations, cultural differences, and communication barriers between providers and patients, all of which influence access to maternal healthcare.

Interviews were conducted in English, and all interviewers were trained in qualitative research methods to facilitate the collection of specific, detailed narratives. The sessions were audio-recorded and transcribed verbatim for analysis. The transcripts were then coded using a mixed-method approach for group model-building, following established causal structure parsing methodologies (Newberry & Carhart, 2024). Open and axial coding were applied to identify key variables and causal relationships, which were then used to construct mental maps reflecting the participants' perspectives on maternal healthcare access. Table 1 summarizes the cause-and-effect variables and their causal relationship from the qualitative interviews and analysis, along with supporting quotes. To enhance the reliability of the coding process and minimize subjective bias, two independent coders analyzed the transcripts separately before reconciling any discrepancies through discussion and mutual agreement.

Beyond the formal workshop, additional qualitative data were integrated into the modeling process to provide a more comprehensive understanding of access to maternal healthcare. The project modelers met monthly with two community advisory boards (representing two broad communities within the region) to iteratively validate the developing models. Board members (n=7) include similar representativeness across maternal health care provision and cultural care/community care advocacy areas. Furthermore, modelers also engaged in informal discussions in multiple community settings further refined the model, mainly through interviews conducted in different locations where participants consistently highlighted patients' trust in providers as a central issue. While these discussions did not follow the structured model-building format, they reinforced and expanded upon key themes, strengthening the reliability and applicability of the findings. This approach ensured that the final system representation accurately captured community perspectives on maternal healthcare access.

Table 1 Example of causal structures identified in qualitative analysis

Cause	Effect	Relationship	Quote
Building trust with prenatal provider	Pregnant people's trust prenatal provider	Increases (+)	"And you got two white girls showing up, and they're like, why would I trust and it is true. And I'm just calling it like it is. But we try to say, my job is only to take care of you. Have a healthy mom and healthy baby. The end. But why would they trust me? They don't know me."
Maternal healthcare system capability	Community-level infrastructure and resources to support health	Increases (+)	"The healthcare staff] were all -- they understand us. They were here. And then we got good care. And then slowly, it has just kind of, like, gone downhill. And it's not because of the providers, but it's because maybe we can't keep them here."

Pregnant people's trust prenatal provider	Pregnant people's perception of prenatal care quality	Increases (+)	"I also think if you build trust during the time of the perinatal visit, that will carry on to the life of that child and for generations to come because all women make decisions on health care for their families. So you have an opportunity to either make or break those relationships."

Results

The complete stock-and-flow diagram is presented in Figure 1. In this diagram, boxes represent accumulations or stocks (state variables), while double lines with valves denote flows or rates of change. Clouds indicate sources or sinks, representing the material and informational boundaries of the system. Arrows signify causal relationships between auxiliary variables (also known as converters), whereas double-lined links represent delays or lagged effects. A plus sign (+) indicates a positive relationship between cause and effect, whereas a negative sign (−) denotes a negative relationship. Major feedback loops are labeled with an "R" prefix for reinforcing loops and a "B" prefix for balancing loops.

The model includes one primary stock or state variable (*pregnant people trust in their prenatal provider*). Additionally, delays are incorporated to reflect the lagged effects of one variable on another. For example, there is a time lag between changes in *community-level infrastructure and resources to support health* and *health of community members*. The model captures six primary feedback mechanisms (R1-R3 and B1-B3 in Figure 1) that illustrate pregnant people's trust in the healthcare system influences healthcare system capability and, in turn, affects maternal health outcomes, including maternal morbidity and mortality. The operational definitions of the variables are provided in Appendix Table A1.

The first reinforcing feedback loop in the model illustrates how increased trust in healthcare providers encourages more frequent care-seeking behavior (R1 in Figure 1). As patients seek care more frequently, they develop stronger relationships with their providers, leading to an accumulation of trust. This increased trust further and reinforces patient's willingness to engage with the maternal care service. As a reinforcing feedback loop, reinforcing trust through engagement can form a 'virtuous' or 'virtual' cycle. For example, greater trust leads to more positive care experiences, strengthening confidence in the system and increasing the likelihood of seeking care in the future, thus forming a virtuous cycle. However, this feedback loop can also function in the opposite direction, creating a vicious cycle. If trust in the healthcare system declines—potentially due to inadequate service quality, negative patient experiences, or systemic inefficiencies—fewer positive care interactions occur. This reduction in trust diminishes patients' motivation to seek care, leading to fewer opportunities for patient-provider engagement and further trust depletion over time.

The balancing feedback loop (B1 in Figure 1) counteracts this reinforcing loop through the healthcare system's response to increased care-seeking. As *patients' trust in their healthcare provider* increases, more patients who *seek care*, leading to an increase in the provider's workload. If staffing levels do not adjust accordingly, excessive workloads may lead to *burnout* and *staff turnover*, disrupting the continuity of care. This disruption reduces the likelihood that patients consistently see the same provider, ultimately weakening trust in the system and reversing the initial trust building process. The model assumes that staffing levels remain fixed

in the short term, as the rate of hiring is significantly slower than the rate at which patients build trust and seek care more frequently. If healthcare administrators do not anticipate and respond to rising patient demand, staff may become overburdened, leading to decreased quality of care and lower patient satisfaction. Over time, increased staff turnover may further reduce healthcare system capacity, accelerating the depletion of patient trust.

A second reinforcing mechanism in the model relates to actual maternal health outcomes, particularly *maternal morbidity mortality*, in response to *seeking and receiving prenatal care*. Higher frequency of received prenatal visits reduces the gap between the *frequency of prenatal visits* a patient receives, and the *frequency of visits needed* based on one's health status (R2 in Figure 1). As this gap diminishes, *maternal morbidity and mortality* rates decrease, which in turn strengthens *trust in the maternal healthcare system* and further encourages *care-seeking* behavior. This dynamic creates a reinforcing cycle that improves maternal health outcomes over time. For example, when patients engage in routine prenatal checkups, receive adequate maternal education on self-care during pregnancy, and are screened for health risks, the likelihood of high-risk pregnancies decreases. This effect underscores the importance of preventive care in reducing the long-term burden on the healthcare system by minimizing the need for intensive medical interventions.

Following, the system's capability in response to workers turnover and burnout is explained in the balancing loop (B2 in Figure 1). As prenatal provider *burnout* increases, *turnover* rates rise, leading to a decline in the overall *maternal healthcare system capability*. This reduction in system capacity places additional strain on the remaining workforce, further exacerbating burnout and perpetuating a self-reinforcing cycle of workforce depletion. As one interviewee stated, "We don't have trained staff and good medical doctors in the community to provide care because they are burnt out and they leave, which reduces their incentive to stay in the area. And the fewer people that stay, the fewer resources are funded in the community."

In addition to these dynamic mechanisms, another positive feedback loop emerges related to the capability of the maternal healthcare system to support community health (R3 in Figure 1). Improving *maternal healthcare system capability* enhances community-level infrastructure and resources, which, over time, contributes to overall improvements in the local population health. As the general *health of community members* improves, the need for additional prenatal checkups beyond the standard recommended visits decreases. This relationship suggests that a well-supported healthcare system not only benefits maternal health outcomes directly but also reduces the demand for extra medical services by fostering better baseline health conditions across the community.

Lastly, the healthcare system's response to the accessibility of prenatal care is reflecting in a balancing loop (B3 in Figure 1). An increase in the *capability of the maternal healthcare system* leads to a *higher frequency of received prenatal visits*. This, in turn, *reduces gaps in prenatal care*, leading to lower *maternal morbidity and mortality rates*, greater *trust in the healthcare system*, and an increase in *care-seeking behavior*. However, as more patients seek care, healthcare providers experience increased *workloads*, contributing to *burnout* and higher staff turnover. Over time, this strain on the system results in a decline in overall healthcare system capacity, limiting its ability to sustain improvements in prenatal care accessibility. This balancing effect highlights the challenge of maintaining a robust maternal healthcare system while addressing workforce sustainability and resource constraints.

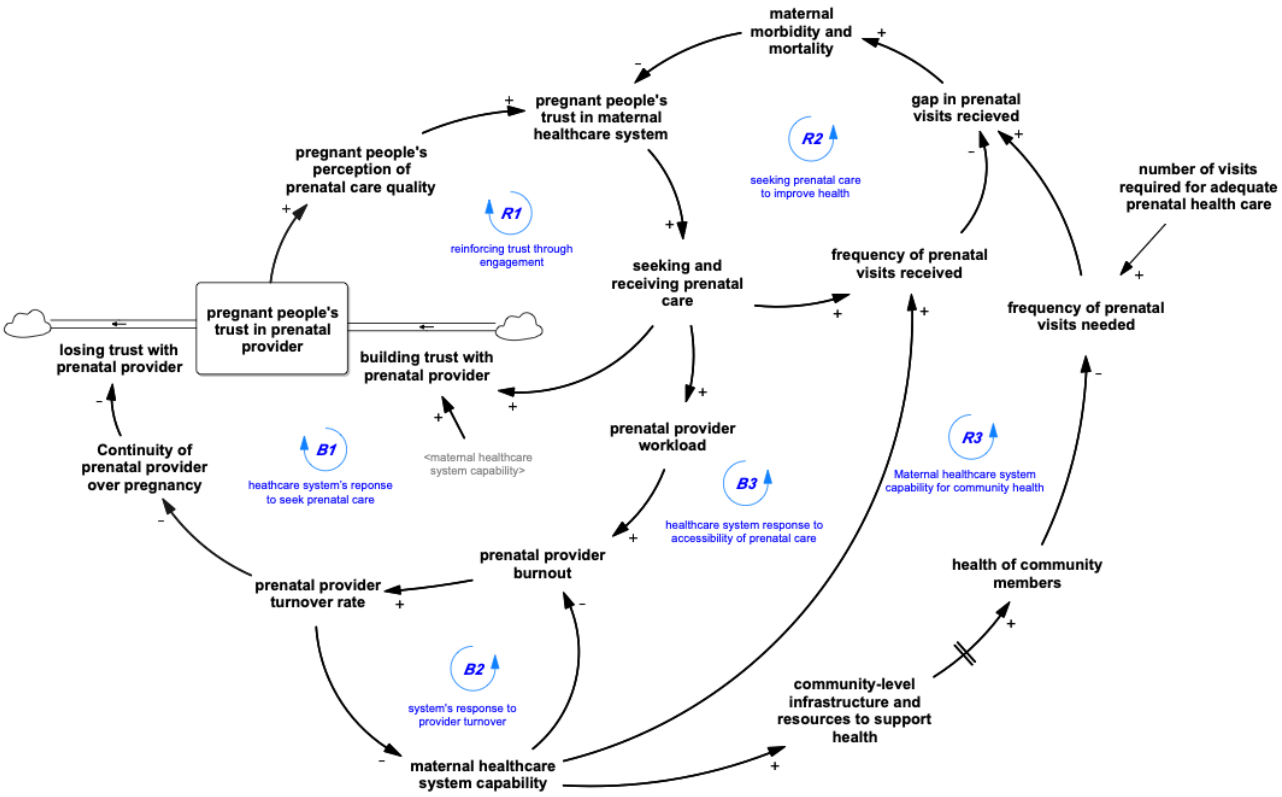

Figure 1. Stock and flow representation for the model on how patient's trust in the healthcare system influences healthcare system capability and maternal mortality and morbidity

Discussion

This study examines the role of trust as a key determinant in prenatal healthcare utilization, particularly within communities facing systemic and structural barriers to accessing care. The findings extend previous research by demonstrating how trust in the maternal healthcare system accumulates and depletes over time through care-seeking behavior relationships with providers, and broader maternal healthcare system capacity. Our stock-and-flow model shows that trust is not a static factor influencing a single decision to seek prenatal care, but rather an ongoing and evolving construct, which is affected by healthcare system constraints such as provider turnover, burnout, and infrastructure capacity.

While previous studies have emphasized the availability and accessibility of care in reducing disparities among marginalized populations in maternal care settings, our findings point out the equally critical role of "trust" in shaping both care-seeking behavior and the engagement with prenatal care. Our stock-flow diagram provides several key insights for maternal healthcare interventions. First, leverage points for improving prenatal care utilization must go beyond increasing access and affordability—patients' trust in providers must be addressed as a dynamic component that evolves over time. Efforts to create continuity of care within communities (e.g., expanding midwifery services, implementing Indigenous-led maternal care models) that can strengthen long-term trust between providers and patients are essential to reducing reliance on short-term, external providers, such as travel nurse who may disrupt continuity of care.

Second, our model highlights that maternal healthcare workforce stability is a fundamental determinant of trust. High provider turnover—which disproportionately affects vulnerable and underserved areas—not only limits access to care but also disrupts the continuity of care that is necessary for building trust over time. Policies should prioritize improving working conditions in these regions to enhance provider retention and reduce burnout to ensuring long-term sustainability of maternal healthcare services.

Third, our findings suggest that maternal healthcare cannot be viewed in isolation from broader community-level healthcare infrastructure. The reinforcing feedback loop (R3) demonstrates how investments in healthcare system capacity have cascading effects on overall community health. Prior research has shown healthcare infrastructure is critically linked to reduced negative birth outcomes, however, healthcare infrastructures continue to be disproportionately weak in rural areas or for indigenous-focused healthcare systems (e.g., IHS) (Collier & Molina, 2019; Interrante et al., 2025; Leider et al., 2020). Therefore, interventions should focus not only on individual-level engagement strategies but also on sustainable, long-term investments in maternal healthcare systems and community-based resources.

While the system dynamics modeling approach is powerful in capturing the complexity and dynamics of patient's trust in provider and its impact on maternal morbidity and mortality over time, several limitations should be acknowledged. First, the model was developed using qualitative data from a specific population, which may limit its generalizability to other regions. Second, the small sample size of participants in the modeling session means that the structure of the model could change significantly if additional perspectives were incorporated.

Third, "trust in prenatal provider" and "perception of prenatal care quality" are nebulous constructs, making it difficult to capture exact causal relationships between them. There may be additional core causal links or feedback loops that were not fully captured in this study. Fourth, the model has not yet been quantitatively simulated with real-world data, meaning it remains a conceptual framework rather than an empirically validated system. Future research should incorporate longitudinal data and quantitative simulation modeling to test different scenarios and strategies. For instance, the model could evaluate how provider workforce retention policies, trust-building interventions, and system-level changes influence maternal health outcomes over time.

This study provides a high-level understanding of how patient trust in providers functions as a dynamic factor in prenatal care engagement, where trust serves as a key mechanism that prompts patients to seek care in the first place. Our findings show that efforts to improve maternal healthcare must go beyond increasing access and availability to address the structural factors shaping workforce stability, continuity of care, and provider retention. By integrating these qualitative insights from patient experiences, healthcare systems can develop more targeted strategies to break cycles of mistrust and improve long-term maternal health outcomes.

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Appendix

Table A1. Operational Definitions for Variables

No	Variable Name	Definition
1	Building trust with prenatal provider	Pregnant people developing a relationship with a specific prenatal care provider based on trust
2	Community-level infrastructure and resources to support health	The overall formal and informal resources that cumulatively support health and wellbeing for community members
3	Continuity of prenatal provider over pregnancy	The consistency and continuity of seeing the same prenatal provider across all prenatal visits during one's pregnancy
4	Frequency of prenatal visits needed	The number and rate (timing) of prenatal visits that a pregnant person will need to effectively evaluate, mitigate, or address health issues that can result in negative outcomes over the course of their pregnancy.
5	Frequency of prenatal visits received	The number and rate (timing) of prenatal visits that a pregnant person receives over the course of their pregnancy
6	Gap in prenatal visits received	The difference between the frequency of prenatal visits needed and received over the course of one's pregnancy
7	Health of community members	The overall health (e.g., physical, mental) of community members (e.g., including people who will get pregnant, are pregnant, or have been pregnant), such that lower health indicates a higher proportion of negative health conditions that can increase risks and rate of negative birth outcomes and maternal morbidity
8	Losing trust with prenatal provider	Pregnant people losing trust in the prenatal provider who is providing them care during a prenatal visit, due to changing a provider (which would require trust to be built up again).
9	Maternal healthcare system capability	The overall capability of a health care system to support maternal health through their available infrastructure related to supporting a workforce (e.g., training, staffing) and addressing health issues (e.g., capacity and infrastructure to handle conditions and needs)
10	Maternal morbidity and mortality	Short and long term negative health outcomes that result from being pregnant and giving birth (morbidity), including death (mortality)
11	Number of visits required for adequate prenatal health care	Adequate prenatal care utilization based on the recommended schedule of visits over the course of one's pregnancy, for low risk pregnancies. Operationalized here using Kotelchuck's index of initiating prenatal care prior to the 4th month of pregnancy and meeting 80% of the number of expected prenatal visits based on medical guidelines.
12	Pregnant people's perception of prenatal care quality	Pregnant people's perception of the quality of the prenatal care (visit) that they received (e.g., how they were treated by their provider, how much they felt their provider was able to address their health needs).
13	Pregnant people's trust in maternal healthcare system	Pregnant people's trust in the overarching system of maternal healthcare (e.g., the structures of the system, including clinic, services, procedures, and staff)

14	Pregnant people's trust in prenatal provider	Pregnant people's trust in a specific prenatal provider that they see during a prenatal care visit
15	Prenatal provider burnout	Negative mental and physical outcomes as a consequence of job-related stress and strain experienced by prenatal care providers; e.g., fatigue, frustration, challenges with job performance, cynicism, and resentment
16	Prenatal provider turnover rate	How often people leave or are replaced by others in a specific prenatal provider position in a clinic
17	Prenatal provider workload	The amount of work that a prenatal provider is required to do to provide care – e.g., the number of people they see and the amount of time and effort they are required to spend on each person to address their needs
18	Seeking and getting prenatal care	Pregnant people scheduling and going to prenatal care visits