

FOSTERING LIVABLE COMMUNITIES FOR BIRTHING PEOPLE

A PLATFORM FOR DATA-DRIVEN INVESTMENT IN THE
WELLBEING OF MOTHERS

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EXECUTIVE SUMMARY

Alarming data has emerged in recent years showing that people living in the United States today are more likely to die in childbirth than their own mothers were—particularly if they are Black or Indigenous.¹

Systemic racism and gender oppression are intersecting root causes of the inequity, and are particularly evident in the widespread patterns of disinvestment from Black and Brown neighborhoods that heighten displacement risk, exacerbate stress, undermine community health, lead to worse access to quality healthcare, and result in poorer health outcomes.

We believe there is a significant opportunity to improve maternal health at the local, community level. Nonetheless, birthing people are seldom centered in local planning, policymaking or programming. In this work, we aim to ensure the needs of birthing people are locally visible and locally addressed.

The Delivery Decisions Initiative (DDI) at Ariadne Labs developed the Maternal Wellbeing City Dashboard as a part of the Safer Childbirth Cities Initiative. We provide a visual display of data and narrative frames that haven been prioritized by a cross section of stakeholders that represent birth workers, community advocates, elected officials, and experts in public health and urban planning. In developing the dashboard, we aimed to address the conditions that make cities livable for birthing people. This stakeholder-informed process was anchored in:

- 1) **Potential impact** on maternal health demonstrated in the public health and urban planning literature,
- 2) **Feasibility** of action at the local level from professional guidance and practice, and
- 3) **Measurability** in publicly available, national datasets.

In pilot testing from March-May 2021, 14 policy advocates, elected officials, civil servants, and direct service providers from New York, Pittsburgh, and Tulsa validated the feasibility and acceptability of using the dashboard for engaging local stakeholders and building knowledge about maternal health and wellbeing. Our pilot testing indicated that the Maternal Wellbeing City Dashboard is feasible to use and acceptable to users across different types of cities and roles.

The testing further expanded our understanding of the types of users that may benefit from the dashboard. In addition to our initial users types of elected officials, policy advocates, direct service providers, and civil servants, testers also suggested that the dashboard could add value for a range of community-based organizations and advocates, students, educators, researchers, media, and community members themselves, especially birthing people, their partners, and families.

Testers reported the primary values of the dashboard are in building knowledge and enabling local engagement in opportunities to improve maternal wellbeing. The broad resonance of these values across roles and cities was rooted in the different ways the dashboard meets people where they are in terms of their pre-existing knowledge of and interest in maternal health. For people new to maternal health and advocacy, the dashboard can be a valuable tool for building knowledge about the issues that face birthing people in their community and ways to start to help. For community advocates from other fields, the dashboard can connect maternal health with their local priorities to center birthing people in their work and coalitions. For maternal health advocates and practitioners, the dashboard can provide data and context to uplift their experiences and be a roadmap to link their expertise and actions with other local advocates and stakeholders.

The pilot testing process validated the opportunity to scale up the dashboard capabilities nationally. It also surfaced adaptation opportunities to further improve the utility of the dashboard for enabling local maternal health advocacy.

Based on the strategic aims of the project, the values reported by testers, and the ease of implementation on the web developer platform in future iterations, we recommend prioritizing:

- > **Navigation and orientation:** Orienting users to the dashboard and navigation to facilitate ease of use for intended use cases.
- > **Flexibility with data interaction:** Providing more flexibility when interacting with the data (e.g. comparisons, rankings, trends in the data over time, custom geographic units).
- > **Local customization and community building:** Creating capability to add community discussion, local data, and resources specific to your city (e.g. data from local hospitals or CBOs, links to local initiative or organizations related to domains).

Collectively these opportunities could support use of the dashboard as a digital organizing tool, connecting users of the dashboard to augment and mobilize collective impact for maternal health in cities in a sustainable, data-informed way.

INTRODUCTION

The Delivery Decisions Initiative is a core research and social impact program of Ariadne Labs that envisions a world in which every person can choose to grow their family with dignity. As a joint center for health systems innovation based at an academic hospital and a school of public health in Boston, Massachusetts, we bring expertise in health care and social sciences. Our goal is to lend power to the growing number of stories that describe suffering among birthing people in the United States by linking these stories to data, and by giving particular attention to how systemic racism and gender oppression intersect in maternal health.¹

Fundamentally, we believe we cannot address what we cannot see, and we cannot see what we do not measure. The needs of birthing people are inseparable from the context of their communities and that data can be used to make these needs locally visible. We developed the Maternal Wellbeing City Dashboard to visually display data that can help local advocates obtain accountability for results and track progress toward achieving equitable maternal health. Although the dashboard is designed to be useful anywhere in the United States and draws from national databases, it is intended for users who aim to take action in fostering more livable communities for birthing people where they live.

This paper describes the process of developing and testing the dashboard across multiple types of users, and reports on current and future uses of the capability it represents. We hope this effort will help center the needs of birthing people in local community planning, policymaking, and programming.

BRIDGING URBAN PLANNING AND PUBLIC HEALTH

The goal of public health is to prevent disease and promote health. Urban planning extends this goal by promoting an inclusive, actionable vision of a community where everyone can thrive. In bringing both disciplines together, we examine social determinants of health, as well as how public policies can support inclusion, belonging, and civic participation. We aim to translate what people understand about a place, integrating lived experience and professional expertise from the broadest possible range of stakeholders into action to make communities better places for birthing people to live and work.

In this work, we adopt “livability” as a framework to integrate urban planning and public health’s shared objective to improve wellbeing. Livability is defined according to local context and objectives, emphasizing the development of measurable “indicators” to track investments and outcomes in wellbeing, and to guide decision-making and local action.

This work is among the first applications of livability to the specific needs of birthing people. However, the existing literature across urban planning and public health suggests a significant opportunity for livable communities to create the conditions for wellbeing over the lifecourse for birthing people with a focus on Black, Indigenous and disinvested communities.

Desirable neighborhood conditions include stable housing, reliable transportation, access to healthy food, inclusive schools, and access to good jobs. Good jobs are those that provide enough wages and benefits that allow parents to afford childcare and have the resources necessary to raise their children with meaning and a sense of efficacy. As their children grow, parents trust that the schools they attend teach health literacy from the earliest age to foster

¹ We acknowledge the term “maternal” as a gendered one and recognize the spectrum of gender identities that birthing people hold. The use of this term is not intended to be exclusive of other gender identities. We use the gender-neutral language “birthing people” whenever possible to be inclusive and affirming across gender identities (cis women, trans men, and people who are non-binary or gender-fluid) and intersex people.

lifelong wellbeing. Other forms of optimal support for birthing people and their families include transportation, work, and nutrition options that facilitate access to healthcare settings that are respectful and responsive to their health and wellbeing, offering a range of provider models that are covered by all forms of insurance. Through the perinatal period and in raising families, birthing people find emotional support in stable, trusting community networks that include both neighbors and local institutions (e.g., schools, social service providers).

THE MATERNAL WELLBEING CITY DASHBOARD

By curating publicly available, neighborhood-level indicators in the dashboard, we aim to tell a story of how to increase racial, gender and neighborhood equity in childbirth by prioritizing local investments for Black, Indigenous, and disinvested communities that experience the worst maternal health outcomes.

The dashboard attends carefully to the history of urban development that underpins racial segregation, gentrification and neighborhood disinvestment, and has shaped where African American/Black and low-income birthing people with children can live safely and affordably. Users of the dashboard can assess how their city's planning, development and governance determines how resources and investments are distributed across neighborhoods. In telling this story, illustrated with local level data capturing social determinants of maternal health in cities across the U.S., we aim to shift the national narrative of merely surviving childbirth to thriving during pregnancy, as a parent, and as a community. We envision transformative possibilities for maternal health advocacy by expanding its stakeholder base and empowering champions for change.

This report is organized as follows: in the next section, we detail our methods, including how we developed and tested the dashboard. We then present the results of our testing with maternal health advocates in New York City, Tulsa, and Pittsburgh, followed by a discussion of those results and recommended adaptations and future iterations of the dashboard.

Fostering livable communities for birthing people requires reframing childbirth and parenting as societal investments that enrich us all, and empowering diverse stakeholders with data to promote these types of investments represents a critical first step toward long-term social change. As you read this report, we invite you to think about how you can use the Maternal Wellbeing City Dashboard to contribute to a growing, community-engaged movement to improve urban conditions for birthing people from your position.

METHODS

DESIGN METHODS DEFINITIONS

Design: “the process of developing informed, sensitive, inclusive, purposeful and innovative solutions that embody functional and aesthetic demands based on the needs of the intended users and their ecosystem”²

Design thinking: “an approach to innovation that draws from the designer's toolkit to integrate the needs of people; the possibilities of technology; and the requirements for business success”²

Empathy map: “a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to help teams better understand their users”³

Human-centered design (HCD): “the process of integrating human perspectives in all steps of the problem-solving process”²

Persona: “a representative identity that reflects one of the user groups... with shared needs and characteristics”²

Prototype: “a model or artifact built to test a concept with users in order to learn from them”²

Usability testing: “evaluating a product or service by testing it with representative users. Typically, during a test, participants will try to complete typical tasks while observers watch, listen and takes notes”⁴

Use case: “a description of how users will interact with a solution (e.g. product / service / program / system)... Each use case is represented as a sequence of simple steps, beginning with a user's goal, and ending when that goal is fulfilled”²

User: the person who will directly use a solution or innovation (in contrast to “stakeholders” more broadly who may be engaged in the space or work in other ways, but will not directly use the solution themselves)⁵

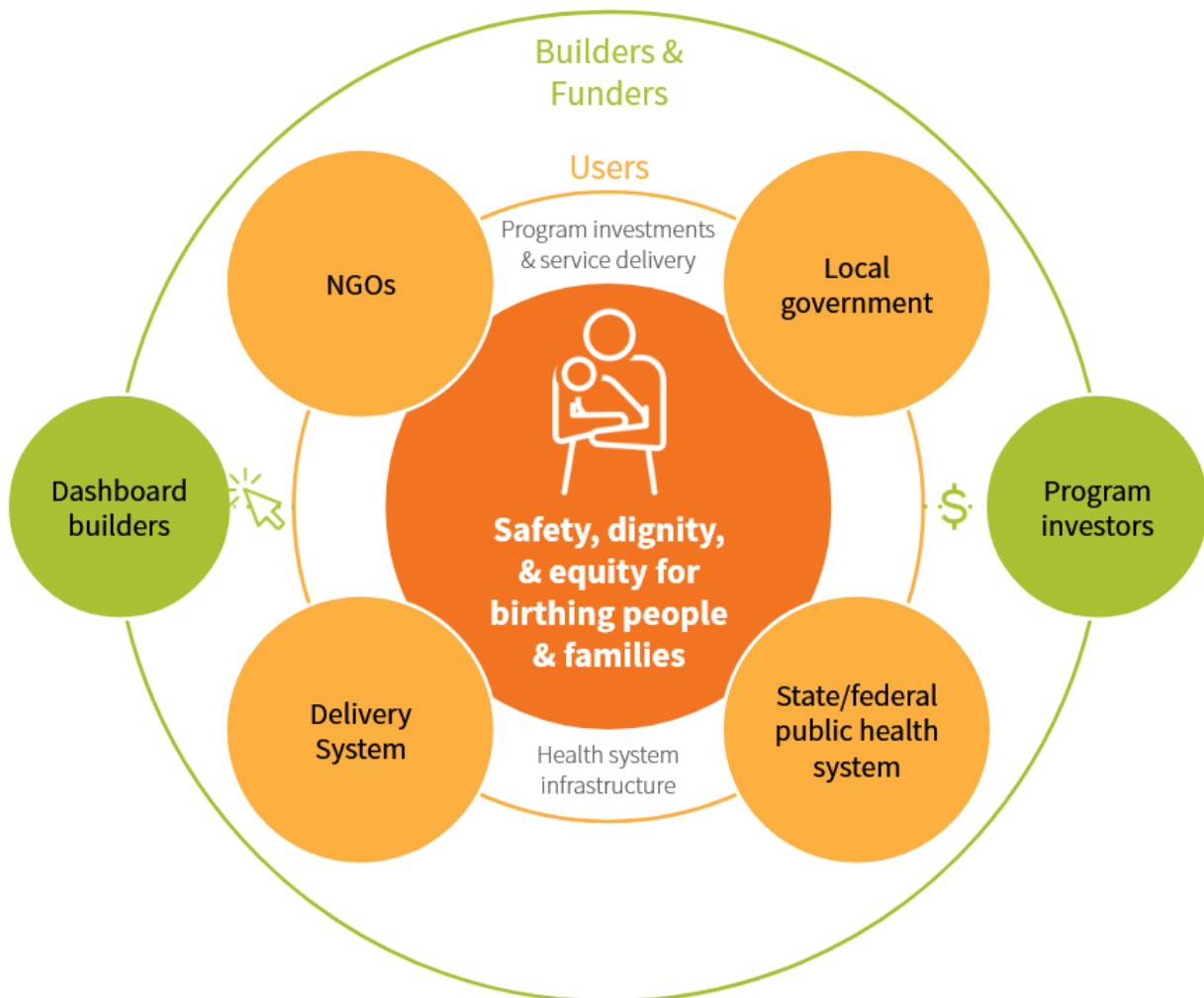
Wireframe: “a two-dimensional illustration of a page's interface that specifically focuses on space allocation and prioritization of content, functionalities available, and intended behaviors”⁴

DASHBOARD DEVELOPMENT

BACKGROUND RESEARCH & INTERVIEWS

We conducted a landscape analysis to map local policy to evidence-based opportunities to improve maternal health. We used targeted search strategies for peer-reviewed and gray literature, emphasizing both the context for action (including historical causes of current conditions), as well as evidence to inform best practices.⁶ We identified key ways that cities can respond to lagging maternal health outcomes, and how these responses are nested within state and federal policy responses. We explored where levers for change reside within federal, state, or local jurisdictions and documented federal and state legislative history and action on maternal mortality. This analysis helped us refine our understanding of the main stakeholders, organizations, and funding opportunities for local maternal health action (Figure 1).

Figure 1. Stakeholder Categories



In May 2020, we virtually convened 30 stakeholders across these six categories. The convening started with an empathy mapping activity to ground participants in empathy for the experiences of birthing people followed by three interactive design sessions that included the following activities and outputs:

- 1) **a synthesized model city** where all participants drew individual illustrated maps envisioning and highlighting the features of a model city for pregnant and birthing people. Participants compared individual maps and generated a shared map incorporating ideas across the group on the factors necessary for a model city that optimally supports pregnant and birthing people. These model cities informed the selection of domains for the dashboard;
- 2) **a modified policy analysis** to achieve optimal social supports and neighborhood conditions for pregnant and birthing people by considering best practices, stakeholder environments, levers for action, barriers to change, and necessary performance and implementation data. The proposed policy pathways developed during this session informed the operationalization of the model cities; and

- 3) **a data brainstorming session** to explore data needed to advocate, guide implementation, and evaluate success, as well as potential data sources and measurement challenges anticipated in evaluating the proposed policy pathways. These data brainstorming sessions informed the selection of indicators for the dashboard.

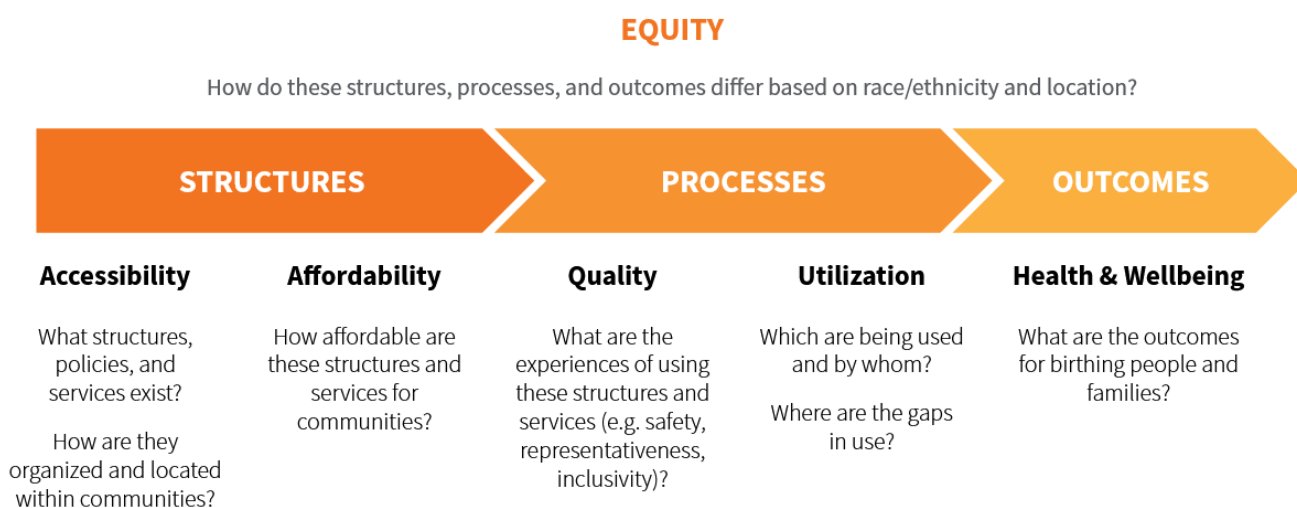
These activities validated the opportunity to construct a dashboard that can aggregate data as a means of centering birthing people in city planning, policymaking, and programming. They also focused our approach on community livability in order to wholly capture people’s needs beyond simply surviving—including economic opportunities, leisure and culture, and belonging and inclusion in the democratic process.⁷

We began with 11 measurable livability domains and then linked our landscape analysis with this framework to identify research that supported specific applications to maternal wellbeing. We prioritized among the domains using three criteria:

- 1) **Potential Impact** on birthing people’s health and wellbeing in communities
- 2) **Feasibility** for cities to plan, legislate and implement improvements at the local level
- 3) **Measurability** based on nationally available data and indicators

We then organized the available measure based on the continuum of structures, processes, and outcomes (Figure 2). Across these categories, we also aimed to disaggregate data by gender, location, and race/ethnicity wherever possible in order to examine inequities.

Figure 2. Categories of Measures



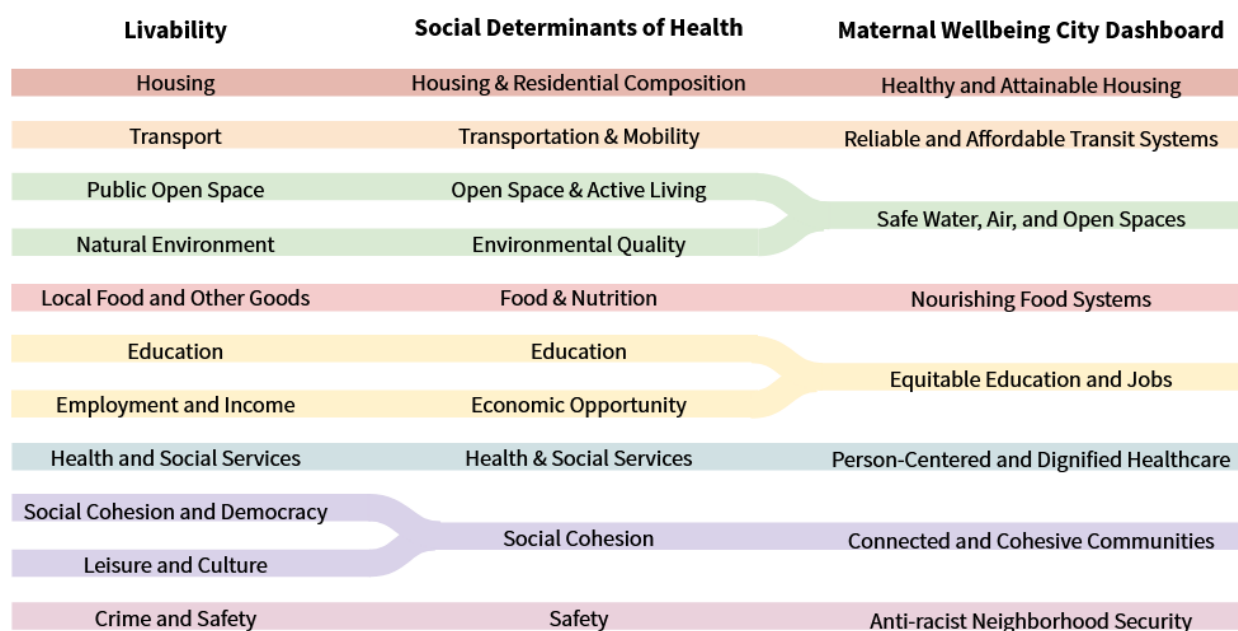
We recruited and formed a multidisciplinary national Advisory Board composed of seven experts who are public sector leaders, maternal health equity advocates, and scholars on using spatial data for health equity. We intentionally recruited for diversity across disciplines, race and ethnicity, and expertise, including lived experience, policymaking, clinical practice, advocacy and research. The Advisory Board came together three times over the course of nine months at key junctures for consultation, including assessing the potential impact, measurability and actionability of our framework of livable communities for birthing people.

We conducted 29 key informant interviews from August through October 2020 to test our prioritization of domains and indicators, develop personas for the primary and secondary users of the dashboard, and produce design

specifications for the dashboard. Based on our expert consultation and key informant interviews, we reduced and finalized our domains to eight social determinants of health for inclusion in our Maternal Wellbeing City Dashboard (Figure 3):

- 1) Healthy and Attainable Housing
- 2) Reliable and Affordable Transit Systems
- 3) Safe Water, Air, and Open Spaces
- 4) Nourishing Food Systems
- 5) Equitable Education and Jobs
- 6) Person-Centered and Dignified Healthcare
- 7) Connected and Cohesive Communities
- 8) Anti-racist Neighborhood Security

Figure 3. Evolution of Dashboard Domains



PROTOTYPING PROCESS

In the fall of 2020, we partnered with mySidewalk, a developer with expertise in community data to produce a dashboard prototype for testing, initially focusing on the cities of Tulsa, Pittsburgh, and New York City. To select the data indicators for the dashboard, we first identified a comprehensive list of approximately 140 indicators and corresponding data sources that mapped to our eight domains. Measurability was a key criterion for our domain selection and consequently informed the data indicator selection as well. During our initial indicator search, we prioritized federal, publicly-available data sources. Our primary rationale for focusing on these data sources was to ensure data availability across the U.S. for small geographies, like census tract, with the hope that the dashboard could provide nationwide coverage and comparisons between cities in a future state. Federal data sources also typically capture large, representative samples and publish their data definitions, survey instruments, and methodology, allowing for consistent understanding and interpretation of the data. We turned to non-federal datasets for topics that our background research demonstrated were important for birthing people living in cities, but were unavailable in public data sources. These data sources were often more limited in geographic scope and less frequently updated than federal, publicly-available datasets.

While there were many advantages to leveraging federal, publicly-available data sources to achieve scale, these data also have limitations. Primarily, the biases of the federal institutions that generate this data are embedded in the data themselves; white researchers and policymakers historically have determined what is important enough to measure, how to measure it, who can access the findings, and how to interpret them.⁸ Furthermore, government-sanctioned data collection efforts systematically undercount African American/Black, Native American and Alaska Native, and immigrant communities.⁹ Federal data also do not reflect the range of identities present within the nation because respondents are forced to select from limited racial/ethnic categories, which can obscure the distinct identities, experiences, and outcomes many groups face. We enumerate these limitations within the dashboard and provide several strategies for improving data collection for birthing people: advocate for collecting data on birthing people's race/ethnicity; supplement federal data sources with data obtained through local data collection efforts involving birthing people; and contextualize quantitative data with birthing people's lived experience.

After compiling the initial list of 140 potential data indicators, we performed multiple rounds of review to reduce the number of indicators that were ultimately incorporated in the dashboard. This reduction was first motivated by our scope of work with mySidewalk, which specified a certain number of indicators to be included on the dashboard. We also decided to limit the number of indicators to ensure our key messages were clear. Our first cut yielded approximately 73 indicators. During this first round of review, we prioritized indicators that were already available in mySidewalk's pre-existing data library, which also largely consists of federal, publicly-available data sources. We chose to rely heavily on mySidewalk's data library because their indicators have already been cleaned and formatted for the mySidewalk platform and vetted for data quality. We also focused on indicators that we identified as impactful for birthing people and feasible for city- and local-level interventions. For select indicators, we drew from data sources outside mySidewalk's data library. Some of these indicators were obtained from data sources with particular relevance to birthing people, like the Pregnancy Risk Assessment Monitoring System (PRAMS). PRAMS is a population-based surveillance system that surveys new mothers about their pregnancies and new babies and is one of the few publicly-available data sources with an explicit focus on birthing people.¹⁰ For other indicators, we turned to sources outside mySidewalk's data library that provided data on domains that are currently not well measured at the population-level, like social cohesion. For instance, in order to obtain data on participation in civic and social associations, which is one facet of social cohesion, we used a county-level social capital index developed by the Penn State College of Agricultural Sciences.¹¹

In October of 2020, we hosted a second expert, interdisciplinary convening to evaluate wireframes, data-informed narratives, for each dashboard domain and to assess enablers and barriers to dashboard implementation, an example of a wireframe presented at the convening can be found in [Appendix 1](#). We convened 39 experts from the local public sector, non-profit advocacy, and direct service, and had representation from a variety of geographies, including: several Safer Childbirth Cities Initiative grantees and others in Baltimore, Boston, Camden, Newark, DC, Chicago, Miami, and New Orleans. The mySidewalk team attended our expert consultations, and we also debriefed with the team regarding feedback and next steps that impact the draft dashboard. Feedback compiled from the convening was integrated into the first draft dashboard.

The mySidewalk team delivered a first draft dashboard for our team to review in December 2020, which enabled us to see the indicators visualized in the mySidewalk dashboard. Consequently, during our final iteration, we made selections based on the interpretability of the visualized indicator; the indicator's impact on birthing people; and mySidewalk's ability to stratify the indicator by gender and race/ethnicity given our focus on highlighting racial and ethnic inequities in maternal health. We further refined the indicator list to 58 indicators on this basis. A final list of indicators can be seen in [Appendix 2](#).

In January 2021 we presented our initial prototype of the Maternal Wellbeing City Dashboard and received feedback on framing of the narrative to support the selected indicators in the dashboard. We also discussed users and potential use cases before the product testing period, while reviewing the product testing plan.

After incorporating our feedback, our team underwent another round of narrative review that was integrated in the final version of the Tulsa dashboard. The mySidewalk team then replicated this dashboard for the cities of Pittsburgh and NYC.

FEASIBILITY AND ACCEPTABILITY TESTING

TEST DESIGN

Through our design research process, we aimed to evaluate the feasibility and acceptability of using the Maternal Wellbeing City Dashboard to support advocacy for maternal health at the local level.^{12,13} We defined **feasibility** as the ease and effectiveness of users’ interactions with the dashboard in testing and in their routine workflows, and we defined **acceptability** as users’ perceptions of their satisfaction with and the value of the dashboard (Table 1). This testing design allows us to understand opportunities for further development and to generate dashboard use ideas to promote ongoing and expanded engagement with the dashboard. We prioritized learning from a diversity of cities and user types to maximize the breadth of opportunities and ideas surfaced.

Table 1. Feasibility and Acceptability Research Questions

Aim	Questions
Feasibility	How do users interact with the dashboard?
	What facilitates use of the dashboard? What barriers are there to using the dashboard?
	How does the dashboard promote engagement and activation?
Acceptability	What do users like about the dashboard? What do users dislike about the dashboard?
	What uses do users perceive for the dashboard?

These research questions were translated into quantitative and qualitative indicators that could be captured through usability testing, semi-structured interviews, surveys, and automated dashboard analytics available within the mySidewalk platform.¹⁴ This mixed-methods design allows us to combine a deeper exploration of user interactions with and perceptions of the dashboard with an understanding of what the dashboard use may look like in practice in the longer-term through self-directed use in their routine workflows and processes. Data collection occurred at three primary points (Table 2):

- 1) **Usability interview:** The usability interview was conducted with the primary user and included a pre-survey on their engagement and activation with local maternal health, a usability test conducted via screen sharing on Zoom, and a semi-structured discussion of their first impressions of the acceptability and perceived uses of the dashboard following the usability test.
- 2) **Dashboard use:** For approximately a month-long period in between the usability and follow-up interviews, the primary user used the dashboard for a use case identified in the usability interview and/or other uses

that surfaced through their routine work. Throughout the dashboard use period, we monitored automated mySidewalk dashboard analytics weekly with data captured at the city-level.

- 3) **Follow-up interview:** The follow-up interview was conducted with the primary user along with any key collaborators who were active collaborators in the workflow for their selected use case(s). The interview included a post-survey on engagement and activation as well as a semi-structured discussion on their selected use case, including facilitators and barriers to use and perceived value of the dashboard.

Table 2. Feasibility & Acceptability Data Collection Points

	Usability Interview	Dashboard Use	Follow-up Interview
Duration	60 mins	Approximately 1 month	60 mins
Testers	Primary user	Primary user (with collaborators if applicable for their dashboard use)	Primary user (with collaborators if applicable and available to join)
Methods	Pre-survey, usability test, semi-structured interview	Automated mySidewalk dashboard analytics	Post-survey, semi- structured interview

The Harvard Human Resource Protection Program’s Institutional Review Board approved the study protocol and consent processes. All testers consented to participate through the online survey platform and verbally at the start of each interview.

CITY AND TESTER RECRUITMENT

For feasibility and acceptability testing of the Maternal Wellbeing City Dashboard, we selected three Safer Childbirth Cities Initiative cities: Tulsa, Pittsburgh and New York City. We selected these cities based on a set of ranked measurable criteria that captured regional and policy-relevant factors enabling dashboard testing within a representative cross-section of U.S. cities including: local capacity to test the dashboard; existing relationships with DDI; presence of maternal health disparities; geographic diversity across cities; and political climate for maternal health advocacy.

To launch recruitment, we met with identified community convenors, organizations with expertise in local maternal health stakeholders and networks who could identify organizations and individuals that represented our target users. We introduced them to the Maternal Wellbeing City Dashboard as well as the goals of testing. We also conducted more granular environmental scans of Tulsa and Pittsburgh, which can be found on the project website, to understand essential context for testing the dashboard locally, given our prior team knowledge about the landscape in New York City. In addition to our convenor approach and the environmental scans, we utilized our team’s professional networks to fulfill recruitment. We collated all identified potential testers into a predetermined list ahead of recruitment.

We aimed to recruit testers for the testing phase who represented key user personas in policy advocacy.¹⁵ We defined our target users as individuals working in nonprofit organizations or the public sector that are or could become involved in maternal health advocacy locally, aiming for user and discipline diversity within and across the three cities. We anchored to the following four user personas: elected officials and their staff, policy advocates in nonprofit organizations, direct service providers and civil servants (Table 3). We prioritized policy advocates in nonprofit

settings, but actively recruited across the four user personas in order to assess the dashboard’s feasibility and acceptability. Across the three cities, we aimed to recruit a total of 12-20 testers, approximately 5 in each city.

Table 3. User Types

	User type	What do they do?	Example
Primary users	Policy advocates	Typically in nonprofit role or coalition-based; may be a researcher that collaborates with practitioners; folks who testify and advocate for legislation	Issue-based coalitions, Academic researchers
	Elected officials and/or their staff	Elected representatives who set agenda, budget and provide legislative oversight who can champion policy change; they may also liaise with policy advocates	City Council members, Mayor
Secondary users	Service providers	Community-based organizations, social service providers, or health service providers; frontline ‘doers’ and ‘implementers’	CBOs or healthcare professionals
	Civil servants	Agency leads, who can drive implementation and public-private collaboration	Departments of Public Health or Health-based commissions

To be eligible for testing, we required a tester to meet the following inclusion criteria:

- 1) Age 18 years or older,
- 2) Ability to read and write in English,
- 3) Access to a computer and internet or cellular data for participating in Zoom interviews and using the digital dashboard, and
- 4) Currently serving birthing people based in Tulsa, OK, New York City, NY or Pittsburgh, PA.

In acknowledgement that advocacy work often occurs collaboratively, we also invited testers to bring colleagues that they used the dashboard with to their follow-up interviews.

We began the recruitment process in March 2020, upon receiving IRB approval and the receipt of our three dashboards from mySidewalk. We contacted approximately 36 individuals from our predetermined list about participation in the testing phase of the work. Of these 36, we enrolled 14 testers to test the dashboard. The same primary contact from each organization participated in all three data collection points. Each interview was led by one member of the study team and was recorded and transcribed via Zoom for analysis.

Many of the individuals we tested with had diverse roles that often intersected some of the user types we had previously identified. For example, we talked with several service providers who also had identified another role as a policy advocate. For the purposes of analysis, we chose a primary role for testers whose work did not fall into one discrete category.

After testing was complete, in May 2021, we reviewed outcomes from the testing period and discussed actual use cases and dissemination plans for the dashboard. The Advisory Board supported interpretation of data from the testing period as we wrote it up for this document, and also validated and discussed actual use cases and dissemination plans for the dashboard.

ANALYSIS

We leveraged a mixed-methods approach to analyze quantitative and qualitative data on user experience, use cases, and recommendations. Quantitative analyses included descriptive statistics on automated mySidewalk analytics and surveys. The automated mySidewalk analytics were collected and analyzed on a weekly basis throughout the testing period with data collection starting on the day of the first usability interview for each city and ending at the end of the full week of the final follow-up interview. Throughout the testing period, we noted the dates of the interviews and other non-testing dashboard use to inform the interpretation of the analytics, and we only used the Tulsa dashboard for non-testing uses, such as demos for funders, advisors, or partners, to limit the noise in the data. Surveys were administered at the beginning of each interview and analyzed at the end of the testing period after the end of data collection. The pre-surveys were analyzed for contextual information on baseline knowledge and motivation to act on local maternal health, and the comparison between the pre- and post-surveys were analyzed to evaluate changes in user knowledge and motivation. Pre- and post-survey data were linked through interview times and analyzed in an aggregated, deidentified way.

For qualitative usability test and interview data, we used a rapid qualitative approach to code and analyze results.¹⁶ Interviews were conducted and recorded through Zoom; recordings were transcribed through the transcription feature built into the Zoom platform and corrected as needed from the video and audio recordings for interpretability. Qualitative data were coded in Google Sheets using a deductive coding scheme based on interview guides as soon as possible following each interview by the interviewer. Throughout the testing period, interviewers discussed coding for consistency and identified emergent inductive subthemes weekly. We developed thematic summaries for each code at two points in the testing—first after the last usability interview for preliminary analysis and second after the last follow-up interview for complete analysis. Summaries included the prevalence of themes by city and user type.

RESULTS

DASHBOARD TESTERS

TESTER CHARACTERISTICS

As displayed in Table 4, we enrolled a total of 14 testers in the feasibility and acceptability testing process, across geographies and user types. We had a 100% completion rate for the pre- and post- surveys and a 93% completion rate for the full study. Four testers did not self-identify within the four categorized user types. All of these testers worked in nonprofit direct service or advocacy agencies, but did not self-identify as service providers themselves. One explained a dynamic role that included responsibilities as a data manager, analyst and researcher in maternal health. The other three users in the other category held varying positions as non-profit leaders or staff members.

Table 4. Enrolled Testers (n=14)¹

City	User type					Total Users
	<i>Elected Officials</i>	<i>Policy Advocates</i>	<i>Service Providers</i>	<i>Civil Servants</i>	<i>Other²</i>	
Tulsa	0	0	1	0	3	4
New York City	0	2	1	2	0	5
Pittsburgh	1	0	2	1	1	5
All cities	1	2	4	3	4	14

- 1) One participant was unable to complete a follow-up interview due to necessary reprioritization within their organization related to the COVID-19 pandemic. However, they were able to complete the post-survey.
- 2) The other category includes folks who self-identified as not falling within the other four categories. This group includes a data manager, analyst and researcher in maternal health; and three non-profit leaders or staff.

Some of our testers (n=4) self-identified as more than one of our defined user types. We assigned a primary role for testers who self-identified with multiple user types. Given the collaborative and networked aspects of advocacy, we chose to highlight the multiplicity and diversity of roles of the dashboard testers. For example, one tester who principally directed a nonprofit, also drew on her experiences as a pediatric and newborn health clinician and as a college professor teaching family and childhood focused coursework. Another tester actively serves birthing people as a doula and childbirth educator, while also working at a nonprofit that supports refugees during the pregnancy and postpartum period. We aimed to recruit testers that bring multiple perspectives to the testing process.

TESTER KNOWLEDGE AND PREVIOUS ADVOCACY

During the usability pre-survey (completed by n=14 testers), more than half of all testers (n=8) said they were very familiar with how places and communities can affect birthing people's lives. We also asked respondents about their

familiarity with how three specific aspects of places and communities affect birthing people: neighborhood environment, access to opportunities and services, and social and community context. Testers reported strongest familiarity (n=9) with how access to opportunities and services affect birthing people's lives. Testers reported a lower level of familiarity (n=6) with social and community context, and the lowest level of familiarity (n=5) with neighborhood environment.

During the usability interviews, testers reported a range of advocacy activities in their previous or current work. In the interviews, we defined advocacy as "working for, supporting, or enabling policies and/or programs for promoting maternal health" to be inclusive of activities beyond only policy or legislative work. The most common advocacy activities that testers reported included legislative advocacy (n=9), fundraising (n=5), strategic and program planning (n=5), and building connections and collaborations within communities or between communities and other stakeholders (n=3).

Data played a role in these advocacy activities for most testers with 57% reporting frequently and 29% reporting very frequently using data in their work in the pre-surveys. The majority (86%) had accessed data through an online dashboard previously, but only 57% reported being familiar or very familiar with online dashboards. In the interviews, testers reported using a wide variety of data and data sources. Half of the testers reported using health data, such as number of births, number of pregnancies, and maternal and infant outcomes, from local or state governments, hospitals, health plans, or national professional or advocacy organizations. Others mentioned internal program data (n=5), qualitative or mixed-methods data from communities (n=4), and community demographics (n=3). Several testers (n=3) specifically mentioned using disaggregated data to highlight inequities, especially racial/ethnic inequities, within their communities.

While we did not specifically ask testers about challenges or barriers in their previous or current work, several raised gaps and opportunities that the Maternal Wellbeing City Dashboard could or should consider addressing. One frontline service provider described the challenge of accessing policymakers and funders in positions of power from their grassroots position, which she felt limited her ability to extend beyond providing individual services that solve existing problems to advocating for systemic changes that could prevent them. Others focused on the gaps in existing data sources available to support their work, including the lack of data specific to maternal health and/or at the local level, difficulties in aggregating data across varied sources, the inability to access or download data in usable forms, and the lack of granularity in data, such as showing distributions instead of only thresholds or measures of central tendency.

"There isn't just one place, and research articles and stuff like that will provide data as well. If not, it's the first thing that I do because it's evidence-based. But those are the main sources that I go to but like I said it takes a while to track down all of those things and combine it into one singular narrative."

-Nonprofit Staffer

DASHBOARD ACCEPTABILITY

During the usability and follow-up interviews, testers were asked what they liked and disliked about the dashboard to better understand their user experience. Testers were also asked to comment about the usability of the dashboard as they experienced it for the first time in their usability interviews and in reflecting during the follow-up interviews. There were four sub themes that emerged: navigation, narrative, data, and visuals. We summarize each below.

NAVIGATION

When asked what they liked about the dashboard, eleven testers reported liking features related to the flow of the site and ability to navigate across pages and content. The majority of testers discussed ease of navigation describing the dashboard as organized. A civil servant described anticipating the dashboard would be very complex with only data presented but liked how organized it was, allowing her to navigate through various topics of interest. Testers (n=2) also liked the availability of hyperlinks throughout the dashboard which allows for a deeper dive into various topics including advocacy resources and social determinants of health.

While testers liked features related to navigation, five testers mentioned specific navigation challenges when using the dashboard with specific emphasis on the landing page and the left-hand side menu. One tester specified the increased time it took to orient to the landing page of the dashboard, and disliked the inconsistencies between the promo cards (links to internal pages within the dashboard) and the left-hand side menu. Testers (n=2) also discussed reorienting the left-hand side menu to tell a more cohesive story. One tester described disliking the inability to find indicators using the left-hand side menu.

NARRATIVE

When asked what they liked about the dashboard, eleven testers reported liking features related to the narrative of the dashboard. More specifically, testers mentioned they liked the combination of narrative and data to tell a story of maternal health on the dashboard.

“I like that the dashboard is not just data, but gives some context to a story, like a story is being told to explain what the data is saying around maternal health. I like that it’s a lot of resources.”

-Service Provider

Testers had positive reactions to the “What Data Can and Can’t Do” page (n=5) on the dashboard, as well as the “How to Advocate for Birthing People” page (n=4). Multiple testers also mentioned appreciation for the glossary, as well as the framing of inequitable maternal health in the U.S.

When asked what they disliked about the dashboard, testers (n=4) mentioned features they disliked related to the narrative. Three out of four testers discussed dislikes specific to language. For example, one policy advocate who works with Spanish and Portuguese speaking communities reported our use of the gender neutral word “Latinx” was not created by Spanish or Portuguese speaking communities and does not translate in Spanish or Portuguese. Another tester described the language as likely to be inaccessible to some users. Lastly, a service provider mentioned disliking the lack of local resources available on the dashboard.

DATA

When asked what they liked about the dashboard, testers (n=8) reported liking features related to the data, including indicator selection, data visualization, data notes, and interpretation. Testers (n=3) liked that the city, county, and state level indicators presented on the dashboard have associated comparators (e.g. national level). Testers (n=3) appreciated the ability to easily analyze data presented in various visualization formats, especially maps.

“I love those maps. I think those maps are incredibly impactful and especially if you're somebody who lives in the city it's easy to see this, you know where our little boroughs are and so I really love that.”

-Service Provider

Several testers specifically described the Poor Mental Health Map as being particularly powerful. One service provider emphasized the potential impact of maps by allowing for the opportunity to zoom into different geographic areas within a city. Furthermore, testers (n=2) liked the inclusion of data sources for each indicator in the footnotes.

When asked what testers disliked about the dashboard, the majority disliked the inability to customize meaningful geographic units for their city to help interpret data, such as providing zip code data for Tulsa and neighborhood data for New York City when analyzing dashboard maps.

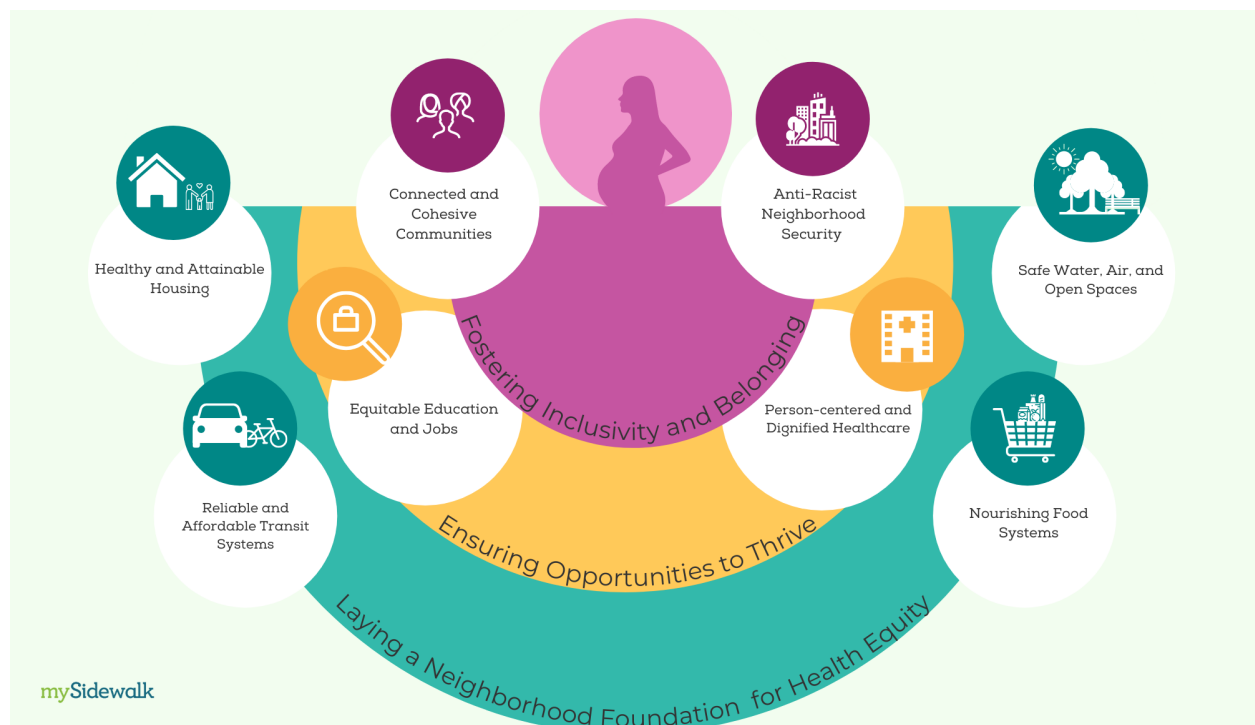
Other testers disliked the inability to export and manipulate raw data, the lack of qualitative stories with lived experience available on the dashboard to complement the data and narrative, and expressed a need for more data on maternal health. Lastly, a civil servant thought the data export icon was too small and might be overlooked by potential dashboard users.

VISUALS

Overall, five testers liked features related to the visuals on the dashboard, including colors, graphics, and images. Testers (n=3) specifically reported liking the images on the dashboard. For example, one service provider liked the domain visual (see Figure 4 below) on the landing page of the dashboard because of the different colors and shapes highlighting the different domains that affect a birthing person's health. Another tester liked the use of photos, which make the dashboard more accessible to varied users, such as those who might lose interest glazing over text. A civil servant also expressed liking the font used throughout the dashboard specifying that it was “inviting” and “welcoming”.

When asked what they disliked about the dashboard, one service provider disliked the stock images displayed on the dashboard, and two service providers found the domain visual unclear and/or the text too small to read on the first impression.

Figure 4. Dashboard Domain Visual



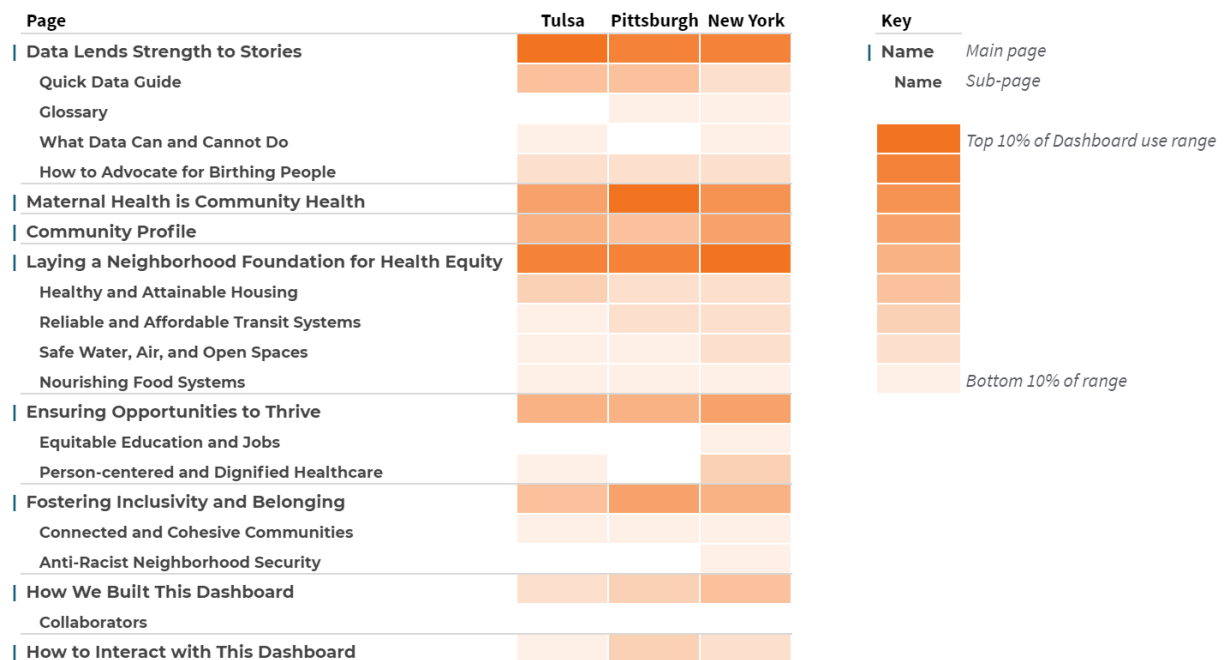
DASHBOARD FEASIBILITY

DASHBOARD INTERACTIONS

We monitored dashboard interactions weekly utilizing Google Analytics provided on the mySidewalk platform for each of the three dashboards. Throughout the dashboard testing period, the dashboard was used 231 times by new and returning users (Google Analytics defines a new user as the first time a device or browser loads website content and generates a unique client ID, a returning user is defined as when an existing client ID starts a new session; see [Appendix 3](#) for detailed dashboard metrics definitions). On average, among days when there was at least one user and >0 seconds average duration of use, each user spent 11 minutes on the dashboard and visited 10 different pages during each dashboard use session. We used the Tulsa dashboard for opportunities to demo the dashboard or share it with partners. For this reason, we expected to see differences in metrics from Pittsburgh and New York City. Our data validates our expectations—the Tulsa dashboard was visited by 155 new and returning users, and the Pittsburgh and New York City dashboards were visited by 41 and 35 new and returning users, respectively.

We found some differences in the number of page views reported on different pages in the dashboard, by city; visualized in Figure 5. Notably, the pages at the beginning of the dashboard and the main pages (available directly on the left-hand menu compared with subpages which needed accordion drop-downs to be expanded to be viewable on the menu) received the most page views across all cities.

Figure 5. Dashboard Use by Page



These analytics should be interpreted in the context of the relatively small number of users accessing the platform based on the sample size of our test and the password protection of the prototype dashboards to prevent other users from accessing the platform during the testing phase. In the longer term with greater numbers of users, the analytics will have increased value to help the dashboard host understand its use and evaluate its success in prompting action. Please see [Appendix 4](#) for our recommended long-term monitoring and evaluation strategy.

Throughout the testing period, testers described varied workflows for incorporating the dashboard into their work. The majority of testers reported using the dashboard on a desktop or laptop computer, confirmed by the automated dashboard analytics, which showed that less than 1% of dashboard use during the testing period came from mobile devices. When using the dashboard, some testers started with individually reviewing the dashboard to familiarize themselves with the content to build knowledge for their own work or to be able to share the dashboard more effectively with others. Other testers focused directly on sharing the dashboard with collaborators by emailing them the dashboard link, screen-sharing the dashboard during virtual or in person meetings, and/or incorporating data visualizations from the dashboard into slides and other materials. Some testers used or shared the dashboard as a whole while others returned to the dashboard in search of particular information, either revisiting something they had previously flagged or searching for new information of interest in their work.

During follow-up interviews testers described facilitators and barriers to completing their chosen use cases. The most commonly identified facilitators were aspects of the data itself (n=4). Two testers described documentation of data, including the year it was updated and descriptors of the source as a facilitator to use. Testers also noted the value of the graph visualizations for communicating information, as well as the granularity of geography provided within map visualizations for providing sufficient detail to be usable in their work. Testers observed that the dashboard organized content from various sources, which facilitated use. Other facilitators mentioned include the media focus on Black maternal health and having time to use the dashboard. In looking ahead to future adaptations,

testers suggested presenting a suggested citation for use in presentations, as well as providing training sessions could be facilitators for use.

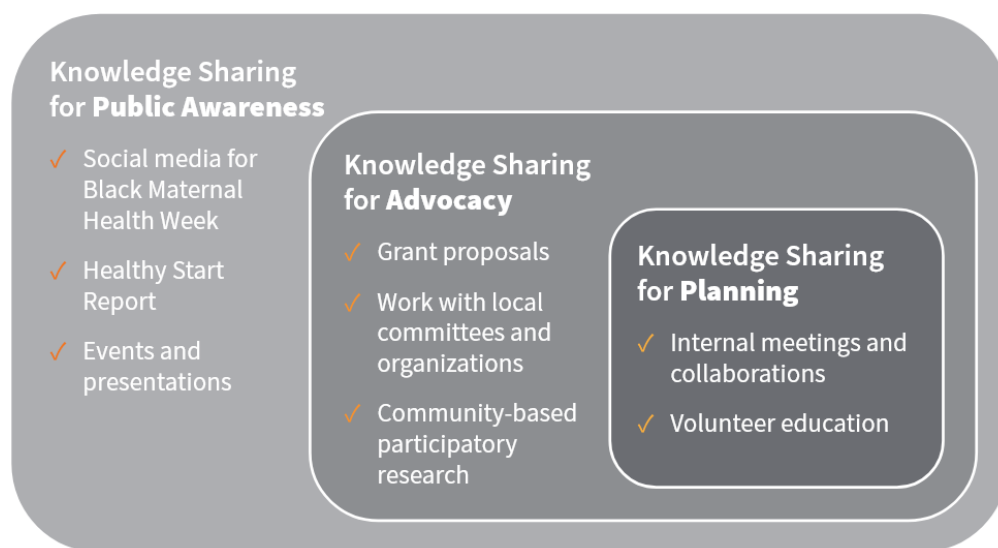
Testers also described barriers to using the dashboard to complete their selected use cases. The most commonly identified barriers were time, capacity, and experience with the dashboard (n=7). Testers described having low capacity to learn how to use the dashboard during the month-long testing period. While some of this may be related to increased focus on COVID-19 vaccination and/or recovery for some of our testers, many of them mentioned that this was characteristic of the fast-paced nature of their work. While specificity of data and data itself proved to be a facilitator for some testers, it also proved to be a barrier to others (n=3). Testers described a lack of specific maternal data on mental health other than postpartum depression as a barrier to use. Other barriers included external environmental factors, like siloes within maternal health communities and lack of visible champions for maternal health in testing cities. Testers also described potential or future barriers as “wordiness”, too few advocacy resources specific to birthing people and lack of data about birthing people who identify as LGBTQ+.

DASHBOARD USES

Across the thirteen testers that completed their follow-up interviews, nine completed the use cases they planned in the usability interview during the month-long testing period, including four testers who also used the dashboard in additional ways beyond their initial plans. One tester still plans to use the dashboard as intended, but did not complete their planned report before the follow-up interview, and three testers were unable to use the dashboard due to time and capacity barriers, such as needing to prioritize COVID-19 related work.

Among those who completed their intended use case or other additional uses, testers used the dashboard for different levels of knowledge sharing with colleagues and collaborators within their local advocacy ecosystem (Figure 6). Within organizations, six testers shared the dashboard with organizational leaders, maternal or family health program teams, data and policy analysts, or volunteers. Three testers used the dashboard for project or grant application planning activities. Externally, three testers shared the dashboard with collaborators in other organizations or committees, and three testers used the dashboard to support broader public awareness work, such as a Black Maternal Health Week proclamation.

Figure 6. Levels of Knowledge Sharing during Testing Period



Beyond the testing period, testers envisioned a wide range of ways they could use the dashboard in their organizational work and for connecting with other stakeholders on maternal and community health (Figure 7). Testers also suggested other potential users within their local ecosystem who could benefit from the dashboard, which expanded the breadth of potential users and reinforced the opportunities for connections across elected officials, community-based organizations and advocates, students and educators, healthcare providers, community members, researchers, media, and funders.

Figure 7. Potential Stakeholder Connections through Dashboard Use

Map for Stakeholder Connections



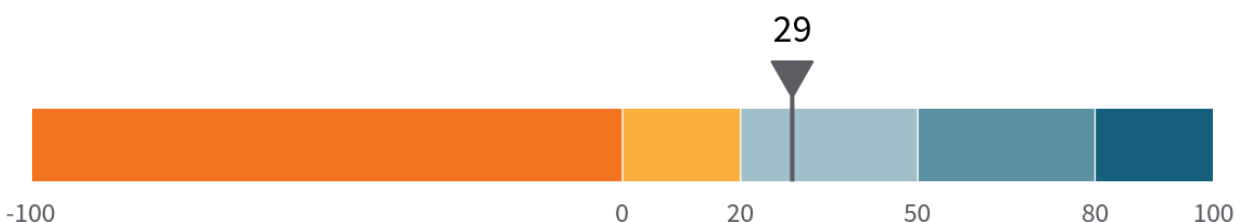
Colored circles indicate the roles of testers interviewed and gray circles indicate other roles mentioned by testers in brainstorming use cases

The Ariadne Labs Maternal Wellbeing City Dashboard website highlights additional details about these use cases that testers suggested for how they and others in their roles could benefit from using the dashboard.

DASHBOARD VALUES

During the follow-up post-survey, we assessed overall perceived dashboard value by asking testers how likely they are to recommend the dashboard to a colleague, on a scale of 0 (not at all likely) - 10 (extremely likely). A plurality of testers (36%) reported a rating of 10. We aggregated these results to calculate a Net Promoter Score (NPS), a standard metric ranging from -100 to 100, to measure the willingness of testers to recommend the dashboard to others.¹⁷ To calculate the NPS, we subtracted the percentage of detractors (14%) from the percentage of promoters (43%), yielding a score of 29 which falls in the “good” range with room for improvement (Figure 8).

Figure 8. Dashboard Net Promoter Score



We categorized testers into one of three categories: **detractors**, **passives**, or **promoters**. Detractors are testers who are unhappy and respond with a rating of 0 to 6. Passives are satisfied with the dashboard but not enough to be considered promoters usually responding with a rating of 7 or 8, and promoters are defined as loyal enthusiasts who respond with a rating of 9 or 10.¹⁷

The majority of testers (n=8) suggested the Maternal Wellbeing City Dashboard would be valuable for supporting stakeholder engagement in their maternal and community health work. They suggested that dashboard could support this engagement by providing them with the confidence and credibility of concrete data to support their work, a narrative connecting maternal health and community health to bring previously siloed stakeholders together, and/or a framework for articulating the ways that people from all roles or positions can contribute to maternal health. Several testers (n=3) particularly highlighted the value of the dashboard for validating community experiences through data and supporting the existing work of community-based organizations by providing a quantitative representation of the systems challenges they are working to address.

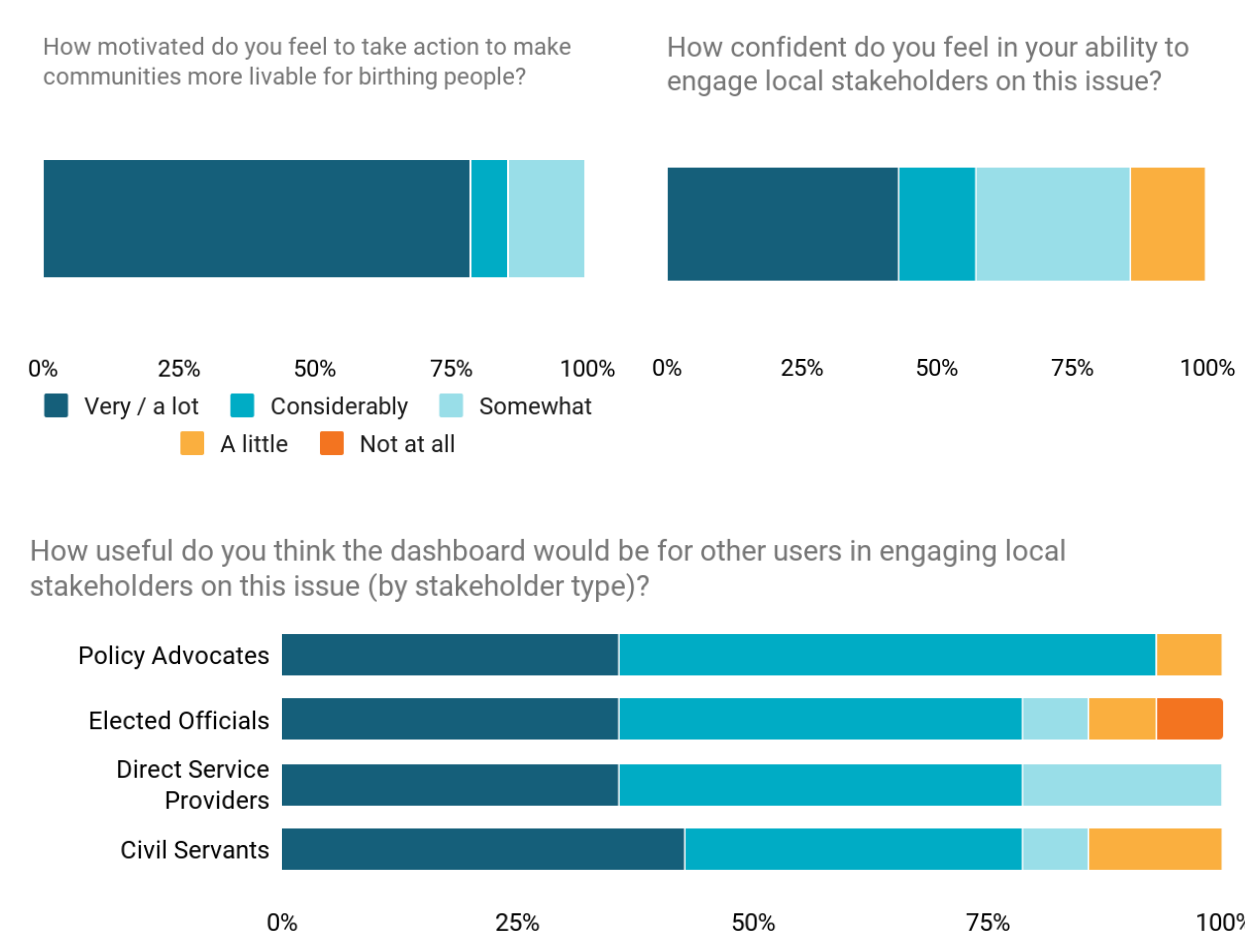
“I think it will increase my confidence right, just like I said, having good reliable data points is always so important that you don't ever want to be giving misinformation, so I think knowing that it's coming from well-researched, up-to-date, all of those, things all the time, that will build my confidence in using it to present facts and figures, which sometimes is complicated, and also a place to refer people back when people have questions or concerns about the data.”

-Service Provider

Survey data reinforced the importance of these values, with 86% of testers reporting being considerably or very motivated to take action to make communities more livable for birthing people in both surveys, but only 57% of

testers reporting being considerably or very confident in their ability to engage local stakeholders on this issue (Figure 9). Testers perceived the dashboard would be most useful for policy advocates to engage local stakeholders on maternal and community health (93%), but at least 79% reported the dashboard could be considerably or very helpful for stakeholder engagement for every user type.

Figure 9. Survey Results on Motivation, Confidence, and Stakeholder Engagement

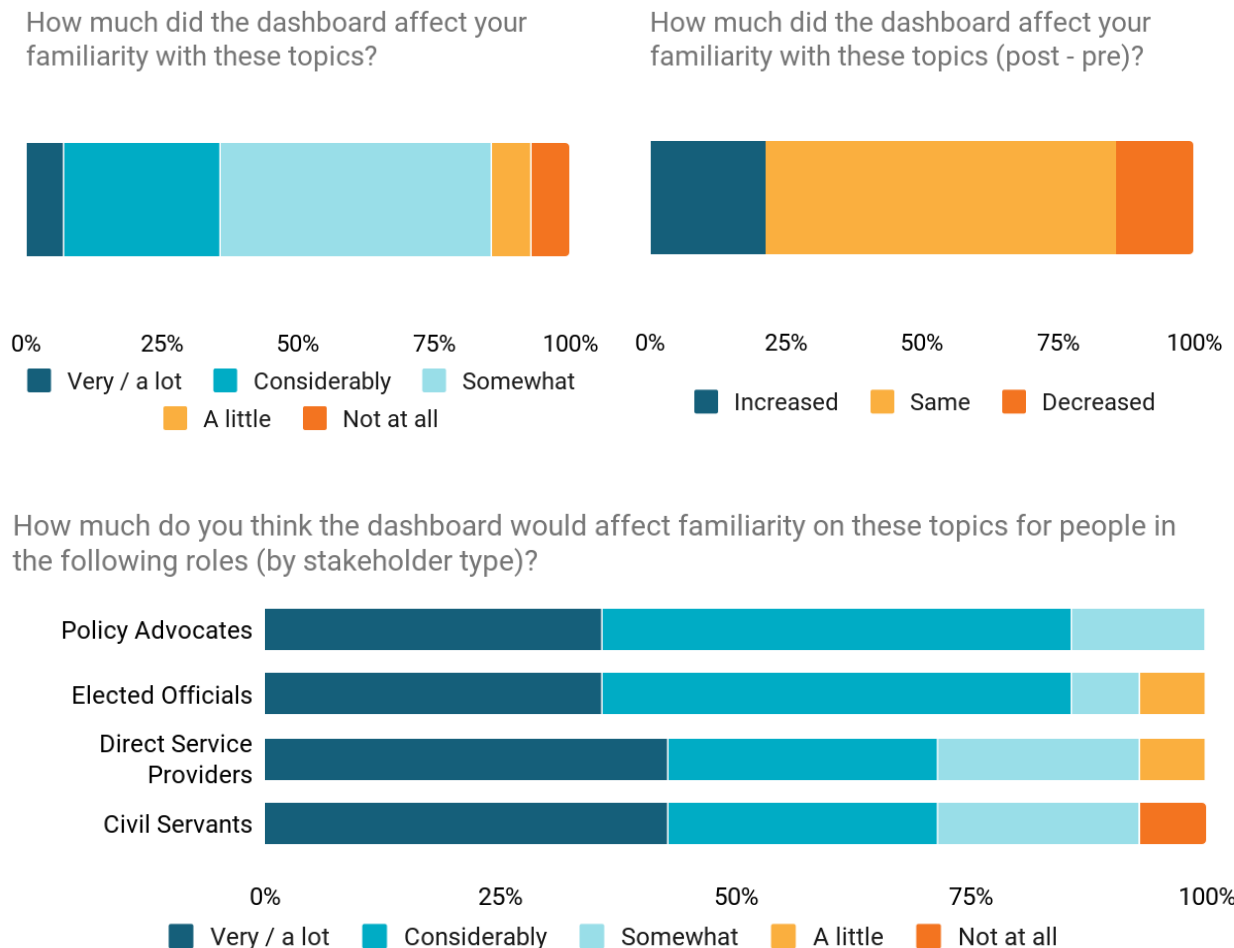


Several testers (n=4) also mentioned that they valued the dashboard for building their knowledge. Three out of four highlighted this value being rooted in connecting maternal health to broader community health and social determinants, which aligned with the most common main takeaway from the dashboard reported across testers (increased knowledge or understanding about the impact of place and social determinants on maternal health; n=6). In the survey, 36% of testers reported the dashboard affected their familiarity with community livability for birthing people considerably or a lot, and 23% of testers had an increased level of knowledge when comparing their self-evaluations on the pre-survey with the post-survey (Figure 10). Testers perceived the dashboard would be most useful for building the knowledge of elected officials (86%) and policy advocates (86%), but at least 71% reported the dashboard could be considerably or very helpful for building knowledge across every user type.

“I think this data kind of gives us things, makes us realize things that we didn't know or even think about [as maternal health] and it'll help us form programs and form initiatives like kind of create initiatives around this data.”

-Civil Servant

Figure 10. Survey Results on Knowledge Building



“These topics” in the survey questions refers to livability for birthing people across the three primary dimensions of the dashboard: neighborhood environment, access to opportunities and services, and social and community context.

Other values reported by testers included facilitating easier access to local information on maternal health by compiling the data and narrative into one locally-focused source and motivating users by connecting them with the broader picture of the community change they are working toward in their individual work. Testers also reported that the dashboard could be valuable for other cities beyond their own and that there could be opportunities to further adapt the dashboard to promote engagement and sharing of best practices across cities.

Three testers also reported reservations about the value of the dashboard rooted in perceptions that advocates already know the information on the dashboard, that researchers may want more direct data access and less

narrative (though the same tester mentioned the storytelling format could have value for the advocacy side of her role), and that there is not demand in the community currently for the dashboard. However, the majority of testers did not perceive any possible harms associated with the dashboard, except for two testers who highlighted potential risks with data on inequities triggering strong emotional reactions or traumas for readers with lived experience of these injustices or stigmatizing groups who have been marginalized if the data was interpreted through an individual responsibility lens instead of the systems change lens the dashboard aims to promote.

DASHBOARD RECOMMENDED ADAPTATIONS

In thinking about their role, we asked testers what they would change about the dashboard to make it more useful for their work. These recommendations are organized into four categories: data, narrative, visuals, and navigation:

DATA

- | | |
|-----------------------|---|
| Interacting with data | <ul style="list-style-type: none"> > Customized, meaningful units for each city (e.g. zip codes in Tulsa, neighborhoods and boroughs in NYC). > Flexible interaction with the data, such as being able to make comparisons, show correlations, analyze trends in data over time, and visualize rankings on metrics by neighborhoods/cities. > Reporting feature to allow users to search by topic (e.g. postpartum depression) or location. > Raw data to allow for data manipulation opportunities. > Additional guidance when interacting with data (e.g. hovering over data visualizations). |
|-----------------------|---|

- | | |
|---|---|
| Addition of new data points and sources | <ul style="list-style-type: none"> > Data on maternal health (e.g. preconception, access to reproductive services, number of births stratified by hospitals, and more data on birth workers, midwives, and access to doulas) and stratifications by race/ethnicity (e.g. Female households with children indicator). For example, a service provider recommended data that was more representative of Asian populations. > Local data sources and opportunities for community based organizations to contribute to the dashboard by inputting their own data. |
|---|---|

NARRATIVE

- | | |
|-------------------|--|
| Advocacy guidance | <ul style="list-style-type: none"> > For birthing people > For advocates who want to network with other advocates from different sectors (e.g. housing, health and social services). > For varied users to advocate more immediately (e.g. here is what you can do tomorrow) |
|-------------------|--|

Additional content	<ul style="list-style-type: none"> > The impact of COVID-19 on maternal health (e.g. workforce, childcare, paid family leave). > The impact of physical health (e.g. hypertension, obesity, cardiovascular disease) on maternal mortality and morbidity > Current legislation (e.g. Black Maternal Health Momnibus Act of 2021) > Birthing people being the experts with lived experience and their role and importance to the community. > The ways the dashboard could be used (e.g. use cases) as a way to better understand how to use the dashboard.
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Additional resources	<ul style="list-style-type: none"> > Local resources (e.g. what a city is doing to make transportation better). > Maternal Mortality Review Committees hyperlinks.
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VISUALS

Images	<ul style="list-style-type: none"> > Photos that represent birthing people with their families as a unit (e.g. including fathers and partners).
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Text formatting	<ul style="list-style-type: none"> > Indentation or color to organize the dashboard.
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NAVIGATION

Ease of orientation and use	<ul style="list-style-type: none"> > Orientation of the dashboard for users (e.g. vision statement on the landing page) and adapt left-side navigation for flow (e.g. switching how to be an advocate with how to interact with the dashboard). > Different entry points to the dashboard for varied users (e.g. providers, policymakers, birthing people) and more guidance on the landing page for different users to be able to quickly access the content or data they need, such as linking to other pages on the dashboard, while taking into consideration the short amount of time users might have to spend with the dashboard. > Cross-referencing different aspects of the dashboard throughout, especially for users who are limited in time and are looking for specific data/content (including hyperlinks in the domain visual to other parts of the dashboard).
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Prompting for use	<ul style="list-style-type: none"> > Hyperlink to allow users to sign up for updates. This can be useful if users don't have the time or capacity to look through an e.g. advocacy toolkit while exploring the dashboard but might want more information or guidance on how to use this toolkit.
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DISCUSSION

The Maternal Wellbeing City Dashboard aims to center birthing people in policy and planning while highlighting efforts at the local-level to reduce racial inequities and promote community livability. Our approach to measure maternal health and wellbeing through the framework of community livability bridges two disciplines—public health and urban planning. Both fields share a fundamental commitment to improving community health and wellbeing. The dashboard provides a unique opportunity to highlight that focus and support culture change as Americans continue to experience a maternal mortality crisis that disproportionately impacts Black and Indigenous birthing people. In the midst of the increasing focus on maternal health across the United States, the dashboard aims to elevate existing maternal health advocacy led by women and BIPOC communities, and build on the movement to collectively address the maternal mortality crisis.

Systemic racism and white supremacy has imperiled the lives of Black Americans and other communities of color so demonstratively in recent years that many cities around the U.S. have declared racism a public health emergency.¹⁸ These systems of oppression are entrenched in cities through urban policy and planning and public health practice. Over the last 50 years, changes in federal and state policies within the U.S. contributed to an urban development cycle in which cities are increasingly responsible for raising revenue locally to pay for services,^{19,20} a phenomenon that is observed in cities worldwide. This urban development cycle is a key contributor to the racial inequities and residential segregation we see in cities today, as working-class communities, disproportionately communities of color, experience alarming rates of displacement²¹, worse health outcomes, and higher criminal justice system contact, among other deleterious effects. Health system consolidation, disinvestment in local public health, and institutional racism and sexism in healthcare delivery are among the key phenomena restricting access to high quality, culturally competent healthcare for these same communities battered by inequitable development.

As wealth and racial inequities in 21st century American cities have grown in parallel with the rising maternal mortality rate in the U.S, these inequities have exasperated maternal health through worsening chronic disease burdens, greater housing instability for Black mothers²² and Black neighborhoods^{23,24}, and other socio-environmental factors that heighten childbirth risks²⁵.

We adapted the framework of community livability to guide the data and narrative in the dashboard, crafting a narrative specific to birthing people supported by publicly available data at the census-tract level. The siloed nature of public policy creates barriers to expanding the boundaries of maternal health and communication across sectors to improve maternal health. The wellbeing of mothers affects us all—whether as parents, neighbors, colleagues, local leaders, and family.

In intentional recruitment of testers who served birthing people but may not have explicitly worked within the realm of what we consider “maternal health,” the community livability framework demonstrated the ability to make connections. Several of our testers explicitly discussed knowledge and/or confidence gained around this connection.

“The interconnectedness of so many different factors, potential risk factors, geography, access to government, access to services, access to transportation, all of that, it's just so interconnected, and I think [the dashboard] does a good job of presenting it in a way that shows them as separate but connected... I guess I just feel more confident in my understanding of all the different factors that are related to maternal health.”

-Elected Official

Our pilot testing indicated that the Maternal Wellbeing City Dashboard is feasible to use and acceptable to users across different types of cities and roles. For this testing, we intentionally focused on three cities with different characteristics and recruited users from a breadth of roles within our targeted user types to surface as many different ideas as possible to inform the current and future work. This diversity validated that the dashboard can support maternal health advocacy across a range of city types, demographics, geographies, and political climates, and that users can envision this type of dashboard adding even further value at scale for cities across the United States. The differences between pilot testing cities also helped us understand the core features and use cases of the dashboard that resonate across settings, such as the organizing framework around livability for birthing people and the broad advocacy guidance, as well as improvement opportunities to customize future versions of the dashboard with local data and content to promote reach, adoption, and impactful use in the longer term.

The testing further expanded our understanding of the types of users that may benefit from the dashboard. In addition to our initial users types of elected officials, policy advocates, direct service providers, and civil servants, testers also suggested that the dashboard could add value for a range of community-based organizations and advocates, students, educators, researchers, media, and community members themselves, especially birthing people, their partners, and families. With data, resources, and support, anyone can be an advocate for maternal health, connect into local stakeholder networks, and promote policies and programs that improve livability. In the long-term, testers suggested that we should continue to look for opportunities to elevate how every person can contribute to supporting birthing people from their position through dashboard adaptations or dissemination strategies.

“I like the overall gist that I'm getting from this dashboard is that no matter what your role is if you're an elected official, if you're a community member, if you're a birthing person, if you work in the health system, there is something here for you specifically, but you can also learn from the standpoint and perspective of someone that's not in the same field as you or something that's not your immediate day-to-day... I feel like a resource like this brings it home for everyone and also makes it seem like it's not mutually exclusive, it's all in the same dashboard you know... I feel like anybody can click on it and feel like they can be actionable about it.”

-Nonprofit Staffer

Testers reported the primary values of the dashboard are in building knowledge and enabling local engagement. The broad resonance of these values across roles and cities was rooted in the different ways the dashboard meets people where they are in terms of their pre-existing knowledge of and interest in maternal health (Figure 11). For people new to maternal health and advocacy, the dashboard can be a valuable tool for building knowledge about the issues that face birthing people in their community and ways to start to help. For community advocates from other fields, the dashboard can connect maternal health with their local priorities to center birthing people in their work and coalitions. For maternal health advocates and practitioners, the dashboard can provide data and context to uplift their experiences and be a roadmap to link their expertise and actions with other local advocates and stakeholders. Given this knowledge building and bridging potential, future iterations of the dashboard should explore its potential as an interdisciplinary organizing tool to bring people together around a shared mission of supporting the wellbeing of birthing people, especially through uplifting existing maternal health advocacy efforts already led by women and BIPOC communities.

Figure 11. Using the Dashboard to Create Livable Communities



Testers mentioned the ways in which they would change the dashboard to make it more useful for their work. Through tester feedback, the testing allows for the opportunity to iterate and improve the dashboard design. We prioritize recommended dashboard adaptations (shown below) guided by three criteria:

- 1) **Strategic importance** and its alignment with our aims to both scale the dashboard and strengthen advocacy efforts in cities across the U.S., as well as evaluate patterns of local maternal health advocacy;
- 2) **Value for users** based on their experience using the dashboard and their recommendations for adaptations to improve the overall user experience and potential benefits; and
- 3) **Ease of implementation** or the level of effort and feasibility involved with our developer to implement the recommended adaptations into a future iteration of the dashboard.

This dashboard was designed to impact maternal health at the local level, however we are constrained by the fact that this dashboard was also built to be scaled across the nation. We recognize that this decision impacts the advocacy resource that we provide in the narrative and our ability to provide more specific information at the local level. We used federal, publicly available quantitative data to ensure data availability for cities across the U.S., as well as comparisons between cities. These data have limitations including government sanctioned data collection efforts systematically undercounting African American/Black, Native American and Alaska Native, and immigrant communities, and these data are not inclusive to the range of identities present within the U.S. We intentionally researched and developed the dashboard to contextualize the data through narrative and framing. Given the positionality of Ariadne Labs in which both the DDI and the Cities project are situated, we are mindful of the ways we can continue to strengthen the dashboard through adaptation opportunities in a way that complements other work in this space.

- > **Navigation and orientation:** Orient users to the dashboard (e.g. vision statement on the landing page) and adapt left-side navigation for flow (e.g. switching how to be an advocate with how to interact with the dashboard)
 - > Cross-referencing different aspects of the dashboard throughout (linking to different domain pages on the domains photo)
 - > Different entry points for varied users and more guidance on the landing page for users to be able to quickly access the content or data they need (linking to pages on the dashboard)
 - > Provide more guidance on advocacy (e.g. for birthing people, cross-sectoral networking)
- > **Flexibility with data interaction:** Several testers reported wanting more flexibility when interacting with the data (e.g. comparisons, rankings, trends in the data over time)
 - > Customize meaningful units for each city (e.g. zip codes in Tulsa, neighborhoods in NYC)
- > **Local customization and community building:** Capability to add community discussion, local data, and resources specific to your city (e.g. data from local hospitals or CBOs, links to local initiative or organizations related to domains)

CONCLUSION

The Maternal Wellbeing City Dashboard can serve as a catalyst for actionability through data and narrative. However, its recognized value is dependent on collective action by local stakeholders in city planning, public health, and policy making (e.g. SCCI grantees). Using curated, publicly available, national data to evaluate community livability for birthing people as a starting point for defining local problems and identifying solutions, the dashboard can equip and expand connections across sectors to advance maternal health through investments in livable communities. The Tulsa, Pittsburgh, and NYC dashboards are available and can be accessed through the Ariadne Labs website. The website also includes use cases for guidance on the ways that users across different roles (Policy Advocates, Local Legislators & Staff, Direct Service Providers & Nonprofits, and Civil Servants) can use the dashboard to make change.

In future work, we aim to scale the Maternal Wellbeing City Dashboard, beyond the three cities we tested with, to enable all those who are working to make U.S. cities more livable for birthing people to visualize and compare key city level data. Through the dashboard improvements described in this paper and by scaling the Maternal Wellbeing City Dashboard nationally, there are opportunities for the dashboard to serve as a digital organizing tool connecting users of the dashboard to augment and mobilize collective impact for maternal health in cities in a sustainable, data-informed way.

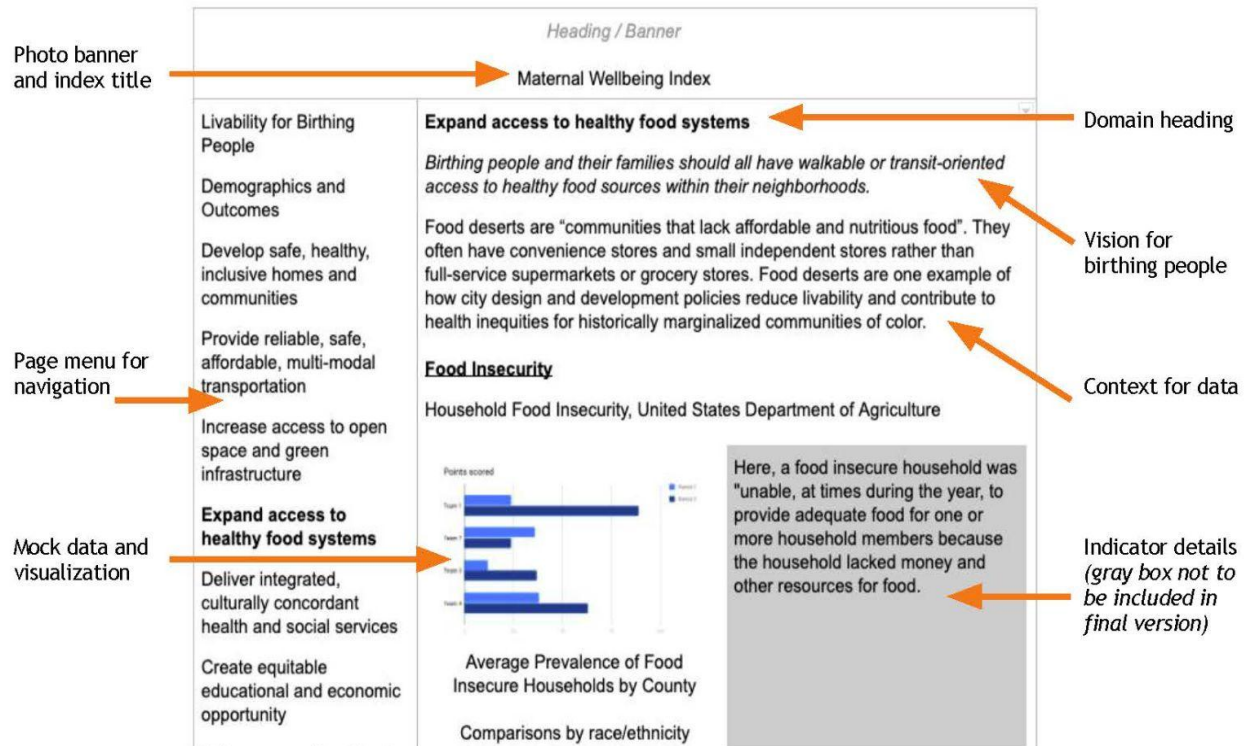
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APPENDICES

APPENDIX 1: MODEL OF AN INITIAL WIREFRAME



APPENDIX 2: FINAL INDICATORS LIST

Indicator	Indicator description	Data Source
Pregnancy Related Deaths	In the Pregnancy Mortality Surveillance System (PMSS), a pregnancy-related death is defined as the death of a woman while pregnant or within 1 year of the end of pregnancy regardless of the outcome, duration, or site of the pregnancy — from any cause related to or aggravated by the pregnancy or its management. Pregnancy-related deaths as defined in PMSS generally do not include deaths due to injury. Races are non-Hispanic or Latino	CDC 2014-2017
Birthing people who had postpartum depression	Postpartum depression is defined as "always" or "often" "feeling down depressed or hopeless or having little interest or little pleasure in doing things she usually enjoyed since delivery." This data is self-reported.	PRAMS 2017
Poor Mental Health	Estimated annual prevalence rate of adults aged ≥18 years who report 14 or more days during the past 30 days during which their mental health was not good.	CDC PLACES
Tobacco Use During Pregnancy	Births with tobacco use during pregnancy. Races are non-Hispanic or Latino. The data is self reported tobacco use during the pregnancy.	CDC WONDER
Female Reproductive Population	Female reproductive population is those aged 15-49 years old.	US Census ACS 5-year Estimates
Females with Birth in Past Year by Age	Categories: Age: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-50	US Census ACS 5-year Estimates
Race and Ethnicity	Frequency distribution of race/ethnicity categories in the specified geographic area. Races are non-Hispanic or Latino unless otherwise noted. Categories: Asian, Black, Hawaiian and Pacific Islander, Hispanic or Latino, Native American, Other, White	US Census ACS 5-year Estimates
Language Spoken at Home	Frequency distribution of language spoken at home among population aged 5+ in the specified geographic area. Categories: Asian-Pacific Islander, English, Other, Other Indo-European, Spanish	US Census ACS 5-year Estimates
Language Spoken at Home Among People in Poverty	Frequency distribution of language spoken at home among population of people in poverty (defined as the federal poverty level) aged 5+ in the specified geographic area Categories: Asian-Pacific Islander, English, Other, Other Indo-European, Spanish	US Census ACS 5-year Estimates
Immigrants by Place of Birth	Frequency distribution of place of birth in the specified geographic area	US Census ACS 5-year Estimates
Median Household Income	Median distribution of income in the last 12 months (in 2018 inflation-adjusted dollars).	US Census ACS 5-year Estimates
Poverty Rate	If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using the Consumer Price Index (CPI-U)	US Census ACS 5-year Estimates
Household Income	Frequency distribution of income in the last 12 months (in 2018 inflation-adjusted dollars). Categories: \$10,000 or Less, \$10,000 to \$14,999, \$15,000 to \$24,999, \$25,000 to \$34,999, \$35,000 to \$49,999, \$50,000 to \$74,999, \$75,000 to \$99,999, \$100,000 to \$149,999, \$150,000 to \$199,999, \$200,000 or More	US Census ACS 5-year Estimates

Female-Headed Households with Children	Female-headed households represent households with related family members that are headed by a female with no husband. Related children may or may not be present.	US Census ACS 5-year Estimates
Families in Poverty by Composition	% of population below the poverty level in the past 12 months in the specified geographic area Categories: Single Female with Children, Single Female without Children, Married Couple with Children, Married Couple without Children, Single Male with Children, Single Male without Children	US Census ACS 5-year Estimates
Entropy Index	The Entropy Index is used to assess the extent of residential segregation in a city. Entropy Index values range from 0 to 1.10 and measure segregation among numerous racial groups. Scores closer to 1.10 indicate higher levels of integration with equal proportions of each racial group in a geography. Scores closer to 0 indicate only one racial group is present and that the area is highly segregated.	US Census ACS 5-year Estimates
Homeownership Rate	Races are non-Hispanic or Latino.	US Census ACS 5-year Estimates
Low Income Households Experiencing Housing Cost Burden	The share of owner- and renter-occupied low-income households that are cost-burdened (spending more than 30 percent of income on housing costs). Low-income households are those who earn up to 80% of the US Housing and Urban Development Area Median Family Income (HAMFI).	HUD CHAS
Households Experiencing Cost Burden	The share of owner- and renter-occupied low-income households that are cost-burdened (spending more than 30 percent of income on housing costs).	US Census ACS 5-year Estimates
Rental/Housing Costs as 50% or More of Income	The share of owner- and renter-occupied households that are cost-burdened (spending more than 30 percent of income on housing costs).	US Census ACS 5-year Estimates
Households Burdened by Housing Costs	This dataset represents the total overcrowded housing units. The data values were calculated by counting all occupied housing units with more than one person per room.	US Census ACS 5-year Estimates
Overcrowded Housing Units	Potential exposure to lead paint represents the count of housing units built in 1979 and earlier. Structures are 1979 or earlier due to US Census data divisions, but lead-based paint stopped being used a year earlier, in 1978.	US Census ACS 5-year Estimates
Potential Exposure to Lead Paint	Proximity to Transit Ranking is based on a 2-20 range, with high values (near 20) meaning it is easy to walk to a transit stop. Areas with lower values are areas that require a long walk to a transit stop. Areas without transit data available were given a score of 1.	US Census ACS 5-year Estimates
Proximity to Transit Ranking	The Traffic Proximity and Volume Environmental Justice Index is the annual average daily traffic count per kilometer weighted by the proportion of the population identified as low-income or belonging to an ethnic/racial minority group. Lower values indicate lower proximity to traffic for low-income and ethnic/racial minority groups, while higher values indicate higher proximity to traffic for low-income and ethnic/racial minority groups.	EPA National Walkability Index
Traffic Proximity and Volume Environmental Justice Index	A low-income individual is defined as a 1 person household with 1 commuter whose income is equal to the National Poverty Line. A median income family has the median household income for a given area, four people, and two commuters. A single parent family has 50% of the median household income for a given area, 1 commuter, and 3 people.	EPA EJSCREEN
Percent of Income Spent on Transportation	The share of owner- and renter-occupied households that are cost-burdened (spending more than 30 percent of income on housing costs).	HUD DOT Location Affordability Index

Travel Time to Work Among Females	This indicator is provided in minutes, for workers aged 16 years and over who did not work at home.	US Census ACS 5-year Estimates
Area Covered by Parks	This dataset describes the number and area of parks in each census tract in the United States. This measure is the proportion of park area within each census tract.	NaNDA 2018
Walkability index	Walkability Index scores range from 1 to 20, with higher scores indicating greater ease of walking in a given area.	EPA National Walkability Index
Proximity to Major Direct Water Dischargers Environmental Justice Index	Lower values indicate a community is closer to major direct water discharges and higher values indicate it is farther from major direct water discharges. The Environmental Justice Indexes are used by the EPA to identify geographic areas that are possibly impacted by environmental hazards, with emphasis on areas with populations which may experience disproportionate effects. Each Environmental Justice Index is built by multiplying together 3 things: (1) the environmental indicator, (2) the demographic index for the block group - demographic index for the whole US, (3) the population count for the block group.	EPA
Respiratory Hazard Index	The Respiratory Hazard Index is an environmental justice measure that assesses concentration of and exposure to toxic air quality. Numbers at or below 1 represent a normal, acceptable risk over a lifetime. Respiratory Hazard Index scores of 1 or above mean further monitoring is needed to determine if the pollutant levels will cause non-cancer adverse health effects.	EPA NATA
Food Deserts by Distance from Store	This data focuses on the distance to a supermarket or large grocery store. A supermarket or large grocery store is defined as having at least \$2 million in annual sales and containing the major food departments including fresh produce, fresh meat, dry and packaged goods, and frozen foods.	USDA, Food Access Research Atlas
Average Percent of Households Experiencing Food Insecurity Over 3-year Period	Food insecure household is one that was "unable, at times during the year, to provide adequate food for one or more household members because the household lacked money and other resources for food"	USDA ERS Food Environment Atlas
Households Receiving SNAP Benefits	The Supplemental Nutrition Assistance Program. (SNAP) is the largest federal food assistance program. SNAP provides benefits to eligible low-income individuals and families via an Electronic Benefits Transfer (EBT) card. The Food and Nutrition Service (FNS) of the U.S. Department of Agriculture administers SNAP through state and local welfare offices.	US Census ACS 5-year Estimates
School Proficiency Index	The Department of Housing and Urban Development (HUD) School Proficiency Index uses school-level data on the performance of 4th grade students on state exams. Index values are percentile ranked and range from 0 to 100. The higher the score, the higher the school system quality is in a neighborhood.	HUD School Proficiency Index
Educational Attainment Among Women with Birth in Past Year	Categories: Less than High School, High School Degree, Some College No Degree, Bachelor's degree, Graduate Degree For each category, there is a number for "Gave Birth" and "No Birth"	US Census ACS 5-year Estimates
Supported parents for parent- adolescent communication about sex	The School Health Profiles (Profiles) is a system of surveys assessing school health policies and practices in states, large urban school districts, and territories. Profiles surveys are conducted biennially by education and health agencies among middle and high school principals and lead health education teachers.	CDC School Health Profiles 2018
In the Labor Force	Birthing Persons with Birth in the Past Year that are in the labor force	US Census ACS 5-year Estimates

Labor Market Engagement Index	The Labor Market Engagement Index summarizes the relative intensity of labor market engagement and human capital in a given geography. The index is dependent on the level of employment, labor force participation rate, and educational attainment. Values are percentile ranked nationally and range from 0 to 100. The higher the score, the higher the labor force participation and human capital in a neighborhood.	US Census ACS 5-year Estimates
Households Receiving Public Assistance Income	Receipt of supplemental security income (SSI), cash public assistance income, or food stamps/SNAP in the past 12 months	US Census ACS 5-year Estimates
Prenatal Care Began in First Trimester by Race and Ethnicity	Births in which the mother received prenatal care. Data available for most counties with at least 100,000 population. Races are non-Hispanic or Latino.	CDC WONDER
Had a postpartum checkup	Participants were asked the following question: Since your new baby was born, have you had a postpartum checkup for yourself? A postpartum checkup is the regular checkup a woman has about 4-6 weeks after she gives birth.	PRAMS 2017
Uninsured Rate by Race and Ethnicity	Races are non-Hispanic or Latino.	US Census ACS 5-year Estimates
Female Receive Medicaid	Population with Medicaid, of all females.	US Census ACS 5-year Estimates
Nurse Midwives Availability	Location quotient of nurse midwives. The Location Quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than the national average, and a location quotient less than one indicates the occupation is less prevalent in the area than the national average.	BLS May 2019
OB/GYNs Availability	Location quotient of obstetricians and gynecologist. The Location Quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than the national average, and a location quotient less than one indicates the occupation is less prevalent in the area than the national average.	BLS May 2019
Primary Care Provider Shortage by Severity of Need	Scores are evaluated for provider shortage areas nationally by the Health Resources and Services Administration. The shortages can be due to geography (not enough providers for a given geographic area), population (not enough providers for specific groups of people like low-income or migrant farm workers), or lack of facilities. Facility shortages are not represented in this map.	HRSA
Mental Health Care Provider Shortage by Severity of Need	Scores are evaluated for provider shortage areas nationally by the Health Resources and Services Administration. The shortages can be due to geography (not enough providers for a given geographic area), population (not enough providers for specific groups of people like low-income or migrant farm workers), or lack of facilities. Facility shortages are not represented in this map.	HRSA
Voter Turnout by Demographic	Voting and Registration data have been collected biennially in the November Current Population Survey (CPS) since 1964. The statistics presented are based on replies to survey inquiries about whether individuals were registered and/or voted in specific national elections.	US Census Current Population Survey, November 2016
Civic and Social Association Rate	Social or civil associations include religious, civic, business, political, professional, labor, bowling, recreational, golf, and sports organizations. For 2014, the Civic and Social Association Rate ranges from -3.18 to 21.81, with a median value of -0.23 for all U.S. counties. Negative values indicate a low level of social capital in a given county.	Penn State College of Agricultural Sciences 2014

Violent Crime Rate	The FBI gathers crime data from law enforcement agencies across the country who voluntarily participate in the Uniform Crime Reporting Program (UCR). The UCR Program collects statistics on violent crime (murder and nonnegligent manslaughter, rape, robbery, and aggravated assault) and property crime (burglary, larceny-theft, motor vehicle theft, and arson).	FBI UCR CIUS
Property Crime Rate	The FBI gathers crime data from law enforcement agencies across the country who voluntarily participate in the Uniform Crime Reporting Program (UCR). The UCR Program collects statistics on violent crime (murder and nonnegligent manslaughter, rape, robbery, and aggravated assault) and property crime (burglary, larceny-theft, motor vehicle theft, and arson).	FBI UCR CIUS
Experienced intimate partner violence in the year before a pregnancy	Violence includes "push, hit, slap, kick, choke, or physically hurt you in any other way" by a husband or partner, and/or ex-husband or ex-partner.	PRAMS 2017
Experienced intimate partner violence during pregnancy	Violence includes "push, hit, slap, kick, choke, or physically hurt you in any other way" by a husband or partner, and/or ex-husband or ex-partner.	PRAMS 2017

APPENDIX 3: DETAILED DASHBOARD METRICS DEFINITIONS (GOOGLE ANALYTICS)

Metrics	Definition	Source
Users	Users are unique website visitors that have initiated at least one session on the website during a specific date range. Users do not actually represent unique individuals, but rather cookies or devices. Sessions made with the same device are grouped together as one “user”.	Leadfeeder
New Users	The first time a device or browser loads your website content, Google Analytics creates the client ID and sends it to the GA server. This unique ID is counted as a new user.	Leadfeeder
Returning Users	If Google Analytics detects an existing client ID in a new session, it counts it as a returning user.	Leadfeeder
Page Views	Counts the number of times a user has loaded any page on your website. If the user refreshes the page, it will count as a new page view. For example, if a user lands on the front page, refreshes, and then views another page, they will have three page views.	Leadfeeder
Pages/Session	Counts the average number of pages visited per session over a certain date range. This includes repeated views of a single page. For example, if a website visitor views three pages on their first visit and only one page on their second, their Pages/Session is 2. It is calculated by dividing page views by sessions.	Leadfeeder
Session	The period of time a user is active on the website. By default, if a user is inactive for 30 minutes or more, any future activity is attributed to a new session. Users that leave the website and return within 30 minutes are counted as part of the original session.	Google Analytics Help
Average Session Duration	Provides a top-level view of how long users spend on the website. It is calculated by dividing the total time spent on site by the total amount of users.	Leadfeeder , Google Analytics Help

APPENDIX 4: MONITORING & EVALUATION (M&E) STRATEGY

From 2020-21, Ariadne Labs tested the Maternal Wellbeing City Dashboard in a controlled pilot setting among a targeted group of users in Tulsa, Pittsburgh, and New York City who were asked to use the dashboard for a use case of their choice. The pilot M&E strategy focused on assessing the feasibility and acceptability of using the dashboard. As we refine the dashboard and plan to roll it out at a larger scale, a different M&E strategy is needed. The goal of the M&E strategy for dashboard dissemination at scale is to help the dashboard host monitor its use and evaluate its success in prompting action. The M&E strategy is based on the theory of change for dashboard dissemination at scale:

- > **Inputs:** The dashboard host disseminates and promotes the dashboard to a target audience (people working to improve community livability for birthing people—e.g. elected officials, civil servants, policy advocates, direct service providers).
- > **Outputs:** People in the target audience access the dashboard (it will be open access, no password required) and engage with the content (spend time viewing pages).
- > **Outcomes:** People using the dashboard build their own knowledge and/or engage with other stakeholders in their local ecosystem to improve community livability for birthing people through public awareness, programs, partnerships, and policies.

Overall, the M&E strategy will help the dashboard host to look across the theory of change—inputs, outputs, and outcomes—and assess where there may be gaps in the dissemination strategy or utility of the dashboard in promoting the desired outcomes.

The first two components of the theory of change (inputs and outputs) can be assessed with a **monitoring strategy**—i.e. monitoring the use of the dashboard over time (who/how many people are using it, what content are they accessing). Drawing on lessons learned from the pilot testing, the core of the monitoring strategy consists of [dashboard analytics](#) which are readily available for download. Hosts can monitor:

1. *Quantity of engagement:* Is the dashboard host reaching the target audience? This can be measured primarily through the number of users over time. It may be helpful to look at changes in user numbers before/after different types of marketing events—for example, whether the number of users went up substantially after an email blast vs. posting on social media. Acquisition analytics can be used to assess which dissemination channels are driving traffic to the dashboard website. For example, if users clicked directly on a link shared by the dashboard host, it implies that they were targeted through dissemination efforts. If users found the dashboard in another way, it might imply new users or user types that were not specifically targeted. If the dashboard host has resources for additional data collection beyond the dashboard analytics, they could collect data on user profiles to assess whether user types align with the target audience.
2. *Quality of engagement:* How are people interacting with the dashboard—which content is most interesting and useful to them? This can be primarily measured through page views; this metric was particularly useful in piloting to identify which content was most popular. Session duration may be useful when looked at as a general signal rather than a precise measure; if there are lots of people leaving the website after only a few seconds, that might be a concern. Longer average session duration could potentially reflect more engagement and more consumption of the dashboard content, but it could also reflect navigation issues preventing users from quickly finding the content they want. If the dashboard host has sufficient budget

and wants to make continued improvements to the dashboard, they could also consider seeking qualitative feedback on usability from selected users to identify areas for improvement.

Table 1 below shows core monitoring metrics that we recommend for dashboard dissemination at scale. The data source for all metrics is mySidewalk dashboard analytics, which are built from Google Analytics and visualized in graph form along with a CSV download option (see screenshots in Figure 1 below for examples and Table 2 for full metric definitions). All metrics are available at weekly, monthly, and/or annual time periods. Metrics and data visualizations might change in a future version of the dashboard if developed into a “press” version (where users can generate an on-demand, interactive dashboard for any city, including comparison cities, in the United States).

Table 1. Suggested core metrics for monitoring dashboard dissemination

Metric	Definition
Quantity of dashboard engagement	
# of dashboard users, new	# of users (devices or browsers) loading dashboard website content for the first time
# of dashboard users, returning	# of users (devices or browsers) loading dashboard website content who have previously visited the website
# of dashboard users, total	# of users (new and returning) that have initiated at least one session on the dashboard website during a specified date range
Average # of dashboard users per day	Total # of dashboard users over a specified date range / # of days in the specified date range
# of dashboard users by referrer site type (organic, referral, or direct)	# of dashboard users disaggregated by referrer site type -Organic: someone clicks on a link from a search results page (e.g., someone finds the dashboard on a Google search results page.) -Referral: someone comes to the dashboard from another third-party website. -Direct: someone types the dashboard’s URL directly into their browser or clicks on a link in an email.
# of dashboard users coming from social networks	# of dashboard users coming from social networks—this includes traffic coming from social media like Twitter and Facebook.
Quality of dashboard engagement	
# of page views	# of times a user has loaded any page on the dashboard website (includes refreshes) within a selected date range. Shown as a list of page view counts for every page in the dashboard that has been viewed by a user.

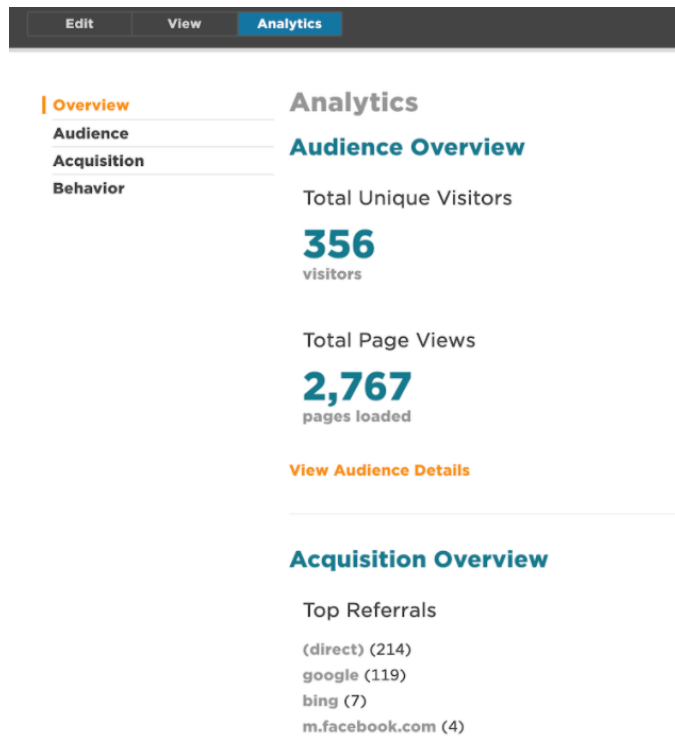
Average # of page views/day	Average number of page views per day
Average # of pages viewed/ session	Average number of pages visited per session over a specified date range
Average of session duration* (seconds)	Average period of time a user is active on the dashboard website (total time spent on the site / total # of users). Session duration is shown in seconds, but the dashboard host can convert this to minutes in order to get a more intuitive understanding of the data.
Popular dashboard pages	A list of the top performing pages in the dashboard website (i.e. pages listed in order of number of page views)

*If the number of dashboard users is small, the average session duration can appear artificially low since it may include days where there was at least one user flagged but no user activity (counted as 0 seconds average session duration). In this situation, the dashboard host may also want to manually recalculate average session duration for larger units of time (e.g. week, month, or year) only including days where there was >0 seconds average duration of use for the users counted.

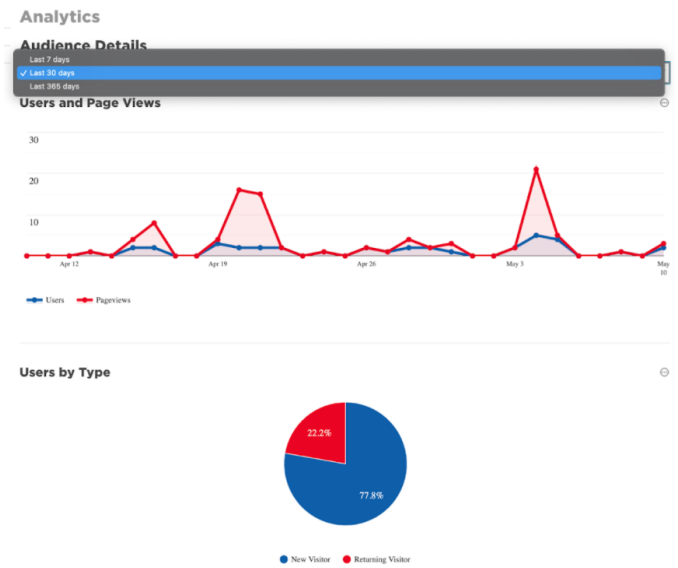
The last component of the theory of change (outcomes) can be assessed with an **evaluation strategy**— i.e. evaluating whether the dashboard is achieving the desired outcomes. This requires hearing directly from dashboard users about their knowledge about the content areas in the dashboard; their confidence and motivation to take action and the perceived utility of the dashboard for doing so; and actual actions they have taken to engage local stakeholders using the dashboard content. To measure these outcomes, the dashboard host could administer a periodic survey of dashboard users to ask questions on these topics. The survey could include a Net Promoter score, as included in the pilot survey, which asks how likely users are to recommend the dashboard to a colleague, as well as questions about which dashboard use cases identified through the pilot are being used in practice and their respective value. If resources allow, the dashboard host could also interview selected users from a variety of user profiles to obtain more nuanced information about whether and how people are taking action based on the dashboard to inform ongoing improvements to the platform and/or dissemination.

Figure 1. Screenshots of mySidewalk dashboard analytic visualizations

Analytics homepage with metrics overview



Analytics time frame selection (7, 30, or 365 days)



Analytics export options (visualization PNG or data CSV)

