

Final Report

Early Evaluation of the PCH Model in Texas

October 2024

Prepared for

Episcopal Health Foundation

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Table of Contents

- Executive Summary* 3**
- I. Introduction*..... 4**
- II. The PCHI Model*..... 5**
 - Evidence of the Success of Case Management7
- III. Report Methodology* 8**
 - Characteristics of Texas zip codes served by PCH sites9
 - Semi-Structured Interviews with PCH Leadership9
 - PCH Client Encounter Data9
- IV. Implementation of Pathways Community HUBs in Texas*..... 10**
 - Harris*.....10
 - Brazos*.....11
 - Williamson*.....13
- V. Quantitative Findings* 15**
 - PCH Site Referral Summary16
 - Timeline of PCH Enrollment18
 - Demographics of PCH Enrollees20
 - Pathways Enrollment by Type.....24
- VI. Quality Measures and Cost Outcomes*..... 30**
- VII. Evaluation of Early Success and Challenges*..... 36**
- VIII. Discussion*..... 38**
- IX. Conclusion*..... 39**
- X. Acknowledgements*..... 40**
- XI. References* 41**

Executive Summary

The Texas Pathways Community HUB (PCH) pilot program is an organized pay-for-performance focused network of community-based organizations that hire and train community health workers (CHWs) to conduct outreach and assessment, and directly connect individuals to needed healthcare and social services. This model is being established in four communities throughout Texas to improve maternal health outcomes. In this brief, we provide a broad overview of the PCH model, the rollout of the PCH model in three of the four PCHs (Brazos Healthy Communities, Harris County Pathways Community, and Pathways Community HUB Wilco), and describe characteristics of individuals enrolled in the program and enrollment measures based on administrative data. We highlight early results for a subset of clients enrolled in a pregnancy pathway, a population which is consistent across all three PCHs. Lastly, we describe existing lessons learned, including successes and challenges, from the implementation of the PCH benefit model.

Texas has one of the highest numbers of vulnerable pregnant women in the nation and high rates of maternal and infant morbidity. The rollout of the PCH model presents a unique opportunity to provide timely and adequate access to prenatal care and other support programs to reduce preventable adverse health effects for mothers and infants. Policies that would help ensure the continued success of the PCH model include providing a state or managed care organization led funding formula for the effort of community-based organizations, community health workers, and to expand coordination of care through increased CHWs utilization of in-home visits.

This report finds that the PCH pilot program at three sites have enrolled more than 400 unique individuals into pathways to date, with most of the individuals having been enrolled in multiple pathways. The type of pathway enrollment differs by sites, and for individuals enrolled in the pregnancy pathway compared with those not enrolled in the pregnancy pathway. Quality measures for those enrolled in the pregnancy pathway indicate that the utilization of prenatal care is low relative to clinical guidelines. On average, individuals enter the program after the first trimester, signaling that the identification of clients at earlier stages of pregnancy may require additional relationships with medical stakeholders. Nevertheless, quality measures for birth outcomes look favorable relative to the county average outcomes. Finally, back of the envelope calculations imply potential savings in infant medical costs related to the delivery, indicating early successes of the benefit of the pregnancy pathway through reductions in preterm births. More work is needed to establish a causal relationship between the rollout of the Texas PCHI model, changes in outcomes, and medical spending.

I. Introduction

Despite spending more on healthcare than peer countries, the United States possesses the lowest life expectancy and poorest performance on many maternal and child health outcomes (Gunja et al., 2022). Racial and ethnic and income-based disparities in maternal and child health are large and persistent (Pollock et al., 2021), driven, in part, by social and economic forces, the social determinants of health, that often go unaddressed by policy intervention (Braveman & Gottlieb, 2014). These issues are particularly salient in Texas which is responsible for 11 percent of US births and 12 percent of maternal deaths (Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), 2024).

In 2022 Texas mothers received prenatal care in the first trimester for just 66 percent of live births, the third lowest rate in the country and well below the national average (75%). Non-Hispanic Black (58%) and Hispanic mothers (62%) received timely prenatal care at much lower rates than non-Hispanic White mothers (75%) (Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), 2024). The same year the uninsured rate among childbearing aged women 15-49 years was 22 percent (US Census Bureau, 2022). The large uninsured population places a heavy burden on the social safety net to manage primary care including reproductive health prior to pregnancy when those falling at or below 203 percent of the federal poverty level would become eligible for perinatal services through Medicaid.

The American College of Obstetricians and Gynecologists (ACOG) recommends receipt of regular, coordinated, prenatal and postpartum care starting in the first trimester to reduce the risk of pregnancy-related complications and improve outcomes for mother and infant (ACOG, 2017). Prenatal care is particularly important for screening assessment of risk factors, patient education and counseling which support healthy delivery. Federal and state efforts to address access to perinatal care have primarily focused on health insurance reforms that expand eligibility or postpartum coverage. Health insurance coverage is an important predictor of receiving clinically recommended perinatal care (Admon et al., 2021), however, differential risk of experiencing severe maternal morbidity (SMM) by age, race, and ethnicity remain present among those with commercial and Medicaid insurance highlighting limitations of policy focused solely on insurance coverage (Chen et al., 2021).

Additionally, the transitions in and out of health insurance coverage after birth can negatively influence ongoing management of social, physical, and mental health needs and, ultimately, perinatal outcomes. Such transitions are common for patients on the margin, particularly in non-expansion states like Texas where eligibility for parents is not as generous as the pregnancy pathway. To mitigate some of these concerns Texas extended coverage in Medicaid to 12 months following delivery in January 2024 (Abbott, 2024). However, this approach does not address social needs beyond the medical system which contribute to the vast disparities in outcomes.

There is growing evidence that improved screening and coordination of a patient's medical and social needs can increase the receipt of timely prenatal care (Lanese et al., 2023) and reduce the incidence of preterm birth (Combs et al., 2023; Garite & Manuck, 2023; Hillemeier et al., 2015)

and low birth weight (Redding et al., 2015). One promising approach, the Pathways Community HUB Institute (PCHI) Model is a flexible care coordination framework that enables the collaboration of community-based organizations across medical and social services through referral partnerships and centers the coordination of client needs around face-to-face visits with a trained community health worker (CHW). Unlike other case management strategies, the PCHI Model is designed to address the social determinants of health in addition to referrals for specific maternal, infant, and other health concerns. A pilot implementation of the PCHI model in the early 2000s in Ohio has shown promising positive returns on investment for Managed Care Organizations (MCOs) and has since been expanded to all Medicaid MCOs (CareSource, Centene, Molina, Paramount, UnitedHealthcare) in the state (Association of Maternal & Child Health Programs, 2021; Redding et al., 2015). Today, 11 community HUBs exist in Ohio and the model has been expanded to other states. Building on these findings, the PCHI Model has recently been expanded to Texas with four distinct programs now serving Bexar, Brazos, Harris, and Williamson counties.

The purpose of this report is to provide a broad overview of the Pathways Community HUBs (PCH) model, the rollout of the PCH model in three of the four PCHs (Brazos Healthy Communities, Harris County Pathways Community, and Pathway Community HUB Wilco), describe characteristics of individuals enrolled in the program and enrollment measures based on administrative data. Lastly, we describe existing lessons learned, including successes and challenges, from the implementation of the PCH benefit model. Understanding the impact of the Texas PCHs on closing risk factors for vulnerable pregnant women will inform efforts to address health inequities in maternal and child outcomes in the state and provide meaningful evidence of the early successes and limitations of the program.

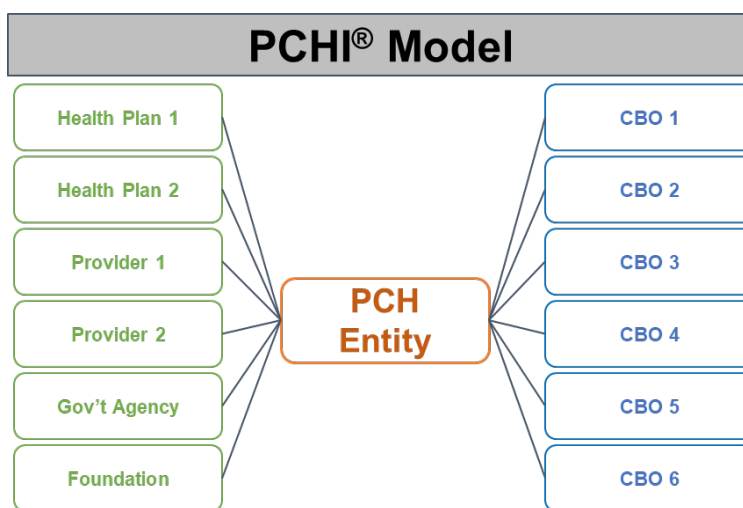
II. The PCHI Model

The PCHI model is a community health workers centered, community-based care coordination program aimed at integrating and referring vulnerable populations to seek appropriate treatment for healthcare and other social needs (PCHI, 2024). The goal is to address gaps in care and health needs through a whole-person approach, with the end goal to improve health outcomes and solve social needs.

At the same time, the PCHI Model aims to break down barriers and reduce inefficiencies. These goals are achieved by limiting PCH organizations to serve only one community/region, thereby centralizing organization and responsibilities, and by relying on existing community resources to engage clients and improve outcomes. Specifically, this allows the PCH organization to be the central partner for developing care coordination networks with healthcare providers and community-based organizations (CBOs). Thus, the PCHI model organizational structure relies on the PCH organization in the center between healthcare providers and CBOs to provide oversight on standardized data and reporting requirements, quality assurance, and contracting as a trusted neutral convener (see Figure 1). Vulnerable populations are referred from the PCH organization

to organizations that employ CHWs, who in turn aim to identify care needs and refer clients to entities, providers, and organizations that can close these care gaps. An alternative organizational structure is possible to provide flexibility with existing infrastructure across the United States. For example, existing organizations may provide referrals and provide community support through social workers and no other entities may exist that can be considered to play the role of CBOs. In such cases, it is possible to establish a PCH entity that is also tasked with the responsibilities of a CBO under a pathway agencies agreement.

Figure 1 – Organizational Setup of PCHI Model



Reference: ©Pathways Community HUB Institute® 2023

The PCH Institute developed a framework and standards to certify proper adoption by organizations tasked with managing the PCH model approach, generally referred to as the PCH. Through this framework, organizations are required to follow protocols and PCHI provides standard forms for CHWs on how to record client care needs (visit form), sociodemographic characteristics (demographic form), and progress in closing gaps in care (progress form), referred to as pathways closure. This framework provides the basis for a standardized quality benchmark report to efficiently report progress in the implementation and success of the PCHI model. Additionally, PCHI provides expert support in the training, development, and implementation of the model. For example, CHWs are trained through learning modules to effectively impact behavioral change to address risk factors of clients, as well as trained through interactions with existing CHW and social workers at CBOs.

The PCH models core component is the identification and classification of 170 modifiable risk factors into 21 defined pathways (spanning social, behavioral, safety, and health risks) to address and mitigate risk factors by CHWs during visits with clients, where 75% of visits must be conducted face-to-face. CHWs main task is to enroll clients into pathways that require specific

actions and to close said pathways. Case management and support programs are still required and driven by the referral networks to which CHWs refer individuals enrolled in a pathway.

The long-term financial solvency of the model is secured through a pay for performance model that focuses on a value-based outcome approach, where organizations are reimbursed every month for CHWs time to engage with clients (which should be no more than 50% of total compensation with engaged members) and the success in closing care needs through a pathway fee (minimum of 50% of total compensation). This engagement fee models follows a common approach of a per member per month payment but is conditional on having a visit by the CHW with the client. The pathway fee reimbursements are based on the social determinants of health ICD-10 diagnoses codes and each diagnosis code is assigned a weight based on the complexity of the task. Initial steps to implement a CHW driven case management model have also been formalized in the Texas legislature with House Bill 1575. The bill formulates case management for Medicaid managed care covered children and pregnant women through non-medical health related needs assessment (Texas House Bill 1575, 2023).

Evidence of the Success of Case Management

Case Management has long been championed to be able to improve long-term health and reduce healthcare spending. However, the public health profession has generally taken several different approaches to case management of patients. Traditionally, case management involved measures of continuity of care, which broadly means that patients should have guideline adherent rates of primary care and specialist visits and are otherwise considered to have fragmented care. Some evidence suggests that individuals with consistent physician checkups can better control diseases and may reduce the reliance on emergency care (David et al., 2015; Dolton & Pathania, 2016; Iizuka et al., 2017; Lippi Bruni et al., 2016). This may be the result of closing gaps in care and enhanced coordination of disease management within the primary care setting as well as with specialty practices. Similarly, care fragmentation has been shown to increase risk of adverse health outcomes for those with chronic diseases (McWilliams, 2016; Milstein & Gilbertson, 2009).

While adequate touch points (or continuity of care) with healthcare professionals can be important to prevent and manage existing diseases, the long-term success of continuity of care has been unclear. This is because individuals who benefit most from case management, i.e., those with chronic diseases that require timely and continuous healthcare interactions, may not be the ones who are able to connect with the healthcare professionals due to competing social needs. Nevertheless, work on continuity of care among the elderly provided some suggestive evidence that having continuous primary care visits can lead to reductions in emergency department use and lower hospitalization rates (Amjad et al., 2016; Hussey et al., 2014; Nyweide & Bynum, 2017). A number of randomized controlled trials were performed to understand how continuity of care, with primary care physicians may affect long-term health and healthcare spending. However, the findings from randomized control trials provide limited support of the benefits (in terms of lower hospitalization and mortality rates) of having annual touch points with primary care physicians (Boulware et al., 2007; Krogsbøll et al., 2019; Peikes et al., 2009).

Prenatal care has also received substantial interest, especially because of substantial disparities in birth outcomes along socioeconomic dimensions. As a result, many programs have utilized in-home visits to improve outcomes and have sometimes shown to be effective, for example, in lowering incidence of low birth weight (Goyal et al., 2013; Roman et al., 2014), though the majority of studies have shown limited success (Kemp et al., 2011; Kitzman et al., 1997; Koniak-Griffin et al., 2000; Lee et al., 2009; Nguyen et al., 2003; Norbeck et al., 1996; Olds et al., 1986), while a number of studies examining CHW-based approaches suggest greater success (Scharff et al., 2022).

Several reasons why continuity of care may not be enough to improve health have been widely discussed. A study by Peikes et al. (2009) used a RCT design to examine the effectiveness of several case management approaches among Medicare patients. These take-aways are summarized by Brown et al. (2012), who outline six distinguishing features for effective case management. These include elements from the PCH model and include 1) having a care manager serve as a communication HUB, 2) face-to-face visits with patients, 3) evidence-based educational intervention, 4) establishing continuity of care with providers, 5) comprehensive clinical medication management, and 6) care coordination after hospitalizations (R. S. Brown et al., 2012). In summary, comprehensive care coordination with face-to-face touch points is key. However, the broader take-away from the literature is that, even for theoretically effective programs that have utilized face-to-face visits with healthcare professionals, identifying at-risk populations with unaddressed social needs that may benefit most from the program is critical to the success of the program and patient outcomes.

An early approach to this style of case management was tested in Ohio, offering evidence of the success of the PCH design, where documented measurement tools to monitor closures of social determinants of health needs were developed in addition to a pay-for-performance reimbursement model (Rex et al., 2021). The PCH model pilot occurred in Richland County, Ohio, where a non-profit organization, the Community Health Access Project, identified and provided centralized care through CHWs to pregnant women at risk of having poor birth outcomes. An evaluation of the pathway approach was completed by Redding et al. (2015) for the study period from 2001 to 2004 and found lower odds of experiencing low birth weight (Redding et al., 2015). A follow-up evaluation of the PCH model implemented in Stark County, Ohio identified that the PCH model improved prenatal care adequacy (Lanese et al., 2023) and a study on low-birth-weight outcomes in Richland County, Ohio found that the program reduced the probability of low birth weight (Chiyaka, 2019). Following the success of the PCH sites in Ohio, this model has rapidly expanded across the country (Association of Maternal & Child Health Programs, 2021), and the PCHI model has received attention from the Centers for Medicare and Medicaid Services, the Agency for Healthcare Research and Quality, and the Assistant Secretary for Planning and Evaluation (Agency for Healthcare Research and Quality (AHRQ), 2016; Alley et al., 2016; ASPE, 2023).

III. Report Methodology

The objectives of this report are to describe the implementation timeline of the PCHs in Brazos, Harris, and Williamson counties, their organizational structure, target populations, partnerships with care coordination agencies and early successes and challenges with implementation. Using publicly available data, we first describe the sociodemographic characteristics and healthcare context of Texas communities served by each PCH site. Then, using qualitative data from semi-structured interviews with PCH site leadership and de-identified client encounter data we describe the status of PCH implementation, characteristics of the enrolled populations at each site, current client enrollment (overall and by pathway) and status of pathways opened to date. This early analysis serves as an important baseline, highlighting indicators of early success and supporting ongoing process improvement among Texas PCH sites.

Characteristics of Texas zip codes served by PCH sites

We describe the average characteristics of zip codes served by each PCH site using publicly available 5-year estimates (2018-2022) from the American Community Survey (ACS). We draw from the following variables from the ACS: Insurance status (percent uninsured), percent of the population by age (younger than 17; 18-24; 25-34; 35-44; 45+), gender (percent male; female), race/ethnicity (percent non-Hispanic White; non-Hispanic-Black; non-Hispanic other; Hispanic), educational attainment (high school or less; some college; bachelor's degree or more), marital status (percent married), median household income, percent uninsured and total population count.

Semi-Structured Interviews with PCH Leadership

Semi-structured interviews were conducted with each site during the early phase (December 7, 2023, and January 17, 2024) and later phase (August 12 to August 30, 2024). Discussions with PCH site leadership were guided by a series of 16 core open-ended questions related to PCH structure (core PCH staff members, CHWs, referral partners), target population, implementation (e.g. start date, status), relationships with care coordination agencies (CCAs), PCH and community infrastructure capacities to conduct care coordination for all 21 pathways, future directions, self-reported baseline successes and challenges, and sustainability (status of MCO contracts and ongoing discussions).

PCH Client Encounter Data

To supplement the information obtained through discussions with PCH leadership we also obtained de-identified client (and pathway) level data from Brazos, Harris, and Williamson PCH sites. These data were made available through July 31, 2024, for all sites. Quality improvement is central to the PCHI design and requires a robust data collection system that enables PCH staff to conduct ongoing process and outcome assessments. Data collection is, primarily, led by CHWs and occurs using a set of electronic intake forms that are standardized across PCH sites as well as pathways referral trackers that enable staff to track the connection of clients to care coordination agencies and identified needs. For example, the PCHI standard forms include a “demographic form” which captures client sociodemographic and health characteristics, and reason for referral

to the PCH, a “visit form” which tracks client social, health, and safety needs, and a “progress form” which tracks the status of each client’s pathway episode of care from referral to closure.

For each site, we first report the total number of client referrals to the PCH site, the number of clients enrolled in pathways, the total number of pathways enrolled, pathway outcomes (finished complete, finished incomplete), the average weeks from enrollment to discharge, and average number of enrolled pathways per client. We then map referrals by zip code and describe the trends in enrollment across all three sites. Next, we describe the sociodemographic characteristics of the enrolled population by site. We report the proportion of the enrolled population enrolled in each of the PCHI 21 Standard Pathways including Adult Education, Developmental Referral, Employment, Family Planning, Food Security, Healthcare Coverage, Housing, Immunization Referral, Learning, Medical Home, Medical Referral, Medication Screening, Medication Reconciliation, Medication Adherence, Mental Health, Oral Health, Postpartum, Pregnancy, Social Service Referral, Substance Use, and Transportation by site and pregnancy status. Lastly, we focus on the pregnancy pathway and describe birth and post-partum outcomes including the assessment of commonly reported perinatal quality measures.

IV. Implementation of Pathways Community HUBs in Texas

Harris

The PCH implementation in Harris County was the culmination of several years of preparation that included two pilot projects in Houston that have used elements of the PCH model. The two pilot studies included The Network of Behavioral Health Providers’ (NBHP) Community Coordination of Care Pilot Project and the Healthy Women Houston (HWH) Pilot Project. The former pilot aimed at servicing low-income children, adolescents, and adults with a mental health diagnosis and social service needs in north Houston. The HWH project’s focus was to reduce maternal mortality in the highest maternal morbidity areas in Harris County. Both projects integrated health care providers (including primary care and behavioral health), social services, and government entities to provide and utilize CHWs to address a broad spectrum of social determinates of health.

Lessons learned from these pilots as well as meetings with PCH stakeholders from other states led to the development of the PCH model in Harris County. A successful implementation required the identification of relevant organizations that can comply with the national PCHI standards to become a PCH certified program. Further, effective management and engagement of CHWs required a needs assessment, which was aided by the two pilot programs, and led to the identification of Medicaid eligible adults with health diagnoses, substance use disorder, and Medicaid eligible pregnant and postpartum women with behavioral health risk factors as the target populations (see also Table 1). To aid enrollment of the target population, CCAs in the target populations’ highest need areas were identified. CCAs CHWs were required to be certified CHWs, with additional behavioral health training as well as continued training (for example to learn about perinatal substance use). Earlier interaction with community partners in the two pilot projects provided a solid foundation for the PCH roll-out. At the initiation of the program, a large network of more than 100 community and referral partners (including The Network of Behavioral Health

Providers membership, Memorial Hermann Hospital System - Southwest, Y.M.C.A. International Services, Houston Food Bank, and more) committed to receive client referrals from the PCH.

The PCH model in Harris County was to follow the basic standards outlined in the PCHI manual, which meant that an entity, in this case NBHP, operated as a PCH that contracted with CCAs. NBHP participation in the Community Coordination of Care Pilot, as well as the structure of NBHP in which it operates with minimal staff and leaves member organizations with the delivery of healthcare, made it a suitable candidate. As part of the PCH, staffing was limited to a PCH director, a quality improvement and project manager, a community resource and referral coordinator, and reimbursement coordinator. The director's job is to oversee the entire project. The quality improvement and project manager's responsibilities include overseeing community health workers and making sure they receive the required support to be successful in their positions (including training), and to generally support the organization of the PCH that includes reviewing measures of success and enrollment targets, among other things. The community resource and referral coordinator's role is to maintain relationships with community referral partners, identify if partners continue to offer relevant services to remain a referral agency, and assign referrals to CHWs by articulating clients care needs and verifying client's information. The reimbursement coordinator makes sure CCAs receive appropriate and timely reimbursements for closed pathways.

A soft opening of the PCH project occurred on November 1, 2022, in which CHWs onboarded already internally identified clients at partner agencies, and the official opening to the public occurred on February 6, 2023. To close pathways, CCAs and the CHWs play a critical role, and 6 CHWs are currently employed at CCAs. The long-term goal is to employ 10 full-time CHWs (to expand capacity) as current staffing levels limit the HUB's ability to market the program as much as they want. The Harris PCH has three experienced CCAs, the Council on Recovery (helping individuals and families across the age spectrum whose lives have been impacted by alcoholism, drug addiction, and co-occurring mental health disorders), Santa Maria Hostel (multi-site residential and outpatient substance use disorder treatment centers for women, and one of a few to offer a full continuum of services for women who are pregnant or parenting), and the City of Houston Health Department's Community Cares program.

Initial funding to support the PCH, CCAs and CHWs would come from seedling funds from EHF and United Healthcare, with reimbursement for CCAs following the PCH standard after 6 months of implementation, while continuing to support CHW training and salaries up to 3 years at the CCAs. Long-term financial stability will be achieved through contracts with Medicaid Managed Care organizations.

Brazos

The PCH implementation in Brazos County builds upon existing community initiatives in the Brazos Valley that connect private and public partners. The broader Brazos Valley is part of an extensive community health initiative program, called the Texas Accountable Communities for health initiative (TACHI). This includes Project Unity, which has a 30-year history of providing a broad array of case management that spans the social determinants of health (SDOH) spectrum,

supports families and children (with child abuse prevention a major initiative), and providing job training for veterans, among other services. More importantly, they have been performing these tasks in-house through in-home visits. Nevertheless, Brazos Valley did not have a robust community health workforce in place, so the PCH model was identified as a suitable candidate model to improve and expand existing community initiatives and build a new CHW infrastructure to address local challenges. Thus, Project Unity, with their existing case management programs in Brazos Valley, was identified as a suitable PCH, with support from Texas A&M Health due to their long history of supporting community efforts. Given the deep roots in the community, identifying populations of need did not necessarily require needs assessment, however, the success of the PCH model depends on identifying clients with addressable needs and partner organizations that can help fill these needs. As such, pregnant women, and pregnant women with mental health concerns, including anxiety and depression, were identified as the main target population. The target population also includes other individuals with chronic diseases that had an emergency department visit at Common Spirit. In the initial phase of the PCHI implementation, the focus was set on pregnant women and a target geographic area was set with zip code 77801, 77803, and 77840.

Unlike the traditional PCH model described above, Brazos employs the individuals who were trained to become CHWs for the PCHI implementation. As such, Brazos has applied to become a Pathways Agency (PA) under the PCHI model. This decision was driven by Project Unity's long history of case management experience in the region, as well as the existing void in Brazos Valley of CCAs with existing CHWs. As such, Project Unity led the training of a CHW workforce in the Brazos Valley. Compared with the traditional PCH approach, the PA approach just means that Brazos operates as a single agency rather than engaging with CCAs (as described above). All other requirements are similar to organizations operating as a PCH.

Individuals hired to become CHWs received 160 hours of online training through PCHI, which provides general pathway model training and 16 hours of Pathways specific training. One aspect that was deemed important to the success of CHWs was that being part of Project Unity also allowed for a high level of support from the organization, where the newly trained CHWs could ask other staff how they handled similar situations for other case management populations. Similarly, Project Unity is well connected in the community to receive and make referrals through its participation in the Community Partnership board, a more than 80 partner collaborative group spanning health (including Federal qualified health center and Baylor Scott and White (BSW)), education, housing (section 8 housing partner), employment, needs-based and faith-based organizations. Early referral patterns display that close to half of all referrals are currently coming from Health Point and Saint Joseph Health, but existing infrastructure at Project Unity (family resource center) and funding partners also play important roles in Section 8 referrals.

Staffing at Project Unity was central for the training and success of CHWs. Project Unity hired a CHW supervisor, who already had field experience at Project Unity. The organization and bookkeeping of pathway referrals are organized by existing staff with experience in case management administration. Directors of the PCH model implementation, who oversee the process and are responsible for the initial funding, are Texas A&M Health and Jeannie Mansill, President of Project Unity. More importantly, individuals who became CHWs were hired with existing

regional ties and a high level of support from Project Unity to reduce potential attrition and turnover. In sum, following the PCH model, staffing was limited. Initial seed funding at Project Unity paid for the CHWs time, therefore not requiring a role focused on making sure CCAs receive appropriate and timely reimbursements for closed pathways.

Initial hiring of individuals started in March 2023, after which they were trained as CHWs. Initial clients were identified and referred to the appropriate pathways beginning in June 2023. To provide adequate access to clients, the PCH model at Project Unity started with 4 CHWs, but funding allowed the expansion to 6 CHWs by summer of 2024.

To provide infrastructure, personnel, and the training funding was secured from a variety of sources to establish the PCH model in Brazos Valley. Initial funding was received from seedling funds from EHF, Common Spirit, Baylor Scott and White, Aetna, and United to provide full salary and benefit support for CHWs. Funding from Common Spirit was also received with the initial goal to lead the evaluation of clients being referred to the PCH model from their emergency department. More importantly, long-term financial stability will be achieved through contracts with Medicaid Managed Care organizations, however, to arrive at a self-sufficient model with insurer contracts, these parties required evidence that the PCH model works in Brazos Valley, as such, the hope is that the initial seed investments from MCOs (Aetna, United, and BSW) are enough to provide evidence of the financial efficacy of the program.

Williamson

The PCH implementation in Williamson County represents a new care delivery approach in the county. Prior to the PCH implementation, Williamson County did not have an existing infrastructure in place. To provide a robust infrastructure in the county, the PCH model was implemented under the existing United Way of Austin and Williamson County umbrella organization. As such, not all of Williamson County is currently a priority for the PCH model, though it is planned to expand the PCH model across the county. To prioritize areas of high need, five health equity zones from health needs assessment in the county were identified. Within each equity zone stakeholders are to be identified that can attest to the unique and varying needs of residents, which may lead to somewhat varying degrees of changes to the target population or referral approach. However, the general identified primary target for the site are pregnant women.

Consistent with the Harris County approach, the PCH model follows the basic standards outlined in the PCHI manual, where United Way of Austin and Williamson is the operating PCH. Minimal employment includes the PCH director, and pathways HUB manager. The director's job is to oversee the entire project, and expand and maintain community relationships, while the pathways HUB manager is responsible for all technical data aspects, management of referrals, PCHI compliance, billing, and reporting.

Operationally, the PCH has referral agreements signed with several organizations: Lone Star Circle of care (the local FQHC), Dell Children's Health Plan, and the community Medicaid Health Plan and non-formal agreements exist with the local WIC program. Referrals are connected to the PCH through the online find help platform, the public 211 hotline.

The CHWs are located and employed at two CCAs in eastern and central Williamson County, which are the highest need equity zones. The possible addition of a third CCA or more is currently being considered. The CCAs must exemplify established relationships with community members. Further, to effectively serve pregnant women, it is a goal to utilize CCAs that employ CHWs that are bilingual in English and Spanish and native Spanish speakers. The PCH has also trained two CHW trainers for future onboarding of CHWs as most CHWs have a social services background but require additional training. To aid with oversight and to provide CHWs with adequate support, each CCA site also has a supervisor who assigns cases. Expected workload per CHW may reach up to 40 clients, though initial implementation started with a load of 20 clients to allow CHWs to understand the complexity of service needs among the referred population.

The PCH model opened in June 2023. Initial funding to support the operation of the PCH and the CCAs stems from funding from EHF and United Way, which provided a two-year grant. Additional funding was received from other foundations and organizations. To maintain the PCH model after the ramp-up phase, and especially after year two, the goal is to continue to raise grant funds if necessary, and otherwise sign contracts with Medicaid managed care organizations (MCOs).

Table 1. PCH Organizational Structure

	Brazos	Harris	Williamson
Planning/Ramp up Period	March - June 2023	June 2021 – November 2022 Pilot November 2022 – January 2023	March - June 2023
Official Start Date	June 2023	February 2023	June 2023
Target Population	<ul style="list-style-type: none"> • Pregnant women in their second pregnancy with risk factors such as anxiety and/or mild depression and adults with chronic disease 	<ul style="list-style-type: none"> • Uninsured and Medicaid enrollees and Medicaid-eligible pregnant/postpartum adults with behavioral health risk factors • Uninsured and Medicaid enrollees and Medicaid-eligible adults with a mental health diagnosis or 	<ul style="list-style-type: none"> • Pregnant and post-partum women

		substance use disorder	
CHWs	6 CHWs (6 FT)	6 CHWs (4 FT, 2 PT)	4 CHWs (4 FT)
Planned Enrollment per CHW	Up to 40 clients per full-time CHW	Up to 40 clients per full-time CHW	Up to 40 clients per full-time CHW
Partner Organizations (CCAs)	None	3 partner agencies	2 partner agencies
Funding sources	<ul style="list-style-type: none"> • EHF • Common Spirit • BSW • Aetna • United 	<ul style="list-style-type: none"> • EHF • United Healthcare • Harris County ARPA funding 	<ul style="list-style-type: none"> • EHF • United Way • St. David's Foundation • Georgetown Health Foundation • Texas Mutual Insurance
MCO contracts	None to date in place	None to date in place	None to date in place

V. Quantitative Findings

In Table 2 we display the average sociodemographic characteristics of zip codes served by each PCH based on five-year estimates from the 2018-2022 American Community Survey (ACS). Brazos and Williamson PCHs appear to serve a slightly older and less racially diverse demographic relative to Harris PCH. Among zip codes served by Brazos, adults 45 years and older represent 42% of the total population while persons younger than 25 years comprise nearly 34%. Non-Hispanic White (57%) and Hispanic (24%) residents comprise most of the population. The zip codes served by Harris PCH have a slightly younger composition (36% less than 24 years of age) and non-Hispanic Black (24%) and Hispanic (46%) residents represent the largest racial/ethnic subgroups followed by non-Hispanic White residents (21%). The uninsured rate among communities served by Harris is 24%, higher than other sites and the Texas state average (17%) in 2022. Communities served by Williamson PCH are older, on average, with adults 45 years and older representing 41% of the population. Non-Hispanic White (57%) and Hispanic (28%) residents comprise the majority of the population. Williamson zip codes also appear better off in terms of education and median household income relative to areas served by other sites. Nearly 66% have completed some college or greater education and the median household income (in 2022 dollars) is more than \$20,000 greater than the average median income of zip codes served by the Brazos and Harris sites (Table 2).

Table 2. Characteristics of Zip Codes Served by PCH

	Brazos	Harris	Williamson
Age			
0-17 Years	21.27	26.28	22.50
18-24 Years	12.55	9.69	7.64
25-34 Years	11.92	15.71	14.14
35-44 Years	11.89	14.12	14.57
45+ Years	42.37	34.21	41.15
Gender			
Female	50.34	50.58	50.52
Male	49.66	49.42	49.48
Race/Ethnicity			
NH-White	57.06	21.32	57.10
NH-Black	14.94	23.78	6.73
NH-Other	4.21	8.56	8.21
Hispanic	23.78	46.35	27.97
Education			
High school or less	46.82	46.56	34.44
Some college	27.49	25.78	30.06
Bachelor's or more	25.69	27.66	35.50
% Married	50.42	46.33	55.81
Median Household Income (\$)	62,103	65,718	89,691
% Uninsured	15.01	23.78	11.62
Total Population	361,034	3,475,034	439,457

Source: 2018-2022 American Community Survey, Five-Year Estimates. **Notes:** Zip codes were assigned to each site based on reported client geographic characteristics of referrals from PCH Care Coordination System (CCS) extracts. Characteristics represent an equally weighted average across all referral zip codes by PCH.

PCH Site Referral Summary

In Table 3 we provide the total number of referrals, total number of unique enrolled individuals, the share of unique enrolled to the number of referrals, total number of pathways enrolled, pathway outcomes (finished complete and incomplete), mean weeks from enrollment to pathway closure, and mean count of open pathways per enrolled client. The Brazos PCH site began enrolling clients in June 2023. As of July 31, 2024, the site has received 212 total referrals, enrolling 131 clients, reflecting a 62% enrollment rate, and 1255 pathways. Among the 990 closed pathways, 953 have finished complete (96%) and 37 (4%) have finished incomplete. On average, the average time from enrollment to closure was 21 weeks and the average number of pathways per client is 11.62. The

PCH site in Harris County began enrollment via a soft opening in November 2022 and the official opening of the program to community referrals occurred in February 2023. As of end July 2024, the site has received 384 total referrals and has enrolled 200 clients, reflecting an enrollment rate of 52%. Clients were enrolled in a total of 1341 pathways for an average of 7 pathways per client. Among the 1192 closed pathways, more than 70% have been successful closures. The average number of weeks from enrollment to closure of pathway was close to 23 weeks. Like Brazos, the PCH site in Williamson County is in an earlier phase of implementation, beginning enrollment in June 2023. Over the 13-month period, the site received 182 referrals and enrolled 82 clients, reflecting a 45% enrollment rate. CHWs opened 548 pathways for an average of 7 pathways per client. Of the 548 pathways, 342 have closed with 84% being successfully closed, while 16% were finished incomplete. The average number of weeks from enrollment to closure of a pathway was 20 weeks.

Table 3. Overview

	Brazos	Harris	Williamson
Total Referrals	212	384	182
Total (%) Enrolled	131 (61.79)	200 (52.08)	82 (45.05)
Total Pathways Enrolled	1255	1341	548
Pathways Finished Complete	953	839	286
Pathways Finished Incomplete	37	353	56
Mean Weeks from Enrollment to Discharge	21.36	22.77	19.92
Mean Total Pathways per Client	11.62	7.02	6.94

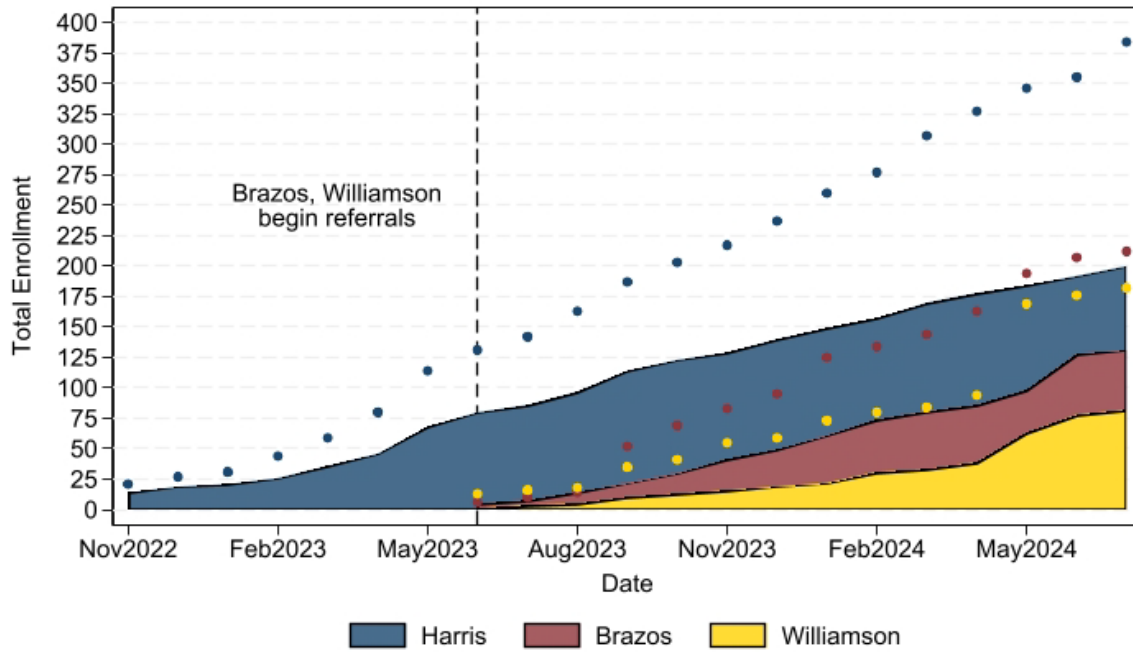
Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024.
Notes: Clients may have more than one pathway and more than one of the same pathway type (E.g., Medical needs, client education topics). Total enrolled represents the count of clients enrolled over the period of implementation regardless of current enrollment status. Mean pathways per client represents the total number of open pathways divided by the number of clients with an open pathway (as of July 31, 2024). Mean weeks from enrollment to discharge represents the total exposure to the PCH HUB from the start of enrollment. Individuals who have not been discharged were included as of July 31,2024.

Timeline of PCH Enrollment

Figure 2 displays the cumulative number of referrals (scatter plot) and enrollees from the start of enrollment to July 31, 2024, at the Harris, Williamson, and Brazos PCHs. During the three months of soft opening at the Harris site enrollment was already at 26 clients by February 2023 and enrollment grew in the first six months of the official implementation phase to more than 90, to more than 140 by the end of December 2023, and to 200 by July 31. On average, the Harris site received 18 new referrals and enrolled 10 clients per month. Enrollment at the Williamson site began in June 2023 and was relatively flat in the first three months (with less than 10 enrollees) with the largest growth beginning in May 2024. To date the site has enrolled 82 individuals of the 182 referrals received. On average, Williamson PCH received 13 referrals and enrolled 6 clients per month. Enrollment at Brazos also began in June 2023 with one additional full time CHW relative to Williamson PCH. In the first three months enrollment was slow, reaching 14 by August 2023, and nearly doubling to 30 by October. Over the 13-month period the site received 212 referrals, enrolling 131 clients with an average of 15 referrals and 9 new enrollments per month.

Comparing the number of enrollees in the first 13 months of opening suggests some differential rates of enrollment. However, sites differ on several important aspects. Harris came into the PCH implementation with established partnerships, experience from two separate coordination pilots, experienced CHWs, and identified clients with an established relationship with the PCH. Discussions with Williamson PCH made clear that slow enrollment early on has been intentional to appropriately train CHWs and ensure they learn how to identify and manage client needs before ramping up enrollment. Unlike Harris PCH the CHW model is relatively new to the staff in Williamson County. The focus on quality is reflected in the proportion of pathways successfully closed to date (Table 3). Based on this early assessment the same can be said of Brazos PCH which had no established community health workforce prior to implementation. The faster enrollment growth in Brazos relative to Williamson PCH may be driven by demand for services and/or Project Unity's long-established relationships in the Brazos Valley.

Figure 2. Enrollment by month, 2022-2024

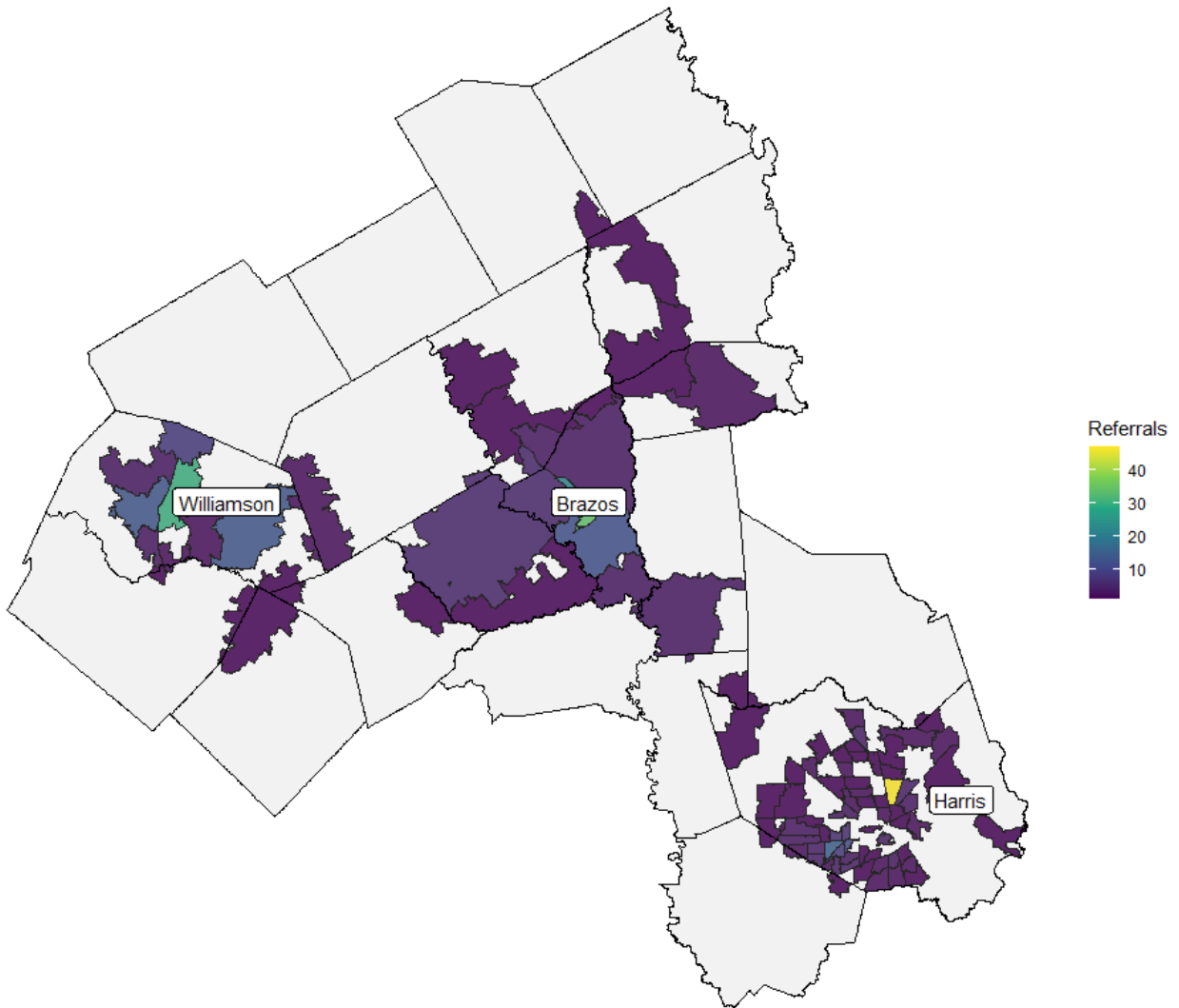


Source: Data from PCH Care Coordination System (CCS) extract. **Notes:** Harris PCH enrollment data start in November 2022 and end in **July** 2024. Enrollment counts were carried forward in the figure but do not reflect actual enrollment in 2024. Enrollment in Williamson and Brazos PCH began in June 2023.

Referrals by Geographic Location

A heatmap of PCH referrals by zip code is displayed in Figure 3. The Brazos referral area is represented by 16 zip codes coming from Brazos and surrounding counties. Three zip codes which include the cities of Bryan and College Station (77840, 77801, 77803) represent more than 60% of referred clients. Harris referrals come from 63 zip codes clustered around central Houston. Most referrals to the Harris site come from 77093 (24%) and 77036 (8%). Referrals to the Williamson PCH come from 11 zip codes in central and eastern Williamson County. Roughly 70% of referrals come from 78626, 78628, and 76574 which cover areas including Georgetown, Jarrell, and Taylor, and areas previously established as health equity zones in the county.

Figure 3. PCH Referrals by Zip Code



Demographics of PCH Enrollees

Brazos

Sociodemographic characteristics of PCH enrollees are displayed in Table 4. Relative to Williamson and Harris sites, enrollees to the Brazos PCH represent an older demographic with adults 45 years and older comprising 12% of the sample. Less than 6% of the sample enrollees reported having more than a high school education, and 87% reported being unmarried. Additionally, men comprise 18% of the sample, consistent with the Brazos PCH targeting pregnant women and persons with chronic conditions. The racial and ethnic composition is consistent with other locations with Hispanic (50%) and non-Hispanic Black (33%) enrollees representing much

of the sample. Nearly 97% of Brazos PCH enrollees were insured, with 90% covered by a public source at the time of enrollment. Relative to the average of zip codes served by Brazos PCH (displayed in Table 2), the enrolled population is, on average, younger, more likely to report being non-Hispanic Black or Hispanic, more likely to report being unmarried and a smaller proportion are uninsured.

Harris

The early data from Harris indicate that most enrollees represent a population at greatest risk of experiencing poor maternal and child health outcomes in the state. However, 3% of the enrolled population is male, a function of the site's targeting two primary population groups including Medicaid enrollees and Medicaid-eligible pregnant/postpartum adults with behavioral health risk factors and Medicaid enrollees and Medicaid-eligible adults with mental health diagnosis or substance use disorder. The majority of enrollees were between the ages of 35 and 44 (74%) and most enrollees were not married (62%) and had a higher probability of identifying as non-Hispanic Black (40%) and Hispanic (45%). Most individuals had a high school degree or less education (69%). The predominant form of insurance coverage was public insurance coverage (44%), though many enrollees had missing insurance information. Relative to the average of zip codes served by Harris PCH (displayed in Table 2), the enrolled population is more likely to be between the ages of 18-44 years, more likely female, less likely to report being non-Hispanic White or non-Hispanic other/multiple races.

Williamson

The demographic composition of Williamson PCH enrollees mimicked those of the Harris site, though a few differences in composition stood out. Most enrollees were Hispanic (72%), and only a very small share identified as non-Hispanic Black (6%). The vast majority also reported having public insurance (73%). Like the Harris site, most enrollees identified as women (95%) and were between the ages of 25 and 44 (74%). Other characteristics were similar to the Harris site; most enrollees were not married (67%) and most individuals had a high school degree or less education (73%). Relative to the average zip codes served by Williamson PCH (displayed in Table 2), adults aged 25-34 years are overrepresented in the enrolled population (14% vs 54%, respectively). The racial/ethnic composition of enrollees also differs greatly from the broader population served by Williamson PCH. For example, individuals identifying as Hispanic comprise 28% of the total population but represent 72% of the enrolled population indicating the enrolled population is highly targeted. The uninsured rate among the enrolled population (12%) is consistent with the 12% observed average among all zip codes served by Williamson PCH.

In summary, sites differed in the sociodemographic profile of enrolled clients, with the Harris and Williamson site mostly serving women, though with different racial and ethnic compositions. Enrolled clients also indicate a population that is more likely to be between 18-44 years, and more racial/ethnically diverse than the broader population of zip codes served by the PCHs.

Unfortunately, there is currently a considerable amount of missing data limiting a precise definition of the sociodemographic profile (from information collected via the standard demographic form, for education level, marital status, and insurance coverage).

Table 4. Socio-Demographic Characteristics of PCH Enrollees, by Site

	Brazos (%)	Harris (%)	Williamson (%)
Age (Years)			
0-17 Years	19.08	0.50	1.22
18-24 Years	15.27	20.00	21.95
25-34 Years	41.22	47.00	53.66
35-44 Years	12.21	27.00	20.73
45+ Years	12.21	5.50	0.00
Unknown/Not Collected	0.00	0.00	2.44
Gender			
Female	80.15	93.00	95.12
Male	17.56	3.00	3.66
Unknown/Not Collected	2.29	4.00	1.22
Race/Ethnicity			
NH-Black	32.82	39.50	6.10
NH-White	14.50	10.00	15.85
NH-Other/Multiple	3.05	5.00	4.88
Hispanic/Latino	49.62	45.00	71.95
Unknown/Not Collected	0.00	0.50	1.22
Education			
High school or less	94.66	69.00	73.17
Some college	3.05	4.50	7.32
Bachelor's degree	2.29	2.50	10.98
Unknown/Not Collected	0.00	24.00	8.54
Marital Status			
Not Married	87.02	61.50	67.07
Married	12.98	10.00	31.71
Unknown/Not Collected	0.00	28.50	1.22
Insurance Coverage			
Private	4.58	1.50	4.88
Public	90.08	43.50	73.17
Other Insurance	2.29	12.00	4.88
Uninsured	3.05	6.50	12.20
Unknown/Not Collected	0.00	36.50	4.88
Enrolled clients (N)	131	200	82

Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024. **Notes:** Missing data may partially reflect a lag between enrollment status change and collection during CHW interviews.

Pathways Enrollment by Type

Table 5 displays the unique number of individuals enrolled in each pathway by PCH site. At the Brazos PCH, individuals were enrolled in 17 of 21 possible pathways. No clients were enrolled in developmental referral, family planning, immunization referral, or medication reconciliation. The top five most enrolled pathways at the Brazos PCH included learning (88%), social service referral (86%), pregnancy (80%), food security (54%), and postpartum (52%). Among enrolled pathways, learning (99%), postpartum (86%), and health coverage (81%) had the highest successful completion rate. Adult education (21%), oral health (29%), and mental health (31%) had the lowest successful completion rate. The two pathways tied to the availability of local healthcare providers suggest the low rate of completion may be due to difficulties identifying providers in a timely manner.

At the Harris site, individuals were enrolled in 20 of 21 total pathways. The top five common pathways were social service referral (69%), learning (60%), postpartum (46%), pregnancy (34%), and food security (30%). Some pathways received relatively little enrollment, 5 pathways had engagement of less than 10% with enrollees, with most of them related to medication related pathways, oral health, and immunizations. The highest successful completion rates were observed for learning (100%), postpartum (76%), and social service referral (68%). Needs associated with education (20%), employment (26%) and housing (26%) had the lowest proportion of successful completions.

At the Williamson site the top five most common pathways were social service referral (77%), pregnancy (65%), food security (61%), postpartum (52%), medical referral (29%), with four out of the five overlapping with the Harris site (Table 5). Some pathways received few or no referrals; 1 pathway had no enrollment, and 6 pathways had engagement of less than 10% with enrollees, representing areas related to immunizations, medication related pathways, mental health, oral health, and substance use. The highest successful completion rates were observed for learning (100%), postpartum (90%), and social service referral (74%). Among pathways with 10 or more unique clients enrolled, transportation, adult education, housing had the lowest proportion of successful completions. This is largely aligned with the experiences at other sites.

Table 5. Pathways Enrollment by Type among Enrolled Clients

Pathway	Brazos			Harris			Williamson		
	%	N	% Finished Complete	%	N	% Finished Complete	%	N	% Finished Complete
Adult Education	26.85	29	20.69	18.32	35	20.00	22.78	18	5.56
Developmental Referral	0.00	0	-	0.52	1	0.00	0.00	0	-
Employment	23.15	25	40.00	24.08	46	26.09	24.05	19	31.58
Family Planning	0.00	0	-	11.52	22	63.64	21.52	17	58.82
Food Security	53.70	58	62.07	30.37	58	56.90	60.76	48	43.75
Health Coverage	24.07	26	80.77	26.18	50	44.00	22.78	18	55.56
Housing	34.26	37	51.35	21.99	42	26.19	21.52	17	11.76
Immunization Referral	0.00	0	-	1.05	2	50.00	2.53	2	50.00
Learning	87.96	95	98.95	59.69	114	100.00	21.52	17	100.00
Medical Home	22.22	24	37.50	13.09	25	36.00	24.05	19	42.11
Medical Referral	37.04	40	55.00	16.23	31	48.39	29.11	23	47.83
Medication Adherence	1.85	2	50.00	0.52	1	0.00	1.27	1	0.00
Medication Reconciliation	0.00	0	-	0.52	1	0.00	1.27	1	0.00
Medication Screening	2.78	3	0.00	0.00	0	-	2.53	2	0.00
Mental Health	12.04	13	30.77	20.42	39	28.21	8.86	7	28.57
Oral Health	35.19	38	28.95	4.71	9	44.44	2.53	2	0.00
Postpartum	51.85	56	85.71	45.55	87	75.86	51.90	41	90.24
Pregnancy	79.63	86	62.79	34.03	65	49.23	64.56	51	47.06
Social Service Referral	86.11	93	77.42	69.11	132	68.18	77.22	61	73.77
Substance Use	1.85	2	50.00	19.37	37	56.76	2.53	2	0.00
Transportation	25.93	28	50.00	13.61	26	50.00	16.46	13	7.69
Enrolled clients with at least 1 opened pathway (N)		108			191			79	

Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024. **Notes:** Table represents unduplicated enrollment by the number of individuals with at least one open pathway where "N" represents the number of clients with 1 or more open pathways for each type. The percentage finished complete represents the number of individuals in the pathway category with a finished complete status over the number with 1 or more open pathways.

Pathway enrollment stratified by pregnancy status highlights differential needs identified among pregnant and non-pregnant clients (Table 6). For example, in Brazos pregnant clients were significantly more likely to be enrolled in pathways focused on education (33% vs 5%, $p<0.01$), employment (28% vs 5%, $p=0.02$), food security (59% vs 32%, $p=0.02$), housing (38% vs 18%, $p=0.08$), and social service referral (90% vs 73%, $p=0.04$), relative to non-pregnant counterparts. Conversely, clients not enrolled in a pregnancy pathway were more likely to have a medical referral (68% vs 29%, $p<0.01$), a medication related pathway opened, and transportation (41% vs 22%, $p=0.07$). Nearly 60% of pregnant clients were enrolled in food security, and 38% in a housing pathway and 90% in a social service referral pathway suggesting large unmet basic needs among the pregnant population in Brazos County.

At the Harris site, pregnant and non-pregnant pathways enrollees had many similar rates of pathway enrollment. Pregnant clients were more likely to be enrolled in a substance use pathway (40% vs 9%, $p<0.01$) and significantly less likely to be enrolled in pathways for employment 8% vs 33%, $p<0.01$), food security (18% vs 37%, $p=0.01$), health coverage (12% vs 33%, $p<0.01$), learning (43% vs 68%, $p<0.01$), or social services referrals (58% vs 75%, $p=0.02$).

At the Williamson PCH, pregnant clients were more likely to be enrolled in a family planning (27% vs 18%, $p=0.02$) or medical home (31% vs 11%, $p=0.04$) and less likely to have unmet oral health needs (0% vs 7%, $p=0.05$) relative to clients not enrolled in a pregnancy pathway. Among all clients, enrollment in social services referrals was above 75% and food security was above 63%. Of those not enrolled in a pregnancy pathway, 57% were postpartum, indicating they enrolled after delivery or too late in the third trimester to schedule prenatal care.

Table 6. Pathways Enrollment by Pregnancy Status

Pathway	Brazos		Harris		Williamson	
	Non-Pregnancy	Pregnancy P-Value	Non-Pregnancy	Pregnancy P-Value	Non-Pregnancy	Pregnancy P-Value
Adult Education	4.55	32.56 <0.01	19.84	15.38 0.45	32.14	17.65 0.14
Developmental Referral	0.00	0.00 -	0.79	0.00 0.47	0.00	0.00 -
Employment	4.55	27.91 0.02	32.54	7.69 <0.01	17.86	27.45 0.34
Family Planning	0.00	0.00 -	9.52	15.38 0.23	7.14	29.41 0.02
Food Security	31.82	59.30 0.02	36.51	18.46 0.01	53.57	64.71 0.33
Health Coverage	27.27	23.26 0.07	33.33	12.31 <0.01	21.43	23.53 0.83
Housing	18.18	38.37 0.08	21.43	23.08 0.79	14.29	25.49 0.25
Immunization Referral	0.00	0.00 -	1.59	0.00 0.31	0.00	3.92 0.29
Learning	81.82	89.53 0.32	68.25	43.08 <0.01	10.71	27.45 0.08
Medical Home	18.18	23.26 0.61	15.87	7.69 0.11	10.71	31.37 0.04
Medical Referral	68.18	29.07 <0.01	16.67	15.38 0.82	17.86	35.29 0.10
Medication Adherence	9.09	0.00 <0.01	0.79	0.00 0.47	0.00	1.96 0.46
Medication Reconciliation	0.00	0.00 -	0.79	0.00 0.47	3.57	0.00 0.17
Medication Screening	13.64	0.00 <0.01	0.00	0.00 -	3.57	1.96 0.66
Mental Health	13.64	11.63 0.80	22.22	16.92 0.39	14.29	5.88 0.21
Oral Health	45.45	32.56 0.26	3.97	6.15 0.50	7.14	0.00 0.05
Postpartum	0.00	65.12 <0.01	43.65	49.23 0.46	57.14	49.02 0.49
Pregnancy	0.00	100.00 <0.01	0.00	100.00 <0.01	0.00	100.00 <0.01
Social Service Referral	72.73	89.53 0.04	74.60	58.46 0.02	75.00	78.43 0.73
Substance Use	4.55	1.16 0.29	8.73	40.00 <0.01	0.00	3.92 0.29
Transportation	40.91	22.09 0.07	16.67	7.69 0.09	14.29	17.65 0.70
Enrolled clients with at least 1 opened pathway (N)	22	86	126	65	28	51

Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024. **Notes:** Table represents unduplicated enrollment among individuals with at least one open pathway.

Time until closure of pathways

For some pathways faster closure can imply efficient work of CHWs, but in other cases longer waiting periods may be out of a CHWs hands, such as limited access to care by providers due to capacity constraints. As such, comparing outcomes across sites may be misleading, as other factors such as healthcare infrastructure differ across sites.

In Figures 3-5 we display the average weeks to closure of each pathway by site. Here we see that sites differ in completion times by pathway. The highest number of weeks until closure in Brazos County were for adult education (26 weeks), employment (24 weeks), and mental health (21 weeks). Learning, postpartum, and social service referral pathways experienced the shortest average times to closure. At the Harris site pathways with more than 20 weeks on average until closure included development referral, immunization referral, medication adherence, and oral health pathways. At the Harris site development, immunization, medication reconciliation, and oral health pathways had closure times over 20 weeks. The Williamson site had closure times over 20 weeks for housing, mental health, and transportation pathways. The shortest average closure times, identified as those below 10 weeks, were observed for adult education, health coverage, immunization referrals, learning, postpartum, and social services referrals. In Harris County learning, postpartum, social service referral had averages below 10 weeks.

In summary, differences emerged across sites for pathways with the highest average weeks until closure, while similar pathways were observed for the fastest closed pathways. Time to closure for specific pathways is driven by several factors, including the availability of local community resources to meet the needs of PCH enrollees. While pathway closure is informative, it may be more a reflection on the local infrastructure to meet the needs of individuals who are referred to for specific services.

Figure 3. Time to closure by pathway, Brazos PCH

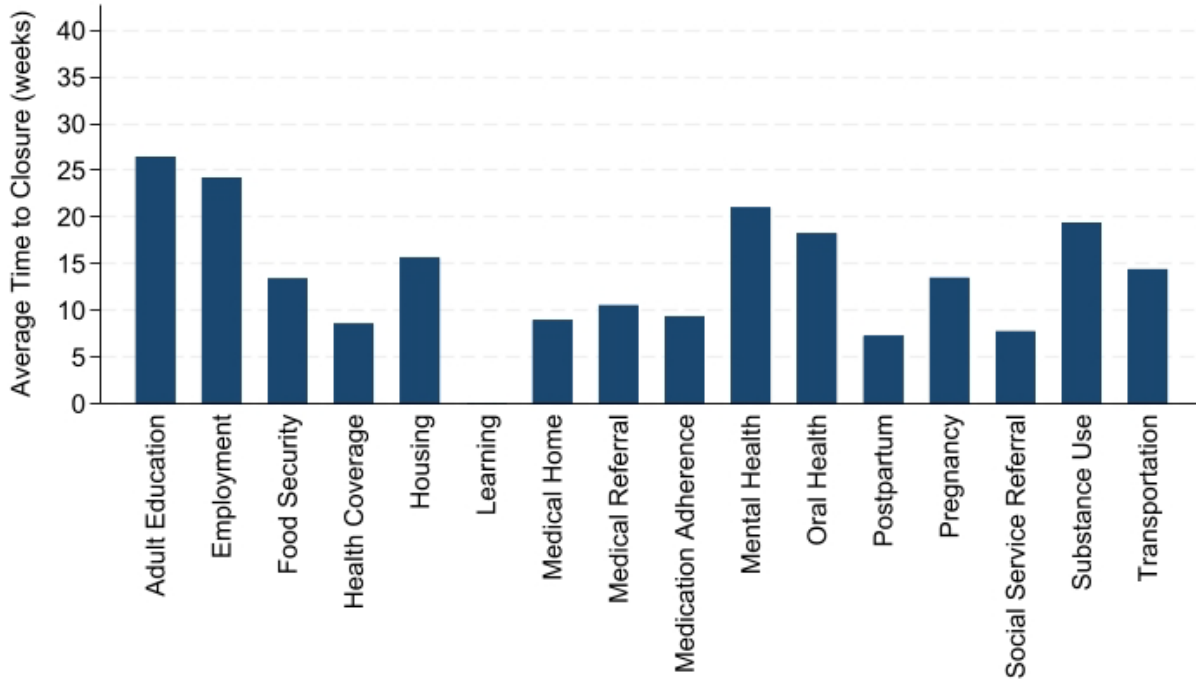


Figure 4. Time to closure by pathway, Harris PCH

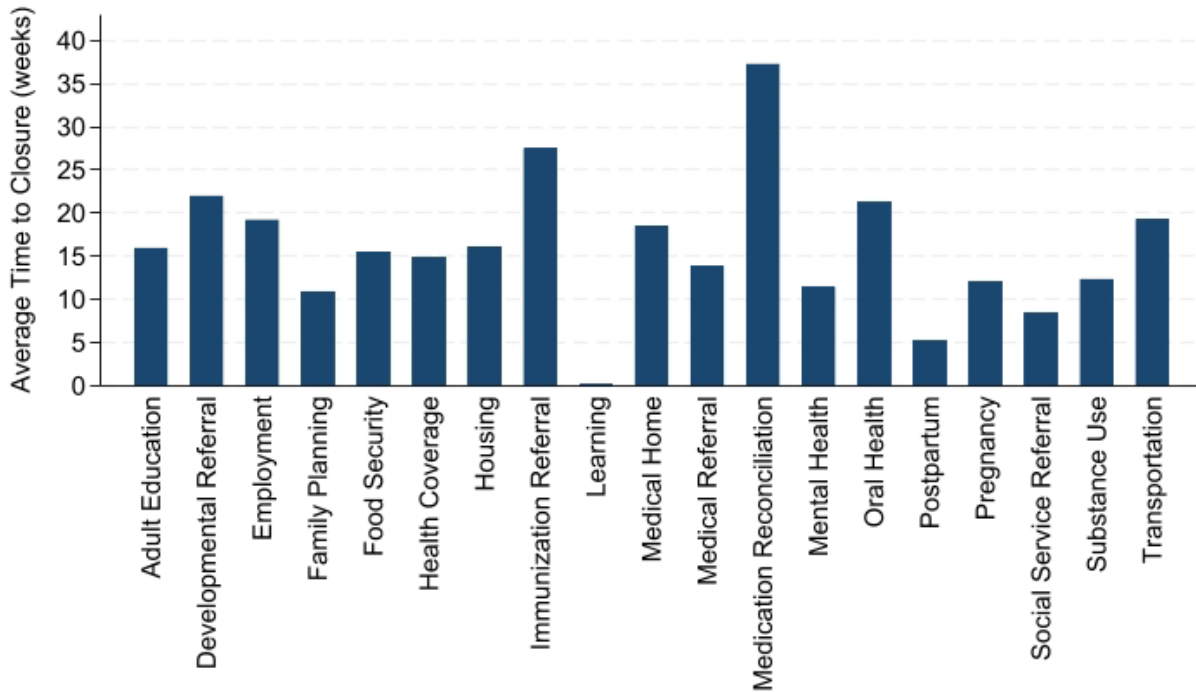
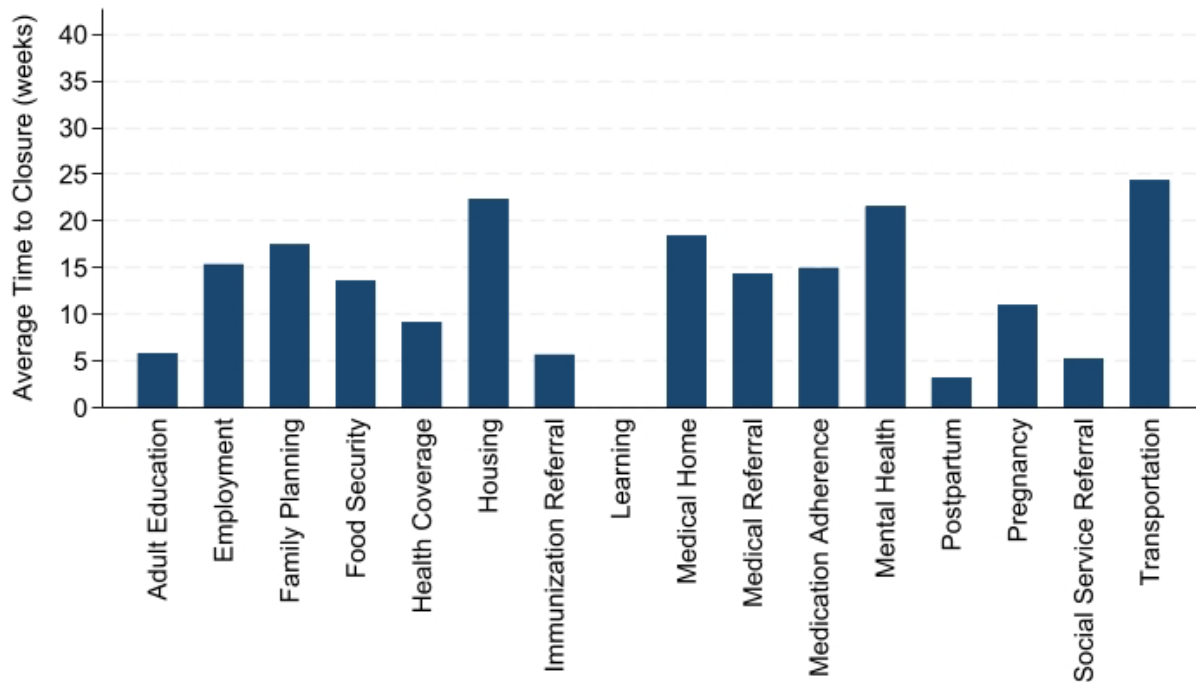


Figure 5. Time to closure by pathway, Williamson PCH



VI. Quality Measures and Cost Outcomes

The collection and reporting of commonly utilized indicators of healthcare quality are built into the PCHs data collection and reporting efforts. In this section we focus on describing quality-of-care outcomes for pregnant enrollees who experienced delivery over the observational window. We focus particularly on pregnant enrollees because they are a common target population across all sites and healthcare delivery plays an important role in perinatal outcomes—a current focus of federal and state policy efforts. To this end, we report several measures of prenatal care utilization including the Adequacy of Prenatal Care Utilization (APNCU) Index (Kotelchuck, 1994), timeliness of enrollment into the pathway (prenatal care engagement by trimester), the share initiating prenatal care in the first trimester (NCQA, 2024), and the share initiating prenatal care in the first four months. For quality outcomes after delivery, we report the average gestational age at delivery and by gestational age categories defined by the World Health Organization including full term (37+ weeks gestation), moderate to late preterm (32-37 weeks gestation), very preterm (28-32 weeks gestation), and extremely preterm (<28 weeks gestation), birth weight defined as normal weight ($\geq 2,500$ grams), low birth weight (LBW; 1,500-2,500 grams), very low birth weight (VLBW; 1,000-1,500 grams), and extremely low birth weight (ELBW; <1,000 grams) and access to postpartum care, defined as the percentage of clients with a postpartum visit between 7 to 84 days after delivery (NCQA, 2024).

The Adequacy of Prenatal Care Utilization (APNCU) Index captures the timeliness of prenatal care initiation and whether individuals received the appropriate number of prenatal care contact based on the clinical recommendations set by the American College of Obstetricians and Gynecologists (ACOG) where individuals are expected to meet guidelines based on their specific gestational age at prenatal care initiation (ACOG, 2017; Kotelchuck, 1994). The APNCU index is a standard prenatal care quality measure and defines prenatal care in four categories (inadequate; intermediate; adequate; adequate plus). “Inadequate” prenatal care includes those initiating prenatal care after the fourth month of pregnancy or receiving less than 50% of recommended visits. “Intermediate” care is defined as having initiated prenatal care by month 4 and having completed 50% to 79% of expected prenatal visits. “Adequate” care is defined as having initiated prior to four month of pregnancy and having completed 80% to 109% or more of expected prenatal visits received. Finally, “adequate plus” care requires the same early initiation of prenatal care (before 4 months) and having completed 110% or more of recommended prenatal care visits (Kotelchuck, 1994; Shin & Song, 2019).

We display quality measures among individuals enrolled in a pregnancy pathway who eventually gave birth in Tables 7 and 8.¹ In Table 7 we display the proportion of the population by APNCU index, gestational age at enrollment and the proportion of clients who reported prenatal care initiation in the first trimester and during the first four months of pregnancy. We also report the average number of prenatal visits recorded in the data. At the Brazos site enrollment into the pregnancy pathway in the first trimester occurred for 23% of the enrollees, while 35% and 42% enrolled in the second and third trimester, respectively. Nearly 87% received inadequate prenatal care which indicates that either they initiated prenatal care after four months gestation or they initiated prior to four months and received less than 50% of recommended prenatal care visits based on the clinical guidelines for their gestational age.² Among those enrolled, 42% reported having completed prenatal care during the first trimester and 58% reported having a prenatal visit within the first four months of pregnancy. On average, clients received 3 prenatal visits (see footnote 2).

At the Harris site, individuals were enrolled at later stages of pregnancy on average, with 7% enrolling in the first trimester, 36% enrolling by the second trimester and 57% during the third trimester. Based on the APNCU index, 90% of clients received inadequate prenatal care while 10% received adequate or better. Among this group, 24% reported having a prenatal visit within the first trimester, and 31% within the first four months of pregnancy. On average, clients received 4 prenatal visits.

¹ The closure of a pregnancy pathway relies on the verification of prenatal care contacts by CHWs. Thus, we do not observe accurate data on prenatal care initiation or visits among clients with a pregnancy pathway still open. Therefore, we restrict the sample to clients with verified births and dates for prenatal care utilization to calculate quality indicators. Importantly, this reflects only a subset of individuals enrolled in the pregnancy pathway at each site.

² In some cases, the number of prenatal care visits recorded in the data reflect only visits occurring during enrollment with the PCH. Thus, the distribution of the APNCU index is likely undercounting prenatal care and shifting the distribution of utilization towards inadequate as most clients are referred to the program after the first trimester. However, the study team thought it pertinent to report the data as recorded rather than assume that unobserved prenatal care followed the ACOG-recommended visit schedule.

At the Williamson site no individuals enrolled in the pregnancy pathway during their first trimester of pregnancy while 46% enrolled during their second trimester and 54% in the third. Consistent with other sites, most (75%) clients received inadequate prenatal care while 21% received intermediate and 4% received recommended prenatal care. Despite late enrollment, this group reported earlier prenatal care initiation, on average, with 58% and 79% of enrollees initiating prenatal care during the first trimester and during the first four months of pregnancy, respectively. On average, clients at Williamson PCH received 5 prenatal care visits.

Table 7. Prenatal Care

	Brazos	Harris	Williamson
Gestational age at enrollment			
1st	23.33	7.14	0.00
2nd	35.00	35.71	45.83
3rd	41.67	57.14	54.17
Adequacy of Prenatal Care Utilization Index (APNCU)			
Inadequate	86.67	90.48	75.00
Intermediate	11.67	0.00	20.83
Adequate	1.67	4.76	4.17
Adequate Plus	0.00	4.76	0.00
Initiated prenatal care during first trimester	41.67	23.81	58.33
Initiated prenatal care during first four months	58.33	30.95	79.17
Prenatal visits (mean)	2.92	4.33	5.17
Observations	60	42	24

Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024.

Notes: Reported statistics include a subset of individuals who were enrolled prior to July 31, 2024 and experienced a delivery prior to that date. APNCU (Adequacy of Prenatal Care Utilization) Index is a measure which uses the month of prenatal care initiation and number of reported prenatal care visits to calculate adequacy of visits received based on gestational age at delivery where adequate number of visits follow ACOG recommendations for prenatal care visit frequency by gestational age. Gestational age at delivery was calculated assuming the estimated delivery date (observed in the data) was set to 40 weeks after last menstrual period.

In Table 8 we display birth-related characteristics of mothers and infants. The average gestational age was above 38 weeks at all sites. The distribution of gestational age by term displays that most childbirth occurred at full term (greater than or equal to 37 weeks) at Brazos (87%), Harris (90%), and Williamson (92%) sites. At the Brazos site we observed that 13% delivered preterm, with somewhat lower rates for Harris (9%), and Williamson (8%). We also report infant birth weight categorized by normal weight (2500 grams or more), low birth weight (LBW; 1500-2500 grams), very low birth weight (VLBW; 1000-1500 grams), and extremely low birth weight (ELBW; less than 1000 grams). At the Brazos site 92% of births were normal weight, while 88% of infants at Harris and 96% at Williamson PCHs were delivered with a normal weight. None of the deliveries

included infants with low birth weight, instead, very low birth weight infants were delivered at the Brazos (7%) and Harris (12%) sites, and extremely low birth weight infants were delivered at the Brazos (2%) and Williamson (4%) sites. The proportion of clients with a postpartum visit between 7 and 84 days after delivery was 80% at the Brazos site, 60% at the Harris site, and 75% at the Williamson site. Performance on this measure is somewhat comparable to national average (77%) reported by Medicaid health maintenance organizations (HMOs) based on data reported by the National Committee for Quality Assurance (NCQA, 2024).

Table 8. Characteristics of Deliveries

	Brazos	Harris	Williamson
Average gestational age at delivery (weeks)	38.23	38.64	38.96
Gestational age categories			
Full term (37+ weeks)	86.67	90.48	91.67
Preterm (32-37 weeks)	11.67	7.14	4.17
Very Preterm (28-32 weeks)	1.67	2.38	4.17
Extremely Preterm (<28 weeks)	0.00	0.00	0.00
Birth weight			
Normal weight (\geq 2500 grams)	91.67	88.10	95.83
LBW (1500-2500 grams)	0.00	0.00	0.00
VLBW (1000-1500 grams)	6.67	11.90	0.00
ELBW (<1000 grams)	1.67	0.00	4.17
Postpartum visits (7-84 days after delivery)	80.00	59.52	75.00
Births (N)	60	42	24

Source: Data from HUB Care Coordination System (CCS) extract current as of July 31, 2024.

Notes: Reported statistics include a subset of individuals who were enrolled prior to July 31, 2024 and experienced a delivery on or before that date. Gestational age at delivery was calculated assuming the estimated delivery date (observed in the data) was set to 40 weeks after last menstrual period.

To gauge the adequacy of these measures, we display characteristics of births occurring in 2023 in Brazos, Harris, and Williamson counties using data from the Centers for Disease Control and Prevention (CDC) Wonder portal. The records include births paid for by Medicaid, the best proxy for the PCH enrolled population. The average gestational age at delivery is nearly identical to the PCH samples. Among all Medicaid deliveries just over 8% were classified as LBW in Brazos, 10% in Harris, and 7% in Williamson. This is broadly consistent with the PCH enrollee data where we observed 8% LBW at Brazos PCH, 12% at Harris, and 4% at Williamson. Based on these averages, births among PCH enrollees at Brazos and Williamson sites outperform county averages among the Medicaid population despite lower-than-average utilization of prenatal care.

Table 9. Select Characteristics of Medicaid Births, by County (CDC Wonder, 2023)

	Brazos	Harris	Williamson
Average gestational age	38.42	38.2	38.68
Percent Preterm (<37 weeks)	11.29	16.08	12.24
Percent LBW (<2500 grams)	8.45	10.28	7.42
Average number of prenatal visits	9.2	8.65	10.71
Births in 2023 (N)	1,337	36,300	1,953

Source: CDC National Vital Statistics System, Natality on CDC Wonder Online Database (2023). <http://wonder.cdc.gov/natality-expanded-current.html>. **Notes:** Data represent county births where Medicaid was identified as the source of payment for delivery. The denominator for percent low birth weight is the total number of births in 2023.

Potential savings

Low birth weight is associated with adverse health outcomes, including the development of chronic diseases and infant mortality, and elevated healthcare costs in the short and long-run. Estimates suggest that the societal cost of preterm birth in 2016 was more than \$25 billion alone (Waitzman et al., 2021). As such, policies to reduce low birth weight have been at the forefront at state and federal policymakers. Examples include the expansion of Medicaid coverage for low-income pregnant women as well as recent Medicaid expansions, such as the Affordable Care Act, to expand coverage and continuity of care in the early months of pregnancy (C. C. Brown et al., 2019).

Understanding the cost of the treatment of newborns just for the delivery at the hospital has received widespread interest. Estimates in 2001 suggest that the average hospital cost within one year of birth for low-birth-weight infants was more than \$15,000 per stay (Russell et al., 2007). Costs vary by gestational age, with late preterm births, defined as being born between week 34 and week 36, costing more than \$25,000 in 2016. Infants born earlier, such as after 29 to 32 weeks, incurred hospitalization costs of more than \$223,000 per hospital stay, and that very preterm (less than 28 weeks) hospitalization costs topped \$317,000 per hospital stay (all in 2017 dollars). Further, costs can be higher and are concentrated among infants who are diagnosed with major morbidities. Relative to these high costs, the average cost of delivery are miniscule, with the mean cost for newborns being close to \$6,000 in 2018 dollars in California (Lai & Lorch, 2023; Phibbs et al., 2019).

While these cost estimates are helpful to place the broader cost burden of pre-term birth into context, costs vary substantially by payor, with commercial insurance known to be more generous than Medicaid. Given that half of all births are paid for by Medicaid, it is imperative to understand the infant hospitalization cost by pre-term for this relevant payor population, and especially in Texas. Unfortunately, state specific estimates on inpatient costs for newborns are hard to obtain

for multiple reasons, such as limited availability of privately negotiated Medicaid prices and utilization. To estimate the average inpatient cost for a newborn, we utilize the Texas Public Use Data File (PUDF) file that includes the universe of hospital discharges in Texas for all payors (Texas Department of State Health Services (DSHS), 2023). These data include hospital charges per inpatient stay and we use these estimates with cost-to-charge ratios to arrive at an average delivery cost attributed to the hospital for the infant (excluding the mother) covered by Medicaid. Unfortunately, this implies that professional fees for services by physicians and lab and imaging tests are not included. Nevertheless, they provide the best Texas specific estimate. To arrive at total hospital costs, we utilize a multiplier of 1.178 that reflects the average cost for a hospital stay attributable to professional fees (Peterson et al., 2023). Using these data we estimated that the average Medicaid childbirth cost was \$5,133, with charges equal to \$2,357 for the facility and \$2,777 ($\$2,357 \times 1.178$) excluding the mother's cost, in Texas in 2022 and that the average normal newborn delivery cost was \$1,925 ($\$884 + \884×1.178), and that pre-term (premature definition based on Diagnosis Related Group) delivery infant cost was equal to \$20,275 ($\$9,309 + \$9,309 \times 1.178$). Given that these numbers are substantially lower than the above cited costs from the literature, we caution the reader that Medicaid rates are substantially lower than commercial rates, but we are unable to verify whether our cost estimates are close to those reported by managed care organizations.

PCHI guidelines suggest that closures of pathways should be reimbursed by an engagement fee and a completion fee, with the pathway completion fee not to be less than 50% of the compensation of all CHW engagements. For the pregnancy pathway there are three main payments stemming from intermittent goals, these include the confirmed 1st prenatal visit, the completion of a prenatal appointment, and the delivery of a normal birth weight child. Under the adequate care scenario that would suggest that a mother would attend 10 visits with the first appointment in the 1st month of pregnancy and delivery of a normal weight baby, the pathway completion fee under conservative estimates would be close to \$1075 under the PCHI model or as high as \$1700 under a more generous payment schedule.

Pre-term birth rates among the Texas Medicaid population ranged from 11.3% in Brazos and 16.1% in Harris in 2023 but differed substantially by race/ethnicity at the county level. Given that the sites population differ from the county average population in terms of race and ethnicity profile of those enrolled in the pregnancy pathway, we take a weighted average of these county level rates to understand the most likely pre-term rate we would expect in our data were they not enrolled in the pathway model (leading to an average of 11.05% for Brazos, 16.96% for Harris, and 11.4% for Williamson). These estimates suggest that relative to reports in Table 8 that the Brazos site cohort had a slightly higher preterm birth rate compared with the race/ethnicity-adjusted county pre-term birth rate (13.34% vs 11.05%), while the Harris (9.52% vs 16.96%) and Williamson (8.34% vs 11.40%) sites had pre-term birth rates below the race/ethnicity-adjusted average. Given that all sites specifically targeted high-risk individuals, these outcomes can be seen as a success, as one may have expected substantially higher pre-term rates than what is reported in the county average.

Finally, the cost estimates for delivery and pre-term birth rates allow us to provide a back of the envelope estimate on the potential benefit of the pathway program in reducing pre-term birth. The

difference between normal and pre-term birth costs can represent the opportunity cost, suggesting that a foregone pre-term birth could save \$15,142 per delivery. For Harris county's 42 deliveries, 7 needed to be born pre-term ($7/42=16.6\%$) to arrive at a rate close to the site race/ethnicity adjusted pre-term delivery rate of the county 16.96%. However, only 4 were delivered pre-term. Similarly, 3 needed to be born pre-term ($3/24=12.5\%$) at the Williamson site to be close to the site race/ethnicity adjusted pre-term delivery rate of the county 11.4%, and only 2 were born pre-term. Thus, Harris potentially saved \$45,426 ($\$15,142*3$) to date relative to the site adjusted pre-term delivery rate of the county. If we assume that a similarly low rate (9.52%) will be achieved for all individuals currently enrolled in the pregnancy pathway model then the Harris site will experience 5 fewer pre-term deliveries ($65*9.52\%-65*16.96\%=-4.84$) compared to the expected county rate, while the Williamson site will approach 2 fewer pre-term deliveries ($49*8.3\%-49*11.4\%=-1.51$). Given that the pathway cost for all 65 pregnancy pathway enrollees at the Harris site will likely be between \$69,875 to \$110,500 and the pre-term savings will be equal to \$75,710 the pregnancy pathway enrollment is close to budget neutral at the Harris and Williamson sites (savings of \$30,284 vs costs between \$52,675 and \$83,300).

Of course, these estimates are conservative, as one may expect that the pre-term delivery rate should be higher at all sites than compared with the statewide average because sites enroll individuals with a large number of assessed needs and those who at high risk of pre-term delivery. While we are unable to verify how high the pre-term rate absent the pathway enrollment may be, it is plausible to believe that the model may provide net savings over a longer observation period.

VII. Evaluation of Early Success and Challenges

The early state of the program already identified aspects relevant to the success of the PCH model across all PCH sites.

At the Harris site, prior experience of the pilot provided staff with existing expertise in case management. Thus, transitioning to the PCH model reduced the start-up cost of staff to familiarize themselves with the model, especially CHWs, who had a record of training, community engagement, and case management in the community prior to the PCH model. Further, initial pilot buy-in from partner organizations helped with the establishment of a referral network and the existing connections with CCAs provided a clear expectation of the value of care provided by these organizations. Additional discussions with entities are in progress that would lead to additional referrals. Continued meetings with CCAs and the community advisory committee also provided a valuable avenue of communication to improve operations, pathway enrollment, and identified efficient ways to improve the closure of pathways through discussion of what is needed in the "field" and how the needs are best addressed.

Similar sentiment was voiced by Brazos and Williamson sites, who also outlined the importance of having CHWs that are dedicated to the community and engaged in their work. Having CHWs who want to make a difference by helping individuals who they see as their neighbors,

churchgoers, and parents at the same schools as their own children attend, provides additional motivations to find ways to help others. This attribute had a substantial impact on the success of the PCH model rollout.

Successes have not been unnoticed in the community. Enthusiasm by healthcare partners has also elevated the PCH program experience. The early successes in referrals, enrollment, and completion of pathways have also led to continued discussions to expand short-term funding. Outreach to promote the pathways program by the PCH sites has led to further connections with hospitals and payors that is expected to lead to more referrals (and sometimes funding) in the near future. Particular to the Brazos site, engagement is strong with providers that led to an arrangement in which providers receive notice on outcomes of referrals. More broadly additional efforts through discussions at the HUBs led to improvements in reporting to better track enrollees' health that can be used for marketing purposes when engaging MCOs.

Challenges remain. Harris County explicitly reported that many referral partner organizations report that funding changes may alter the approach of referrals. This is partially driven by the COVID-19 pandemic American Rescue Plan Act (ARPA) funding mechanism, where hospitals, providers, and other organizations received one time funding that in some cases has been used to expand case management capabilities at referral agencies. This may have led to competing entities in the short term who consider that they have similar capabilities in case management to the PCH model, especially in clinical care. It is uncertain if these models will continue to exist but they can currently affect the direction of referrals due to the confusion that the PCH model may in fact aim to provide similar care management (which they are not). Given that the ARPA money is running out, these challenges may just be a short-term concern.

Existing case management may also contribute to confusion on the added value of the PCH model above existing efforts. Case management is not a new concept, and many existing case management programs, including those operated by hospitals and insurers, generally utilize an audio-only approach, where they call patients identified as having clinical needs. This may lead to the belief that these case management models, which only focus on clinical care, are similar to the PCH model. Obviously, this is not the case, and additional work is needed to convince MCOs that existing case management approaches are substantially weaker in nature, sometimes ignoring the social determinants of health component, and that the PCH model is a completely different approach that aims to tackle a whole health approach by closing all needs of clients that can improve quality of life and reduce long-term healthcare spending.

Connecting with potential and enrolled participants can also be a challenge as some individuals are hesitant to engage with healthcare providers. Identifying and connecting with vulnerable populations is challenging because the PCH model requires participants be connected with existing community systems of care. This is not always the case and may mean that the most marginalized participants may go untreated. This is especially true for the uninsured, who may not seek care, or seek care in emergency rooms. Thus, it is pertinent to connect and establish referral networks with hospitals and other emergency care providers and particularly important to address perinatal outcomes where improvement on quality measures relies on the early enrollment of mothers,

ideally in the first trimester of pregnancy. Even when enrolled, language barriers are sometimes a concern because program material may only be available in a language not spoken by the enrollee.

Challenges with MCO contracts remain. Ideally, it would have been helpful to have MCO contracts in place prior to the launch of the PCH model. Of course, this is unlikely to happen as the PCH model is new to Texas and because MCOs would like to see the long-term financial viability of the program. This means that insurers want to see evidence of success that translates into meaningful impact in the community, based on the number of pathway enrolled clients, and potential savings in down the road healthcare spending by closing gaps in need. As such, negotiations with MCOs are ongoing.

A major strength of the PCH model is the electronic collection of data which provides partners with a complete picture of the client profile and care needs. This is achieved through a strong and supportive relationship between CHWs and the care network that provides CHWs with the ability to identify outstanding pathways as well as pathway progress. Subsequently, this leads to a detailed information system on the completion of pathways. Unfortunately, there is currently a considerable amount of missing data collected via the standard demographic form, for education level, marital status, and insurance coverage. It is unclear if the missing data identifies information that has not been collected or if the missingness is due to a lag between CHW collection and entry into the system. Nonetheless, this process evaluation may be beneficial to support ongoing programmatic improvements pertaining to data collection and entry.

VIII. Discussion

This early analysis of Texas PCHs shows promise in establishing a CHW led case management program for pregnant women with a high risk of negative health outcomes. Based on the demographic profile and identified social needs of enrolled clients, the program is effectively reaching a diverse and complex population with unmet health and social needs and connecting them with services available locally. More data is needed to draw strong conclusions regarding the long-term return on investment of the PCH model. Finally, the viability of the model will require buy-in from care management organizations to establish these programs permanently and potentially statewide.

One major strength of the PCH model is the administrative detail in collecting data which provide CHWs, the site and referral partners with a complete picture of care needs (and closed care needs) that are valuable during case management but also for care management organizations. Reporting standards need to be improved or more carefully followed to analyze the success of the program. Currently, some data elements are missing, such as demographic information, which is needed to inform on which individuals are being enrolled. Further, it is hard to gauge in some cases whether rates of successful pathway closure reflect the ability of the sites to make connections to the required community-based services. For example, in Table 5 we show that 35% of the enrolled population at Brazos PCH have been enrolled in an oral health pathway but only 29% have finished complete (i.e., with clients making successful contact with an appropriate provider). This could be a signal that 1) the appropriate community-based organizations have not been engaged with the

PCH site, or 2) the local community infrastructure is not capable of meeting the demand for client needs. The latter is particularly important to highlight as the broader health and policy communities consider options to address social needs among the Medicaid eligible population. More work is needed to understand how experiences with limited availability of community-based services impact pathway enrollment and closure.

This early evaluation primarily focused on reporting results from outcomes directly related to pathways. As such, the limited scope of this evaluation may mask important benefits of the program. Future work should expand on the current analysis to provide better estimates on cost savings of the program. Currently, we are only able to perform a rough back of the envelope calculation drawing on estimates from publicly reported sources. Connecting PCH data with medical claims data is one valuable tool that would enable researchers and policymakers to understand the holistic impact of the pathway model on individuals in the short and long-term. Further, our analysis was only able to describe potential savings for those enrolled in the pregnancy pathway, the connection with care management organization data could substantially expand the scope of the savings analysis beyond the potential short-term cost savings associated with the hospital stay at delivery.

More research is needed to broaden the scope of the potential benefits of the PCH program beyond medical spending. For example, integrating individuals into stable housing, employment, health insurance coverage, and improved medication adherence may lead to improvements in long-term modifiable social determinates of health risk factors, and reduce social inequities in the community. Quantifying how modifying risk factors may impact individuals' quality of life requires additional stakeholder buy-in to provide the necessary data for such analysis. Thus, the currently available outcomes of the PCHI model may undervalue the total benefit to participants, including broader dimensions of social wellbeing.

IX. Conclusion

The expansion of the PCHI model into Texas has provided access to case management to reduce preventable adverse health effects for mothers and infants and generally reduce modifiable risk factors. Our early review of the implementation of the program describes the characteristics of individuals enrolled in the program and describes infant health outcomes for those enrolled in the pregnancy pathway. We show that most of the individuals have been enrolled in multiple pathways, though the type of pathway enrollment differs by sites, and for individuals enrolled in the pregnancy pathway compared with those not enrolled in the pregnancy pathway. State policy makers and managed care organizations need to understand the implications on the financial impact of the program and we provide a back of the envelope calculation that serves as rough estimate of the return on investment of the pregnancy pathway stemming from potential savings associated with care provided for infants at delivery. These estimates can serve as a first steppingstone to ensure the continued success of the PCH model in Texas.

X. Acknowledgements

The study team would like to thank Texas PCH leadership and staff for their helpful comments and supporting the availability of their electronic health records for the purposes of this evaluation.

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