State of Wisconsin
Department of Health Services
Tony Evers, Governor
Kirsten L. Johnson, Secretary

January 6, 2026

The Honorable Howard L. Marklein
Joint Committee on Finance Co-chair
Room 316 East State Capitol
Madison, WI 53702

The Honorable Mark Born
Joint Committee on Finance Cochair
Room 308 East State Capitol
Madison, WI 53702

Dear Senator Marklein and Representative Born:

In accordance with Wis. Stat. § 49.45 (26g) (h) I am submitting a final report to you summarizing the results of the Intensive Care Coordination Pilot (ICCP) program.

Sincerely,

Kirsten L. Johnson
Secretary-designee

Intensive Care Coordination Program
(2017 Wisconsin Act 279)

Final Evaluation Report

Submitted to the

Wisconsin Department of Health Services

P-03590 (01/2026)

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A HEDIS measure specification was used for measuring emergency department visits for this report.

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Acronyms

Acronym	Term
AODA	Alcohol or Drug Abuse
CCI	Charlson Comorbidity Index
DHS	Department of Health Services
DiD	Difference-in-Differences
ED	Emergency Department
HP	Health Promoter
ICCP	Intensive Care Coordination Program
IRP	Institute for Research on Poverty
PCP	Primary Care Physician
SDOH	Social Determinants of Health
SNAP	Supplemental Nutrition Assistance Program

EXECUTIVE SUMMARY

Emergency Department (ED) visits can be both costly and avoidable. To address this, the Intensive Care Coordination Program (ICCP) was developed to pilot a new method aimed at reducing avoidable ED visits among Medicaid recipients in Wisconsin. Created by 2017 Wisconsin Act 279 (Act 279), the program sought to decrease inappropriate ED use by offering intensive care coordination services. Three health systems—Ascension Wisconsin, Aurora Health Care Inc., and Froedtert Health—participated in the program, which was conducted in four rounds from March 2022 to February 2024. Each round lasted six months with Medicaid recipients able to be enrolled for up to two rounds.

Act 279 outlined requirements of care coordination to be included in each health system's ICCP. The requirements included discharge instructions, referral information, medication instructions, intensive care coordination, and information about other social resources such as transportation and housing. Each health system had their own processes for care coordination, but all health systems aimed to address social determinants of health (SDOH).

The evaluation utilized a difference-in-differences research design to assess the effectiveness of the ICCP. A comparison group of Medicaid recipients was used who were eligible for the ICCP, but did not participate. This approach helped isolate the program's impact by accounting for external factors possibly affecting all ED users. Data sources included Medicaid claims, enrollment files, FoodShare enrollment data, and Unemployment Insurance wage data. The primary outcomes recommended by Act 279 for evaluating this pilot program were ED visits and ED costs. Analyses measured the association of the ICCP with these primary outcomes as well as other potential impacts of care coordination, such as the use of primary and specialty care and enrollment in social services.

The key finding of this report is that ICCP did not significantly reduce the number of ED visits or ED costs among participants relative to the comparison group. Both the ICCP group and comparison group showed similar declines in ED visits and costs over time, suggesting that the program did not have an additional impact beyond existing trends. As a result, there were no calculated cost savings due to the program.

In secondary analyses, the program also did not significantly reduce the number of non-emergent ED visits or the costs related to such visits, or lead to increases in the use of primary care or specialty care. These findings suggest that the program did not divert care from the ED to other, more appropriate settings. In the later rounds of the program, however, the ICCP was associated with increased FoodShare enrollment and increases in formal sector employment, consistent with the program's focus on SDOH.

Program implementation issues and other unmeasured factors could have influenced the ICCP evaluation results. The COVID-19 pandemic during the early stages of ICCP likely impacted implementation and workforce factors related to the program. ICCP implementation was flexible including the use of different participant eligibility criteria across hospital systems and a change in the timing of the intervention in the later stages of program. A challenge to future policy implementation may be to find the correct balance between implementing a standardized intervention and providing hospital systems the flexibility they may need to refine the intervention to be most effective for their system. As described in the report, the 7% of Wisconsin Medicaid individuals with six or more ED visits in 2023 incurred approximately 29% of the total Medicaid ED costs. The potential for future Medicaid and hospital cost savings may exist for program and policy interventions to address high ED utilization.

THE INTENSIVE CARE COORDINATION PROGRAM

Emergency department (ED) visits are costly and may be avoidable. The 2017 Wisconsin State Legislature passed Act 279 with the goal of reducing inappropriate ED use. The Act funds up to $1,500,000 each fiscal year for intensive care coordination services to Medicaid recipients with the stated goal of reducing emergency use among these recipients. Between March 2022 and February 2024, three different health systems operated care coordination programs with the intent of reducing ED visits. This report describes the programs and participants and evaluates the effectiveness of the program on reducing visits and costs to the Wisconsin State Medicaid program.

The Intensive Care Coordination Program (ICCP) was run during four rounds of treatment with each round lasting six months. Health systems chose participants from their system who used the ED at high rates over a 12-month eligibility period. Cutoffs are described in more detail below. Participants could enroll in the ICCP for one or two rounds, but not for more than two. The program offered care coordination through social workers or case managers to participating Medicaid recipients. Health systems were provided financial compensation.

Table 1 lists the 12-month eligibility period, the day the health systems submitted their initial list of participants, the day the final list of participants was due, and the six-month period during which care coordination was provided. It is important to note that initially, The Institute for Research on Poverty (IRP) was asked to confirm eligibility of participants based on the number of recent ED visits. However, this meant that there was a long lag between eligibility and care coordination. Based on health systems' feedback, this was changed in Round 3 and the time between eligibility and care coordination was greatly reduced.

Table 1: Eligibility and Enrollment Timeline

Enroll-ment Round	Eligibility Period	List of Potential Enrollees Due	Final List of Enrollees Due	Care Coordination Period
1	6/1/2020 – 5/31/2021	12/13/2021	2/14/2022	3/1/2022 – 8/31/2022
2	12/1/2020 – 11/30/2021	6/13/2022	8/15/2022	9/1/2022 – 2/28/2023
3	2/1/2022 – 1/31/2023	12/12/2022	2/13/2023	3/1/2023 – 8/31/2023
4	8/1/2022 – 7/31/2023	6/12/2023	8/14/2023	9/1/2023 – 2/29/2024

As detailed in Act 279, health systems were compensated for participating in the program with a three-tiered payment system:

1) The health systems received initial reimbursement payments of $250 for each participant enrolled in the program one month after the start of an enrollment round.

2) Second, if the number of ED visits for at least half of recipients declined during an enrollment round relative to the last six months of the eligibility period, health systems received an additional $250 for each participant after the end of a round.

3) Lastly, health systems could qualify for a "shared-savings" payment at the end of the entire program on July 1, 2025.

The shared-savings payment can be up to 50% of the savings from reduced ED use. Shared savings are calculated by subtracting the total of the first two payments from the estimated cost of ED visits that would have occurred without intensive care coordination. If the result of the calculation is positive in the first six months of enrollment in the program, the Department of Health Services (DHS) distributes 25% of the amount saved to the health system. If the result of the calculation is positive after 12 months of enrollment in the program, DHS distributes a share of the savings to the health system such that the total amount of shared savings payments equals 50% of the savings from the entire 12-month period.

Selection of Participating Health Systems

Five health systems submitted applications to DHS by the due date of March 11, 2020, and all five were selected for the pilot. IRP and DHS worked with the health systems to assign a cap on the number of participants in each of the four care coordination periods. The cap was based on available funding and the number of participants each health system anticipated accepting per round in their initial applications.

However, due to staffing concerns related to the COVID-19 pandemic, implementation of the pilot was delayed several months. Further, two health systems elected to not participate in the pilot program due to staffing concerns. The remaining three health systems initiated their pilot programs in March 2022:

- Ascension Wisconsin (Milwaukee location)
- Aurora Health Care Inc. (Milwaukee and Kenosha locations)
- Froedtert Health (Milwaukee, Menomonee Falls, West Bend, and New Berlin locations)

Eligibility Criteria for Participants

Act 279 specified that the program was to focus on frequent ED users aged 18–64 who were Medicaid recipients in Medicaid managed care or fee –for service, but not concurrently enrolled in Medicare. Example definitions of frequent ED users in Act 279 include recipients who visit the ED:

- three or more times within 30 days,
- six or more times within 90 days, or
- seven or more times within 12 months.

Table 2 shows the eligibility criteria used by each health system based on surveys provided by the health systems to the IRP research team. While the 12-month eligibility period was consistent across health systems, each health system used a different number of ED visits within the period as the criterion for enrollment in their program.

Table 2: Eligibility Criteria

Health System	Enrollment Criteria for the 12-Month Eligibility Period
Ascension	6+ ED visits with at least one in the Ascension system
Aurora	5+ ED visits with at least one in the Aurora system
Froedtert	• 4+ ED visits in Rounds 1 or 2 • 3+ ED visits in Rounds 3 or 4 • Selection of those with 3+ ED visits was limited to individuals with the highest adult risk scores in their internal Epic system • At least one ED visit must have been in the Froedtert system • A maximum of 10 ED visits within the Froedtert system • Excluded enrollees who have: an external primary care provider outside of the Froedtert system, sickle cell disease, an opioid use or alcohol abuse disorder, more inpatient admissions than ED visits, visited an inclusion clinic • Excluded enrollees who are homeless

Each health system was allowed to tailor their eligibility criteria based on the population they serve and staffing levels. DHS, IRP, and the health systems worked together to give health systems the opportunity to enroll the maximum number of participants allowed under funding from Act 279. In practice, some health systems chose to enroll fewer people based on staffing concerns.

Aurora's eligibility criterion was consistent throughout the pilot program. After having difficulty enrolling as many participants as desired in Rounds 1–2, Froedtert was granted permission to reduce their criterion to 3 or more ED visits in Rounds 3–4. The ensuing evaluation analyses incorporate this change. Ascension reported using an eligibility criterion of 6 or more ED visits in the eligibility period initially and all analyses reflect this criterion. During the production of this final evaluation report, Ascension corrected their eligibility criterion to be 5 or more ED visits in enrollment Rounds 1-3 which would have included approximately 5% more enrollees. Although analyses could not be revised in time for the completion of this report, it is unlikely that the inclusion of additional participants would change primary findings.

The Program in Each Health System

Act 279 broadly specifies specific services that are to be included in the program. For example:

- ED discharge instructions and contacts for follow-up care;
- referral information;
- appointment scheduling;
- medication instructions;
- intensive care coordination by a social worker, case manager, nurse, or care coordinator to connect the participant to a primary care provider or managed care organization, and;
- information about other health and social resources, such as transportation and housing.

In addition, Act 279 outlines that the care coordination team is to consist of health care providers who are not physicians, such as:

- nurses;
- social workers, case managers, or care coordinators;
- behavioral health specialists;
- schedulers.

Beyond these broad elements of the program, each health system had freedom in designing a program that worked for the given system. IRP surveyed each health system each period on what services were provided and who provided them. A summary follows, and **Appendix A** provides further information.

Ascension's pilot program utilized Health Promoters (HP) who frequently engaged with participants and assessed social determinants of health (SDOH). The process started when ED high utilizers who were 18 years and older were flagged in Ascension's care management platform. HPs made three outreach attempts by phone and conducted in-person outreach if the participant checked into the ED. The program's intake assessment process examined SDOH and other issues that may have informed the need for follow-up services. Based on the intake assessment, HPs developed care plans for the participant, connected them with a primary care physician (PCP), educated on appropriate care settings, referred to the appropriate health team member to address their needs, helped establish transportation for appointments, and referred to financial assistance. Follow-up calls were made at least every two weeks to work on care plan goals and address any of the participants' questions or needs.

Aurora's pilot program utilized social workers and involved specialized, intensive case management services. The process started with a site-specific, monthly report of participants identified as high utilizers through their electronic health record (EHR). A forensic chart review was done, and participants were met face-to-face in the ED, where they received clear discharge and follow-up instructions and support. Social workers conducted SDOH screenings, followed by individualized care coordination and planning. Social workers contacted participants a minimum of three to five times monthly for check-ins, appointment reminders, follow-up calls for ED visits and appointments, home visits, and referrals. Interdisciplinary monthly participant management plan meetings—with ED director and staff from the public safety, behavioral health, and social work fields—helped tailor care plans to individual circumstances which could include ED use, comorbidities, social needs, and medical interventions. To address SDOH, social workers may have accompanied the participant to follow-up appointments; enrolled them into a local food program; referred to public benefits to assist with insurance applications; provided advanced care planning education; and connected participants with legal assistance, day programs, housing shelters, or numerous other community resources. HPs may also have connected participants with health maintenance organization (HMO) case managers who could provide additional outreach and care coordination. As staff awareness of the program increased, referrals increased as well.

Froedtert's pilot program utilized three social workers to offer flexible care coordination to Medicaid participants with at least three ED visits over the measurement period. Coordination ranged from weekly calls to contact only after ED visits based on the participant's needs and ED utilization. Initial outreach involved two phone calls. If there was no response, a MyChart message or letter was sent to the participant that included alternative care options and resources available within the health system. Upon enrollment, each participant received a SDOH needs evaluation to determine additional resources the program could provide and to

understand the impact of SDOH on that participant's medical care. Social workers would then call or message participants via MyChart to provide support, education, and resources. The social workers provided additional education on alternative care options for less critical symptoms, established participants with a PCP, scheduled follow-up PCP appointments after an ED visit (sometimes with the help of medical assistants), and communicated with providers regarding participant questions or if orders were needed for equipment, home care, behavioral health, dietician, etc. To address SDOH, the program provided the participant with resources for housing, finances, food, transportation, behavioral health, advocacy, and dentistry, or connected them with an organization that could assist the participant. Froedtert even created a free virtual visit code to remove the cost deterrent for these participants. Froedtert increasingly standardized the resources provided to each participant after the first year so that they all received alternative care resources, behavioral health resources, and Health Care Power of Attorney documents. Upon discharge, they established connections with multiple insurance providers to offer additional support for medical and community resource needs after leaving the program, which Froedtert reported as a successful endeavor.

Participants

This section details the number of participants in each round for each health system and the characteristics of participants**. Table 3** shows the number of eligible participants for each round and health system. DHS performed eligibility validations of the initial list of participants from the health systems which reduced the number of participants officially enrolled. Additional criteria were applied later to determine payments to health systems and inclusion in evaluation analyses. Ascension greatly increased the number of eligible participants in Round 4, compared to Rounds 1–3. In the Aurora health system, the number of eligible participants particularly increased between Round 1 and 2. The Froedtert health system significantly increased their eligible participants between Rounds 2 and 3.

Table 3: Number of Eligible Participants by Round and Health System

Health System	Round 1	Round 2	Round 3	Round 4
Ascension	96	83	45	757
Aurora	117	176	160	164
Froedtert	314	342	467	434
Total	***527***	***601***	***672***	***1355***

The characteristics of participants in each round, measured during eligibility period, before the start of the ICCP program, are included in **Table 4**. The average number of ED visits per month just prior to their enrollment in the ICCP program ranged from 0.68 to 0.87 across rounds. Participants who were admitted to the ED during the pre-ICCP period were at risk of returning to the ED again within a short period of time (returning within three days on average 10-13% of the time and within nine days between 15-19% of the time, respectively). More than half of the sample was female, with the percentage of female participants ranging from 60% to 68%. The average age of participants was 36 across all rounds. Between 19% and 34% of participants were enrolled in Medicaid based on having a disability, according to administrative data on Medicaid enrollment category.

The Charleson Comorbidity Index (CCI) was also used as a proxy for health care utilization needs. The CCI has been validated as a measure of one-year mortality risk and captures 19

comorbidities from the International Classification of Diseases (ICD) diagnosis codes found in the Medicaid claims data (Charlson et al., 1987). Each of the 19 comorbidities was measured for 12 months before the start of the program and used as an indicator for an individual having at least one of the comorbidities. Between 58% and 67% of participants had at least one comorbidity. Additionally, about half of participants had formal-sector wages during the eligibility window, and between 67% to77% were enrolled in FoodShare, which is Wisconsin's Supplemental Nutrition Assistance Program (SNAP).

Table 4: Recipient Characteristics and Health Care Use in Eligibility Period

	Round 1	Round 2	Round 3	Round 4
ED Visit Use (Per Month)				
ED visits	0.79	0.76	0.68	0.87
Non-emergent ED visits	0.38	0.35	0.33	0.38
Emergent ED visits	0.11	0.11	0.10	0.12
ED visit costs	$227.35	$235.35	$229.89	$291.06
Non-emergent ED visit costs	$17.27	$17.89	$16.89	$21.46
3-day return ED visits (based on % of initial visits)	11%	11%	10%	13%
9-day return ED visits (based on % of initial visits)	17%	16%	15%	19%
Overall Health Care Use (Per Month)				
Primary care visits	0.48	0.5	0.5	0.47
Specialty care visits	2.45	2.53	2.38	2.45
Total health care visits	2.78	2.91	2.64	2.72
Total health care costs	$839.84	$935.56	$886.12	$1,033.25
Demographic and Economic Characteristics (Per Eligibility Period)				
Any formal wages	48%	48%	50%	48%
Monthly Average Wage (excludes those with no income)	$848.84	$822.77	$1,019.55	$862.88
Enrolled in Foodshare	77%	76%	67%	74%
Has a disability	26%	25%	19%	34%
Has at least one comorbid condition (CCI index)	60%	67%	60%	58%
Female	68%	65%	61%	60%
Age	36.57	36.37	36.74	36.80
N	***527***	***601***	***672***	***1355***

Note: Unless otherwise noted, each outcome is the average monthly value for the eligibility period.

The top 10 most common diagnosis codes for ED visits for eligible enrollees is shown in **Table 5**. For each eligibility period, the most common primary diagnoses ICD-10 codes were summarized for eligible enrolled members. Some of the diagnoses are potentially avoidable if there was proper management of the disease. For example, Type 2 diabetes mellitus with hyperglycemia could possibly be prevented if the individual had a primary care physician or endocrinologist to address the condition. On the other hand, some of the visit codes may be truly unavoidable. For example, chest pain may be indicative of a myocardial infarction that necessitates immediate treatment. Ideally, the program would target individuals with codes

related to visits that are avoidable, either by collaborating with a primary care provider, specialist, or both.

Table 5: Number of Diagnosed Conditions in the ED in Eligibility Period

Diagnosis Codes	Rounds 1-2	Diagnosis Codes	Rounds 3-4
R51.9: Headache, unspecified	1011	R07.89: Other chest pain	1686
R11.2: Nausea with vomiting, unspecified	961	R51.9: Headache, unspecified	1399
R07.89: Other chest pain	947	R07. 9: Chest Pain, Unspecified	1371
R07. 9: Chest Pain, Unspecified	920	R11.2: Nausea with vomiting, unspecified	1143
R45.851: Suicidal ideations	600	M54.5: Low back pain	859
R10.9: Unspecified abdominal pain	572	O26.893: Other specified pregnancy related conditions, third trimester	781
U07.1: Covid-19	545	R45.851: Suicidal ideations	761
R10.84: Generalized abdominal pain	492	R10.84: Generalized abdominal pain	752
N39.0: Urinary tract infection	489	J06.9: Acute upper respiratory infection, unspecified	713
E11.65: Type 2 diabetes mellitus with hyperglycemia	428	R10.9: Unspecified abdominal pain	708

Note: Participants could have multiple diagnoses and visits, so the count of diagnoses is higher than the count of participants.

Health System Payments

As discussed above, there were three different payments health systems could qualify for: an enrollment payment, a visit reduction payment, and a shared savings payment. The enrollment payment was made for any eligible participant that enrolled in the program. The visit reduction payment was made if at least half the participants had a reduction in ED visits in the treatment period compared to the eligibility period. Additionally, participants had to be enrolled in Medicaid for at least three of the treatment months. The shared savings payment was made if the program accrued any savings to the Medicaid program. If the Medicaid savings due to reduced ED visits was more than the cost of the first two health system payments, the health system received a payment representing up to 50% of the savings depending on the length of the period in which savings occurred. As shown later, there were no calculated savings.

Table 6 summarizes total payments made for each health system. Wisconsin Act 279 allocated $1.5 million dollars per fiscal year for the program and $1,760,250 has been distributed to health systems to date.

Table 6: Health System Payments Made to Date

Health System	Payments
Aurora	$ 300,000
Ascension	$ 602,250
Froedtert	$ 858,000
Total	***$ 1,760,250***

EVALUATION METHODOLOGY

Research Questions

In collaboration with DHS, the IRP research team formulated three main hypotheses related to the ICCP program as well as specific research questions related to each hypothesis.

Hypothesis 1: Intensive care coordination will decrease use of the ED among Medicaid beneficiaries, particularly related to primary-care treatable and non-emergent conditions.

Q1-1: What are the patterns over time in ED visits, and return visits by the same person, among Medicaid beneficiaries in Wisconsin?

Q1-2: Does intensive care coordination reduce ED visits (total visits, and return visits by the same person) among Medicaid beneficiaries? Does the effect vary for people using specific types of clinical care, or for people with disabilities?

Q1-3: Does the impact of intensive care coordination on ED visits differ for non-emergent visits and for emergent visits?

Hypothesis 2: Intensive care coordination will decrease ED care costs among Medicaid beneficiaries, particularly related to primary-care treatable and non-emergent conditions.

Q2-1: What are the characteristics of Medicaid beneficiaries who drive ED health care costs (top 10^{th} percentile, top 25^{th} percentile)?

Q2-2: Does intensive care coordination reduce costs of ED care among Medicaid beneficiaries? Does the effect vary for people with special health care needs or for people with disabilities?

Q2-3: Does the impact of intensive care coordination on ED care costs differ for non-emergent ED visits relative to other types of ED visits?

Hypothesis 3: Intensive care coordination will increase use of primary care and specialty care visits and increase enrollment in other relevant social services. Total costs to Medicaid will decrease.

Q3-1: Will intensive care coordination increase use of relevant services (primary care visits, specialty care visits, and alcohol and other drug abuse resources as applicable)?

Q3-2: Do various characteristics of the referral providers influence the use of care after a referral (e.g., shorter distance to public transportation, have after-hours care)?

Q3-3: Will intensive care coordination increase enrollment in social services, such as FoodShare, or increase formal sector earnings?

Q3-4: Will intensive care coordination decrease total health care visits and costs for Medicaid members?

Data Sources

This report relies on Medicaid claims from the State of Wisconsin from June 2020, the start of the eligibility period of Round 1, through February 2024, the end of the pilot program. These claims include all services that the Wisconsin Medicaid program paid for, as well codes that allow for identification of visit type and individual receiving the services. In addition, each service is associated with a date that the service took place as well as a code for where the service took place. Services were flagged as occurring at a participating health system if they match the National Provider Identifier (NPI) associated with each hospital in the health system. The procedure codes contained in each claim were used to construct variables for various visit types. This is described in more detail below.

Medicaid enrollment files were also used. These files include everyone who enrolled in the Wisconsin Medicaid program using CARES. This file includes individual identifiers that allow for linking to the Medicaid claims data. In addition, they include basic demographic characteristics such as race, ethnicity, and gender. This data was used to adjust for demographic characteristics in our regression models.

The Medicaid claims and enrollment files were supplemented with additional administrative data, including data on FoodShare recipients and Unemployment Insurance (UI) wage data. FoodShare is the Wisconsin program that helps people purchase food, also known as SNAP at the federal level. The administrative data we used indicates whether each Medicaid beneficiary was enrolled in FoodShare in each given month. Most Medicaid beneficiaries are typically eligible for FoodShare as is the case for the ICCP sample as well. The UI wage data is legally required to be reported for almost all formal sector employees and is reported to the government quarterly by their employer. Thus, almost all formal sector wages in the state of Wisconsin are included in these data.

Outcome Measures

Primary Outcomes

The primary outcomes of interest were emergency department visits and emergency department costs. Visits were classified as ED visits based on the procedure codes in the Medicaid claims data using the HEDIS[1] measure specifications; see **Appendix B** for details. Based on input from DHS, costs were calculated by using the internal control number (ICN) of each claim. If a claim was classified as an ED visit, all costs for the given ICN were summed up into a single value which was used as the cost of the ED visit.

Secondary Outcomes

The first set of secondary outcomes of interest included 3-day return visits and 9-day return visits. These variables were measured each time a member of the study sample had an ED visit; the 3-day return visit variable would take the value 1 if the same patient had another ED visit within 72 hours, and 0 otherwise. The 9-day return visit outcome was similarly defined. These outcomes were selected because 3-day and 9-day return visits have been used as previous benchmarks in the ED literature. For example, many return visits to the ED for the same diagnosis, particularly those within three days, have been found to be associated with

[1]HEDIS® – The Healthcare Effectiveness Data and Information Set (HEDIS®) is a registered trademark of NCQA.

incorrect discharge diagnoses or errors in follow-up care (Qureshi, et. al., 2018; Nunez, et. al.,2006).

A second set of secondary outcomes measured the number of ED visits associated with visits for non-emergent health concerns and the costs associated with such visits. These outcomes were selected to measure whether the ICCP program redirected some care from the ED to outpatient or primary care settings. More specifically, if the ICCP program redirected some care from the ED to outpatient or primary care settings, we might expect to see a decline in the cost of ED visits caring for non-emergent health concerns. Visits were classified as non-emergent based on the Billings algorithm as implemented in (Ballard, et al., 2010). See **Appendix B** for additional details.

The third set of secondary outcomes captured other health care use, total health care use and costs, and connectivity with relevant social services, as well as labor market outcomes. Specifically, we measured the number of primary care visits, specialty care visits, or health care visits to treat alcohol or drug abuse (AODA) concerns, as well as enrollment in FoodShare, the proportion of people with any formal wages, and the average monthly wage if in formal employment. These outcomes were selected because the ICCP programs were designed to connect patients with appropriate non-ED health care providers and other support services to address SDOH. Additional details on the definition of each variable are in **Appendix B**.

The ICCP and Comparison Group Analytic Samples

Time Periods of Interest

We divided the 24-month period of the ICCP pilot program into two main time periods. We did so because major changes in the eligibility criteria were enacted partway through the pilot program, and these changes could affect the generalizability of the results.

The first period, referred to in this report as Rounds 1 and 2, comprised the first two six-month treatment periods of the ICCP program starting 3/1/2022 and 9/1/2022. During this period, there was a longer lag between the measurement of ED visits to qualify Medicaid beneficiaries for the program and the enrollment of qualifying participants into the ICCP program. Due to concerns that this lag time was too long, it was subsequently shortened after Round 2. Froedtert also changed their eligibility criteria for the ICCP program between Rounds 2 and 3. Given that these changes could have meaningful effects on the population recruited to participate, we present results separately for Rounds 1 and 2 versus Rounds 3 and 4 of the program, which began respectively on 3/1/2023 and 9/1/2023.

Program Enrollment

Our main analysis focused on the effects of being enrolled in the ICCP program for six months. While ICCP participants could be enrolled in the program for up to 12 months per statute, in practice, very few participants were enrolled for 12 months at a time and those participants were not equally represented by all participating health systems. Due to the difficulty of reaching general conclusions about the effects of program enrollment for 12 months with this smaller sample, we focused on analyzing the effects of the first six months of participation in ICCP in the main text. However, results from the 12-month sample are available in **Appendix E**.

Inclusion and Exclusion Criteria

To construct the analytic sample, we kept all individuals who enrolled in the program and were eligible based on the Medicaid claims and enrollment data. Specifically, we included individuals who met criteria specified in Act 279 and individuals who met the minimum number of ED visits required to participate in the program in each round for each health system. Gainwell was contracted by DHS to perform the initial check that the individuals met the criteria from Act 279. From this initial group, we excluded individuals who did not have any visits to the ED of the health system in the Medicaid claims during the eligibility window. They may have had visits that were not paid for by Medicaid, but we rely solely on the Medicaid claims files to construct visits and costs. We also excluded individuals who participated in two prior rounds of ICCP, as they were no longer eligible to enroll. When evaluating Rounds 1 and 2 or Rounds 3 and 4, we excluded individuals who participated for two consecutive rounds.

Comparison Group Identification

To construct the comparison group, we took two steps. First, we restricted the sample to individuals who would have been eligible for the program based on their ED utilization during the eligibility period, but who never participated in the program. These individuals are high ED users but were not selected by the health systems to participate, partially due to capacity concerns. Second, we further restricted the sample to ensure the comparison group closely resembles the ICCP group on key characteristics measured prior to the start of the ICCP program. Specifically, propensity score matching was used to re-weight the comparison group. These weights ensure that the comparison group is as similar to the ICCP group as possible in terms of their ED visits and costs, as well as other key predictors such as other health care use, health conditions, and demographics. This method has been used extensively in the medical program evaluation literature (Aaskoven et al., 2022; Chen & Jin, 2012; Fu et al., 2017; Strumpf et al., 2017). In constructing costs, we address extreme outlier values through Winsorizing by replacing anybody in the top five percentiles of costs with the 95th percentile value. Additional details on the statistical analysis are provided in **Appendix C**.

Table 7 summarizes the characteristics of the ICCP group and matched comparison group using data from the eligibility period. Due to changes in the eligibility criteria and the proximity of the eligibility period to the treatment period after Round 2 of enrollments, Rounds 1–2 and Rounds 3–4 are analyzed separately in the Results section. Results of the matching process for the two pairs of enrollment rounds reveal the ICCP and comparison groups to be set up well for the comparative analyses of program outcomes. Differences in the variety of ED visit rates are typically only .01–.04 per month for both sets of rounds. Differences in the use of primary care and specialty care are also small among the groups at .00–.07 visits per month. The portion of ICCP and comparison group members with a disability or comorbid condition only varied by 1 percentage point in both the Rounds 1-2 and 3-4 comparisons.

Table 7: ICCP and Matched Comparison Group Characteristics and Health Care Use in the Eligibility Period

	ICCP Group	Matched Comparison Group	Difference	ICCP Group	Matched Comparison Group	Difference
		Rounds 1 and 2			Rounds 3 and 4	
ED Visit Use (Per Month)						
ED visits	0.87	0.84	0.03	0.74	0.70	0.04
Non-emergent ED visits	0.40	0.39	0.01	0.34	0.32	0.02
Emergent ED visits	0.12	0.11	0.01	0.11	0.10	0.01
ED visit costs	$258.23	$248.18	$10.04	$248.31	$235.68	$12.63
Non-emergent-ED visit costs	$19.04	$18.37	$0.67	$16.64	$15.41	$1.22
3-day return ED visits	13%	12%	1 ppt	11%	11%	0 ppt
9-day return ED visits	19%	18%	1 ppt	17%	16%	1 ppt
Overall Health Care Use (Per Month)						
Primary care visits	0.50	0.51	0.01	0.48	0.48	0.00
Specialty care visits	2.59	2.55	0.04	2.35	2.28	0.07
Total health care visits	2.96	2.94	0.02	2.63	2.55	0.08
Total health care costs	$971.47	$961.13	$10.34	$979.19	$940.36	$38.83
Demographic and Economic Characteristics (Per Eligibility Period)						
Any formal wages	46%	47%	-1 ppt	49%	49%	0 ppt
Monthly Average Wage (excludes those with no income)	$825.90	$856.81	-$30.92	$910.38	$933.65	$-23.26
Enrolled in Foodshare	80%	81%	-1 ppt	71%	71%	0 ppt
Has a disability	28%	27%	1 ppt	40%	41%	-1 ppt
Has at least one comorbid condition (CCI index)	67%	66%	1 ppt	58%	58%	0 ppt
Female	61%	63%	-2 ppt	60%	63%	-3 ppt
Age	37.56	37.17	0.39	36.52	36.35	0.17
N	***633***	***1,810***		***1,553***	***4,441***	

Note: The return visit figures capture the % of initial visits that had a return visit within the specified number of days. The percentage point change from before to after the intervention is represented as “ppt”.

Research Design and Analysis Interpretation

The objective in evaluating a treatment's effect on an outcome is to measure the difference between 1) the change in an outcome in the presence of the treatment compared to 2) the change in the same outcome for a comparison group that did not receive the treatment.

The evaluation used a difference-in-differences (DiD) quasi-experimental research design to measure the relationship between the ICCP treatment and changes in ED visits and other health care outcomes. In addition to measuring differences in outcomes between the ICCP and comparison group, the DiD technique also involves comparing the changes in outcomes over time before and after the ICCP treatment period began. The average effect of the treatment is estimated by subtracting the change in outcomes (i.e., ED visits) in the comparison group from the change in outcomes in the ICCP group. This comparison of outcomes for two groups over two periods in this technique also allows for the control of other external factors potentially affecting both groups, such as the impact of the COVID-19 pandemic, economic or policy changes, or "regression to the mean."

The "regression to the mean" concept assumes that recipients who received care coordination qualified for the pilot during a time that they had unusually high ED use and that this would have reverted to their typical level without the care coordination. Thus, regression to the mean occurs if the ICCP group would have decreased their use of ED visits in the absence of the program anyway. Because of regression to the mean, pre-post comparisons may suggest that intensive care coordination interventions reduce care visits even if a more rigorous study with a randomized control group would find no impact (Finkelstein et al., 2020).

The assumption underlying the DiD research design is that trends in ED visits would have evolved similarly for the ICCP and the comparison group during the post-intervention period if the intervention had not occurred. This is known as the parallel trends assumption. This assumption is untestable, but its plausibility can be assessed by testing if the trends in ED visits were similar across the two groups prior to the intervention. Accordingly, the research team tested whether trends between these groups were parallel across the two groups during the eligibility period for all outcomes and all subgroups analyzed. For brevity and clarity, the test results are not presented in the report, but all analyses passed this test related to the parallel trends assumption unless otherwise specified.

A Framework for Interpreting the Results

The following questions answered by the difference-in-differences analyses can help interpret the results. For clarity, we use ED visits as an outcome in this example.

- Did ED visit trends change in the treatment period relative to the earlier eligibility period for the ICCP group?
- Even though no ICCP treatment was delivered for the comparison group, did ED visit trends change in the treatment period relative to the earlier eligibility period?
- Primary Question: What is the additional change in ED visits associated with the ICCP treatment, above and beyond the changes in ED visits experienced by the comparison group?

RESULTS

Hypothesis 1: Intensive care coordination will decrease use of ED among Medicaid beneficiaries, particularly related to primary-care treatable and non-emergent conditions.

Q1-1: What are the patterns over time in ED visits, and return visits by the same person, among Medicaid beneficiaries in Wisconsin?

Examining the patterns in ED visits for all Medicaid beneficiaries in Wisconsin helps establish comparative context with which the ensuing ED visit results for the ICCP may be viewed. When considering patterns of ED visits over time, we use data from 2021–2023, for which we have full and complete data. For each year, we divide Medicaid beneficiaries into four groups: those who had less than or equal to three ED visits in the given year, those who had exactly four visits, exactly five visits, and six or more visits. We show the total number of visits, the total costs, and the total number of people in each group.

Turning to the number of ED visits per year (**Figure 1**), we see that it slowly increased between the years 2021 and 2023. From 2021 to 2022, the total number of visits increased from 713,440 to 753,150, an increase of 3%. There was an additional 2.2% increase from 2022 to 2023, where there were 769,850 visits. Although the number of visits increased for all groups, the percentage of visits for each group was largely unchanged. For example, visits by people with more than six ED visits in the year comprised roughly 29% of all visits in each year.

Given the increase in ED visits each year, as expected, the costs of ED visits increased between 2021 and 2023 as well (**Figure 2**). However, the increase in costs was smaller than the increase in the number of visits. From 2021 to 2022, the costs for all ED visits paid for by Medicaid increased from $662.76 million to $677.50 million, an increase of 2.2%. Total costs increased only slightly, to $682.23 million, or 0.7%, in 2023. The relative total costs of each group match the relative number of ED visits. For example, the total costs of ED visits by people with more than six ED visits is roughly 29% of all ED costs.

Last, we consider how many people fall into each group. **Figure 3** shows how large each group was each year. The figure includes anyone with at least one ED visit in 2023. The number of Medicaid recipients enrolled with six or more ED visits in each year is rather small. Although they comprise 29% of total visits and costs, they comprise just 7% of individuals with any ED visit. The ICCP was established based on such findings. If a program such as ICCP could reduce the ED use of this select group of high ED users, it would have an exponential impact on ED visits and costs.

Figure 1: Total ED Visits per Year

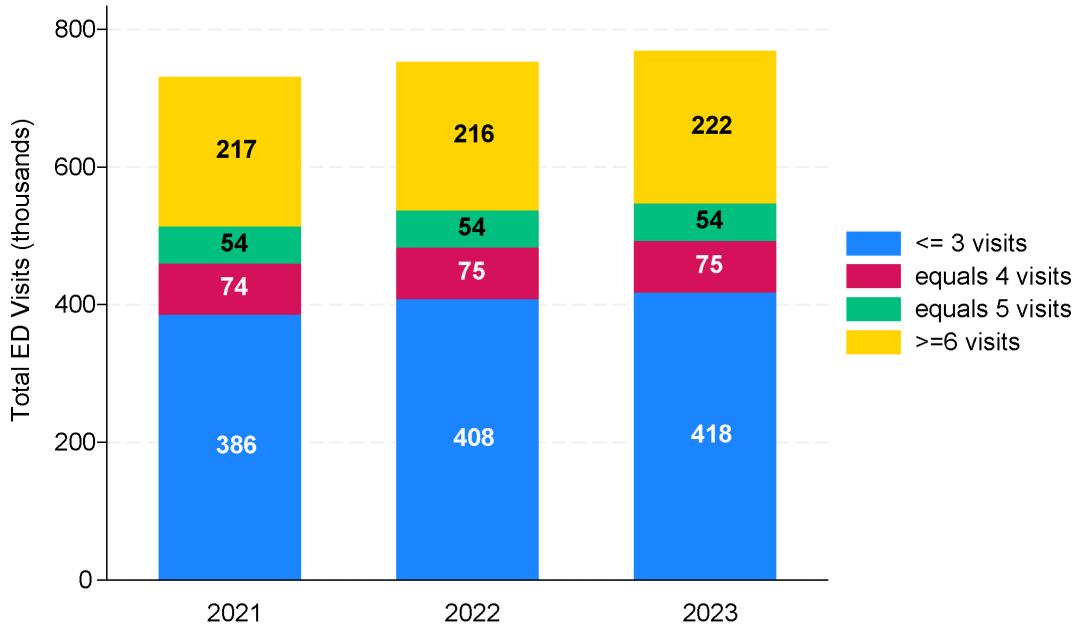


Figure 2: Total ED Costs by Year

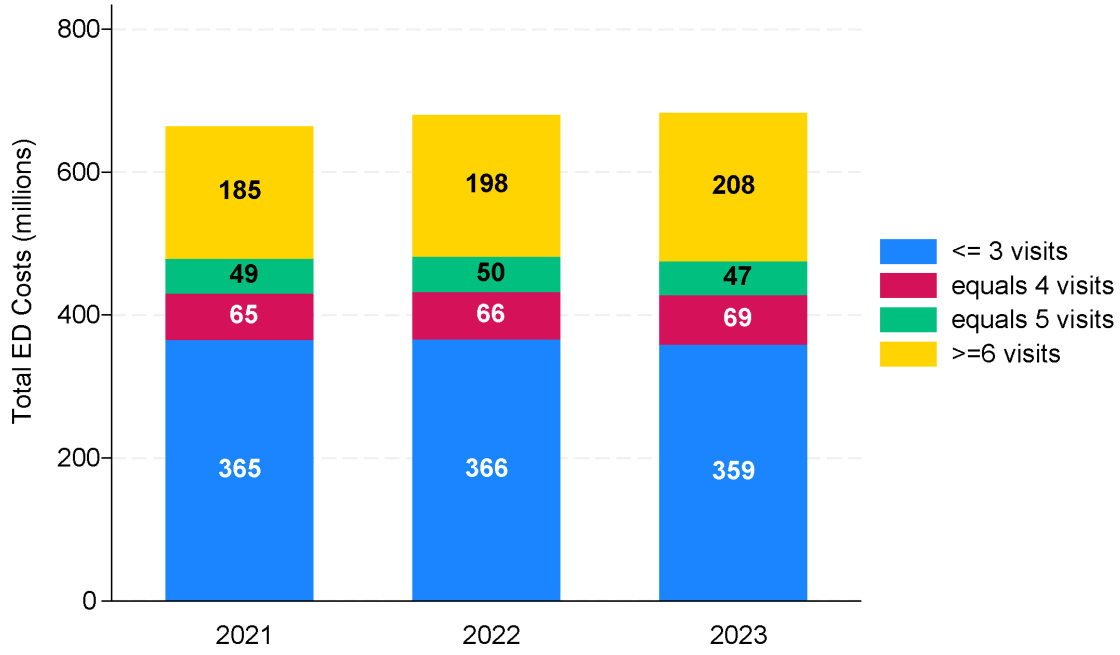
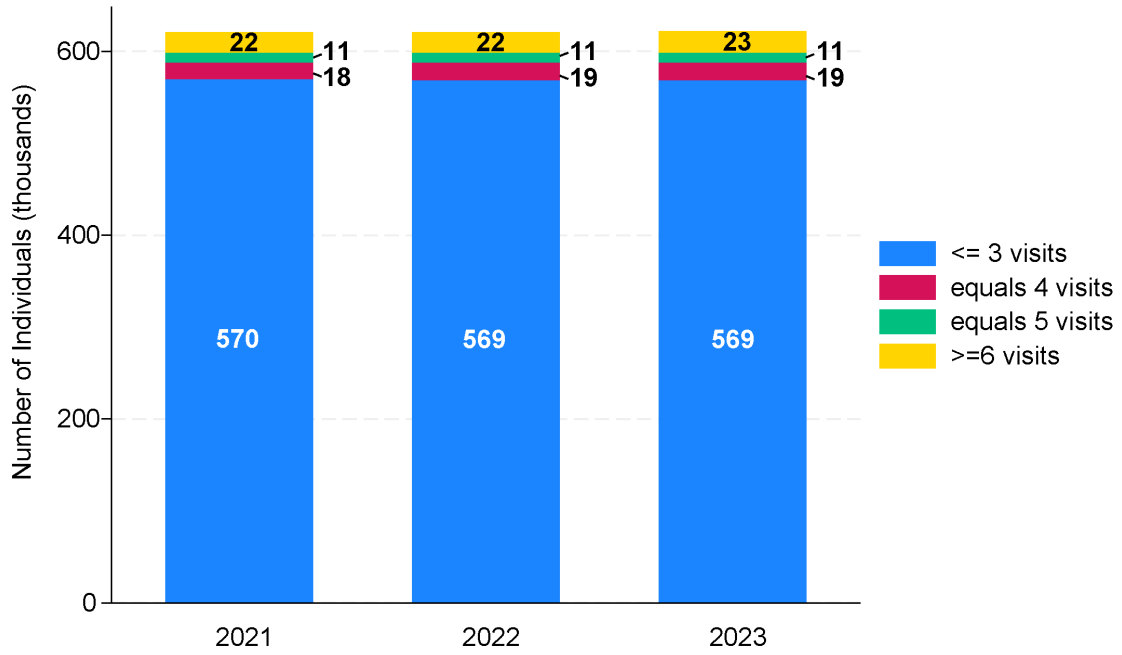


Figure 3: Medicaid Beneficiaries by ED Visit Categories by Year



The percentage of ED visits that resulted in a return visit to the ED within 3 or 9 days vary by season, but have been otherwise stable between June 2020 and February 2024. Both are highest in the summer and lower during the winter months. The percentage of ED visits that result in a 3-day return visits vary between 8% and 10% and the percentage of visits that result in a return visit within 9-days cycles between 14 and 16%. This is roughly consistent with previous estimates of 3-day return visits and more recent estimates of 9-day return visits (Rising, et al., 2014; Duseja, et al., 2015; Hong, et al., 2019). There has been no notable change over time in either measure for Wisconsin Medicaid enrollees.

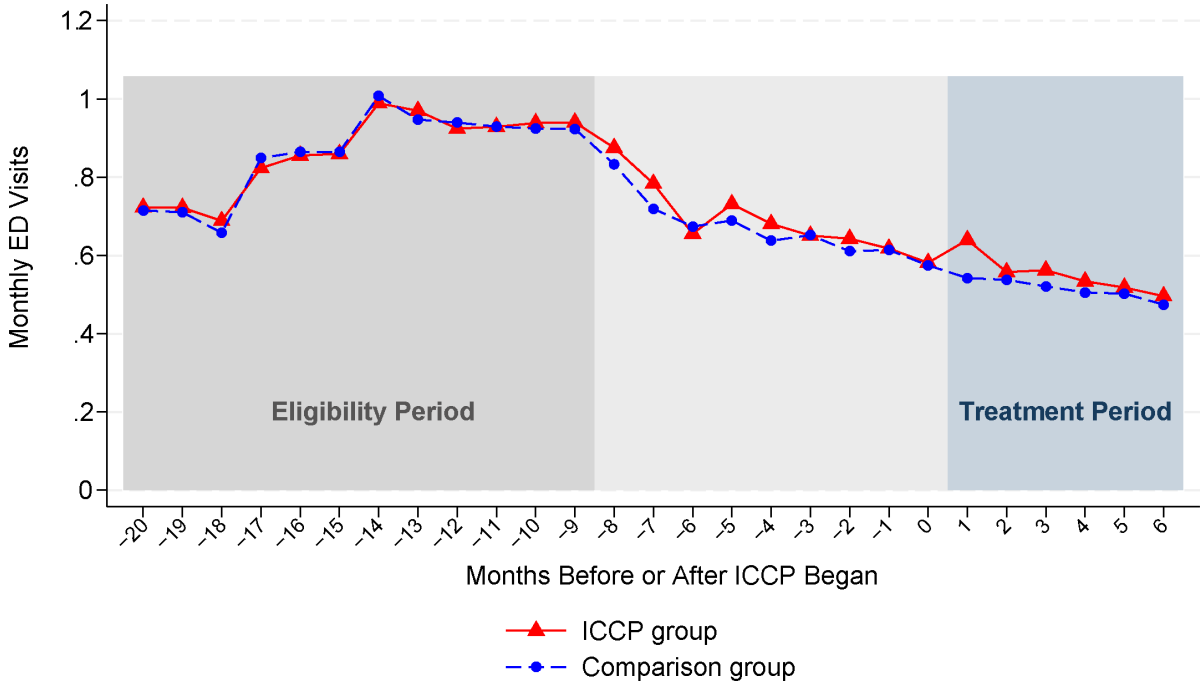
Q1-2: Does intensive care coordination reduce ED visits (total visits, and return visits by the same person) among Medicaid beneficiaries? Does the effect vary for people using specific types of clinical care, or for people with disabilities?

If the ICCP was successful in helping reduce ED visits, we would expect the number of ED visits in the ICCP group to show an *additional* decrease after the start of the treatment period, beyond any decrease that occurred in the untreated comparison group.

Figure 4 shows the trend in ED visits before and after the start of the treatment period, in both the ICCP group and the comparison group. Before the start of the ICCP program, trends in monthly ED visits were similar among the ICCP group and comparison group. Subsequently, ED visits decrease after the start of the treatment period, with similar decreases for the ICCP group and comparison group. The patterns of visits are somewhat different before versus after the change in enrollment criteria for the program (i.e., Rounds 1 and 2 versus 3 and 4; see Panels A and B respectively); however, in each case number of ED visits for the comparison group followed a very similar pattern to the ICCP group.

Figure 4: ED Visits in the ICCP Group and Comparison Group, Before and After the Intervention

(a) Rounds 1 and 2



(b) Rounds 3 and 4

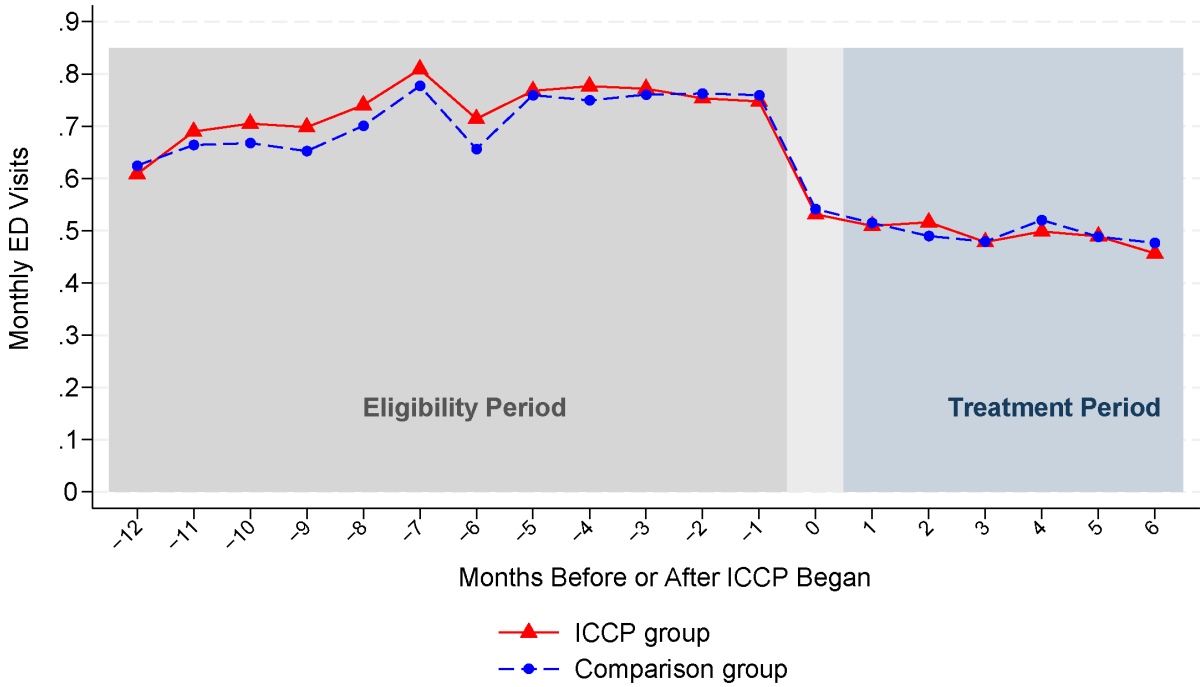


Table 8 reports estimated changes in ED visits among Medicaid enrollees associated with the ICCP program. During Rounds 1 and 2, for example, the number of ED visits among the ICCP group decreased from 0.79 per month before the program to 0.55 per month after the program. Over the same timeframe, the number of ED visits decreased among the comparison group from 0.78 to 0.51 per month. In a DiD regression analysis controlling for external factors, there was not any significant additional change in ED visits associated with the program. Specifically, the ICCP program was associated with an additional change of 0.04 ED visits per month relative to the comparison group, but this change was not significant.

The ICCP program was not associated with declines in ED visits in alternate specifications of the analysis. First, the findings were similar for the other outcomes and time periods, as shown in **Table 8**. The ICCP program was not associated with significant changes in the number of ED visits, including overall visits or return visits within 3 days or 9 days, during either of the time periods we studied.

Second, in exploratory analyses, we stratified the data by health system and examined changes in outcomes for people who were in the program for 12 months rather than 6 months. These analyses had small sample sizes; there were only 183 people in the 12-month analysis for Rounds 1 and 2 and 175 people in the 12-month analysis for Rounds 3 and 4, and frequently less than 300 people in the analysis of data by health system. However, these analyses did not find the ICCP program to be associated with significant declines in ED visits (**Appendix D-E**.)

While we originally intended to explore differential effects for people with a history of asthma or diabetes complications or people enrolled in Medicaid due to a disability, sample sizes were too small to obtain valid estimates. Each analysis would have included fewer than 75 people. Thus, these analyses were excluded from the report.

Table 8: ED Visits and Return Visits in ICCP Group and Comparison Group, Before and After the Intervention

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	Before	After	Change	Before	After	Change	Estimate	95% CI	*P*-value
Rounds 1 and 2									
ED Visits	0.79	0.55	-0.24	0.78	0.51	-0.26	0.04	[-0.03,0.10]	0.24
3-Day ED Return Visits	12%	8%	-4 ppt	12%	7%	-4 ppt	0 ppt	[-1, 2 ppt]	0.63
9-Day ED Return Visits	17%	12%	-6 ppt	17%	11%	-6 ppt	1 ppt	[-1, 3 ppt]	0.26
Rounds 3 and 4									
ED Visits	0.72	0.49	-0.22	0.70	0.50	-0.20	-0.02	[-0.06,0.01]	0.22
3-Day ED Return Visits	11%	8%	-4 ppt	11%	7%	-4 ppt	0 ppt	[-1, 1 ppt]	0.70
9-Day ED Return Visits	16%	11%	-5 ppt	16%	11%	-5 ppt	0 ppt	[-1, 1 ppt]	0.90

Note: The return visit figures capture the % of initial visits that have a return visit within the specified number of days. The percentage point change from before to after the intervention is represented as "ppt."

Q1-3: Does the impact of intensive care coordination on ED visits differ for non-emergent visits and for emergent visits?

While results indicate the ICCP intervention did not have an impact on ED visits overall, a more targeted impact on non-emergent or avoidable ED visits could have occurred. If the ICCP intervention helped educate Medicaid recipients about the appropriate uses of the ED, non-emergent uses may decrease. In addition, when ICCP redirected care from the ED to outpatient or primary care settings, a decline in the future number of ED visits for non-emergent health concerns may also occur.

Accordingly, **Table 9** presents findings from an analysis of changes in non-emergent ED visits associated with the programs. In Rounds 1 and 2, the mean number of non-emergent ED visits in the ICCP group changed from 0.36 per month before the program to 0.25 per month after the program, a decline of 0.11 visits per month. Over the same period, however, the comparison group experienced a similar decline in visits (0.12 visit per month). Accordingly, the adjusted DiD estimate was not statistically significant. Similarly, the ICCP program was not associated with changes in the number of non-emergent ED visits during Rounds 3 and 4. During Rounds 1 and 2, there was a decrease in emergent ED visits for the ICCP group of 0.04 visits per month. During the same period, the comparison group had a decrease of 0.03 visits per month. Adjusted DiD estimates show a decrease in emergent ED visits for the ICCP group relative to the comparison group of 0.01 visits per month. However, this change was not significantly different from zero based on our definition of significance as $p<0.05$.

Findings were similar using alternate specifications. None of the individual health systems experienced significant changes in non-emergent ED visits. Similarly, when a 12-month treatment period was examined, no significant changes in non-emergent ED visits were found (**Appendix E**).

Table 9: Types of ED Visits in ICCP Group and Comparison Group, Before and After the Intervention

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	Before	After	Change	Before	After	Change	Estimate	95% CI	*P*-value
Rounds 1 and 2									
Non-Emergent ED visits	0.36	0.25	-0.11	0.35	0.23	-0.12	0.02	[-0.01,0.05]	0.28
Emergent ED visits	0.11	0.07	-0.04	0.11	0.08	-0.03	-0.01	[-0.03,0.00]	0.08
Rounds 3 and 4									
Non-Emergent ED visits	0.34	0.23	-0.11	0.32	0.23	-0.10	-0.01	[-0.03,0.01]	0.51
Emergent ED visits	0.11	0.08	-0.03	0.10	0.08	-0.02	0.00	[-0.01,0.01]	0.45

Hypothesis 2: Intensive care coordination will decrease ED care costs among Medicaid beneficiaries, particularly related to primary-care treatable and non-emergent conditions.

Q2-1: What are the characteristics of Medicaid beneficiaries who drive ED health care costs (top 10th, top 25th percentile)?

Turning to who is responsible for Medicaid payments for ED visits, we show the average ED costs and visits, as well as demographics for select groups in **Table 10**. The first column

summarizes anyone with an ED visit in 2023. The second shows individuals in the top 25th percentile, and the last the top 10th percentile. Wisconsin Medicaid paid $2,088 for ED visits for the average person with any ED visit. They had 2.4 visits on average. Individuals in the top 25th percentile were responsible for $7,496 and had 4.24 visits, while individuals in the top 10th percentile had $16,158 in costs for 5.1 visits. People with any ED visits were more likely to be female (60%), but this fraction was smaller in the top 10th percentile (54%). Individuals in the higher percentiles also tended to be older. Surprisingly, they were no more likely to be disabled.

Table 10: Characteristics of Medicaid Beneficiaries with High ED Costs in 2023

	All	Top 25th percentile	Top 10th percentile
ED costs	$2,088.45	$7,495.72	$16,157.72
ED visits	2.35	4.24	5.14
Female	60%	61%	54%
Age	36.97	38.79	41.89
Non-Hispanic	89%	91%	92%
White	56%	59%	56%
Black	24%	20%	20%
Disability	42%	41%	40%
Number of Months Covered in 2023	11.11	11.17	10.99
N	***331,219***	***82,805***	***33,122***

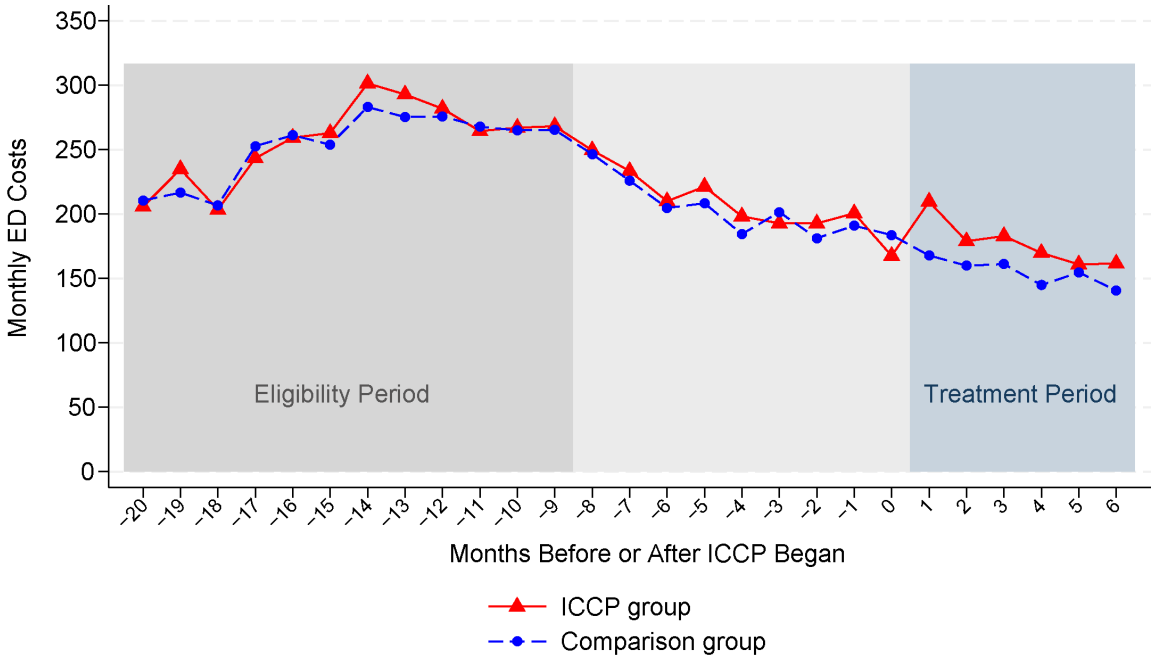
Note: This table includes all Medicaid beneficiaries enrolled in 2023.

Q2-2: Does intensive care coordination reduce costs of ED among Medicaid beneficiaries? Does the effect vary for people with special health care needs or for people with disabilities?

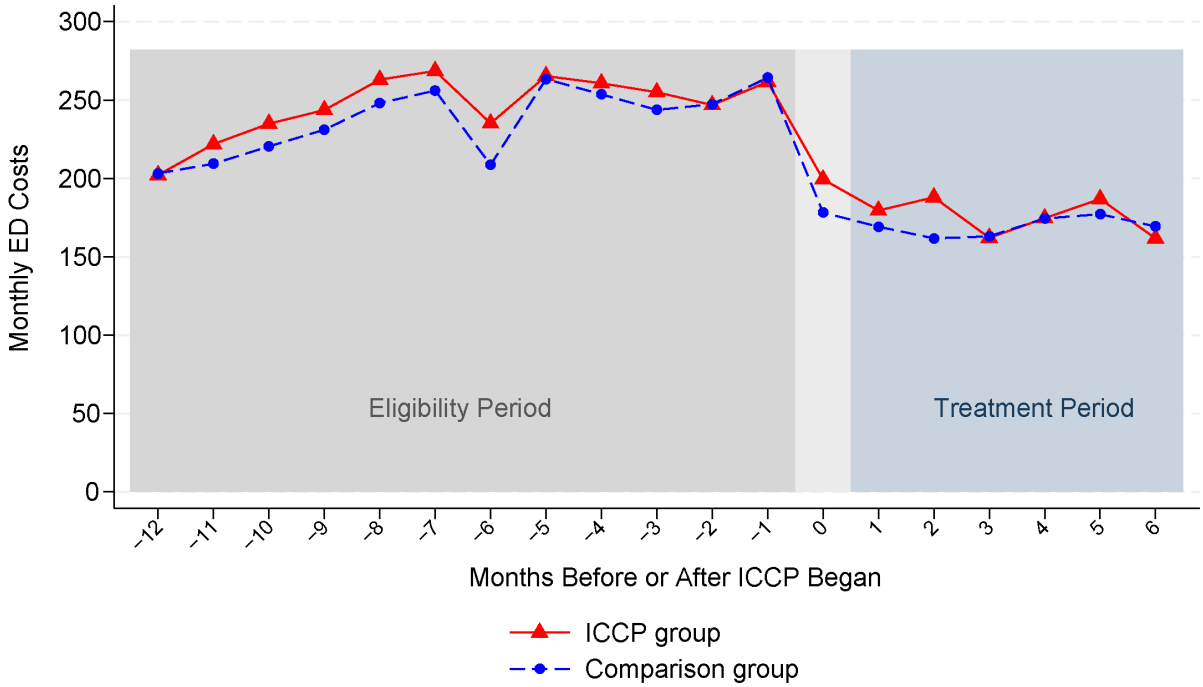
Figure 5 shows the trend in the costs of ED care before and after the start of the treatment period in the ICCP group and the comparison group. These data show declines in ED costs before versus after the onset of the ICCP program, with similar declines shown for the ICCP group and comparison group. These patterns hold both before the change in the eligibility criteria for the program (Rounds 1 and 2) and after the change in the eligibility criteria for the program (Rounds 3 and 4; see **Panels A and B** respectively).

Figure 5: ED Costs in the ICCP Group and Comparison Group, Before and After the Intervention

(a) Rounds 1 and 2



(b) Rounds 3 and 4



Accordingly, the DiD regression analysis did not detect any additional change in ED visit costs associated with the ICCP program. During Rounds 1 and 2, average monthly ED costs changed from $236 to $177 in the ICCP group, a $59 decline, compared with a $76 decline in the comparison group (from $232 to $155); after regression adjustment, there was no significant link between the ICCP and ED visit costs (estimate: $7, 95% CI -$15 to $28, *p*=0.54). Similarly, during Rounds 3 and 4, average monthly ED costs changed from $243 to $176 in the ICCP group, a $67 decline, compared with a $64 decline in the comparison group (from $233 to $169); after regression adjustment, there was no significant link between the ICCP and ED visit costs (estimate: -$5, 95% CI -$19 to $10, *p*=0.54).

When we stratified the data by health system or when we examined the data for people who received the program for 12 months rather than 6 months, we also found no evidence that the ICCP program was associated with declines in ED costs. Similar to the six-month results, findings for the 12-month results were not significantly different from zero.

While we originally intended to explore changes in ED costs for people with special clinical needs (e.g., people with a history of asthma or diabetes complications or people enrolled in Medicaid due to a disability), sample sizes were too small to obtain valid estimates. Each analysis would have included fewer than 75 people. Thus, these analyses were excluded from the report.

Q2-3: Does the impact of intensive care coordination on ED costs differ for non-emergent ED visits relative to other types of ED visits?

The association between the ICCP program and costs for non-emergent ED visits was analyzed, but did not detect any additional change in costs for non-emergent ED visits associated with the ICCP program. During Rounds 1 and 2, average monthly costs for non-emergent ED visits changed from $17.30 to $10.68 in the ICCP group, a $6.62 decline, compared with a $5.40 decline in the comparison group (from $16.95 to $11.55); after regression adjustment, there was no significant link between the ICCP and costs for non-emergent ED visits (estimate: $0.01, 95% CI -$0.02 to $0.04, *p*=0.53). Similarly, during Rounds 3 and 4, average monthly costs for non-emergent ED visits changed from $16.32 to $12.63 in the ICCP group, a $3.69 decline, compared with a $3.40 decline in the comparison group (from $15.43 to $12.04); after regression adjustment, there was no significant link between the ICCP and costs for non-emergent ED visits (estimate: $0.04, 95% CI -$1.39 to $1.48, *p*=0.95).

Hypothesis 3: Intensive care coordination will increase use of primary care and specialty care visits and increase enrollment in other relevant social services. Total costs to Medicaid will decrease.

Q3-1: Will intensive care coordination increase the use of relevant services (primary care visits, specialty care visits, and alcohol and other drug abuse resources as applicable)?

The ICCP programs developed by the health systems were designed to connect patients with appropriate non-ED health care providers as appropriate to address their health needs. As such, we tested whether the ICCP program was associated with increases in the use of primary care, specialty care, and AODA treatment visits for the population enrolled in the program. Our data, shown in **Table 11**, do not show the ICCP program to be linked with increased use of these non-ED health services. Use of these services had no significant association with the ICCP program except in Rounds 3 and 4, when the ICCP group was associated with a decline in use of primary care and specialty care, contrary to the hypothesized direction.

Table 11: Use of Specific Health Care Services in ICCP Group and Comparison Group, Before and After ICCP Program Implementation

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	Before	After	Change	Before	After	Change	Estimate	95% CI	*P*-value
Rounds 1 and 2									
Primary Care Visits	0.48	0.41	-0.07	0.49	0.40	-0.09	0.01	[-0.02,0.05]	0.49
Specialty Care Visits	2.49	2.08	-0.41	2.45	1.95	-0.50	0.09	[-0.05,0.22]	0.20
AODA visits	0.29	0.27	-0.02	0.34	0.29	-0.04	0.02	[-0.08,0.13]	0.69
Rounds 3 and 4									
Primary Care Visits	0.47	0.39	-0.08	0.48	0.43	-0.05	-0.04	[-0.06,-0.01]	0.01**
Specialty Care Visits	2.31	1.95	-0.36	2.29	2.03	-0.25	-0.11	[-0.19,-0.02]	0.01**
AODA visits	0.21	0.16	-0.05	0.21	0.21	0	-0.05	[-0.10,0.00]	0.07

* - p value < .05, ** - p-value < .01

Q3-2: Do various characteristics of the referral providers influence the use of care after a referral (e.g., shorter distance to public transportation, have after-hours care)?

Referral data was unavailable to analyze this question. We had planned on doing extensive surveying of health systems participating in the program. However, COVID-19 presented dramatic challenges, especially in emergency departments and staff availability to complete these surveys became a concern. We did survey systems about the types of services included in the program. When doing so, the surveys were designed to minimize burden for the health systems. We shortened the survey and pre-populated it with answers from their applications and previous surveys. In the effort to manage survey burden, referral survey questions were excluded.

Q3-3: Will intensive care coordination increase enrollment in social services, such as FoodShare, or increase formal sector earnings?

The ICCP programs developed by the health systems were designed to connect patients with appropriate non-medical support services, including safety net programs like FoodShare if appropriate. For example, Froedtert reported that social workers provided assistance for housing, finances, food, and transportation. Both Ascension and Aurora reported screening for social determinants of health (SDOH) and utilizing HPs to address any concerns. Details of each health system's care coordination program is described in **Appendix A**. Improved access to these supports could also impact patients' ability to find and maintain employment. Accordingly, we assessed whether the program was associated with changes in FoodShare enrollment, formal employment and wages. As shown in **Table 12**, the ICCP program was not associated with changes in FoodShare enrollment, employment or the wages of those who were employed in Rounds 1 and 2. In Rounds 3 and 4, the ICCP program was associated with a significant increase in the proportion of people who were employed, and the proportion of people who were enrolled in FoodShare. Specifically, the program was associated with a 6 percentage-point increase in FoodShare enrollment, and a 2 percentage-point increase in formal sector employment.

Table 12: FoodShare Enrollment and Formal Sector Wages in ICCP Group and Comparison Group, Before and After ICCP Program Implementation

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	Before	After	Change	Before	After	Change	Estimate	95% CI	*P*-value
Rounds 1 and 2									
Enrolled in FoodShare	0.78	0.72	-0.06	0.79	0.71	-0.08	0.02	[-0.01,0.04]	0.25
Employed	0.46	0.44	-0.02	0.47	0.47	-0.01	-0.02	[-0.04,0.01]	0.24
Wages, if Employed	1021.44	1155.01	133.57	1052.67	1178.67	126	3.63	[-75.91,83.16]	0.93
Rounds 3 and 4									
Enrolled in FoodShare	0.71	0.68	-0.03	0.71	0.65	-0.06	0.06	[0.04,0.08]	0.00**
Employed	0.49	0.46	-0.03	0.49	0.44	-0.05	0.02	[0.01,0.04]	0.01**
Wages, if Employed	1053.28	1143.14	89.85	1065.28	1114.61	49.33	26.1	[-20.61,72.82]	0.27

* - p value < .05, ** - p-value < .01

Q3-4: Will intensive care coordination decrease total health care costs for Medicaid members?

A program designed to reduce avoidable ED use might plausibly increase or decrease total health care costs. On the one hand, frequent ED users might be suffering from conditions that could be more appropriately handled in primary or specialty care; in such a case, appropriate care for these Medicaid recipients could involve an increase in total health care visits and costs. On the other hand, connecting frequent ED users with supports such as FoodShare could keep patients healthy and prevent new health care needs from arising, reducing health care visits and costs.

Accordingly, **Table 13** shows changes in total health care visits and costs associated with the ICCP program. As expected, the findings were mixed. In Rounds 1 and 2 of the program, the ICCP group experienced an additional increase in health care costs by $93.50 and no significant additional change in overall visits. In Rounds 3 and 4 of the program, the ICCP group experienced an additional decrease in health care visits of 0.16 visits per month relative to the comparison group, but no additional decline in total costs.

When we examined the data for people who received the program for 12 months, we also found no consistent evidence that the ICCP program was associated with declines in total health care costs. Small sample sizes also indicate results should be interpreted with caution.

Table 13: Total Health Care Costs in ICCP Group and Comparison Group, Before and After ICCP Program Implementation

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	Before	After	Change	Before	After	Change	Estimate	95% CI	*P*-value
Rounds 1 and 2									
All Visits	2.87	2.41	-0.46	2.84	2.26	-0.58	0.16	[-0.01,0.33]	0.07
All Costs	948.09	851.15	-96.94	939.88	749.86	-190.02	93.50	[14.55,172.45]	0.02*
Rounds 3 and 4									
All Visits	2.59	2.20	-0.39	2.56	2.33	-0.23	-0.16	[-0.26,-0.05]	0.00**
All Costs	966.91	836.38	-130.52	936.36	821.15	-115.21	-3.57	[-59.34,52.20]	0.90

* - p value < .05, ** - p-value < .01

CONCLUSIONS

Overall, the evaluation found no evidence that the Intensive Care Coordination Program (ICCP) was associated with a decline in visits to the emergency department for Medicaid beneficiaries that were enrolled in the program as high ED utilizers. Nor was there a decline in associated costs to the Medicaid program. There were no calculated cost savings due to the program.

Initial descriptive trend analyses without a comparison group did reveal that ED visit rates and associated Medicaid costs were lower after intensive coordinated care was provided than in the earlier eligibility period for ICCP. However, despite the decline in ED visits, the evaluation cannot conclude that the ICCP intervention had a causal impact on the decline. When comparing data from the ICCP group and a similar comparison group of high ED utilizers in the Medicaid population, both groups showed similar declines in ED visits and costs over time. As such, the evaluation did not measure any additional impact of the ICCP on ED use beyond other factors that affected other individuals identified as high ED utilizers.

Health service interventions sometimes are discovered to have a greater impact on a smaller subpopulation whose needs and characteristics best match the intervention. The evaluation analyzed the impact of the ICCP on subgroups of enrollees for this possibility, but similarly did not detect any significant declines in ED visits or costs in the ICCP group relative to the comparison group. The ICCP was also not associated with changes in ED use for non-emergent purposes or the costs associated with these visits. Similarly, no evidence was found that participating in ICCP for 12 months rather than 6 months would have an additional impact on reducing ED use or costs. However, the group of 12-month participants was small which limited the generalizability of the results.

Beyond ED visits, the program did have a significant impact on other outcomes in Rounds 3-4, when the gap in time between the eligibility and intervention periods was minimized. The evaluation found an increase in FoodShare enrollment and employment rates for the ICCP group beyond what the comparison group experienced. The ICCP's assessment of other health and social needs and referral to services appear to may have had a measurable an impact on these outcomes.

However, during the same period, the ICCP was associated with reductions in primary and specialty health care visits after the ICCP intervention. Intensive care coordination was hypothesized to increase the use of such services. One possibility could be that the identification of health needs and referral to primary and specialty care services was ineffective or barriers to accessing the services existed. Another possibility could be that the effectiveness of the ED services and the intensive care coordination improved the individual's health symptoms and reduced the need for subsequent health care.

DISCUSSION AND POLICY IMPLICATIONS

Two evaluation results are worth summarizing again. The ICCP group's decline in ED visits was not significantly different than the comparison group's decline in ED visits. Secondly, the declining trend in ED visits curiously began before intensive care coordination services were provided. The timing of the declining trend in ED visits for the comparison group was similar. The dual declining trends in ED visits highlighted by the comparison group raises a possible explanation – individuals with exceptionally high ED utilization may experience some level of decline in ED visits over time even without intensive care coordination. When individuals are identified as high ED utilizers during the ICCP eligibility period, it does not imply that ED usage will remain similarly high for everyone without intervention. Some individuals may be experiencing a short period of recurring crisis which is likely to end or be moderated regardless of any intervention. The comparison group's similar decline in ED visits helped highlight this "regression to the mean" effect which has been found in other research on high health care utilizers (Finkelstein et al., 2020).

Additionally, other factors that were unable to be measured by the evaluation are also important to consider as possible influences on the results. Most notably, Rounds 1 and 2 of program enrollment occurred in 2020-2021 during the most intense period of the COVID-19 pandemic. The health care workforce and service provision were impacted during the pandemic. However, if those special circumstances equally affected the ICCP and comparison group, they would not bias the results.

There may also be benefits to the program that are not captured in the current measures that could be considered in future evaluations. For example, each health system attempted to identify and address participants' social determinants of health through referral to follow-up services. While the evaluation found increases in employment and the use of FoodShare, additional outcomes may have been realized that were unmeasured such as more stable housing or enrollment in other income assistance programs. In addition, while the research procedure ensured the treatment and comparison groups were matched well on clinical and demographic characteristics, this evaluation did not assess whether ICCP has differing effects across clinical or demographic subgroups. Sample sizes of these groups were too small to have power to detect changes in this implementation of ICCP, but a larger program with more health systems and more participants may be able to analyze any differences for these subgroups. Finally, while changes in ED visits were not found, the ICCP could have also impacted other acute health services. Hospital inpatient admissions, for example, could be examined in the future to determine if the ICCP had a broader impact on other acute services.

The evaluation was designed as an outcomes evaluation, but other types of evaluation may benefit ICCP in the future. The research questions examined the impact of ICCP on the primary outcomes defined as ED visits, ED visit costs, and use of other health and social services. The evaluation was not designed to assess the implementation of the program, but implementation issues can have important impacts on a program's ability to reach its goals. An outcomes evaluation assesses the effectiveness of a program reaching its outcome goals. An implementation evaluation assesses whether the program implementation had fidelity to its model, was standardized appropriately, and had a target population that best matched the intervention. Such issues can yield information directly helpful in adapting program policy if needed.

Several implementation issues were observed, but not measured for their impact on the program's effectiveness. The eligibility criteria were different across participating hospital

systems initially and were adapted by hospitals during the program pilot period in a few cases. A time lapse between the eligibility period and the intensive care coordination service period was 9 months in Rounds 1-2 of enrollment to accommodate eligibility data verification before it was shortened in Rounds 3-4. The flexibility for hospital systems to adapt during an implementation period can be important to refine the intervention to be most effective, but the intervention's effectiveness becomes more difficult to evaluate over periods of such change.

Future research and program development should focus on enhancing the effectiveness of such interventions to achieve ED visit reductions and cost savings. To answer the outstanding question about the effects of the implementation process on the ICCP outcomes, a next step could be to evaluate the process obtaining more input from participating hospitals and enrollees. Their input could inform questions such as whether intensive care coordination services were timely enough relative to an ED visit and whether the target population could be refined to focus on a subpopulation. Input from hospitals may identify strengths and weaknesses that could inform searches for additional intervention models to complement and/or enhance the current ICCP intervention model. For example, is an initiative to enhance accessibility of 24-hour care in such areas necessary for the ICCP to maximize its effectiveness?

A challenge to future policy implementation may be to find the correct balance between implementing a standardized intervention and providing hospital systems the flexibility they may need to refine the intervention to be most effective for their system. As described earlier in the report, the 7% of individuals with six or more ED visits in 2023 incurred approximately 29% of the Medicaid ED costs. The potential for future Medicaid and hospital cost savings may exist for program and policy interventions to address high ED utilization.

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Intensive Care Coordination Program
(2017 Wisconsin Act 279)

Final Evaluation Report

APPENDICES A-E

APPENDIX A: INTENSIVE CARE COORDINATION INTERVENTION, BY HEALTH SYSTEM

Table A1: Details of Intensive Care Coordination Program in Each Health System

Health System	How are Health Care Visits Facilitated?	How are Participants Engaged?	How are Social Determinants of Health Assessed?
Ascension	• Health Promoter (HP) refers participants to RN for chronic disease management recommendations. HP completes the ongoing behavior management and reinforces education for disease management. HP refers to Social Worker for behavioral health needs. HP does participant check-ins and PCP connection and follow-up. • If a participant doesn't have a PCP, the participant is connected with a PCP within Ascension or at a FQHC. • Care plan goal for PCP engagement and evaluate goal of 3 successful appointments. • Outreach to participants every 2 weeks and work on care plan goals.	• Flagging all pilot participants in their care management platform so that they are able to engage them onsite. • Proactive outreach to participants to get them enrolled in the program. Three outreach attempts by phone. • If a participant refuses, and they come to the ED, try to engage them in person to offer the program again.	• Health Promoter (HP) is the associate who engages the participant frequently and addresses SDOH issues. • Intake assessment: Questions include SDOH questions and triggers to address issues that participants are dealing with. • Education on right care, right place and given flyer on ED, Urgent Care and Primary Care visits and how and when to use. • Care plan development based on chronic disease management or/and SDOH care plan if participants agree to participate in the program.
Aurora	• Individualized care coordination and planning. • Forensic chart review of participant's electronic medical record. • Appointment scheduling and transportation support. Appointment reminder calls. Care planning with participants' insurance provider/case management. • Care planning with internal care teams to better direct care when participant presents to emergency department. (medical doctor, social worker, and public safety official)	• Face-to-face meeting with participants while in emergency department. • Clear discharge/follow-up instructions and support.	• Social Determinants of Health screening. • Participants provided with resources specific to social determinant of health or medical needs. • Health Promoter (HP) addresses SDOH issues.

Health System	How are Health Care Visits Facilitated?	How are Participants Engaged?	How are Social Determinants of Health Assessed?
Froedtert	• Provide access to additional assistance on establishing with a PCP or setting up follow up PCP appointments after an ED visit. • Social worker is able to provide available PCP options within Froedtert and also connect participants to My Health Direct to schedule with Federally Qualified Health Centers. • Social worker is able to refer participants to Medicaid staff for further assistance in scheduling follow up PCP appointments. • The Medicaid staff can assist in finding an earlier appointment with another provider if the participant needs to be evaluated sooner. • If needed, social worker is able to assist in communicating with participant's PCP regarding participant concerns/questions or if orders are needed for equipment, home care, behavioral health, dietician etc. • Created a free virtual visit code for these specific participants, so out of pocket cost does not deter these participants from using the virtual visit option. • Coordinate with the in-person ED social workers to collaborate on next steps for our participants. • When enrolled in the program, social work can provide care coordination to these participants as often as needed. • Established communication with case management teams though partner agencies.	• Have three social workers that provide care coordination to these specific participants. The participants enrolled in this program receive additional education on how to use their health resources appropriately. This is done by providing participants with Urgent Care/Fast Care and virtual visit options when symptoms are non-emergent. • Contact participants via phone or MyChart to provide support, education and resources. • Help ranges from weekly calls to contacting a participant only after ED visits. • The resources are provided via phone, email, mail, or MyChart.	• Social worker provides participants with assistance for housing, finances, food, transportation, and behavioral health. • Refer participants back to their insurance companies to provide additional support with their medical needs and community resource needs if needed. Many of these programs can assist participants with member advocacy, housing, transportation, behavioral health, dentistry etc.

APPENDIX B: MEASURE DEFINITIONS

Definitions of Key Variables Used

The list of variables, or measures, in the table below were described in the Methodology section of the report. Some variables were used as outcome measures such as ED visits and ED visit costs. Other variables were used to match the ICCP and comparison groups as closely as possible for the analyses.

Additional variables in the table below were planned to be used to stratify the data to assess whether the ICCP was associated with positive outcomes for people with specific health care conditions. The groups selected for this analysis included people who had any visits related to complications of diabetes, asthma, or for care related to alcohol or drug abuse during the eligibility period, and people who qualified for Medicaid because they had a disability. However, because fewer than 75 people existed in any of the health condition stratified groups, the results were deemed too unreliable to be included in this report.

Table B1: Construction of Key Variables

Variable	Definition
Outcome Variables	
Emergency department visit	ED visit identification based on HEDIS MY 2024 Emergency Department Utilization – Uncertified, Adjusted, Unaudited HEDIS Rate.
3-day return visits	Defined on the ED visit level. Variable days the value 1 if the same person returned to the ED again within 3 days and 0 otherwise.
9-day return visits	Defined on the ED visit-level. Variable days the value 1 if the same person returned to the ED again within 9 days and 0 otherwise.
Non-emergent ED visits Emergent ED visits	Billings algorithm, as implemented in (Ballard, et al., 2010). See further explanation below in this appendix.
Emergency department visit cost Total cost Costs associated with non-emergent ED visit Costs associated with emergent ED visit	Allowed amount from the expenditure data (e.g., the maximum payer liability for a given service) for the selected visit; or in the case of total costs, for all health care visits during the period of interest.
Total number of health care visit	On a given day, we consider there to have been a health care visit if there is a medical claim (ICN) on that day. If there are multiple ICNs on the same day for the same person, it is counted as one visit. If the same ICN extends over two days for the same person (for example, a late-night ED visit that spans a midnight), the visit is attributed to the first day.
Primary care visit	Used rendering provider specialty information, or if missing, billing provider specialty. If the code is "125", "316", "318", "322", "345", or "328", then the associated visit is a primary care visit. If the code is "900", "080", "010" or missing, we mark it as uncertain whether it is a primary care visit (missing on this variable). All other visits are marked as not a primary care visit.
Specialty care visit	Procedure codes that are not associated with preventive medicine, not prenatal procedures, not counseling or services related to alcohol and drug use, not counseling or services related to mental health, not health education (e.g., counseling for diabetes, weight loss), not physical or occupational therapy, not smoking cessation counseling, not end-stage renal disease care, and not prenatal care coordination.

Variable	Definition
Alcohol or drug abuse related visits	Indicator variable taking the value 1 if the individual had any visits during the eligibility window with a claim with a primary diagnosis code related to alcohol or drug abuse diagnosis.
FoodShare enrollment	A variable taking the value 1 if the person was enrolled in the FoodShare program according to administrative data and 0 otherwise. We calculated this using the FoodShare recipients file, which contains monthly FoodShare eligibility and benefits data for individuals in the ICCP sample. When analyzing this outcome, we excluded individuals who has participation code "XA" or "XC" (not eligible individuals), and dropped those who have non-positive monthly benefits
Any formal sector employment for wages Formal Wage	We used the quarterly UI wage data for individuals in the ICCP sample to calculate average monthly wages and whether there were any formal wages in each period.
Matching Variables	
People with a disability	Defined based on Medicaid "medstat" codes.
Past care related to injury	Indicator variable taking the value 1 if the individual had any visits during the eligibility period related to Injury (ICD codes starting with "S" or "T").
Past care related to asthma	A variable taking the value 1 if the person had visits related to asthma during the eligibility period and 0 otherwise. For people aged 18-39, we used AHRQ's PQI 15 (Asthma in Younger Adults Admission Rate). For people aged 40+, we used code from AHRQ's PQI 5 (Chronic Obstructive Pulmonary Disease (COPD) or Asthma in Older Adults Admission Rate).
Charlson Comorbidity Index	Charlson Comorbidity Index (CCI) calculated using data from the eligibility window. We construct a variable that takes the value 1 if there are any comorbidities and 0 otherwise.
Past care related to back pain	Indicator variable taking the value 1 if the individual had any visits during the eligibility period associated with AHRQ's Clinical Classifications Software Refined (CCSR) list for Spondylopathy, Low backpain, Spinal cord injury.
Past care related to *acute* ambulatory care sensitive conditions	Indicator variable taking the value 1 if the individual had any visits during the eligibility period related to an acute ambulatory care sensitive condition [AHRQ PQIs 11 and 12].
Past care related to *chronic* ambulatory care sensitive conditions	Indicator variable taking the value 1 if the individual had any visits during the eligibility period related to a chronic ambulatory care sensitive condition [AHRQ PQIs 1,3,5,7,8,14,15,16].
Past care related to complications of diabetes	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to complications of diabetes. These are calculated using the AHRQ PQIs 1, 3, 14, and 16, i.e., the Diabetes Short-Term Complications Admission Rate, the Diabetes Long-Term Complications Admission Rate, Uncontrolled Diabetes Admission Rate, and Lower-Extremity Amputation Among Patients with Diabetes Rate.
Past care related to dental care	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to dental conditions.
Past care related to mental health	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to CCSR categories related to mental/substance use disorders.
Past care related to alcohol or drug abuse (AODA)	Indicator variable taking the value 1 if the individual had any visits during the eligibility window with a claim with a primary diagnosis code related to alcohol or drug abuse diagnosis.
Past inpatient care	Indicator variable taking the value 1 if the individual had any visits during the eligibility window with the following procedure codes: 99217-99226, 99231-99236, 99251-99255, 99304-99310, 99318, 99324-99328, 99334-99337, 99339-99340, 99341-99345, 99347-99350.

Variable	Definition
Past care related to opioid related disorders	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to opioid related disorders diagnosis codes (definition: Opioid use disorders: ICD codes related to opioid use disorder as listed in https://www.icd10data.com/ICD10CM/Codes/F01-F99/F10-F19/F11-).
Past care related to alcohol related disorders	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to alcohol related disorders diagnosis codes (definition: ICD codes related to alcohol abuse disorders as listed in https://www.icd10data.com/ICD10CM/Codes/F01-F99/F10-F19/F10-).
Past care related to sickle cell disease	Indicator variable taking the value 1 if the individual had any visits during the eligibility window related to sickle cell disease and disorder (definition: ICD codes starting with D57).

Definition of Emergent or Non-Emergent ED Visits

We use the Billings algorithm as in https://wagner.nyu.edu/faculty/billings/nyued-background (Ballard et al., 2010). We first map the procedure codes into 4 categories according to the emergent level and whether the disease is primary care treatable or preventable. Procedure codes and ICD diagnosis codes are used to assign a probability percentage representing how likely the ED visit was for non-emergent purposes. Each single visit is assigned a probability for each of the following four categories:

- Non-emergent ED visit,
- EDPCT: Emergent and primary care treatable ED visit,
- EDPA: Emergent and ED care needed, but preventable/avoidable, and
- EDNPA: Emergent and ED care needed, but not preventable/avoidable.

Then we use the Ballard specification with 50% thresholds to assign the final determination of emergent vs. non-emergent to each ED visit:

- Non-emergent ED visits: If probabilities for non-emergent + EDPCT >50%
- Emergent ED visits: If probabilities for EDPA + EDNPA >50%.

APPENDIX C: PROPENSITY SCORE MATCHING METHODOLOGY

Statistical Analysis Technique

To discern the impact of the care coordination intervention on the outcomes of interest, we employ inverse propensity score weighting regression modeling (Austin et al., 2021). Specifically, we first calculate the propensity score ps_i for each individual i that represents the likelihood that someone with this person's observed characteristics would be in the treatment group. In mathematical terms, if D_i is a binary variable denoting the treatment status of individual i (which takes the value 1 if they were enrolled in ICCP and 0 otherwise), and X_i is the person's observed characteristics, then the propensity score is estimated as follows:

$$ps_i = \Pr(D_i = 1 | X_i). \quad (1)$$

To estimate the propensity scores, we use a logit model where the outcome variable is treatment group membership. The predictor variables X in this model are measured prior to the start of the intervention period and include measures of health care use and costs, special health care needs, and age.

We additionally included interactions and higher-order terms of these variables and the interactions between them as needed to achieve similar prior trends in ED visits across the two groups. Consistent with best practices for the propensity score analysis, our analysis focuses on the subset of the ICCP group who have similar counterparts in the comparison group—e.g., ICCP group members are only included if they have propensity scores within the range of scores found in the control group (Garrido et al., 2014, Crump et al., 2009).

We employed regression models chosen based on the functional form appropriate for the data. To model outcomes related to the number of visits (e.g., ED visits), we used negative binomial regression models. A negative binomial regression model is particularly well-suitable for over-dispersed count data—a statistical phenomenon observable in our dataset, characterized by the presence of individuals who frequent the ED at markedly high rates. To model costs, a two-part model is utilized to capture the distinct nature of the cost data. The cost distribution for health care services is characterized by a significant proportion of zero costs for individuals without visits, alongside a range of positive costs for those who use health care. The two-part model serves as a special mixture model, effectively allowing for the zeros and the non-zeros to be generated by different densities. Specifically, the first part of the two-part model assesses the probability that an individual had any costs, and the second part assesses what the expected costs would be.

If we denote y_{it} to be the outcome of interest (e.g., number of ED visits for individual per month *t*), each of these models uses the appropriate functional form to model the relationship between the outcome and key predictors as follows:

$$y_{it} \sim f\left(\mu D_i + \gamma Post_t + \beta Post_t D_i + \delta_{m(t)} + \delta_{y(t)} + \alpha_{h(i)} + \epsilon_{it}\right), \quad (2)$$

In the above equation, *m(t)* denotes the calendar month at time *t*, *y(t)* denotes calendar year at time *t*, and *h* denotes the health system to which *i* is assigned. D_i is an indicator variable that takes the value 1 if the individual was in the ICCP group, and $Post_t D_i$ takes the value 1 for

individuals in the ICCP group only in the time periods after they enrolled in the program. $\delta_{m(t)}$ and $\delta_{y(t)}$ are vectors of indicator variables for each calendar month and year, respectively; $\alpha_{h(i)}$ is a vector of indicator variables corresponding to each health system, and ϵ_{it} is the error term. We use heteroscedasticity robust standard errors which are clustered at the individual level, and propensity scores are incorporated using inverse propensity score weights. Since we are weighting individuals using the inverse propensity score when running this regression, we do not need to control for their individual-level characteristics.

β is the coefficient of interest in Equation (2) and would measure the change in the number of emergency department visits due to the program in a linear model. Consistent with prior research on health care utilization and costs, we use non-linear models as noted above and report average marginal effects, i.e., the average additional change in the outcome associated with the intervention (Strumpf et al., 2017). A p-value of .05 was pre-specified to indicate statistical significance. A significant and negative effect would suggest that the intervention was associated with a decline in ED visits or costs.

Model Construction and Matching Variables

To select a comparison group that is as similar as possible to the group receiving the ICCP program, we input data from four timeframes just prior to the initiation of the program into our matching algorithm. We do so to closely match the trends prior to the start of the program using all available data. We denote the following periods with different names:

- **Eligibility period**: This is the official period in which individuals must have the minimum number of visits to qualify for the care coordination program.

- **Review period**: (Please note that this period was relevant in the first two rounds, when there was a long lag between the eligibility period and the start of treatment, but not in the later two rounds.) This is the period after the eligibility window but before the initiation of treatment. We measured the average outcomes total over this time, and separately assessed the changes in outcome variables between the first and second 3 months of this period, and changes between then second and third 3 months of this period.

Step 1: We estimate the propensity score using the following set of variables (hereafter, the "**basic variables**"). These are always included in calculations of the propensity score.

- **Measures of health care use and other outcomes of interest** (ED costs, ED visits, 3-day and 9-day return ED visits, number of non-emergent and emergent ED visits, costs related to non-emergent ED visits; primary care visits, specialty care visits, total costs, and total visits; any formal wages and level of wages if any; FoodShare enrollment). For each, we take the averages during the eligibility window and review period. We also incorporate information on the exact number of ED visits monthly during eligibility period.
- **Measures of specific visits**: A series of indicator variables capturing whether there were any visits associated with each of the following health measures (any acute ambulatory care sensitive condition, any chronic ambulatory care sensitive condition, diabetes composite, injury, backpain, dental visit, asthma, inpatient, AODA, mental health, sickle cell, opioid use disorder, alcohol use disorder), during the eligibility period, and during the review period.
- **Age** at the start of the intervention period.

- **Treatment round** (time period)
- **Charlson Comorbidity Index**: A binary variable indicating an Index value greater than 0 during the eligibility window.
- **Disability**, measured as the individual qualifying for Medicaid because of a disability.

Variables with missing values were filled in with the mean value, to avoid dropping people due to missing values; however, we included an indicator variable in the matching process that denoted whether there were any missing values for a given person. Extreme values of the outcome variables (e.g., costs beyond the 95th percentile) were replaced with the value of the 95th percentile before starting the matching process.

Step 2: We used the propensity scores obtained from a model using the variables above to create a weighted sample and assessed the trends in ED visits prior to the ICCP intervention for the ICCP and comparison groups. This process with the variables used in the propensity scores adjusted until past trends in ED visits were similar across the ICCP and comparison groups. Upon the conclusion of this process, the total set of variables included in the propensity score models are as follows:

Rounds 1 and 2 propensity score matching variables

- Average monthly ED visits
- Average additional monthly ED visits for people with a disability
- Average additional monthly ED visits for people with a chronic condition, according to the CCI measure
- ED visits during eligibility window each month
- Basic variables during the eligibility window
- Basic variables during the review period
- Basic variables: Change between the first and second half of the eligibility window
- Basic variables**:** Change between the first and second 3-month periods of the review window, and change between the second and third 3-month periods of the review window
- Age at the start of the treatment

In addition, we exactly match the treatment and comparison groups on time (e.g., time period of Round 1 versus Round 2).

Rounds 3 and 4 propensity score matching variables

- Average monthly ED visits
- Average additional monthly ED visits for people with a disability

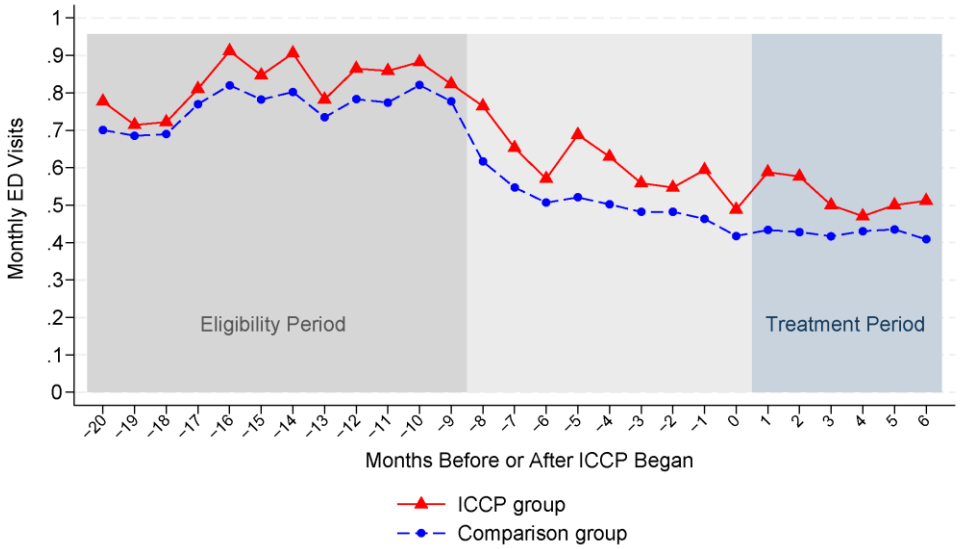
- Average additional monthly ED visits for people with a chronic condition, according to the CCI measure
- ED visits, ED visit costs, and AODA visits during eligibility window each month
- Basic variables during the eligibility window
- Basic variables: Change between the first and second half of the eligibility window
- Age at the start of the treatment

In addition, we exactly match the treatment and comparison groups on time (e.g., time period of Round 1 versus Round 2).

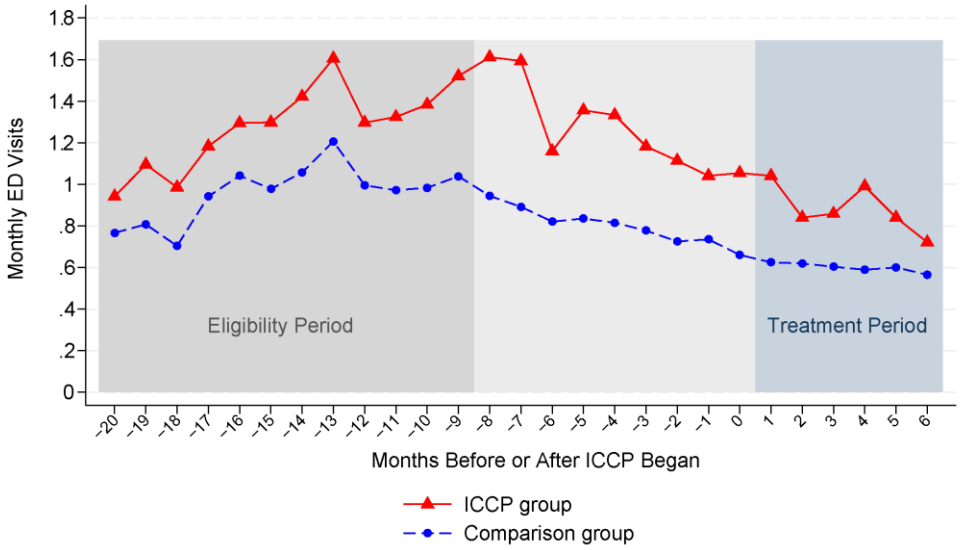
APPENDIX D: SUPPLEMENTAL RESULTS BY HEALTH SYSTEM

Figure D1: ED Visits in the ICCP and Comparison Group, Before and After the Intervention, by Health System Rounds 1 and 2

(a) Ascension



(b) Aurora



(c) Froedtert

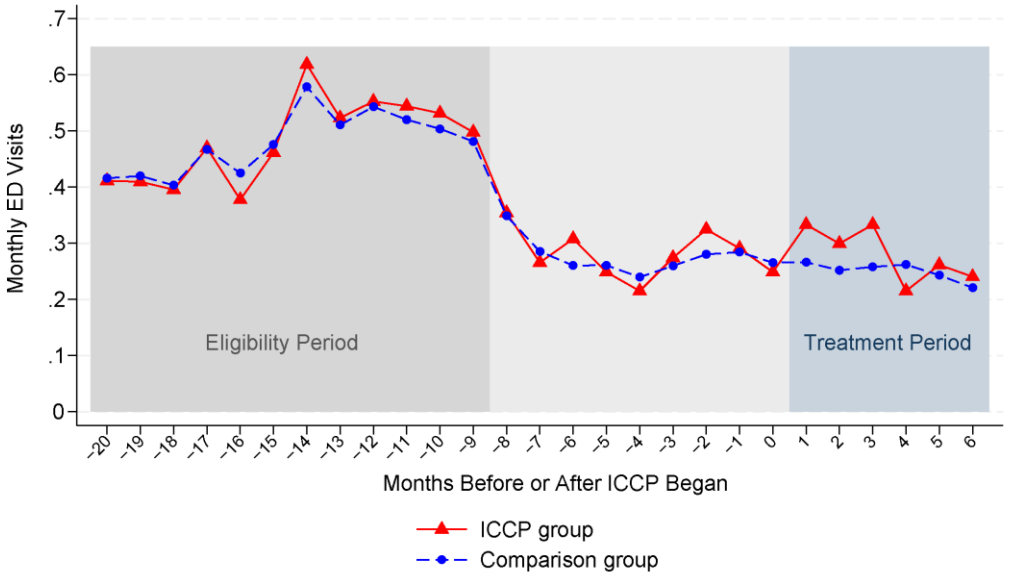
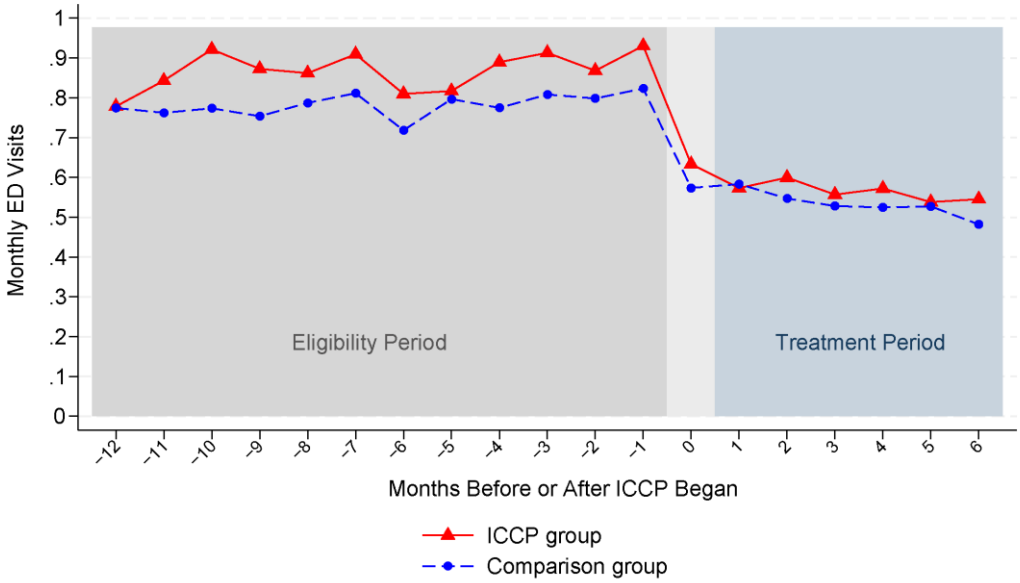
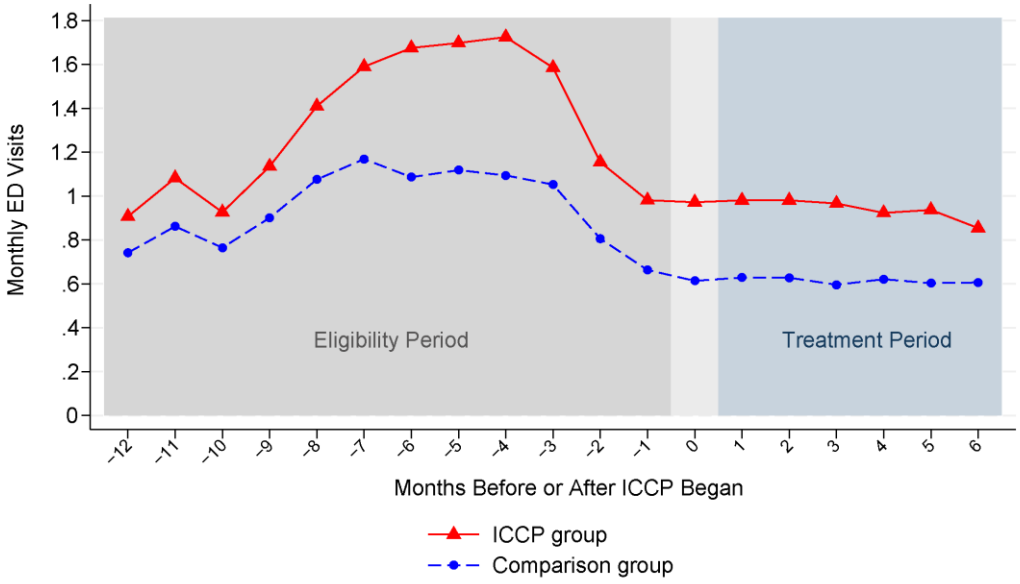

Monthly ED Visits
.7
.6
.5
.4
.3
.2
.1
0
Eligibility Period
Treatment Period
−20 −19 −18 −17 −16 −15 −14 −13 −12 −11 −10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6
Months Before or After ICCP Began
ICCP group
Comparison group

Figure D2: ED Visits in the ICCP and Comparison Group, Before and After the Intervention, by Health System Rounds 3 and 4

(a) Ascension



(b) Aurora



(c) Froedtert

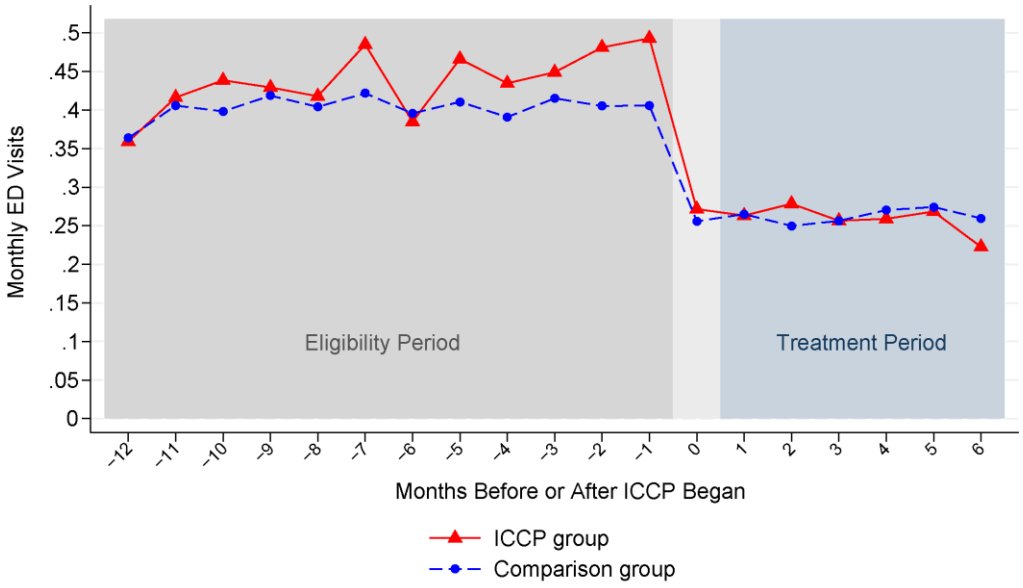

Monthly ED Visits
.5
.45
.4
.35
.3
.25
.2
.15
.1
.05
0
Eligibility Period
Treatment Period
-12
-11
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
Months Before or After ICCP Began
ICCP group
Comparison group

Table D1: ED Visits in ICCP Group and Comparison Group, Before and After ICCP Program Implementation, By Health System

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	**Before**	**After**	**Change**	**Before**	**After**	**Change**	**Estimate**	**95% CI**	***P*-value**
Ascension, Rounds 1 and 2 (N=170)									
ED Visits	0.73	0.52	-0.21	0.65	0.43	-0.23	0.05	[-0.02,0.13]	0.16
ED Costs	232.99	180.08	-52.91	202.9	138.65	-64.25	13.82	[-16.82,44.46]	0.38
Ascension, Rounds 3 and 4 (N=552)									
ED Visits	0.85	0.56	-0.29	0.77	0.53	-0.23	-0.02	[-0.08,0.04]	0.47
ED Costs	291.59	205.29	-86.30	271.51	187.96	-83.55	-2.21	[-30.56,26.14]	0.88
Aurora, Rounds 1 and 2 (N=219)									
ED Visits	1.28	0.88	-0.40	0.89	0.60	-0.29	0.01	[-0.10,0.13]	0.82
ED Costs	439.59	335.49	-104.10	339.77	237.27	-102.50	11.24	[-42.75,65.22]	0.68
Aurora, Rounds 3 and 4 (N=222)									
ED Visits	1.30	0.94	-0.36	0.92	0.61	-0.31	0.07	[-0.05,0.19]	0.24
ED Costs	516.57	371.12	-145.50	397.27	273.64	-123.6	-1.98	[-57.93,53.96]	0.94
Froedtert, Rounds 1 and 2 (N=237)									
ED Visits	0.40	0.28	-0.12	0.39	0.25	-0.14	0.04	[-0.01,0.08]	0.13
ED Costs	103.38	76.36	-27.02	103.45	67.43	-36.02	9.77	[-4.18,23.73]	0.17
Froedtert, Rounds 3 and 4 (N=639)									
ED Visits	0.43	0.26	-0.17	0.39	0.26	-0.13	-0.03	[-0.07,0.00]	0.06
ED Costs	130.70	87.22	-43.49	118.57	77.41	-41.16	1.32	[-9.92,12.56]	0.82

* - p value < .05, ** - p-value < .01

Note: In Rounds 3-4 for the Aurora health system, the ED visit rate trends before enrollment were unequal between the ICCP and comparison groups, so the change results must be interpreted with caution.

APPENDIX E: SUPPLEMENTAL RESULTS, 12-MONTH SAMPLE

Figure E1: ED Visits in the ICCP and Comparison Groups, Before and After the Intervention, for 12-Month Sample Rounds 1 and 2

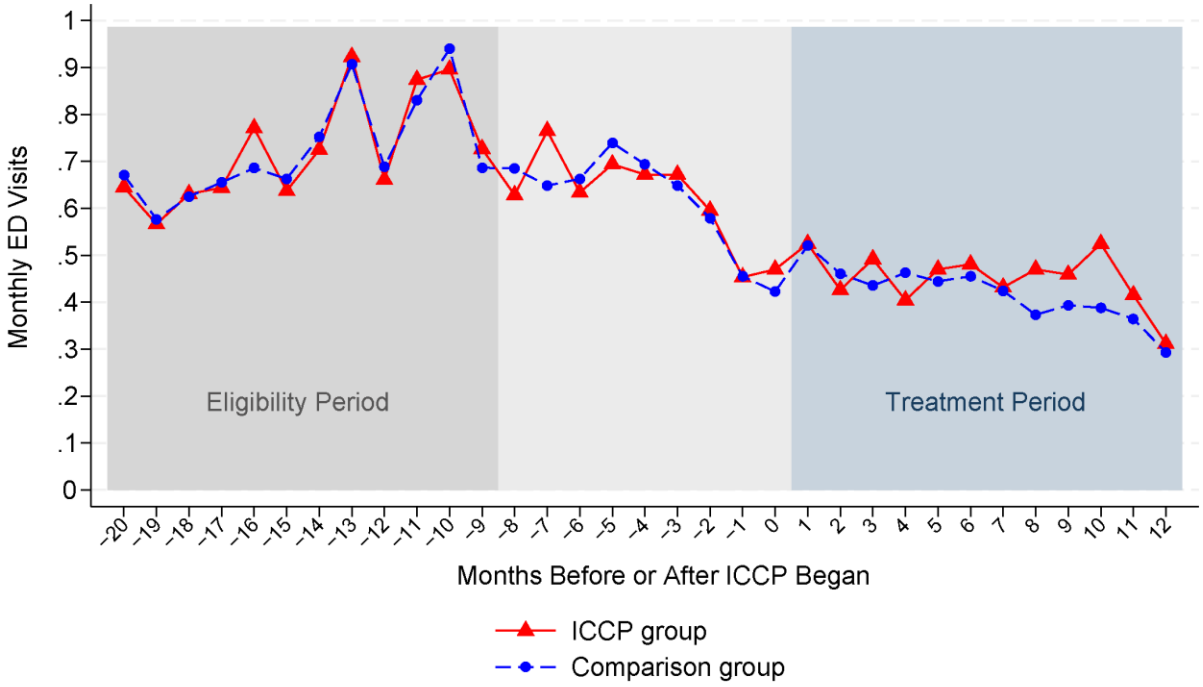


Figure E2: ED Visits in the ICCP and Comparison Groups, Before and After the Intervention, for 12-Month Sample Rounds 3 and 4

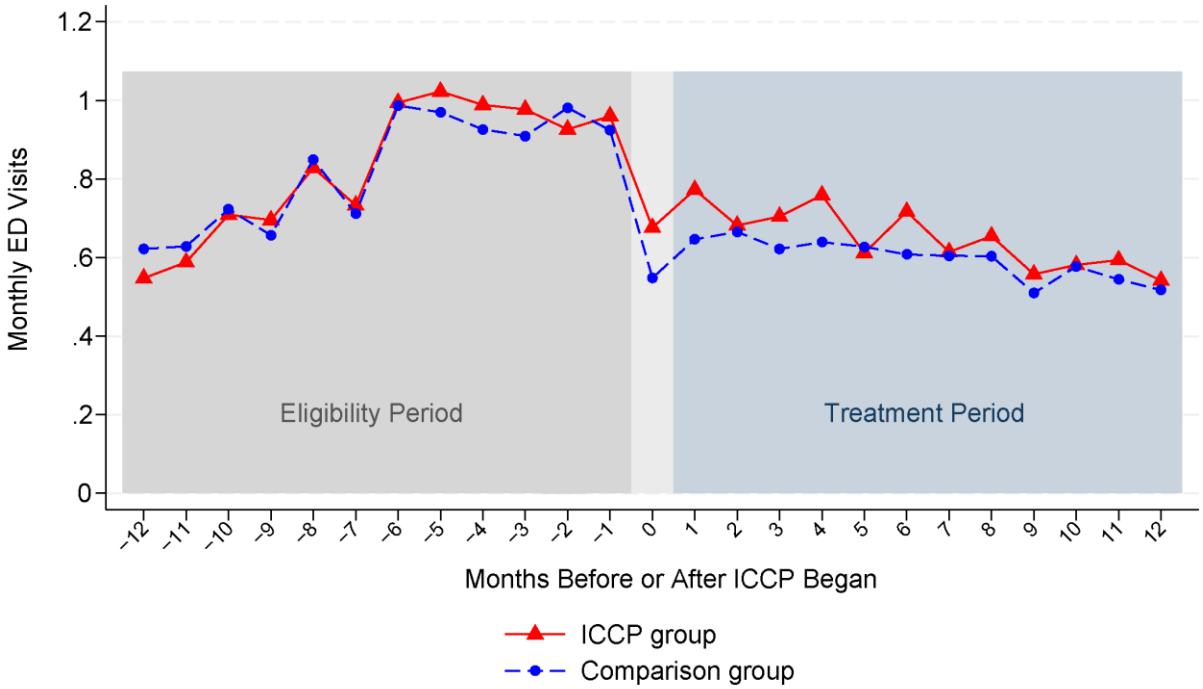


Table E1: ED Visits in ICCP Group and Comparison Group, Before and After ICCP Program Implementation: 12 Month Sample

	ICCP Group			Comparison Group			Additional Change in ICCP Group		
Outcome	**Before**	**After**	**Change**	**Before**	**After**	**Change**	**Estimate**	**95% CI**	***P*-value**
Rounds 1 and 2 (N=183)									
ED Visits	0.68	0.45	-0.23	0.68	0.42	-0.26	0.03	[-0.05,0.11]	0.44
ED Costs	211.78	147.79	-63.99	211.92	127.84	-84.08	15.69	[-11.63,43.01]	0.26
3-Day ED Return Visits	9%	7%	-3 ppt	9%	6%	-3 ppt	1 ppt	[-1, 2 ppt]	0.61
9-Day ED Return Visits	15%	9%	-6 ppt	15%	9%	-6 ppt	0 ppt	[-2, 2 ppt]	0.88
Non-Emergent ED visits	0.36	0.22	-0.14	0.36	0.2	-0.16	0.03	[-0.02,0.07]	0.29
Rounds 3 and 4 (N=175)									
ED Visits	0.82	0.65	-0.17	0.80	0.60	-0.20	0.02	[-0.08,0.12]	0.71
ED Costs	256.82	202.62	-54.20	249.82	190.72	-59.10	-0.58	[-35.60,34.44]	0.97
3-Day ED Return Visits	12%	9%	-3 ppt	12%	8%	-4 ppt	1 ppt	[-2, 3 ppt]	0.49
9-Day ED Return Visits	18%	14%	-5 ppt	18%	12%	-6 ppt	1 ppt	[-2, 4 ppt]	0.48
Non-Emergent ED visits	0.37	0.29	-0.08	0.37	0.27	-0.10	0.01	[-0.04,0.07]	0.63

Note: The return visit figures capture the % of initial visits that have a return visit within the specified number of days. The percentage point change from before to after the intervention is represented as “ppt”.