



State of Wisconsin  
Department of Health Services

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January 1, 2020

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Joint Committee on Finance  
Room 317 East  
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The Honorable Patrick Testin, Chair  
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The Honorable Rob Summerfield, Chair  
Assembly Committee on  
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Dear Senators and Representatives:

I appreciate the opportunity to provide the Legislature with an update on the Department's Dental Reimbursement Pilot Project, which operates within the State's Medicaid program.

2015 Wisconsin Act 55 authorized and funded the Dental Pilot Project, directing the Department to increase reimbursement rates for pediatric dental care services and adult emergency dental services provided in Brown, Marathon, Polk, and Racine counties. The Department implemented the rate increase for eligible services in those counties beginning October 1, 2016.

2017 Wisconsin Act 344, creating Wis. Stats. § 49.45(24k)(c), directs the Department to submit a report, by January 1, 2020 and biennially thereafter, about the Dental Pilot Project to the

Legislature's committees with jurisdiction over health or public benefits and to the Joint Committee on Finance.

Under the prior administration, the Department commissioned an assessment of the Dental Pilot Project to determine the effect of the increased dental reimbursement rates on a number of outcomes of interest, including the following:

- Dental service utilization, for both children and adults, in the first year of implementation, relative to utilization prior to implementation;
- For adults, non-traumatic use of emergency department services and follow-up dental visits, in the first year of implementation, relative to participation prior to implementation;
- The cost of dental services, for both children and adults, in the first year of implementation, relative to costs prior to implementation;
- Dental providers' participation as a Medicaid provider in the first year of implementation, relative to prior to implementation; and
- Dental providers' perceptions of the Medicaid program.

Ultimately, this assessment was unable to determine if the increased reimbursement rates had the desired effect of improving Medicaid members' access to dental services, reducing non-traumatic emergency department visits, or incenting dental providers to become Medicaid providers. The assessment could not attribute any of the observed changes in services to the pilot initiative.

Recognizing the limitations of this assessment, the Department has engaged with another evaluation group familiar with Medicaid claims data to further examine the effect of the reimbursement rate increase on access to dental care, dental service utilization, Medicaid costs, and dental provider participation in Medicaid. The second evaluation will benefit from an additional year of post-implementation dental claim data and will employ analytical methods appropriate for understanding the causal relationship, if any, between the reimbursement rate increase and members' access to and utilization of dental services. The Department anticipates this second evaluation will be published in the spring of 2020. We will submit the evaluation to the Legislature upon its completion.

The Department recognizes the difficulties members experience accessing dental services. We are interested in working with the Legislature to remedy these challenges and believe the forthcoming evaluation will be instructive in identifying opportunities to improve access to dental services.

Sincerely,



Andrea Palm  
Secretary-designee

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# Medicaid Dental Pilot Program Evaluation

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**Final Report**

**Submitted to the  
Wisconsin Department of Health Services**

**June 2020**



**Institute for  
Research on  
Poverty**  
UNIVERSITY OF WISCONSIN-MADISON



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## ABBREVIATIONS LIST

CI Confidence Interval

DiD Difference-in-Differences

DHS Wisconsin Department of Health Services

FQHC Federally Qualified Health Center

MSA Metropolitan Statistical Area

NPI National Provider Identifier

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## I. EXECUTIVE SUMMARY

Wisconsin's Medicaid dental reimbursement pilot program increases Medicaid payment rates for pediatric dental services and eight specific adult emergency dental services, operating as a pilot in Brown, Marathon, Polk, and Racine counties. The Wisconsin Department of Health Services (DHS) implemented the rate increase on October 1, 2016, and the program has been in effect since that date. Authorizing legislation specified that DHS measure and report on several outcomes from this pilot initiative. This evaluation addresses those questions, summarized as follows:

1. Who received services, and did the pilot program change access to services by Medicaid members?
2. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?
3. How much did the program cost, and did it result in any cost savings?

The evaluation includes all dental claims for the period October 2014 through September 2018, allowing observation for two years before the pilot was implemented and two years after the pilot was implemented. The evaluation measures the difference in outcomes before and after implementation in the pilot counties, compared to the differences in outcomes before and after that same time point in counties that did not participate (non-pilot counties). This allows estimates of causal effect attributed to the pilot program itself, accounting for other trends that could have caused any observed changes.

### ***#1. Who received services, and did the pilot program change access to services by Medicaid members?***

The pilot program appears to have expanded access to services for Medicaid members in one of the four pilot counties (Brown), by increasing the percentage of members receiving services, and the number of visits and services they receive. A separate factor, outside of the pilot program payment change (described within this report), augmented the success in that county.

Other counties show some change in visits and services, but no consistent pattern; where numbers of members receiving services increased (in Marathon County), number of visits and services decreased. Polk County shows some increase in participating providers, total visits, and visits per provider, but no increase in number of Medicaid members served – thereby concentrating more visits and services among the same number of members.

The relative success of only one pilot county may reflect other community factors that augmented the effect of the intervention, including the effects of Brown County's active oral health coalition. Such wide variation in results across the different pilot counties suggests that the pilot program intervention (the increase in payment rates for selected dental services) does not consistently or reliably expand access to services for Medicaid members.

***#2. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?***

Two of the pilot counties, Brown and Polk, showed increases in dental providers for Medicaid members, increases in the total visits they delivered, and increases in visits per provider. Only one pilot county showed increases in the number of services per visit.

The pilot program may have induced more dentists to participate in the Medicaid program, as observed in Brown and Polk Counties, but they do not reliably expand services to more Medicaid members. Significant shortages persist throughout in the capacity of the dental workforce to supply services to Wisconsin's Medicaid population. Brown County, it appears, maximized the response to the pilot program's payment increase through a substantial community organizing effort and a robust infusion of resources into the non-profit sector. But, overall, the pilot program payment itself did not reliably or consistently strengthen dental service provision and use by Medicaid members.

***#3: How much did the program cost, and did it result in any cost savings.***

During the two year period following implementation of the pilot program, the Wisconsin Medicaid program spent \$40.5 million for dental services in the four pilot counties, compared to an estimated \$18.3 million that would have been spent in the absence of the pilot program. The pilot program itself accounts for an increase expenditures of \$22.2 million. The mechanical increase in reimbursement rates accounts for most of the increase in outlays/program costs, apart from Brown County's substantial increase in services provided.

The evaluation finds no cost savings as a result of the pilot program. The pilot program, if it had expanded access to regular and preventive care, might have averted the need for emergency services. However, the pilot counties demonstrate no such reduction in the use of emergency services relative to their comparison counties, and experienced no relative reduction in emergency service costs.

Overall, the pilot program confirms findings in previous literature, that an increase in Medicaid payment appears necessary but certainly not sufficient to improve access to dental services. The results reported here suggest that the pilot program may induce more dentists to participate in the Medicaid program, as observed in Brown and Polk Counties, but the results are not consistent, and they do not reliably produce overall expansions in services to more Medicaid members. The pilot program did not reduce costs associated with the use of emergency dental services. And, overall, the level of dental service use by Medicaid members in the pilot counties remains well below that of patients with commercial insurance.

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## II. PROJECT BACKGROUND

### A. Project Overview: Four-County Medicaid Pilot Program

Wisconsin's 2015 Budget Act 55<sup>1</sup> created a pilot program that enhanced Medicaid dental services reimbursement, with the intent to increase the participation of dentists in the state Medicaid program.<sup>2</sup> The pilot program increases Medicaid payment rates for pediatric dental services and eight specific adult emergency dental services, operating as a pilot in Brown, Marathon, Polk, and Racine counties. The Wisconsin Department of Health Services (DHS) implemented the rate increase on October 1, 2016, and the program has been in effect since that date.

The four pilot program counties represent both rural and urban areas of Wisconsin. Table 1 displays how the counties compare to one another on a range of factors.

**Table 1. Selected Characteristics of Pilot Program Counties<sup>3</sup>**

	<b>Brown</b>	<b>Marathon</b>	<b>Polk</b>	<b>Racine</b>
Population	259,786	135,264	43,349	195,398
Percent of Population with incomes below the Federal Poverty Level	10.3%	9.4%	9.8%	12.1%
Percent Children (< age 18) in Poverty	14.0%	13.0%	13.5%	17.7%
Percent of Adults (ages 18-64) in Poverty	9.6%	8.5%	9.3%	11.0%
Medicaid dental payment model	Fee-for-Service	Fee-for-Service	Fee-for-Service	Managed Care
Percent of children enrolled in BadgerCare, October 2016, excluding income extensions.	30.4%	31.3%	37.2%	37.0%
Percent of adults ages 19-64 enrolled in BadgerCare, October 2016, excluding income extensions	5.6%	5.8%	6.8%	7.6%

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<sup>1</sup> 2015 Wisconsin Act 55. Page 325. Available at

<https://docs.legis.wisconsin.gov/2015/related/acts/55.pdf>

<sup>2</sup> Wisconsin Legislative Fiscal Bureau. Dental Access Initiatives. Paper #365. LFB 2019-21 Budget Summary: Page 173, #12. May 2019. Available at

[https://docs.legis.wisconsin.gov/misc/lfb/jfcmotions/2019/2019\\_06\\_04/002\\_health\\_services/008\\_paper\\_365\\_dental\\_access\\_incentives](https://docs.legis.wisconsin.gov/misc/lfb/jfcmotions/2019/2019_06_04/002_health_services/008_paper_365_dental_access_incentives)

<sup>3</sup> Population data from ACS Table DP05, ACS Demographic and Housing Estimates, 2018 5-Year Estimates; Poverty Data from ACS Table S1701; Poverty Status in the Past 12 Months, 5-year Estimates; Medicaid Enrollment Data from Wisconsin Medicaid - ForwardHealth Enrollment Data, October 2016. Available at

<https://www.forwardhealth.wi.gov/WIPortal/content/Member/caseloads/481-caseload.htm.spage>

Authorizing legislation in 2017 Wisconsin Act 344<sup>4</sup> specified that DHS measure and report on the following outcomes from this pilot initiative:

1. The number of Medical Assistance recipients who received services under the pilot program in total and specified by those who received pediatric care and who received adult emergency dental services.
2. An estimate of the potential reduction in health care costs and emergency department use by Medical Assistance recipients due to the pilot project.
3. An analysis of Medical Assistance recipient populations who received services under the pilot project and populations who may benefit from the pilot project.
4. The feasibility of continuing the pilot project and expanding the project in specific areas of the state or statewide.
5. The amount of moneys distributed under the pilot project and, if moneys allocated for the pilot project were not distributed, a summary on why the moneys were not distributed.

The increased payment rates for the pilot counties more than doubled the statewide Medicaid reimbursement rates. (See Attachment for the rate schedule for the pilot program targeted services.) The rate increase applies to services provided through both fee-for-service and managed care arrangements.

Payment increased for

- pediatric dental services, including all dental services provided to members 0- to 20-years old, and
- adult (age 21 and above) emergency services, including a subset of oral evaluations, X-rays, and extractions that are commonly provided as emergency dental care in a dental office.

The Wisconsin Dental Association worked with the Wisconsin DHS in selecting the list of covered adult emergency dental services. They intended that the pilot allow adult MA patients to obtain urgent dental care from dentists, “thereby lowering visits to emergency rooms and reducing the number of prescriptions needed for pain and infection which do not solve the underlying oral health issues.”<sup>5</sup> These service codes occur outside the hospital setting.

It is important to note that the payment increase does not apply to services billed through a federally qualified health center (FQHC), because these clinics already receive higher Medicaid payment under a cost-related prospective payment system. FQHCs operate and provide dental services in Brown, Marathon and Polk counties. While Racine County does not have an FQHC dental clinic, both Kenosha

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<sup>4</sup> 2017 Wisconsin Act 344. Available at <https://docs.legis.wisconsin.gov/2017/related/acts/344>

<sup>5</sup> Wisconsin Dental Association. Dental Medicaid. Available at <https://www.wda.org/bill-status/dental-medicaid>

and Milwaukee counties do have clinics that may serve Racine County residents. During the same time period of Medicaid pilot program implementation, FQHCs also received new federal and other funding to expand their dental services. Those changes in capacity, separate from the Wisconsin Medicaid dental pilot program, also had an influence on Medicaid dental service trends.<sup>6</sup>

DHS reports that the pilot counties varied in the level of organized effort focused on gaining dental provider participation. In particular, Brown County appears to have benefited from a well-organized community effort led by its local Oral Health Partnership (OHP).<sup>7</sup> DHS worked on the program planning and implementation of the dental pilot, with the participation of the Wisconsin Dental Association (WDA). The WDA promoted dentists' participation in the program,<sup>8</sup> rating the enhanced payment rates as "quite comparable" to dentists' contracted commercial insurance plan rates.<sup>9</sup>

## **B. Background and Literature**

The Medical Assistance program (Medicaid) and Wisconsin's BadgerCare program provide health care coverage to low-income children and adults, elderly, blind or disabled individuals who have limited financial resources, and other categorically eligible populations. Both the Medicaid and Wisconsin's BadgerCare programs cover parents and adult caregivers of children in families with household income below certain levels and also cover adults without dependent children ("childless adults") up to 100% of the federal poverty level. The Wisconsin Medicaid program serves approximately one in five Wisconsin residents.<sup>10</sup> The Department of Health Services (DHS) administers the program under a framework of state and federal laws through a state Medicaid plan approved by the federal Centers for Medicare and Medicaid Services (CMS).

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<sup>6</sup> Valid evaluation of any trends in dental service use by Medicaid members during this time period requires a sorting between those service changes linked to FQHC program changes, separate from the Medicaid pilot program. The methods section later in this report will explain this further. The Wisconsin DHS had contracted with the University of Wisconsin-Madison Population Health Institute (UWPHI) to conduct an evaluation of the pilot program after one year of implementation. That report was delivered to DHS in February 2019. That study, however, relied on aggregate county-level data, did not separate FQHC from other provider data, and did not use methods that allowed for causal inferences, so that study was unable to draw conclusions about the reasons for any observed changes in dental service use or provision.

<sup>7</sup> See Oral Health Partnership information here: <https://www.smilegb.org/history-of-ohp>

<sup>8</sup> "What is the dental Medicaid pilot and why should I participate?" Wisconsin Dental Association. Available at <https://www.wda.org/blog/dental-medicaid-pilot-participate>

<sup>9</sup> "How do the new enhanced Medicaid rates compare to commercial insurance companies?" Wisconsin Dental Association. Available at [https://www.wda.org/wp\\_super\\_faq/new-enhanced-medicaid-rates-compare-commercial-insurance-companies](https://www.wda.org/wp_super_faq/new-enhanced-medicaid-rates-compare-commercial-insurance-companies)

<sup>10</sup> Wisconsin Legislative Fiscal Bureau. Medical Assistance and Related Programs. Informational Paper #41. January 2019. Available at [https://docs.legis.wisconsin.gov/misc/lfb/informational\\_papers/january\\_2019/0041\\_medical\\_assistance\\_and\\_related\\_programs\\_informational\\_paper\\_41.pdf](https://docs.legis.wisconsin.gov/misc/lfb/informational_papers/january_2019/0041_medical_assistance_and_related_programs_informational_paper_41.pdf)

The Wisconsin Medicaid program covers various dental services for children and adults, including comprehensive coverage of dental exams, cleanings, diagnostic services, fillings, crowns, periodontics, and other dental services. Wisconsin is one of 18 states that includes Medicaid comprehensive dental services in adult coverage; 16 states offer limited coverage, and the other states cover only emergency services or offer no coverage.<sup>11</sup> Wisconsin Medicaid pays for dental services primarily on a fee-for-service basis in 66 of the 72 Wisconsin counties. In the remaining six counties, the DHS contracts with managed care organizations for delivery of dental services to most eligible members.

DHS reported that, for CY2014, Wisconsin's average statewide use of dental services was 43% for children and 34% for adults.<sup>12</sup> A separate report for federal fiscal year 2016, shows 30.7% of Wisconsin children covered by Medicaid/BadgerCare received any dental service.<sup>13</sup> Wisconsin's rate was among the lowest in the country, and compared unfavorably to 48.2% of Medicaid children nationally receiving any dental service during that time period.<sup>14</sup>

The American Dental Association reports that, as of 2016, about 34% of Wisconsin dentists participate in providing services to the Medicaid program, compared to about 39% of dentists nationally.<sup>15</sup> In the neighboring state of Minnesota, a reported 64% of dentists participate. The percentage of Wisconsin dentists enrolled to provide service in the Medicaid program is lower than other types of health care providers; the majority of enrolled dentists are inactive or provide very limited service to Medicaid members.<sup>16</sup> For calendar year 2014, 47% of enrolled dentists were active, 20% were inactive, and 33% had limited participation.

Beyond limited provider availability, several other factors influence the use of dental services by Medicaid members. These include lack of knowledge about dental service coverage and/or about the

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<sup>11</sup> Center for Healthcare Strategies. Adult Dental Benefits: An Overview. Fact Sheet, September 2019. Available at [https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet\\_091519.pdf](https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet_091519.pdf)

<sup>12</sup> Wisconsin Department of Health Services. Medicaid Plan for Monitoring Access to Fee-for-Service Health Care. 2016. Available at <https://www.dhs.wisconsin.gov/publications/p01565.pdf>

<sup>13</sup> Annual EPSDT Reporting Using the Form CMS-416. Available at <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>

<sup>14</sup> Annual EPSDT Reporting Using the Form CMS-416. Available at <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>

<sup>15</sup> American Dental Association. Dentist Participation in Medicaid or CHIP. Health Policy Institute Infographic, 2016. Available at [https://www.ada.org/~media/ADA/Science%20and%20Research/HPI/Files/HPIGraphic\\_0318\\_1.pdf?la=en](https://www.ada.org/~media/ADA/Science%20and%20Research/HPI/Files/HPIGraphic_0318_1.pdf?la=en)

<sup>16</sup> Wisconsin Department of Health Services. Medicaid Plan for Monitoring Access to Fee-for-Service Health Care. 2016. Available at <https://www.dhs.wisconsin.gov/publications/p01565.pdf>



importance of regular dental care, difficulty finding time to visit the dentist during dental office hours, transportation barriers, and childcare challenges.<sup>17</sup>

Dental providers cite low Medicaid reimbursement rates, along with burdensome administrative requirements and the cost of missed appointments as reasons for not participating in the Medicaid program.<sup>18</sup> The Wisconsin Legislative Fiscal Bureau has cited low Medicaid payment rates as a reason that many dental providers in Wisconsin do not participate in the program or restrict the number patients they serve.<sup>19</sup>

The Medicaid program pays providers lower fees for health services overall compared to what providers receive from other payers.<sup>20,21</sup> The Medicaid-to-Medicare fee index – a measure of Medicaid physician fees relative to Medicare fees is 72% nationally, and 62% in Wisconsin.<sup>22</sup> The American Dental Association reports Wisconsin as among three states nationally with the lowest Medicaid fee-for-service reimbursement as a percentage of fees charged by dentists and as a percentage of private insurance payments, for both child and adult dental services.<sup>23</sup> By these measures, Wisconsin Medicaid pays about a third of charges and private insurance levels. An important note, however: Wisconsin's health care prices are generally among the highest

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<sup>17</sup> Centers for Health Care Strategies, Inc. Medicaid Adult Dental Benefits: An Overview. July 2018. Available at [https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet\\_072718.pdf](https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet_072718.pdf)

<sup>18</sup> Centers for Health Care Strategies, Inc. Medicaid Adult Dental Benefits: An Overview. July 2018. Available at [https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet\\_072718.pdf](https://www.chcs.org/media/Adult-Oral-Health-Fact-Sheet_072718.pdf)

<sup>19</sup> Wisconsin Legislative Fiscal Bureau, Health Services, Medical Assistance, General (Paper #351), 2015.

<sup>20</sup> Centers for Medicare & Medicaid Services. (2020, April 18). *Program History*. Retrieved from Medicaid.gov: Keeping America Healthy: <https://www.medicaid.gov/about-us/program-history/index.html>

<sup>21</sup> Tollen L. (2015). *Health Policy Brief: Medicaid Primary Care Parity*. Retrieved from HealthAffairs: <https://www.healthaffairs.org/doi/10.1377/hpb20150511.588737/full/>

<sup>22</sup> Kaiser Family Foundation, State Health Facts. Medicaid-to-Medicare Fee Index, 2016. Available at <https://www.kff.org/medicaid/state-indicator/medicaid-to-medicare-fee-index/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D>

<sup>23</sup> Gupta N, Yarbrough C, Vujicic M, Blatz A, Harrison B. Medicaid Fee-For-Service Reimbursement Rates for Child and Adult Dental Care Services for all States, 2016 American Dental Association. Health Policy Institute. April 2017. [https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief\\_0417\\_1.pdf](https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0417_1.pdf)

nationally,<sup>24</sup> so a part of these fee-to-charge ratios could reflect the market power of the Wisconsin provider sector in leveraging higher prices in the commercial market.<sup>25</sup>

Most of Wisconsin's residents live in federally-designated Health Professional Shortage Areas (HPSA) for dental services, meaning substantially fewer practicing dentists than needed to serve lower-income, Medicaid, and uninsured residents.<sup>26</sup> This limits the capacity to supply needed services to the Medicaid population. The Wisconsin DHS estimates a need for an additional 200 full-time equivalent dentists to reduce the significant shortage of providers for Medicaid members.<sup>27</sup>

Various studies have assessed the effect of higher Medicaid fees on physician participation. Higher Medicaid fees increase the probability of appointment availability<sup>28,29</sup> decrease reports of doctors not accepting the insurance,<sup>30</sup> decrease reported difficulties finding a physician, and generally improve access to care for children.<sup>31</sup>

Several states have previously pursued efforts similar to Wisconsin's, increasing dental reimbursement rates in an effort to improve dental access for Medicaid members and increase participation by dentists. Studies assessing single state payment increases have found positive

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<sup>24</sup> Health Care Cost Institute (HCCI). National Chartbook of Health Care Prices, 2015. May 2016.

Available at <https://www.healthcostinstitute.org/images/pdfs/HCCI-National-Chartbook-of-Health-Care-Prices-2015.pdf>

<sup>25</sup> Health Care Cost Institute (HCCI). Healthy Marketplace Index. Available at

<https://healthcostinstitute.org/research/hmi-interactive#HMI-Price-Index>.

<sup>26</sup> Wisconsin Office of Rural Health. Health Professional Shortage Area – Dental Health Care. Available at <http://worh.org/library/health-professional-shortage-area-dental-health-care-0> and HPSA:

Dental Health Care – Milwaukee County, Available at <http://worh.org/library/hpsa-dental-health-care-%E2%80%93-milwaukee-county>; Underlying data from the U.S. Health Resources and Services Administration, HPSA Find tool, Available at <https://data.hrsa.gov/tools/shortage-area/hpsa-find>

<sup>27</sup> Wisconsin Department of Health Services. Number of Dentist FTEs Needed to Reduce Significant Shortages for Medicaid Members. September 2019. Available at

<https://www.dhs.wisconsin.gov/publications/p0/p00368.pdf>

<sup>28</sup> Sharma R, Tinkler S., Mitra A, Pal S., Susu-Mago,R., Stano,M. (2017). State Medicaid fees and access to primary care physicians. *Health Economics*, 629-636.

<sup>29</sup> Candon M, Zuckerman S, Wissoker D, Saloner B, Kenney, GM, Rhodes K., Polsky D. (2017). Declining Fees and Primary Care Availability for New Medicaid Patients. *JAMA Internal Medicine* , 145-146.

<sup>30</sup> Alexander, D, Schnell M. (2019). *The Impacts of Physician Payments on Patient Access, Use and Health*. The National Bureau of Economic Research.

<sup>31</sup> White C. (2012). A Comparison of Two Approaches to Increasing Access to Care: Expanding Coverage versus Increasing Physician Fees. *Health Serv Res*, 47: 963-983. doi:[10.1111/j.1475-6773.2011.01378.x](https://doi.org/10.1111/j.1475-6773.2011.01378.x)

results, particularly for children.<sup>32</sup> A 1994 increase in Medicaid dental payments in Connecticut increased the percentage of dentists accepting children covered by Medicaid from 33% to 50%.<sup>33</sup> Michigan Medicaid's Healthy Kids Dental program, which paid dentists at private reimbursement levels in pilot counties, resulted in a 31% increase in dental care use, an increase in dentist's participation and decrease in the distance traveled by patients.<sup>34</sup> South Carolina's year 2000 dental Medicaid payment increase also substantially increased children's access to dental services.<sup>35</sup> Medicaid payment hikes in Alabama and Mississippi were linked to increases in sealant prevalence among 7-9 year old children.<sup>36</sup>

In 2008, the National Academy for State Health Policy (NASHP) studied six states – Alabama, California, Michigan, South Carolina, Tennessee, and Virginia -- assessing the effect of raising Medicaid reimbursement rates on access to dental care.<sup>37</sup> In these states, provider participation increased by at least one-third, along with increases in the number of patients treated and the number of Medicaid enrollees using dental services. Nonetheless, the portion of children receiving services remained far below that of privately-insured children.

NASHP concluded that 1) rates need to at least cover the cost of providing service, which was then estimated to be 60% to 65% of dentists' charges; and 2) rate increases are necessary – but not sufficient on their own – to improve access to dental care. Here, NASHP refers to the administrative burdens of Medicaid, and the need to address other patient barriers to effective use of care.

The degree of expansion in dental service provision directly relates to the level of increase in payments. Decker (2011) reports positive correlation between increased Medicaid payment and dental care service: a \$10 increase in dental payments increases the likelihood that a child has seen a

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<sup>32</sup> Nasseh K, Vujicic M. (2015) The Impact of Medicaid Reform on Children's Dental Care Utilization in Connecticut, Maryland, and Texas. *Health Serv Res.* 50(4):1236–1249.

<sup>33</sup> Nainar HS., Tinanoff N. (1997). Effect of Medicaid reimbursement rates on children's access to dental care. *American Academy of Pediatric Dentistry.* 315-316.

<sup>34</sup> Eklund SA, Pittman JL, Clara SJ. (2003). Michigan Medicaid's Healthy Kids Dental Program. *JADA,* 1509-1515.

<sup>35</sup> Nietert PJ, Bradford WD, Kaste ML. (2005). The Impact of Innovative Reform to the South Carolina Dental Medicaid System. *Health Services Research,* 1078-1090.

<sup>36</sup> Griffin SO, Jones KA, Lockwood S, Mosca NG, Honoré PA. (2007). Impact of Increasing Medicaid Dental Reimbursement and Implementing School Sealant Programs on Sealant Prevalence. *Journal of Public Health Management & Practice,* 202-206.

<sup>37</sup> Borchgrevink A, Snyder A, Gehshan S. (2008) The Effects of Medicaid Reimbursement Rates on Access to Dental Care. National Academy for State Health Policy. Available at: [https://nashp.org/wp-content/uploads/sites/default/files/CHCF\\_dental\\_rates.pdf](https://nashp.org/wp-content/uploads/sites/default/files/CHCF_dental_rates.pdf)

dentist in the past 6 months by 4 percentage points.<sup>38</sup> More recently, Chalmers and Compton (2017) similarly concluded positive effects of payment increases, noting in particular that states with low dentist density and low dentist participation in Medicaid may be able to improve access to dental services significantly.<sup>39</sup>

However, meaningful increases appear to require large investments. Mayer et al. (2000) reports increases in dental payments in North Carolina were associated with relatively small increases in access to dental care, deeming the payment increases only “marginally effective.”<sup>40</sup> Buchmeuller and Shore-Sheppard (2013) report a modest, but statistically significant, positive relationship between Medicaid payment rates and several measures of dental care use. This includes a positive and statistically significant, but relatively small, effect of Medicaid payment rates on whether a dentist treats any publicly-insured patients and the percent of the practice's patients who have public insurance. The findings suggest that increasing Medicaid payments to the level of private market fees would increase access to care, but the incremental cost of the additional visits induced would be very high; An increase of about 40% in Medicaid reimbursement rates for dental preventive services yields only an increase of about 1% to 3% use of preventive services.<sup>41</sup>

Milliman very recently reports a study of seven states’ Medicaid dental payment rates. Here, service use levels improve – especially for children -- with increases in Medicaid dental provider reimbursement levels relative to commercial billed charges.<sup>42</sup> This report cautions about limits in the data, but asserts the directional conclusion that 1) in general, Medicaid service use levels approach that of commercial populations as Medicaid fees increases relative to commercial billed charges, and 2) the correlation appears stronger for children than adults.

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<sup>38</sup> Decker SI. (2011). Medicaid Payment Levels to Dentists and Access to Dental Care Among Children and Adolescents. *JAMA*, 187-193.

<sup>39</sup> Natalia I. Chalmers NI, Compton RD. (2017) Children’s Access to Dental Care Affected by Reimbursement Rates, Dentist Density, and Dentist Participation in Medicaid. *American Journal of Public Health* 107:1612-1614.

<sup>40</sup> Mayer ML, Steams SC, Norton EC, Rozier RG. (2000). The effects of Medicaid expansions and reimbursement increases on dentists' participation. *Inquiry*. 37(1): 33-44.

<sup>41</sup> Buchmueller TC, Orzol S, Shore-Sheppard LD. (2015) The Effect of Medicaid Payment Rates on Access to Dental Care among Children. *Am J Health Econ*. 1(2):194–223; See also: Buchmeller TC, Shore-Sheppard LD. (2013). *The Effect of Medicaid Payment Rates on Access to Dental Care Among Children*. Cambridge, MA: National Bureau of Economic Research.

<sup>42</sup> Fontana J, Lewis C, Carver T. Medicaid adult dental reimbursement. Milliman White Paper. May 2019. Available at <http://assets.milliman.com/ektron/medicaid-adult-dental-reimbursement.pdf>

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### III. EVALUATION QUESTIONS, DESIGN, & METHODS

#### A. Evaluation Questions

As noted, authorizing legislation in 2017 Wisconsin Act 344<sup>43</sup> specified that DHS measure and report on the following outcomes from this pilot initiative:

1. The number of Medical Assistance recipients who received services under the pilot program in total and specified by those who received pediatric care and who received adult emergency dental services.
2. An estimate of the potential reduction in health care costs and emergency department use by Medical Assistance recipients due to the pilot project.
3. An analysis of Medical Assistance recipient populations who received services under the pilot project and populations who may benefit from the pilot project.
4. The feasibility of continuing the pilot project and expanding the project in specific areas of the state or statewide.
5. The amount of moneys distributed under the pilot project and, if moneys allocated for the pilot project were not distributed, a summary on why the moneys were not distributed.

These questions focus on descriptive elements of the program, and also seek a causal link between the pilot program itself and observed outcomes. We identify several evaluation questions and measures in order to support such causal inferences. Table 2 identifies the evaluation questions and measures, and provides a crosswalk between these questions and measures, and the legislature's questions:

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<sup>43</sup> 2017 Wisconsin Act 344. Available at <https://docs.legis.wisconsin.gov/2017/related/acts/344>

**Table 2. Evaluation Questions and Outcome Measures**

Legislature’s questions	Evaluation Measures
<b>Evaluation Question #1. Who received services, and did the pilot program change access to services by Medicaid members?</b>	
<p>1. The number of Medical Assistance recipients who received services under the pilot program in total and specified by those who received pediatric care and who received adult emergency dental services.</p> <p>3. An analysis of Medical Assistance recipient populations who received services under the pilot project and populations who may benefit from the pilot project.</p>	<p>A1. Percentage of Resident County BadgerCare Members Receiving Any Dental Service</p> <p>A2. Percentage of Child BadgerCare Members Who Reside in Each County and Received Any Dental Service</p> <p>A3. Percentage of Adult Resident County BadgerCare Members Receiving Any Dental Service</p> <p>A4. Percentage of Children BadgerCare Members Who Reside in Each County and Received Preventive Service</p> <p>A5. Percentage of Adult Resident County BadgerCare Members Receiving Emergency Services with Increased Reimbursement Rates</p> <p>A6. Percentage of BadgerCare Members Who Crossed County Lines to Receive Services</p>
<b>Evaluation Question #2. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?</b>	
<p>4. The feasibility of continuing the pilot project and expanding the project in specific areas of the state or statewide.</p>	<p>B1. Total Number of Providers Serving Medicaid Members</p> <p>B2. Total Number of Visits</p> <p>B3. Number of Visits per Provider</p> <p>B4. Number of Services per Provider</p> <p>B5. Total Number of Emergency Department Dental-Related Visits</p>
<b>Evaluation Question #3. How much did the program cost and did it result in any cost savings?</b>	
<p>5. The amount of moneys distributed under the pilot project and, if moneys allocated for the pilot project were not distributed, a summary on why the moneys were not distributed.</p> <p>2. An estimate of the potential reduction in health care costs and emergency department use by Medical Assistance recipients due to the pilot project.</p>	<p>C1. Total Outlays for the First Two Years</p> <p>C2. Changes in Payments per Member</p> <p>C3. Payments for Emergency Department Dental Services</p> <p>C4. Reasons for Increase in Payments</p>

## **B. Evaluation Design and Methods**

### **B.1. Study Populations**

This evaluation focuses on two study populations. The first relates to who received dental care during the evaluation period. This group includes all BadgerCare members – children, parents, caregiver adults, and childless adults -- that were enrolled for any period during the evaluation period.

The second study population consists of all dental service providers that submitted claims for service to Medicaid/BadgerCare members, excluding providers of services through a Federally Qualified Health Center (FQHC), during the evaluation period.

### **B.2. Evaluation Period**

This evaluation includes all dental claims for the period October 2014 through September 2018, allowing observation for two years before the pilot was implemented and two years after the pilot was implemented.

### **B.3. Data Sources & Outcome Measures**

#### Data Sources

The evaluation relies on two administrative data sources: Medicaid claims and enrollment in Wisconsin:

Wisconsin Medicaid claims and encounter data Claims and encounter data include every service that the state of Wisconsin pays for through Medicaid. Dental claims include information about the procedure codes for the services and the date the service was provided. In addition, each claim has the county in which the service was rendered. Claims data also include the amount that the Medicaid program paid for each service rendered. Each observation is a single service provided to an individual.

CARES & Medicaid Enrollment The Wisconsin CARES database is the state's online eligibility and enrollment portal of public benefits, including Medicaid and BadgerCare. This database contains information about demographics and program participation on all cases that apply for or receive public assistance from the state. Demographics include age, sex, educational attainment, county of residence, and income. Each observation is an individual month.

We link these two sources using a unique pin generated by the Wisconsin Administrative Data Core (WADC).<sup>44</sup> We link the claims with CARES in order to connect the demographic information with information about the county residence for each person receiving services, where an individual received services, what services an individual received, when the service was performed, and how much the state paid for each service.

All of the analyses exclude services that were provided at a federally qualified health center (FQHC). FQHC providers were not subject to the pilot program's change in payment, because FQHCs operate under a separate cost-related prospective payment system with Medicaid. In addition, FQHCs during this time period had been expanding their dental services with the attainment of federal grant funds. This pilot program evaluation needed to exclude from its measurement (via claims) any change in service clearly tied to factors separate from the change in Medicaid payment policy. We identify services provided at FQHCs as any claim that has a billing provider taxonomy that includes "FQHC," a rendering provider taxonomy that includes "FQHC," or a billing or rendering provider specialty that indicates it is an FQHC. Overall, we identified about 22% of the claims to be from FQHCs and these are eliminated from our analysis entirely, although this percentage does vary by county. For example, as discussed above, no FQHC provides dental care in Racine County.

### Outcome Measures

The pilot program evaluation focuses on who received care, who provided care, and how much the program costs, and possible cost savings, as specified in Table 2, above.

#### *1. Who received services, and did the pilot program change access to services by Medicaid members?*

First, we look at the percentage of Medicaid members who reside in each county that received any dental care in each month. We consider all Medicaid members and also specifically assess children and adults. Because counties differ in size, we focus on the percentage of individuals enrolled in BadgerCare who received care, rather than the number of individuals residing in each county who received care. Second, we look at the percentage of BadgerCare child members who reside in each county and received preventive care. Third, we look at the percentage of BadgerCare adults who reside in each county and received an emergency service that had an increased reimbursement rate.

We also consider the percentage of each group that crossed county lines to see a dental provider. If the supply of dental providers increased in counties after the program was implemented, we might expect residents of pilot counties to be less likely to cross county lines than they were before, relative to the non-pilot counties. However, several reasons may explain why individuals cross county lines for dental care, and whether they are able to obtain care in their county of residence is only one factor. The provider in the neighboring county may be closer to the patient's residence, or the

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<sup>44</sup> Brown PR, Thornton K, Ross D,, Smith, JA, Wimer L. (2020). Technical Report on Lessons Learned in the Development of the Institute for Research on Poverty's Wisconsin Administrative Data Core. Madison, WI : Institute for Research on Poverty.



patient may prefer a provider in another county. This evaluation is not able to identify the reasons that individuals crossed county lines.

*2. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?*

We evaluate several measures of the supply of dental care. First, we consider the total number of providers in each county. We show the total number of providers that serve any BadgerCare member, any BadgerCare child, and any BadgerCare adult. We also evaluate the total number of visits that were provided in each county for all BadgerCare members, BadgerCare children, and BadgerCare adults. As a measure of the intensity of care provision, we also evaluate the number of visits per provider and the number of services per visit that occurred in each county.

*3. How much did the program cost, and did it result in any total cost savings?*

We show both the total Medicaid-paid dental claims by county, and the total amount for the services that experienced increased reimbursement rates. In addition, we show the dental expenditures per enrollee for each. We also evaluate payments for emergency dental services as a measure of potential cost savings. In order to attribute what fraction of the increased costs were due to the increased reimbursement rates, as opposed to a change in supply or demand, we evaluate what would have happened had the pilot counties had the same number of services per member as the control counties.

#### **B.4. Analytic Methods**

The evaluation relies on a difference-in-difference (DiD) framework, comparing the difference in outcomes before and after implementation in the pilot counties to differences in outcomes before and after that same time point, but in counties that did not participate (non-pilot counties). DiD is a quasi-experimental design that uses pre- and post-intervention data from treatment and control groups to estimate a causal effect. Causal effect means an estimate of the effect of a specific intervention or treatment on the observed outcomes. DiD compares the changes in outcomes over time between a population that is enrolled in a program (the intervention group) and a population that is not (the control group). The comparison to the control group offers measurement of the counterfactual: of the changes observed in the treatment group, what changes might have happened anyway, even if the intervention did not occur. The DiD approach removes biases in comparisons between the pre- and post-intervention period for the treatment group that could be the result of trends due to other causes of the outcome.

### *Comparison/Control Groups*

To compare the pilot program counties to the non-pilot counties, we use two separate control groups, based on geography as displayed in Figure 1.

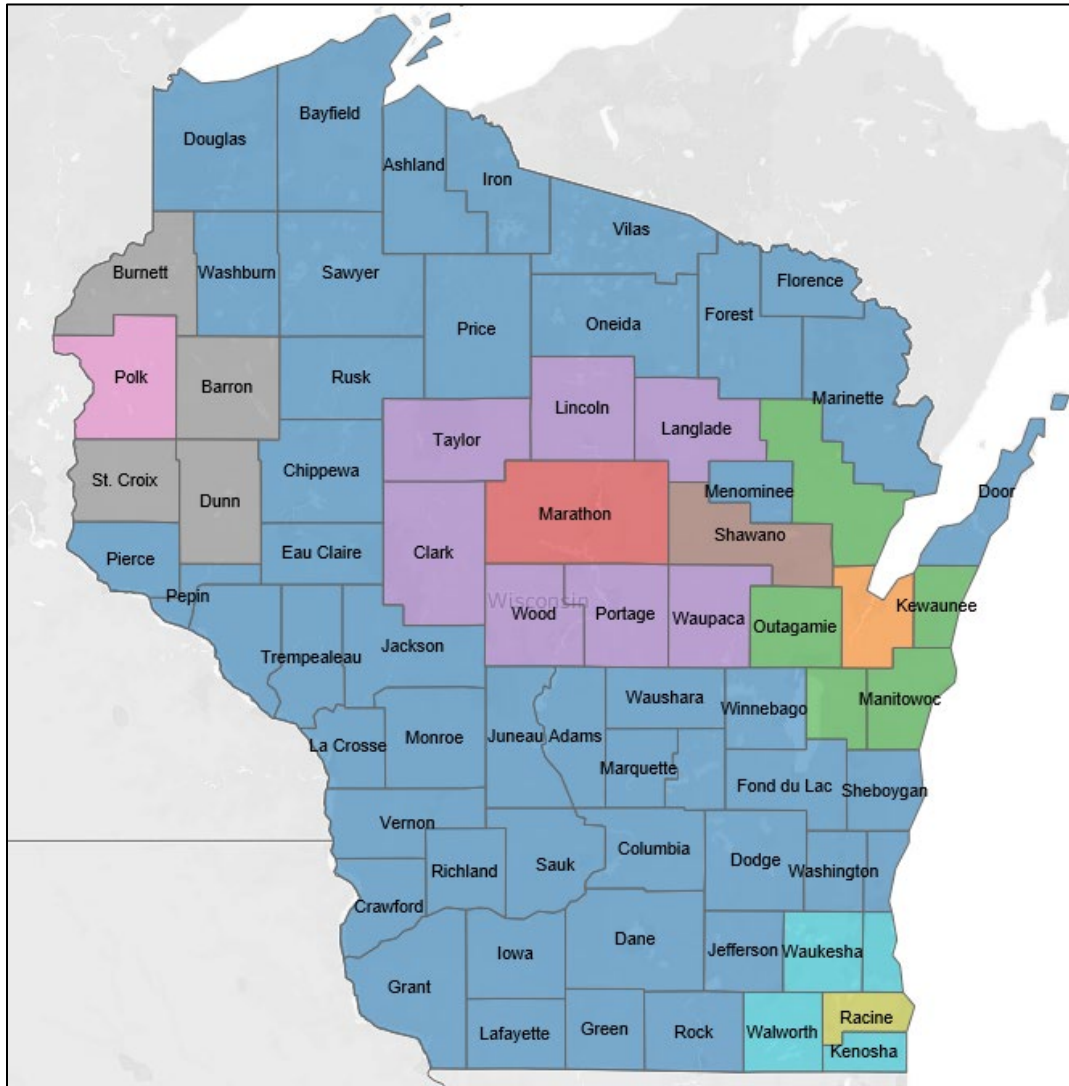
The first comparison group is counties similar in urbanicity to the pilot programs. The control group for the pilot program's three urban counties (Brown, Marathon, and Racine) includes a group of all other Wisconsin counties (excluding the pilot counties) classified as part of a Metropolitan Statistical Area (MSA).<sup>45</sup> The comparison group for rural Polk County includes a grouping of all other non-MSA counties. When considering outcomes that are related to obtaining care, we prefer this control group over the one described below to ensure that spillover between pilot and control counties is minimal. This would occur if individuals living on the border of a pilot county are able to receive care in the pilot county, even though they are not residents of the pilot county. For example, residents from Outagamie County, which borders Brown County, may have increased access to care, via an a change in supply in Brown County after the pilot program was implemented. When comparing changes in use of care between residents of Brown and Outagamie counties, the difference between the two counties would not appear as large, and this would make the effect of the pilot of the appear smaller than it truly is.











The second control group that we use consists of the bordering/neighbor counties to the pilot counties. We use this control group when considering outcomes related to services provided, because the counties are most similar, and we are less worried about spillover of providers. This would happen, for example, if a provider was already serving BadgerCare members in a neighboring county and started providing care in the pilot county because of the increased rates. If this occurred, we would estimate that the effect of the program on the number of providers is larger than it actually was. However, we find very few pilot county providers who previously served BadgerCare members from other counties while not their own counties and then, post-pilot program implementation, simply changed to serving residents from within their own (pilot) county.

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<sup>45</sup> Jones M, Ewald M. Putting Rural Wisconsin on the Map. WisContext. May 17, 2017. Available at <https://www.wiscontext.org/putting-rural-wisconsin-map>

Figure 1. Medicaid Dental Pilot Program Counties and Comparison Counties



	Non-Pilot
	Brown County pilot
	Brown comparison counties
	Marathon County pilot
	Marathon comparison counties
	Shawano County – comparison for both Brown and Marathon pilots
	Polk County pilot
	Polk comparison counties
	Racine County pilot
	Racine comparison counties

Metropolitan Statistical Area Counties	
Brown	Milwaukee
Calumet	Oconto
Chippewa	Outagamie
Columbia	Ozaukee
Dane	Pierce
Douglas	Racine
Eau Claire	Rock
Fond du Lac	Sheboygan
Green	St. Croix
Iowa	Washington
Kenosha	Waukesha
La Crosse	Winnebago
Marathon	

### Model

In order to evaluate the effect of increased payments for our outcomes of interest, we implement a difference-in-difference model. Essentially, we are comparing the pilot counties to the control groups before and after the program was implemented.

For each outcome, we collapse the individual level data so that each observation is a county-month. For example, if the outcome of interest is the percentage of BadgerCare members that received care and 15% of members in Brown county received care at some point in March 2017, then the observation is 15 for this month. We then estimate the following model:

$$y_{ct} = \alpha + \beta P_t + \gamma_c + \delta D_{ct} + u_{ct} \quad (1)$$

where  $c$  indexes county and  $t$  indexes month. Each model includes a set of county fixed effects, which are captured by  $\gamma_c$ , as well as an indicator variable indicating that the program had been implemented,  $P_t$ .  $D_{ct}$  is an indicator variable for each county that is equal to 1 if the pilot was implemented and the county was a pilot county and 0 otherwise. This variable is equal to 1 only for Brown, Marathon, Polk, and Racine counties in the months from October 2016- September 2018. The error term is represented by  $u_{ct}$ .

The coefficient of interest is  $\delta$  which indicates if the pilot program affected participating counties differently than their chosen control group. We show confidence intervals calculated using robust standard errors as well as intervals calculated using errors that are clustered by county.<sup>46</sup> We identify statistically significant changes when  $\delta$  is significant at the 5% level for both methods of calculating the interval. Each table with regression coefficients shows the estimated value of  $\delta$  in the cell labeled Pilot County X Post.

The difference-in-difference framework assumes that, had the pilot not been implemented, outcomes in the pilot-counties would have trended in the same way that the non-pilot control counties did. Although pre-pilot outcomes do not have to be identical, the trends in outcomes for the treatment and control counties do have to be parallel. For each outcome, we show figures that depict the pilot county as well as the relevant control group for the two years prior to the pilot starting and the two years after it began. Some outcomes in Marathon and Racine Counties clearly violate this assumption. In these cases, we still show the summary statistics and results from the above regression, but we are not able to draw inferences about the effect of the pilot program in these counties for these outcomes.

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<sup>46</sup> Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How Much Should We Trust Differences-In-Differences Estimates? *Quarterly Journal of Economics*, 119(1), 249–275.

## IV. FINDINGS/RESULTS

### A. Who received services, and did the pilot program change Medicaid members' access?

The legislature's statutory authorizing language required that the state Medicaid agency report the number of Medical Assistance recipients who received services under the pilot program in total and specified by those who received pediatric care and who received adult emergency dental services. Table 3 shows the total number and percent of BadgerCare members in each pilot county and in the state of Wisconsin who received and did not receive dental care. The population includes each individual who was enrolled at any point during the pilot program. An individual is identified as receiving dental care if they received any service for the first two years of the pilot program.

**Table 3. Number and Percent of BadgerCare Members Receiving Dental Services under the Dental Pilot Program, October 2016-September 2018**

	All	Received Dental Service	Percent Received Service	Did Not Receive Dental Service	Percent Did Not Receive Dental Service
<b>Brown County</b>					
Children	29,298	13,822	47%	15,476	53%
Childless adults	10,147	2,033	20%	8,114	80%
Parents/Caregiver Adults	10,853	3,140	29%	7,713	71%
Pregnant women	1,921	326	17%	1,595	83%
<b>Marathon County</b>					
Children	13,467	5,574	41%	7,893	59%
Childless adults	5,057	611	12%	4,446	88%
Parents/Caregiver Adults	4,811	862	18%	3,949	82%
Pregnant women	966	104	11%	862	89%
<b>Polk County</b>					
Children	4,878	1,786	37%	3,092	63%
Childless adults	1,821	274	15%	1,547	85%
Parents/Caregiver Adults	2,047	451	22%	1,596	78%
Pregnant women	302	37	12%	265	88%
<b>Racine County</b>					
Children	25,191	11,803	47%	13,388	53%
Childless adults	10,575	2,917	28%	7,658	72%
Parents/Caregiver Adults	9,800	3,670	37%	6,130	63%
Pregnant women	1,379	299	22%	1,080	78%
<b>Wisconsin Statewide</b>					
Children	598,796	247,174	41%	351,622	59%
Childless adults	268,173	49,654	19%	218,519	81%
Parents/Caregiver Adults	236,835	59,174	25%	177,661	75%
Pregnant women	35,122	5,553	16%	29,569	84%

This table provides a post-pilot snapshot of the status of dental care use among Medicaid/BadgerCare members. Statewide, 41% of children used services in the two-year period, compared to only 37% in Polk County, 41% in Marathon County, and a somewhat better performance in Brown and Racine Counties at 47%. For parents/caregiver adults, 25% received services, compared to only 18% in Marathon County, 22% in Polk County, and 29% in Brown County, and 37% in Racine County. The percentages using services in the two year period by childless adults and by pregnant women remain quite low across the board, although Racine County shows somewhat better performance for these two populations.

Table 4 shows use by BadgerCare adults of the dental services specified under the pilot program for increases in payments, during the two-year period of pilot program operation. Statewide, adults receiving emergency dental services account for about three-quarters of all adults receiving dental services. In the pilot counties, this varies, with adults receiving dental emergency services accounting for about 90% of all adults receiving dental services in Brown County, about 80% in Racine County, and less than 70% in Marathon and Polk Counties.

Counties show the same trend for the number of services delivered/used (Table 5). Statewide, emergency dental services account for 40% of all adult dental services rendered. This compares to 57% in Brown County, 48% in Racine County, 37% in Marathon County, and 28% in Polk County.

These figures are simply descriptive, and do not indicate whether the pilot program had any effect on the supply/provision or use of dental services. For this, we implement several separate analyses.

We consider whether individual residents of each pilot county were more likely to receive care after the implementation of the program, relative to individuals who lived in non-pilot counties. The care could have been provided in any county, although later we evaluate whether care was provided in the resident county or elsewhere. We look at all BadgerCare members, BadgerCare children, and BadgerCare adults.

The analysis considers two specific types of care: preventive care provided to children and, for adults, the emergency services for which the pilot program provided increased payment rates. We again calculate this by counting the number of BadgerCare children or adults who reside in the county and received the type of care, regardless of where it was provided.

Last, we consider whether individuals who live in pilot counties were less likely to cross county lines compared to individuals living in non-pilot counties after the pilot was implemented. We view this as a measure of access to care.

**Table 4. Number of BadgerCare Adults Receiving Dental Services and Number and Percent Receiving Pilot Program Specified Emergency Dental Services, October 2016-September 2018**

	<b>Eligibility Group</b>	<b>Number Received Dental Service</b>	<b>Number Received Emergency Dental Service</b>	<b>Percent of Dental Services Received were Emergency Services</b>
Brown County	Childless adults	1,868	1,690	90%
	Parents	3,081	2,868	93%
	Pregnant women	282	255	90%
	Other	645	523	81%
Marathon County	Childless adults	556	401	72%
	Parents	853	562	66%
	Pregnant women	89	61	69%
	Other	152	96	63%
Polk County	Childless adults	240	158	66%
	Parents	446	265	59%
	Pregnant women	34	15	44%
	Other	68	43	63%
Racine County	Childless adults	2,715	2,237	82%
	Parents	3,607	2,954	82%
	Pregnant women	255	208	82%
	Other	1,052	840	80%
Wisconsin Statewide	Childless adults	45,861	35,138	77%
	Parents	58,259	44,162	76%
	Pregnant women	4,848	3,242	67%
	Other	16,797	12,112	72%

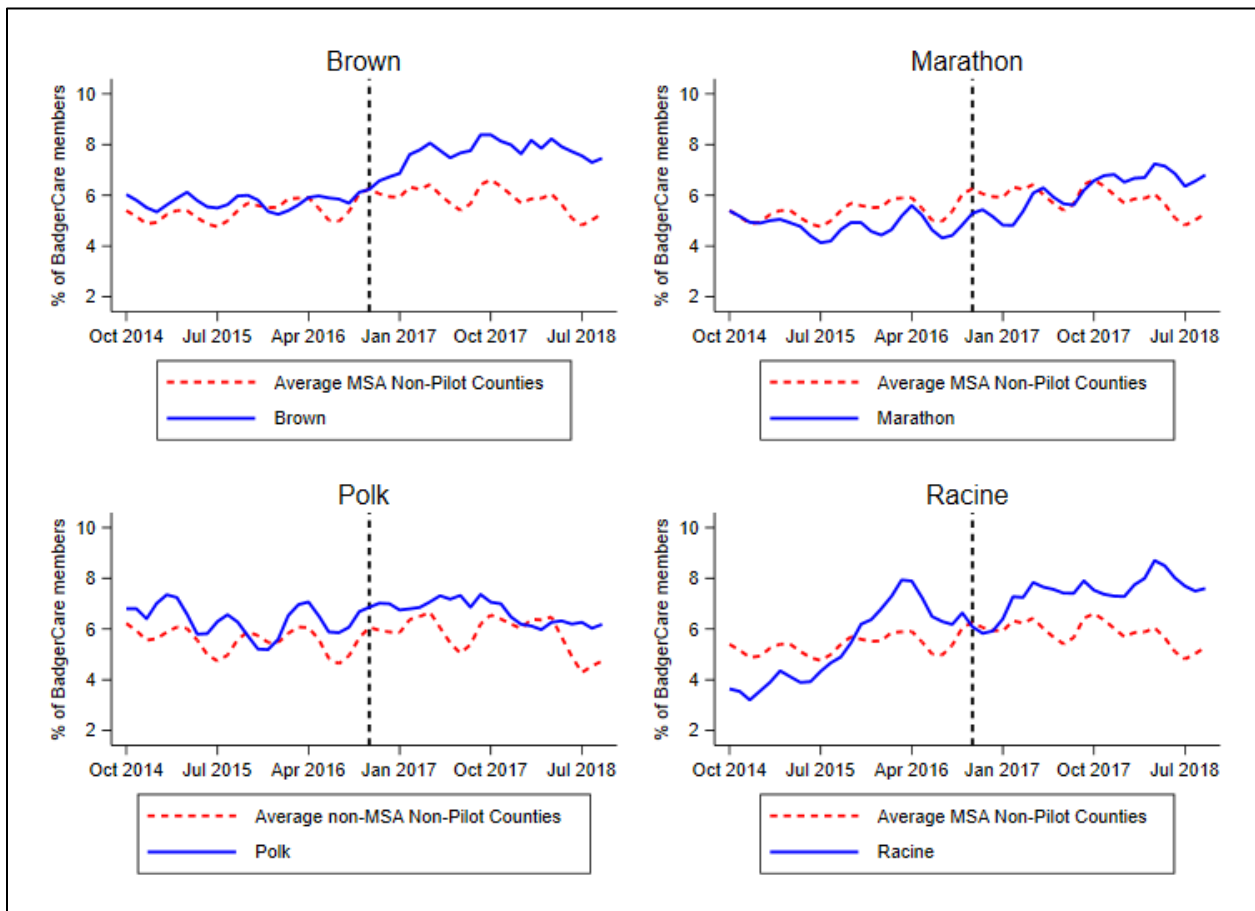
**Table 5. Number of Adult Dental Services Rendered and, of these Services, Number and Percent that Were Pilot-Specified Emergency Dental Services, October 2016-September 2018**

	<b>Wisconsin</b>	<b>Brown County</b>	<b>Marathon County</b>	<b>Polk County</b>	<b>Racine County</b>
# of services rendered to adults	1,035,464	70,730	16,866	9,792	71,076
# of emergency services with increased rate rendered to adults	417,944	40,476	6,323	2,780	34,012
Percent of dental services that were emergency services with increased rate	40%	57%	37%	28%	48%

## A1. Percentage of Resident County BadgerCare Members Receiving Any Dental Services

Figure 2 displays, for Brown County, a large increase in the percentage of its BadgerCare residents who received dental care immediately at the start of the pilot program. Prior to the program, Brown County looked very similar to the control group, which consists of all MSA counties that did not participate in the pilot program. In the two years before the pilot began, about 5.7% of Brown County BadgerCare members received dental care each month. After the implementation of the pilot program, monthly use increased about 2 percentage points to 7.7% per month. (Table 6) This corresponds to a statistically significant increase of 1.4 percentage points in each month. Table 8 presents results from the model shown in Equation 1. Given a baseline rate of 5.7, Brown County shows an increase of almost 25% ( $= 1.4/5.7$ ). The same increase was not seen in non-pilot MSA counties: although there was a very small increase, from 5.2 to 5.5% per month.

**Figure 2. Percent of BadgerCare Members Who Reside in Each County that Received Any Dental Service in Any County**





Marathon County shows a similar pattern, displayed in Figure 2; The pilot county looked very similar to the control counties until the implementation of the program, when BadgerCare member residents of Marathon County also experienced an increase in the likelihood of receiving care. As Table 6 shows, the increase in Marathon County was about 1.4 percentage points, from 4.8% to 6.2% per month. Once county and pilot are controlled for in estimating Equation 1, we find that the pilot program increased the percentage of Marathon BadgerCare members who received any dental care by 0.9 percentage points, or 17.7%. (Table 8)

Unlike Brown and Marathon Counties, we do not find such increases in the percentage of Polk BadgerCare members that received care. Figure 2 shows that, after the program implementation, little change occurred between Polk County and the control counties. Because Polk is non-MSA, control counties consist of non-MSA, non-pilot counties. Prior to the program, about 6.4% of Polk BadgerCare members received any form of dental care per month, while 6.7% did after pilot program implementation. (Table 6) The non-MSA, non-pilot counties increased from 5.4 to 5.5% per month. The change in Polk is not statistically significant compared the increase in the control counties. (Table 8)

Racine County shows a substantial increase in the percentage of Racine BadgerCare members receiving dental care, but that increase began well before the implementation of the pilot program. (Figure 2) Any increases happening before the start of the pilot program cannot be attributed to the pilot program itself and those occurring after the start of the pilot program likely show continuation of the pre-pilot trend.<sup>47</sup>

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<sup>47</sup> As advised by DHS, we considered the same outcome excluding services rendered by iDental in Racine County, which opened at a similar time as the pilot was implemented. However, we still find a similar increase in the percentage of Racine BadgerCare members who received dental care before the pilot began.

**Table 6. Percent of BadgerCare Members Receiving Any Dental Service Based on Member Resident County and Time Period**

	% of BadgerCare Members Who Reside in Each County & Received Any Service in Any County		% of BadgerCare Children Who Reside in Each County & Received Any Service in Any County		% of BadgerCare Adults Who Reside in Each County & Received Any Service in Any County	
	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
Brown County	5.72	7.66	7.39	9.40	2.82	4.50
Marathon County	4.80	6.17	7.10	8.10	0.95	2.77
Polk County	6.36	6.69	7.79	8.42	4.08	3.89
Racine County	5.37	7.41	5.70	7.88	4.84	6.62
MSA, Non-Pilot Counties	5.21	5.50	6.66	7.09	2.95	2.92
Non-MSA, Non-Pilot Counties	5.36	5.50	7.29	7.48	2.56	2.55

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

**Table 7. Percent of BadgerCare Members Receiving Certain Types of Service by Member Resident County and Time Period**

	% of BadgerCare Children Who Reside in Each County & Received Preventive Service in Any County		% of BadgerCare Adults Who Reside in Each County & Received Emergency Services with Increased Rates in Any County	
	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
Brown County	5.26	6.72	1.47	3.11
Marathon County	4.38	5.27	0.38	1.38
Polk County	4.44	4.27	1.67	1.63
Racine County	3.53	5.27	2.77	3.95
MSA, Non-Pilot Counties	4.54	4.92	1.42	1.54
Non-MSA, Non-Pilot Counties	4.74	4.96	1.12	1.16

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

**Table 8. Regression Results, BadgerCare Members Residing in Each County Who Received Services**

	All Ages, All Services	Children, All Services	Adults, All Services	Children, Preventive Services	Adults, Emergency Services with Increased Reimbursement
<b>Brown County</b>					
Pilot County X Post	1.420***	1.434***	1.346***	1.019***	1.315***
95% CI, Robust Standard Errors	[1.050, 1.790]	[0.953, 1.916]	[1.097, 1.595]	[0.609, 1.430]	[1.160, 1.470]
95% CI, Robust Standard Errors Clustered by County	[1.000; 1.841]	[1.019; 1.849]	[0.817; 1.876]	[0.698; 1.340]	[0.996; 1.634]
<b>Marathon County</b>					
Pilot County X Post	0.853***	0.424	1.483***	0.445*	0.676***
95% CI, Robust Standard Errors	[0.407, 1.299]	[-0.133, 0.982]	[1.017, 1.949]	[-0.081, 0.971]	[0.417, 0.934]
95% CI, Robust Standard Errors Clustered by County	[0.433; 1.273]	[0.009; 0.839]	[0.953; 2.012]	[0.124; 0.766]	[0.356; 0.995]
<b>Polk County</b>					
Pilot County X Post	0.041	0.279	-0.277	-0.518**	-0.134
95% CI, Robust Standard Errors	[-0.411, 0.493]	[-0.258, 0.816]	[-0.717, 0.163]	[-0.998, -0.038]	[-0.358, 0.090]
95% CI, Robust Standard Errors Clustered by County	[-0.235; 0.316]	[-0.045; 0.603]	[-0.545; -0.009]	[-0.811; -0.225]	[-0.284; 0.016]
<b>Racine County</b>					
Pilot County X Post	1.528***	1.614***	1.447***	1.288***	0.862***
95% CI, Robust Standard Errors	[0.775, 2.282]	[0.755, 2.474]	[0.781, 2.113]	[0.602, 1.974]	[0.370, 1.355]
95% CI, Robust Standard Errors Clustered by County	[1.108; 1.949]	[1.200; 2.029]	[0.918; 1.976]	[0.967; 1.609]	[0.543; 1.182]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the percentage of Medicaid members who live in each county & received specific type of dental care. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the percent of BC members that received any dental service and reside in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are all non-pilot counties with the same urbanicity level. We exclude FQHCs as well as observations with missing or unknown rendering provider or residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

## **A2. Percentage of Child BadgerCare Members that Reside in Each County and Received Any Dental Services**

Next, we consider the percentage of children BadgerCare members that reside in each county and received any dental services. Similar to how Figure 2 shows the percentage of all BadgerCare members who reside in each county and received any dental care, Figure 3 shows the percentage of children who reside in each county and received any dental care, as well as the percentage for the corresponding control group.

Child BadgerCare members who reside in Brown County were more likely to receive care after pilot program implementation, as displayed in Table 6. More children receive dental care than adults, and the percentage increased two percentage points, from 7.4% to 9.4% per month after the program began. After estimating Equation 1, we find that the increase for children in Brown County relative to the non-pilot MSA counties was a statistically significant 1.4 percentage points, or about 19%. (Table 8)

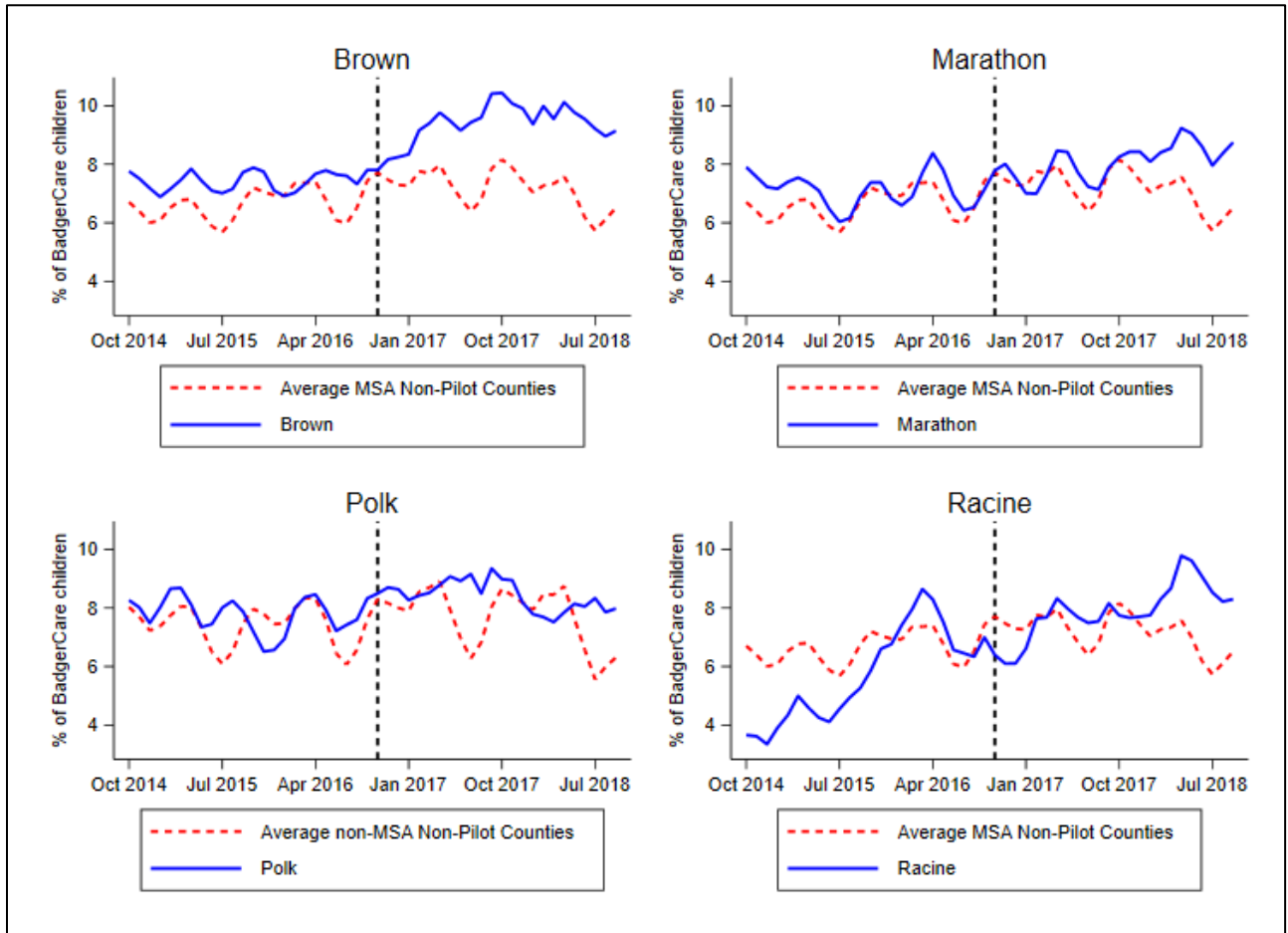
No other counties experienced the increase in the percent of child BadgerCare members that Brown County did. Graphically, this can be seen in Figure 2. Table 8 shows that the changes in the percentage of BadgerCare children who received care were not statistically significant for Marathon and Polk Counties. Similar to the increase in care to all residents of each county, the percentage of children in Racine County who received care increased before the implementation of the pilot program, so the trend cannot be tied to the pilot program itself.

## **A3. Percentage of Adult Resident County BadgerCare Members Receiving Any Dental Services**

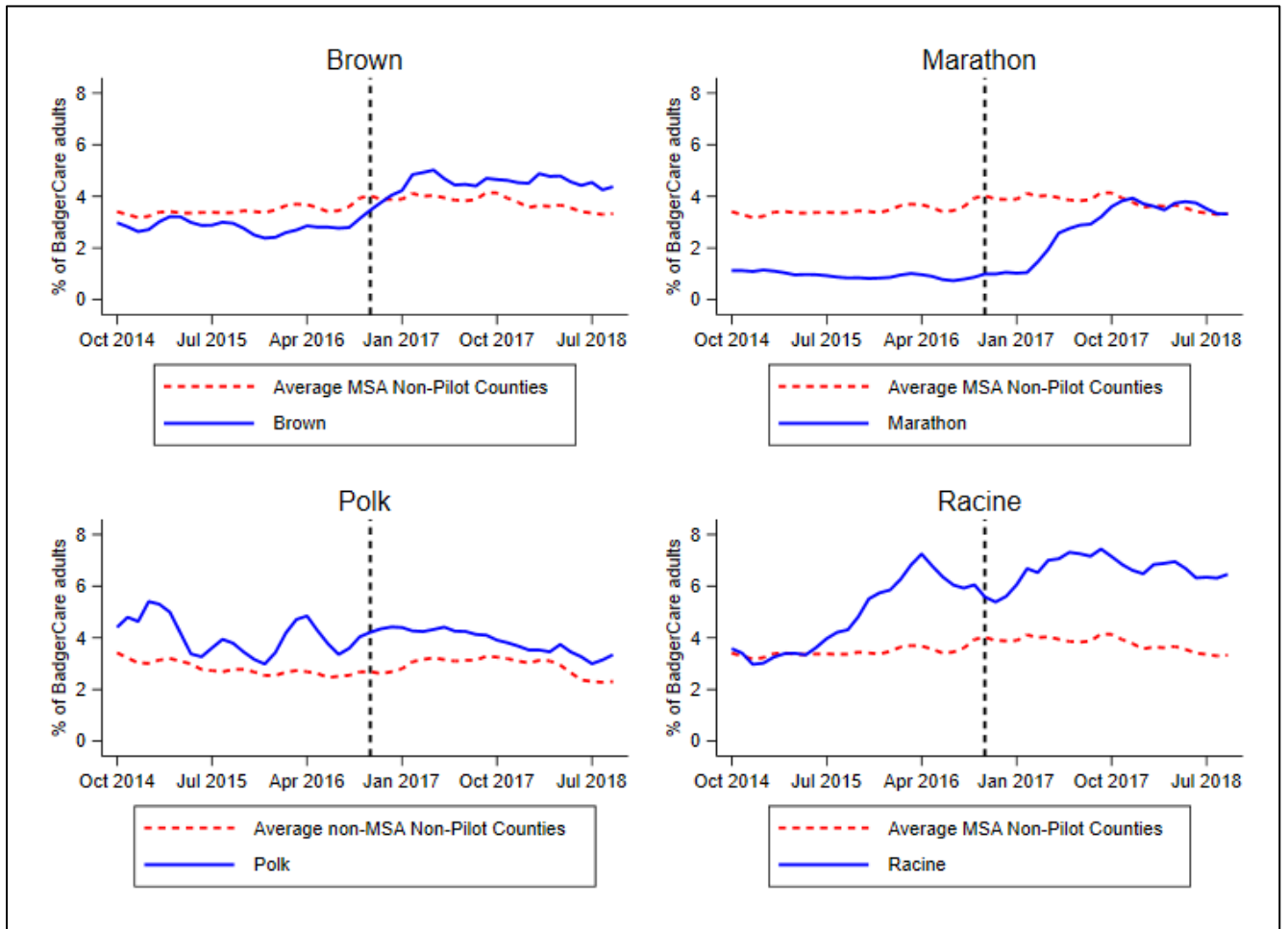
Figure 4 shows the percentage of adult BadgerCare members residing in each county that received any dental care. Again, Brown County experienced increases in the percentage of individuals who received dental care, which can be seen in the corresponding figure. Prior to the program, Brown County was very similar to the control counties. However, after pilot program implementation, a clear divergence occurred. The percentage of adult BadgerCare members that reside in Brown County and received care each month increased from 2.8% to 4.2% after the program began. Non-pilot MSA counties show virtually no change (2.95% to 2.92%), as shown in Table 6. The change in Brown County, relative to control counties, yields a statistically significant 1.3 percentage point increase, or 46% of the baseline. (Table 8)

Marathon County also shows an increase in the percentage of BadgerCare adults who received dental care. (Figure 4, Table 6) However, this increase did not occur immediately. It was not until March 2017 that the percentage of adults who reside in Marathon County began to increase. After that date, the increase was large and very rapid. When comparing the two-year period before the program began to after, we find that the percentage of adults in Marathon County who received care went from .95% to 2.8%. Based on Equation 1, this is a statistically significant increase of 1.48 percentage points, or 156% of the baseline. (Table 8)

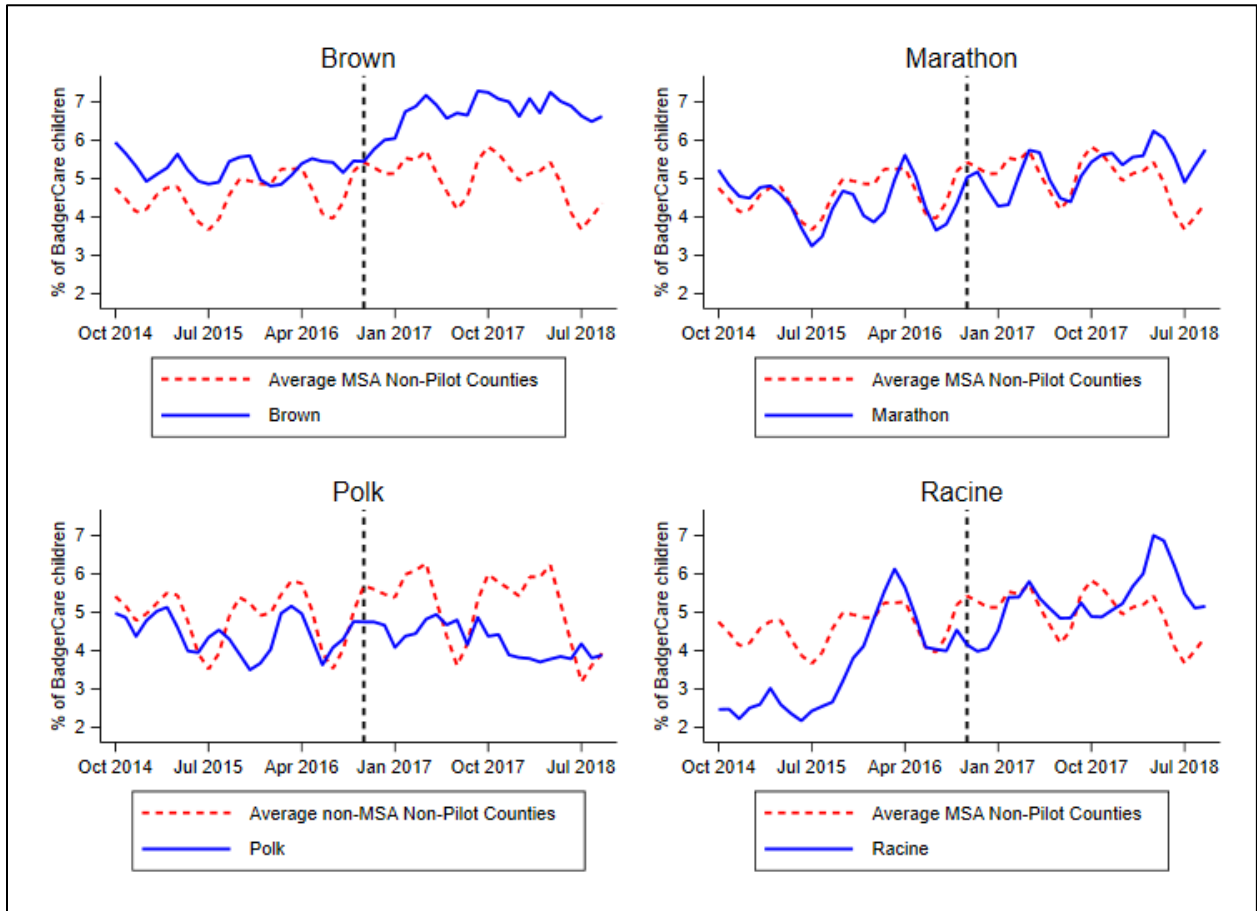
**Figure 3. Percentage of BadgerCare Children Who Reside in Each County that Received Any Dental Service in Any County**



**Figure 4. Percentage of BadgerCare Adults Who Live in Each County that Received Any Dental Service in Any County**



**Figure 5. Percentage of BadgerCare Children Who Reside in Each County that Received Preventive Service in Any County**



The percentage of adults in Polk County that received dental care remained virtually unchanged after the implementation of the program. Before the dental pilot was implemented, 4.1% of Polk County adult BadgerCare members received dental care each month, and after the program, only 3.9% did. In non-MSA, non-pilot programs, there was also no change; the percentage remained steady at about 2.6%. There was no statistically significant change in the percentage of adults in Polk County that received dental care after the pilot was implemented. (Table 8)

Similar to the increase in care to all residents and children of Racine County, the percentage of adults in Racine County who received care increased before the implementation of the pilot program, so the change cannot be linked to implementation of the pilot program.

#### **A4. Percentage of Children BadgerCare Members Who Reside in Each County and Received Preventive Services**

The increase in reimbursement rates was concentrated among children's preventive services. For this reason, we isolate the percentage of children who received preventive care in each county as an outcome.

Similar to all other outcomes, the percentage of children BadgerCare members who lived in Brown County and received preventive care increased substantially after the implementation of the program. This is shown graphically in Figure 5. Prior to the program, Brown County and the non-pilot MSA counties were very similar, but immediately after the program began, children in Brown County were much more likely to receive care. In Brown County, 5.3% of children each month received preventive services prior to the program, while 6.7% did after the program began. In the non-pilot MSA counties the percentage moved from 4.5% to 4.9%. (Table 7) Results from the estimation of Equation 1 in Table 8 show that the difference in Brown County compared to the pilot programs was 1 percentage point, which corresponds to an increase of about 19% from baseline.

In Marathon County, the percentage of children who received preventive services increased from 4.4% to 5.3%. (Table 7) However, because of the increase in non-pilot MSA counties, this increase was not statistically significant. (Table 8)

In Polk County, the percentage of children who received preventive care prior to the pilot was 4.4% and after the pilot was implemented it was 4.3%. In the non-MSA, non-pilot counties, the percent of children who received preventive care actually increased from 4.7% to 5%. (Table 7) When comparing Polk to the control groups, this was a statistically significant decrease of .5 percentage points, or 11%. (Table 8)

Racine County showed a rapid increase in children who receive preventive care prior to the start of the pilot program, so it is not possible to attribute the observed trend to the initiation of the pilot program itself.



## **A5. Percentage of Adult Resident County BadgerCare Members Who Received Emergency Services with Increased Reimbursement Rates**

The pilot program increased Medicaid reimbursement rates for eight specified emergency services for adults. The Wisconsin Medicaid program, with input from the Wisconsin Dental Association, specifically selected these services with the intention of decreasing emergency department visits for dental care. They occurred outside the hospital setting. Two counties increased the percentage of adults that received those emergency services: Brown County and Marathon County.

In Brown County, the increase occurred immediately at the start of the program. (Figure 6) Prior to the dental pilot program, about 1.5% of adults enrolled in BadgerCare living in Brown County received at least one of these emergency services each month. This increased to 3.1% after the pilot was implemented. In the non-pilot MSA counties, this percentage remained fairly flat, from 1.4% to 1.5%. (Table 7) Brown County, compared to the control counties, increased a statically significant 1.3 percentage points, or 87% of baseline. (Table 8)

In Marathon County, the increase occurred after a delay, beginning in March of 2017. The percentage of adults who received emergency services monthly increased a full percentage point -- from 0.38% to 1.38%. (Table 7) When comparing Marathon to the control counties, this represented a statistically significant increase of 0.7 percentage points, or 184% of baseline. (Table 8)

Polk County shows essentially no change in the percent of adults who received specified emergency services. Use changed from 1.7% to 1.6% monthly. For non-MSA non-pilot counties, this percent also remained flat at about 1.1% monthly. (Table 7) There was no significant change in the percentage of Polk county adults that received emergency services with increased rates after the implementation of the pilot. (Table 8)

Racine again shows large changes prior to the start of the pilot program, so it is not possible to attribute the observed trend to the initiation of the pilot program itself.

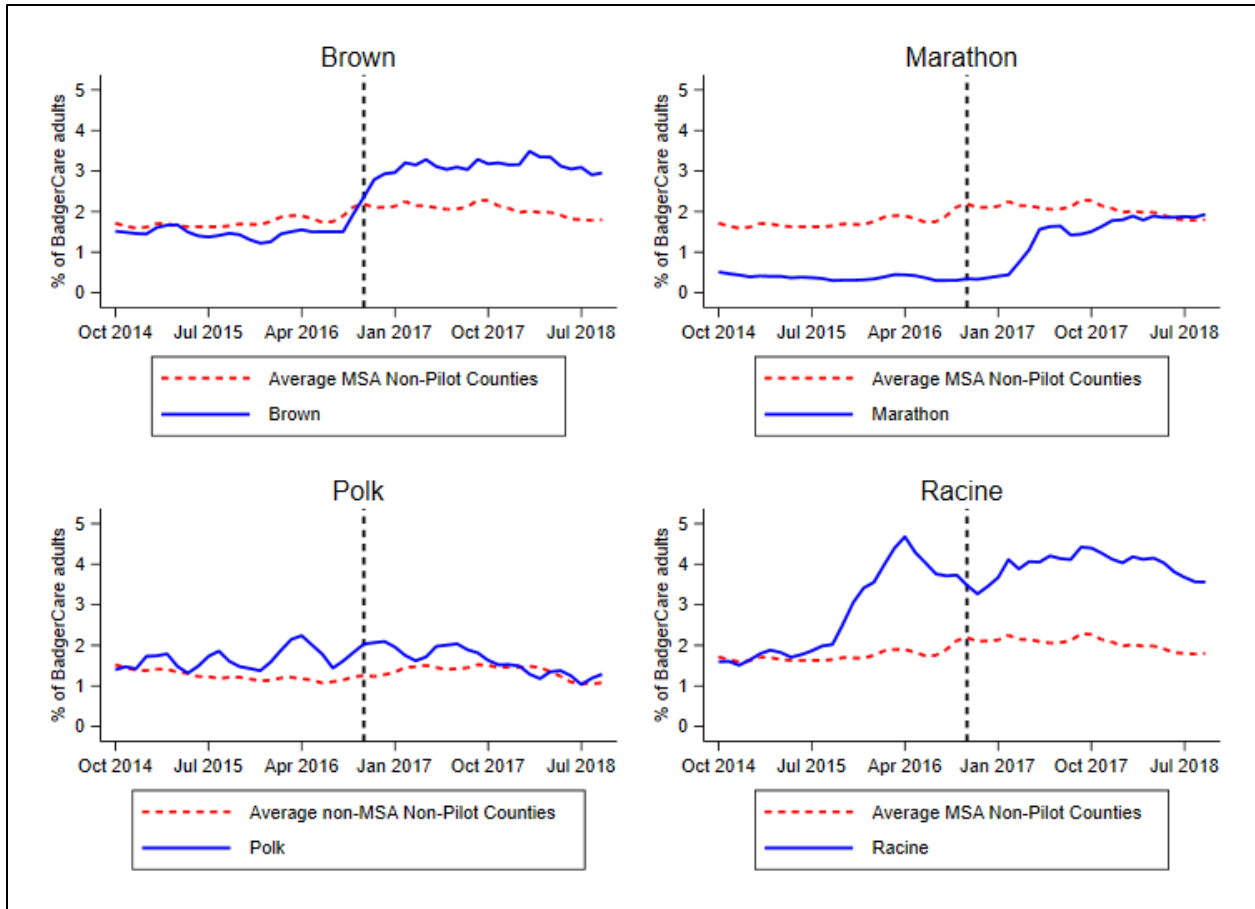
## **A6. Percentage of BadgerCare Members Who Crossed County Lines to Receive Care**

We assess the percentage of BadgerCare members living in each county that crossed county lines (out-migration) in order to receive dental care before and after the pilot went into effect. Again, we compare how these percentages changed after the pilot was implemented in pilot counties relative to the trend in non-pilot counties.

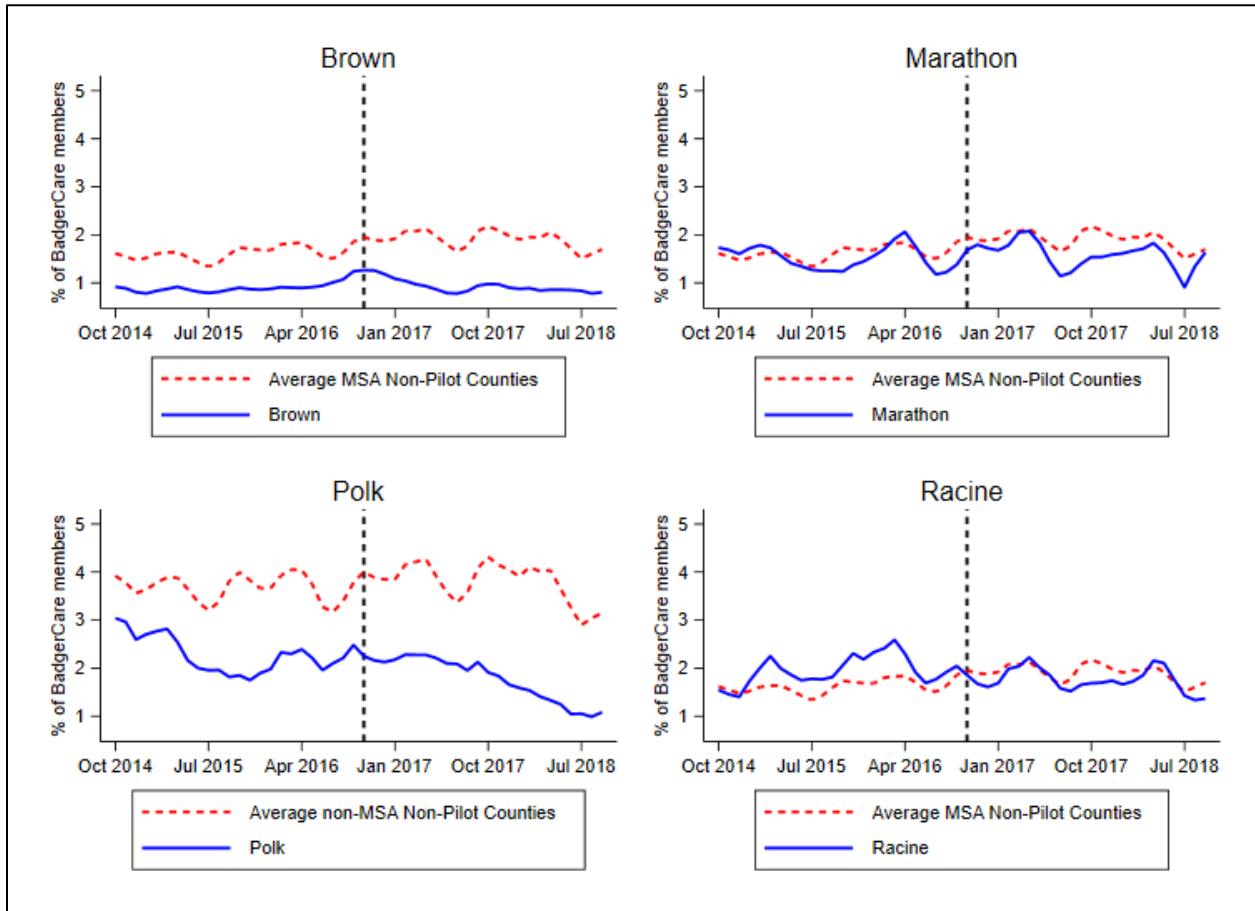
Figure 7, Figure 8, and Figure 9 show the percentage of BadgerCare members that reside in each of the pilot counties that crossed county lines to receive care, reported separately for all members, children, and adults, respectively. Table 9 shows the percentage of BadgerCare members in each county who crossed county lines to receive dental care before and after the pilot was implemented. For each

outcome that we consider, pilot counties show small changes in out-migration, while non-pilot counties show a relatively larger, although still small in magnitude, increase in out-migration.

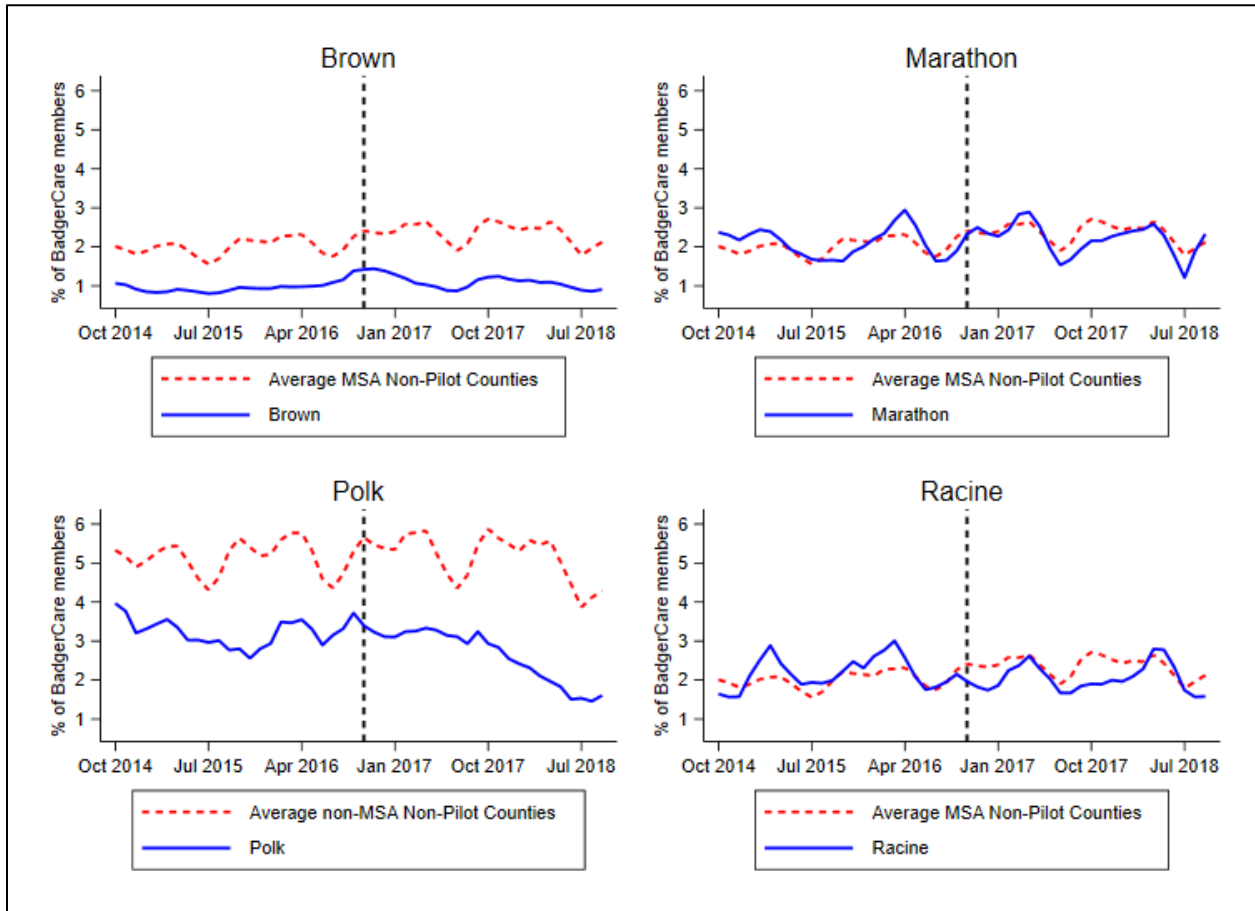
**Figure 6. Percentage of BadgerCare Adults Who Reside in Each County that Received Emergency Services with Increased Rates in Any County**



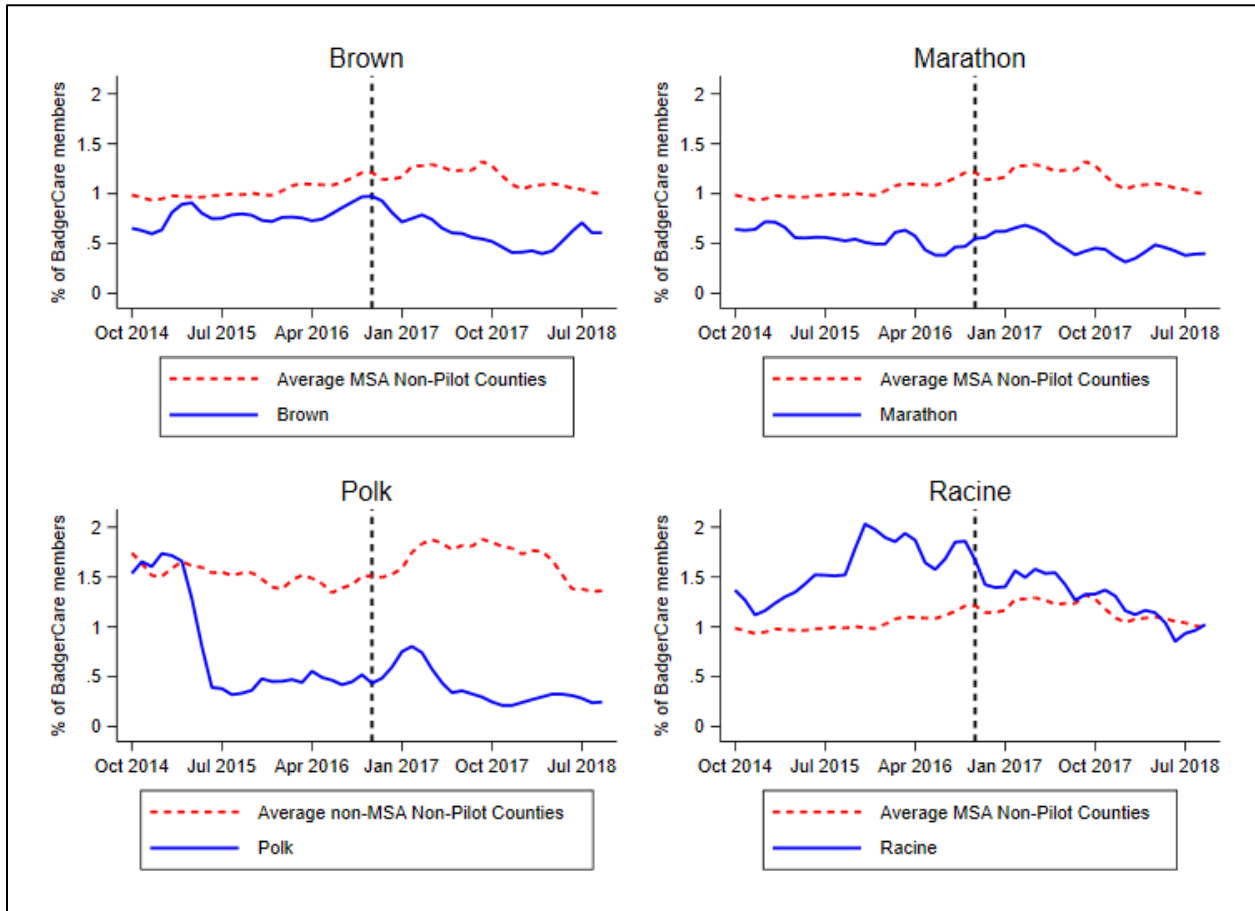
**Figure 7. Percentage of BadgerCare Members that Reside in Each County that Crossed County Lines to Receive Any Dental Service**



**Figure 8. Percentage of BadgerCare Children Who Reside in Each County that Crossed County Lines to Receive Service**



**Figure 9. Percentage of BadgerCare Adults Who Reside in Each County that Crossed County Lines to Receive Care**



**Table 9. Percent of BadgerCare Members Who Reside in Each County and Crossed County Lines for Care**

	% of Badger Care Members Who Reside in Each County and Crossed County Lines for Care		% of Badger Care Children Who Reside in Each County and Crossed County Lines for Care		% of Badger Care Adults Who Reside in Each County and Crossed County Lines for Care		% of Badger Care Children Who Reside in Each County and Crossed County Lines for Preventive Care		% of Badger Care Adults Who Reside in Each County and Crossed County Lines for Emergency Services with Increased Rates	
	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
Brown County	0.9	0.94	0.96	1.11	0.77	0.62	0.39	0.46	0.48	0.35
Marathon County	1.53	1.60	2.10	2.24	0.56	0.48	1.24	1.52	0.23	0.19
Polk County	2.29	1.78	3.24	2.64	0.8	0.39	2.10	1.71	0.34	0.14
Racine County	1.96	1.76	2.18	2.05	1.60	1.29	1.47	1.33	0.86	0.69
MSA, Non-Pilot Counties	2.52	2.98	3.31	3.89	1.27	1.47	2.11	2.60	0.63	0.8
Non-MSA, Non-Pilot Counties	3.88	3.99	5.54	5.61	1.47	1.59	3.37	3.46	0.72	0.81

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

**Table 10. Regression Results, Percent of Badger Care Members in Each County that Crossed County Lines to Receive Dental Care**

	All Ages, All Services	Children, All Services	Adults, All Services	Children, Preventive Services	Adults, Emergency Services with Increase Reimbursement
<b>Brown County</b>					
Pilot County X Post	-0.245***	-0.210***	-0.289***	-0.191***	-0.222***
95% CI, Robust Standard Errors	[-0.340, -0.149]	[-0.336, -0.084]	[-0.387, -0.192]	[-0.300, -0.082]	[-0.285, -0.158]
95% CI, Robust Standard Errors Clustered by County	[-0.373; -0.116]	[-0.352; -0.068]	[-0.424; -0.155]	[-0.334; -0.049]	[-0.309; -0.134]
<b>Marathon County</b>					
Pilot County X Post	-0.209*	-0.222	-0.208***	0.022	-0.133***
95% CI, Robust Standard Errors	[-0.425, 0.007]	[-0.547, 0.103]	[-0.287, -0.129]	[-0.296, 0.341]	[-0.177, -0.089]
95% CI, Robust Standard Errors Clustered by County	[-0.337; -0.081]	[-0.364; -0.080]	[-0.343; -0.074]	[-0.120; 0.165]	[-0.221; -0.045]
<b>Polk County</b>					
Pilot County X Post	-0.635***	-0.640***	-0.560***	-0.435**	-0.308***
95% CI, Robust Standard Errors	[-0.936, -0.335]	[-1.041, -0.239]	[-0.819, -0.300]	[-0.773, -0.097]	[-0.395, -0.221]
95% CI, Robust Standard Errors Clustered by County	[-0.886; -0.384]	[-1.039; -0.241]	[-0.715; -0.404]	[-0.748; -0.121]	[-0.418; -0.197]
<b>Racine County</b>					
Pilot County X Post	-0.484***	-0.495***	-0.447***	-0.404***	-0.267***
95% CI, Robust Standard Errors	[-0.709, -0.259]	[-0.808, -0.182]	[-0.624, -0.271]	[-0.706, -0.102]	[-0.386, -0.148]
95% CI, Robust Standard Errors Clustered by County	[-0.612; -0.356]	[-0.637; -0.353]	[-0.582; -0.313]	[-0.547; -0.261]	[-0.355; -0.179]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the percentage of Medicaid members who cross county lines to get dental service. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the percentage of BC members that reside in the control county and crossed county lines to receive dental relative to BC members in the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. We exclude FQHCs as well as observations with missing or unknown rendering provider or residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

In Brown County, prior to the start of the pilot, 0.9% of BadgerCare members crossed county lines to receive care. After the pilot was implemented, this number was essentially the same, 0.94. However, in non-pilot MSA counties, this number increased more, from 2.52 to 2.98. Results from Equation 1 show that this implies a statistically significant decrease of 0.25 percentage points of Brown County out-migration, or 28% of baseline. (Table 10) The percentage of children BadgerCare members who resided in Brown County that crossed county lines to receive dental care also changed very slightly from .96 to 1.1. However, in other non-pilot MSA counties, this number increased from 3.3 to 3.9. This implies a statistically significant decrease of 0.21 percentage points, or 22%. For adults in Brown County, this number fell from .72 to .62. In the comparison group, we found a small increase from 1.3% to 1.5%. Table 10 shows that, when comparing Brown County to other MSA counties, out-migration decreased in Brown County by 0.29 percentage points, or 40% of baseline.

Specific services in Brown County show similar patterns, with small changes in out-migration by Brown County BadgerCare members compared to relatively larger increases in out-migration by members resident in non-pilot MSA counties. It should be noted that although each of these outcomes is statistically significant, they are relatively small in magnitude. The percentage of Brown County children BadgerCare members who crossed county lines to receive care was 0.39 before pilot program implementation and was 0.46 after. In comparison, this percentage changed in non-pilot MSA counties from 2.1 to 2.6. This comparison yields a decrease of 0.19 percentage points in Brown County, relative to non-pilot MSA counties, or 49%. (Table 9) The percentage of adult BadgerCare members increased slightly, from 0.7 to 0.8, who crossed county lines in order to receive the pilot program's specified emergency care services. In non-pilot MSA counties, the percentage increased from 0.63 to 0.8. Results from Equation 1 imply that the change in Brown County compared to other non-pilot MSA counties was statistically significant decrease of 0.22 percentage points, or 31%. (Table 10)

Marathon County shows very small changes in the percentage of individuals who crossed county lines to receive care. This is true for all BadgerCare members, child members, and adult members. When comparing Marathon to the MSA non-pilot counties before and after the pilot was implemented, we find a statistically significant decrease in the percentage of all adult BadgerCare members who crossed county lines for care, of 0.21 percentage points, or 38% of baseline. Similarly, adults who received emergency services, show a decrease in Marathon County relative to the MSA non-pilot counties of 0.13 percentage points, 57% of baseline. (Table 10) However, we find that there was no statistically significant change in out-migration for Marathon county BadgerCare members or children. (Table 10)

Polk County experienced a decrease in the percentage of BadgerCare members crossing county lines, for all members, child members, and adult members. (Table 9) In addition, out-migration decreased for children who received preventive care and for adults who received pilot-specified emergency services. In the non-MSA non-pilot counties, the opposite occurred: There were small increases in the percentage of individuals who crossed county lines to receive care for each of the five groups. Thus, comparing Polk County to non-MSA non-pilot counties yields a statistically significant decrease for each group. For all BadgerCare members, there was a decrease in the percentage of Polk County BadgerCare members who



crossed county lines of 0.64 percentage points, a decline of 28%, relative to non-MSA non-pilot counties. For children, there was also a decrease of 0.64 percentage points, 20% of baseline. Polk County adults show a decrease of .56 percentage points, 70% of baseline, relative to non-MSA non-pilot counties. Children receiving preventive services show a decline of 0.44 percentage points, or 21% of baseline. Finally, Polk County adults receiving emergency services show a decrease of 0.31 percentage points in out-migration, relative to the non-MSA non-pilot counties, or 91% of baseline. (Table 10)

## **B. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?**

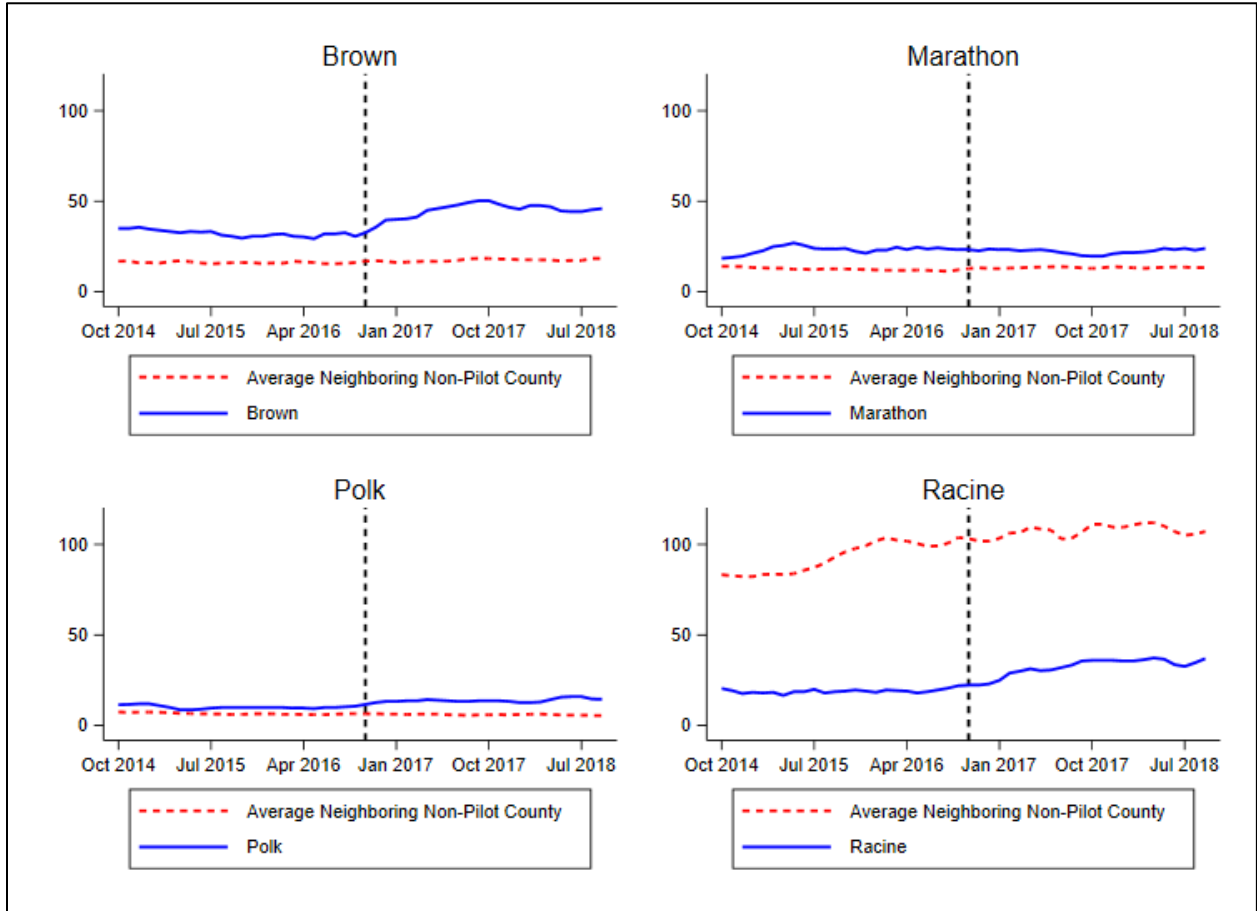
Next, we turn to the supply of care in each pilot county. Within each county, we report trends in the number of providers who saw any BadgerCare patient, regardless of the patient county of residence. We also report trends in the total number of visits rendered by each provider and the number of services per visit.

We study outcomes pertaining to 1) the volume of services provided overall, and 2) the intensity of service provision by participating providers. The first set is related to the total volume of care rendered. These outcomes include the total number of providers and visits rendered to BadgerCare members in each county.

The second set of outcomes is related to the intensity of supply from each provider. These outcomes include the total number of visits per provider, as well as the total number of services per visit for each provider. We consider each outcome separately for all BadgerCare members, child members, and adult members.

Last, we consider the total number of hospital emergency department visits for dental care in each county. One of the goals of the pilot was to increase the availability of dentists providing specified office-based emergency services to adults, thereby decreasing visits to the emergency department. We measure the trends in emergency department visits to assess the pilot's impact on this goal.

**Figure 10. Number of Providers in Each County that Rendered Care to BadgerCare Members who Reside in Any County**



## **B1. Total Number of Providers Serving Medicaid Members**

Figure 10 shows the number of providers who provided care in each county to any BadgerCare member. Brown County shows an increase at the time of pilot program implementation. Prior to the start of the program, an average of 32 providers per month served BadgerCare members. This number increased to almost 45 providers after the pilot implementation in Brown County. (Table 11) Counties that neighbor Brown County, during that time, show fewer providers serving BadgerCare members at the start, at 9.3 per month, and this number remained virtually unchanged during the time of the pilot -- reaching 9.9 in the post-pilot period. After estimating Equation 1 with the total number of providers as an outcome, we find that the number of providers rendering care to BadgerCare members in Brown County increased by 12, an increase of 34% from baseline. (Table 12)

When restricting the sample to providers that served BadgerCare children, this number increased from about 28 per month to 37.5 per month in Brown County. For adults, the number of providers increased from 26.5 to 31. (Table 11) Results from Equation 1 show that, for children, Brown County increased by 9.5 providers compared to the neighboring counties, or 34%. (Table 12) The number of providers who rendered care to BadgerCare adults in Brown County increased by 6, or 23%, relative to neighboring counties.

Marathon County shows little change in the number of providers after pilot program implementation. (Table 11) In fact, the average number of providers that served BadgerCare patients remained consistent after the pilot program took effect, while counties that are neighbors to Marathon increased slightly from 9 to 10.8 per month. (Table 11) There was no statistically significant change in the number of providers who rendered care to BadgerCare members in Marathon County. (Table 12)

Marathon County providers that served children declined slightly, from 21.5 to 20.8, while the number seeing adults increased slightly, from 10 to 11. (Table 11) In neighboring counties to Marathon, the number of providers that served any BadgerCare child increased from 8.5 to 10.3, while the number who served adults decreased slightly from 7.8 to 7.2. Comparison of Marathon to the neighboring counties shows no difference in the number of providers serving children after pilot program implementation. However, the small increase in the number of providers who served BadgerCare adults in Marathon County was a statistically significant 2.7, or 27%, difference in comparison to the slight decrease observed in neighboring counties. (Table 12)

**Table 11. Number of Providers That Rendered Services to Any BadgerCare Member in Each County**

	Number of Providers in Each County That Saw Any BadgerCare Member		Number of Providers in Each County That Saw Any BadgerCare Child Member		Number of Providers in Each County That Saw Any BadgerCare Adult Member	
	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
Brown County	32.29	44.67	27.88	37.50	26.54	31.00
Brown Neighboring Counties	9.31	9.88	7.80	8.33	7.00	6.83
Marathon County	23.25	22.33	21.5	20.79	10.08	11.00
Marathon Neighboring Counties	9.16	10.84	8.52	10.32	7.79	7.20
Polk County	10.13	13.79	9.67	13.17	9.54	11.04
Polk Neighboring Counties	4.63	4.09	4.27	3.83	3.13	2.64
Racine County	19.00	32.25	14.46	27.08	14.75	25.79
Racine Neighboring Counties	53.33	60.47	44.58	52.23	36.52	40.84

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

**Table 12. Regression Results, Number of Providers Who Rendered Services in Each County to Different Groups of BadgerCare Members who Reside in Any County**

	Providers Seeing Any BadgerCare Member	Providers Seeing Child BadgerCare Members	Provider Seeing Adult BadgerCare Members
<b>Brown County</b>			
Pilot County X Post	12.403***	9.530***	6.178***
95% CI, Robust Standard Errors	[10.087,14.720]	[7.186,11.874]	[4.327,8.029]
95% CI, Robust Standard Errors Clustered by County	[10.672; 14.135]	[8.025; 11.034]	[4.810; 7.546]
<b>Marathon County</b>			
Pilot County X Post	-1.182	-1.04	2.730***
95% CI, Robust Standard Errors	[-2.619,0.255]	[-2.451,0.370]	[1.683,3.777]
95% CI, Robust Standard Errors Clustered by County	[-5.514; 3.150]	[-5.656; 3.575]	[1.378; 4.082]
<b>Polk County</b>			
Pilot County X Post	4.242***	3.977***	1.938***
95% CI, Robust Standard Errors	[3.525,4.959]	[3.262,4.692]	[1.176,2.701]
95% CI, Robust Standard Errors Clustered by County	[3.363; 5.121]	[3.407; 4.547]	[1.422; 2.455]
<b>Racine County</b>			
Pilot County X Post	-1.553	-3.656	2.084
95% CI, Robust Standard Errors	[-6.180,3.073]	[-8.320,1.009]	[-1.992,6.160]
95% CI, Robust Standard Errors Clustered by County	[-16.616; 13.510]	[-22.341; 15.030]	[-9.053; 13.221]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the number of providers in each county that provide care to BadgerCare members. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the number of providers that rendered care in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot contiguous counties. We exclude FQHCs as well as observations with missing or unknown rendering provider or residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

Polk County shows a seemingly small increase in the number of providers who served BadgerCare members after the pilot began. (Figure 10) However, with relatively few providers at baseline, this change yields a large percentage increase. The average monthly number of providers who served any BadgerCare member was 10.1 prior to the start of the pilot and 13.8 afterwards. In the counties that neighbored Polk, the number of providers fell very slightly from 4.6 to 4.1. (Table 11) This increase in Polk County compared to the neighbors, after the pilot was implemented was statistically significant at 4.2, or 41.6% from baseline. (Table 12)

The number of providers that saw BadgerCare children increased from 9.7 to 13.2 after the pilot was implemented in Polk County, while the number of providers who rendered care to BadgerCare adults also increased, from 9.5 to 11. (Table 11) Neighboring counties show a small decrease in both the number of providers who served BadgerCare children and the number of providers who served BadgerCare adults. Both these increases in Polk County, relative to the neighboring counties, were statistically significant. For children, this increase was 4 providers per month, or 41% from baseline. For adults, this increase was 2 providers, or 21% of baseline. (Table 12)

The number of providers also increased in Racine County, but the number of providers in the neighboring counties similarly increased. (Figure 10) In Racine County, the number of providers who rendered care to BadgerCare members increased from 19 to 32.3, while in neighboring counties this number increased from 53.3 to 60.5. (Table 11) The difference of providers before and after pilot program implementation in Racine, compared to neighboring counties, is not statistically significant. (Table 12)

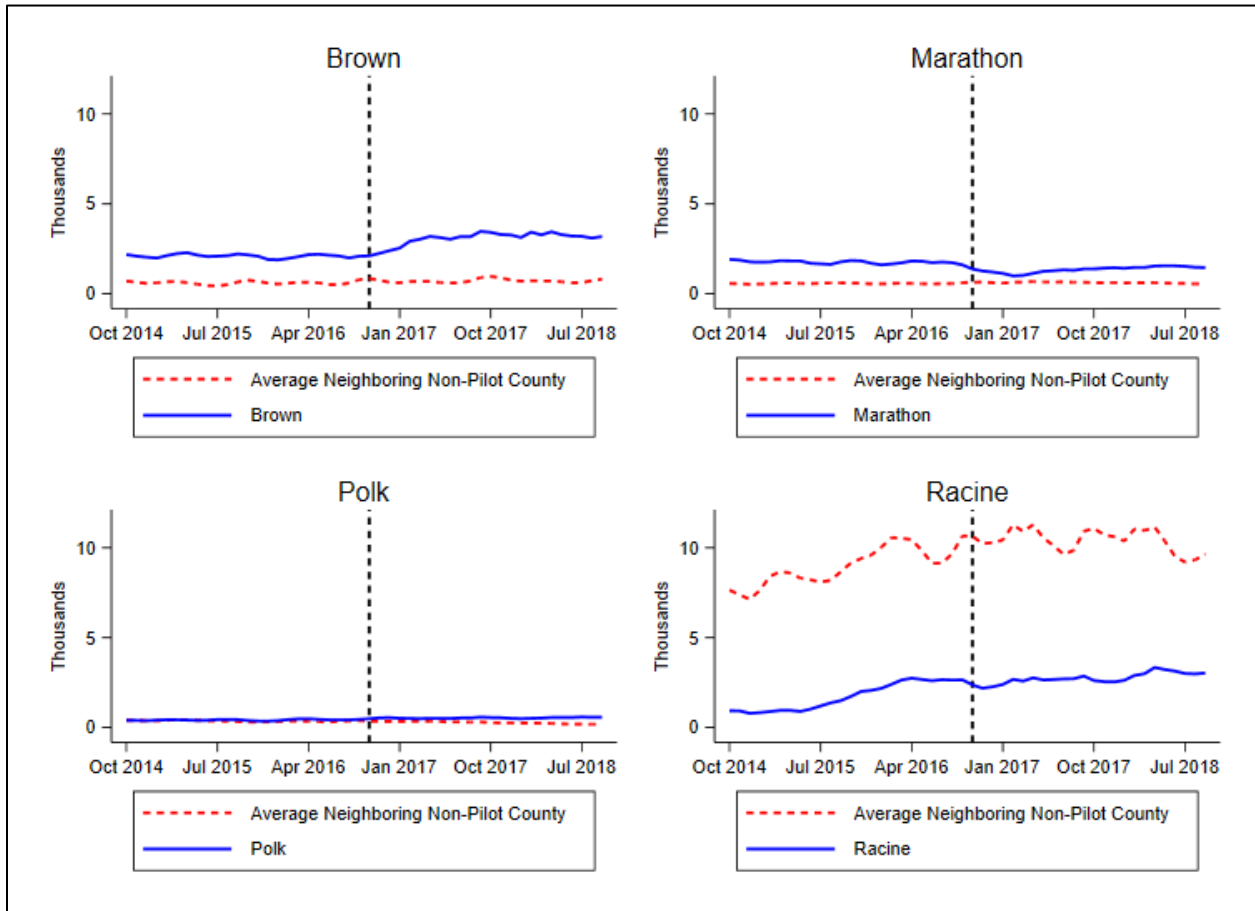
The number of providers that served BadgerCare children in Racine County increased after pilot program implementation in Racine (from 14.5 to 27) and in the neighboring counties (from 44.6 to 52.2) The number of providers serving BadgerCare adults also increased in Racine (from 14.8 to 26) and in neighboring counties (36.5 to 40.8). (Table 11) Similar to the number of overall providers, Table 12 shows no statistical difference between Racine and neighboring counties in the change in number of providers that served BadgerCare children or adults before and after pilot program implementation.

## **B2. Total Number of Visits**

Figure 11 displays the total number of visits in pilot counties and the average for the neighboring counties. Table 13 shows the total number of visits provided in each county to BadgerCare members, BadgerCare children, and BadgerCare adults for each pilot county and in the neighboring counties.

In Brown County, the total number of visits increased precipitously as soon as the program was implemented, as displayed in Figure 11. Although Brown County had more visits than its neighboring counties before the start of the pilot, both lines were relatively stable until the pilot began. Prior to the start of the pilot, Brown County shows 2,097 visits per month increasing to 3,077 after the pilot began. (Table 13) Neighboring counties show small increases, from 327 to 382. Results for Equation 1, shown in Table 14, indicate that the number of monthly visits in Brown County increased by 918, or 44%.

**Figure 11. Number of Visits Provided in Each County to BadgerCare Members who Reside in Any County**



The number of visits for children and adults similarly increased, as did overall visits in Brown County. The total number of visits to BadgerCare children increased from 1,689 to 2,327, while the total number of visits to BadgerCare adults increased from 403 to 743. In counties that neighbor Brown, the number of visits provided to BadgerCare children increased from 256 to 326. However, the number of visits to BadgerCare adults in neighboring counties decreased from 70 to 56. The number of visits for BadgerCare children in Brown County after the pilot, compared to neighboring counties, shows a statistically significant increase of 544.5, or 32% from baseline. For adults, the increase was 373, or 93%. (Tables 13 and 14)

**Table 13. Number of Total Visits for BadgerCare Members Rendered by Providers in Each County**

	Number of Visits for Any BadgerCare Member by Providers Rendered in Each County		Number of Visits for Any BadgerCare Child by Providers Rendered in Each County		Number of Visits for Any BadgerCare Adult by Providers Rendered in Each County	
	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
Brown County	2,097.17	3,077.04	1,688.79	2,326.83	403.08	742.96
Brown Neighboring Counties	326.66	382.15	256.26	325.97	69.73	54.85
Marathon County	1,769.33	1,347.13	1,722.17	1,106.29	43.75	238.29
Marathon Neighboring Counties	385.46	467.07	286.28	367.16	98.24	98.95
Polk County	421.04	535.25	274.04	386.54	145.88	146.75
Polk Neighboring Counties	216.58	159.82	170.10	131.40	45.91	27.61
Racine County	1,727.29	2,737.21	949.42	1,659.75	775.54	1,072.29
Racine Neighboring Counties	4,721.56	5,403.26	2,982.38	3,540.56	1,733.63	1,854.42

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.



**Table 14. Regression Results, Total Number of Visits to BadgerCare Members that Reside in Any County by Providers that Render Services in Each County**

	<b>Number of Visits Rendered in Each County to Any BadgerCare Member</b>	<b>Number of Visits Rendered in Each County to Children BadgerCare Members</b>	<b>Number of Visits Rendered in Each County to Adult BadgerCare Members</b>
<b>Brown County</b>			
Pilot County X Post	918.439***	544.466***	373.066***
95% CI, Robust Standard Errors	[714.044,1122.835]	[385.335,703.596]	[315.363,430.770]
95% CI, Robust Standard Errors Clustered by County	[748.007; 1088.872]	[377.289; 711.642]	[349.692; 396.441]
<b>Marathon County</b>			
Pilot County X Post	-436.941***	-647.521***	211.199***
95% CI, Robust Standard Errors	[-535.956,-337.927]	[-722.947,-572.094]	[160.107,262.290]
95% CI, Robust Standard Errors Clustered by County	[-663.514; -210.369]	[-855.085; -439.957]	[192.587; 229.810]
<b>Polk County</b>			
Pilot County X Post	201.611***	175.760***	25.456***
95% CI, Robust Standard Errors	[159.193,244.030]	[139.045,212.475]	[7.798,43.115]
95% CI, Robust Standard Errors Clustered by County	[89.829; 313.394]	[79.488; 272.032]	[8.504; 42.408]
<b>Racine County</b>			
Pilot County X Post	-486.845	-468.471**	-16.651
95% CI, Robust Standard Errors	[-1174.006,200.317]	[-931.866,-5.076]	[-266.150,232.849]
95% CI, Robust Standard Errors Clustered by County	[-2413.624; 1439.934]	[-1804.671; 867.729]	[-616.602; 583.301]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the number of visits by providers in each county to BadgerCare members. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the total number of services in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot contiguous counties. We exclude FQHCs as well as observations with missing or unknown rendering provider or residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

Marathon County's total number of visits decreased substantially at the beginning of the pilot program implementation period, as shown in Figure 11. This sharp decrease counters other findings for Marathon County, and complicates any potential inferences about the effectiveness of the pilot program. The decrease in the number of visits was entirely due to the number of visits for children decreasing. (Table 13) In a separate analysis that we conducted, we find that the entirety of this downward trend in service to children occurred because children from other counties decreased their visits into Marathon County; Visits by children in Marathon County remained unchanged.<sup>48</sup> The total number of visits for adults appears to have increased quite substantially between pre and post period. However, the difference-in-difference analysis framework relies on comparison counties that have parallel trends prior to pilot implementation, which then may diverge after the intervention. The lack of such parallel trends for Marathon County prior to implementation complicates inferences about the effects of the program for this outcome.

In Polk County, the total number of visits increased after pilot program implementation, while visits decreased in neighboring counties, as shown in Table 13. The total number of visits to BadgerCare members in Polk County increased from 421 to 535. In the counties that neighbor Polk County, the number of monthly visits fell from 217 to 160. The comparison of Polk to its neighboring counties before and after pilot program implementation, results from Equation 1, show that total visits in Polk increased by 201, or 48%. (Table 14)

The increase in the total number of visits in Polk County was driven by an increase in the number of visits for BadgerCare children, and not BadgerCare adults. The number of visits in Polk County per month for BadgerCare children increased from 274 to 387. In counties that neighbor Polk, this value fell from 170 to 131. The difference-in-difference results show that this was a statistically significant increase of 176, or 64%, in Polk, relative to its neighbor counties. However, in Polk County, the number of visits to BadgerCare adults remained steady at about 146 per month. Neighboring counties show a decrease in the number of monthly visits from 46 to 28. These results taken together -- the lack of change in Polk County accompanied by a large decrease in neighboring counties -- amount to a statistical increase in Polk County relative to the control counties. Following pilot program initiation, the number of visits for BadgerCare adults show a relative increase, compared to neighboring counties, of 25.6, or 17.5% from baseline, shown in Table 14.

In both Racine County and its neighboring counties, the total number of visits increased with pilot program implementation. (Figure 11) The total number of monthly visits to BadgerCare members in Racine County increased from 1,728 to 2,737. However, at the same time, the number of visits in neighboring counties also increased, from 4,722 to 5,403. Racine County shows no statistically significant change in the number of visits compared to its neighbor counties, as shown in Table 14.

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<sup>48</sup> Complete analyses of Medicaid members' county in-migration and out-migration for dental services are available from report authors.

The number of monthly visits to BadgerCare children in Racine County increased from 949 to 1660, while this same value increased from 2,982 to 3,541 in the counties that neighbor Racine. For adults in Racine County, the number of visits increased from 776 to 1,072. In neighboring counties, this number also increased, from 1,733 to 1,854. (Table 13) Neither the change for children nor adults was statistically different from the change in neighboring counties when clustering by county level. (Table 14)

### **B3. Visits per Provider**

Next, we turn to the number of Medicaid/BadgerCare visits per provider, a measure of how much time each provider devotes towards seeing BadgerCare patients. The number of visits per provider serves as a measure of the degree of engagement by providers with the Medicaid program. For each provider, we tally the number of BadgerCare patients that reside in any county to whom the provider rendered care to in each month.

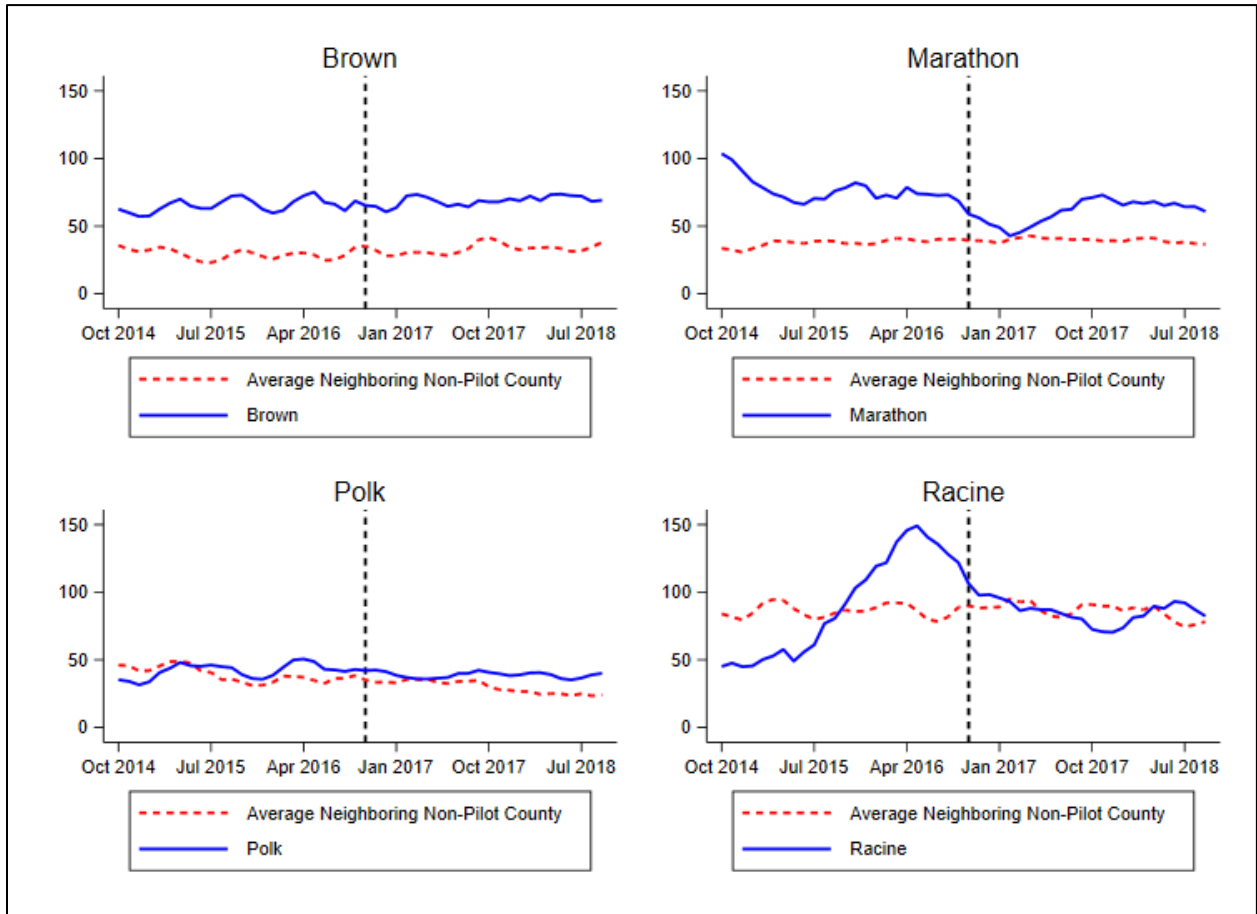
Figure 12 shows the number of visits for all BadgerCare members per provider in each pilot county and per provider in the control group of neighboring counties. In Brown County, this measure of engagement is relatively flat. Both Marathon and Racine Counties show large changes prior to the pilot program that preclude the ability to link the observed trend to the pilot program. Polk County shows a small increase in the number of visits per provider.

Table 15 displays the average total number of visits per provider in the two years prior to pilot program implementation, and the two years after the pilot program initiation. Results from Equation 1 are shown in Table 16.

Brown County shows no statistically significant change in the number of visits per provider for all BadgerCare members and for BadgerCare children relative to its neighboring counties. However, the number of BadgerCare adult visits increased by 10.8 visits per provider, or an increase from baseline of 65.3 visits per provider of 70.5%.

Polk County shows a decrease in the number of overall visits per provider. However, the counties that neighbor Polk showed a larger decrease for all BadgerCare members, children, and adults. For example, the total number of visits per provider in Polk County fell slightly after pilot program implementation, from 42.1 to 39. However, in the counties that neighbor Polk, this value fell from 27 to 19.8. Thus, the change in number of visits per provider in Polk County in comparison to the neighboring counties, yields a relative *increase* in Polk County of 6.4 visits per provider, or 15%. A comparison of visits per provider for children and adults yields similar results: a small change in Polk County accompanied by a large decrease in neighboring counties. Taken together, this amounts to an increase in Polk County relative to the control counties. The number of visits for child BadgerCare members per provider show a relative increase of 7.6 (26.5%) and visits for adult BadgerCare members per provider show a relative increase of 2.9 (18.7%)

**Figure 12. Number of Visits per Provider that Provided Service in Each County to BadgerCare Members that Reside in Any County**



**Table 15. Visits for BadgerCare Members per Providers that Render Service in Each County**

	Visits for BadgerCare Members per Provider that Render Care in Each County		Visits for BadgerCare Child Members per Provider that Render Care in Each County		Visits for BadgerCare Adult Members per Provider that Render Care in Each County	
Brown County	65.30	69.00	61.04	62.53	15.25	24.06
Brown Neighboring Counties	18.24	20.66	16.49	20.50	5.70	4.43
Marathon County	77.19	60.75	81.35	53.55	4.41	21.51
Marathon Neighboring Counties	28.91	33.72	21.83	27.77	9.73	10.86
Polk County	42.10	38.94	28.72	29.4	15.51	13.38
Polk Neighboring Counties	26.99	19.75	21.17	16.3	10.05	5.71
Racine County	90.81	85.89	63.66	61.78	52.26	43.91
Racine Neighboring Counties	70.81	72.46	60.04	60.18	30.80	27.92

NOTE: Numbers are calculated as average per month. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

**Table 16. Regression Results, Visits to BadgerCare Members Residing in Any County per Provider Rendering Service in Each County**

	Visits to BadgerCare Members per Provider Rendering Service in Each County	Visits to BadgerCare Children per Provider Rendering Service in Each County	Visits to BadgerCare Adults per Provider Rendering Service in Each County
<b>Brown County</b>			
Pilot County X Post	2.138	-2.143	10.753***
95% CI, Robust Standard Errors	[-2.912,7.189]	[-7.544,3.258]	[8.623,12.882]
95% CI, Robust Standard Errors Clustered by County	[-2.927; 7.204]	[-6.679; 2.392]	[7.900; 13.606]
<b>Marathon County</b>			
Pilot County X Post	-16.250***	-29.902***	16.807***
95% CI, Robust Standard Errors	[-22.608,-9.892]	[-35.866,-23.938]	[12.148,21.466]
95% CI, Robust Standard Errors Clustered by County	[-18.476; -14.025]	[-33.311; -26.493]	[14.485; 19.129]
<b>Polk County</b>			
Pilot County X Post	6.357***	7.593***	2.881**
95% CI, Robust Standard Errors	[1.756,10.957]	[3.883,11.304]	[0.491,5.272]
95% CI, Robust Standard Errors Clustered by County	[-1.338; 14.051]	[0.426; 14.760]	[0.692; 5.071]
<b>Racine County</b>			
Pilot County X Post	-5.502	-2.286	-5.351
95% CI, Robust Standard Errors	[-22.420,11.416]	[-13.993,9.420]	[-14.477,3.776]
95% CI, Robust Standard Errors Clustered by County	[-7.929; -3.075]	[-3.735; -0.838]	[-7.024; -3.678]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the number of visits to BadgerCare Members per providers that render care in each county. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the number of visits to BC Members per provider in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot contiguous counties. We exclude FQHCs as well as observations with missing or unknown rendering provider or member’s residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

#### **B4. Number of Services per Visit**

Next, we consider how providers responded within each visit to the change in reimbursement rates. We look at the number of services provided per visit in each pilot county to BadgerCare members.

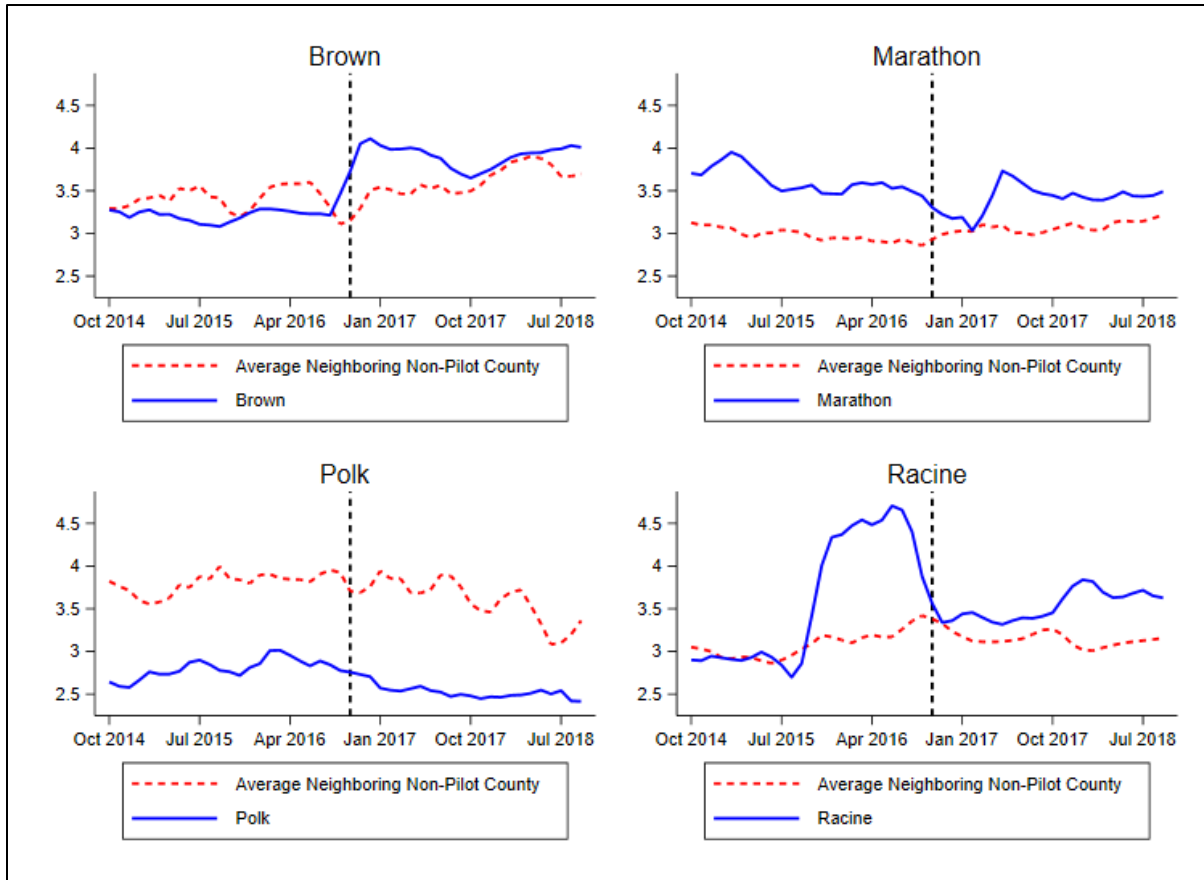
Figure 13 shows the number of services per visit for providers that render care in each county to BadgerCare members that reside in any county. Table 17 displays services per visit for care rendered in each county to BadgerCare members in the two years prior to pilot program implementation, and the two years after the pilot program initiation. Results from Equation 1 are shown in Table 18.

Figure 13 shows that Brown County had a substantial increase in the number of services per visit immediately at the start of the pilot. However, the same pattern was not observed in other counties. Marathon County shows a general downward trend prior to start of program, which makes inference about the effect of the program difficult. Racine County also shows a large and shifting change in the number of services per visit that, due to the timing, cannot be attributed the pilot program.

In Brown County, the number of services per visit increased from 3.2 to 3.9 after pilot program implementation. For BadgerCare children, the number of services per visit increased from 3.5 to 3.9 in the two-year period after pilot program implementation. For BadgerCare adults, the number of services per visit increased from 2.2 to 4 after the pilot. The counties that neighbor Brown County show a very small increase in the number of services per visit for all BadgerCare members, children and adults, as shown in Table 17. Table 18 shows that Brown County experienced an increase in the number of services per visit, for all groups, when compared to their neighboring counties. For all BadgerCare members, the increase was 1.7 services per visit. For children BadgerCare members, there was an increase of 1.9 services per visit due to the pilot program, and for adult BadgerCare members, there was an increase of 1.5 services per visit.

In Polk County, the number of services per visit remained mostly unchanged for each of the groups. For all BadgerCare members, the number of services per visit changed from 2.8 to 2.5 after pilot program implementation. For children, the number of services per visit slightly increased from 2.5 to 2.75, while the number of services per visit for adults did not change. The control counties that neighbor Polk show no change in the number of services per visit. The comparison of Polk County to the neighboring counties yields no statistically significant change in the number of services per visit for any group. (Table 18)

**Figure 13. Number of Services per Visit for Providers that Render Care in Each County to BadgerCare Members that Reside in Any County**





**Table 17. Services per Visit for Dental Care Rendered in Each County to BadgerCare Members**

	Services per Visit for Care rendered in Each County to BadgerCare Members that Reside in Any County		Services per Visit for Care rendered in Each County to BadgerCare Children that Reside in Any County		Services per Visit for Care rendered in Each County to BadgerCare Adults that Reside in Any County	
Brown County	3.22	3.92	3.45	3.90	2.24	4.00
Brown Neighboring Counties	3.14	3.30	3.21	3.23	2.29	2.68
Marathon County	3.62	3.40	3.63	3.51	3.05	2.98
Marathon Neighboring Counties	2.99	3.22	3.05	3.31	2.66	2.57
Polk County	2.80	2.53	2.75	2.44	2.91	2.78
Polk Neighboring Counties	3.25	3.22	3.46	3.34	2.27	2.00
Racine County	3.61	3.53	4.01	4.03	3.10	2.76
Racine Neighboring Counties	2.65	2.66	2.81	2.80	2.48	2.46

**Table 18. Regression Results, Services per Visit for Care Rendered in Each County to BadgerCare Members Residing in Any County**

	<b>Visits to BadgerCare Members per Provider Rendering Care in Each County</b>	<b>Visits to BadgerCare Children per Provider Rendering Care in Each County</b>	<b>Visits to BadgerCare Adults per Provider Rendering Care in Each County</b>
<b>Brown County</b>			
Pilot County X Post	1.721***	1.891***	1.482***
95% CI, Robust Standard Errors	[1.587,1.856]	[1.705,2.077]	[1.254,1.710]
95% CI, Robust Standard Errors Clustered by County	[1.331; 2.112]	[1.582; 2.200]	[0.638; 2.326]
<b>Marathon County</b>			
Pilot County X Post	-0.282***	-0.155**	0.129
95% CI, Robust Standard Errors	[-0.408,-0.156]	[-0.303,-0.007]	[-0.230,0.488]
95% CI, Robust Standard Errors Clustered by County	[-0.488; -0.076]	[-0.431; 0.122]	[-0.020; 0.278]
<b>Polk County</b>			
Pilot County X Post	-0.055	0.028	-0.069
95% CI, Robust Standard Errors	[-0.248,0.137]	[-0.230,0.286]	[-0.226,0.088]
95% CI, Robust Standard Errors Clustered by County	[-0.803; 0.692]	[-0.827; 0.882]	[-0.416; 0.277]
<b>Racine County</b>			
Pilot County X Post	-0.165	-0.03	-0.420***
95% CI, Robust Standard Errors	[-0.511,0.181]	[-0.511,0.450]	[-0.606,-0.234]
95% CI, Robust Standard Errors Clustered by County	[-0.410; 0.080]	[-0.261; 0.200]	[-0.748; -0.093]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the number of services per visit for care rendered in each county to BadgerCare members that reside in any county. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the number of services per visit for providers who render care in the pilot county relative to control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot contiguous counties. We limit the sample to providers of type Dentist. We exclude FQHCs as well as observations with missing or unknown rendering provider or member’s residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

## **B5. Total Number of Emergency Department Dental-Related Visits Provided**

We now consider the total number of hospital setting emergency department visits for dental care rendered in each county to BadgerCare members that reside in any county. To identify these visits, we use the entire universe of Medicaid claims data (not just dental). We mark observations with procedure codes 99281-99285, which indicate an emergency department setting.<sup>49</sup> We use ICD-9 codes 520 - 529 and ICD-10 codes K00 - K14 (diseases of the oral cavity, salivary glands and jaw) to identify dental diagnosis codes. We keep only those observations that have an ED procedure code and have at least one dental diagnosis code. There may be many diagnosis codes per visit, but there needs to be at least one dental among them for us to classify the visit as a dental visit. We collapse multiple services in the same day by the same person to a single visit. More specifically, if a person has more than one ED service in a day, we take the total amount paid for all ED services that day and collapse to one visit. We count the number of visits by rendering provider county and month, for everyone, for only children and for only adults.

We use this as a measure of potentially avoidable treatment (and cost) if a Medicaid member is receiving adequate regular dental service. If access to services improves for Medicaid members in pilot counties for office-based dental care, as contemplated by the Wisconsin Dental Association in recommending the payment changes for adult services, then we might expect to see a decrease in the total volume of emergency department visits.

Brown County shows a gradual decrease in the total number of emergency service visits, as do the comparison (MSA non-pilot) counties, for the entire evaluation period. Monthly emergency service visits in Brown County fell from 166 prior to the pilot to 101 after the pilot was implemented. In the MSA non-pilot counties, the number of services fell from 278 to 220. Results from the estimation of Equation 1 show no difference in Brown County relative to the MSA non-pilot counties. (Table 20) The change in emergency visits for children and adults in Brown County relative to the comparison counties was also not statistically significant, depending on how the standard errors were calculated.

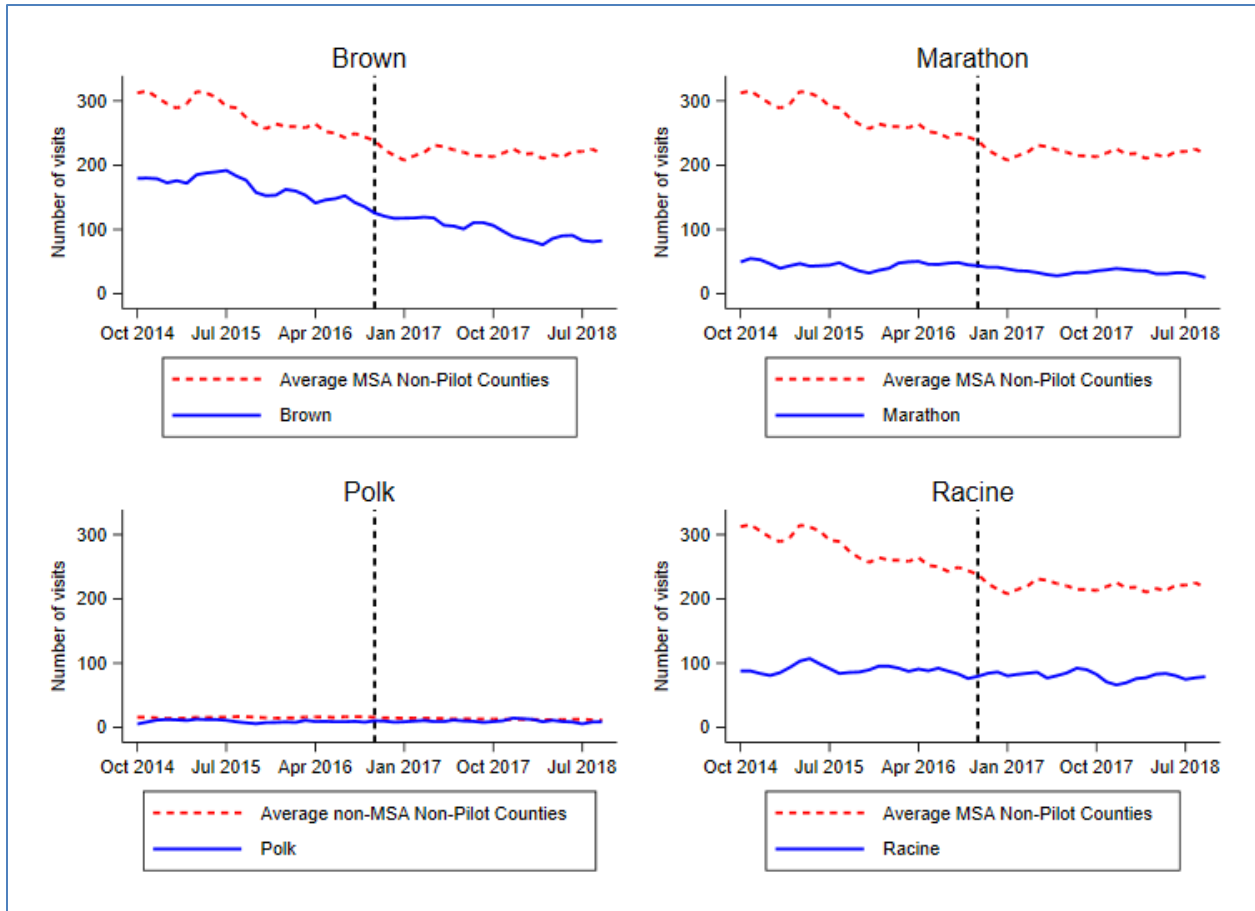
Marathon County did not experience the decline in emergency visits, even while the MSA non-pilot counties did. It is not possible to attribute any changes for this outcome to the pilot. This is also true for Racine County.

In Polk County, the number of emergency visits was flat before and after the pilot was implemented. Prior to the pilot, the number of monthly emergency visits was 9.6, while after the pilot there were 10 per month. In the non-MSA non-pilot counties, there were 16 monthly visits prior to the pilot and 13.4 after the pilot. Comparing Polk to the non-MSA non-pilot counties, we find a small increase in the number of emergency visits in Polk County of 2.9. This increase was entirely concentrated in an increase in monthly emergency services for adults, which increased by 2.6.

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<sup>49</sup> This analysis does not include free standing emergency rooms not attached to hospitals.

**Figure 14. Number of Emergency Department Visits for Dental Care per Month that Was Rendered in Each County to BadgerCare Members**



**Table 19. Number of Emergency Department Visits for Dental Care per Month that Was Rendered in Each County to BadgerCare Members**

	Number Emergency Services Provided to Any BadgerCare Member		Number Emergency Services Provided to Child BadgerCare Members		Number Emergency Services Provided to Adult BadgerCare Members	
	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot
Brown County	165.9	100.7	27.7	24.7	138.2	76.0
Marathon County	45.1	34.4	6.3	5.7	38.8	28.7
Polk County	9.6	10.0	2.8	2.5	6.9	7.6
Racine County	89.8	80.6	18.0	21.2	71.8	59.4
MSA, Non-pilot Counties	277.9	219.7	66.4	56.8	211.5	162.7
Non-MSA, Non-pilot Counties	15.8	13.4	3.3	2.6	12.5	10.7

NOTE: We identify ED visits using procedure codes 99281-99285. We identify visits with dental diagnosis using ICD-9 codes 520-529 and ICD-10 codes K00-K14. These codes represent diseases of oral cavity, salivary glands, and jaws. All values are weighted by county population.

**Table 20. Regression Results, Number of Emergency Department Visits for Dental Care per Month to BadgerCare Members that Reside in Any County that Was Rendered in Each County**

	All	Child	Adult
<b>Brown County</b>			
Pilot County X Post	-9.41	5.774**	-15.204*
95% CI, Robust Standard Errors	[-27.200,8.379]	[0.981,10.566]	[-30.494,0.086]
95% CI, Robust Standard Errors Clustered by County	[-77.625; 58.804]	[-6.767; 18.314]	[-70.971; 40.562]
<b>Marathon County</b>			
Pilot County X Post	45.097***	8.245***	36.916***
95% CI, Robust Standard Errors	[30.320,59.874]	[4.641,11.849]	[24.459,49.372]
95% CI, Robust Standard Errors Clustered by County	[-23.118; 113.312]	[-4.296; 20.785]	[-18.851; 92.682]
<b>Polk County</b>			
Pilot County X Post	2.917**	0.358	2.568***
95% CI, Robust Standard Errors	[0.667,5.167]	[-0.689,1.405]	[0.693,4.443]
95% CI, Robust Standard Errors Clustered by County	[1.006; 4.828]	[-0.116; 0.832]	[1.014; 4.122]
<b>Racine County</b>			
Pilot County X Post	46.635***	12.076***	34.622***
95% CI, Robust Standard Errors	[31.195,62.074]	[7.549,16.604]	[21.880,47.364]
95% CI, Robust Standard Errors Clustered by County	[-21.580; 114.849]	[-0.464; 24.617]	[-21.145; 90.388]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the number of emergency service visits in each rendering county. We identify ED visits using procedure codes 99281-99285. We identify visits with dental diagnosis using ICD-9 codes 520-529 and ICD-10 codes K00-K14. These codes represent diseases of oral cavity, salivary glands, and jaws. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in the number of ED visits for dental care in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot MSA/non-MSA counties. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01

## C. How much did the program cost, and did it result in any cost savings?

### C1. Total Outlays for the First Two Years

In this section, we compute the total amount that the state has paid for dental services in the two-year period that includes October 2016 through September 2018. We show total amounts for services rendered in each pilot county. In addition, we show total outlays specifically for the services that were marked for increased Medicaid reimbursement rates.

Table 21 shows the total value of dental payments made for services rendered in each pilot county. We show payments made (in nominal dollars, not adjusted for inflation) for the pre-pilot period, as well as the first year of the pilot, the second year of the pilot, and the combined values of the pilot. We also show the percent change for each county. In non-pilot MSA counties, total dental payments increased by 13% and in non-MSA non-pilot counties, total dental payments increased by 12% from the pre-pilot period to the two years post pilot. The increase was much larger in the pilot counties.

Brown County increased total dental payments from \$5,752 to \$16,735 (thousand), or 191% after pilot program implementation. In Marathon County, total payments increased just 33%, from \$5,794 to \$7,711 (thousand). In Polk, total payments increased from \$1,079 pre-pilot to \$2,388 (thousand) post-pilot, a 121% increase. Racine County experienced the largest total increase, where payments grew from \$4,947 to \$16,109 (thousand), or 226%.

Table 22 shows the total payments for services, with the pilot program's increased rates. The changes in spending on services with increased rates is similar in pattern to the changes shown in total dental spending. Non-pilot MSA counties increased total payments for these dental services by 11% and non-MSA, non-pilot counties increased payments by 15%. Pilot counties experienced much larger increases in payments. Brown County increased 212% in payments for services, with the increased rates between the pre- and post-pilot periods. Marathon County had a smaller increase, but still larger than the non-pilot counties, at 38%. Polk County increased 110% and Racine County increased 218%.

**Table 21. Total Payments (\$1000s) for Dental Services Rendered in Each County**

	<b>Pre-Pilot</b>	<b>Year 1 of Pilot</b>	<b>Year 2 of Pilot</b>	<b>Total Post-Pilot</b>	<b>Percent Change</b>
Brown County	5,752	7,746	8,989	16,735	191%
Marathon County	5,794	3,590	4,121	7,711	33%
Polk County	1,079	1,150	1,238	2,388	121%
Racine County	4,947	6,708	9,401	16,109	226%
MSA, Non-pilot Counties	4,437	2,528	2,477	5,005	13%
Non-MSA, Non-pilot Counties	352	202	192	394	12%

NOTE: The pre-pilot period is defined as October 2014 – September 2016. Year 1 of the pilot is defined as October 2016 – September 2017. Year 2 of the pilot is defined as October 2017 – September 2018.

**Table 22. Total Payments (\$1000s) for Dental Services with Increased Reimbursement Rates Rendered in Each County**

	<b>Pre-Pilot</b>	<b>Year 1 of Pilot</b>	<b>Year 2 of Pilot</b>	<b>Total Post-Pilot</b>	<b>Percent Change</b>
Brown County	5,211	7,459	8,772	16,231	212%
Marathon County	4,879	3,125	3,621	6,746	38%
Polk County	903	951	943	1,894	110%
Racine County	4,868	6,583	8,921	15,503	218%
MSA, Non-pilot Counties	4,062	2,296	2,229	4,525	11%
Non-MSA, Non-pilot Counties	316	186	177	363	15%

NOTE: The pre-pilot period is defined as October 2014 – September 2016. Year 1 of the pilot is defined as October 2016 – September 2017. Year 2 of the pilot is defined as October 2017 – September 2018.



## C2. Changes in Payments per Member

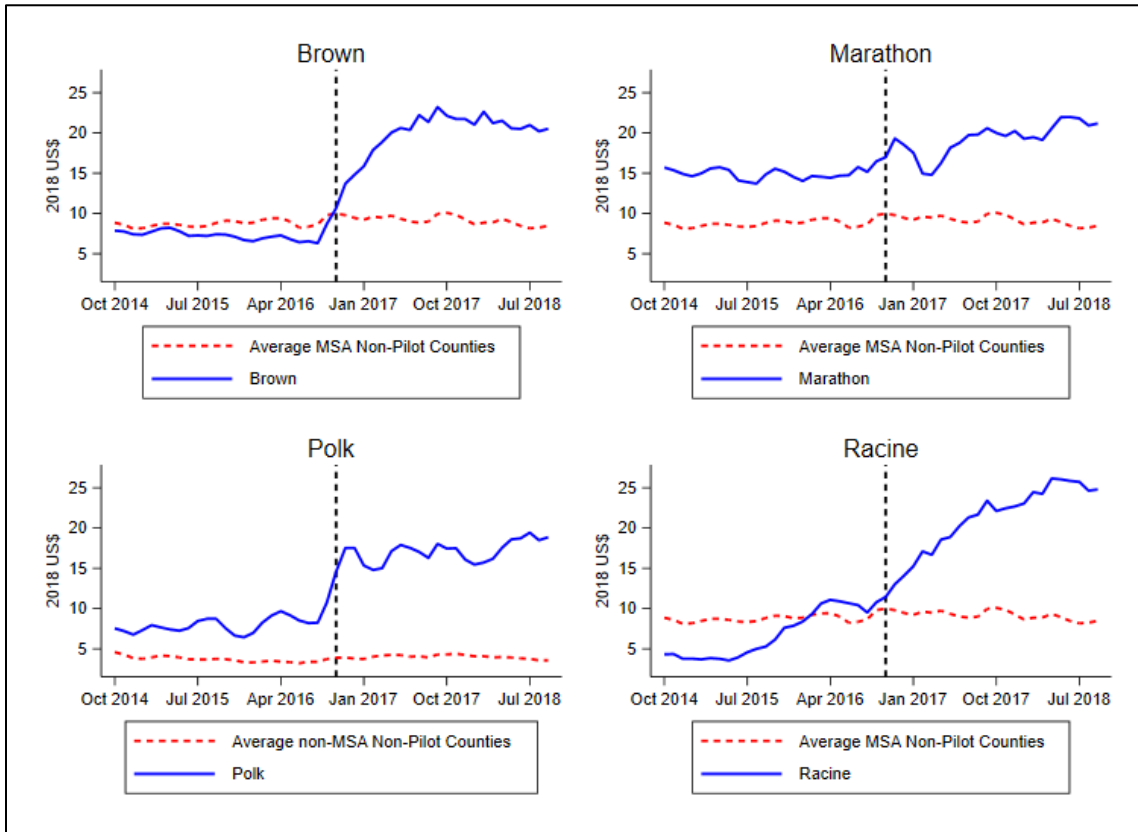
In this section, we show how payments per member changed with implementation of the pilot program. For each pilot county, we compare payments per member (standardized to 2018 dollars using the Medical Care CPI) to the control group that consists of MSA and non-MSA counties.

To calculate per capita dental payments, we sum the total payments made for dental services provided in each pilot county and divide by the number of BadgerCare members that reside in that county. Figure 14 shows these values for each of the pilot counties and for the control counties. We convert all payments to 2018 dollars using the medical care CPI. Per capita dental payments reflect payments made for Medicaid members who received/used services. The payments increase mechanically due to the nature of the pilot program, and these per capita payments will also increase as the intensity of service provision (number of services per patient) increases. Counties that experienced a mechanical increase in payments but did not increase the number of services delivered to Medicaid members would not show the same kind of increase as would counties that increase the number of services delivered to Medicaid members.

Brown County shows a substantial increase in per-capita dental payments immediately at the start of the pilot program. (Figure 15) For all BadgerCare members, prior to the start of the program, the per-capita dental payments were about \$7.22 per month. However, in the two years since the start of the program, this value increased to about \$19.85. (Table 23) Non-pilot MSA counties show no marked increase. Payments were \$8.76 prior to the program and \$9.22 after the start of the program. Results from Equation 1, comparing the change in per-capita dental payments in Brown County after pilot program implementation to the change in payments in non-pilot MSA counties show that payments increased by a statistically significant \$11.83, or 61% from baseline. (Table 24)

Per-capita dental payments for both children and adults also increased in Brown County after the pilot went into effect. (Figure 16 and Figure 17) For children, monthly payments increased from \$9.90 to \$24.58 and for adults this value increased from \$2.64 to \$11.38 per month. (Table 23). Per-capita payments for children increased slightly in non-pilot MSA counties, from \$10.73 to \$11.50. However, for adults, they were unchanged, from \$5.91 to \$5.84. The pilot increased per-capita payments for children in Brown County relative to the non-pilot MSA counties by \$13.66, 137% of baseline. For adults, the increase was \$8.33, or 315% of baseline. (Table 24)

**Figure 15. Per Capita Dental Payments for Services Rendered in Each County to BadgerCare Members per BadgerCare Member that Reside in that County**



NOTE: All figures are in 2018 real-dollars, inflated using the medical care CPI.

**Table 23. Per-Capita Dental Payments for Services Rendered in Each County per BadgerCare Member in Each County**

	Per-capita Dental Payments for Services Rendered to BadgerCare Members in Each County		Per-capita Child Dental Payments for Services Rendered to BadgerCare Children in Each County		Per-capita Adult Dental Payments for Services Rendered to BadgerCare Adults in Each County	
	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot
Brown County	7.22	19.85	9.90	24.58	2.64	11.38
Marathon County	14.91	19.28	23.09	25.94	1.37	7.55
Polk County	7.93	17.10	7.78	21.41	8.15	10.13
Racine County	6.75	21.04	5.86	24.14	8.08	16.05
MSA, Non-pilot Counties	8.76	9.22	10.73	11.49	5.91	5.84
Non-MSA, Non-pilot Counties	3.70	4.02	4.26	4.98	3.22	3.05

NOTE: All values are in 2018 real-dollars, inflated using the medical care CPI and are weighted by county population. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018.

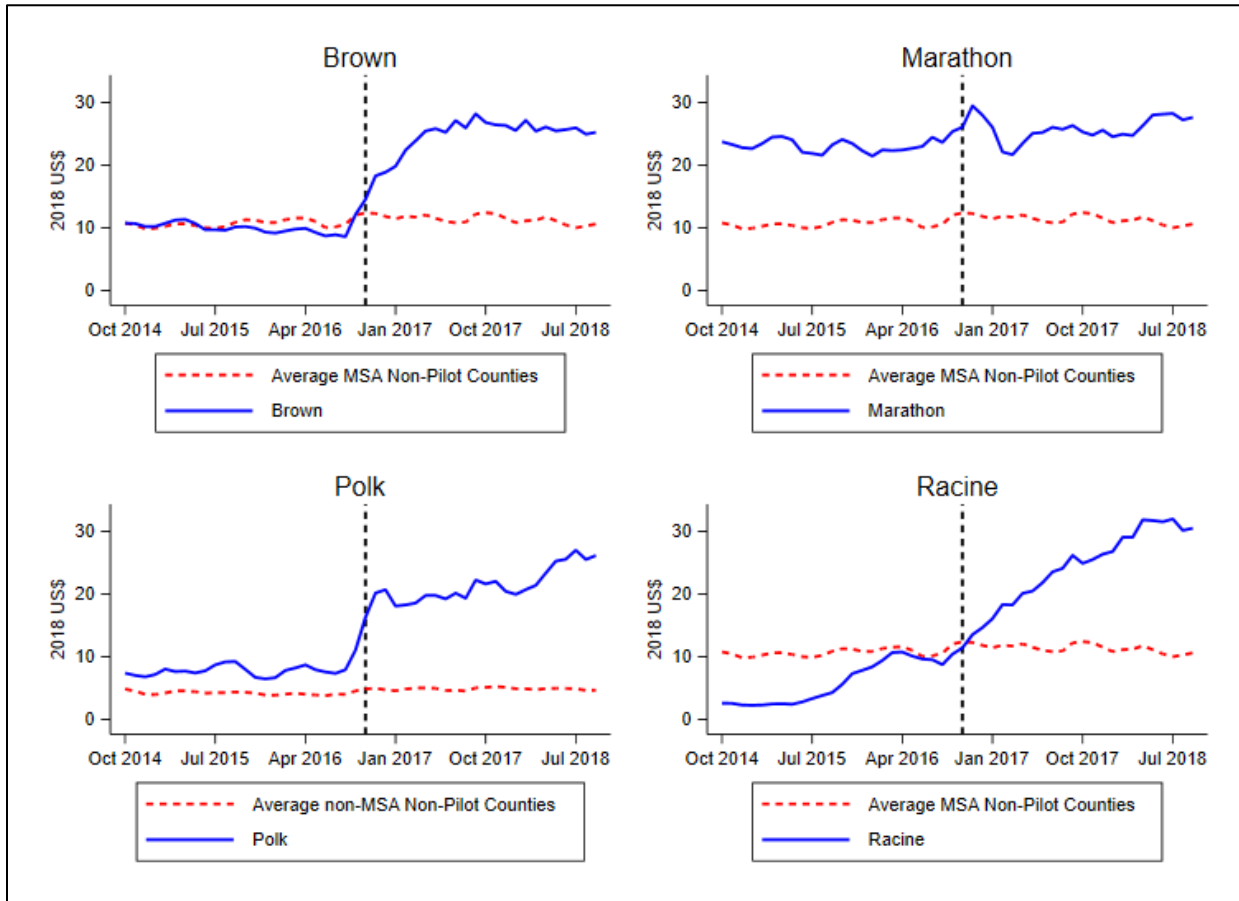
**Table 24. Regression Results, Per Capita Dental Payments for Services Rendered in Each County per BadgerCare Member in Each County**

	All	Child	Adult
<b>Brown County</b>			
Pilot County X Post	11.834***	13.662***	8.334***
95% CI, Robust Standard Errors	[10.400, 13.269]	[12.052, 15.271]	[7.122, 9.546]
95% CI, Robust Standard Errors Clustered by County	[11.141; 12.528]	[12.660; 14.664]	[7.269; 9.399]
<b>Marathon County</b>			
Pilot County X Post	4.552***	3.427***	5.736***
95% CI, Robust Standard Errors	[3.365,5.740]	[2.047,4.807]	[4.262,7.209]
95% CI, Robust Standard Errors Clustered by County	[3.859; 5.245]	[2.425; 4.429]	[4.671; 6.801]
<b>Polk County</b>			
Pilot County X Post	9.034***	13.038***	2.550***
95% CI, Robust Standard Errors	[8.094,9.974]	[11.520,14.556]	[1.271,3.829]
95% CI, Robust Standard Errors Clustered by County	[8.485; 9.583]	[12.160; 13.915]	[2.102; 2.998]
<b>Racine County</b>			
Pilot County X Post	13.342***	16.712***	8.037***
95% CI, Robust Standard Errors	[11.085,15.598]	[13.711,19.714]	[6.645,9.429]
95% CI, Robust Standard Errors Clustered by County	[12.649; 14.035]	[15.710; 17.714]	[6.972; 9.102]

NOTE: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the total payments in each county per BC enrollee in the rendering county, in 2018 real-dollars, inflated using the medical care CPI. Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in per capita dental payments for services rendered in the pilot county relative to the control counties. The pre-pilot period is defined as October 2014 – September 2016. The post-pilot period is defined as October 2016 – September 2018. We exclude FQHCs as well as observations with missing or unknown rendering provider or member’s residence county. Observations where the rendering provider or residence county is tribal land are also excluded. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering.

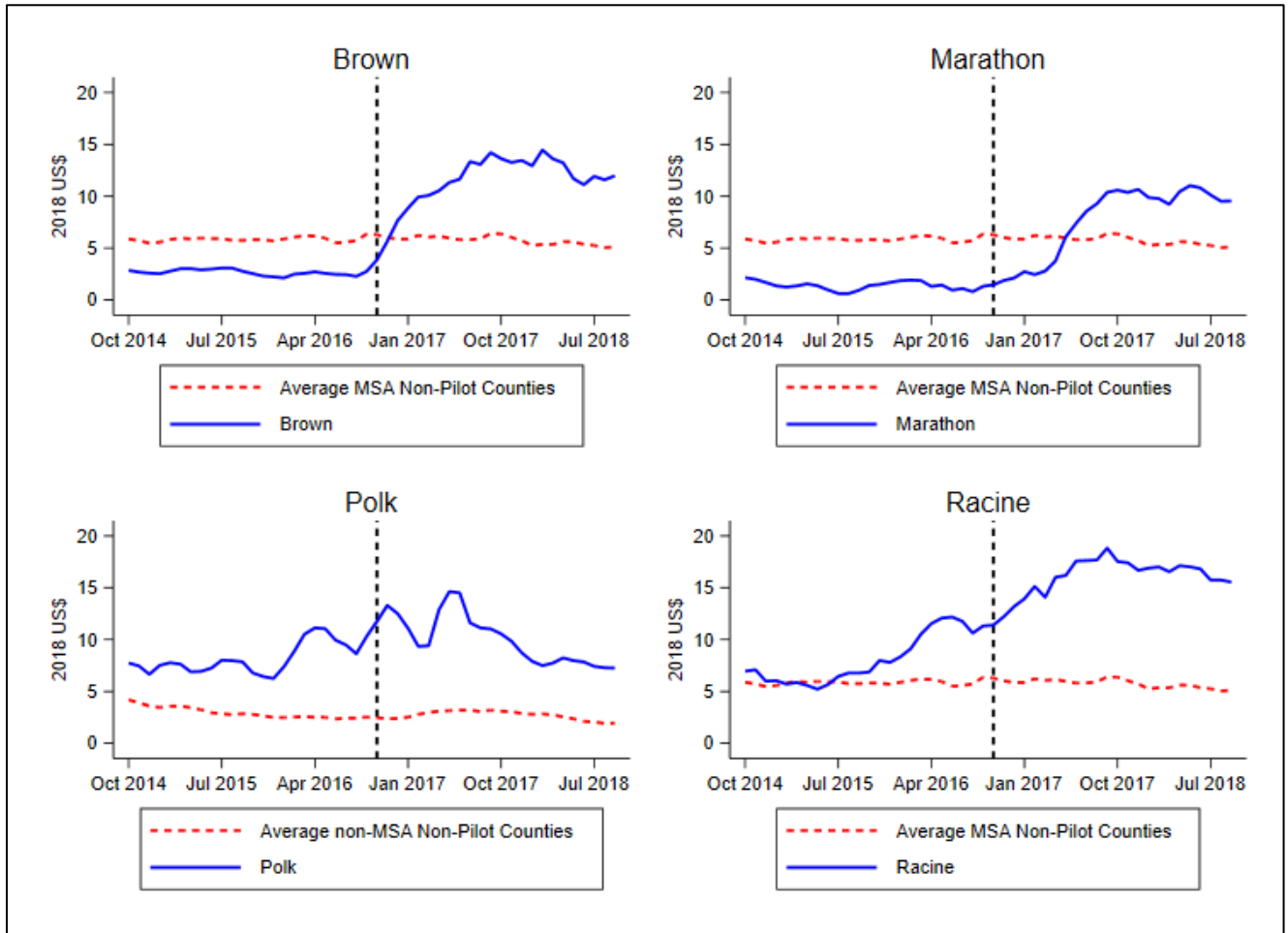
\* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

**Figure 16. Per-Capita Dental Payments for Services Rendered to Child BadgerCare Members in Each County per Child BadgerCare Members that Reside in that County**



NOTE: All figures are in 2018 real-dollars, inflated using the medical care CPI.

**Figure 17. Per-Capita Dental Payments for Services Rendered to Adult BadgerCare Members in Each County per Adult BadgerCare Members that Reside in that County**



NOTE: All figures are in 2018 real-dollars, inflated using the medical care CPI.

Marathon County also experienced an increase in per-capita dental payments, although the increase was much less pronounced than the increase in Brown County.. (Figures 15-17) The monthly per-capita dental payments were initially high in Marathon County, at \$14.91, in the two years prior to the start of the program. After the pilot went into effect, they increased to \$19.28. (Table 23) Results from Equation 1 indicate that relative to non-pilot MSA counties, per-capita dental payments in Marathon County increased by \$4.55, or 31% after the pilot went into effect. (Table 24)

Most of the increase in per-capita dental payments in Marathon County was driven by an increase in dental payments for services rendered to adults. Per-capita dental payments for services rendered to children increased slightly after the implementation of the program, from \$23.09 to \$25.94. Payments for adults increased from \$1.37 to \$7.55. Comparing the change in per-capita dental payments before and after the program for Marathon County to the non-pilot MSA counties indicate that payments for children increased \$3.43, or 15% from baseline. Payments for adult BadgerCare members increased by \$5.74 per month, or 419% of baseline payments. (Table 24)

Similar to Brown County, Polk County experienced an immediate increase in per-capita dental payments for dental care with the initiation of the pilot program. (Figures 15-17) Monthly per-capita payments increased, from \$7.93 in the two-years prior to the pilot, to \$17.10 for the two years after the pilot went into effect. In non-MSA, non-pilot counties, monthly per-capita payments remained very stable, changing slightly from \$3.70 to \$4.02. Results from Equation 1, shown in Table 24, comparing the increase in Polk County to the other non-MSA counties show that per-capita dental payments in Polk County increased \$9.03, or 114%.

The increase in per-capita dental payments in Polk County was much larger for children. (Figure 16) than it was for adults. (Figures 17) Monthly per-capita dental payments for services rendered to children increased from \$7.78 to \$21.41 and for adults they increased from \$8.15 to \$10.13. In the non-MSA, non-pilot counties, monthly per-capita dental payments for children increased only slightly, from \$4.26 to \$4.98 and per-capita payments for adults fell slightly from \$3.22 to \$3.05. Taken together, this means that per-capita payments increased in Polk County because of the pilot program by \$13.04, or 167%. For adult per-capita payments, the increase in Polk relative to other non-MSA counties was \$2.55, or 31% from baseline. (Table 24)

Racine County shows an increase in per-capita dental payments that began well before the start of the pilot program. Because the trend started prior to pilot program initiation, and it is not possible to attribute the observed changes in per-capita payments to the pilot program.

### **C3. Total Payments for Emergency Department Dental Visits**

Next, we turn to the total payments made for emergency department dental visits. As previously noted, we use emergency department visits for dental care as a measure of potentially avoidable costs. If access improves for regular and preventive dental services, the pilot program may reduce the need for and costs of emergency department dental services. However, we find little evidence that this occurred in the time frame of the two-year pilot program implementation.

As outlined in section B5, we define emergency visits for dental care as visits with procedure codes 99281-99285 and at least one ICD-9 code of 520-520 or ICD-10 code of K00-K14 (diseases of the oral cavity, salivary glands and jaw).

Both Brown County and the comparison MSA non-pilot counties show gradual decreases in total payments for emergency department visits for dental care throughout the evaluation period. (Figure 18) In Brown county, average monthly pre-pilot payments for emergency department visits was \$17,395. For the post period, this was \$8,978. In the MSA non-pilot counties, payments for emergency services fell from \$25,181 to \$19,815. (Table 25) The comparison provides no evidence that payments for emergency services changed significantly in Brown County. This is also true for payments for emergency services to children and for emergency services to adults, as shown in Table 26.

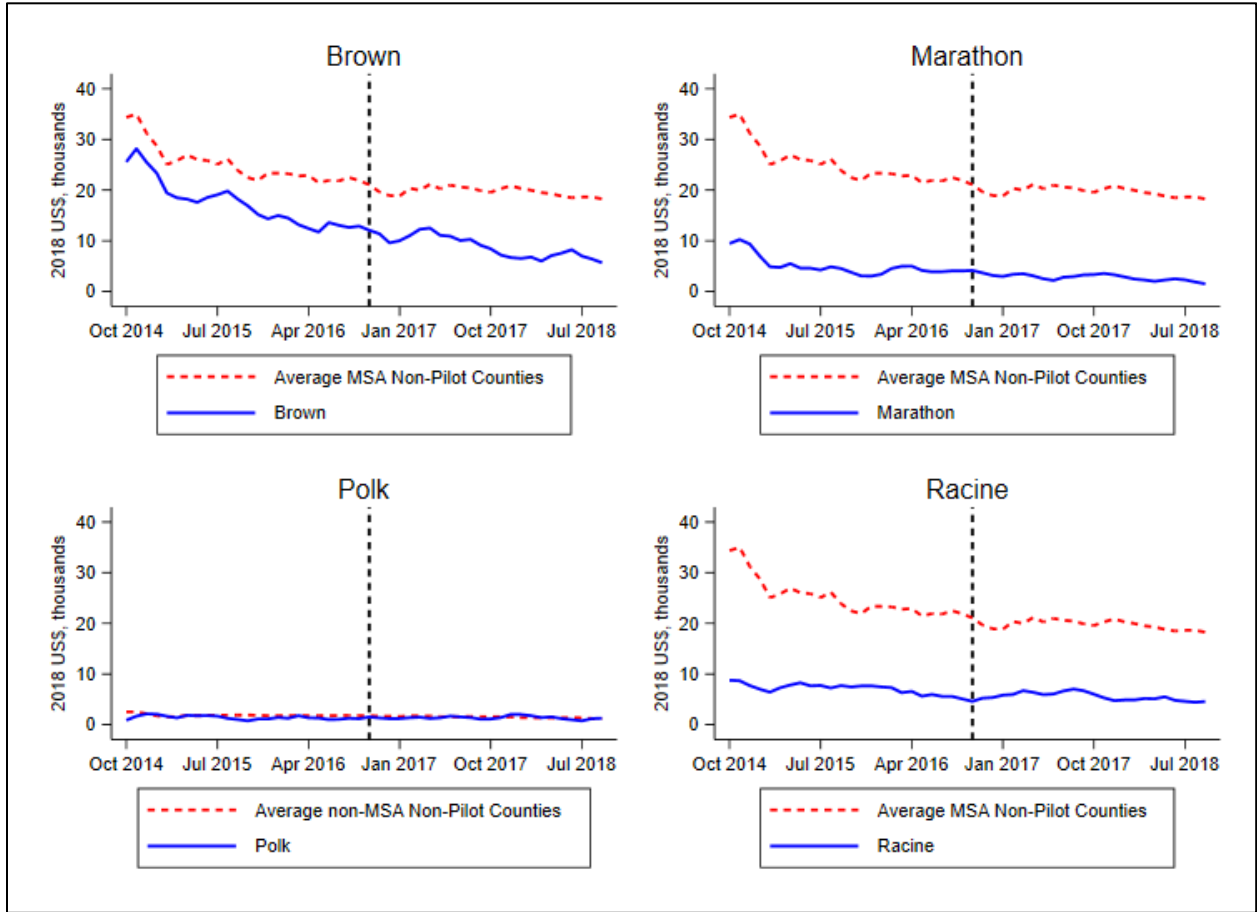
Marathon County shows a similar pattern: both Marathon and the comparison MSA non-pilot counties experienced decreases between the pre and post-pilot periods. Payments in Marathon County fell from \$5,077 to \$2,846. (Table 25) Again, similar to Brown County, the difference between Marathon and MSA non-pilot counties was not statistically significant, depending on how the standard errors are calculated. This is also true for payments for services rendered to children and services rendered to adults. (Table 26)

The change in Polk County to payments for emergency services was small. Payments fell from \$1,427 to \$1,395. (Table 25) In comparison to non-MSA non-pilot counties, payments fell from \$1,876 to \$1,532. We find no evidence of change in costs for emergency services to BadgerCare members, BadgerCare children, or BadgerCare adults with the implementation of the pilot program. (Table 26)

Like Brown and Marathon counties, payments for emergency services rendered in Racine County fell. In Racine, payments fell from \$7,108 to \$5,549. (Table 25) But, the parallel trends in comparison counties indicate no evidence that the pilot program reduced costs for emergency services in Racine County. This is true for all BadgerCare members, for children, and for adults. (Table 26)



Figure 18. Total Payments for Emergency Department Dental Visits Provided in Each County



**Table 25. Total Payments for Emergency Dental Visits Rendered in Each County (in \$)**

	Payments for Emergency Visits Provided to Any BadgerCare Member		Payments for Emergency Visits Provided to Child BadgerCare Members		Payments for Emergency Visits Provided to Adult BadgerCare Members	
	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot	Pre-pilot	Post-pilot
Brown County	17,395	8,978	3,451	2,588	13,944	6,373
Marathon County	5,068	2,846	842	543	4,226	2,303
Polk County	1,427	1,395	415	379	1,012	1,016
Racine County	7,108	5,549	1,550	1,697	5,559	3,852
MSA, Non-pilot Counties	25,181	19,815	8,012	7,088	17,159	12,702
Non-MSA, Non-pilot Counties	1,876	1,532	416	324	1,460	1,205

NOTE: We identify ED visits using procedure codes 99281-99285. We identify visits with dental diagnosis using ICD-9 codes 520-529 and ICD-10 codes K00-K14. These codes represent diseases of oral cavity, salivary glands, and jaws. All values are weighted by county population and shown in 2018 dollars, using the medical care CPI to adjust for inflation.

**Table 26. Regression Results, Total Costs for Emergency Dental Visits Rendered in Each County**

	All	Child	Adult
<b>Brown County</b>			
Pilot County X Post	-3279.282**	-27.93	-3253.942***
95% CI, Robust Standard Errors	[-6254.084,-304.480]	[-879.830,823.969]	[-5727.887,-779.996]
95% CI, Robust Standard Errors Clustered by County	[-9137.611; 2579.047]	[-1049.519; 1049.519]	[-8059.505; 1550.622]
<b>Marathon County</b>			
Pilot County X Post	2903.944***	535.960*	2382.490***
95% CI, Robust Standard Errors	[933.019,4874.868]	[-17.843,1089.764]	[755.045,4009.934]
95% CI, Robust Standard Errors Clustered by County	[-2954.385; 8762.272]	[-541.489; 1613.410]	[-2422.074; 7187.053]
<b>Polk County</b>			
Pilot County X Post	325.073*	59.006	267.69
95% CI, Robust Standard Errors	[-49.550,699.697]	[-114.618,232.629]	[-53.776,589.157]
95% CI, Robust Standard Errors Clustered by County	[75.622; 574.525]	[-12.419; 130.430]	[69.856; 465.524]
<b>Racine County</b>			
Pilot County X Post	3566.359***	981.541***	2599.325***
95% CI, Robust Standard Errors	[1714.971,5417.747]	[356.073,1607.008]	[1100.753,4097.896]
95% CI, Robust Standard Errors Clustered by County	[-2291.970; 9424.688]	[-95.909; 2058.990]	[-2205.239; 7403.889]

NOTES: Results from a basic DiD regression without additional controls. Each regression is weighted by county population. The dependent variable is the cost of emergency service visits in each rendering county. We identify ED visits using procedure codes 99281-99285. We identify visits with dental diagnosis using ICD-9 codes 520-529 and ICD-10 codes K00-K14. These codes represent diseases of oral cavity, salivary glands, and jaws. . Pilot County X Post is an indicator variable if the pilot had been implemented in the county at the time of observation. The estimated coefficient is the change in total payments for ED visits for dental care in the pilot county relative to the control counties. The pre-pilot period is defined as Oct 2014 - Sept 2016. The post-pilot period is defined as October 2016 – September 2018. Control counties are non-pilot MSA/non-MSA counties. Robust standard errors and 95% CIs are shown in brackets. Clustered 95% CIs use county-level clustering. \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01

#### C4. Why Did Payments Increase?

In this section, we estimate how much payments increased because of the pilot program. We then consider what fraction of the increased payments were due to the mechanics of the program and what fraction was due to changes in services delivered. That is: What portion of the increase in payment outlays is due to the increased reimbursement rate for services rendered, and what is due to changes in the supply and use of services?

Table 27 provides the detail. To estimate the increase in payments due to the pilot program, we estimate Equation 1 where the outcome is total dental payments. We then assume that the pilot counties, in the absence of the program, would have behaved exactly like the non-pilot control groups. For example, if payments made in MSA non-pilot counties increased by 5% after the pilot program was enacted, we assume that the MSA pilot counties (Brown, Marathon, and Racine) would have also increased by this amount. Multiplying this by the pre-pilot payments yields the predicted payments during the pilot program.

We then aim to explain what fraction of the increase was due to payments and what fraction was due to a change in services. To isolate the effect due to an increase in payments, we assume that each pilot county would have behaved like their counterpart non-pilot counties in terms of services rendered. For example, if MSA non-pilot counties experienced an increase in the number of services provided of 3%, we assume that the MSA pilot counties would have also increased by 3%. We multiply the average payment per service in the post period by the predicted number of services to get the total payments that would have been made if the payments increased but there was no change in services rendered.

Last, we take the increase in payments due to the increased reimbursement rates and divide that by the actual increase in payments to obtain what fraction of the increased payments was due strictly to the increase in reimbursement rates.

Consider payments made for children's dental services in Brown County:

- Total payments made during the pilot program for all dental services rendered to children was \$12,575,767.
- Total predicted payments for the two-year pilot period is \$5,279,911. (Table 27)
- The difference between the actual payments made and the predicted payments is \$7,295,856.
- The predicted payments for the two-year pilot period -- if only the rates increased -- is equal to the predicted number of services multiplied by the increased rate. This would equal \$8,967,729.
- Payments would be increased by \$3,687,818 if only the reimbursement rate increased.
- Thus, 51% of the increased payments ( $= \$3,687,818 / \$7,295,856$ ) is due only to the increased reimbursement rates.
- The remaining 49% is due to the increased number of services provided.

In Brown County, the additional payments made for services rendered to children was \$7,295,856. As outlined above, about half was due to the mechanical increase in payments and half was due to an increase in the number of services provided. Because there are a high number of services provided to children anyway, the increase in reimbursement rate even without a change in services would lead to higher total payments.

The increase in payments for services rendered to Brown County adults after pilot program implementation was \$2,507,907. Of this, 14% was due to a mechanical increase in reimbursement rate only. The remaining 86% was due to an increase in services rendered. A large percentage increase in the number of visits for adults drives the increased payments.

Marathon County experienced large changes in visits and services before the pilot was implemented. An inconsistent pattern in the number of services provided, as shown in Figure 13, precludes the ability to estimate how the number of services and payment outlays would have changed in the absence of the pilot. The same is true in Racine County.

Polk County shows an increase of \$1,068,743 in payments of dental services for children due to the pilot program. Of this, 91% was due to the mechanical increase in the reimbursement rate only, and not because there was an increase in the number of services provided.

Payments for services rendered to adults in Polk County increased by \$179,612. About three-quarters of this increase was mechanical and the remaining quarter was due to the increase in services.

During the two year period following implementation of the pilot program, the Wisconsin Medicaid program spent \$40.5 million for dental services in the four pilot counties, compared to an estimated \$18.3 million that would have been spent in the absence of the pilot program. The pilot program itself accounts for an increase expenditures of \$22.2 million, due to both the increase in payment rates for services, and the increase in services provided.

<b>Expenditures for Dental Services, Pilot Program Counties, October 2016-September 2018</b>	
Total Payments	<b>\$ 40,457,381</b>
Predicted Total Payments Absent Pilot	<b>\$ 18,283,398</b>
Payment Increase Attributable to Pilot Program: Actual Spending Minus Predicted Spending	<b>\$ 22,173,983</b>

**Table 27. Total Change in Payments, Percent due to Service Increase, and Percent due to Payment Rate Increase (Mechanical)**

During Pilot Program Period	Brown county		Marathon county		Polk county		Racine county	
	Children	Adults	Children	Adults	Children	Adults	Children	Adults
Total Payments	\$ 12,575,767	\$ 3,275,830	\$ 6,187,943	\$ 1,028,970	\$ 1,799,241	\$ 530,736	\$ 10,621,766	\$ 4,437,128
Total Services	217,441	70,605	93,380	16,857	22,679	9,805	161,506	71,079
Average Payable Amount per Service	\$ 58	\$ 46	\$ 66	\$ 61	\$ 79	\$ 54	\$ 66	\$ 62
Predicted Total Services Absent Pilot (Regression)	155,056	24,158			21,411	8,977		
Predicted Total Payments Absent Pilot (Regression)	\$ 5,279,911	\$ 767,924	\$ 5,928,143	\$ 196,773	\$ 730,498	\$ 351,123	\$ 2,750,465	\$ 2,278,561
Actual Spending Minus Predicted Spending	\$ 7,295,856	\$ 2,507,907	\$ 259,800	\$ 832,198	\$ 1,068,743	\$ 179,612	\$ 7,871,301	\$ 2,158,567
Predicted Total Payments if only Reimbursement Rates Increased	\$ 8,967,729	\$ 1,120,841	\$ 11,046,092	\$ 220,607	\$ 1,698,647	\$ 485,919	\$ 7,746,905	\$ 4,172,319
% of Payments Change due to Increased Reimbursement Rates	51%	14%			91%	75%		
% of Payments Change due to Increase in Services Rendered	49%	86%			9%	25%		

Note: Marathon Racine Counties showed substantial changes in service prior to initiation of the pilot program, thus prohibiting estimation or attribution of any overall payment change trend to pilot-specific service changes or payment rate changes.

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## V. LIMITATIONS

There are several limitations that should be noted. The first is related to the data used and the second is related to the assumptions underlying the empirical framework.

First, all analysis is based on Medicaid claims data for the state of Wisconsin. While this is the ideal data to study questions outlined in this report, there are potential limitations. The quality of the analysis relies on the data being consistent before and after the pilot was implemented and across county lines. For example, if some providers changed the way they bill or the county that they bill from, this could contaminate our findings. Ideally, all services would be coded as having been rendered in the county where the service was provided. However, this is likely not always the case.

Another example related to the use of claims data that could pose challenges to our analysis is if a provider has several offices in different counties from which they practice in. If they change how they code these services during the timeframe of our analysis, this could potentially contaminate our findings.<sup>50</sup> For example, if at the start of the pilot, a provider in a pilot-county changed from billing from a non-pilot county to a pilot-county, we would falsely attribute increases in services provided in the pilot-county to the program.<sup>51</sup>

We are also unable to isolate the role of school-based clinics and the expansion of dental sealant programs. Dental sealant programs have expanded in counties throughout the state in recent years. To the extent that these services expanded more so in the pilot counties because of the increased reimbursement rates, they will be captured in this evaluation's total estimates. Unfortunately, the number of claims that are coded with schools as the place of service is not consistent across counties. For example, in Brown County, fewer than five claims were coded as having schools identified as the place of service during the pilot. The rendering provider, rather than the school itself, more likely bills for school-based services.

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<sup>50</sup> In private communication, it was suggested that one or more Marathon providers may have several branch offices in the region that bill from Marathon County, and that this practice may have changed during the pilot program.

<sup>51</sup> The claims data also rely on the use of identifying providers. To do so, we use the provider NPI (National Provider Identifier). Each NPI should correspond to a single provider. However, in a very few situations, some claims have an NPI linked to an office or practice, rather than a single individual. This would lead to a potential undercount of the number of providers in each county. It is not considered problematic for our analysis because the number of claims affected is minimal, and would not have changed differentially over time between the pilot and non-pilot counties.

The use of the difference-in-difference framework relies on assumptions. In particular, our analysis relies on the construction of a valid control group. Although control group and treatment groups need not have the same mean prior to the start of the program, they do need to move in parallel in the pre-period. This is what is known as parallel trends. This assumption is clearly violated for certain outcomes for at least two counties. Namely, the violation of parallel trends makes us unable to draw conclusions about the percentage of Marathon County residents that received dental care. This is also why we are unable to draw conclusions about the pilot program's effect of the number of visits and services provided in Racine County.

Another assumption underlying our framework is that nothing substantial changed in the counties during the timeframe of our study. This assumption would be violated if, for example, a local initiative occurred to increase dental care utilization, unrelated to the increased reimbursement rates (for example, expansion of school dental sealant programs). If such an initiative happens in a pilot county after the pilot begins, then we would be erroneously attributing the increased utilization to the pilot program. Alternatively, if it occurs in a non-pilot county, we would be underestimating the effect of the pilot program.

Last, ideally, treatment would be randomly assigned. If treatment was not randomly assigned and, instead, counties were chosen based on characteristics that are correlated with outcomes of interest, then findings will be skewed. For example, if Brown was selected for the pilot program because it was most likely to show success, then the effect of the pilot includes the effect of these other determinants. To control for this, all our models include county fixed effects, which control for characteristics of each county that may be unobserved.



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## VI. DISCUSSION AND CONCLUSIONS

Table 29 displays a summary of the results for each outcome evaluated.

### *Brown County*

It appears that, in Brown County, the pilot program induced significant service expansion. More Medicaid members received more visits and services, and decreased their migration out of county for services. Brown County experienced an increase in the overall supply of dental service, relative to the control counties. Indeed, the number of providers increased for all BadgerCare members, child members, and adult members. With services spread over more in-county providers, Brown County does not show an increase in children visits per provider, but does show an increase in adult visits per provider. Increases occurred in services rendered per visit.

Brown County incurred an overall increase in per-capita dental payments, part of which was mechanical and part of which was due to increases in visits and services. The pilot-program's increases in dental service use and access did not translate into reductions in overall use of dental emergency services and emergency-related costs.

Brown County appears to have benefited from a well-organized community effort led by the Oral Health Partnership (OHP).<sup>52</sup> This non-profit focuses on delivering services to Medicaid- and low-income children. Coincident to the Medicaid pilot program, in January 2017, the OHP received a large donation from Delta Dental of Wisconsin, allowing the partnership to substantially expand its operations, including the addition of new sites for direct services. This factor modifies the degree to which the county's success may be attributed to the pilot program itself.

### *Marathon County*

More adults received visits and remained in-county for services, and more providers are serving adults. However, because of the differences in trends prior to the implementation of the program, we cannot attribute changes in the total number of visits, visits per provider, or services per visit to the program. Marathon County experienced a mechanical increase in payment outlays, and it remains unclear whether the increase is due exclusively to the enhanced rate or due to increasing visits or services that occurred prior to the policy change. These changes in dental service use and access did not translate into reductions in overall use of dental emergency department services and emergency-related costs.

### *Polk County*

Polk County shows no measurable change in the percentage of county residents receiving care, but the members did decrease their out-migration for services. The overall supply of dental care increased in Polk County: Polk County shows a statistically significant increases in the number of providers serving BadgerCare members relative to the control counties. This translated to an increase in the overall

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<sup>52</sup> See Oral Health Partnership information here: <https://www.smilegb.org/history-of-ohp>

number of visits and visits per provider. The use of emergency services overall did not change, and the pilot program did not bring a change in Medicaid program costs for such services. Polk County did show an increase in dental service per-capita payments, but with the relative small increases in visits and services, most of the increase in per-capita payments occurred from mechanical fee changes. The Polk County changes in dental service patterns did not translate into reductions in overall use of dental emergency department services and emergency-related costs.

#### *Racine County*

Racine County shows several changes prior to the initiation of the pilot program related to Medicaid member's use of dental services, visits per provider, and services per visit. None of these pre-pilot program changes can be attributed to the pilot program, and the initiation of the pilot program did not signal any particular change in trend. No change occurred in the number of providers serving Medicaid members. Per capital dental payments increased, but any of these increases may have been due to the mechanics of the pilot program rate change and background trend, and not due to any change in service pattern induced by the pilot program. The Racine County changes in dental service patterns did not translate into reductions in overall use of dental emergency department services and emergency-related costs.

**Table 28. DiD: Difference between Change in Pilot County relative to Change in Comparison County**

	<b>Brown</b>	<b>Marathon</b>	<b>Polk</b>	<b>Racine</b>
Percentage of Resident County BadgerCare Members Receiving Any Dental Services	Increase	Increase	No change	Increase prior to pilot program
Children, receiving any service		No change	No change	
Children, receiving preventive service		No change	Decrease	
Adult, receiving any service		Increase	No change	
Adult, receiving Emergency Services		Increase	No change	
Percentage of BadgerCare Members that Crossed County Lines to Receive Services	Decrease	Decrease	Decrease	
Children, receiving any service		No change		
Children, receiving preventive service		No change		
Adult, receiving any service		Decrease		
Adult, receiving Emergency Services		Decrease		
Number of Providers Serving Medicaid/BadgerCare, All	Increase	No change	Increase	No change
Serving Children		No change		
Serving Adults		Increase		
Total Number of Visits	Increase	Decrease prior to pilot program	Increase	No change
By Children				
By Adults				
Visits per Provider, All	No change	Decrease prior to pilot program	Increase	Increase prior to pilot program
By Children	No change			
By Adults	Increase			
Services per Visit, All	Increase	Decrease prior to pilot program	No change	Increase prior to pilot program
To Children				
To Adults				
Emergency Services, All	No change	No change, while declining in comparison counties	Increase	No change, while declining in comparison counties
To Children			No change	
To Adults			Increase	
Per-capita Dental Payments, All	Increase	Increase	Increase	Increase
For Children				
For Adults				
Total Payments for Emergency Services, All	No change	No change	No change	No change
For Children				
For Adults				

## ***Evaluation Questions: Overall Conclusions***

### ***#1. Who received services, and did the pilot program change access to services by Medicaid members?***

The pilot program appears to have expanded access to services for Medicaid members in one of the four pilot counties (Brown), by increasing the percentage of members receiving services, and the number of visits and services they receive. The coincident (January 2017) receipt of funds from Delta Dental to expand services, through the Brown County Oral Health Partnership, would have contributed to this observed trend. This factor modifies the degree to which the county's success may be attributed to the pilot program itself.

Other counties show some changes in visits and services, but no consistent pattern; where the percentage of members who received care increased (in Marathon County), number of visits and services decreased. Polk County shows increases in participating providers, total visits, and visits per provider, but no increase in the percentage of resident Medicaid members served.

The relative success of only one pilot county may reflect to other community factors that augmented the effect of the intervention, including the reported efforts of Brown County's dental health coalition. Other counties did not appear to have such organized efforts. A report for Marathon County United Way, summarizing various health and well-being indicators in the 2017-2019 period, refers exclusively to FQHCs as the "consistent providers for Medicaid/BadgerCare patients."<sup>53</sup> The report does not mention the Medicaid dental pilot program.

Such wide variation in results across the different pilot counties suggests that the pilot program intervention (the increase in payment rates for selected dental services) does not consistently or reliably expand access to services by Medicaid members.

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<sup>53</sup> LIFE Report of Marathon County: 2017-2019. United Way of Marathon County.

<https://www.unitedwaymc.org/wp-content/uploads/2017/12/Section-Summary-Supplement.pdf>

***#2. Who provided services, and did the pilot program change the amount of dentist participation in Medicaid/providing services to Medicaid members?***

Media reports suggest that the dental pilot itself was attracting more dentists to participate in serving Medicaid members.<sup>54,55</sup> But some dentists noted that even the enhanced payment was not sufficient to induce participation in the program.<sup>56</sup>

Two of the pilot counties, Brown and Polk, showed increases in dental providers for Medicaid members, increases in the total visits they delivered, and increases in visits per provider. Only one pilot county showed increases in the number of services per visit. There were pre-existing trends in both Marathon and Racine that preclude attribution of any observed changes to the pilot program, or any inferences about the effectiveness of the pilot program on provider participation in Medicaid.

These results suggest that the pilot program may induce more dentists to participate in the Medicaid program, as observed in Brown and Polk Counties, but the results are not consistent, and they do not reliably produce expansions in services to more Medicaid members. A payment increase would need to induce the re-allocation of existing dental visit slots from commercially-insured patients to Medicaid members. This is unlikely as long as Medicaid payments remain substantially lower than commercial insurance payments. Or, it would require the addition of more dental visit hours overall in a dental practice schedule. That requires expanded dental workforce capacity – a challenge given existing provider shortages in areas throughout the state.

***#3: How much did the program cost, and did it result in any cost savings.***

The dental pilot program increased per-capita dental payments mechanically, simply by increasing the rates paid for selected services. Per-capita dental payments also increased to the degree that visits and service levels increased. Such per-capita increases attributable to the pilot program occurred in Brown and Polk Counties. In Brown County, about half of the total payment increase was due to the expansion in service, while the other half was mechanical. In Polk County, about three-quarters of the payment increase was mechanical, and about a quarter was due to service expansions.

The evaluation finds no cost savings as a result of the pilot program, with no reductions in emergency service visits and their associated costs.

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<sup>54</sup> Dentists Ask For More Funding For Treating Patients With Medicaid, Shamane Mills. Wisconsin Public Radio. February 27, 2018. <https://www.wpr.org/dentists-ask-more-funding-treating-patients-medicaid>

<sup>55</sup> Dental Care Access Problem Eases in Racine County. WGTD 91.1FM. <https://www.wgtd.org/news/dental-care-access-problem-eases-racine-county>

<sup>56</sup> Wisconsin Pilot Program Aims To Increase Access To Dental Care For Low-Income Children, Shamane Mills. Wisconsin Public Radio. February 26, 2018. <https://www.wpr.org/wisconsin-pilot-program-aims-increase-access-dental-care-low-income-children>

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## VII. ATTACHMENT: DENTAL SERVICE FEE SCHEDULE

Targeted Reimbursement Rate Maximum Allowable Fee Schedule, Revised 1/1/2018. Wisconsin Department of Health Services. Available at [https://www.forwardhealth.wi.gov/WIPortal/content/Provider/medicaid/dentist/Targeted\\_Reimbursement\\_Rate\\_MAFS.htm.spage](https://www.forwardhealth.wi.gov/WIPortal/content/Provider/medicaid/dentist/Targeted_Reimbursement_Rate_MAFS.htm.spage)

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