Wisconsin Division of Public Health (DPH), Department of Health Services WIC: Evaluation of Telehealth Service Delivery Using Online Nutrition Education (ONE) Platform

WI.1. Technical Appendix

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WI.1.1 THIS-WIC Study Framework

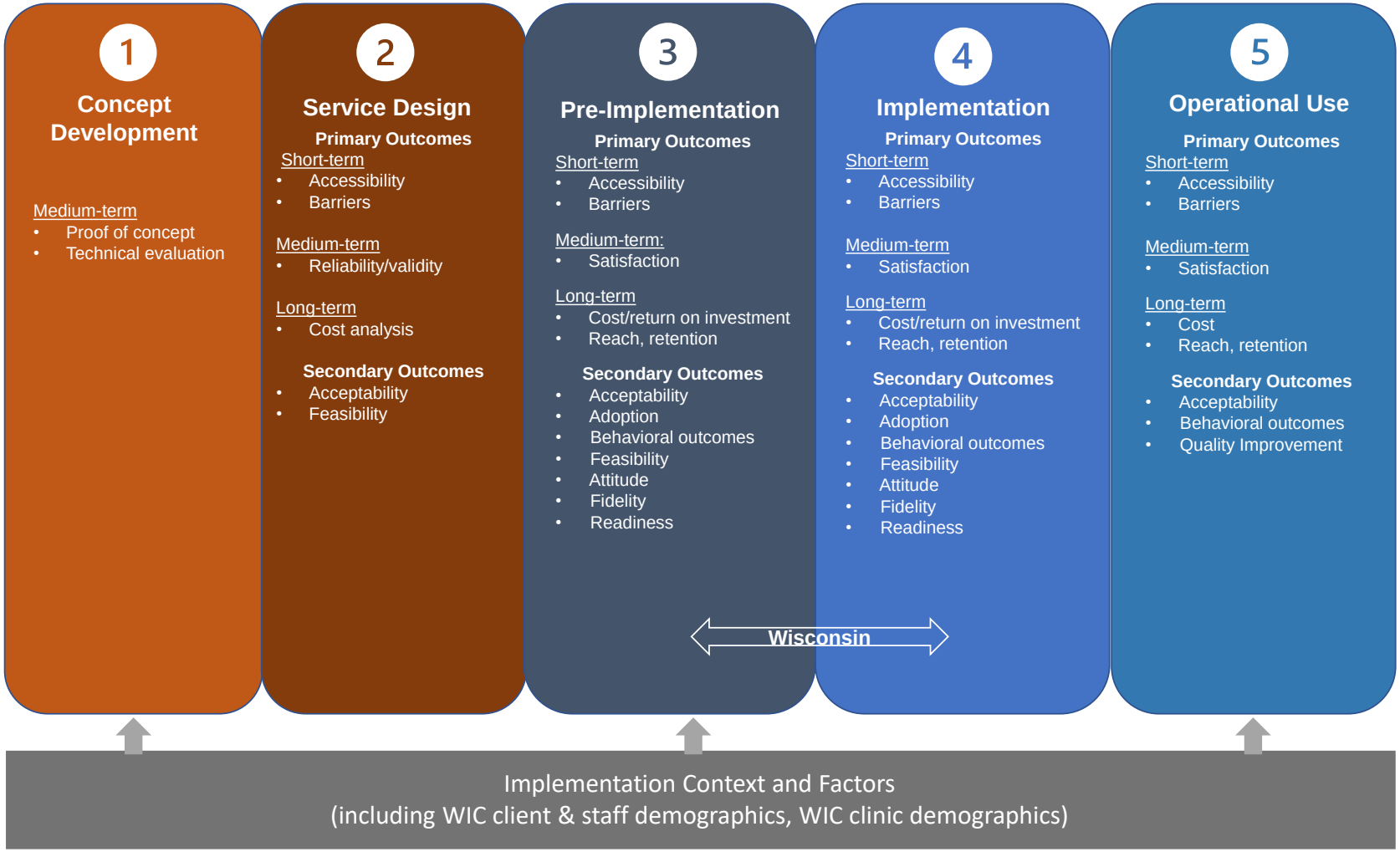
The U.S. Department of Agriculture (USDA)/Tufts Telehealth Intervention Strategies for the Supplemental Nutrition Program for Women, Infants, and Children (THIS-WIC) used the five-stage model for comprehensive research on telehealth developed by Fatehi and colleagues[1] to guide the overall design of a telehealth research program (see **Figure WI.1.1**):

- Stage 1 (concept development): Propose a technology-based solution to a health problem; this stage may include a needs analysis, proof of concept, and a technical evaluation of the concept.
- Stage 2 (service design): Study feasibility and accessibility to determine how the service delivery model should be modified to accommodate the proposed telehealth intervention.
- Stage 3 (pre-implementation): Study the telehealth solution under a controlled environment to assess efficacy.
- Stage 4 (implementation): Study the telehealth solution in real-world settings to assess effectiveness.
- Stage 5 (operational use): After implementing a telehealth intervention, focus on operational use and sustainability of the solution.

Wisconsin's (WI's) project spanned Stages 3 and 4, as WI worked with Nutrition Matters to develop and customize the platform for the State and piloted it with their local agencies.

In the context of THIS-WIC, the model mapped a multistage journey from developing a telehealth solution to assessing an established telehealth service. The model's internal consistency results from previous observations of the progression of telehealth projects in the telehealth field. Fatehi and colleagues[1] noted that telehealth research evaluations may not need to include all elements or stages, particularly where comparable services have been rigorously assessed.

Figure WI.1.1 THIS-WIC Five-Stage Model for Comprehensive Telehealth Research and Priority Areas



WI.1.2 WIC Agencies Participating in THIS-WIC Evaluation

WI recruited WIC agencies to participate in the THIS-WIC evaluation using an application process open to all agencies. Thirteen agencies were selected, with representation from each of the five regions of the State; these agencies were split between rural and urban designation and randomized to the intervention (n=7) or comparison (n=6) group (**Table WI.1.1**). WI defined rural areas as counties with 50 percent or more of the total population in a rural area as defined by the 2010 US Census.[2] Local agency engagement funds were allocated to participating agencies. Comparison agencies were offered access to Online Nutrition Education (ONE) after the conclusion of the THIS-WIC evaluation, followed by a wider statewide rollout. Shortly after the project began, two agencies dropped out (one in the intervention group and one in the comparison group). Therefore, the evaluation included six WIC agencies in the intervention group and five WIC agencies in the comparison group.

Table WI.1.1 List of Local WIC Agencies in the Intervention and Comparison Agencies in WI

Intervention Agencies	Comparison Agencies
Bay Area (1)[a]	City of Milwaukee (3)
Jefferson County (1)	Family Health Center/la Clinica (1)
Oneida County (1)	La Crosse County (1)
Portage County (1)	Nutrition and Health Associates (2)
Public Health – Madison and Dane County (1)	Rusk County (1)
West Allis (3)	Sheboygan[b]
Juneau Adams[b]	

[a] Numbers in parentheses represent the number of clinics under each local agency.
[b] Withdrew from the study.

Table WI.1.2 shows the geographic location, number of staff, number of clients served, and race/ethnicity of clients served at intervention and comparison agencies. Two intervention agencies were in rural areas, and one comparison agency was in a rural area. Agency size, as measured by the number of staff and clients served, varied considerably across the intervention and comparison agencies, as did the race/ethnicity of clients served.

Table WI.1.2 Local WIC Agency and Client Characteristics of Intervention and Comparison Agencies in WI, Q1/2021

	Intervention Agencies							Comparison Agencies					
Characteristic	Bay Area	Jefferson County	Juneau & Adams[a]	Oneida County	Portage County	Public Health Madison and Dane County	West Allis	City of Milwaukee	Family Health/ la Clinica	La Crosse County	Nutrition and Health Associates	Rusk County	Sheboygan County[a]
Region	N	S	S	N	N	S	SE	SE	NE	W	S	W	NE
County	Bay Area	Jefferson	Adams	Oneida	Portage	Dane	Milwaukee	Milwaukee	Green Lake	La crosse	Rock	Rusk	Sheboygan
Urbanicity	Rural	Urban	Rural	Rural	Urban	Urban	Urban	Urban	Rural	Urban	Urban	Rural	Urban
Number of Staff	2	4	4	1	3	8	6	13	4	19	3	3	6
Caseload	555	1,049	930	307	860	4,348	3,855	7,299	639	1,744	2,986	289	1698
Families	297	653	577	197	501	2763	1270	1118	389	991	865	170	985
Pregnant	28	65	57	29	61	294	264	496	27	136	193	17	124
Breastfeeding	48	66	44	14	66	323	177	213	39	78	153	18	76
Non-Breastfeeding Postpartum	21	54	46	16	52	256	252	736	35	128	203	10	124
Infants	104	206	152	70	174	1,012	799	1,837	128	352	668	50	382
Children	319	603	607	172	485	2,424	2,302	3,918	375	938	1,594	170	966
Race/Ethnicity of Clients Served (%)													
AI/AN	13.2	0.4	0.4	1.6	0.5	0.5	0.7	0.2	0.3	0.9	0.4	1.0	0.0
Asian	0.0	0.3	0.3	1.0	10.9	8.0	5.1	14.1	0.5	17.5	0.5	0.5	24.3
Black/AA	0.9	2.2	0.6	1.3	3.1	30.6	15.7	62.5	1.3	6.4	12.7	1.0	5.5
Hispanic	5.4	35.6	9.8	9.8	17.3	28.9	30.0	18.2	22.7	5.8	26.2	8.0	23.0
NH/PI	0.4	0.1	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.4	0.0	0.0	0.0
White	76.0	93.8	90.2	91.5	79.9	49.7	66.7	18.3	97.2	65.3	78.5	93.4	61.8
Spanish Interpretation Needed	0.2	10.9	1.1	0.0	2.0	13.7	0.6	6.6	7.4	0.4	8.7	2.1	4.1

[a] Agency withdrew after implementation began.
NOTES: AI/AN = American Indian or Alaska Native; Black/AA = Black or African American; NH/PH = Native Hawaiian or Other Pacific Islander

WI.1.3 Data Sources for the THIS-WIC Evaluation

Table W1.1.3 summarizes the data sources used for the THIS-WIC evaluation in WI.

Table WI.1.3 Description of Data Sources for the THIS-WIC Evaluation in WI

Data Source	Description	Developed By	Collected By
MIS Data	Caseload and client characteristic data. Aggregate data across intervention and comparison agencies	State agency	State agency
Telehealth Metadata	Telehealth usage and engagement metrics	Telehealth vendor	State agency
Surveys: Client and Staff	Telehealth satisfaction, quality of telehealth interaction, and whether telehealth solution addressed known barriers to WIC participation	THIS-WIC	State agency
Key Informant Interviews	Telehealth experience of state and local agency stakeholders	THIS-WIC	THIS-WIC
Implementation Data	Fidelity to the intervention protocol and implementation strategies	State agency & THIS-WIC	State agency
Cost Data	Source of information on startup and ongoing costs related to telehealth adoption, implementation, and sustainability	THIS-WIC	THIS-WIC & State agency

WI.1.3.1 Telehealth Solution Implementation Data

Implementation data were collected using two methods: State agency–led quarterly guided discussions with local agency staff and responses to the Implementation Tracking Tool for startup (pre-implementation), midway, and endpoint or late phase of implementation. See **Appendix WI.3** for the data collection instruments.

Quarterly Guided Discussions

The WI State agency led guided discussions on implementation of the telehealth solution with WIC local agency staff, and responses were collected during regular meetings through Zoom polls and conversations with staff or by follow-up email as necessary. Local agency intervention staff provided feedback on their experiences using ONE during remote service delivery, including appointment length, content, and quality and overall staff perceptions of ONE; and State agency staff provided training and support. State agency staff documented responses in an Excel spreadsheet, shared quarterly with the THIS-WIC team. Discussions were held monthly during the early stages of implementation and quarterly during the second half of implementation.

Implementation Tracking Tool

THIS-WIC emailed the Implementation Tracking Tool to the WI State agency at startup (see **Appendix WI.3**). WI State agency staff completed the Implementation Tracking Tool and submitted it to THIS-WIC. At midpoint, THIS-WIC emailed the WI State agency team their startup responses with instructions to review and update them to reflect the status of each item.

Similarly, at endpoint, THIS-WIC emailed the WI State agency team their midpoint responses with instructions to review and update them to reflect their status for each item.

The menu of 46 strategies in the Implementation Tracking Tool were grouped into eight conceptually relevant implementation categories, using the groupings developed by Waltz et al.[3] (**Table WI.1.4**). Analysis involved tabulating the startup, midpoint, and endpoint status for each strategy to assess change. The startup measures were considered the implementation plan, and the change from startup to midpoint and endpoint measures were considered indicative of readiness. In addition to understanding the readiness for implementation, these data were also used to provide context for the staff- and client-level outcomes.

WI.1.4 Client Survey Sample Size, Response Rate, Characteristics, and Representativeness

Information describing the sociodemographic characteristics and WIC participation for survey respondents was derived from the Client Survey and the Management Information System (MIS). Variables from the Client Survey included the respondent's race/ethnicity, the total number of years the household has received WIC services, location of residence, and the respondent's average daily consumption of fruits and vegetables. The MIS record data closest to the appointment date were extracted for the following variables: presence of WIC client with high-risk status in the household, household size, annual household income, written language used at home (English, Spanish, other), and respondent's years of education.

WI.1.4.1 Client Survey Sample Size

WIC clients who received nutrition education during a remote appointment with a Competent Professional Authority (CPA) were eligible to take part in the evaluation. Respondents had to be 18 years of age or older and fall into one or more of the following categories: pregnant, non-breastfeeding postpartum, breastfeeding, or the parent/guardian of a participating infant or child in the WIC program. **Table WI.1.5** presents the caseload and target response rate for each phase based on the total caseload for intervention and comparison agencies. Although an increase of 10 points is hypothesized to be practically important, the actual difference could be smaller in many cases. For instance, a required sample size would be inflated by about 5 times if the actual difference is only about 4. Sample sizes based on two hypothetical response rates (5% and 10%, which are typical for online surveys) are also provided for reference.

Table WI.1.4 THIS-WIC Implementation Tracking Tool Categories in WI

Implementation Category	Implementation Strategy	
Use Evaluative and Iterative Strategies	▪ Assess for readiness and identify barriers and facilitators. ▪ Conduct local needs assessment. ▪ Audit and provide feedback. ▪ Conduct small tests of change. ▪ Develop a formal implementation blueprint.	▪ Develop and organize quality monitoring systems. ▪ Obtain and use WIC clients and family feedback. ▪ Purposely reexamine the implementation. ▪ Stage implementation scaleup.
Provide Interactive Assistance	▪ Centralize technical assistance.	▪ Provide local technical assistance.
Adapt and Tailor to Context	▪ Promote adaptability. ▪ Tailor strategies.	▪ Use data experts. ▪ Use data warehousing techniques.
Develop Stakeholder Interrelationships	▪ Conduct local consensus discussions. ▪ Develop academic partnerships. ▪ Build a coalition. ▪ Capture and share local knowledge. ▪ Identify and prepare champions. ▪ Identify early adopters. ▪ Inform local opinion leaders.	▪ Organize WIC staff implementation team meetings. ▪ Promote network weaving. ▪ Recruit, designate, and train for leadership. ▪ Use advisory boards and workgroups. ▪ Use an implementation advisor. ▪ Visit other sites.
Train and Educate Stakeholders	▪ Conduct educational meetings. ▪ Conduct ongoing training.	▪ Develop and distribute educational materials.
	▪ Make training dynamic. ▪ Provide ongoing consultation.	▪ Shadow other experts. ▪ Use train-the-trainer strategies.
Support Clinicians	▪ Create new telehealth teams. ▪ Develop resource sharing agreements. ▪ Revise professional roles.	▪ Facilitate relay of telehealth breastfeeding/nutrition data to staff. ▪ Remind WIC staff and clients.
Engage Consumers	▪ Intervene with WIC clients to enhance uptake and adherence.	▪ Involve WIC clients and family members.
Change Infrastructure	▪ Change record systems. ▪ Change physical structure and equipment.	▪ Change service sites. ▪ Start a dissemination organization/ committee.

Table WI.1.5 Caseload and Target Response Rate for Client Survey in WI[a,b]

Local Agency	Caseload	Per Phase		Response Rate	
		N if diff =10,	N if diff =4	N with 5%	N with 10%
Intervention Agencies					
Bay Area	555	4	21	28	56
Jefferson County	1,049	7	40	53	105
Oneida County	307	2	121	16	31
Portage County	860	6	33	43	86
Public Health-Madison and Dane County	4,348	28	164	218	435
West Allis	3,855	25	145	193	386
Intervention total	10,974	72	524	580	608
Comparison Agencies					
City of Milwaukee	7,299	46	275	365	730
Family Health Center/la Clinic[a]	639	5	25	32	64
La Crosse County	1,744	11	66	88	175
Nutrition and Health Associates	2,986	19	113	150	299
Rusk County	289	2	11	15	29
Comparison total	12,957	83	490	650	1297
TOTAL	23,931	155	905	1,201	2,396

[a] Caseload data are for Q1/2021.
[b] Excludes two local agencies that dropped out in the first quarter.

WI.1.4.2 Client Survey Invitations and Response Rate

Following the WIC appointment, staff at participating intervention and comparison agencies sent an invitation to clients, inviting them to complete a survey about their experience with the appointment. As seen in **Table WI.1.6**, 8,233 clients were invited, and 26.8 percent consented to complete the Client Survey. Of those who consented, 98 percent completed the survey and 97.5 percent were successfully linked with the MIS identifier. Analysis involving MIS data to describe the characteristics of survey respondents and regression controlling for demographic characteristics was limited to the data from matched respondents.

Table WI.1.6 Client Survey Invitations, Consents, and Survey Completion in WI

Survey Status	Definition	Calculation	%
Invitations Sent	Email with link to survey[a]	8,233	N/A
Response	Consents/Invitations	2,207/8,233	26.8
Completion	Completes/Consents	2,163/2,207	98.0
Match	MIS Matches/Consents	2,153/2,207	97.5

[a] Survey links were sent based on completion of an eligible appointment during the implementation period.

WI.1.4.3 Sociodemographic Characteristics of WIC Client Survey Respondents

Table WI.1.7 presents the characteristics of Client Survey respondents in WI. As seen, 84.1 percent of the respondents were in the comparison agencies, and 16.9 percent were in the intervention agencies. Overall, about half of the respondents self-identified as non-Hispanic White, and slightly less than 20 percent identified as Hispanic (18.9%). Compared to the comparison agencies, the intervention agencies had more non-Hispanic White (57.4% vs. 45.8%) and Hispanic (24.3% vs. 17.6%) respondents and fewer non-Hispanic Black (10.1% vs. 23.0%) respondents.

More than half (53.6%) of the respondents were between 26 and 35 years of age; the age distribution of survey respondents in the intervention and comparison agencies was comparable. Overall, slightly more than two-thirds (67.5%) of the respondents had some high school education (grades 9 to 12), and about one-third (29.2%) had completed some college education (1 to 5 years). Compared to respondents in the comparison agencies, a greater proportion of respondents in the intervention agencies had completed some college (26.3% vs. 42.9%). About 90 percent of respondents preferred to read in English; fewer respondents in the intervention than comparison agencies preferred to read in Spanish (8.8% vs. 4.8%).

The median household size was identical (4 members) for respondents in the intervention and comparison agencies; the results of the median test indicate that the distribution of household size for the intervention and comparison agencies was statistically different. The median annual household income was slightly higher for respondents in the intervention agencies than in the comparison agencies ($30,000 vs. $26,000 respectively). Overall, about 43 percent of respondents lived in a rural area, 32 percent lived in an urban area, and 25 percent lived in a suburban area. Compared to respondents from the comparison agencies, fewer respondents in the intervention agencies lived in a rural area (33.3% vs. 45.2%).

Table WI.1.7 Sociodemographic Characteristics of Client Survey Respondents in WI

Variable	Overall	Intervention	Comparison	p-value[d]
	%			
Age[a]	N=2,003	N=378	N=1,615	0.2053
18 to 25	22.8	20.9	23.2	
26 to 35	53.5	57.9	52.4	
36 to 45	21.3	20.1	21.6	
46 to 55	1.8	1.1	2.0	
56 to 65	0.6	0.0	0.7	
66+	0.0	0.0	0.1	
Education[b]	N=757	N=133	N=624	0.0003*
1 to 8 years	2.1	0.0	2.6	
9 to 12 years	67.5	54.9	70.2	
1 to 5 years of college	29.2	42.9	26.3	
1 or more years of graduate school	1.2	2.3	1.0	
Race/Ethnicity[a]	N=2,002	N=378	N=1,624	<.0001*
Non-Hispanic Black/African American	20.5	10.1	23.0	
Non-Hispanic White	48.0	57.4	45.8	
Non-Hispanic American Indian/Alaska Native	0.6	1.6	0.4	
Non-Hispanic Asian	7.6	3.2	8.7	
Non-Hispanic Native Hawaiian/Pacific Islander	0.0	0.3	0.0	
Non-Hispanic two or more races	3.3	2.4	3.6	
Non-Hispanic other	0.9	0.8	1.0	
Language read and/or spoken[b]	N=2,061	N=396	N=1,665	0.0213*
English	90.2	93.9	89.4	
Spanish	8.0	4.8	8.8	
Other	1.7	1.3	1.9	
Place of residence[a]	N=1,931	N=372	N=1,559	<.0001*
Rural	42.9	33.3	45.2	
Suburban	25.4	37.4	22.5	
Urban	31.7	29.3	32.3	
Household size[b]	N=100	N=10	N=90	0.0001*
Median, IQR[c]	4.0 [3.0, 5.0]	4.0 [3.0, 5.0]	4.0 [3.0, 5.0]	
Household annual income ($)[b]	N=242	N=32	N=210	0.0009*
Median, IQR[c]	27,264.0 [14,400.0, 39,000.0]	30,000.0 [18,000.0, 41,820.9]	26,000.0 [13,572.0, 38,400.0]	

Source: [a] THIS-WIC Client Survey; [b] WI MIS
[c] IQR =Interquartile range
[d] p-values are based on chi-square test for categorical variables and two-sample median tests for continuous variables. For race, age, and education, 25% or more of the cells have expected counts less than 5 so chi-square may not be a valid test.
* p<0.05

WI.1.4.4 Length of WIC Tenure and High-Risk Status of WIC Client Survey Respondents

As seen in **Table WI.1.8**, 24.4 percent of respondents had received WIC services for less than 1 year, and a similar percentage had received WIC services for 5 years or more. A greater

proportion of respondents from the comparison than the intervention agencies had received WIC services for 5 years or more (27.5% vs. 19.3%). About 40 percent of respondents had a high-risk WIC client in their household. MIS data were used to classify clients as high risk at their most recent appointment.

Table WI.1.8 Length of WIC Tenure and High-Risk Status of Client Survey Respondents in WI

Variable	Overall	Intervention	Comparison	p-value[a]
	%			
In total, how many years have you received WIC services? Would you say it has been ...	N=1,999	N=378	N=1,621	0.0103*
<1 year	24.4	26.2	23.9	
1–2 years	29.5	33.6	28.5	
3–4 years	20.3	20.9	20.1	
5+ years	25.9	19.3	27.5	
Household high-risk status[b]	N=2,061	N=396	N=1,665	0.8621
Yes	40.3	40.7	40.2	
No	59.7	59.3	59.8	

Source: WI MIS
[a] p-value is based on chi-square test.
[b] High-risk status is a dichotomous indicator coded "1" if one or more WIC clients in the household were assigned high-risk at their most recent WIC appointment.
* p<0.05

WI.1.4.5 Client Survey Representativeness

The aggregate MIS data and Client Survey data were used to generate balance tables and assess the representativeness of the survey respondents. This analysis entailed comparing the survey respondents' sociodemographic characteristics, duration of WIC participation, and high-risk status with those of clients at the intervention and comparison agencies. The administrative data presented in the balance tables are aggregate MIS data spanning Q2/2022 to Q1/2023; quarterly disaggregated balance tables are presented in **Appendix WI.4**.

As seen in **Table WI.1.9**, the sample for the Client Survey generally reflected the breadth and diversity of the WIC caseload in the intervention and comparison agencies in WI. The administrative data included clients younger than 18 years of age, but only individuals aged 18 or older were eligible for the study. In general, consistent patterns were noted for age distribution of WIC clients in the administrative and Client Survey data; the largest percentage of clients were in the 21- to 30-year age categories, with fewer respondents aged 41 or older. Consistent patterns were also noted for education attainment of WIC clients in the administrative and Client Survey data, with 40 to 50 percent of clients, respectively, attaining 12th grade education.

Table WI.1.9 Comparison of Administrative Records and Client Survey Sample for Age and Education in Intervention and Comparison Agencies in WI, Average Q2/2022–Q1/2023 [a]

	Intervention		Comparison	
	%			
Q2/2022–Q1/2023	Administrative	Sample	Administrative	Sample
Age	N=2,922	N=35	N=3,354	N=180
11–14 years	0.29	0.00	0.50	0.00
15–16 years	2.27	0.00	4.64	0.00
17–18 years	10.04	0.00	12.59	2.92
19–20 years	14.16	7.86	18.29	4.31
21–24 years	27.42	20.00	27.38	21.39
25–30 years	27.37	37.86	24.41	37.50
31–35 years	12.59	22.14	8.36	20.42
36–40 years	4.89	10.71	3.14	11.53
> 40 years	0.98	1.43	0.68	1.94
Education	N=2,580	N=46	N=2,739	N=174
0–7 years	2.71	0.00	2.77	1.87
8–11 years	14.63	10.87	21.77	13.38
12 years	47.11	46.20	54.05	56.83
13–15 years	23.32	29.35	15.78	18.27
≥ 16 years	12.23	13.59	5.63	9.64

Source: WI MIS
[a] Two WIC agencies were excluded from this analysis because they dropped out of the intervention.

As seen in **Table WI.1.10**, for both intervention and comparison agencies, the sample included a higher percentage of White persons and a lower percentage of Black/African American persons than the administrative data. Additionally, for intervention and comparison agencies, the sample included fewer Hispanic clients than the administrative data. Household size was similar in the administrative data and the Client Survey sample in the intervention and comparison agencies, with the largest percentage of WIC clients coming from households with 3 or fewer members followed by households with 4 members.

Table WI.1.10 Comparison of Administrative Records and Client Survey Sample for Race/Ethnicity, and Household Size for Client Survey Sample in Intervention and Comparison Agencies in WI, Average Q2/2022–Q1/2023

	Intervention		Comparison	
	%			
Q2/2022–Q1/2023	Administrative	Sample	Administrative	Sample
Race	N=32,115	N=752	N=23,970	N=155
Non-Hispanic White	34.85	59.09	55.96	76.01
Non-Hispanic Black	44.91	25.12	22.78	9.34
Non-Hispanic Am. Indian	0.31	0.37	1.22	0.81
Non-Hispanic Asian	13.47	9.64	7.94	3.38
Non-Hispanic Pacific Islander	0.15	0.13	0.23	0.32
Non-Hispanic 2 or more race	6.32	5.65	11.86	10.14
Ethnicity	N=32,115	N=752	N=23,970	N=124
Hispanic (Yes)	22.41	18.88	38.97	29.79
Household size	N=9,265	N=733	N=8,081	N=153
3 or fewer members	42.09	30.25	44.67	36.70
4 members	24.94	28.07	23.35	31.97
5 members	16.60	21.25	16.75	15.66
6 or more members	16.37	20.43	15.24	15.66

Source: WI MIS

As shown in **Table WI.1.11**, for both the intervention and comparison agencies, infants represented the largest percentage of clients in the administrative and sample data, followed by breastfeeding clients. Intervention agencies had slightly higher percentages of pregnant women than comparison agencies for the administrative and sample data.

Table WI.1.11 Comparison of Administrative Records and Client Survey Sample for Participant Type Category in Intervention and Comparison Agencies in WI, Average Q2/2022–Q1/2023

	Intervention		Comparison	
	%			
Q2/2022–Q1/2023	Administrative	Sample	Administrative	Sample
Participant Type Category	N=37,652	N=752	N=29,139	N=142
Infant	56.55	55.83	58.54	60.39
Breastfeeding	22.79	20.77	21.13	17.07
Non-Breastfeeding	7.55	8.54	7.33	10.79
Child	6.06	8.11	8.02	8.70
Pregnant	7.05	6.75	4.98	3.06

Source: WI MIS

WI.1.5 Staff Survey Sample Size, Response Rate, and Respondent Characteristics

WI.1.5.1 Staff Survey Sample Size and Response Rate

All staff involved in the delivery of nutrition education/breastfeeding support at intervention agencies were invited to participate in the Staff Survey. Thirteen unique staff members responded to the Staff Survey in the early and late phases. Twenty-seven staff were invited to participate, and 23 staff completed the early phase survey (85% response rate). In the late phase, 24 staff were invited to participate, and 17 staff completed the late phase survey (71% response rate) (**Table WI.1.12**).

Table WI.1.12 Number of Staff Who Were Invited and Responded to Early and Late Phase Staff Surveys in WI

	Number of Staff			
	Early		Late	
WIC Agency	Invited	Responded	Invited	Responded
Bay Area	2	2	4	3
Jefferson County	3	3	3	3
Juneau & Adams[a]	3	2	N/A	N/A
Oneida County	1	1	1	0
Portage County	4	4	4	4
Public Health—Madison and Dane County	8	5	7	4
West Allis	6	6	5	3
TOTAL	27	23	24	17
Overall Response Rate	85%		71%	

Source: WIC Staff Survey
[a] WIC agency withdrew after telehealth solution implementation began.

WI.1.5.2 Characteristics of Staff Survey Respondents

WIC agencies experience turnover and hire new staff, so the same survey was administered at both time points. The distribution of age, race/ethnicity, and WIC participation did not differ among early- and late-phase Staff Survey respondents (**Table WI.1.13**).

Table WI.1.13 Characteristics of Early and Late Phase Staff Survey Respondents in WI

Variables	Early Phase	Late Phase	p-value[a]
	%		
Age	N=23	N=17	0.618
18–25	8.7	11.8	
25–35	17.4	29.4	
36–45	43.5	23.5	
46–65	17.4	29.4	
56–65	13.0	5.9	
66+	0	0	
Race/Ethnicity	N=23	N=17	>0.999
Hispanic	4.4	5.9	
Non-Hispanic Black or African American	0	0	
Non-Hispanic White	91.3	94.1	
Non-Hispanic American Indian or Alaska Native	0	0	
Non-Hispanic Asian	0	0	
Non-Hispanic Native Hawaiian or multiracial	4.4	0	
Previous WIC participation	N=4	N=1	0.373
Yes	17.4	5.9	

Source: WIC Staff Survey
[a] p-values are based on chi-square tests.

WI.1.5.3 WIC Role and Years of Experience of Staff Survey Respondents

As seen in **Table WI.1.14**, role, years of WIC experience, and travel patterns of WIC staff did not differ between the early- and late-phase Staff Surveys. WIC staff were primarily registered dietitians and breastfeeding support staff, and about 40 percent had worked in WIC for more than 12 years. All staff surveyed in the early phase traveled to provide service before the COVID-19 pandemic, whereas about 85 percent did so in the late phase.

Table WI.1.14 Role and Years of WIC Experience of Early and Late Phase Staff Survey Respondents in WI

Variables	Early Phase	Late Phase	p-value[a]
	%		
WIC role[b]	N=23	N=17	
CPA/CPPA	73.9	64.7	
Nutrition support roles (e.g., registered dietitian, nutritionist)	95.7	76.5	0.530
Breastfeeding roles (e.g., IBCLCs)	52.2	47.1	0.070
Local agency directors	17.4	25.5	0.749
Year worked in WIC	N=23	N=17	0.427
<2 years	8.7	17.7	
2–4 years	4.4	17.7	
5–8 years	17.4	11.8	
9–12 years	30.4	11.8	
12+ years	39.1	41.2	
Travel to provide service before COVID-19	N=21	N=12	0.153
Yes	100	85.7	

Source: WIC Staff Survey
[a] p-values are based on chi-square tests.
[b] Percentages do not add up to 100 because staff could select more than one role.

WI.1.6 Staff Key Informant Interviews Sample Size and Response Rate

In the early phase, all staff who completed the Staff Survey were invited to participate in the key informant interviews. Given the low response rate to the Staff Survey in the early phase, all staff who used the telehealth solution for nutrition education and breastfeeding support were invited to the key informant interview, regardless of their survey completion status in the late phase. **Table WI.1.15** presents the number of staff invited and the number of staff who completed the early and late phase surveys. As shown, the response rate to the staff key informant interviews was 41 percent in the early phase and 33 percent in the late phase.

Table WI.1.15 Number of Staff Who Were Invited and Participated in Key Informant Interviews in WI

WIC Agency	Number of Staff			
	Early Phase		Late Phase	
	Invited[a]	Interviewed	Invited	Interviewed
Bay Area	2	1	4	1
Jefferson County	3	2	3	1
Juneau & Adams	2	0	—[b]	—[b]
Oneida County	1	1	1	1
Portage County	4	2	4	2
Public Health – Madison and Dane County	4	1	7	3
West Allis	6	2	5	0
TOTAL	**22**	**9**	**24**	**8**
Response Rate (%)	**41%**		**33%**	

Source: WIC Staff Survey
[a] One staff member who completed the Staff Survey left the agency between the survey and key informant interview data collection.
[b] WIC agency withdrew after telehealth solution implementation began.

WI.1.7 Data Analysis

WI.1.7.1 Aggregate MIS Analysis

For WI, WIC administrative data included WIC client characteristics, certification information, nutrition and risk assessment, nutrition education, and WIC food benefit redemption. WI also linked the Client Survey identifier with the client-level MIS data.

Aggregate data were used to examine the representativeness of survey respondents, by comparing the sociodemographic characteristics of clients and survey respondents. Although the analysis of linked MIS and Client Survey data provides the most useful outcome variables, it is limited by sample size, depends on the representativeness of the sample, and is available only for the time periods covered by the sample.

Administrative data linked to Client Survey respondents were also used to examine retention and benefit redemption among survey respondents. Crosstabulations and chi-square statistics were used to examine the differences between intervention and comparison agencies.

Retention. This analysis was restricted to Client Survey respondents who completed their surveys in the first 6 months of telehealth implementation. Retention was examined by tracking the proportion of Client Survey respondents (overall and by participant type) who redeemed their WIC benefits 6 months after their appointment.

Benefit Redemption. WI's MIS captures the percentage of WIC vouchers redeemed by survey respondents. Benefit redemption was categorized as (a) <10%, (b) 10–90%, and (c) >90%. The proportion of WIC benefits redeemed by respondents in the month after their appointment was

compared for Client Survey respondents, both overall and by participant type, from the intervention and comparison agencies.

Finally, aggregate MIS data were also used to examine agency-level trends in breastfeeding initiation and exclusive breastfeeding for the intervention and comparison agencies. The analysis of aggregate data has the advantage of providing information about all WIC clients in the intervention and comparison agencies, and it provides information about more time periods (including time periods before the intervention began), but it is limited to the variables captured by the MIS. Descriptive analyses were used to analyze the data and present the findings. All analyses were conducted in SAS 9.4.

WI.1.7.2 ONE Metadata

Metadata on telehealth solution usage were captured by the ONE platform for each participating local agency. This included data on the number of pending, open active, open inactive, and closed accounts; the number of articles shared by staff and viewed by clients; and the number of recipes accessed by clients. WI State agency staff generated and provided quarterly report summaries to THIS-WIC. Descriptive analyses were used to examine counts of resources used in each quarter of telehealth implementation. All analyses were conducted in Excel.

WI.1.7.3 Client Survey

The client outcomes evaluation examines the experiences of WIC clients who received WIC services and completed a Client Survey in one of the WIC clinics associated with the 11 local agencies in the study between April 1, 2022, and March 31, 2023. WIC agencies were stratified based on geography (urban vs. rural) and randomly assigned from within strata to study condition (intervention or comparison group). Six local agencies were assigned to the intervention group, and five were assigned to the comparison group. One local agency assigned to the intervention group was excluded from the analysis because five or fewer WIC clients completed the survey. The analyses included 5 WIC local agencies in each group: 399 survey respondents from intervention agencies and 1,712 from comparison agencies. All surveys were completed by an adult to reflect WIC services they received for themselves (i.e., pregnant, postpartum, or lactating women) or for their infant/child.

Breastfeeding Practices

Information from the MIS was used to summarize breastfeeding practices in households with an infant (aged 0 to 12 months) during the intervention period. If the household included more than one infant during the intervention period, breastfeeding practices for the youngest infant were selected for analysis. Two breastfeeding variables were examined: whether the infant was ever breastfed and whether the infant was exclusively breastfed for at least 6 months.

Attitudes Toward the Telehealth Solution

Survey respondents from the intervention agencies were asked about their experience with their telehealth appointment. The number of statements (between 5 and 10) presented to each respondent was determined by the type of telehealth services used for their appointment. All

survey respondents were asked about their level of agreement with the following five statements:

- I could hear the WIC nutrition educator clearly.
- It was easy to figure out how to use and receive WIC services.
- My WIC appointment was shorter than usual when receiving care.
- The way I received WIC services was easier than going to a WIC clinic.
- I would like to receive services the same way at my next WIC appointment.

Respondents who indicated that they used the ONE platform for their WIC appointment were also asked about their level of agreement with these three additional statements:

- The telehealth platform was simple to use for my WIC appointment.
- I had trouble accessing the telehealth platform.
- The telehealth solution content was in a language I can read.

Finally, respondents who indicated that they used the ONE platform paired with Zoom for video-based, synchronous appointments were also asked about their level of agreement with the following two statements:

- I could see the WIC nutrition educator clearly during my most recent WIC appointment.
- I could easily talk to the WIC nutrition educator during my recent appointment.

Each statement included a 5-item, Likert type response option that ranged from “strongly disagree” to “strongly agree.”

Client/Respondent Outcomes

Primary and secondary outcomes assessed the comparative advantage of the telehealth intervention. Primary outcomes are related to WIC service delivery and include client satisfaction and barriers to participation. Secondary outcomes include client intentions to change dietary behaviors based on the assumption that improvements in service delivery led to improved client engagement.

Client Satisfaction. Eight items assessed client satisfaction. These items assessed respondent’s experience with their most recent appointment and included overall satisfaction, was a good use of my time, was convenient, would recommend this WIC appointment to other WIC participants, glad I completed my WIC appointment, appointment was convenient, prefer to receive WIC services the same way at next appointment, and perceptions of the WIC nutrition educator (was friendly and easy to talk to, had good communication skills). Each item included a five-level, Likert type response option that ranged from “strongly disagree” to “strongly agree.” These items demonstrated a high degree of interrelationship (interitem correlation, alpha =.89) and were treated as an index. Summing the eight items produced index scores with a potential range of 20 to 100 points, with higher scores indicating greater satisfaction.

Barriers. The Client Survey included questions on availability and use of technology, as well as questions regarding administrative-, individual-, and staff-level barriers to accessing WIC services. Four questions asked about the availability of a computer and smartphone at home,

mode of connecting to the Internet, reasons for not connecting to the Internet at home, and frequency of Internet problems. Two questions asked about comfort with use of technology and frequency of videoconferencing to connect with family and friends.

Eight items asked respondents about barriers to accessing WIC services for their most recent WIC appointment. Barriers included administrative factors (such as receiving a specific appointment time and experiencing long wait times), individual-level factors (such as transportation issues, childcare issues, difficulty getting time away from work), and staff interactions (such as language barrier, racial/ethnic barrier, and poor/no Internet connectivity). Each item included a four-level, Likert type response option that ranged from “frequently” to “never” with lower scores reflecting more experience with the barrier and higher scores reflecting less experience with the barrier.

Intentions to Change Dietary Behaviors. Three survey items asked respondents about their intentions to change diet-related behaviors following their WIC appointment. Using a five-level, Likert-type response option that ranged from “strongly disagree” to “strongly agree,” with higher numbers indicative of greater levels of agreement, the questions asked about their intentions to (1) change how they eat, (2) change how they feed their family, and (3) make healthier food choices.

Data Analysis

Descriptive Statistics. Descriptive statistics include respondent and household demographics, availability and comfort with technology, attitudes toward the telehealth intervention, and respondent behaviors (fruit and vegetable consumption and breastfeeding). Crosstabulations for categorical variables present proportions among those who provided data (i.e., missing values were excluded from the analysis) by group (intervention and comparison). Descriptive statistics for continuous variables present medians and interquartile ranges (25th percentile – 75th percentile) because the data on household income and household size were assumed to be skewed.

Significance tests compare respondent demographics and household characteristics, availability and comfort with technology, and respondent behaviors between respondents in the intervention and comparison agencies. For categorical variables, chi-square tests for independence are presented. For continuous variables, the median test was used. This test examines whether the two samples come from the same population by assessing the distribution of sample scores around the median instead of comparing the actual median values.

Statistical Models. Analyses to assess client outcomes (satisfaction index, barriers, and intentions to change dietary behaviors) used hierarchical linear regression models comparing differences in group means among respondents who received WIC services in intervention and comparison agencies. The models were estimated with the SAS PROC MIXED (3) procedure using restricted maximum likelihood and Type-3 F test to assess study hypotheses with statistical significance set at $p < 0.05$. Degrees of freedom for tests of intervention effects were determined using the Kenward and Rogers (1997) method.[4]

For the adjusted model for client satisfaction index, demographic/household variables that demonstrated statistically significant differences between intervention and comparison agencies were entered into multivariable hierarchical linear regression. Categorical variables that produced a low cell count warning were excluded because these variables have poor coverage across categories and are likely to lead to model failure. If the initial model did not converge, the model was simplified by removing the least significant variable (i.e., in relation to the satisfaction index), if this information was available, and removing the most complicated variables (i.e., has most categories) if converge problems were so extreme that significance tests could not be estimated. This process was repeated iteratively until a model solution was obtained or we arrived at the adjusted model.[4, 5]

WI.1.7.4 Staff Survey

Descriptive analyses were undertaken to examine the Staff Survey data. Chi-square tests were performed to examine differences in responses from early- to late-phase surveys. When analyzing the staff outcomes, attempts were made to adjust for biases in standard error estimates due to repeated measurements whenever feasible. For ordinal/ continuous outcomes, the analysis adjusted for the unique respondent ID numbers as random effects and corrected for repeated measurements. However, due to low sample size, the same adjustments could not be made for categorical outcomes, which impose more stringent requirements on sample size. Instead, these data were analyzed as if the two time points are not related. All analyses were conducted in Stata 18 (StataCorp LLC, College Station, TX, USA).

WI.1.7.5 Staff Key Informant Interviews

All interviews were conducted in English, audio recorded, and transcribed by Zoom verbatim. Each transcript was reviewed for accuracy and corrected to reflect actual dialogue spoken by listening to the audio recording.

Before undertaking analysis, three THIS-WIC team members created a preliminary codebook, with codes deductively informed primarily by the Consolidated Framework for Implementation Science Research[6] and the Evaluation Framework for Telemedicine.[7] Five trained qualitative researchers who conducted the interviews also coded the interviews.

A single codebook was used to code early and late phase interviews. The codebook included a description, inclusion and exclusion guidance, and an example quote for each code when relevant. To start, five researchers independently coded the same four transcripts from four different WIC state agencies participating in the THIS-WIC evaluation. Coders met to compare codes, arrived at an agreement on differing codes through discussion, and updated the codebook to address inconsistencies or to add clarity.

Next, researchers established interrater reliability across four different transcripts. These four transcripts involved the WIC roles of two frontline nutrition staff (e.g., Registered Dietitian [RD]), one breastfeeding-focused staff (e.g., International Board-Certified Lactation Consultant [IBCLC]), and one local agency director. Researchers coded each transcript individually, ran coding comparisons against the primary coder, and discussed results. Coders discussed results

until all codes reached a 90 percent agreement and a Kappa coefficient of at least 0.40 (fair to good judgment). Researchers conducted the same process for all four transcripts. As new researchers joined the project, the main coder facilitated the same reliability process with the previously established agreement NVivo files until coders reached 90 percent agreement and a Kappa coefficient of at least 0.40.

Two reviewers coded the remaining transcripts. The main coder randomly assigned transcripts to coders in batches of five. After coders completed their five assignments, the group reconvened and discussed coding uncertainties as a full coding team. Researchers then updated the codebook after reaching consensus, if needed. NVivo version 13 (QSR International) was used to organize and analyze coded interviews.

WI.1.7.6 ONE Implementation

Responses to the Implementation Tracking Tool were collected at the startup, midpoint, and endpoint of telehealth implementation. See **Appendix WI.4** for implementation strategy categorization.[3] Analysis involved tabulating the startup, midpoint, and endpoint status for each menu strategy to assess change. The startup measures were considered the implementation plan, and the changes from startup to midpoint and endpoint measures were considered indicative of readiness. In addition to understanding the readiness for implementation, these data were also used to provide context for the staff and client-level outcomes.

Data on use of ONE at each local intervention agency level were collected directly in ONE or documented in WI's MIS. The WI State agency team collected these data from the local agencies and submitted tabulated data to THIS-WIC team quarterly during the intervention period. Descriptive analyses were undertaken in Tableau Prep (version 2023.1) and Microsoft Excel (version 2308) to examine implementation.

WI.1.7.7 ONE Startup and Ongoing Cost Analysis

Cost analysis was conducted to understand the (1) startup cost, (2) ongoing service delivery cost, and (3) ongoing cost per enrollment and appointment. One local agency did not provide cost data for the pre-implementation period (FY2019) and was therefore excluded from the ongoing service delivery cost analysis. All costs were adjusted to 2023 dollars using the Consumer Price Index. All analyses were completed in Microsoft Excel (version# 2308) and Stata 17. The COVID-19 pandemic impacted the timeline and rollout of ONE. WIC service delivery in intervention and comparison agencies was adjusted due to the pandemic as all appointments became remote (i.e., phone-based) under federal waivers. To facilitate the comparison of costs from before to after introduction of the telehealth solution and between intervention and comparison agencies, the pre-implementation period was set to FY2019, before the start of the pandemic (WI provided the FY2019 data to THIS-WIC in 2022). We then assessed how service delivery costs changed from preintervention (in FY2019) to postintervention (from April 2022 to March 2023).

ONE Startup Cost

Statewide startup costs for telehealth solution startup were calculated as follows:

- Generated subtotals by summing the data for each resource category in the tool (e.g., labor, equipment, indirect, contracted services).
- Computed total cost and cost per month as follows:
  - Total cost = sum of cost across resource categories
  - Cost per month = total cost/number of months in the startup period

Ongoing WIC Service Delivery Cost

Ongoing service delivery costs were computed for each participating local agency at three time points—baseline/pre-implementation (FY2019), 6-months post-implementation (April to September 2022), and 12 months post-implementation (October 2022 to March 2023)—as follows:

- Staffing cost was calculated by multiplying the reported average number of hours each staff member spent providing nutrition and breastfeeding education services by that person's average hourly salary.
- If an agency purchased equipment, the cost of the equipment was amortized over the reported period, until replacement.
- Subtotals were created for each resource category (labor, equipment, supplies, contracted services, and indirect) and then summed across categories to calculate a total by local agency.

WI also incurred ongoing costs associated with the telehealth solution at the state level; these costs were apportioned across all intervention agencies, based on each agency's reported enrollment counts.

Ongoing WIC Service Delivery Cost Per Enrollment and Per Appointment

To facilitate the comparison of costs from before to after introduction of the telehealth solution and between intervention and comparison agencies, the pre-implementation period was set to FY2019 (i.e., before the start of the pandemic). Changes in service delivery costs from pre-intervention (FY2019) to post-intervention (April 2022 to March 2023) were examined.

Average monthly ongoing costs, average cost per enrollment, and average cost per appointment were computed for each period of the ongoing cost analysis. Ongoing cost per enrollment and per appointment were computed by dividing the average monthly cost by the number of monthly enrollments and monthly appointments, respectively, in that same period. To understand the distribution of monthly costs, the mean, median, minimum, and maximum cost per enrollment and per appointment were examined across the intervention and comparison agencies. Changes in ongoing service delivery per-enrollment and per-appointment costs from pre-implementation to post-implementation were compared for intervention and comparison agencies.

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