Georgia Department of Public Health (DPH) WIC: Pathways Telehealth Intervention

GA.1. Technical Appendix

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Georgia WIC Women, Infants & Children

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GA.1.1 THIS-WIC Study Framework

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 GA.1-1**). The first stage starts with suggesting a technology-based solution for a health problem (Stage 1: concept development) and may include a needs analysis, proof of concept, and a technical evaluation of the concept. In the next stage (Stage 2: service design), feasibility and accessibility are studied to determine how the service delivery model should be modified to accommodate the proposed telehealth intervention. In Stage 3: pre-implementation, the telehealth solution is studied under a controlled environment to assess efficacy or studied in real-world settings where the goal is to assess effectiveness (Stage 4: implementation). After implementing a telehealth intervention, research then shifts to focus on operational use and sustainability of the solution (Stage 5: operational use). Georgia's (GA's) project spanned Stages 3 and 4 and was categorized as an efficacy/effectiveness trial because it was implemented in the WIC setting instead of a controlled environment.

In the context of THIS-WIC, the model mapped a multistage journey from developing a telehealth solution to the assessment of 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. GA falls along the third and fourth stage of the model as it focuses on operational use of the mobile-friendly telehealth technology.

GA.1.2 WIC Local Agencies Participating in THIS-WIC Evaluation

GA WIC identified three local agencies—Gwinnett, Coastal, and Augusta—to participate in the THIS-WIC project and implement Pathways. These local agencies were selected based on geographical location in the state, demonstrated history of providing quality service, capacity to participate (i.e., adequate staff), interest in implementing a new telehealth system, and indication of readiness to implement telehealth. Gwinnett local agency is in the north central portion of the state of GA and is the second most populous county in GA. Augusta local agency is in the central eastern border of GA and is the second largest metropolitan area with urban and rural demographics. The Coastal local agency is the fastest growing area of any region in GA, outside of the metropolitan area, with four counties inland and six counties on the coast. Together, in FY2019, the three local agencies served approximately 40,036 participants in 33 clinics.

GA WIC used the local agency-level data on race, ethnicity, and total participation/caseload to match the intervention agencies with comparison agencies. The Albany local agency is in the southwestern area of the state, the Cobb Douglas local agency is in the north central region of the state, and the LaGrange local agency is in the west central portion of the state. **Tables GA.1.1** and **GA.1.2** list the local agencies involved in the evaluation.

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

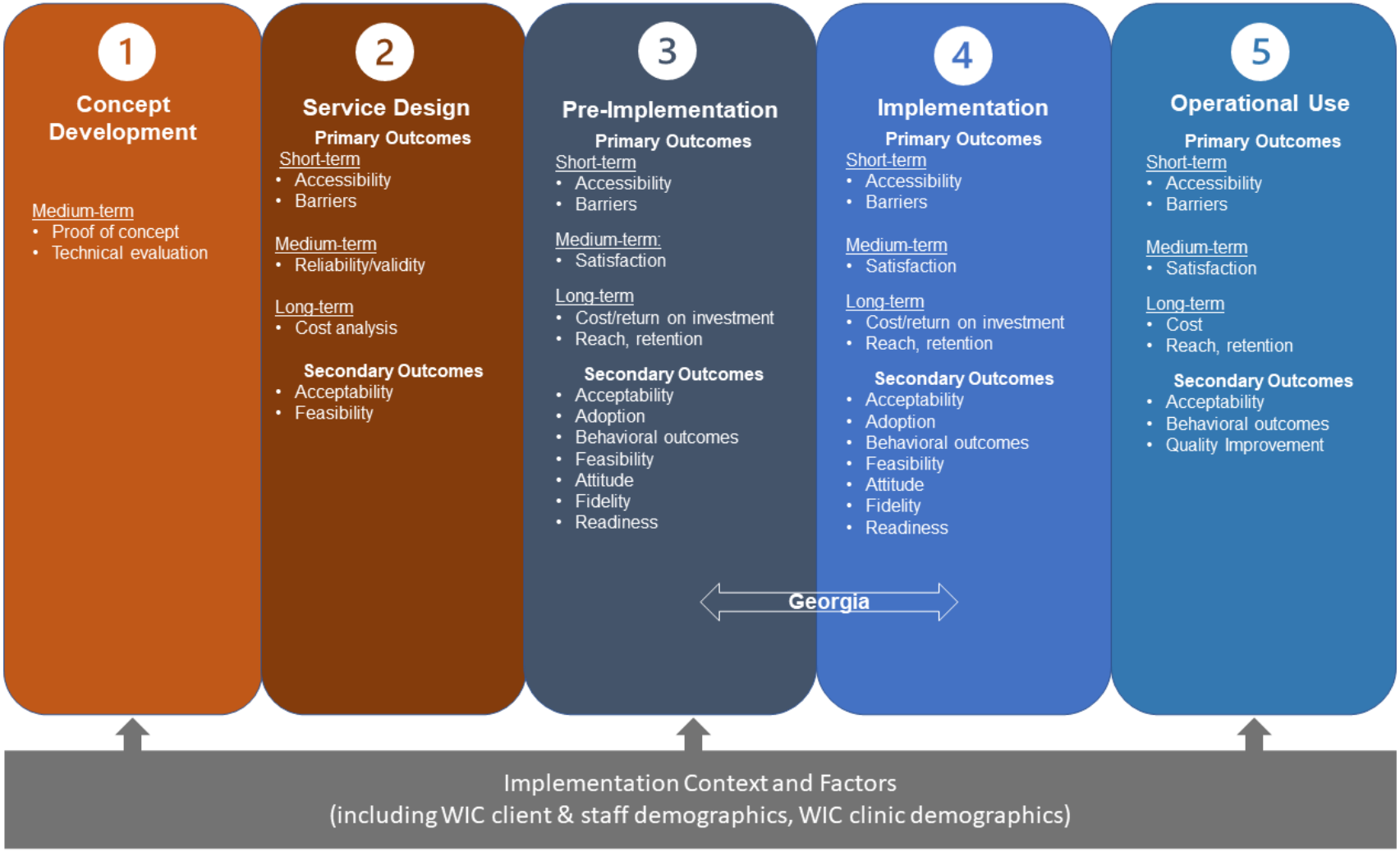

Table GA.1.1. WIC Local Agencies in the Intervention and Comparison Groups in GA[a]

Intervention Group	Comparison Group
Augusta (1)	Albany (1)
Coastal (15)	LaGrange (2)
Gwinnett (5)	Cobb Douglas (5)

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

Table GA.1.2. Local Agency and Client Characteristics of Intervention and Comparison Local Agencies in GA

Characteristic	Intervention			Comparison		
	Augusta	Coastal	Gwinnett	Albany	LaGrange	Cobb
Region	Central east	Southeast	North Central	Southwest	Central west	North central
County	Augusta-Richmond	Glynn	Gwinnett	Dougherty	Troup	Cobb
Caseload (n)	3,691	3,262	6,380	2,737	3,314	3,010
Pregnant (n)	324	298	515	230	266	248
Breastfeeding (n)	65	102	364	34	72	84
Non-breastfeeding postpartum (n)	384	245	481	255	298	225
Infants (n)	1,113	869	1,920	859	962	902
Children (n)	1,805	1,748	3,100	1,359	1,716	1,551
Race/Ethnicity of Clients Served (%)						
AI/AN[2]	N/A	N/A	N/A	N/A	N/A	N/A
Asian	N/A	N/A	N/A	N/A	N/A	N/A
Black/AA[3]	74.5	56.6	42.4	85.7	55.3	46.3
Hispanic	5.1	7.8	36	3.2	18.1	34
NH or 2 or more races	7	7.9	7.7	4	5.9	6.5
White	13.2	14.3	14	6.9	20.8	13.3

Source: GA WIC MIS, participation summary report, December 2020

GA.1.3 Data Sources for Pathways Evaluation

Table GA.1.3 provides the description of data sources used in the evaluation.

Table GA.1.3. Description of Data Sources for Pathways Evaluation in GA

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
Pathways Telehealth Metadata	Telehealth usage and engagement metrics	Telehealth vendor	State agency
Client and Staff Surveys	Telehealth satisfaction, quality of telehealth interaction, and whether telehealth solution addresses known barriers to WIC participation	State agency and THIS-WIC	State agency
Staff Key Informant Interviews	Telehealth experience of local agency and state agency stakeholders	THIS-WIC	THIS-WIC
Implementation Data	Fidelity to the intervention protocol and implementation strategies	State agency and 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 and State agency

GA.1.3.1 Telehealth Solution Implementation Data

Implementation data were collected using two methods: (1) staff implementation surveys developed and administered by the GA WIC state agency and (2) responses to the Implementation Tracking Tool for startup (pre-implementation), midway, and endpoint or late phase of implementation. See **Appendix GA.3** for data collection instruments.

GA.1.3.1.1 Quarterly Staff Implementation Surveys

The GA WIC state agency used a quarterly local agency reporting tool to collect feedback on implementation from WIC staff in intervention agencies. WIC staff provided feedback on their experience using Pathways during remote service delivery, including appointment length, content, and quality and overall staff perceptions of Pathways, whereas state agency staff provided training and support.

GA.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 MIS. Variables from the Client Survey included 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.

GA.1.4.1 Client Survey Sample Size

All WIC clients who received nutrition counseling or breastfeeding support during a remote appointment 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. Sample size estimation used the composite score for client satisfaction as the main outcome of interest, which ranges from 0 to 100 points, with a standard deviation of 15 points. A difference of 10 points was considered as practically meaningful. Assuming a sampling ratio (intervention: comparison) of 1:1, alpha (type I error rate) 5 percent, and power 80 percent, a total minimal sample size of 144 per time point is needed to detect the difference of 10 points (72 from intervention, 72 from comparison at the early phase; another 72 from intervention and 72 from comparison at the late phase).

Table GA.1.4. presents the caseload and target response rate for each phase, based on the total caseload at intervention and comparison agencies. While an increase of 10 points was hypothesized to be practically important, in many cases the actual difference could likely be smaller. 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 survey) are also provided for reference.

Table GA.1.4. Caseload and Target Response Rate for Client Survey in GA

Local Agency	Caseload	Per Phase		Response Rate	
		N if diff=10	N if diff=4	N with 5%	N with 10%
Intervention					
Augusta	3,691	25	149	185	370
Coastal	3,262	22	132	164	327
Gwinnett	6,380	43	257	319	638
Comparison					
Albany	2,737	19	110	137	274
Cobb Douglas	3,010	21	121	151	301
LaGrange	3,314	23	134	166	332
Total	22,394	153	903	1,122	2,242

Source: GA WIC MIS, participation summary report, December 2020

GA.1.4.2 Client Survey Invitations and Response Rate

Following their 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 GA.1.5**, 1,668 clients consented to complete the survey. Of those who consented, 91 percent completed the survey and 10.7 percent were successfully linked with the MIS identifier.

Table GA.1.5. Client Survey Invitations, Consents, and Survey Completion in GA

Survey Status	Definition	Calculation	%
Response	Consents/Invitations	1,668	n/a
Completion[a]	Completes/Consents	1,518/1,668	91.0
Match[b]	MIS Matches/Consents	163/1,517	10.7

[a] Survey responses were not required after screening and consent. "Complete" is defined as responding to the eight satisfaction items and a clinic association.

[b] Match was defined as the ability to link WIC family level administrative data to the survey respondent.

GA.1.4.3 Sociodemographic Characteristics of WIC Client Survey Respondents

Table GA.1.6 presents the characteristics of Client Survey respondents in GA. Of the 1,517 survey respondents, 1,358 (89.5%) were in the intervention agencies and 159 (10.5%) were in the comparison agencies. Except for respondent's age, none of the household characteristics were significantly different between intervention and comparison. Overall, more than half (53.7%) of respondents self-identified as non-Hispanic Black/African American, 20 percent identified as Non-Hispanic White, and slightly less than 20 percent as Hispanic. Slightly more than half of the respondents (52.5%) were between 26 and 35 years of age. The intervention agencies had more respondents between the ages of 18 and 25 than the comparison agencies (23.1% vs. 17%). Overall, 69 percent of respondents had some high school education and slightly less than 15 percent had completed some college education. Most respondents (93%) reported the use of English at home (written). The median household size was four members, and the median annual household income was $12,000. About 52 percent of respondents lived in a suburban area, 25 percent lived in an urban area, and 23 percent lived in a rural area.

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

As seen in **Table GA.1.7**, about 30.4 percent of survey respondents had received WIC services for less than one year and 17.2 percent had received WIC services for 5 years or more. A greater proportion of survey respondents from the comparison than the intervention agencies had received WIC services for 5 or more years (22.3% vs. 16.7%). About 36 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 GA.1.6. Sociodemographic Characteristics of Client Survey Respondents in GA

Variable	Overall (%)	Intervention (%)	Comparison (%)	p-value[d]
Age[a]	N=1,285	N=1,173	N=112	0.0495*
18–25	22.6	23.1	17.0	
26–35	52.5	52.7	50.0	
36–45	21.7	21.4	25.0	
46–55	1.8	1.5	4.5	
56–65	1.2	1.0	2.7	
66+	0.3	0.3	0.9	
Education[b]	N=162	N=141	N=21	0.9826
8th grade or less	1.9	2.1	0.0	
Some High School	8.6	8.5	9.5	
High School graduate	60.5	61.0	57.1	
Some college	14.2	13.5	19.0	
Associates degree	4.3	4.3	4.8	
Bachelor's degree	9.9	9.9	9.5	
Master's degree or higher	0.6	0.7	0.0	
Race/ethnicity[a]	N=1,285	N=1,175	N=110	0.0980
Non-Hispanic Black/African American	53.7	52.8	63.6	
Non-Hispanic White	19.9	20.7	11.8	
Hispanic/Latino	17.9	18.2	14.5	
Non-Hispanic American Indian/Alaska Native	0.3	0.3	0.9	
Non-Hispanic Asian	2.9	3.1	0.9	
Non-Hispanic Native Hawaiian/Pacific Islander	0.1	0.1	0.0	
Two or more races	4.1	3.9	6.4	
Other	1.1	1.0	1.8	
Language used at home (written)[b]	N=162	N=141	N=21	0.1433
English	93.2	94.3	85.7	
Spanish	6.8	5.7	14.3	
Place of residence[a]	N=1,273	N=1,162	N=111	0.1378
Rural	22.8	22.1	29.7	
Suburban	51.8	52.5	44.1	
Urban	25.5	25.4	26.1	
Household size[b]	N=1,355	N=1,217	N=138	0.7945
Median [IQR][c]	4.0 [3.0, 4.0]	4.0 [3.0, 5.0]	4.0 [3.0, 4.0]	

(continued)

Table GA.1.6. Sociodemographic Characteristics of Client Survey Respondents in GA (continued)

Variable	Overall (%)	Intervention (%)	Comparison (%)	p-value[d]
Household annual income ($)[b]	N= 1,355	N= 1,217	N= 138	0.4725
Median [IQR][c]	12,000.0 [4,800.0, 24,000.0]	12,000.0 [4,800.0, 24,000.0]	14,400.0 [6,708.0, 19,200.0]	

Source: [a] THIS-WIC Client Survey, [b] GA 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, education, language used at home, 25% or more of the cells have expected counts less than 5 so chi-square may not be a valid test.

* p<0.05

Table GA.1.7. Length of WIC Tenure of Client Survey Respondents in GA

Variable	Overall (%)	Intervention (%)	Comparison (%)	p-value[a]
In total, how many years have you received WIC services? Would you say it has been …	N=1,286	N=1,174	N=112	0.0414
<1 year	30.4	31.3	21.4	
1–2 years	31.6	31.9	28.6	
3–4 years	20.8	20.2	27.7	
5+ years	17.2	16.7	22.3	
Household high-risk status[b]	N=162	N=141	N=21	0.8642
Yes	36.4	36.2	38.1	
No	63.6	63.8	61.9	

Source: GA MIS

[a] p-value based on chi-square tests.

[b] High-risk status is a dichotomous indicator coded "1" if one or more WIC clients in the household was assigned high-risk at their most recent WIC appointment.

GA.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 the overall and high-risk clients at the intervention and comparison agencies. The administrative caseload data presented in the balance tables are aggregate MIS data spanning Q2/2022 to Q2/2023; quarterly disaggregated balance tables disaggregated are in **Appendix GA.4**.

As seen in **Table GA.1.8**, the distribution of race and household size was generally similar for the administrative caseload and survey respondents for both intervention and comparison agencies.

Table GA.1.8. Comparison of Race, Ethnicity, and Household Size of Client Survey Sample with Administrative Records, Intervention, and Comparison Agencies in GA[a]

	Intervention		Comparison	
	Administrative	Sample[b]	Administrative	Sample[b]
Q2/2022–Q1/2023	%			
Race	N=10,615	N=292	N=4,057	N=28
Non-Hispanic White	40.27	27.62	37.37	14.55
Non-Hispanic Black	48.89	54.63	54.76	66.36
Non-Hispanic Am. Indian	1.26	1.25	0.5	0.91
Non-Hispanic Asian	3.25	3.17	1.53	0.91
Non-Hispanic Pacific Islander	0.25	0.17	0.11	0.00
Non-Hispanic 2 or more race	6.09	13.98	5.72	17.27
Ethnicity	N=10,616	N=294	N=4,057	N=28
Hispanic (Yes)	22.62	18.20	23.48	14.29
Household size[b]	N=10616	N=47	N=4057	N=6
3 or fewer members	45.17	46.10	44.55	45.45
4 members	26.04	27.66	26.32	36.36
5 members	16.21	17.02	16.42	13.64
6 or more members	12.58	9.22	12.71	4.55

Source: GA MIS

[a] Two WIC clinics were excluded from this analysis as they dropped out from the study.

[b] Sample data missing for Q3_2022.

As shown in **Table GA.1.9**, for both intervention and comparison agencies, children represented the largest percentage of clients in the administrative data (slightly more than 50% in both intervention and comparison agencies) while infants and children represented the largest percentage of clients in the sample data (about one-third in both the intervention and comparison samples).

Table GA.1.9. Comparison of Participant Category of Client Survey Sample with Administrative Records, Intervention, and Comparison Local Agencies in GA

	Intervention		Comparison	
	Administrative	Sample[a]	Administrative	Sample[a]
Q2/2022–Q1/2023	%			
Participant Type Category	N=10,616	N=122	N=4,057	N=13
Infant	23.48	34.15	21.35	34.21
Breastfeeding	9.63	15.58	9.8	13.16
Non-Breastfeeding	6.95	17.49	5.95	13.16
Child	53.21	24.04	56.95	28.95
Pregnant	6.73	8.47	6.31	10.53

Source: GA MIS

[a] Sample data missing for Q3_2022.

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

GA.1.5.1 Sample Size and Response Rate

All WIC staff and administrators engaged in delivering nutrition or breastfeeding counseling services for high-risk WIC clients at intervention agencies were invited to complete the Staff Survey. As shown in **Table GA.1.10**, GA invited 111 and 110 staff members to complete the early and late phase surveys, respectively. Response rate for the early phase surveys was 65.77 percent (n=73) whereas for the late phase it was 60 percent (n=66).

Table GA.1.10. Staff Survey Sample Size and Response Rate in GA

Local Agency	Early Phase (Number of Staff)		Late Phase (Number of Staff)	
	Invited	Responded	Invited	Responded
Augusta	34	12	36	10
Coastal	12	9	7	7
Gwinnett/Newton/Rockdale	65	52	67	48
TOTAL	111	73	110	66
Overall response rate (%)	65.8		60.0	

Source: THIS-WIC Staff Survey

GA.1.5.2 Characteristics of Staff Survey Respondents

Because WIC agencies experience staff turnover and hire new staff, the same survey was administered at both time points. There were no significant differences in the age and race/ethnicity distribution or WIC participation among early- and late-phase Staff Survey respondents (**Table GA.1.11**).

Table GA.1.11. Characteristics of Early- and Late-Phase Staff Survey Respondents in GA

Variables	Early Phase (%)	Late Phase (%)	p-value[a]
Age	N=71	N=62	0.779
18–25	2.8	1.6	
25–35	25.4	21.0	
36–45	21.1	27.4	
46–65	32.4	33.9	
56–65	18.3	14.5	
66+	0.0	1.6	
Race/Ethnicity	N=69	N=62	0.963
Hispanic	23.2	19.4	
Non-Hispanic Black or African American	42.0	40.3	
Non-Hispanic White	26.1	30.6	
American Indian or Alaska Native	1.4	1.6	
Asian	2.9	1.6	
Native Hawaiian or multi-racial	4.3	6.5	
Previous WIC participation	N=36	N=31	0.935
Yes	50.7	50	

Source: THIS-WIC Staff Survey

[a] p-values are based on chi-square tests.

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

As seen in **Table GA.1.12**, there were no differences in the role, years of WIC experience, and travel patterns of WIC staff in the early- and late-phase Staff Surveys. WIC staff were primarily registered dietitians and breastfeeding support staff, and about 32 percent and 39 percent of early- and late-phase staff had worked in WIC for over 12 years, respectively. Although about 43 percent of staff surveyed in the early phase traveled to provide service prior to COVID-19 pandemic, about 40 percent did so in the late phase.

Table GA.1.12. Role and Years of WIC Experience of Early and Late Phase Staff Survey Respondents in GA

Variables	Early Phase (%)	Late Phase (%)	p-value[b]
WIC role[a]	N=51	N=48	
CPA/CPPA	25.0	25.8	0.915
Registered dietitians	25.0	29.0	0.600
Breastfeeding roles (e.g., IBCLCs)	18.1	17.7	0.962
Local agency directors	2.8	4.8	0.530
Year worked in WIC	N=71	N=62	0.651
<2 years	23.9	14.5	
2–4 years	15.5	17.7	
5–8 years	14.1	17.7	
9–12 years	14.1	11.3	
12+ years	32.4	38.7	
Pre–COVID-19 travel to provide service	N=23	N=21	0.693
Yes	43.4	39.6	

Source: THIS-WIC Staff Survey

[a] Percentages do not sum to 100 percent. Staff may have multiple roles and not all roles are tabulated in the table.
[b] p-values are based on chi-square tests.

GA.1.6 Staff Key Informant Interview Sample Size and Response Rate

As shown in **Table GA.1.13**, all staff who completed the Staff Survey and indicated they had used telehealth were invited to participate in the key informant interviews in the early and late phase.

Table GA.1.13. Number of Staff Who Were Invited and Participated in Key Informant Interviews in GA

Local Agency	Early Phase (Number of Staff)		Late Phase (Number of Staff)	
	Invited	Responded	Invited	Responded
Augusta	5	2	7	2
Coastal	5	3	4	3
Gwinnett/Newton/Rockdale	27	11	29	12
TOTAL	37	16	40	17
Overall response rate (%)	43.2		42.5	

GA.1.7 Data Analysis

GA.1.7.1 Aggregate MS Analysis

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

Descriptive analyses were used to analyze the data and present the findings. All analyses were conducted in SAS 9.4. Crosstabulations and chi-square statistics were used to examine the differences between intervention and comparison agencies.

Aggregate MIS data were used to examine survey respondents' representativeness by comparing sociodemographic characteristics of the overall caseload with that of the survey respondents. It should be noted that while 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 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 clinics.

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 survey respondents (overall and by participant type) who redeemed their WIC benefits 6 months following their appointment.

Benefit Redemption. GA WIC MIS captures the percentage of WIC vouchers redeemed by participants. Benefit redemption was categorized as (a) <10 percent, (b) 10 to 90 percent, and (c) >90 percent. The proportion of WIC benefits redeemed by participants in the month following 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 clinic-level trends in outcomes for the intervention and comparison agencies. The analysis of aggregate data has the advantage of providing information about all WIC participants in the intervention and comparison agencies, and it provides some information about more time periods (including periods before the intervention began). 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.

GA.1.7.2 Pathways Implementation

GA.1.7.2.1 Implementation Tracking Tool

Responses to the Implementation Tracking Tool were collected at the startup, midpoint, and endpoint of telehealth implementation. The menu of 46 distinct strategies in the Implementation Tracking Tool were grouped into eight conceptually relevant implementation categories, using the groupings developed by Powell et al.[2] Although the researchers had developed nine categories through concept mapping, a “use financial strategies” category was not included in the THIS-WIC menu. **Table GA.1.14** lists the eight implementation categories and corresponding menu strategies. The 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 change from startup to midpoint and endpoint measures were considered indicative of fidelity. In addition to understanding the fidelity of implementation, these data were also used to provide context for the staff- and client-level outcomes.

Data on use of telehealth solution at the local agency level were collected directly in Pathways or documented in the GA WIC MIS system. The GA WIC state agency team collected, tabulated, and submitted these data to the THIS-WIC team quarterly during the intervention period. Descriptive analyses of implementation data were performed using Microsoft Excel (version 2308).

Table GA.1.14. THIS-WIC Implementation Tool Categories

Implementation Category	Implementation Menu 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 scale-up
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

GA.1.7.3 Pathways Metadata

Metadata on telehealth solution usage were captured by the Pathways software platform for each participating local agency. Metadata 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. GA WIC state agency staff generated

and provided quarterly data 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.

GA.1.7.4 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 six local agencies in the study between March 2022 and June 2023. Intervention agencies were matched with comparison agencies for race, ethnicity, and total participation/caseload. Three local agencies were assigned to the intervention group and three matched local agencies were assigned to the comparison group. There were 1,358 survey respondents from intervention agencies and 159 from comparison agencies. All surveys were completed by an adult either to reflect WIC services they received for themselves (i.e., pregnant, post-partum, or breastfeeding women) or for their infant/child.

Breastfeeding Practices

Information from the MIS was used to summarize breastfeeding practices in households with an infant (age 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

All respondents from the intervention agencies responded to the following seven statements using a five-item, Likert-type response option that ranged from “strongly disagree” to “strongly agree”:

- 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.
- The telehealth platform was simple to use for my WIC appointment.
- I had trouble accessing the telehealth platform.

Respondents who completed their appointment via Pathways responded to two additional 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.

An additional question with dichotomous response options (yes/no) asked all respondents whether the content of the telehealth solution was in a language they could read.

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 WIC appointment and include 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=.92) 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 survey included questions on availability and use of technology, as well as questions regarding administrative, individual-level, and staff-level barriers to accessing WIC services. Four questions asked about availability of a computer and smartphone at home, mode of connecting to the internet, reasons for not connecting to 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, participants responded to statements about their intentions to (1) change how they eat, (2) change how they feed their family, and (3) make healthier food choices.

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) employed hierarchical linear regression models comparing differences in group means among participants who received WIC services in intervention and comparison agencies. The models were estimated with the SAS PROC MIXED 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.[3]

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 terms of relationship to the satisfaction index) if this information was available and removing the most complicated variables (i.e., has most categories) if convergence 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.

GA.1.7.5 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 because of repeated measurements whenever feasible. For ordinal/continuous outcomes, the analysis adjusted for the unique participant ID numbers as random effects and corrected for repeated measurements. However, because of low sample size, the same adjustments could not be made for categorical outcomes, which impose more stringent requirement in 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).

GA.1.7.6 Staff Key Informant Interviews

All interviews were audio recorded and transcribed by Zoom verbatim in English only. 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 (CFIR)[4] and the Evaluation Framework for Telemedicine.[5] 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. Coders met over video to compare codes, arrived at an agreement on differing codes through discussion, and updated the codebook to address inconsistencies or to add additional clarity.

Next, researchers established inter-rater reliability across four different transcripts. These four transcripts involved the WIC roles of two front-line nutrition staff (e.g., RD), one breastfeeding-focused staff (e.g., IBCLC), and one 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 the 90 percent agreement and 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 a consensus if needed. NVivo version 13 (QSR International) was used to organize and analyze coded interviews.

GA.1.7.7 Pathways 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. Due to understaffing, one local agency transferred all its clients to a different provider 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 18.

The COVID-19 pandemic impacted the timeline and roll-out of the telehealth platform. WIC service delivery in both intervention and comparison agencies was adjusted due to the pandemic and even the comparison agencies transitioned to remote service delivery during the pandemic's height. 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; GA provided the FY2019 data to THIS-WIC in 2023). How service delivery costs changed from pre-intervention in FY2019 to post-intervention (January 2022–June 2023) were then assessed.

Pathways Startup Cost

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

- Generating subtotals by summing the data for each resource category in the tool (e.g., labor, equipment, indirect, contracted services).
- Computing 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), at 6 months post-implementation (July 2022), and at 12 months post-implementation (January 2023), as follows:

1. Staffing cost was calculated by multiplying the reported average number of full-time equivalents each staff type spent providing nutrition and breastfeeding education services by that staff type's average hourly salary.
2. If a local agency purchased equipment, the cost of the equipment was amortized over the reported period, until replacement.
3. 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 agencies.

Ongoing Implementation 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 (February 2022–January 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. The ongoing cost per enrollment and per appointment were computed by dividing the average monthly cost by the number of monthly enrollments and monthly appointments in that same period. To understand the distribution of monthly costs, mean, median, minimum, and maximum cost per enrollment and per appointment were examined across the intervention and comparison agencies. Cost changes in ongoing service delivery per-enrollment and per-appointment from the pre-implementation to the post-implementation periods were compared for intervention and comparison agencies.

Return on Investment Analysis

State agencies incur an initial startup cost to develop and implement the telehealth solution, and this investment may provide a return based on the difference between the cost of conducting appointments with the telehealth solution and the cost of their standard approach. If it costs less to deliver services with the telehealth solution than usual care, the telehealth solution results in a financial return to the GA WIC agency. Once these savings surpass the startup costs, there is a positive return on the investment in the program. These returns can be used to provide services to additional clients.

To conduct the return on investment analysis, the number of appointments that would be needed to recoup the startup costs was calculated by dividing total startup costs by the potential savings associated with each appointment conducted at intervention agencies implementing the telehealth solution. The break-even point (i.e., the point at which the financial return equals the startup cost) was estimated by dividing the number of appointments needed to recoup the cost by the number of appointments conducted at agencies implementing the telehealth solution.

GA.1.8 References

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