

CHAT WITH WIC: INVESTIGATING THE DEVELOPMENT OF A WIC CHATBOT

by

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## I. LITERATURE REVIEW ON WIC

What is WIC?

### Background: National

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a domestic discretionary program that serves low-income pregnant, postpartum, and breastfeeding women, and children from birth to the age of 5 years. WIC provides participants subsidies for healthful foods, health care referrals, breastfeeding support, and nutrition educational counseling. By providing nutrition support and services at critical times of childhood growth and development, WIC strives to improve the health and nutritional status of low-income women and children.<sup>1</sup>

First launched as a pilot program in 1972 and permanently established in 1974, WIC is managed by the Food and Nutrition Service (FNS) of the United States Department of Agriculture (USDA). Federal funding for WIC is provided through an annual appropriations process. Since 1997, Congress has annually allotted ample funding to serve all who successfully enroll.

The USDA allocates funding to state agencies for the delivery of WIC services and management of state programs. State agencies then disperse these monies through grants, which are allocated to local agencies that work in coordination with community-based health departments, hospitals, and nonprofit organizations. Each local agency is typically responsible for several WIC clinics. Many different facilities may serve as WIC clinics such as county health departments, hospitals, mobile clinics, community centers, schools, public housing sites, migrant health centers and camps, and Indian Health Service facilities.<sup>2</sup>

WIC operates through 90 state agencies including 50 state health departments, 34 Indian Tribal Organizations, the District of Columbia, and five partner territories (Northern Mariana, American Samoa, Guam, Puerto Rico, and the Virgin Islands). Under these state agencies exists nearly 1,900 local agencies and 10,000 clinics. On the retail side, there are approximately 47,000 authorized WIC retailers across the nation.<sup>3</sup>

### Background: Texas

The Texas Health and Human Services Commission (HHSC) is responsible for running the Texas WIC program and dispersing federal funding amongst the 65 local agencies located across the state. Local clinics and offices which offer WIC services in Texas include WIC clinics, local health departments, county and city agencies, migrant health centers, community action agencies, and hospitals. Currently, there are over 300 full-time, permanent WIC offices and upwards of 200 temporary satellite sites.<sup>4</sup>

### National WIC Demographics

As of 2020, WIC serves approximately 6.4 million participants across the nation. The WIC participant population consists of approximately 25% pregnant and postpartum women (N≈1.9 million), 25% infants (n≈ 1.8 million), and 50% children ages 1-5 (n≈3.7 million).<sup>5</sup> The racial/ethnic makeup of WIC participants nationally is 41.6% Hispanic, 30.1% White, 19.6% Black, and 8.6% other. Women ages 18-34 years old make up 86% of women served in the program.<sup>6</sup> WIC's reach is extensive as it is estimated that approximately half of the children born in the US, annually, are born to women participating in WIC.<sup>3</sup>

## Texas WIC Demographics

Texas WIC assists approximately 675,806 participants monthly, making it the second largest state WIC program in the nation. In fact, Texas WIC clients make up nearly 11% of all WIC participants in the nation.<sup>7</sup> Recent data shows that the racial/ethnic make-up of WIC participants in Texas is 70.7% Hispanic, 14.2% Black, 9.1% White, 1.9% Asian, 1.7% American Indian/Alaskan Native, and 0.15% Hawaiian/Pacific Islander.<sup>8</sup>

Many Texans have inadequate access to food and healthcare services. For example, approximately 3.1 million individuals reside in rural areas.<sup>9</sup> Additionally, 18.4% of Texas citizens do not have health insurance and 13.1% live in households that endure food insecurity.<sup>10</sup> Thus, Texas WIC plays a crucial role in providing nutrition and healthcare services to a population that is in need of assistance.

## Eligibility

### Eligibility criteria

In order to be eligible for WIC, applicants must meet categorical, residential, and income requirements as well as be considered to be at nutritional risk.

Categorical requirements include women who are pregnant, up to six months postpartum, and/or breastfeeding until their infant's first birthday. Additionally, newborns up until the age of one, and children until the age of five years, are also eligible to be enrolled.<sup>11</sup>

Residential requirements are assessed during the application process. To satisfy residential eligibility, applicants must live in the state or Indian tribal reservation in

which they are applying for WIC benefits. In some special situations, applicants may need to live in specific service areas within the state and apply at WIC clinics that serve the respective area.<sup>11</sup>

Income requirements are based on household size. Applicants who live in a household with income under 185% of the federal poverty income guidelines meet the income criteria for enrolling. Another way that applicants can qualify is if they already receive, or if certain family members receive, assistance from the Supplemental Nutrition Assistance Program (SNAP), Medicaid, or Temporary Assistance for Needy Families (TANF). However, discretion in defining income eligibility exists across state agencies. This is due to an inconsistency regarding the timeframe considered for the applicant's current income. A review conducted by the U.S. Government Accountability Office in 2013, which analyzed the WIC policy manuals for 10 different states, revealed many differences in how income guidelines are managed. For example, the review found that 2 states assess income based on the last 30 days prior to applying, 1 state assesses income based on the previous 60 days before applying, and 2 states don't define current income at all.<sup>12</sup> Furthermore, states have discretion when determining how many people in a household can be included when considering income for the economic unit.<sup>12</sup> In Texas, income determination can be based on weekly, bi-weekly, monthly, and yearly income.<sup>13</sup>

Applicants must be examined by a health professional for nutritional risk to be determined. "Nutritional risk" includes a variety of medical or dietary conditions such as anemia, being under or overweight, and/or having a history of inadequate pregnancy outcomes. WIC nutritionists typically make this determination, free of charge, for applicants.<sup>11</sup>

Currently, applicants can find eligibility requirements online or by contacting state agencies' toll-free phone numbers. In some states such as Texas, larger local agencies have a call center which can provide information on eligibility inquiries. However, a myriad of issues and barriers, which will be discussed later, cause clients to struggle with obtaining and remembering this crucial information.

## WIC Services

### Food Packages

In 1973, WIC food packages were developed to provide nutrients that were commonly lacking in the diets of low-income infants, children, and pregnant and breastfeeding women. These packages provided foods considered to be supplemental, meaning they were sources of high-quality protein, iron, calcium, vitamin A, and vitamin C.<sup>14</sup> Authorized foods included milk, cheese, eggs, infant and adult cereals, fruit juice, and infant formula.<sup>14</sup> During this time, WIC provided supplemental foods to pregnant and breastfeeding women, infants, and children up to the age 3 years. In 1975, categorical eligibility expanded to non-breastfeeding women up to 6 months and children up until their 5<sup>th</sup> birthday. Additionally, in 1977, a package was added for children with special dietary needs. In 1978, an amendment replaced requirements for specific nutrients by redefining supplemental foods as “foods containing nutrients determined by nutrition research to be lacking in the diets” of WIC eligible individuals.<sup>14</sup>

In 1980, new organizational regulations were applied, increasing the number of food packages provided by age and life stage: infants 0-3 months, infants 4-12 months, children/women with special dietary needs, children 1-4 years of age, pregnant and breastfeeding women, and non-breastfeeding postpartum women.<sup>14</sup> The new regulations

added dry beans and peas or peanut butter to the food packages for children and pregnant and breastfeeding women. In addition, the regulations capped the amount of sugar per dry ounce of adult cereal to 6 grams.<sup>14</sup> By expanding the number of packages offered, WIC aimed to better address the various nutritional needs of their participants. This was accomplished by enhancing the food variety and nutritional quality for these respective packages.<sup>14</sup>

In 1992, a new food package was added for exclusively breastfeeding women as their infants did not need to receive formula from WIC. The package included carrots and fish and increased the amount of juice, cheese, peanut butter, and dry beans/peas that were offered.<sup>15</sup> This package was created in an effort to incentivize exclusive breastfeeding. Additionally, congress established the WIC Farmers' Market Nutrition Program (FMNP) in 1992. Through the FMNP, WIC participants receive \$10-\$30 value in coupons to be spent on fresh produce at approved farmers markets. Due to limited funding, the FMNP is only offered in a few states, including Texas.<sup>14</sup>

In 2007, the FNS enacted an interim rule that led to a monumental revision to the WIC food packages. This directive increased WIC participants' voucher amount for fruits, vegetables, and whole grains.<sup>16</sup> Furthermore, it reduced or eliminated juice in packages and replaced whole milk with low fat milk.<sup>16</sup> The rule was primarily based on the recommendations provided by the Institute of Medicine's report, "WIC Food Packages: Time for a Change".<sup>14,17</sup> The revised packages also better aligned with the Dietary Guidelines for Americans<sup>18</sup> and the infant feeding guidelines established by the American Academy of Pediatrics.<sup>19</sup> By February 2009, the interim rule was implemented across the nation.<sup>16</sup>

Prior to 2009, the WIC food packages included no incentives to support breastfeeding. Specifically, the packages for infants ages 0-6 and 6-12 months were identical, regardless of intended feeding modality, and packages for breastfeeding mothers were identical to those for mothers who fed their infants formula. A goal of the package revisions in 2009 was to incentivize breastfeeding with foods offered through the packages.<sup>11</sup> For example, the package for exclusively breastfeeding mothers includes 1 lb. of cheese and 30oz. of canned fish, each of which are not offered in packages for partially breastfeeding or non-breastfeeding mothers. Additionally, fully breastfed infants qualify for twice as many infant fruits and vegetables as partially or fully formula-fed infants. Furthermore, only exclusively breastfed infants qualify to receive infant meats with their package.<sup>18</sup>

The revisions made to the food packages also allowed for states to better accommodate the cultural food preferences of their potential and current clients. For example, in Texas, whole-grain tortillas and yellow or white corn tortillas are grain options that match the cultural meals prepared by the predominant Hispanic/Latino population of Texas WIC. Thus, Texas WIC added these whole-grain and corn tortilla options to fulfill the cultural preferences of Texas participants.<sup>20</sup>

With the package changes implemented in 2009, the composition of WIC food packages better reflects updated knowledge regarding the nutritional needs of low-income individuals in the US. Specifically, the packages more accurately meet the nutritional needs of pregnant, breastfeeding, and postpartum women, infants, and children. Current food packages are demonstrated in tables 1 and 2.

Table 1: Maximum Monthly Allowances of Supplemental Foods for Infants (Food Packages 1, 2, and 3). <sup>21</sup>						
	--Fully Formula fed--		--Partially Breastfed--		--Fully Breastfed--	
Foods	Food Packages I and III A: 0-3 months B: 4-5 months	Food Packages II and III 6-11 months	Food Packages I and III A: 0 to 1 month B: 1-3 months C: 4-5 months	Food Packages II and III 6-11 months	Food Package I 0-5 months	Food Package II 6-11 months
WIC Formula	A: 806 fl oz reconstituted liquid concentrate B: 884 fl oz reconstituted liquid concentrate	624 fl. oz. reconstituted liquid concentrate	A: 1 can powder B: 364 fl oz reconstituted liquid concentrate C: 442 fl. oz. reconstituted liquid concentrate	312 fl. oz. reconstituted liquid concentrate	N/A	N/A
Infant Cereal	N/A	24 oz	N/A	24 oz	N/A	24 oz
Baby food fruits and vegetables	N/A	128 oz	N/A	128 oz	N/A	256 oz
Baby food meat	N/A	N/A	N/A	N/A	N/A	77.5 oz

Table 2: Maximum Monthly Allowances of Supplemental Foods for Children and Women (Food Packages 4, 5, 6, and 7). <sup>21</sup>				
Foods	Children	-----Women-----		
	Food Package 4: 1-4 years	Food Package 5: Pregnant and Partially (mostly) breastfeeding (up to 1 year postpartum)	Food Package 6: Postpartum (up to 6 months postpartum)	Food Package 7: Fully Breastfeeding (up to 1 year postpartum)
Juice, Single Strength	128 fl oz	144 fl oz	96 fl oz	144 fl oz
Milk	16 qt	22 qt	16 qt	24 qt
Breakfast cereal	36 oz	36 oz	36 oz	36 oz
Cheese	N/A	N/A	N/A	1 lb
Eggs	1 dozen	1 dozen	1 dozen	2 dozen
Fruits and vegetables	\$8 in cash value vouchers	\$11 in cash value vouchers	\$11 in cash value vouchers	\$11 in cash value vouchers
Whole wheat bread	2 lb	1 lb	N/A	1 lb
Fish (canned)	N/A	N/A	N/A	30 oz

Legumes, dry or canned and/or peanut butter	1 lb (64 oz canned or 18 oz)	1 lb (64 oz canned or 18 oz)	1 lb (64 oz canned or 18 oz)	1 lb (64 oz canned or 18 oz)

In 2014, the USDA-FNS requested that the National Academies of Sciences, Engineering, and Medicine assemble an expert committee to evaluate the nutritional status, food intake, and nutritional needs of the WIC-eligible demographic. The committee was also asked to provide recommendations for revising food packages so they would be in alignment with the Dietary Guidelines for Americans and the culture of potential and current WIC participants.<sup>22</sup> The committee’s overarching recommendations are shown in Table 1. WIC is currently waiting for the release of the newest edition of the Dietary Guidelines for Americans before implementing the committee’s recommendations.

Table 3: National Academies of Sciences, Engineering, and Medicine Expert Committee Recommendations for Package Revisions to meet 2020 DGA <sup>22</sup>	
1	Increase the dollar amount for cash vouchers, add fish, as appropriate, and lower the amounts of juice, milk, legumes, and peanut butter offered in all packages for women and children (4, 5a, 5b, and 7)
2	Support the cultural food preferences and special dietary needs of participants by requiring states to offer additional choices in each WIC food category
3	Tailor infant food packages on an individual bases to optimize breastfeeding duration and intensity
4	Reduce amounts of infant cereal, jarred infant fruits and vegetables, and infant food meats across package 2
5	WIC should discontinue the required provision of formula issued in food package 3

6	Package 5b should be issued to women with greater than one fetuses and package 7 should be distributed to women who are partially breastfeeding multiple infants
7	Modification to some WIC foods should be made in order to better align with dietary guidance.

### Nutrition Education and Breastfeeding Support

In 1978, legislative action created the requirement that nutrition education be provided to all participants and that no less than 1/6th of WIC’s total administrative funding go towards educational activities. In the late 80’s and early 90’s, WIC increased programmatic emphasis on breastfeeding support and promotion.<sup>11</sup> In 1989, Congress authorized an \$8 million aid for breastfeeding promotion initiatives in WIC and permitted WIC agencies to utilize administrative funds for procurement of breastfeeding aids. In 1992, WIC released the enhanced food packages, which aimed to incentivize the exclusive breastfeeding of infants. In 1994, legislation mandated that WIC spend a minimum of \$21, continually adjusted for inflation, on breastfeeding promotion for every pregnant and breastfeeding participant.<sup>14</sup> In 1999, the FNS introduced the Revitalizing Quality Nutrition Services (RQNS) initiative. This project aimed to bolster WIC’s nutrition services by integrating client-centered nutrition education methods as a means for promoting healthful behaviors over the lifespan of participants.<sup>23</sup> Acting as a foundation for additional programmatic initiatives, RQNS influenced the inception of Value Enhanced Nutrition Assessment (VENA) and the publication of the WIC Program Nutrition Education Guidance in 2006. Both VENA and the WIC Program Nutrition Education Guidance laid out comprehensive guidelines describing how to effectively

carry out personalized nutrition assessments, nutrition education, and referrals for participants.<sup>23</sup>

The WIC Program Nutrition Education Guidance introduced a policy framework, aligned with federal regulations, designed to provide guidance for WIC clinics to optimize nutrition education (Figure 1). This framework comprises six elements, including: 1) reviewing participants' nutrition assessment, 2) selecting appropriate educational messages, 3) selecting counseling methods, 4) selecting type of medium delivery, 5) selecting informational/environmental reinforcements, 6) selecting follow-up appointments.<sup>23,24</sup> In addition, the WIC Nutrition Service Standards were developed by the FNS and National WIC Association to provide further guidance on optimizing nutrition education, in general, as well as education, promotion, and support for breastfeeding, specifically.<sup>23</sup>

Collectively, the RQNS, VENA, and WIC Program Nutrition Education Guidance, along with several tools and trainings provided by states and local agencies, ensure that the quality of nutrition education and breastfeeding support and education is excellent.

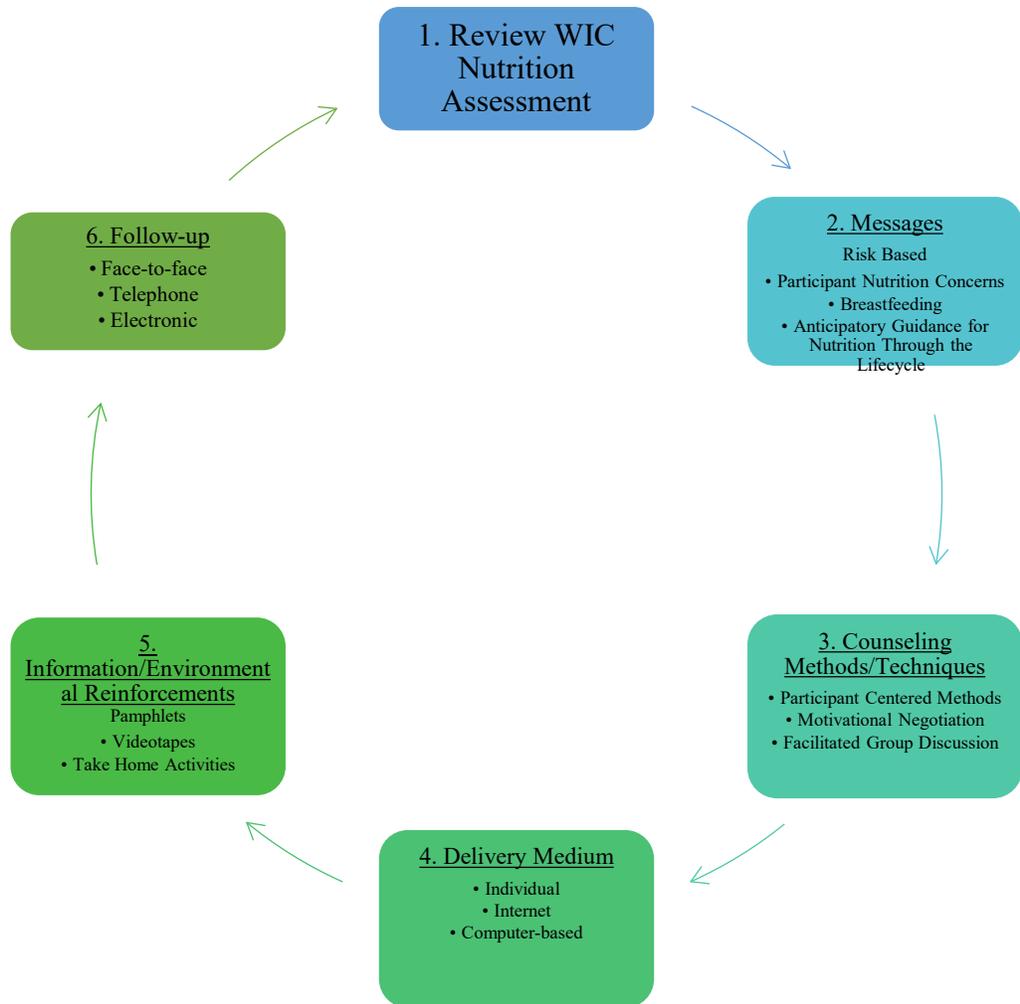


Figure 1: WIC Nutrition Education Guidance Framework

The requirement of nutrition education is the key program benefit that sets WIC apart from other FNS administered programs. As such, the goals of nutrition education are to:

“1) emphasize the relationship between nutrition, physical activity, and health with special emphasis on the nutritional needs of pregnant, postpartum, and breastfeeding women, infants and children under five years of age; and

2) assist the individual who is at nutritional risk in achieving a positive change in dietary and physical activity habits, resulting in improved nutritional status and in the prevention of nutrition-related problems through optimal use of the WIC supplemental foods and other nutritious foods.”<sup>24,25</sup>

Additional goals include ensuring that education also incorporates the negative effects of harmful substances during pregnancy and breastfeeding.<sup>24</sup>

The delivery of nutrition education in clinics can vary based on location and resources available. Clinics differ by the quality of the facilities and the availability of equipment and supplies. The majority of clinics have a private room that can be used for one-on-one and/or group nutrition education counseling. Additionally, about half of the sites have a space that is strictly dedicated to group counseling.<sup>23</sup> Available equipment and supplies typically consists of bulletin boards, DVD players/TVs, racks, tables, and stands to display information. Some sites have equipment for cooking classes and food tasting demonstrations.<sup>23</sup>

WIC clinic staffing is typically reflective of site caseload. Nationally, the average number of full-time employees is 5 and staffing number ranges from as few as 3 at small sites to as many as 10 for large sites.<sup>23</sup> Caseload responsibility per full-time employee ranges from 65 participants at small sites to nearly 500 participants for large sites.<sup>23</sup>

Many types of staff are responsible for delivering nutrition education, including registered dietitians, administrative staff, directors, clinic supervisors, lactation consultants/ educators/ counselors, nutrition education coordinators, registered nurses, and others have provided consultations at various clinics across the nation.<sup>23</sup> While the

education and credentials of staff varies, most who provide nutrition education have worked with WIC for at least 7 years.<sup>23</sup> Moreover, WIC requires all educators to complete nutrition education training.<sup>23</sup>

Nutrition education has been traditionally delivered through face-to-face counseling.<sup>23</sup> This is done at every clinic and enables individualized information to be provided from the counselor. Additionally, about half of the nation's clinics utilize group education sessions and technology-based methods, such as online nutrition education.<sup>23</sup> Telephone and virtual counseling sessions are also used, however, these methods are less common.<sup>23</sup>

There are several types of appointments including enrollment verification, recertification, mid-certification, secondary education follow-ups, and high-risk follow-ups.<sup>23</sup> Aside from face-to-face counseling, which is employed at nearly all appointments, the approach used to deliver nutrition education can depend on the type of appointment. For example, group education sessions tend to be applied for secondary education follow-up appointments.<sup>23</sup>

Nutrition education topics discussed depend on the type of appointment, and category of the participant (i.e. pregnant, breastfeeding, postpartum, parents/caregivers). For instance, topics most frequently discussed during one-on-one consultations with parents/caregivers include breastfeeding, formula preparation/feeding, introduction of solid foods, and infant growth and development.<sup>23</sup> Topics most frequently discussed by participant type can be seen in figures 2.1-2.5.

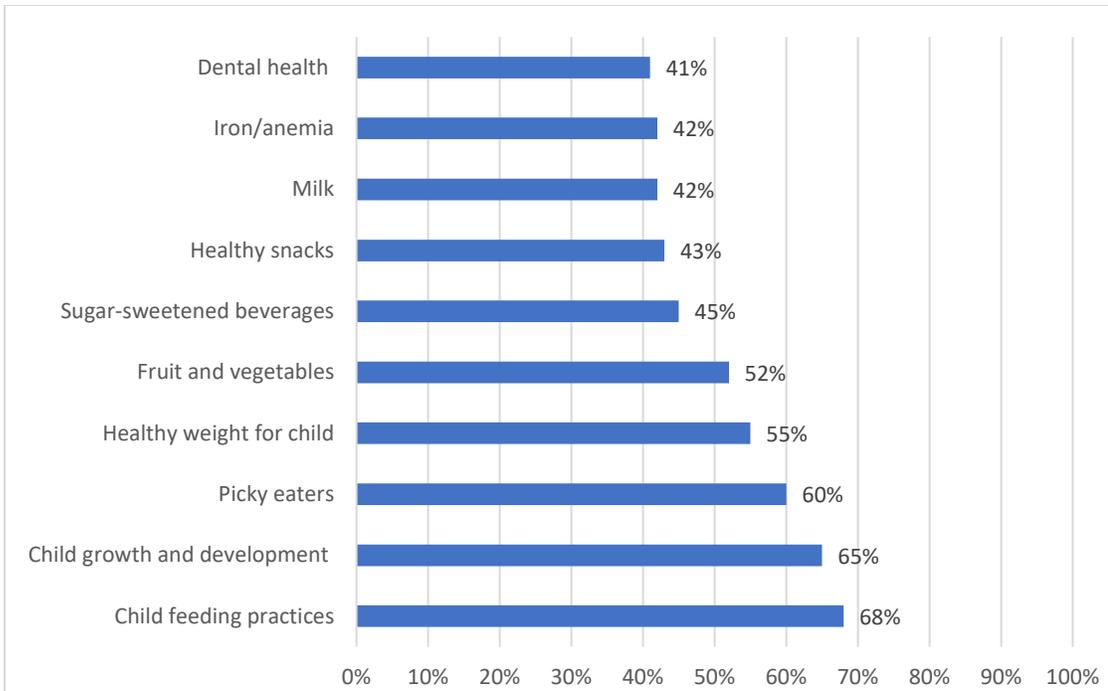


Figure 2.1. Topics Discussed with Pregnant Women in One-on-One Counseling. (Figure adapted from WIC Nutrition Education Study: Phase 1 Report).<sup>23</sup>

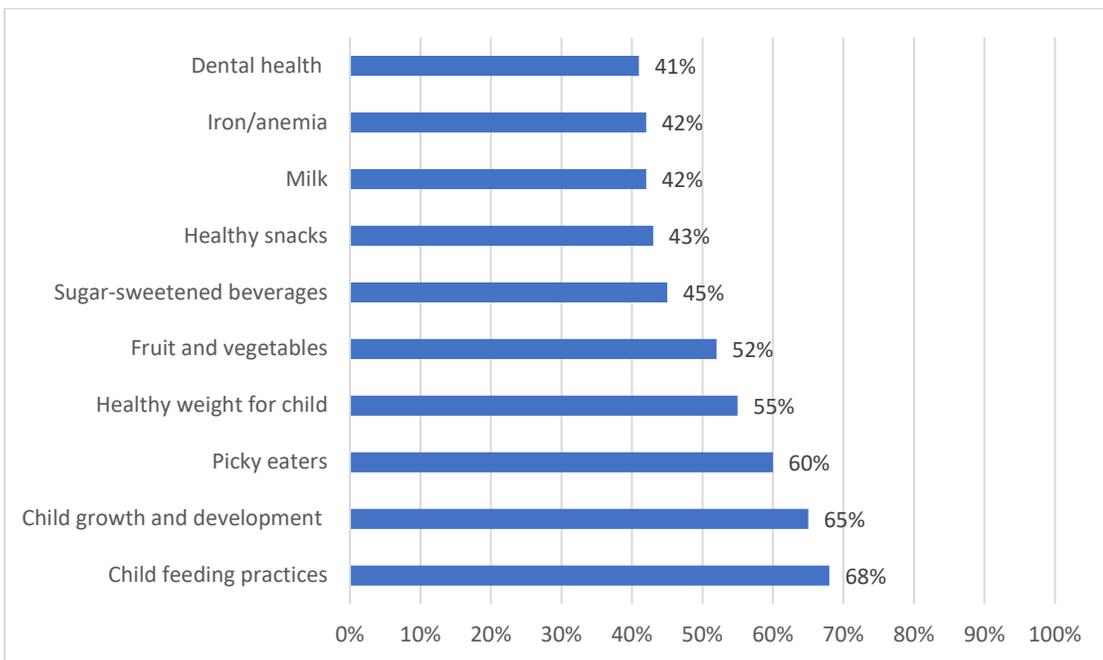


Figure 2.2. Topics Discussed with Breastfeeding Women in One-on-One Counseling. (Figure adapted from WIC Nutrition Education Study: Phase 1 Report).<sup>23</sup>

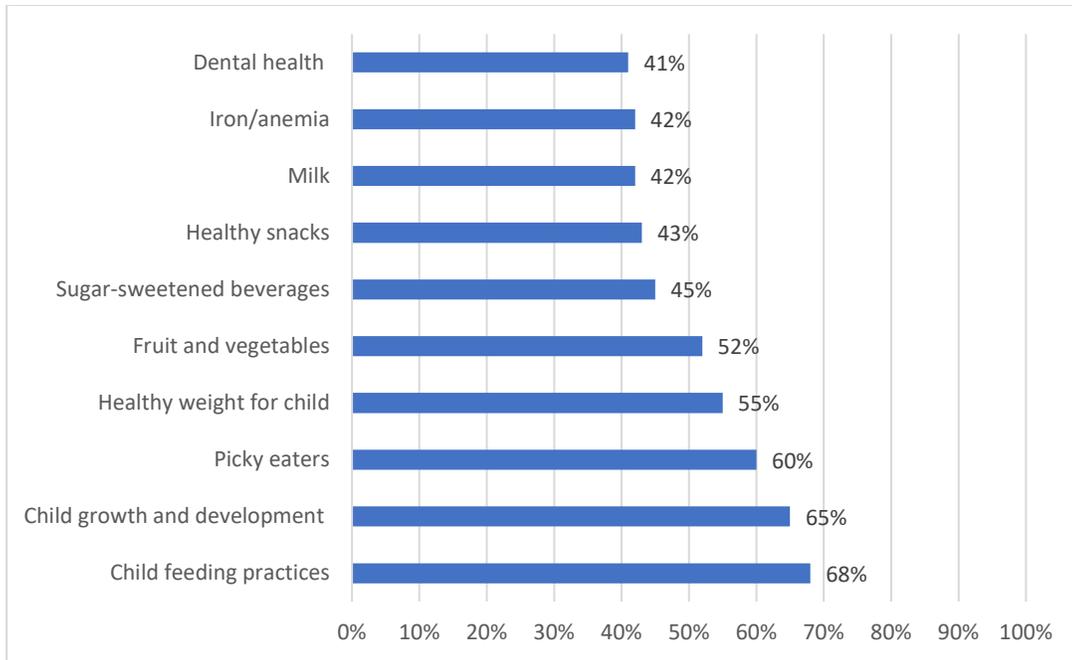


Figure 2.3. Topics Discussed with Postpartum (Non-breastfeeding) Women in One-on-One Counseling (Figure adapted from WIC Nutrition Education Study: Phase 1 Report).<sup>23</sup>

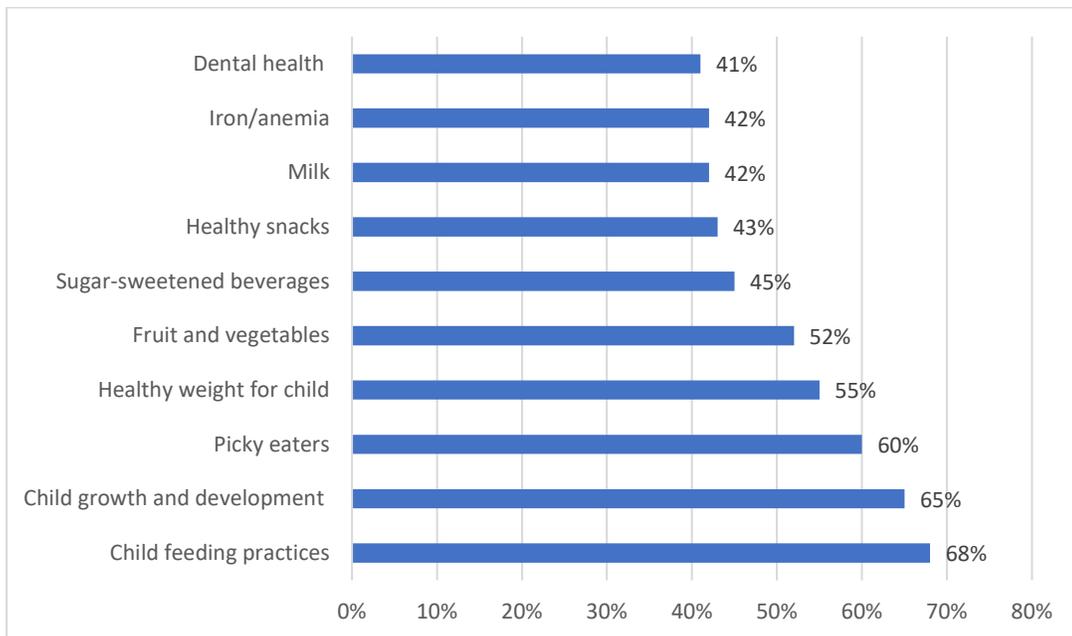


Figure 2.4. Topics Most Often Discussed with Parents or Caregivers of Infants in One-on-One Counseling Sessions (Figure adapted from WIC Nutrition Education Study: Phase 1 Report).<sup>23</sup>

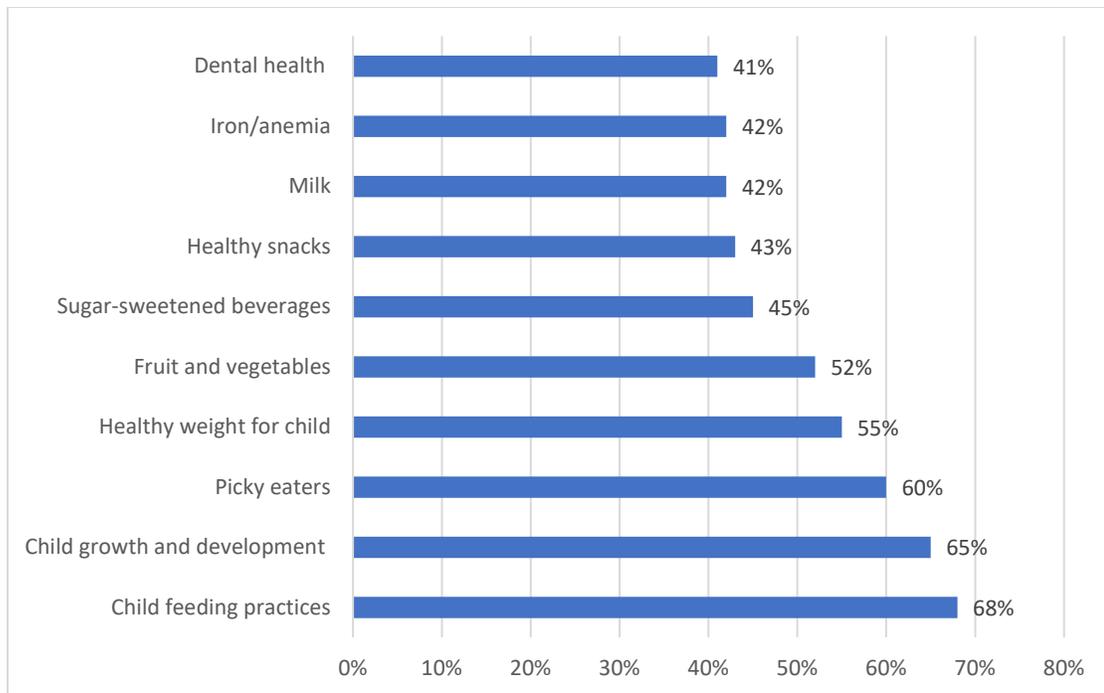


Figure 2.5. Topics Most Often Discussed with Parents or Caregivers of Children in One-on-One Counseling Sessions (Figure adapted from WIC Nutrition Education Study: Phase 1 Report).<sup>23</sup>

## Outcomes of WIC Participation

### National

Participation in WIC has been linked to several positive outcomes for families, communities, and the nation as a whole. Studies have shown that participation in WIC services improves participants' birth outcomes, reduces healthcare costs, facilitates participant immunization, impacts breastfeeding initiation and duration, and combats food insecurity.<sup>26,27</sup>

### *Birth outcomes*

In the U.S., approximately 1 in every 5 children live in poverty.<sup>28</sup> Previous research has demonstrated that families living in lower SES households are at a significantly increased risk for being of a poor nutritional status.<sup>29-31</sup> Inadequate

nutritional status during pregnancy can have detrimental health implications on both a mother and her offspring. Additionally, optimal nutritional status of a child during the first 5 years of life is of the utmost importance as this is a time when key developmental milestones occur. Thus, one of the key objectives of WIC is to decrease poverty-related nutritional risk to support lifelong health for participants.

Indeed, studies indicate that participating pregnant mothers are less likely to experience preeclampsia, excessive gestational weight gain, less-than-recommended gestational weight gain, and are more likely to be within the recommended amount of gestational weight gain.<sup>32</sup> Furthermore, a series of USDA reports which analyzed birth outcomes from over 100,000 individuals on WIC and Medicaid reported that WIC participants experience longer pregnancies, fewer premature births, fewer infants born of moderately low and very low birth weights, and less infant deaths.<sup>33</sup> WIC seems to be most effective at improving outcomes for high-risk families. Studies have demonstrated that WIC significantly reduces incidence of stillbirths, infants of very low birth weight, and very premature births in families experiencing categorically lower socioeconomic status (SES), live in categorically lower SES communities, who practice the fewest prenatal maternal health behaviors, and are of a minority racial and/or ethnic group.<sup>34,35</sup> Positive nutritional outcomes that are associated with WIC are largely driven by the nutrient dense foods provided by the WIC food packages.<sup>36</sup>

### *Healthcare savings*

WIC services have long been identified as key contributors in decreasing healthcare costs across the nation. A study published in 1992 analyzed the impact of prenatal WIC participation on Medicaid costs in North Carolina, Minnesota, Florida,

Texas, and South Carolina. Results demonstrated that Medicaid costs-savings significantly outweighed the costs of WIC prenatal services. The average cost-benefit ratio of the 5 studied states was 2.32.<sup>37</sup> Furthermore, for every dollar spent on WIC prenatal services, savings in Medicaid after the first 60 days of infant birth ranged from \$1.77 to \$3.13.<sup>37</sup> A 2017 cost-benefit analysis revealed that maternal participation in WIC during pregnancy was predictive of lower healthcare expenses over the lifetime of their child. Specifically, this research simulation focused on a cohort of 500,000 pregnant women in California. It was revealed that at California WIC's usual participation rates (84% of eligible participants), WIC services would result in savings of roughly \$349 million across the lifetime of the cohort's children. At this rate, every \$1 spent on prenatal WIC care resulted in a mean savings of \$2.48. Moreover, these researchers predicted that a 10% increase in prenatal enrollment would likely result in an additional \$6.5 million in cost-savings.<sup>38</sup> This study corroborated previous cost-benefit findings and further emphasized the economic and societal savings that WIC participation may induce.

### *Immunizations*

Newborn babies are typically immune to many diseases due to the abundance of antibodies provided during pregnancy.<sup>39</sup> However, this immunity dwindles as infants age, leaving them susceptible to illness. Thus, adhering to a recommended vaccination schedule over the first years of life, when the immune system is undergoing transformative development is of the utmost importance for optimal health.<sup>39</sup>

Unfortunately, being of low SES status, belonging to a minority ethnic group, and experiencing household stress is associated with lower rates of immunization.<sup>40</sup>

Individuals who live in these situations experience barriers such as low access to medical

care and inadequate knowledge regarding the individual and societal benefits of vaccination.<sup>41</sup> By promoting the importance of immunizations, WIC aims to prioritize participant vaccination.

Across the nation, WIC stresses the importance of immunizations to clients. Furthermore, clinics may support immunization by offering vaccinations at the clinic.<sup>42</sup> Studies have shown that WIC participation is associated with increased child vaccination coverage compared to eligible, non-participants or mothers who have dropped out of WIC. Indeed, the immunization rate of children participating in WIC is even comparable to the vaccination rate of affluent children.<sup>42</sup> In a study conducted by Luman et. al, 74% of children born to WIC-participating mothers received the full panel of recommended vaccinations. Comparatively, 64.2% and 66.8% of children born by mothers that were either eligible and never participated in WIC, or previously participated and dropped out of WIC, received the fully recommended vaccination panel, respectively.<sup>27</sup>

### *Breastfeeding outcomes*

Although WIC actively aims to support breastfeeding, the literature linking WIC participation and positive breastfeeding outcomes, including initiation and duration, is discordant. Research findings suggest that mothers participating in WIC are less likely to breastfeed their children than non-participating, WIC-eligible mothers.<sup>43</sup> Prior to 2009, the WIC food packages included no incentives to support breastfeeding.<sup>14</sup> Not surprisingly, studies conducted prior to the 2009 food package revisions, reported a large gap in breastfeeding initiation and duration between WIC participants and eligible non-participants.<sup>43-48</sup> In 2009, the packages were modified to support breastfeeding.<sup>14</sup> Specifically, the revision increased the amount of food offered in the packages to

breastfed infants, and increased the duration of time that the package would be provided for mothers who breastfed. In addition, the package for infants who were partially breastfed included less formula than that provided for fully formula fed infants.<sup>14</sup>

After the 2009 federal package changes were implemented, for the most part, breastfeeding outcomes improved.<sup>49</sup> A study conducted by Li et al., utilized a National Health and Nutrition Examination Survey (NHANES) data set of 4,308 WIC-eligible children, born between 2000-2014, to compare breastfeeding outcomes before and after the 2009 package revision. Specifically, the study compared the rates of infants who were ever breastfed and infants who were breastfed until 6-months of age. Results revealed that amongst the portion of the cohort that was born during the 2000 to 2008 timeframe, infants of WIC-enrolled parents were breastfed at a significantly lower rate than infants of eligible, non-participants. Remarkably, infants in the cohort that were born from 2009-2014 to WIC-participating parents were just as likely to be breastfed as eligible, non-participants. However, eligible, non-participants who were born between 2009-2014 were still more likely to be breastfeeding at 6-months after the child was born.<sup>50</sup>

In another study, researchers in South Carolina analyzed the effect of WIC participation on breastfeeding initiation among black women at the time of hospital discharge.<sup>32</sup> This study revealed that being enrolled with WIC was associated with a 7% increase in initiation rates amongst black mothers.<sup>51</sup> In a secondary analysis of New York State Department of Health WIC surveillance data, it was reported that the rate of breastfeeding initiation and duration increased among women who received support from WIC breastfeeding peer counselors.<sup>52</sup> Furthermore, a study which analyzed WIC participation and breastfeeding initiation and duration among 2,136 unmarried, low-

income, urban mothers from the Fragile Families and Child Wellbeing Study, found that WIC participation was associated with a slight increase in initiation rates.<sup>53</sup>

Although some research indicates that WIC participation is correlated with lower breastfeeding rates, the reason for these findings is likely driven by differences between WIC participants and non-participants, rather than the WIC program. For example, given the financial benefit of receiving free formula, women who plan on formula feeding may be more inclined to participate in comparison to those who plan to breastfeed. Additionally, issues related to social, cultural, and political barriers have been documented differences between WIC participants and non-participants.<sup>54-56</sup> Thus, the discordance in WIC participation and breastfeeding rates is, at least in part, a result of selection bias and unaccounted confounding factors.

#### *Food insecurity*

Food insecurity is experienced when households lack the money or resources required to obtain an adequate amount of, safe, and nutritious food for themselves and their family.<sup>57</sup> Studies have demonstrated the substantial implications that food insecurity has on the occurrence of nutritional deficiencies and poor health outcomes.<sup>57</sup> Additionally, food insecurity negatively effects school readiness, academic performance, and educational attainment.<sup>43</sup> According to the USDA's "Household Food Security in the United States in 2019" report, approximately 13.7 million (10.5%) households are food insecure in the US.<sup>10</sup> By providing resources to families that are at high-risk for experiencing food insecurity, WIC may indirectly combat household food insecurity.

While the literature regarding the relationship between WIC and food insecurity is relatively scarce, some evidence does exist. A study conducted by Kreider, Pepper, and Roy demonstrated that WIC participation decreases the risk of experiencing food insecurity and very low food security by 20% and 38%, respectively.<sup>58</sup> Additionally, a longitudinal study demonstrated that in Massachusetts, the most at-risk mothers who had enrolled in WIC during their first trimester of pregnancy were approximately one-third less likely to experience food insecurity as compared to if they had enrolled during their third trimester.<sup>59</sup> While not necessarily a central mission of WIC, the evidence suggests that participants of WIC are less likely to experience food insecurity.

## Texas

In fiscal year 2019, Texas WIC provided more than \$216,000,000 in food benefits to program participants.<sup>60</sup> This amounted to each participant receiving approximately \$26.48 in food redemptions per month.<sup>61</sup> While each of the programmatic benefits discussed in the previous section are also realized in the state of Texas, the literature provides some additional insight on how Texas WIC uniquely impacts state's participants.

In Texas, many families live in rural areas, are of low SES, and/or live along the Texas-Mexico border. These are living situations in which the risk for food insecurity is high. Thus, affordability, availability, and accessibility of nutritious food is essential amongst these communities. Indeed, a recent study which assessed the nutrition environment of food retail stores in Texas found that Texas WIC is making nutritious food available and accessible. Specifically, driven by the food package changes in 2009, Texas WIC has contributed to increased shelf space for healthful foods, a greater variety

of vegetables being sold, and decreased shelf space for less healthful foods in grocery stores.<sup>20</sup> Furthermore, labeling WIC-authorized foods with a pink “WIC-approved item” stamp and a Least Expensive Brand (LEB) logo is helping Texas WIC participants locate WIC food items and maximize their benefits.<sup>20</sup>

Texas WIC is also unique in the way which their peer educators deliver nutrition education. In 2007, Texas WIC began developing a client-centered nutrition education (CCNE) framework for their local agencies’ adoption.<sup>62</sup> This CCNE approach is a hands-on method of nutrition education that encourages participants to play an active role in their learning while the staff acts as more of a guide of the information. The CCNE method utilizes a variety of settings including group discussions, online lessons, take-home lessons, and health fairs.<sup>63</sup> The goal of the CCNE framework is to engage clients in a manner that is fun, meaningful, relevant, and educational.<sup>62,63</sup>

## Participation and Enrollment

### Process

The purpose of the first appointment at a WIC clinic is typically to certify and enroll eligible applicants into the WIC program. First, applicants will be asked to provide proof of identification, residency, and income. Additionally, applicants who are enrolled in other governmental assistance programs may be asked to provide proof of enrollment. Next, clinic staff conduct a nutrition assessment of the applicant and/or their children. During the assessment, weight, height, and hemoglobin are measured. If the applicant meets all requirements, they will receive a Texas WIC electronic benefits transfer (EBT) card on which their benefits are loaded, be scheduled for a follow-up appointment, and be

enrolled into WIC. In Texas, enrolled client information is uploaded into the Texas Integrated Network (TXIN) the state's management information system (MIS).

## Trends

### *National*

Annual WIC enrollment has been influenced by factors such as funding, cost-containment, economic conditions, and the national birth rate. From WIC's inception in 1972, through 1997, the program saw consistently large annual increases in participation.<sup>12</sup> In the 1980s the expansion of program funding and initiation of cost-saving programs, particularly the infant formula rebate program, allowed for WIC state agencies to procure more food and, thus, serve an increased client base.<sup>14</sup> By the late 90s, WIC received enough funding to provide benefits for all eligible individuals.<sup>14</sup> However, thereafter, until 2000, a decline in the enrollment of children led to an approximately 4% dip in overall participation. This change marked the first time in program history that enrollment decreased. In general, this decrease was likely correlated to a decline in the number of births during the mid-90s. After 2000, enrollment once again began to steadily increase until peaking at nearly 9.2 million participants in 2010.<sup>12</sup>

From 2010 to the present, WIC participation has declined annually. Currently, there are approximately 6.3 million enrolled in WIC, nearly a 31.5% decrease in participation since 2010.<sup>64</sup> The number of participating women, infants, and children has each declined by roughly 4-6% per year.<sup>65</sup> Furthermore, coverage rates of eligible

households declined from 64% in 2011 to 51% in 2017.<sup>66</sup> This trend had never been previously observed in program history.

**Average monthly WIC participation, FY 1974-2018**

*Participation for all three participant groups fell for the eighth consecutive year in FY 2018*

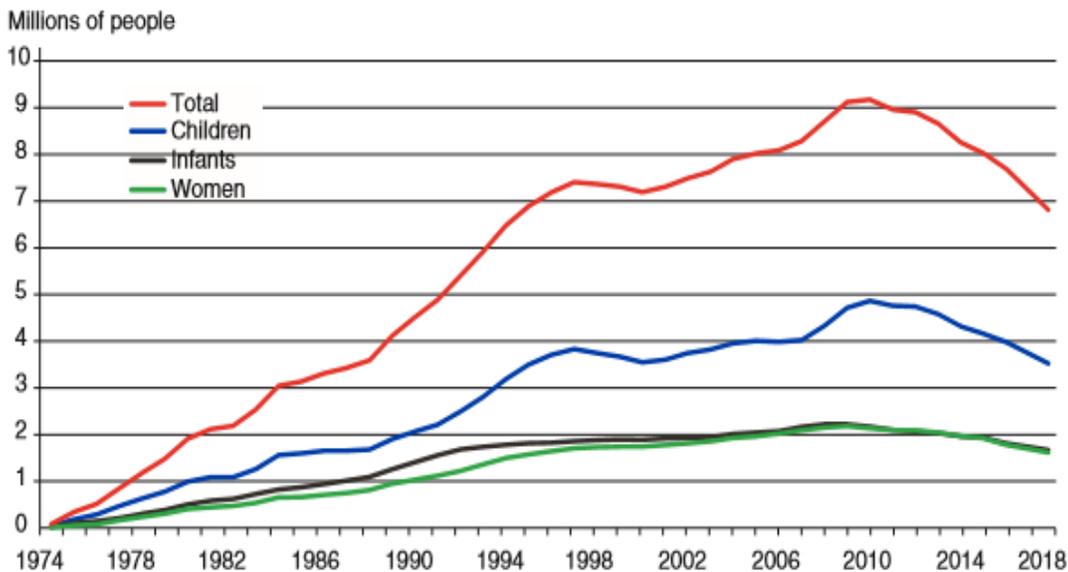


Figure 3: Average Monthly participation in WIC, Fiscal Year 1974-2018<sup>66</sup>

*Texas*

Mirroring national participation, Texas WIC participation has steadily been on the decline as well. Since 2015, Texas WIC has lost an average of 43,321 participants per year.<sup>64</sup> This rapid decrease in participation quite alarming considering that the number of eligible non-participants has increased over this time.<sup>61</sup>

**Reasons for declining participation**

Many factors have contributed to the decline of national WIC participation since 2011. Factors include, but may not be limited to, economic recession, programmatic misconceptions, logistical challenges experienced by potential and current clients, cultural and language incongruency between staff and participants, perceptions of package limitations, and difficulties when redeeming WIC food packages.

The economic recession, experienced from 2007-2009, was associated with an increase in WIC enrollment.<sup>67</sup> The recession likely facilitated enrollment because, with the increase in poverty rates, more individuals were qualified for and in need of WIC services. With the subsequent economic recovery, the drop in WIC enrollment after 2011 may reflect, at least in part, a decrease in economic need.

Misconceptions related to WIC eligibility exist amongst low-income families. For example, household members may falsely believe that their income exceeds the eligibility cut off for WIC. Many families are unfamiliar with income parameters and wrongfully conclude that only families with very low income or no income at all qualify.<sup>68</sup> Additionally, many families may not understand that WIC offers benefits to children up to the age of 5. Indeed, research reveals that families may erroneously perceive that only children under the age of 2 years qualify for WIC.<sup>68</sup> In addition, it has been reported that families may feel as though they would be taking scarce WIC resources from families and infants that are more deserving.<sup>68,69</sup>

Concerns around citizen status has recently become an important issue for WIC-eligible, non-participants. Although WIC strives to be a safe and welcoming space for all families, legal immigrant parents and parents of children who are citizens are hesitant to utilize WIC due to the current political climate regarding immigration.<sup>68,69</sup> WIC-eligible families may believe that they do not qualify for WIC due their immigration status and/or fear that they will face repercussions for participating.<sup>68</sup> It has been reported that WIC-eligible families have avoided WIC enrollment due to perceived potential consequences including payback obligations, military conscription, college aid ineligibility, child or parent deportation, and non-citizen family member penalties.<sup>69,70</sup>

Historically, logistical issues related to attending appointments have precluded successful WIC enrollment. Inconvenient clinic locations, conflicting appointment times, and lack of transportation have been described as the most common obstacles preventing enrollment among WIC-eligible families.<sup>68,71</sup> These logistical problems, which exist in rural, suburban, and metropolitan areas across the nation, can make WIC inaccessible for eligible families.

The overall clinic experience plays an important role in enrolling and retaining participants. Long wait times, crowded clinics, excessive paperwork, language barriers, and perceived poor customer service have been described as barriers to participation.<sup>68,72,73</sup> Additionally, working parents of WIC-eligible families are frequently employed at jobs that are low-wage, provide little to no paid leave, and entail unpredictable work hours. Thus, concerns about spending too much time away from work for an appointment have been reported. If the time, stress, and/or monetary cost of participating in WIC outweighs the benefits provided, potential and current participants may be more likely to forgo future program participation.<sup>68</sup>

Language, language proficiency, and cultural barriers can hinder an individual's ability to effectively identify important information about WIC and communicate while in clinics. Specifically, issues with reading and understanding WIC resources, navigating enrollment documentation, optimizing nutrition services, and redeeming food package vouchers have been described as critical.<sup>68,74,75</sup> With respect to language, in the United States, one fifth of families with children 6 and under speak a non-English language at home.<sup>68</sup> Furthermore, one third of all Hispanic children in the United States live in poverty.<sup>76</sup> In the clinics, staff unfamiliarity with culturally traditional foods and

preparation methods have been described as barriers to optimal nutrition education.<sup>75</sup> To optimize participation, WIC must be able to provide outreach, services, and materials that effectively communicate with potential clients, especially of the Latinx population, to provide increased comfort and understanding for non-English speaking families.

The packages themselves may limit enrollment. It has been described that some participants perceive that WIC offers a limited range of authorized food options, brands, and child-friendly choices.<sup>77</sup> Additionally, clients have been dissatisfied that the monetary value of child packages are worth less than the infant packages.<sup>77</sup> The estimated monetary value of monthly food package for children, compared to infant packages, is about one third.<sup>68</sup> Specifically, a WIC food cost report revealed that the dollar value of an infant package was \$123.06 compared to \$39.07 for child packages in 2014.<sup>78</sup> Parents' perceptions that the food options in child packages are limited and the decrease in value of WIC package benefits is frequently mentioned as a reason for abandoning the program after the first year.<sup>68</sup>

Shopping and checkout experiences have also been described as key determinants for program satisfaction and continuation.<sup>68</sup> Issues with searching for and redeeming WIC-approved foods in grocery stores have been described as potential drivers for decreased participation.<sup>68</sup> Specifically, issues related to identifying WIC-eligible foods and package-allotted amounts of fruits and vegetables, accessing stores with adequate fruit and vegetable variety, and stores lacking products in WIC-allowable forms have been identified as common issues for participants while shopping.<sup>79-81</sup> Furthermore, problematic check-out experiences, including separating WIC foods from non-WIC foods, allowable items not scanning as WIC-eligible, signing off on paper food vouchers

in front of other shoppers, holding up lines while redeeming benefits, and cashiers struggling to properly ring-up WIC-eligible foods have been described as uncomfortable for WIC participants.<sup>81</sup> If these negative shopping and checkout experiences persist, participant satisfaction and continuation will suffer.

Although WIC provides remarkable benefits to those who successfully enroll, participation has continued to reel over the course of the last decade. Given the benefits of WIC from an individual to the national level, a robust attempt to correct issues which deter participation must be made. When considering the relatively young average age of WIC-participating parents and the difficulties that have been reported, programmatic technological innovations may provide an optimal solution. Now is the time for WIC to introduce a new technology that has the capability of addressing barriers of enrolling in WIC, optimizing WIC services, and promoting WIC recertification.

## II. CONCEPTUALIZING A TEXAS WIC CHATBOT

### Previous WIC Technologies

#### Introduction

WIC has strived to be an innovative program since its establishment. As discussed in the previous chapter, updates not involving technology have included actions such as adjusting food packages and augmenting nutrition counseling practices. The rapid evolution of the internet and technology-based advances since the start of the 21<sup>st</sup> century has driven technology implementation in WIC. A disparity in access to technology between higher and lower income families has been common in the United States for many years. However, this gap has begun to close over the last decade due to a rise in mobile phone accessibility and app technology utilization.<sup>82</sup> In consideration of a declining caseload, programmatic modernization with technology has become highlighted as a method to mediate processes that slow business efficiency. Prominent technological innovations that WIC has incorporated to address such processes include online nutrition education, texting services, electronic benefits transfer (EBT) system, mobile applications, social media, and online client portal.

#### Online Nutrition Education

The advancement of the internet during the 21<sup>st</sup> century enabled an opportunity for information to be transferred between WIC clients and staff via online nutrition education. The establishment of online nutrition education aimed to mediate issues associated with in-person nutrition education, such as time constraints of clients and WIC staff, lack of programmatic human resources, shortages in racial and ethnic diversity amongst WIC staff, and to be limited to receiving nutrition education during WIC clinics’

hours of operation.<sup>83,84</sup> Indeed, a study by Bensley et al. demonstrated that WIC clients desire for online nutrition education.<sup>84</sup> Evaluations conducted on the effectiveness of online nutrition education revealed that it acts as a viable option for improving parent-child feeding issues, bettering nutrition-related behaviors of clients, and maintaining client satisfaction with the quality of WIC nutrition education.<sup>83-86</sup> Data from 2016 indicates that 34 states and 5 intertribal councils utilize online nutrition education.<sup>87</sup>

### Texting Services

Text messaging or short message service (SMS) allows information to be conveniently exchanged via mobile devices, including cell phones, in a manner that requires minimal effort. Text messaging is the most frequently used modality for mobile health initiatives.<sup>88</sup> Evidence suggests that SMS interventions have been effective for smoking cessation, increasing physical activity, and promoting weight loss.<sup>89</sup> In the case of WIC, text messaging has begun to be explored as a method to remind clients of appointments, reinforce nutrition education, and facilitate breastfeeding support for postpartum mothers.<sup>75,89-91</sup> However, text messaging is not yet a staple for WIC staff and client communication.

A randomized controlled trial conducted by Martinez-Brockman et al. assessed the effectiveness of a text messaging intervention on contact time between postpartum mothers and their peer counselors at WIC, and breastfeeding exclusivity at 2 weeks and 3 months postpartum.<sup>89</sup> While the intervention failed to show a significant impact on exclusive breastfeeding rates, it did significantly shorten the amount of time taken for postpartum mothers to contact their peer counselors. By enabling postpartum mothers to immediately communicate with their counselors, the SMS intervention facilitated the

transmission of personalized breastfeeding support and education much sooner when compared to the control group.<sup>89</sup> This finding provides an example of the benefits that immediate communication via text messaging has provided WIC.

### Electronic Benefits Transfer System

The EBT system was developed to supplant the food voucher system with either a benefit redemption card or a digital PIN. Under the voucher system, participants typically received monthly paper vouchers which listed the foods that comprised their package. In 2010, the Child Nutrition and WIC Reauthorization Act mandated that WIC State Agencies adopt statewide delivery of the EBT system by 2020.<sup>81</sup>

Previously, if a participant did not purchase every listed item at the time of transaction, they risked missing out on the unused portion of their voucher. Additionally, the voucher system was known to cause delays when checking out due to cashiers having to verify each food item and sign off on the voucher.<sup>92</sup> Delays at time of purchase were thought to potentially influence stigma and/or embarrassment of the WIC customer.<sup>81</sup>

The implementation of the EBT system provides participants with increased flexibility and selection regarding when they can purchase foods and the quantity of food per transaction.<sup>81</sup> Furthermore, the EBT system has reduced checkout stigma by allowing clients to purchase foods without verification from cashiers.<sup>92</sup> The EBT system has proven beneficial for improving redemption and ease of checking out; however, its impact on enrollment and retention of participants on the state and national level is less obvious.<sup>12,93</sup>

While the concept of the EBT system is similar from state-to-state, the execution of EBT benefit issuance varies. In some states, participants must visit a WIC clinic to have their benefits loaded, while other states can upload benefits remotely. In Texas, clients must go into clinics to have their benefits issued. Having to visit clinics presents many barriers to WIC participating families related to transportation, work hours, and family coordination. Finally, the rollout and programmatic acceptance of the EBT system has occurred slowly. While Texas WIC was an early adopter, nationwide implementation has still yet to occur.<sup>94</sup>

### Social Media

Social media sites have predominantly been viewed as networks which allow friends and family to stay connected. In the case of breastfeeding mothers, social media has been used for support, to provide a sense of community, and to share advice amongst each other.<sup>95</sup> A mixed method study conducted by Griauzde et al. also revealed that low-income Hispanic mothers, some of which were WIC participants, frequently used Facebook, Pinterest, and YouTube to find child-friendly recipes. Additionally, study participants indicated interest in using social media as a means of receiving child health and feeding information.<sup>95</sup>

Currently, Facebook is the most popular social media site with 190+ million users in the United States.<sup>96</sup> The majority of Facebook users are between the ages of 18-49.<sup>97</sup> With so many users being of childbearing and/or childrearing age, social media presents WIC with an immense opportunity to provide critical information to individuals who fit their potential and current clients' demographic. Thus, some state and local

agencies, as well as individual clinics, have created Facebook, Twitter, and Instagram accounts.

While social media is utilized by WIC in numerous ways, literature evaluating the effectiveness of various social media-driven initiatives is scarce. A study by Pellechia et al. aimed to describe the effectiveness of a social media toolkit for *Loving Support Makes Breastfeeding Work (Loving Support)*, the USDA's national breastfeeding promotion and support campaign. The toolkit was designed to increase engagement with the Loving Support website and consisted of graphics and customized messages that were developed for WIC agencies to post on their social media platforms. The toolkit was indeed effective as it facilitated a 50% increase in website views and a 17% increase in content downloads on the Loving Support website.<sup>98</sup> Increased engagement was related to agencies posting on their social media platforms, using hashtags to make the posts easy to find, and account followers liking and sharing the posts.<sup>98</sup> Such findings demonstrate how social media can direct the attention of users to WIC initiatives and information.

While social media presents an enormous opportunity for the spread of key topics related to WIC initiatives and information, misinformation within social media accounts and groups is prevalent.<sup>99</sup> Notably, inaccurate information within online breastfeeding groups has been observed.<sup>100</sup> Thus, it is of the utmost importance that the information that is presented on any WIC social media accounts is clearly trustworthy. Additionally, while increased program engagement has not yet been directly linked to improved health outcomes in the literature, public health professionals are keen on social media's capacity to communicate health and wellbeing-related messages.<sup>101,102</sup>

## Mobile Applications

More than 90% of individuals between the ages of 18 and 49 and two-thirds of all low-income adults owned a smart phone in 2019.<sup>103</sup> However, only 56% of those in the lowest income bracket reported having broadband internet in their home.<sup>104</sup> Consequently, while low-income families can typically access the internet, many are under-connected and forced to rely on their mobile devices to search the web.<sup>105</sup> Studies have indicated that the creation of mobile-friendly WIC apps, which better accommodates those with mobile-only internet access, are desired by WIC participants.<sup>84,106,107</sup>

In an effort to mediate the issue of under-connectivity and fulfill the technological preferences of participants, many state and local WIC agencies have launched mobile-friendly WIC apps. As of 2018, 17 mobile phone WIC apps existed across 37 states, US territories, and tribal nations.<sup>87</sup> For example, in Texas, the myWIC shopping app was released in 2019. This app assists participants with understanding their benefit package and what foods they may purchase. Other features of apps across the nation include additional shopping management, clinic appointment management, informational resources, WIC-required nutrition education modules, and other user inputs.<sup>87</sup> Notable app features which received high praise include benefit balance checking, barcode scanning, upcoming appointment information, clinic locators, nutrition education modules, and the capability to provide general information about WIC.<sup>87</sup> However, users have highlighted app issues too. Specifically, some of the apps do not retain login information, prevent participants from rescheduling appointment times, and lock up, preventing participants from accessing information in the app.<sup>87</sup> While further evaluation

on the usefulness of WIC apps is needed, early findings have indicated that app technology is beneficial for families with limited internet access.<sup>87,108</sup> Despite the promise of WIC apps, to date, to my knowledge, there are no cases in which the apps have been used to foster enrollment.

### Management Information Systems

WIC agencies have long utilized management information system (MIS) technology as their primary modality for managing benefit issuance, benefit redemption, client certification, nutrition education completion, health surveillance information, healthcare referrals, vendor information, appointment scheduling, data reporting, and system administration.<sup>109</sup> However, at the turn of the 21<sup>st</sup> century, Congress mandated that the FNS establish a plan for the development and implementation of updates to states' MIS systems. In 2001, WIC responded to this mandate with a report that emphasized the goals, objectives, and strategies needed to address programmatic needs with a MIS system. Specially, WIC noted that many state agencies were utilizing MIS systems that were outdated, paper-intensive, and required excessive manual data entry by WIC staff.<sup>109</sup> These aging systems negatively impacted program efficiency and the quality of WIC services.<sup>109</sup> Thus, the development and implementation of updated MIS systems into WIC agencies were designed to increase the efficiency, effectiveness, and accountability of all programmatic operations.<sup>109</sup>

The development of a universal MIS system has not been adopted by all WIC states. Rather, states or state consortiums have individually developed their own MIS systems. Texas WIC's MIS system was initially implemented in 1995. However, by 2015, it had outlived its utility. Specifically, the system required staff members to

manually backup and sync data, slowing the benefit issuance process.<sup>110</sup> In response, Texas WIC contracted with the Microsoft sub-company, Vexcel, to develop the Texas Integrated Network (TXIN) MIS system. TXIN aims to optimize clients' experiences through efficient certification and disbursement of immediate benefits.<sup>110</sup> Currently, to my knowledge, there is an absence of literature on the impact of state MIS systems as they relate to enrollment and retainment.

### Need for a New Technology

While each of these WIC-focused technological initiatives have been beneficial in some respects, none have significantly mediated WIC's decreasing enrollment or markedly improved retention. A primary cause for this phenomenon is likely linked to these technologies' inability to allow potential and current clients to obtain real-time information about enrolling in WIC and/or maintaining participation. In order to learn about eligibility for the program and to schedule appointments, individuals often need to interact with WIC staff through a phone call. In smaller local agencies, such calls are handled by staff in the clinic. Providing this information over the phone is likely a contributor to the noted disruptions in clinic operations, long wait times, and reduced customer service for participants who are in the clinic.<sup>111</sup>

Although not cited in the literature, staff may feel the need to rush phone calls with potentially eligible users in an effort to decrease wait times in the clinic. However, by rushing the phone call, the integrity of certification is likely to be diminished. Ultimately, this may result in incorrectly deeming an individual eligible or ineligible and cause a missed opportunity to enroll a new client or waste time setting up an unnecessary appointment, respectively. Some agencies have call centers to help handle the call

volume; however, the costs of call centers make their implementation not a feasible option for most agencies.

The ability to interact with WIC to ask specific nutrition education questions could also be improved.<sup>112</sup> When clients have specific questions, they must call or visit the WIC clinic. It may be much easier for clients to use a web search engine, such as Google, in lieu of contacting WIC. However, with the prevalence of misinformation readily and instantly available online, clients not only need standard nutrition education, but they also need immediate access to reliable, evidence-based information. While WIC does provide web-based nutrition education, clients still cannot obtain immediate, personalized answers to their questions.<sup>112,113</sup> A study by Huberty et al. showed that providing pregnant women relevant health information via the internet during pregnancy increased their confidence to engage in physical activity.<sup>114</sup> Similarly, if WIC can provide personalized information about breastfeeding and related maternal matters, clients may feel more confident to engage in the respective activities.

Collectively, issues that cause participants to wait, be it related to making appointments, waiting for an appointment, or having their personal nutrition or breastfeeding questions answered outside of the clinic, can reduce the perceived benefit of WIC participation.<sup>111</sup> When taken together, these issues contribute to decreased benefit utilization, new client enrollment, and current client retention.<sup>115</sup> A potential solution is to offer a technology-based option for programmatic processes that can be automated with instantaneous responses that do not require staff intervention.

## A Chatbot as a Solution

### Introduction

Chatbots are machine agents that can engage in dynamic communication with users, independent of direct human involvement.<sup>116</sup> In today's technological environment, chatbots have become a cornerstone innovation for various sectors of society including marketing, banking/finance, e-commerce, supply chains, travel, real-estate, and healthcare.<sup>117,118</sup> Chatbots have been praised by businesses' clients and customer service representatives alike. Currently, it is estimated that 1.4 billion people globally use chatbots on a regular basis.<sup>119</sup> Customers commonly commend chatbots' ability to provide immediate information, around-the-clock availability, and easy usability.<sup>120</sup> Customer service representatives have been reported to be keen on chatbots because of their ability to answer simple questions, resulting in a reduction of call volume at their place of business.<sup>108</sup> Customer service representatives feel that the resultant reduction in call volume provides time for them to handle more complex customer issues, have a greater impact on the company, provide personalized customer experiences, and, ultimately, increase job satisfaction.<sup>121,122</sup>

Rule-based and artificially intelligent chatbots are the two types of chatbots being utilized today. A rule-based chatbot communicates information based on a pre-defined decision tree that is embedded by the developer. Alternatively, artificially intelligent chatbots utilize natural language processing to decipher the user's inquiries and respond with the requested information. Chatbots are typically web- or application-based and are presented in a window that is similar to a live chat or to Facebook messenger; however,

some chatbots such as Apple's Siri, Amazon's Alexa, and Microsoft's Cortana verbally interact with their users.<sup>116</sup>

### Chatbots in Healthcare

Although chatbot-led healthcare and public health initiatives are continually emerging, current literature does provide insight on early chatbot use in these sectors. Divisions where chatbot utilization is occurring within the healthcare sector include psychology/mental health, oncology, chronic disease management, and various lifestyle behavior change initiatives.<sup>116,117,123-125</sup> Chatbot features have been geared towards therapeutics, skills training, health screening, user self-management, counseling, education, and disease diagnosis within these fields.<sup>125</sup> In short, chatbots have facilitated users to improve individual competency in monitoring medical conditions, cognitions related to disease states, attitudes, and health-related behaviors.<sup>117</sup>

### Key Technical Enablers of Chatbots in Healthcare

Chatbots possess many qualities that render them useful in healthcare settings. According to Pereira and Diaz, these qualities are broadly classified as technical enablers.<sup>117</sup> Aspects of a chatbots that act as technical enablers include synchronicity and asynchronicity, anonymity, consumability, personalization, and scalability.<sup>117</sup>

Chatbots offer a unique ability to provide (1) immediate responses that are in sync with a user's inquiry and (2) provide updates and information to individuals while they are offline. Immediate responses have proven beneficial as individuals desire prompt answers to their questions.<sup>117</sup> Additionally, the ability to be proactive by fulfilling tasks such as providing reminders has been appreciated.<sup>117</sup> These characteristics of chatbots

could prove particularly useful in the context of WIC as participants may be provided immediate information regarding participation and receive appointment reminders once they've scheduled a visit. Furthermore, immediacy and proactivity of chatbots have been shown to be especially important within the context of social media. Specifically, chatbots can be present on a programs' social media page to answer visitors' questions while also reaching out and providing updates and reminders to individuals through messenger apps.<sup>117</sup>

Those who visit a program's social media page may want to collect information about the organization without sharing their own personal information. A chatbot is well suited to provide exactly what these individuals' desire as interacting with a chatbot can be accomplished anonymously. Anonymity is key when considering that individuals may prefer not to share sensitive information such as citizen status, place of residence, or health information. Additionally, potential users may be more open and less fearful when interacting with computers and/or programmed agents as compared to with real humans.<sup>126</sup>

The consumability of a technology refers to the amount of friction that is present when trying to use the technology. Specifically, consumability includes the amount of technological competence needed to operate a technology as well as the extent to which a technology must be installed, accessed, updated, configured, and administered.<sup>117</sup> Chatbots have been described as superior to previous technologies with respect to their level of consumability. Specifically, chatbots are easily consumable because they lack the need to be installed, are platform independent, and typically require minimal amounts of learning to use.<sup>117</sup> These aspects provide a potential advantage when compared to innovations such as instant messaging or mobile apps.<sup>127</sup> Instances presented in the

literature in which an easily consumable chatbot is critical include for health screenings, motivational support, and decision making guidance.<sup>128-130</sup>

The ability for a chatbot to be personalized to the user has been shown to be desirable and increase user satisfaction, which, in turn, results in improved engagement.<sup>117</sup> The personalization of a chatbot has proven beneficial for food allergy and diabetes management by utilizing patients' medical information to provide tailored dietary advice.<sup>131,132</sup> Additionally, chatbots have been successfully leveraged to support physical wellness by providing personalized health screens, motivational messages, and individualized guidance.<sup>129,133,134</sup> Furthermore, in a study by Fernandez-Luque et al. a chatbot inquired about the communication preferences of users and adapted its message delivery based on their inclination.<sup>135</sup> Not only do chatbots ability to be personalized increase acceptance of the bot, but personalization typically leads to better outcomes for the user too.

A technology's ability to be increasingly and sustainably used by a large body of individuals over a spread area is referred as its scalability. Chatbots have the potential to be highly scalable, as they are capable of handling extensive and diverse client bases in a cost-efficient manner. By being scalable, chatbot can help large bodies of individuals, especially when human resources are limited.<sup>117</sup> For example, Wysa, an empathetic, text-based chatbot, is being studied for its potential to be a supplementary or intermediate depression therapy tool to counteract the global shortage of psychotherapists.<sup>136</sup>

## Outcomes of Chatbot Utilization

Chatbots have the potential to reduce organizational expenditures while increasing employees time to handle tasks that require human assistance. A report generated by Juniper Research estimates that by 2023, chatbots will generate \$11 billion in savings for the retail, banking, and healthcare sectors predominantly by lessening the caseload of individuals who are in need of a customer service representative.<sup>137</sup> Additionally, the report stated that between the three previously mentioned sectors, chatbots are projected to alleviate 2.5 billion hours for customers and staff by 2023.<sup>137</sup> Chatbots have been reported to reduce the number of incoming customer service calls and eliminate response and interaction lags that occur during phone calls and other social outlets.<sup>137</sup>

## The Potential of a Texas WIC Chatbot

It has been demonstrated that an expansion of WIC services through technology implementation, is a programmatic need.<sup>106</sup> A well designed, web-based chatbot is a technology that is strongly suited to alleviate the shortcomings of the current technological landscape of Texas WIC. A chatbot's cost and time saving potential are highly desired by the program. If a chatbot can decrease WIC's programmatic spending on customer service-related costs, it would increase the amount of funds that WIC has available for initiatives that provide more direct benefit to their clients and/or staff. Additionally, if a chatbot can mediate the excessive call volume that Texas WIC clinics currently experience, it will facilitate a more intimate and less distracted interaction between the clients and staff.

The potential for a chatbot to be personalized to Texas WIC clients may be highly advantageous for the program. As was seen from research regarding online nutrition

education, WIC clients desire information that is tailored to them, rather than material that is general by nature.<sup>84</sup> Personalized features that a chatbot could deliver may include, but are not limited to, appointment look up, tailored nutrition education, benefit package information, EBT balance, nearby clinics and WIC-accepting store locations, and re-certification reminders. Additionally, such information can be readily accessed 24/7 through a chatbot. Around the clock availability is a phenomenon that has never existed in the WIC context as, historically, personal information retrieval has typically been limited to clinics' hours of operation.<sup>84</sup>

As previously mentioned, WIC's demographic of potential and current clients largely utilize mobile devices such as smartphones.<sup>138</sup> While these devices provide access to the internet, clients may be under connected, preventing them from utilizing all the services of features and applications on the internet.<sup>105</sup> However, chatbots are highly adaptable to all internet-accessing platforms, they have potential to mediate the limitations that underconnectivity may bring. Thus, no matter the device being used, the individual will always be able to access the full range of features offered by the chatbot. For this reason, a chatbot's platform flexibility also bodes well in the Texas WIC program.

It has been demonstrated that social media provides a phenomenal opportunity to reach a broad range of people, especially younger individuals; however, information shared on social media pages can be perceived as not trustworthy.<sup>99</sup> Given Texas WIC's current and growing presence on social media, a chatbot that is developed by Texas WIC may mediate individuals' fear of receiving misinformation. Furthermore, given the extensive amount of people who own multiple social media accounts, a social media-

integrated chatbot provides an enormous opportunity for Texas WIC to connect with a greater number of potential clients.

Ultimately, a chatbot is a technological innovation that has the capability to relieve programmatic inefficiencies and shortcomings of Texas WIC. A chatbot provides multiple benefits in terms of cost-savings, employee time optimization, business inefficiency reduction, personalization of information for clients, 24/7 availability, increased trustworthiness of info accessed on social media, and expanding WIC's capacity to reach potentially eligible clients. When taken together, a chatbot is a technology with great potential for reversing the trend of decreasing enrollment and retention of Texas WIC clients.

While the immense potential of a chatbot for the Texas WIC program is clear, what is less known is how to optimally develop and implement such a technology. When contemplating this notion, there are many variables to consider. First, Texas WIC employees', ranging from state level stake holders to frontline clinic staff, perceptions must be considered. Given that these individuals carry out each essential task for the continual operation of the program, their knowledge is critical. Additionally, collecting input from the eventual end users, including potential and current WIC clients, is crucial. This group can directly inform the development of a chatbot by providing what they feel the chatbot must deliver on. This information is key if Texas WIC aims to create a chatbot that is accepted and sustainably utilized by their organization's demographic.

## Theoretical Framework

### Introduction

To optimally investigate the development and implementation of a chatbot, a multi-level theoretical framework which guides the collection of WIC staff and potential user input is required. At the macro level, a User-Centered Design (UCD) approach provides an iterative, step-by-step process model that describes how to best progress through each phase of chatbot development.<sup>139</sup> The scope of this thesis lies within the first phase of the UCD development process, concept generation and ideation. Within this phase of the UCD framework, the PRECEDE-PROCEED model offers insight on how to create a chatbot that specifically serves the potential and current WIC demographic and is sustainable within the Texas WIC program.<sup>140</sup> The PRECEDE-PROCEED model acts as webbing by which multiple technology acceptance theories may be integrated into this study.<sup>141</sup> This structure creates a theoretical hierarchy that can provide the multi-faceted data needed to optimally develop, implement, and sustain a Texas WIC chatbot. The following section describes each of these theories.

### User-Centered Design

A UCD framework is a process model that is ideal for optimizing the development and implementation of a Texas WIC chatbot. Originally coined 1986 by Donald Norman and Stephen Draper, UCD was created to provide an understanding of the dynamic between a novel, interactive technology, the end-users, and the interaction that occurs between the two.<sup>142</sup> UCD informs a technology's development by collecting end-user groups' input on how the technology can best fit their respective needs.<sup>139</sup> Thus, UCD considers multiple levels of input, making it an ideal framework for developing and

implementing technologies into businesses and programs with a structured business hierarchy such as Texas WIC. UCD methodology has been successfully employed when creating, designing, and implementing innovative mHealth technologies aimed to improve health behavior such as smartphone applications.<sup>107,143-145</sup> As can be seen in figure 4, UCD consist of four main phases including concept generation & ideation, prototype design & system development, evaluation, and technology deployment.<sup>139</sup>

#### *UCD Phase 1: Concept generation and ideation*

The concept generation and ideation phase of UCD is meant to assess the needs of the end users. Specifically, this phase is meant to garner input on the intended uses and overall purpose of a Texas WIC chatbot. Research protocols which fit into this phase include, but are not limited to, focus groups, interviews, and surveys. Additionally, this phase emphasizes the end users' environment in which the chatbot may be used, social/cultural practices, biases towards technology, and communication styles.<sup>139</sup>

#### *UCD Phase 2: Prototype design and system development*

After this initial needs assessment has been analyzed, UCD proposes that a prototype may be developed based on the gathered input.<sup>139</sup> The first prototypes are typically simple in nature and only offer a portion of the capabilities that a final product, such as a chatbot, will deliver. However, a simple initial design allows for continuation of the iterative development of the chatbot.

#### *UCD Phase 3: Evaluation*

UCD emphasizes the need for end-users to evaluate the initial and the subsequent chatbot prototypes. This may be done by conducting usability tests such as end-user

surveys and think aloud studies.<sup>139</sup> During these studies, researchers aim to collect data on their participants' behavior, comments, and shortcomings while using each chatbot prototype. As the design-cycle progresses, the iterative evaluation of each prototype refines and further enhances different aspects of the chatbot.<sup>139</sup>

Finally, after each phase of the UCD process has been completed, a robust chatbot may be deployed to the end-user, in this case, visitors of the TexasWIC.org. After launch of the product, the UCD model emphasizes on-going evaluation. Similar evaluation techniques may be applied.<sup>139</sup>

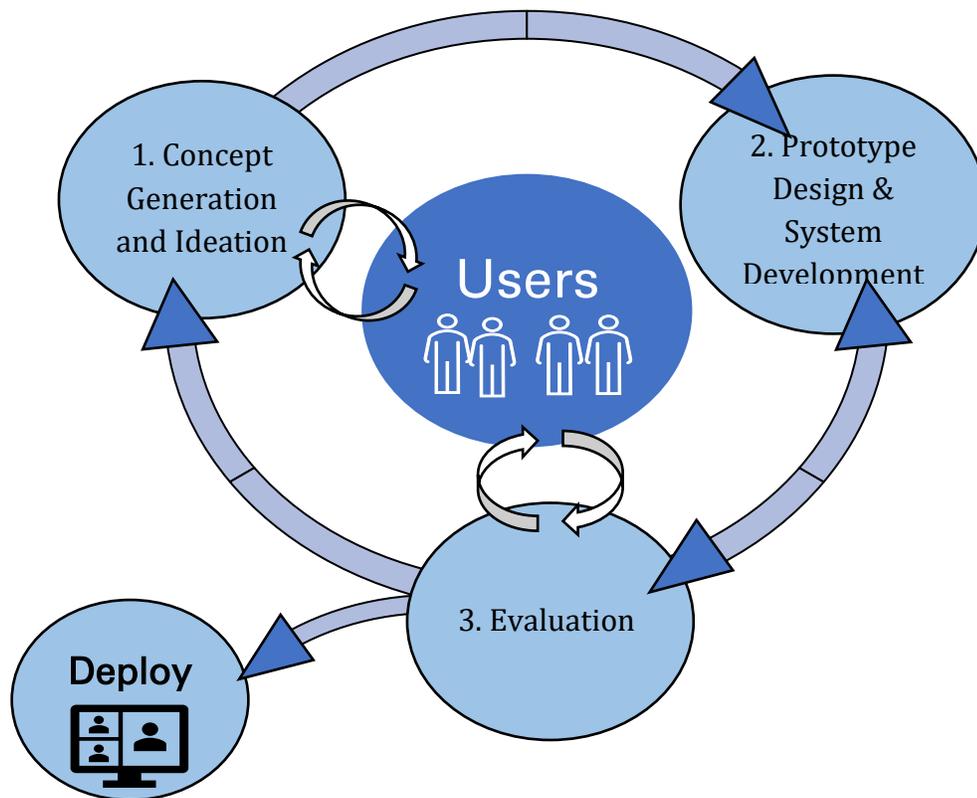


Figure 4: User-Centered Design Model.<sup>139</sup>

## PRECEDE PROCEED Model

The PRECEDE PROCEED model is an educational and ecological framework that has been used extensively to create roadmaps for planning and evaluating health-related interventions.<sup>146</sup> Developed by Green and Kreuter in 2005, the purpose of the model is to plan and develop interventions to improve a population's health outcomes. It is important to note that the name of the model is an acronym which syncs with the model's 8 phases. PRECEDE stands for Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation and makes up the first 4 phases of the model. Predisposing factors include experience and emotional traits such as an individual's attitude, values, beliefs, and perceptions. These elements may facilitate or hinder the adoption of a desired behavior.<sup>147</sup> Reinforcing factors involve the feedback and/or rewards that individuals' experience when performing certain behaviors.<sup>147</sup> This feedback system will encourage or deter continuation of the behavior. Finally, enabling factors typically exist as communal forces or systems which facilitate or impede a behavior.<sup>147</sup> Examples of enabling factors include, but are not limited to, internet access, functional technology, smartphone ownership, instruction, and technology literacy. PROCEED represents Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development and constitutes the last 4 phases of the model. This portion of the model produces evidence regarding how a chatbot may be sustained in the Texas WIC program.

The first 4 phases are collectively referred to as the assessment phase because they aim to collect data on the needs of a population of interest. As the model name

implies, the assessment phase precedes an intervention. The scope of this thesis lies within the assessment of phase of the PRECEDE-PROCEED model.

The final 4 phases are collectively referred to as the evaluation phase because they facilitate the collection of data regarding the effectiveness of an intervention. Again, the title of the model holds true in that the evaluation phase proceeds the intervention. Due to this study's formative nature, the PROCEED portion of this framework will be applied when assessing the developed chatbot's sustainability within Texas WIC.

A strength of the PRECEDE PROCEED model is that it accounts for the multiple determinants of behavior. Thus, it is a framework that can integrate several behavior-driven theories.<sup>141</sup> This is particularly important when considering technology acceptance and usage. By both guiding the assessment and evaluation of introducing and sustaining a chatbot in the Texas WIC program, while also having the capacity to concurrently consider behavioral and technology acceptance theories, the PRECEDE PROCEED model may facilitate the optimal development of a Texas WIC chatbot.

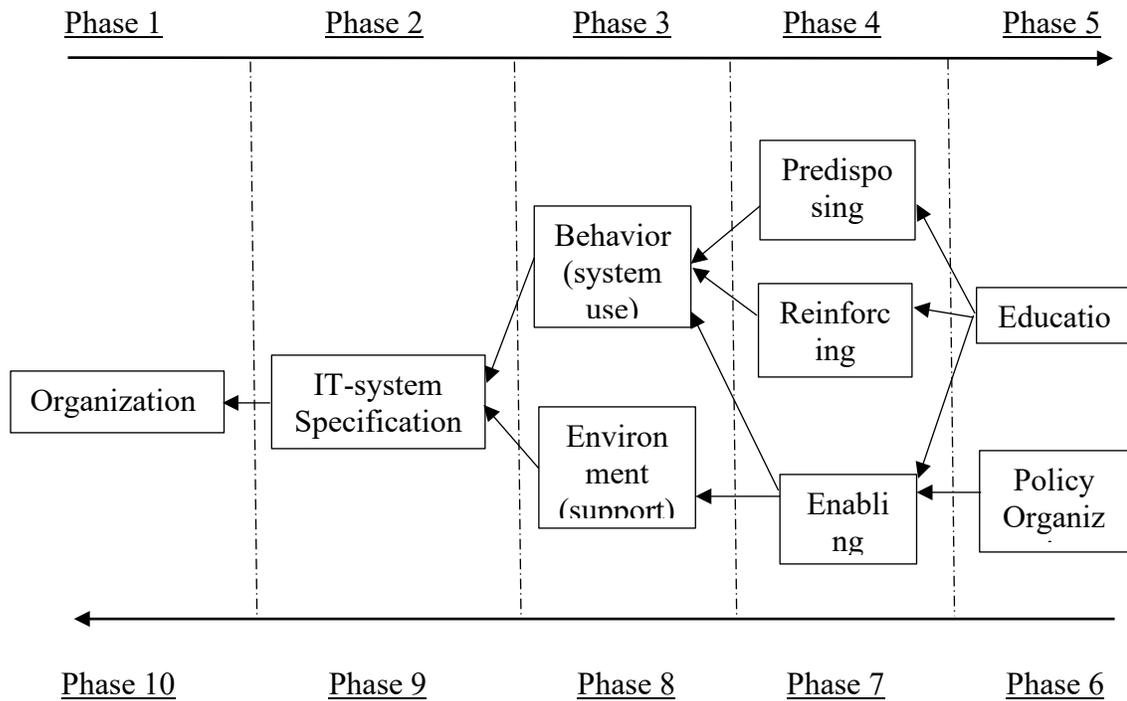


Figure 5: PRECEED-PROCEED Model for Information Technology Use<sup>141</sup>

### Social Cognitive Theory

Bandura's Social Cognitive Theory (SCT) was designed to describe factors which influence how behavior is learned and continued by an individual.<sup>148</sup> SCT proposes that individuals' beliefs, as well as their environment, facilitate targeted behaviors; in turn, the successful practice of the respective behaviors has a reinforcing effect on their beliefs about the pursued behaviors.<sup>148</sup> This loop of interaction between the individual, environment, and the resulting behaviors is defined as *reciprocity* in SCT.<sup>149</sup> When considering chatbot usage as a targeted behavior, the beliefs of WIC clients about technology and chatbots, as well as environmental factors that enable or prevent chatbot usage, SCT related constructs must be studied.

Self-efficacy, a construct that is defined as beliefs about one's ability to perform a specific behavior, is a key feature of SCT.<sup>150,151</sup> When considering the adoption of a chatbot by potential and current WIC clients, positive self-efficacy towards chatbot usage is critical. Thus, an individual's confidence in their technological skills is just as important as convincing prospective and current Texas WIC clients of the benefits to be derived from a chatbot. Consequently, self-efficacy may be a key antecedent to chatbot adoption and usage.

### Technology Acceptance Model

The Technology Acceptance Model (TAM) is a robust framework that is commonly used to test the acceptance of an innovative technology in various settings and populations. Although originally created to be applied in a work environment, the TAM has been adapted to describe the adoption of technologies for personal use.<sup>152-156</sup> The TAM consists of two main constructs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which are touted to determine an individual's intention to accept and adopt a novel technology.<sup>157</sup> Perceived Usefulness is defined as the extent by which a user considers that utilizing a respective technology would enhance their performance on a task.<sup>157,158</sup> For example, a chatbot may be perceived as useful if a WIC client can book an appointment with it. PEOU is described as the degree to which an user perceives that using the respective technology will be free of effort.<sup>157,158</sup> According to TAM, PU and PEOU influence the Behavioral Intention (BI) of using a technology, which is stated to be a direct driver of technology usage.<sup>157</sup>

The TAM framework is applicable when considering the implementation of a chatbot into WIC. Because they may be applied to both a work and personal use context,

constructs of TAM can be used to gauge the perceptions of a chatbot’s usefulness and ease of use among WIC staff and clients. Through qualitative and quantitative application of TAM, insightful data regarding how a chatbot can be best accepted by TexasWIC.org website visitors will provide insight on how to optimize adoption and usage.

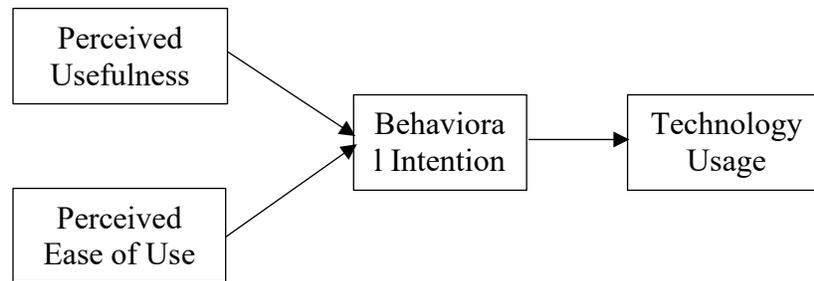


Figure 6: Technology Acceptance Model

### Technophilia

Developed by Purian Ronit and published in 2011, the Technophilia framework provides additional insight on the technology adoption process and key factors that drive sustained technology usage. In comparison to other technology acceptance frameworks, Technophilia is unique because it considers how emotions towards technology not only influences initial adoption, but also how emotions adjust with sustained usage over time and subsequently lead to enhanced technology utilization. Technophilia purposes that when considering the adoption of a new technology, each individual experiences the techno-complex. The techno-complex is a psychological ambivalence that is felt towards a technology with which an individual has minimal experience.<sup>159</sup> The Technophilia framework provides insight on how to minimize the effects of the techno-complex. Furthermore, Technophilia is specifically relevant for understanding of technology

acceptance and continued usage amongst low socio-economic status populations.<sup>159</sup> Thus, it is a framework that is applicable to the Texas WIC-eligible and -enrolled demographic.

The Technophilia framework emphasizes that enjoyment of technology usage acts as a driver for initial technology adoption. Specifically, enjoyment consists of entertainment derived from the usage of a technology and the ability to engage in communication with the technology. Previously, entertainment has been described as the level of playfulness that a technology provides. Examples of what makes a technology playful include, but are not limited to, ergonomics, aesthetic design, and/or an affective human-computer interaction.<sup>159</sup> If a technology is enjoyable to use, it is likely that an individual will develop a positive *attitude* towards technology and usage of technology will become a *norm*. Technophilia postulates that when this occurs, an ambivalent individual is likely to overcome the techno-complex and accumulate *experience* with technology. Accruing experience is a reward of enjoying the usage of a technology.

When an individual reaches a certain threshold of experience, their perception regarding the *ease of using* the technology, as well as their general *digital literacy*, increases.<sup>159</sup> Conversely, as experience is gained, an individual's perception of the technology's *usefulness* becomes realistic and, thus, they perceive the technology as less usefulness relative to the first time it was used.<sup>159</sup> Once this process of technology adoption and usage has been fulfilled, the user may be considered a technophile for the respective technology.<sup>159</sup>

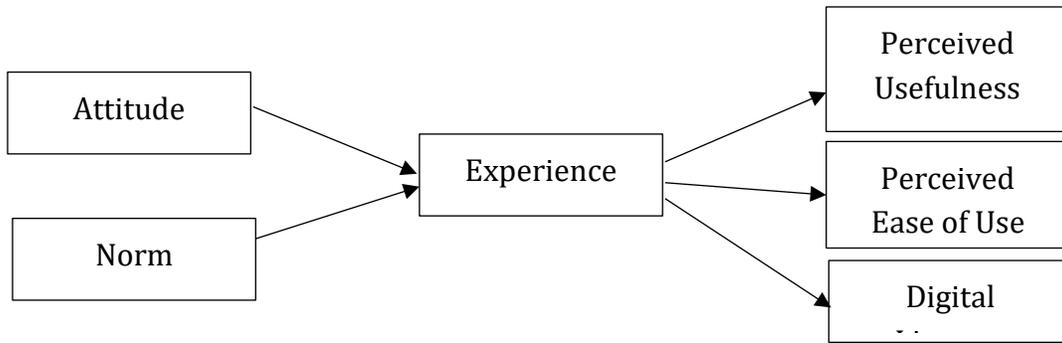


Figure 7: Technophilia Model at Individual Level

Summary of Theoretical Frameworks

Table 4: Hierarchy of Theories Used, their Respective Constructs, and Purpose.		
<b><u>Theory:</u></b>	<b><u>Constructs Used:</u></b>	<b><u>Purpose:</u></b>
User-centered Design	Phase 1: Concept generation and ideation  Phase 2: Prototype design and system development  Phase 3: Evaluation	Phases of UCD provide process guidance for the conceptualization, development, and implementation of a Texas WIC chatbot.
PRECEDE-PROCEDE	Predisposing, Reinforcing, and Enabling factors.	Provides insight on how a chatbot can be developed, adopted, and sustained in the Texas WIC program.  Acts as a web by which technology acceptance theories can be implemented.
Social Cognitive Theory	Self-efficacy  Environment	Provides insight on how Texas WIC demographic feels about their ability to successfully adopt a chatbot.

Technology Acceptance Model	Perceived usefulness Perceived ease of use Intention to patronage	Provides key information related to acceptance of a novel technology.
Technophilia	Enjoyment Perceived usefulness Perceived ease of use Digital literacy	How an individual's emotions about a chatbot can influence adoption and usage.

## Objectives

### Statement of Purpose

1. Explore insights from WIC staff, WIC clients, and potential WIC clients in Texas on how a chatbot may help mitigate inefficiencies in WIC services, and thus increase enrollment and participation.
2. Implement early stages of user-centered design to describe optimal chatbot functionalities aimed at increasing enrollment and participation.

### Research Questions

1. What are recommendations from WIC stakeholders and intended users for the Texas WIC Chatbot interface?
2. Will a chatbot be well-received by WIC staff, WIC clients, and potential WIC client?

### Hypothesis

- I. We anticipate that WIC staff, WIC clients, and potential WIC clients will desire a chatbot that is intuitive, can functionally deliver on its promoted features,

provides accurate information regarding the four pillars of WIC eligibility, and allows for appointment lookup and scheduling.

- II. We hypothesize that the prospect of a chatbot will be well-received.

### III. METHODS

#### Background Information

#### Funding and Collaboration Efforts

The proposed project was funded by the 2017/2018 USDA Special Project Grants, grant number HHS00013550000 to Dr. Sylvia Crixell and Dr. Lesli Biediger-Friedman. Funding for this project was allocated for the development, implementation, and evaluation of innovations that aim to optimize benefit delivery and improve the customer service experience in the WIC program. This study builds on previous collaborative work between Texas WIC and researchers within the Texas State University Nutrition and Foods Program.<sup>107</sup>

The Texas WIC program and researcher from the Texas State University Nutrition and Foods Program co-applied and were awarded funding for the project. Funding was granted for the purpose of creating an online chatbot to address questions about eligibility, the application process, customer service, and other factors to increase the accessibility of Texas WIC. Texas State University Nutrition and Foods Program contracted with the Texas WIC Program to provide evaluation and consultation services for the chatbot project. This study encompasses the collaborative, formative data collection for the initial chatbot development. Additionally, this work is a continuation of previous work that focused on a WIC mobile phone application.<sup>108</sup> This research was approved by the Texas State University Institutional Review Board (2018682) and reviewed and deemed exempt by the Texas Department of State Health Services (DSHS) Institutional Review Board (18-029).

## Project overview

This study utilized a sequential exploratory mixed-method design in which qualitative group interviews informed the development of quantitative surveys. The User-Centered Design (UCD) model served as a guide to collect perceptions, needs, and suggestions of stakeholders and potential chatbot users. All proposed research procedures for this formative assessment proposal occurred in phase 1 of UCD: Concept Generation and Ideation. Research procedures included group interviews with Texas WIC stakeholders, a Texas WIC staff survey, and a Texas WIC website visitor survey. This proposal aims to report on the formative development of a Texas WIC chatbot.

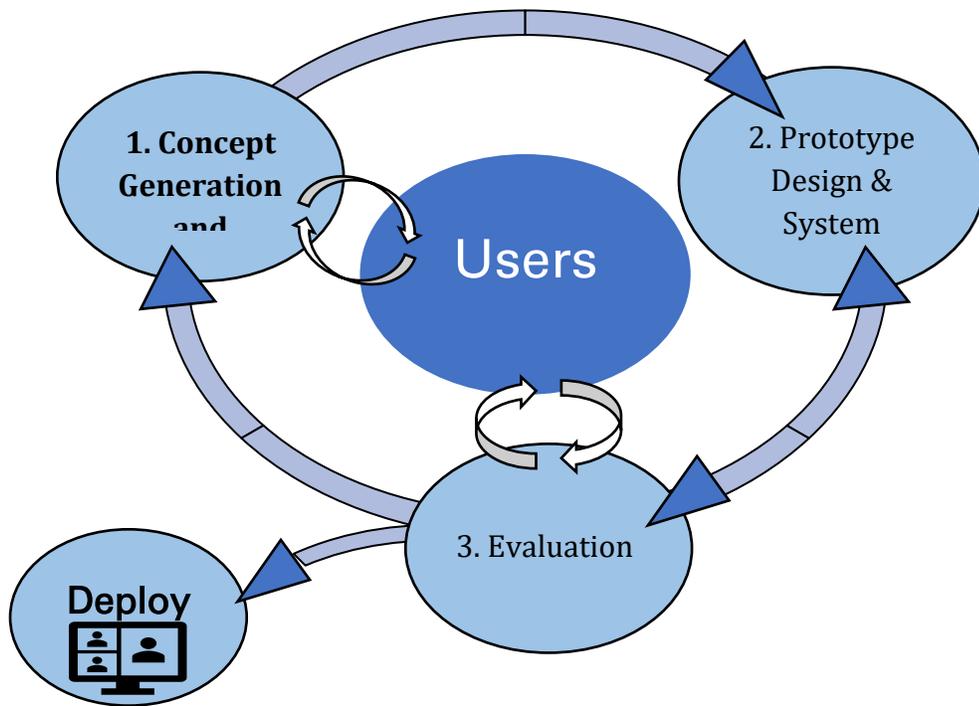


Figure 8: User-Centered Design Model.<sup>139</sup>

## Project Research Procedures

### Group Interviews

#### *Recruitment:*

In collaboration with Texas WIC, a convenience sample of WIC stakeholders, directors, and staff was created to allow for recruitment. A Texas WIC state-level communications specialist and the research team recruited the three different levels of WIC staff in three respective phases. The first phase of recruitment focused on state-level MOSAIC consortium stakeholders from the south-central region of the United States including Texas, Louisiana, New Mexico, and two Indian Tribal Organizations. The state-level communications specialist from Texas WIC contacted MOSAIC stakeholders to inform them about the upcoming group interviews. The Texas State research team then followed up with a Qualtrics survey which was used to gather the stakeholders' availability. Group interviews were scheduled based on the days that the stakeholders indicated the most availability.

The second phase of recruitment was directed at local agency directors from across the state of Texas. A Texas WIC state level executive sent all local agency WIC directors an interest piquing email, in which directors were informed about the upcoming group interview recruitment effort. Two days following the email, the research team sent a Qualtrics survey to the same local agency directors to gather their availability for the subsequent two weeks. Group interviews were scheduled based on the days that the directors indicated the most availability.

The third and final stage of group interview recruitment was geared towards frontline clinic staff from across Texas. Recruitment began by introducing the chatbot project in the February edition of WIC's monthly newsletter. A link to a Qualtrics survey was included in the newsletter, which was used to gather staffs' interest and availability to participate in group interviews. Group interviews were scheduled on the days that staff indicated the most availability.

*Design:*

Pre-Interview Survey:

Once potential group interview participants had agreed to partake in the group interviews, they were asked to complete a pre-interview survey. The pre-interview survey assessed participants' familiarity and comfort with online technologies. The survey was adapted using validated measures of technophilia, a theoretical model that demonstrates a relationship between a user's acceptance of novel technologies with the technologies *perceived usefulness* and *ease of use* as well as the user's *digital literacy* and previous *experience* with related technologies.<sup>159</sup> Each of the italicized components in the previous statement are constructs of technophilia. The subsequent paragraph will describe the number and type of survey questions that were included for each construct.

To determine staff's *perceived usefulness* of a chatbot, three, 3-point Likert scale items were asked. These questions aimed to collect data on how the speed of information retrieval compares with other forms of communication and if the chatbot allows for communication at more convenient times and locations. To establish staffs' perception of the *ease of use* of the chatbot, three, 3-point Likert scale questions were used. These questions gauge how difficult staff perceive chatbot usage to be without in-person or

online support and how complicated communicating through a chatbot is compared to other modalities of communication. Thirteen survey items were used to determine staffs' *digital literacy*. These items ask several questions regarding staffs' ability to download and utilize various technologies such as apps, websites, e-mail, and text messaging. Staffs' *experience* with chatbots and similar technologies was measured with six survey items. This set of survey questions aim to collect data on the amount of experience staff have executing specific services with chatbots and virtual agents.

The pre-interview survey allowed for the research team to gain a baseline understanding of participants' tendency to accept novel technologies. This provided an initial framework by which participant interview responses may be interpreted. Additionally, demographic information was collected, and participants consented to participate in the study on the pre-interview survey.

#### Group Interviews:

In order to accommodate the busy work schedules of WIC stakeholders and staff, modifications were explored to develop adaptive, purposeful small group discussions. Thus, we utilized group interviews as the qualitative investigation method for this study. Group interviews provide insightful data on the social dynamic within a social or work setting, how to develop future methodological techniques, and distinguishing key informants.<sup>160</sup> Group interviews involve observers that are informed of the setting and concepts of interest.<sup>160</sup> Furthermore, group interviews serve as a foundation for the integration of grounded theory. For these reasons, group interviews are commonly used in the exploratory stage of research projects.<sup>160</sup>

A semi-structure guide was utilized because it allows for the exploration of insights regarding specific topics; however, it provides flexibility for emergent themes to be revealed.<sup>161</sup> The format used herein included semi-structured, open-ended questions and prompts to understand the Texas WIC clinic setting, solicit opinions of the WIC staff regarding technology, and generate ideas for creating a mock-up chatbot (See appendix A).<sup>161</sup> The Texas State Research team and Texas WIC worked in a highly collaborative manner to develop the semi-structured group interview guide. The guide began with an introduction to chatbots and then proceeded to several activities which gathered input on: 1) special customer service; 2) current examples of positive and negative customer services; 3) use of technology in the clinic that is positive; 4) use of technology in the clinic that is negative; 5) where in the flow of services a chatbot could be helpful in improving the client experience; 6) where in the flow of services a chatbot would not be helpful in improving the client experience; 7) when provided with hypothetical clients, what would a chatbot need to do to provide special experience; 8) identifying an appropriate chatbot persona; and 9) what is needed for WIC to implement and promote a chatbot. Additionally, an initial code list was developed based on the key prompts and topics in the interview guide. The code list was updated with new codes after each interview.

Each activity was created to gather feedback regarding specific theoretical constructs of the PRECEDE PROCEED model, Social Cognitive Theory, and Technology Acceptance Model. See table 5 below for theoretical constructs collected and the rationale for which they were utilized.

Table 5: Qualitative Theoretical Constructs and their Inclusion Rational		
<u>Theory:</u>	<u>Constructs Used:</u>	<u>Rational for Use:</u>
PRECEDE-PROCEDE Model <sup>147</sup>	Predisposing factors Enabling factors Reinforcing factors	Provides a framework for sustainable programmatic infrastructure modification.
Social Cognitive Theory <sup>151</sup>	Self-efficacy Environment	Helps to identify predictive factors to interpersonal, social, and programmatic dynamics regarding technology usage amongst the WIC demographic.
Technology Acceptance Model <sup>157</sup>	Perceived usefulness Perceived ease of use	Provides key insights regarding staffs' perception of what makes technology useful, in general, and a chatbot specifically, useful and easy to use.

All group interviews were conducted successively with MOSAIC partners, directors, and frontline staff, respectively. Zoom video conferencing system was used to conduct the group interviews. A PowerPoint presentation was shown to the group interview participants and helped guide the conversation for each respective activity. The online interface allowed all participants to see each other, the interviewer, and question prompts with participant responses via screen share. As participants shared their thoughts during the interview, a technical assistant moderator typed their responses on to the shared PowerPoint slide (Appendix B). Each participant was provided an incentive for their participation.

### *Data Collection:*

Baseline data regarding participants' comfort with and likelihood of adopting a chatbot was collected in the pre-interview survey. The group interviews took place from November of 2018 through February of 2019. Group interviews involved various activities that gauged the participants' perceptions on how a chatbot may be optimally developed and implemented into WIC. Group interviews were recorded and transcribed for analysis of descriptive, theoretical, and emergent themes.

### Texas WIC Staff Survey

#### *Recruitment:*

The Texas State research team worked with Texas WIC to recruit WIC staff for the survey. Texas State drafted an email that informed Texas WIC staff members of when the survey will be administered and the purpose of the survey. A state-level communication specialist sent this email to Texas WIC directors and encouraged staff to complete the survey. Additionally, the survey was linked in Texas WIC's weekly employee newsletter.

#### *Design:*

##### Overview

After analyzing the qualitative data, a survey was developed to assess whether the qualitative findings were statistically generalizable to a larger sample of WIC staff. In total, the survey included 65 questions. The survey initiated by collecting the participants' consent to participate in the study and demographic information. Next, staffs' comfort and familiarity with technology was measured by adapting scales from the *technophilia* framework. Subsequently, the survey utilized scales that measure staffs' *intention to patronage (IOP)* the chatbot. Finally, mock chatbot personas were presented to and

judged by WIC staff. Evaluation of the personas was conducted by employing *self-assessment manikins (SAM)* scales which measured emotions provoked by the chatbot personas. The survey concluded by collecting a shipping address for the research incentive to be sent.

### Technophilia

As described previously in the group interview pre-survey section, scale questions that measured constructs of technophilia were incorporated into the Texas WIC Staff Survey.

### Intention to Patronage

*Intention to patronage (IOP)* is a stand-alone theoretical construct that measures staffs' probability of using the branded chatbot in the future.<sup>162</sup> Additionally, this construct reveals whether WIC staff would be willing to recommend the chatbot to a friend. Three survey items are used to are used to collect data on the IOP construct. These questions gauge WIC staffs' willingness to find information with the chatbot and the likelihood that staff would recommend the chatbot to clients.

### Self-assessment Manikins

Originally developed in the field of psychology, the *self-assessment manikins (SAM)* were used to measure staffs' feelings about three different potential chatbot personas.<sup>162,163</sup> Specifically, the SAM scales measured feelings of pleasure, arousal, and dominance towards each persona. Three scale questions, which each consist of progressive manikin expressions, gauged how much pleasure staff received from each

persona, the amount of excitement each persona provided, and the extent to which they felt in control of the interaction with each persona.

#### *Data Collection:*

WIC staff were recruited via email to Texas WIC directors and by including the survey link in WIC's weekly employee newsletter. The survey aimed to expand upon finding from the group interviews. The survey adapted various validated scale items from Technophilia, intention to patronage, and self-assessment manikins. An incentive was provided for those who completed the survey. The survey was live from mid-May 2019 through late June 2019. Once closed, survey results were exported for statistical analysis.

#### Texas WIC Website Visitor Survey

##### *Recruitment:*

Texas WIC posted a pop-up statement on their website, TxWIC.org, to catch the attention of website visitors. The pop-up statement described that WIC was developing a chatbot and that a linked survey was being used to collect input on what website visitors felt needed to be included in the chatbot. Once clients clicked the link, they were directed to the survey.

##### *Design:*

The Texas WIC website visitor survey was very similar to the staff survey as it too collected consent and demographic information while also employing the constructs of technophilia, intention to patronage, and SAM scale questions. However, this survey was edited so that the questions were directed towards potential and current WIC clients

and not staff. Additionally, Texas WIC and Texas State collaboratively edited the survey to ensure that the reading level was adequate for the intended demographic.

#### *Data Collection:*

Participants were recruited from TxWIC.org via a pop-up statement that was posted on the homepage of the website. A link in the pop-up statement led participants to the survey. The survey was employed to allow the research team to develop an understanding of if TxWIC.org website visitors would adopt a chatbot and what they wanted from a chatbot. The survey adapted various validated scale items from technophilia, intention to patronage, and SAM. Texas state-level WIC executives and the Texas State research team iteratively edited the survey so that it optimally matched the reading level of the intended demographic. The survey was posted on the homepage and class page of TxWIC.org from July 2019 through early September 2019. After the survey closed, results were exported for statistical analysis.

## Analysis

### Introduction

This study utilized a sequential exploratory mixed-methods design. Qualitative exploration (using group interviews) informed the development of an instrument for subsequent online surveys. Findings from both data sources were integrated to inform the development of the chatbot.

### Group Interviews

Immediately following the conclusion of each group interview, the moderator and assistant moderator reviewed their notes and discussed initial findings. Interview notes

from each interview were applied to update the code list. All codes, quotes, and interview notations were organized using 2019 Microsoft Excel.<sup>164</sup> Group interviews were transcribed from interview video/audio recordings by a professional transcription service. After each round of coding, the two researchers met to reconcile coding disagreements and identify emergent codes, initiating an additional round of transcript coding.<sup>165,166</sup> This multiple pass method was repeated until the coding of all themes for each transcript was completed. After the conclusion of the coding process, a third member of the research team then reconciled any remaining coding disagreements.<sup>165,166</sup> Finally, inter-coder reliability was calculated by dividing total number of coding agreements by the sum of all coding agreements and disagreements.<sup>166</sup> Overall inter-coder reliability of the group interview transcripts was 98.4% (100(1224/1244)).

#### Staff Survey

Responses to the staff survey were analyzed descriptively. Ordinal Likert scales were utilized for data collection. Frequency distributions were generated for participants responses to demographics, technophilia items, IOP items, and SAM items. All statistical analysis was conducted with Statistical Packages for Social Sciences (SPSS Version 25, IBM Corp).

#### Client Survey

Responses to the client survey were analyzed via descriptive analysis. Ordinal Likert scales were utilized for data collection. Frequency distributions were generated for participants responses to demographics, technophilia items, and SAM items. All statistical analysis was conducted with Statistical Packages for Social Sciences (SPSS Version 25, IBM Corp).

## IV. MANUSCRIPT

### Background

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a US program that provides health-promoting services for women who are pregnant, postpartum, and/or breastfeeding, and children from birth to the age of 5. Key services provided by WIC include subsidies for purchasing healthful foods, health screening, health care referrals, breastfeeding support, and nutrition education. While there are several parameters that define eligibility, demonstration of low-income status is pivotal. Positive health outcomes linked to program participation demonstrate the impact of WIC; they include improved prenatal nutritional status and birth outcomes, reduced healthcare costs, increased immunization rates, and decreased food insecurity.<sup>26,27</sup>

Robust participation in WIC ensures that vulnerable populations receive services during critical times in development. In 2010, approximately 2.2 women, 2.2 million infants, and 4.9 million children participated in WIC across the nation.<sup>65</sup> Alarming, over the last decade, participation has decreased by approximately 4-6% per year.<sup>65</sup> Put another way, the percentage of income-eligible households that participate in WIC declined from 64% in 2011 to 51% in 2017.<sup>167</sup> Factors contributing to decline in participation include, but are not limited to, misconceptions about eligibility requirements, language disconnects between staff and participants, unfavorable perceptions of the value of food subsidies, and impediments to acquiring WIC-supported foods.<sup>68,72,75,77,168</sup> Perhaps the most critical issues revolve around logistics involved in navigating the system for potential and current WIC participants. WIC's business operations, otherwise known as the flow of WIC services, refers to the processes of providing potential clients with eligibility information, enrolling new clients, re-

certifying existing clients, and distributing program benefits.<sup>115</sup> Any disruption to the flow of services may affect participation.

Inefficiencies that currently exist in the flow of WIC services include, but are not limited to, long wait times in clinics, overcrowded clinics, excessive paperwork, and the perception of poor customer service as clinic staff may often be concurrently engaged in multiple tasks.<sup>68</sup> Taken together, these issues may contribute to decreased enrollment, retention, and realization of WIC benefits.<sup>115</sup> Texas WIC, the second largest state WIC program in the US,<sup>64</sup> serves approximately 676,000 participants per month. The reach of Texas WIC is extensive and diverse, with Hispanic (70.7%) and Black (14.2%) families making up the majority of participants.<sup>8</sup> Texas WIC enrollment and retention rates mirror the declines observed at the national level; participation has decreased from approximately 1.03 million in 2010 to 676 thousand in 2020.<sup>64</sup> Given the enrollment challenges faced by Texas, it is an ideal state to investigate solutions that may improve program participation.

To date, Texas WIC has aimed to engage clients via technology, by offering online nutrition education, mobile phone applications, texting services, and social media outreach.<sup>62,86,107,169</sup> While these technologies may help with some aspects of the flow of services for existing clients, they do not address the enrollment issues within the flow of services faced by prospective clients or the re-certification and program distribution issues within the flow of services faced by current clients.

A technology that is well-suited to improve the efficiency in the flow of Texas WIC services is a chatbot. A chatbot is a machine agent that engages in dynamic communication with users, independent of direct, back-end human involvement.<sup>116</sup> In

today's technology-driven environment, chatbots have become a cornerstone innovation among a variety of societal sectors, such as marketing, banking/finance, e-commerce, supply chains, travel, real-estate, and healthcare.<sup>117,118</sup> In general, implementation of chatbots has resulted in improvements in desired operations.<sup>117,120,121</sup> A primary advantage of chatbots is that they can be designed to benefit both the organization that implements the chatbot and the clients/customers that they serve.<sup>170</sup> For the organization, chatbots can provide an immediate point of contact for potential and current clients, collection of critical user data, automated responses to customers regarding frequently asked questions (FAQs), and an overall reduction of costs related to customer service and support.<sup>170</sup> For the customer, in addition to providing access to automated responses to FAQs, chatbots, based on the customer's input, can provide immediate personalized information around the clock.<sup>170</sup> In addition, chatbots are accessible to a wide audience, as they can be utilized from both computers and mobile devices.<sup>117</sup> This accessibility is especially important considering that the use of smartphones is ubiquitous among the majority of the Texas WIC demographic.<sup>138</sup>

While a chatbot has tremendous potential to improve enrollment and participation in WIC, chatbot development for large public health programs should involve a deliberate process guided by design frameworks and behavioral theory. The User Centered-Design (UCD) model is a design framework that incorporates input from intended users and stakeholders in each step of design, development, and testing.<sup>139</sup> UCD consists of iterative cycles that comprise concept generation and ideation, prototype design and system development, and evaluation.<sup>139</sup> Procedures commonly used for the concept generation and ideation phase of UCD include, but are not limited to, interviews,

focus groups, and surveys.<sup>139</sup> The exploration of user- and stakeholder-focused technology ideation, which allows for the development of a field-informed prototype, has led to the successful development of a variety of health-related technology innovations.<sup>107,108,139</sup>

While UCD provides guidance regarding what procedures to conduct for each phase of technology development, the PRECEDE-PROCEDE model (PPM) offers a framework by which results from UCD procedures may be integrated. Specifically, the PPM delivers an educational and ecologic structure which links interventions to multi-level behavioral determinants.<sup>141,171</sup> PPM allows for modification of a program or initiative by identifying personal- and organizational-level factors that may be utilized to optimize an intervention. Using PPM within the context of technology design for a public health program allows for the integration of multiple behavioral and technology acceptance theories which help identify predisposing, reinforcing, and enabling factors that influence technology acceptance and usage at the individual and organizational levels.<sup>141</sup>

Technology development is further strengthened by grounding design in behavior theory. Commonly used behavioral theories in the context of technology development are the Technology Acceptance Model (TAM) and Social Cognitive Theory (SCT).<sup>172</sup> The TAM explains users' intention to accept and adopt a novel technology by assessing their perception of a product's usefulness and ease of use.<sup>157</sup> The SCT posits that individuals' behaviors are a product of the interaction between personal characteristics and environmental influences.<sup>148</sup> Within TAM and SCT, self-efficacy is an important

construct that represents an individual's belief in their own capacity to learn and use technology.<sup>148</sup>

In collaboration with Texas WIC, housed within the Texas Department of State Health Services, the overarching goal of this study was to inform the development of a Texas WIC chatbot to improve the flow of WIC services and ultimately facilitate improved program participation. In this paper, we report on the initial steps of the UCD of a Texas WIC chatbot. Our aim was to explore users' perceptions, intention to use, and self-efficacy in engaging with a WIC chatbot, while using the PPM framework to examine the predisposing, reinforcing, and enabling factors that may encourage and deter chatbot use.

## Methods

### Overview

This study utilized a sequential exploratory mixed methods design. All research procedures were developed in collaboration with the state HHSC chatbot development team. The Texas State research team and HHSC chatbot development team created a group interview guide to facilitate discussion regarding the optimal development of a chatbot. Qualitative group interviews were performed to solicit WIC stakeholders' and staffs' interest in a chatbot as a means to facilitate participation and, if interested, gain insight on desired features, functionality, and rollout considerations. The results of the group interviews informed the development of an instrument for a subsequent online survey of WIC staff and TexasWIC.org website visitors.

## Qualitative exploration

### Recruitment

To explore the predisposing, reinforcing, and enabling factors that may encourage and deter chatbot use, group interviews were conducted with three levels of WIC staff, including WIC administrators of a multi-state/territorial consortium, Texas WIC local agency directors, and frontline staff in Texas WIC clinics and call-centers.

To recruit, WIC administrators and agency directors were personally invited to participate by a state level DSHS communication specialist. Texas WIC frontline clinic and call-center staff were invited to participate via a monthly Texas WIC newsletter. All participants expressed their interest by completing an online recruitment survey that collected contact information and availability for group interviews.

### Pre-Interview Survey

In an effort to comprehend group interview participants baseline understanding of chatbots and technology, participants were asked to complete a pre-interview online survey prior to group interviews. The survey first described the study and provided an informed consent process. After providing informed consent, participants answered questions related to basic demographics, including their role at WIC. Next, participants answered questions related to the TAM including perceived usefulness and perceived ease of use of chatbots.<sup>157</sup> Next, group interview stakeholders were asked to assess their digital literacy, as well as their opinions regarding the digital literacy of Texas WIC clients.<sup>157</sup> Finally, the survey concluded by gauging group interview stakeholders' technology experience. Results were categorized in tertiles based on assessment of participants' Likert score distribution (signifying low, medium, and high scores, with the

exception of Perceived Usefulness, which is presented as 2-quantiles due to homogeneity of responses) and analyzed descriptively.

#### Data Processing

A semi-structured group interview guide was used in every group interview to provoke conversation amongst participants. The interview guide was developed with a grounded theory approach, incorporating constructs from the TAM<sup>157</sup>, PPM<sup>171</sup>, and the SCT<sup>148</sup> to elicit conversation regarding individual and organizational factors that influence or interfere with chatbot acceptance and sustained usage. Key topics of the interview guide included positive and negative customer service experiences in WIC, technology as a facilitator or barrier to a positive customer service experiences, and how a chatbot may best serve WIC staff and clients. Table 6 outlines the 5 probes used to facilitate discussion. Trained moderators, along with a silent note taker, from the Texas State research team led the group interviews.

Topic:	Description:	Constructs
1. Positive and negative customer service experiences	The moderator asked stakeholders to describe the key aspects that compose special and negative customer service experiences.	<ul style="list-style-type: none"> <li>• Ice breaker</li> </ul>
2. Flow of WIC services	The moderator asked for stakeholders to share examples of how technology facilitates or impedes positive customer service experiences at each step of the flow of WIC services. Subsequently, the moderator asked stakeholders to consider how a chatbot may be integrated at each step in the flow of WIC services.	<ul style="list-style-type: none"> <li>• Self-efficacy</li> <li>• Individual predisposing, reinforcing, and enabling factors</li> <li>• Perceived usefulness</li> <li>• Perceived ease of use</li> </ul>
3. Hypothetical clients	The moderator presented the hypothetical scenarios: <ol style="list-style-type: none"> <li>1. A client who needs formula and plans to leave as soon as their child turns 1.</li> </ol>	<ul style="list-style-type: none"> <li>• Perceived usefulness</li> <li>• Desired chatbot features</li> </ul>

	<ol style="list-style-type: none"> <li>2. Someone who wants to apply to WIC but doesn't follow through with making an appointment.</li> <li>3. Someone who is angry after having a negative experience.</li> </ol> <p>After each scenario, the moderator asked the stakeholders how they felt a chatbot could improve the hypothetical situation.</p>	
4. Chatbot persona	<p>The moderator presented the stakeholders with three potential chatbot personas:</p> <ol style="list-style-type: none"> <li>1. Professional</li> <li>2. Casual Professional</li> <li>3. Casual</li> </ol> <p>Stakeholders were asked to share what they found appealing and unappealing about each persona.</p>	<ul style="list-style-type: none"> <li>• Perceived usefulness</li> <li>• Perceived ease of use</li> </ul>
5. Dream job	<p>The moderator asked stakeholders to share what they felt was most important when promoting the chatbot with WIC staff and participants. Additionally, stakeholders were asked to discuss what information WIC staff and clients would need in order to feel competent using the chatbot.</p>	<ul style="list-style-type: none"> <li>• Organizational predisposing, reinforcing, and enabling factors</li> <li>• Self-efficacy</li> </ul>

Interviews were audio and video recorded and transcribed verbatim. Qualitative data was manually analyzed by a 2-coder inductive, grounded theory approach.<sup>161</sup> Using the same code list, the coders independently coded each transcript, adding to the code list as new data emerged. After each transcript had been initially coded, the coders would meet to clarify code definitions, remove redundant codes, and highlight any coding disagreements. The coders would then re-code the respective transcript. This process was repeated across multiple passes until coding saturation was met and a satisfactory intercoder reliability was reached (98.4%).<sup>161</sup> Finally, a third member of the research team was consulted to reconcile any remaining code disagreements.

## Quantitative surveys

### Overview

Both surveys were iteratively developed by the collaborative efforts of the Texas State research team and the Texas WIC team. The surveys aimed to test the

generalizability of the group interview findings; thus, they utilized theoretical constructs and similar questions from the group interview guide. The surveys included measures of perceived usefulness and perceived ease of use from TAM, chatbot experience, and persona rating. The wording for each surveys' measures slightly differed in order to be directed towards each set of participants.

#### Recruitment

The Texas State research team worked with Texas WIC to recruit WIC staff for the first survey. Texas State drafted an email that informed Texas WIC staff members of when the survey will be administered and the purpose of the survey. A state-level communication specialist sent this email to Texas WIC directors and encouraged staff to complete the survey. Additionally, the survey was linked in Texas WIC's weekly employee newsletter.

Texas WIC posted a pop-up statement on their website, TxWIC.org, to catch the attention of website visitors. The pop-up statement described that WIC was developing a chatbot and that a linked survey was being used to collect input on what website visitors felt needed to be included in the chatbot. Once clients clicked the link, they were directed to the survey.

#### Analysis

Responses to both surveys were analyzed descriptively. Ordinal Likert scales were utilized for data collection. Frequency distributions were generated for participants responses to demographics, perceived usefulness items, perceived ease of use items, chatbot experience items, and chatbot persona items. All statistical analysis was conducted with Statistical Packages for Social Sciences (SPSS Version 25, IBM Corp).

## Results

### Pre-interview Survey Results

#### Demographics

Group interview stakeholder characteristics are presented in Table 2. The majority of participants were female (88%), between the ages of 31-50 (66%), White (47%) or Latinx (38%), and had received a bachelor's degree (56%). Additionally, most group interview stakeholders (85%) indicated that they had worked for WIC from 3-20+ years.

	Overall	
	n	(%)
Female	28	(88)
Age (years)		
< 30	5	(16)
31-40	9	(28)
41-50	12	(38)
> 51	6	(19)
Race		
Hispanic, Latinx	12	(38)
White, non-Hispanic	15	(47)
Black, African American	2	(6)
Native American	2	(6)
Education		
High School/GED	3	(9)
Some college	6	(19)
Bachelor's degree	18	(56)
Master's degree	5	(16)
Years with WIC		
≤ 2	5	(16)
3 - 5	7	(22)
6 - 20	14	(44)
> 20	6	(19)
Role		
Local-administrative	6	(19)

Local-clerk	2	(6)
Local-management	9	(28)
Local-nutritionist	2	(6)
State-administrative	3	(9)
State-management	3	(9)
Other	7	(22)

#### Perceived usefulness and ease of use of chatbots

Most stakeholders agreed that the internet was helpful in improving communication. However, a larger proportion of the frontline staff (42% of frontline staff compared to 8% of directors and 14% of MOSAIC partners) believed that online communication was more complicated than using traditional methods (e.g. phone). More participants reported negative beliefs regarding the perceived ease of internet communication than any other construct (i.e. usefulness, literacy, or experience). This was most evident in frontline staff (58% in the “low category) and state-level managers (14% in the “high” category).

#### Digital literacy and perception of WIC participants’ digital literacy

Regarding the digital literacy of interview participants, frontline staff were evenly divided between the “low” and “high” groups, with 42% in each. Directors reported higher digital literacy than MOSAIC partners, with 54% in the “high” category compared to 14% of state-level managers. Regarding WIC clients, frontline staff were more likely to perceive them to be less digitally literate, with 67% in the “low” category compared to 38% of directors and 29% of MOSAIC representatives.

Technology experience

The majority of directors (69%) and MOSAIC participants (71%) reported a high level of experience with chatbots and related technologies, compared to only 17% of frontline staff.

Table 8: Pre-Interview Survey Results								
	Overall		MOSAIC		Director		Frontline	
	n	(%)	n	(%)	n	(%)	n	(%)
<b>Perceived Usefulness</b>								
Low	7	(22)	1	(14)	1	(8)	5	(42)
High	2	(78)	6	(86)	1	(92)	7	(58)
	5				2			
<b>Perceived Ease of Use</b>								
Low	1	(38)	3	(43)	2	(15)	7	(58)
	2							
Medium	1	(31)	3	(43)	5	(38)	2	(17)
	0							
High	1	(31)	1	(14)	6	(46)	3	(25)
	0							
<b>Digital Literacy</b>								
Low	7	(22)	1	(14)	1	(8)	5	(42)
Medium	1	(34)	4	(57)	5	(38)	2	(17)
	1							
High	1	(41)	1	(14)	7	(54)	5	(42)
	3							
<b>Perception of WIC Clients' Digital Literacy</b>								
Low	1	(47)	2	(29)	5	(38)	8	(67)
	5							
Medium	5	(16)	0	(0)	3	(23)	2	(17)
High	1	(38)	5	(71)	5	(38)	2	(17)
	2							
<b>Technology Experience</b>								
Low	6	(19)	0	(0)	0	(0)	6	(50)
Medium	9	(28)	1	(14)	4	(31)	4	(33)

High	1 6	(50)	5	(71)	9	(69)	2	(17)
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## Exploratory Group Interviews

### Overview

Results of the exploratory group interviews address stakeholders' perceptions of individual factors that influence applicant and participant acceptance and usage of a chatbot, organizational factors that must be considered prior to chatbot development, desired features of a chatbot, and an ideal chatbot persona.

### Staff perceptions of individual factors that influence participant chatbot use

Stakeholders frequently discussed their perceptions regarding individual factors that could influence chatbot use and adoption amongst the Texas WIC demographic.

Table 9 demonstrates key themes from stakeholder group interviews, associated PPM factors, and interview quotes that illustrate each theme. Themes are organized under the constructs of perceived usefulness, perceived ease of use, and self-efficacy.

### *Perceived Usefulness*

Perceived usefulness themes included preparation, time, and convenience.

Stakeholders perceived that a chatbot that enhanced preparation for clinic appointments would be particularly useful for WIC applicants, participants, and staff. In particular, stakeholders felt that a chatbot that facilitated completion of required paperwork and prepared applicants and/or participants for what to expect during clinic visits would enable both the staff and applicants/participants to save time. Additionally, stakeholders felt that time would be saved as clinic visits would likely be shorter when participants were prepared beforehand via the chatbot interaction. One stakeholder noted that a chatbot "Would give me personally a sense of satisfaction that we're providing our staff with useful tools, not only that are useful for our clients' time, but our staff's time and

we're better able to focus on other knee-to-knee experiences with the clients.” (GI 5).

With respect to convenience, stakeholders felt that a chatbot available 24/7, accessible via smartphones, would allow WIC applicants access to FAQ questions immediately in lieu of requiring a call to a WIC clinic. Per one stakeholder comment, “It makes things more convenient for [participants]...by it being available 24/7 and possibly from their smart phone.” (GI 7)

#### *Perceived Ease of Use*

Perceived ease of use themes included chatbot functionality and complexity. The theme of chatbot functionality was considered critical by stakeholders for participant acceptance of a chatbot. Specifically, stakeholders felt that the chatbot must properly function within its scope of advertised capabilities and have a layout that is simple. Stakeholders expressed that the chatbot's scope of capabilities must be clear to participants and that the chatbot must operate correctly within the defined scope. As stated by one stakeholder “If you have the chatbot, you define the scope really well and it absolutely delivers what it says its going to deliver.” (GI 1). Furthermore, stakeholders felt that if participants could not successfully execute a chatbot's features, they would be unlikely to continue using it. Indeed, several times it was stated that most participants might only attempt to learn the chatbot once, and if it was too difficult to use in that attempt, participants might avoid future use. This was reflected when a participant stated, “If the information was vague, unclear, or incorrect, I think that would be the biggest downfall for using something like [a chatbot] because if [the chatbot] got the information wrong one time or two times, they are never going to want to use it again.” (GI 6) With respect to complexity, stakeholders cautioned that the chatbot should not be too complex to use, and that interacting with the chatbot should require few steps. One stakeholder

stated that “If it’s very user-friendly to where they can just click here and get an appointment, it might be easy for them to use.” (GI 7). Indeed, stakeholders expressed that if participants perceived the chatbot as being difficult to use, they would be unlikely to adopt it. One participant highlighted “We have to consider [simplicity] before jumping into something really technical right now.” (GI 3) Stakeholders expressed that a chatbot with too many steps or “clicks” would likely be difficult for participants to use.

#### *Self-Efficacy*

Self-efficacy themes included technology familiarity and performance expectancy. With respect to technology familiarity, stakeholders believed that some applicants and participants would be more likely to adopt a chatbot than others, based on personal familiarity with chatbots and similar technologies. Specifically, such familiarity could predicate confidence. One stakeholder noted “A lot of people who are going to be using this are texters and social media people, so they are used to short and choppy and 120 characters or less” (GI 8). Stakeholders also suggested that age might predict technology familiarity, because, as compared to older individuals, younger WIC applicants and participants are generally more familiar with technologies like chatbots. As one stakeholder stated, “I think that now with the technology and with the young participants that we’re getting, I think it’s a good idea to get a chatbot... but we still have older women that are seeking information or setting up appointments... so I think... it might be a little bit more negative experience for them, only because they might not be used to that technology.” (GI 10).

With respect to performance expectancy, stakeholders expressed that previous performance of other chatbots and similar technologies might shape applicants’ and

participants' expectancy for how WIC's chatbot would perform. Specifically, stakeholders felt that if applicants and participants had had a negative experience with a chatbot, they may then expect that the WIC chatbot would be similarly disappointing. Thus, participants who have had a negative experience with a technology such as a chatbot may feel less confident in the capacity of a chatbot to function properly. One stakeholder described their hesitancy in trusting a chatbot, based on previous experience by stating "Because it's not a real person... I'm going to have to go through a bunch of different things and questions before [a chatbot] will really be able to answer my question... it's going to send you on this wild goose chase... you already know those negative experiences, so you attach it to this [chatbot] when you know it from the get-go." (GI 5)

Table 9: Group Interview Themes by Theoretical Construct

Theoretical Construct	Theme	PPM factor	Description
Perceived Usefulness	Preparation	<ul style="list-style-type: none"> <li>Enabling factor</li> </ul>	A chatbot can enable a client to be prepared for an appointment.
	Time	<ul style="list-style-type: none"> <li>Reinforcing factor</li> </ul>	Chatbot usage will be reinforced if it saves the time of participants and staff.
	Convenience	<ul style="list-style-type: none"> <li>Enabling factor</li> </ul>	Answering FAQs, being accessible on smartphones, and 24/7 availability are conveniences that reinforce chatbot use and enable participants to conveniently receive information from WIC.

Perceived Ease of Use		
Functionality	<ul style="list-style-type: none"> <li>• Enabling factor</li> </ul>	If the chatbot functionally operates within its scope of advertised features participants will know that it works. Thus, optimal functionality reinforces and enables usage.
Complexity	<ul style="list-style-type: none"> <li>• Enabling factor</li> </ul>	If the chatbot is simple to use it will enable participants to easily utilize each feature.
Self-Efficacy		
Technology familiarity	<ul style="list-style-type: none"> <li>• Predisposing factor</li> </ul>	If participants are familiar with chatbots or similar technologies, they will be predisposed to using the WIC chatbot.
Performance expectancy	<ul style="list-style-type: none"> <li>• Predisposing factor</li> </ul>	The past performance of chatbots and similar technologies will predispose the participants' expectancy of how the WIC chatbot will perform.

#### Organizational Factors of Chatbot Development

During the interviews, stakeholders also discussed critical predisposing, reinforcing, and enabling organizational factors that must be considered prior chatbot development. Common themes that were discussed include chatbot usage insight, chatbot staffing management, chatbot security, chatbot functionality assurance, and staff competence to utilize the chatbot. Table 10 describes each theme and highlights whether the theme predisposes, reinforces, or enables the chatbot, organizationally.

Table 10: Texas WIC Organizational Needs for Chatbot Implementation and Utilization			
Theme	PPM Factor	Description	Quotes
Chatbot Usage Insight	Reinforcing factor	Stakeholders expressed a desire to be informed on how often chatbot is being used and if it is effectively answering participants' question. They felt that this insight could be used to reinforce chatbot promotion internally and usage.	"I think it would be important too...to know what people are going to for the chatbot, like what are they asking the chatbot? What is the information they're wanting to know so we know because that can help us better do our jobs as well." (GI 5)
Staffing Management	Enabling factor	Stakeholders expressed the need to know if there would be chatbot training for their staff, if additional staffing would be needed, how the chatbot would be maintained, and roles of the local and state agencies. In general, interview participants felt that their sites are too short staffed to dedicate an employee to maintaining the chatbot. Additionally, the stress of chatbot-related job loss was discussed.	"I would want to know who is responsible for [the chatbot]...I mean, is it going to be one of our staff that's going to be responsible for answering participants or is it going to be an outside source?" (GI 7)
Functionality Assurance	Reinforcing factor	Stakeholders expressed that staff need to be confident that the chatbot's supporting technology and the chatbot itself will be completely functional.	"So, another piece of that concern, kind of adding onto that would be am I able to, in promoting this, am I able to successfully demonstrate it? Can I go in and have a conversation, can I project onto one of our Mondo boards with this chatbot and have it create an appointment. Have it give me guidance in nutrition education and let the staff see what happens on the other end, let them see how it connects to our system. Being able to give a good demonstration with all of that knowledge that I have is vital." (GI 3)

Cyber security	Predisposing factor	Stakeholders need confidence that the data shared with the chatbot is secure. Additionally, maintaining compliance with HIPPA protocols was discussed.	“I also felt kind of uncomfortable... what if this gets hacked, what if my information gets taken? I was worried about providing that information through a chatbot.” (GI 5)
Staff competence	Enabling factor	Stakeholders felt that WIC staff will need to be competent in using each chatbot feature before promoting it to participants.	“I think there would just need to be some good training for our staff too, just so we know that, so they fully understand how it works and if it involves any other work on their part.” (GI 7)

#### Desired chatbot features

Stakeholders discussed features of the chatbot that they believed would be helpful for participants and the organization. Chatbot features that were frequently described as desirable include pre-qualification screening, a shopping guide for WIC approved foods, a WIC clinic and grocery store locator, a prompt for users to make an appointment, an appointment scheduler, appointment and nutrition education reminders, the capability to direct participants to information on the TexasWIC.org website, a section that allows participants to file a complaint, and the capability of communicating in multiple languages.

#### Ideal chatbot persona

Stakeholders responded favorably to a persona that was friendly instead of being too rigid but cautioned that the chatbot should avoid excessive or “fake” friendliness. One participant stated, “The more fake friendly or overtly fake friendly, the worse it is.” (GI 1). Stakeholders also felt that a chatbot should be inclusive when addressing the user and not assume characteristics about the user. For example, stakeholders felt that the chatbot should avoid making assumptions about the user’s pregnancy status or gender. Finally, in

regard to the amount of dialogue a chatbot should use, stakeholders believed that brevity is key.

## Staff and TxWIC.org Visitor Surveys

### Demographics

Participant demographics and education level for both the staff and website survey are presented in table 11. The majority participants from both samples were female and of the Hispanic, LatinX race/ethnicity. The staff and website visitor demographics differed by their average age and education level. Staff survey participants were significantly older and had received higher levels of education in comparison to website survey participants.

Table 11: Staff and Website Visitor Survey Participant Characteristics			
	Website survey (n=397)	Staff survey (n=749)	p value
	n (%)	n (%)	
Age (mean (SD))	29.4 (7.7)	43.6 (11.5)	<0.001 <sup>a</sup>
Female	392 (98.7)	728 (97.2)	0.1 <sup>b</sup>
Race/ethnicity			<0.001 <sup>b</sup>
Black	66 (16.6)	72 (9.6)	
White, non-Hispanic	109 (27.5)	182 (24.3)	
Hispanic, LatinX	188 (47.4)	451 (60.2)	
Other	34 (8.6)	44 (5.9)	
Education			<0.001 <sup>b</sup>
Highschool/GED	192 (48.4)	142 (19.0)	
Some college	113 (28.5)	266 (35.5)	
Associate degree	37 (9.3)	61 (8.1)	
Bachelor's degree	43 (10.8)	231 (30.8)	
Graduate degree	12 (3.0)	49 (6.5)	

<sup>a</sup> two-sample t-test, <sup>b</sup> chi-square test

### Perceived Usefulness

Almost all participants from both the staff and website visitor surveys perceived that chatbots are helpful in improving communication. Specifically, 96.9% of staff and 96.1% website visitors either agreed or strongly agreed that chatbots allow for

communication from convenient locations. Furthermore, 97.9% of staff and 95.8% of website visitors agreed or strongly agreed that chatbots enable communication at convenient times. In addition, chatbots were perceived as being faster than other forms of communication as agreed or strongly agreed upon by 97.3% and 97.1% of surveyed staff and website visitors, respectively.

#### Perceived Ease of Use

While most participants felt that chatbots are useful, fewer were convinced that they are easy to use. Specifically, 75.7% of staff and 57% of website visitor participants agreed or strongly agreed that chatbots are difficult to use without online support. Furthermore, 68.5% of staff and 48.8% of website visitor participants agreed or strongly agreed that chatbots are difficult to use without human support. However, most staff (60.6%) and website visitors (76.8%) disagreed that chatbots are more complicated than other forms of communication such as email, social media, and phone calls.

#### Chatbot Experience

Most of the respondents were aware of chatbots, but fewer regularly used them. Staff and website visitors reported that they were more familiar with chatbots in the context of seeking information online (72.7% and 67%) and customer service functions (75.3% and 74.1%) than for purchasing products (64.2% and 57.1%) or scheduling appointments (67.6% and 62.2%).

#### Persona

Generally, responses to the personas did not vary based on respondent type. The most positive response was received by the casual persona, which was characterized by a warm professional tone. However, staff and website visitors responded almost equally

positively to the formal persona, which was characterized by a neutral tone. The persona with the extremely casual personality was comparatively not well-received.

#### Combined Results Figure

Figure 9 presents a novel demonstration of how this study's results are organized based on UCD and PPM. Considering that this study was guided by phase 1 of UCD, the figure is set in phase 1 of the UCD process. Within phase 1 of UCD, the PPM is utilized to organize and demonstrate how discussed themes and survey findings either predispose, reinforce, or enable chatbot usage for Texas WIC applicants and participants.

Considering that the resultant themes and survey findings are based on the theoretical constructs of TAM and SCT, this combined figure also integrates technology acceptance and behavioral theory. Key factors that predispose initial chatbot use include technology familiarity, performance expectancy, and cyber security. Factors that reinforce chatbot use include time saving, usage insight, and functionality assurance. Finally, factors that enable the chatbot use include preparation, convenience, functionality, complexity, staffing management, and staff confidence in the chatbot.

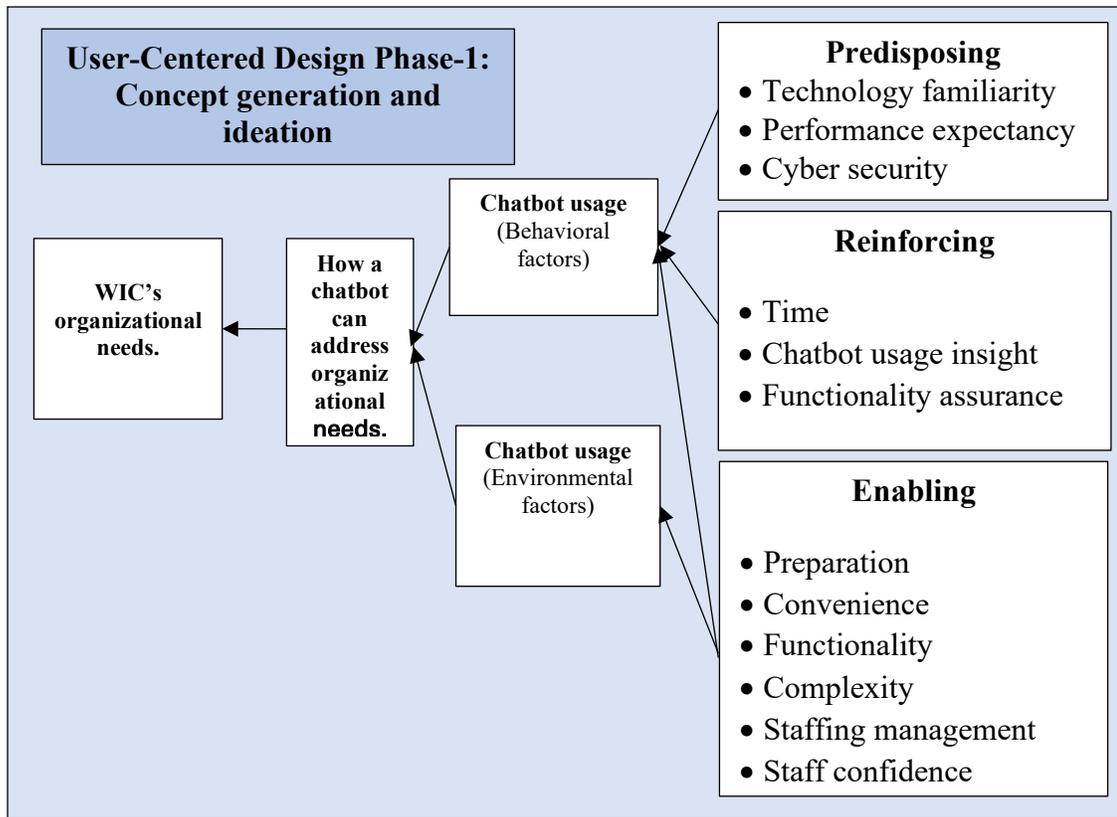


Figure 9: Combined Results Model

## Discussion

To our knowledge, this is the first study to examine how a chatbot may facilitate enrollment and participation in a large public health program. While previous work has been done to examine technology preferences and use amongst the WIC staff and demographic, no investigation have demonstrated how to leverage technology in a manner that improves impediments to enrollment and recertification. As such, these findings provide unique contributions to an emerging field of study.

It is important to acknowledge that the development of a technology intended to be integrated within a public health organization cannot just meet the needs of the end users but also must meet the needs of the organization and the people working within it. Therefore, in this design process, the locus of focus shifted to incorporate all of these

important ‘users’ of the chatbot. First, we collaborated with the organization, i.e. the key personnel driving chatbot development at Texas WIC headquarters. This involved joint development of the project itself and weekly check-ins throughout the project. For all research steps, the instruments and processes were developed in close collaboration with these key personnel. The locus of focus then expanded to include more stakeholders at the state, local agency director, and clinic staff levels. Subsequently, after these key ‘users’ had been examined, perception of the individuals from the WIC demographic were studied.

The utilization of both the UCD model and PPM provided a novel structure by which the results were integrated. Phase 1 of the UCD model provided insight regarding what procedures should be conducted to assess the chatbot-related needs of WIC staff, potential participants, and current participants. Per the guidance of UCD, this study utilized group interviews and two surveys. The PPM presented a structure that allows for the results of the group interviews and surveys to be organized as individual or organizational factors that each predispose, reinforce, or enable chatbot use. Furthermore, as described by Kukafka et al.<sup>141</sup>, the deployment of the PPM for IT development in a multi-level organization allows for the harmonious integration of behavioral and technology acceptance theories. Thus, utilization PPM in this study provided structured integration of the TAM and SCT, as can be seen in the combined figure.

#### Principle Findings

Per the TAM, perceiving a technology to be useful is an important antecedent to technology adoption.<sup>157</sup> Thus, it is encouraging that participants across all three procedures perceived that a chatbot could be useful. Particularly, stakeholders, staff and

website visitors were enthusiastic about the potential for a chatbot to increase the speed and convenience at which communication between Texas WIC and the organization's participants and applicants occurs. Ultimately, the outcome that both staff and WIC participants and applicants desire is optimal efficiency and productivity during an appointment. As demonstrated in the literature, a chatbot is a technology that can facilitate the delivery productivity.<sup>173,174</sup>

Belief that a technology is easy to use may predict successful adoption.<sup>157</sup>

Therefore, results regarding staffs' and website visitors' perception of a chatbot's ease of use suggest that both staff and clients may need education on how simple chatbots are to use. That being said, while a large portion of both surveyed staff and website visitors perceived that chatbots may be difficult to use, it should be noted that staff demonstrated this belief at a much higher rate than website visitors. Thus, given that perceived ease of use often increases with familiarity of a technology<sup>172</sup>, it may be advisable to introduce the WIC chatbot to staff well before it is rolled out on the Texas WIC's website. WIC staff can then assure participants and applicants that the chatbot is easy to use.

Previous literature suggest that interactive systems should be developed to provide enjoyable socialization for the user.<sup>175</sup> Indeed, results of the group interviews and surveys indicate that the persona of the Texas WIC chatbot is important. Specifically, these findings suggest that developers should err on the side of caution when developing the chatbot's persona. Although participants appreciated warm, casual tones, the professional personality was almost equally well-received. In contrast, respondents had strong negative reactions to the extremely casual persona. This is in line with findings

from Brandtzaeg and Folstad who noted that entertainment and socialization were secondary drivers of chatbot usage; however, productivity was most important.<sup>174</sup>

#### Strengths and limitations

This study has a number of strengths including the use of a sequential exploratory mixed-methods design, the integration of an established technology development framework, use of behavioral and technology acceptance theories, continuous collaboration with Texas WIC, and the examination of staff, participant, and potential participants perceptions regarding the chatbot.

A key limitation of this study is current and potential WIC participants were not interviewed. Therefore, all qualitative data regarding participants' perceptions of usefulness, ease of use, and self-efficacy are from the perspective of WIC stakeholder. Considering that the surveys were developed based on the feedback from the group interviews, key information may have been omitted from the quantitative analysis.

#### Conclusion

This study provides insight regarding how a chatbot may be best adopted by WIC staff, applicants, and current participants. Additionally, this study reports perceptions regarding how a chatbot may mitigate impediments to the flow of WIC services. In order for the Texas WIC chatbot to be successful and foster usage, it must be easy to use and deliver on advertised features. Additionally, addressing key organizational factors will be critical to the chatbot's success. By utilizing the input from this study's participants, the ideation and development of a UCD-informed chatbot may commence. The next phase of UCD will focus on developing and evaluating a prototype chatbot. Findings from this

study provide insight on how future technologies can be optimally developed for and integrated into large public health programs.

**APPENDIX SECTION**

A. GROUP INTERVIEW GUIDE.....100  
B. GROUP INTERVIEW PRESENTATION.....104

## APPENDIX A: GROUP INTERVIEW GUIDE

### **Purpose**

Obtain staff buy-in and get feedback on preferences for proposed features and marketing to staff and participants.

### **Specific Objectives**

Describe how staff want clients to feel when they interact with WIC.

Identify current actions which either positively or negatively affect: (1) the client's feelings about the WIC program and /or (2) the clients having a specific experience described by the participants.

List and prioritize the ChatBot features staff see as being helpful to improve WIC services for clients. (examples = making appointments, answering eligibility questions)

Determine the type of personality the ChatBot should have to help a client experience the positive feelings described in objective one.

Describe which clients may be more likely to accept the use of the ChatBot.

Describe potential barriers and solutions to staff recommending the ChatBot to clients.

### **Session Introduction**

#### **Moderator 1 SAYS:**

Hi, my name is XXX. I am your moderator for today. Can everyone see? Hear?

Let's get started with introductions.

My colleagues, XX, and XX are assisting, but are not visible.

#### **Moderator 1 CALLS ROLL**

#### **Moderator 1 SAYS:**

A few days ago, you were sent an invitation to participate in this focus group, including information about this chatbot project along with a link to complete a survey and provide your consent to participate. Thank you! As we described, we will record this focus group so that we do not miss anything. All responses will be kept confidential except to researchers. Any reports or publications will not include names. Thank you for taking time to talk with us today. Your input is extremely valuable and important to our process. Remember that all perspectives are needed, and we want to hear from you.

At time, we would like to encourage you to jot down any ideas/thoughts and then email them to us at the end.

Are there any questions before we start?

Now I am going to share the screen.

#### **<Technical Assistant SHARES PRESENTATION SCREEN WITH FIRST SLIDE>**

Currently, a brief overview is posted on the screen.

#### **< Technical Assistant BRINGS UP THE CHATBOT SLIDE>**

This next screen reminds us about Chatbots.

Let's get started.

### **SPECIAL CUSTOMER SERVICE**

**< Technical Assistant SHOWS ACTIVITY SLIDE >**

**Moderator 1 SAYS:**

First, think about an experience you have had as an individual that has felt special. Maybe it was a special dinner at a restaurant that went perfectly, or a good experience you had at a doctor's office or when you walked into a hair appointment. How did that experience make you feel?

**< Technical Assistant TYPES PARTICIPANTS' WORDS ONTO SCREEN >**

Now, think of an experience you have had as a client where you left feeling disappointed. I know we could all probably talk about this for hours. Why don't we all think for a moment and jot down a couple of experiences that come to mind, and we can share how those disappointing experiences made us feel.

**< Technical Assistant TYPES PARTICIPANTS' WORDS ONTO SCREEN >**

### **SERIES OF ACTIVITIES INVOLVING WIC FLOW CHART**

**< Technical Assistant SHOWS WIC FLOW CHART SLIDE >**

**Moderator 1 SAYS:**

Now let's look at this flow chart, which visualizes a typical client's interactions with WIC.

### **CURRENT EXAMPLES OF POSITIVE CUSTOMER SERVICE**

Today, what are you or your staff doing to help clients have a special experience?

### **USE OF TECHNOLOGY IN THE CLINIC THAT IS POSITIVE**

What type of technology are you using to help clients have a special experience?

### **CURRENT EXAMPLES OF NEGATIVE CUSTOMER SERVICE**

Today, what are you or your staff doing that may lead to client to have a disappointing experience?

### **USE OF TECHNOLOGY IN THE CLINIC THAT IS NEGATIVE**

Are there any technologies you are using that may be contributing to the client's negative experience?

What will happen if clients don't feel that their experience with WIC is special?

How will it affect you if clients don't have these positive feelings?

### **WHERE IN THE FLOW OF SERVICES CAN A CHATBOT BE HELPFUL IN IMPROVING THE CLIENT EXPERIENCE**

Let's look at the flow chart again. Now, we'll be thinking about how a WIC chatbot might affect the client experience. Where could a ChatBot be used to make the WIC experience feel more like the special experiences you described?

## WHERE IN THE FLOW OF SERVICES WOULD A CHATBOT NOT BE HELPFUL IN IMPROVING THE CLIENT EXPERIENCE

How could a Chatbot make the WIC experience be negative? In other words, what should a potential WIC chatbot avoid?

## HOW A CHATBOT WOULD INTERACT WITH HYPOTHETICAL WIC CLIENTS TO PROVIDE A POSITIVE EXPERIENCE

<Technical assistant SHOWS HYPOTHETICAL CLIENT SLIDE>

**Moderator 1 SAYS:**

On the screen, you can see three different types of WIC clients.

Someone who needs formula but is planning to leave as soon as the child turns one

Someone who wants to apply to WIC, but doesn't follow through with making an appointment

Someone angry after having a negative experience

For each of these people what does the chatbot need to do to help that person have a special experience?

< Technical Assistant TYPES PARTICIPANTS' WORDS ONTO SCREEN>

What are some common things the chatbot needs to do across all these types of clients to give them a special experience?

< Technical Assistant TYPES PARTICIPANTS' WORDS ONTO SCREEN>

## IDENTIFYING AN APPROPRIATE CHATBOT PERSONA

**Moderator 1 SAYS:**

We're going to switch gears here a little bit and talk about what kind of personality a potential WIC chatbot should have.

Now, one-by-one please describe:

What is appealing/not appealing

Is there anything special about any of them?

Is there anything that annoys you?

Overall, which chatbot would you keep, and which would you discard?

## WHAT IS NEEDED FOR WIC TO IMPLEMENT AND PROMOTE A CHATBOT

**Moderator 1 SAYS:**

Suppose you were asked to promote the use of the chatbot in your WIC clinic (e.g. to new clients visiting for the first time).

Before you took on this task, what questions would you ask?

What would be your greatest concerns about getting your colleagues to recommend the chatbot to WIC clients?

In the end, do you feel you would be successful in convincing your colleagues to recommend chatbot to clients? What makes you feel that way?

**Wrap Up [5 minutes]**

**Moderator 1 SAYS:**

Based on our conversation today, in what ways might a WIC chatbot help your job satisfaction?

In conclusion of our discussion, is there anything that you would like to add about ChatBots and the idea of using a WIC ChatBot?

Remind them to send any additional thoughts to the email address.

Thank participants

APPENDIX B: GROUP INTERVIEW PRESENTATION

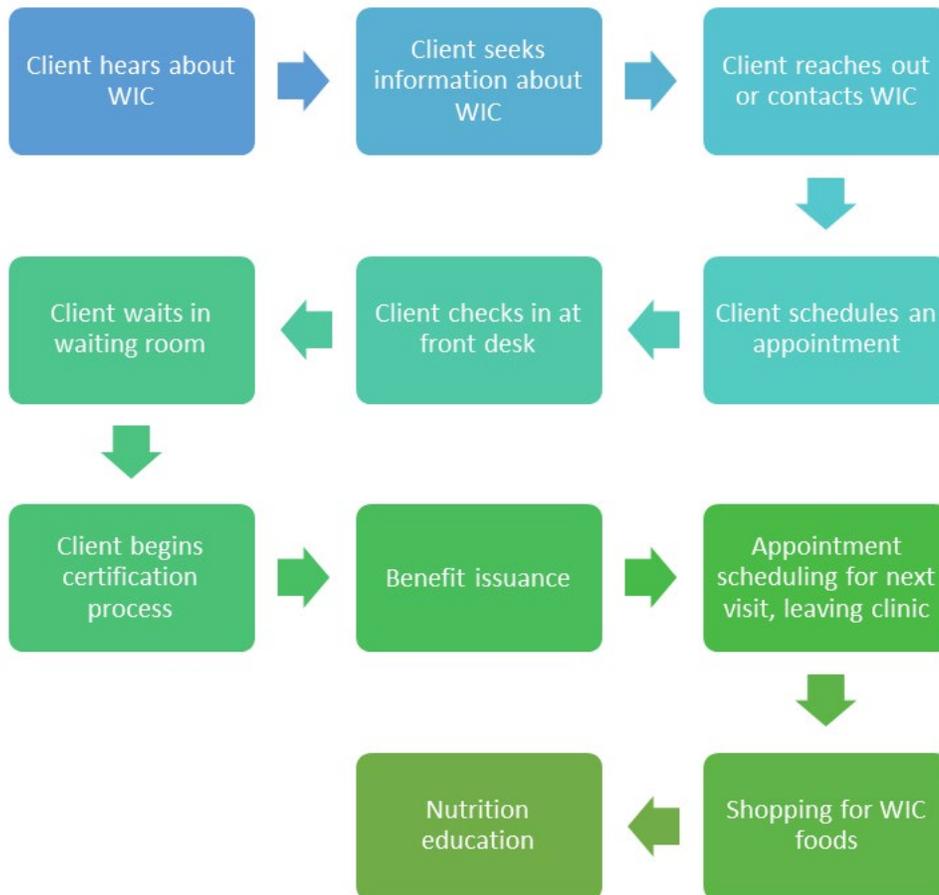
WIC Chatbot

Focus Group  
February 13, 2019

Chatbot  
Review

- Automated
- Conversational
- Artificially intelligent
- Used on multiple platforms
- Fun and functional

## Activity: List of Words



Someone who  
needs formula  
but is planning  
to leave as  
soon as the  
child turns  
one

---

Someone who  
wants to apply  
to WIC, but  
doesn't follow  
through with  
making an  
appointment

---

Someone  
angry after  
having a  
negative  
experience



Hi there! I'm Maya, the Texas WIC chatbot. I'm here to answer your questions about WIC, the Texas nutrition program for pregnant and breastfeeding women and families with children younger than 5.



How can I help you today?

Do I qualify for WIC?



Let's see if you qualify for WIC. Are you pregnant, or do you have children under age 5 who live with you?

Yes



Great! That's the first step. What is your first and last name?

Alicia Brown



Thanks, Alicia. Nice to meet you. What is your date of birth? You can type it like mm/dd/yyyy.

October 19



Got it. And what year were you born?





Hi! I'm Jenna, the Texas WIC chatbot. I'm here to answer your questions about the WIC program.



How can I help you today?

Do I qualify for WIC?



Okay, let's see if you qualify for WIC. WIC is a nutrition program for pregnant or breastfeeding women and families with children younger than 5.

Do you have children under the age of 5 living with you?

Yes



Okay, good. Now I'm going to ask a few questions about you. What is your first and last name?

Alicia Brown



Thanks, Alicia. What is your date of birth? You can type it like mm/dd/yyyy.

October 19



And what year were you born?





Welcome friend! You're looking positively radiant today. My name is Ana. I am a part of WIC, the coolest nutrition program for pregnant and breastfeeding women and families with kiddos younger than 5.



I kind of know everything when it comes to WIC so ask away! I can hook you up with information such eligibility requirements or general breastfeeding knowledge. So, what can I do for ya? 🍌

Do I qualify for WIC?



Let's see if you qualify! 🍌 Are you a soon-to-be mommy? Or do you have a kiddo that's under 5 years old?

Yes



Super-duper! First step accomplished! Now, what is your first and last name?

Alicia Brown



What a beautiful name! To confirm, is this your full name?  
First name: Alicia  
Last name: Brown

Yes



Nice to meet you, Alicia!



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