

Spring 2014

Implementation of a mHealth program within a homeless population of young mothers

Maureen Byrnes

Follow this and additional works at: <https://scholarship.shu.edu/final-projects>



Part of the [Maternal, Child Health and Neonatal Nursing Commons](#)

Recommended Citation

Byrnes, Maureen, "Implementation of a mHealth program within a homeless population of young mothers" (2014). *Seton Hall University DNP Final Projects*. 1.

<https://scholarship.shu.edu/final-projects/1>

IMPLEMENTATION OF A mHEALTH PROGRAM WITHIN A HOMELESS
POPULATION OF YOUNG MOTHERS

BY

Maureen Byrnes, RN, CNM, MSN

DNP Scholarly Project Committee

Dr. Mary Ellen Roberts, Chair

Dr. Judith Lothian

Ms. Meghan Leigh, MS, LSW

Approved by the DNP Scholarly Project Committee:

Dr. Mary Ellen Roberts, Chair

Date: _____

Dr. Judith Lothian

Date: _____

Meghan Leigh, MS, LSW, Preceptor

Date: _____

Submitted in partial fulfillment of the Requirements for the degree of
Doctor of Nursing Practice
Seton Hall University
2014

Copyright 2014 by Maureen Byrnes

TABLE OF CONTENTS

	Page
LIST OF TABLES	4
LIST OF FIGURES	5
ABSTRACT	6
SECTIONS	
I BACKGROUND	7
II REVIEW OF THE LITERATURE	16
III PROJECT METHODOLOGY	23
IV PROJECT OUTCOMES	39
V SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	45
VI REFERENCES	53
VII APPENDICES	
A. Infant Mortality Rates by State	55
B. mHealth Conceptual Model of Behavior Change for the Text4baby Project	56
C. Text4baby Poster	57
D. Text4 baby Bilingual Enrollment Referral Card	58
E. Text4baby Enrollment Tear-Off Pads	59
F. Text4baby Tuesday Weekly e-Newsletter	60
G. TEAM Text4baby Certificate	61
H. Text4baby Stories From the Community	62
I. New Jersey's Regional Early Intervention Developmental Brochure	63
J. Florida WIC Program: Food for Baby's 1 st Year Brochure	64
K. The Covenant House Mission Statement	65

LIST OF TABLES

Table	Page
1. Clinical Site Visit Data	33-34

LIST OF FIGURES

Figure	Page
1. Project Enrollment Data-Raphael's Life House	40
2. TEAM Text4baby: Shares with health programs and providers	41
3. Perception of texts received by homeless young mothers	43

ABSTRACT

Purpose: Despite major medical advancements and education, more than 500,000 babies are born prematurely and an estimated 28,000 infants die before their first birthday annually (www.marchofdimes.com/peristats). New Jersey's infant mortality rate appears exemplary when compared to the United States overall infant mortality rate. Yet, New Jersey's infant mortality rate, preterm birth rate and low birth rate by mother's race reveal a far greater risk for infants born to a mother who is African American (www.nj.gov/health/epht/outcome.shtml). The need for innovative approaches to improving New Jersey's maternal-infant health is paramount. Mobile phones may provide an appropriate means of addressing maternal-infant health challenges for women from underserved communities. The overall aim of this implementation project is to enroll young homeless pregnant and parenting mothers, accessing services within two urban settings of Covenant House-New Jersey, in the Text4baby mHealth program.

Methods: After consultation, young homeless 18-21 year old pregnant and new mothers who presented for residential or day services at Covenant House, if agreeable, were given the Text4baby program "How to Enroll" tear-off sheet, that is in use nationwide. Mothers were offered assistance with enrolling via cell phone as well as being offered the option of enrolling online. Staff education and weekly follow-up clinical site visits with staff and homeless resident mothers occurred at each clinical site. Weekly follow-up discussions focused on: reception of Text4baby messages, enrollment concerns or difficulty, if texts were read, if texts were perceived as interesting and helpful to the enrolled mother, and if texts resulted in a change of healthcare behaviors of enrolled mothers.

Findings: Homeless, pregnant 18 to 21 year old mothers residing in Covenant House transitional housing, that were offered assistance with enrolling via cell phone, enrolled in the free nationwide maternal-infant mHealth program, Text4baby, at a rate of 83.33%. Enrolled homeless mothers had a 0% un-enrollment rate, in addition to joining TEAM Text4baby at a rate of 90%. There were no enrollment or technical difficulties reported. Text messages were read and saved by homeless mothers; perceived as interesting and helpful; and were acted upon by both pregnant and new mothers in this project. Pregnant and new mothers presenting for day-services at Covenant House-Crisis Shelter were offered information and enrollment assistance regarding Text4baby, as appropriate.

Conclusions: The Text4baby mHealth program provided important health information to 18-21 year old homeless pregnant and new mothers residing within transitional housing at Covenant House. Enrollment rates and TEAM Text4baby rates were excellent and exemplify the mission and social capital within Covenant House-New Jersey. The Text4baby Process Policies developed for both clinical sites support sustainability of this innovative approach to improve maternal-infant healthcare outcomes, effecting this especially vulnerable population of homeless, young mothers and infants.

SECTION I

BACKGROUND

Text4baby was launched in 2010 and is the first free national mHealth (mobile health) text messaging service in the United States. This innovative mHealth program sends free targeted text-messages to women who are pregnant or parenting an infant under the age of one. Its aim is to improve maternal and infant health outcomes (Gazmararian, Elon, Yang, Graham & Parker, 2013). Despite major medical advancements and years of public health promotion and education, more than 500,000 babies are born prematurely and an estimated 28,000 infants die before their first birthday annually (www.marchofdimes.com/peristats).

The United States infant mortality rate of 6.6/1000 live births is higher than that of most other developed countries. The infant mortality rate for non-Hispanic African American women is 2.4 times the rate for non-Hispanic White women. Of the roughly 4.2 million babies born every year in the United States, 12.3% of all babies are born prematurely and 8.2% are born low birth weight. Additionally, 1 in 28 infants are born to a mother receiving late or no prenatal care (www.marchofdimes.com/peristats).

Infant mortality rates, by state, range from a high of 10/1000 for Mississippi, 9.5/1000 for Alabama, and 9.1/100 for Louisiana to a low of 3.9 for New Hampshire. The District of Columbia, which is not a state, has the distinction of having the highest infant mortality rate in the United States at 10.8/1000 live births. New Jersey's infant mortality

rate of 5.6/1000 live births appears impressive when compared to the United States infant mortality rate of 6.6/1000 live births (www.kidscount.org/Births) (Appendix A). Yet, according to the Birth Certificate Database, Office of Vital Statistics and Registration, New Jersey Department of Health, the infant mortality rate, preterm birth rate, low birth weight rate by mother's race reveals a far greater risk for infants born to a mother who is African American (www.nj.gov/health/epht/outcome.shtml).

According to the New Jersey Department of Health, the infant mortality rate is a critical measure of a population's health and a worldwide indicator of health status and social well-being. Prematurity and low birth weight increases the risk for infant morbidity and mortality. Infants born preterm or low birth weight are at a greater risk of dying in the first month of life. They may also require intensive care at birth and are at higher risk of developmental disabilities and chronic illnesses throughout life. They are more likely to require special education services. Health care costs and length of hospital stay are higher for both preterm and low birth weight infants (www.nj.gov/health/epht/outcome.shtml).

These statistics highlight the need for innovative approaches to improving maternal-infant health. Mobile phones may provide an appropriate means of addressing maternal-infant health challenges and reaching women from underserved communities.

In 2011, The World Health Organization completed a global observational report and estimated that there were over 5 billion cell phone subscribers, with commercial wireless signals covering over 85 percent of the global population, reaching far beyond the boundaries of the world's electrical grid (World Health Organization, 2011). Bennett

(2012) observed that there are more iPhones sold than babies born throughout the world annually.

In the United States, recent research shows that 87% of African Americans and Hispanics and 80% of Whites own mobile phones. African Americans (79%) and Hispanic Americans (83%) are more likely than are whites (68%) to send text messages (Smith, 2010). According to Blumberg and Luke (2012), Americans living in or near poverty are more likely to live in a 'cell phone only' household (no fixed phone line) and those living in 'cell phone only' households are more likely to have experienced numerous barriers to healthcare.

Clinical Sites

Covenant House, the largest charity of its kind in the Americas, provides shelter, stability, love and structure for homeless, runaway and trafficked youth (Ryan & Kelley, 2012). Covenant House New Jersey provides a wide range of services, residential and day services, to a population of 18-21 year old youth at Covenant House Crisis Shelter, Newark, while Raphael's Life House serves 18-21 year old homeless pregnant or new mothers with babies. Covenant House meets the immediate need for food, shelter and clothing, as well as a broad group of support services which include career development, medical care, educational and vocational services, counseling and behavioral health services, drug abuse treatment and prevention programs, addiction referrals, legal services, life skills, mother-child programs, pastoral care, transitional living programs, street outreach and after care. Covenant House is the largest provider in the state to homeless, runaway and at-risk youth between the ages of 18-21 years old. Currently,

Covenant House serves 132 youth statewide, plus 19 babies each night. There are 45 beds at the Newark Crisis Shelter and 12 moms with their babies at Raphael's Life House, Elizabeth.

Raphael's Life House is Covenant House's designated longer-term transitional residence for 18-21 year old homeless women who are pregnant or parenting infants. They will find a warm welcome and the help they need to begin their new lives with their new babies. Raphael's Life House offers a continuum of services including classes on prenatal care and parenting, educational and vocational training, and life skills programs. Young mothers with health problems and other issues can receive treatment at the on-site medical clinic and participate in the other supportive services located at Covenant House Crisis Shelter, Newark. Since 1993, over 550 young homeless women have entered the doors of Raphael's Life House and their babies have started their lives there. Former residents often stay connected to the staff and fellow residents after moving on to independent living.

According to the Covenant House report on the "State of Street Kids in New Jersey", available on their website www.covenanthousenj.org, 12% of New Jersey's 18-24 year olds live in poverty, 30% of the kids in their care have been in the foster care system and left with nowhere to turn on their 18th birthday and 70% have a history of physical or sexual abuse.

Each year, as many as two million 18-21 year old people in the United States face an episode of homelessness (Ryan & Kelley, 2012). More than half of homeless youth report their parents either told them to leave or didn't care if they left. Some youth never had a consistent home because they were foster children, never adopted, or aged-out of the

foster system. Some youth are kicked out of their homes right after telling their parents they are gay or pregnant (Ryan & Kelley, 2012).

In a recent study of a representative national sample of shelter residents by The Covenant House Institute, it was reported that only 41% have a high school diploma, 40% had been living in foster care or another institutional setting, 38% experienced physical abuse, 40% of female youth reported a history of sexual abuse, 80% were unemployed, 63% lacked health insurance, greater than 25% had been hospitalized for depression, anxiety or other mental health issue, and more than 50% came from a family where someone used drugs regularly (Ryan & Kelley, 2012).

The Text4baby mHealth program could provide an acceptable platform to homeless pregnant 18-21 year old women for providing important health information, which could potentially change awareness of healthy behavior choices leading to optimal birth outcomes.

Description of the project

This project implemented a mobile health (mHealth) program, Text4baby, within a homeless population of 18-21 year old pregnant and new mothers within Covenant House Crisis Shelter, Newark, New Jersey and Raphael's Life House Transitional Housing for Homeless Mothers and Infants, Elizabeth, New Jersey.

In 2010, The White House announced the launch of Text4baby, the nation's first free mHealth service, developed in partnership by the National Healthy Mothers Healthy Babies (HMHB) coalition, Voxiva, CTIA-The Wireless Foundation, the United States Department of Health and Human Services (HHS), and Johnson & Johnson, the founding

sponsor. Text4baby has been implemented nationally through this unprecedented public-private partnership that has reached over 690,000 subscribers with critical health and safety information about pregnancy and baby's first year of life (www.text4baby.org). Text4baby messages provide a variety of health and safety information that is important during pregnancy, postpartum, and during the baby's first year of life. Topics include safety, immunizations, nutrition, birth defects prevention, breastfeeding, developmental milestones, and more. Messages are sent approximately three times a week. Sometimes texts are sent more frequently to accommodate for urgent, time-sensitive information, such as flu vaccination and prevention, Pertussis outbreaks, and infant safety recalls.

The primary target audience for Text4baby is women who may be at higher risk for poor health outcomes and who may have problems accessing health information. Text4baby is specifically focused on reaching pregnant or new mothers who are younger than 25 years of age, low-income women and women of color who identify as African-American or Hispanic/Latina (Remick & Kendrick, 2013). All of the 18-21 year old homeless pregnant or new mothers at Covenant House meet this criterion.

This implementation project seeks to determine if Text4baby is perceived as an acceptable platform for providing important health information to homeless young mothers, resulting in a change of homeless young mother's healthcare knowledge, which can then lead to improved health behavior choices. Making and keeping healthcare appointments, discussing health topics and concerns with healthcare providers and following evidence based practice health protocols are important benchmarks in demonstrating the value and impact of the Text4baby targeted mobile health program more broadly and specifically within a homeless population of young mothers.

To ensure that Text4baby is accessible to mothers of all income levels, CTIA-The Wireless Foundation worked with wireless phone companies to waive all text messaging fees associated with the program (www.Text4baby.org). Additionally, access to SafeLink Wireless service has been provided to all interested project participants. SafeLink Wireless is a provider of the United States Government's Lifeline Support Program. Lifeline is a federal government benefit for participants of specified public assistance programs or whose household income is at or below 150% of the Federal Poverty Guidelines (www.safelinkwireless.com). All of the 18-21 year old homeless pregnant or new mothers at Covenant House met this criterion.

Participation in this project and in the Text4baby program was voluntary. If interested, the homeless pregnant or new mother met with me individually regarding the Text4baby mHealth program. Additionally, individual on-site support through the enrollment process was offered in this project. Mothers were free to not meet with me or to cancel their enrollment in the Text4baby program at any time. SafeLink Wireless Lifeline Assistance Program application assistance was also provided to program eligible mothers, as needed.

Purpose and aims of the project

At the Covenant House Crisis Shelter in Newark, New Jersey, all candidates for enrollment were informed of the project by the Covenant House Domestic Global Health Fellow. The Domestic Global Health Fellow oversees all aspects of healthcare access and programs for all resident and day-service homeless youth. If interested, the homeless

pregnant or new mother then met with me individually regarding the Text4baby mHealth program.

At Covenant House Transitional Housing Shelter specifically for pregnant or new mothers, Raphael's Life House in Elizabeth, New Jersey, the Resident Case Manager informed the homeless resident mother of the project and then informed me of the mothers interest in participation or not.

The immediate overall aim of this project was the enrollment in Text4baby by the homeless pregnant and parenting mothers accessing services or residing within the Covenant House Crisis Shelter in Newark, New Jersey or residing at the Covenant House Transitional Housing Shelter for homeless pregnant or new mothers in Elizabeth, New Jersey. The longer term expected results related to participation in this mHealth program was an increase in knowledge and awareness of maternal-infant health related content delivered via text messaging, with a resultant change in maternal-infant health related behaviors leading to optimal maternal-infant outcomes. The sustainability and replication of this mHealth project within other Covenant House shelters nationally, or other homeless shelters that serve homeless pregnant or parenting mothers, also holds promise.

Risks and benefits

There are no known risks to participating in the Text4baby maternal-infant education and awareness mHealth platform. The benefits of participating in this project and the Text4baby mHealth program include increased maternal-infant health knowledge and behavior change; such as appointment attendance, improved communication with health providers and improved access to reliable health information and services. These findings

have significant implications for understanding the feasibility and value of the Text4baby program and were evaluated at the close of the implementation project.

Significance of the project

Too many babies are being born prematurely, at low birth weight or dying before their first birthday in the United States of America. There are a disproportionate number of black infants within all three of the above infant morbidity and mortality categories. Other than Hawaii and the District of Columbia, unfortunately New Jersey has the largest disparity rates among white and black infant birth outcomes. The infant mortality rate for black infants is 3.5 times higher than the infant mortality rate for white infants in New Jersey (www.nj.gov/health/epht/outcome.shtml). Some causes for this are poverty, lack of access to health information and a lack of access to care.

Homeless young 18-21 year old pregnant or newly parenting mothers may benefit by receiving valuable maternal-infant health information delivered in a convenient, free and accessible manner. Yet, to date, there is no scholarly discussion of implementing the Text4baby mHealth program within homeless populations of young mothers.

This implementation project, if proven successful, would lend itself to replication throughout the Covenant House Shelter System nationally and within other homeless shelters, in general, who care for 18-21 year old pregnant and new mothers within the state and country.

SECTION II

REVIEW OF THE LITERATURE

A literature review of Medline-PubMed, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Academic Search Premier, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Science Direct, Communication and Mass Media Complete, Health and Psychosocial Instruments, Health Source: Nursing/Academic Edition, Health Technology Assessments, PsychINFO, Social Sciences Full Text, Science Reference Center, ERIC and Google Scholar was completed using the search term of Text4baby, and MeSH subheadings of homeless, Covenant House, and New Jersey. Databases were searched without date restrictions, although this topic is more relevant within the last three years. A total of 10 articles were discovered. Due to of the newness of this maternal-infant mHealth program, research is ongoing.

Theoretical Basis

Social Cognitive Theory and Health Belief Model, as discussed and described by Bandura (2004), provide the foundation for the development of a new preliminary theory model applied to Text4baby (Evans, Wallace & Sniders, 2012). Evans, Wallace and Sniders (2012) discuss how this proposed theoretical model has been used to guide the development of the Text4baby program and its potential in providing consistent evaluation across studies.

The mHealth model of behavior change for the Text4baby project is based upon traditional behavior theory, initially developed by Bandura (2004), as it aspires to build self-efficacy to successfully utilize healthcare, improve health knowledge and literacy and increase expectations for successful pregnancy and new motherhood (Evans, Wallace et al., 2012). According to the authors, the proposed theoretical mHealth theory model builds knowledge and skills to manage health and prevent health risks. This new mHealth theory is also used to predict behavior change as it incorporates behavior theory with the unique features of the mobile channel.

A preliminary model of “mHealth conceptual model of behavior change for the Text4baby project” (Evans, Wallace et al., 2012) was used to guide the development of this implementation project (Appendix B).

Because of the newness of the Text4baby program, the Evans, Wallace et al. (2012) article documents the first randomized pilot evaluation study published. Text messaging has been demonstrated to be a potentially powerful tool in effecting behavior change. The Evans, Wallace et al. (2012) study attempts to assess the efficacy of the Text4baby text messaging campaign. The researchers involved in this study compared prenatal text messaging at two prenatal clinics, with a predominately Spanish speaking population. Two telephone surveys were given to enrollees. Overall, this pilot study found that mothers exposed to Text4baby were nearly three times more likely to believe that they were prepared to be new mothers, compared to those in the no exposure control group.

In another 2012 article, Evans, Abroms, Poropatich, Nielsen and Wallace discuss a case study wherein the authors explicitly discuss the incorporation of the Evans, Wallace et al. (2012) behavioral theory model within the Text4baby mHealth program. The

authors review a case example of the evaluation of Text4baby at Madigan Army Medical Center, Tacoma, Washington. This evaluation again presents the proposed mHealth theoretical model of behavior change, informing interested promoters of mHealth as to how behavioral theory works within mobile health and encourages consistent application of the conceptual model across studies, thereby enabling meaningful comparisons.

Empirical Literature

Development of and need for the Text4baby mHealth platform is a central concept of the program. Text4baby is the first free national mobile health service in the United States, recently launched in 2010. Through the provision of targeted, timely health information to pregnant women and new mothers, Text4baby aims to reduce barriers to accessing information and resources, increase knowledge around key health topics, improve positive health behaviors and build a mother's self-efficacy to engage in healthy behaviors (Remick & Kendrick, 2013).

Jordan, Ray, Johnson and Evans (2011) and Whittaker et al. (2012) present comprehensive overviews of the development and need for the Text4baby program. The U.S. Infant Mortality rate of 6.59/1000 is higher than most other developed countries and 50 percent higher than the *Healthy People 2010* target goal (Jordan, Ray, Johnson & Evans, 2011). Infant mortality and premature birth rates are higher for African American infants. Low birth weight is another important health indicator that deserves attention. The cost saving potential of Text4baby as a powerful and relevant educational tool is compelling.

Partnership development is a central concept of the Text4baby program. The unique history and background of the Text4baby broad public-private partnership is covered in detail within both the Jordan et al. (2011) and Whittaker et al. (2012) articles.

Government, corporations, academic institutions, professional institutions, tribal agencies and non-profit organizations all came together to support this first mHealth program focused on improving maternal-infant outcomes. The authors are experts in the evolution and intricacies of Text4baby partnership development because of their participation in it. The partners describe an unprecedented collaborative networking of powerful stakeholders who believed in the potential this program to accomplish its goals.

Content development and text messaging research processes are central concepts of the project and discussed by Remick and Kendrick (2013), Jordan et al. (2011) and Whittaker et al. (2012). Mobile formatting for health education was supported with data regarding the prevalence of cellular phones and texting habits nationally, as well as by gender, age, income level, educational background and race as variables by all of the authors. Message development is covered in great detail by Whittaker et al. (2012). Message development is overseen by key identified healthcare collaborators who then decide which topics would be timed to the mother's week of gestation or the infant's age. Technical collaborators then developed the platform required for this to occur. The Text4baby Content Development Council (www.text4baby.org) is made up of leading national medical health organizations and federal partners who review and validate message content and message revisions, ensuring message content is current and accurate. Messages are based on evidence-informed guidance and most recently include enhancements to the text messages, including interactive features, mobile webpages,

videos, and resource phone numbers. Well-baby visit and appointment reminders, as well as specific health related topics discussing prenatal care, vaccination, health insurance, and flu information are sent to support improved health behaviors. Partners that comprise the Content Development Council include the American Academy of Pediatrics, The American College of Obstetricians & Gynecologists, Centers for Disease Control and Prevention, March of Dimes, Society for Maternal-Fetal Medicine, American College of Nurse-Midwives, Association of Women's Health, Obstetric and Neonatal Nurses, Health Resources and Services Administration, National Association of Pediatric Nurse Practitioners and the U.S. Department of Health and Human Services.

Enrollment factors are central concepts of the project. J. A. Gazmararian led a team of Emory University researchers in the first two studies examining various components effecting enrollment in the Text4baby mHealth program. In 2012, Gazmararian, Yang, Elon, Graham and Parker provide the first research results of how literacy skills relate to successful self-enrollment in the Text4baby program. Health literacy is important to mHealth information and, as the authors point out, should be concise, clear and actionable while also aligning with the literacy skills of the intended users. Limited health literacy and its associated costs regarding maternal-infant outcomes are central to the success of this outcomes focused mHealth program. SMS (short message service), also referred to as a text message, development was addressed by the Healthy Mothers Healthy Babies health literacy experts who validated message content was appropriate for all literacy levels.

This group of Emory University researchers then further studied whether low health literacy was associated with reduced enrollment success. The Gazmararian, Yang et al.

(2012) findings suggest that the skill level needed to successfully navigate the enrollment process was most challenging for the women most in need of the health messages.

Assisting women to enroll ‘on-site’ could prove beneficial in Text4baby enrollment success.

In 2013, the same group of Emory University researchers, (Gazmararian, Elon et al.) published the results of their prospective cohort study regarding factors related to the Text4baby enrollment process and reception among their study participants. Within this study’s underserved, mainly African-American, English speaking, limited literacy population, about half of the women attempted self-enrollment. Promotion of Text4baby may be more successful if pregnant or new mothers are encouraged to enroll ‘on-site’. This study provides much needed and valuable information regarding Text4baby program acceptability among African-American mothers.

Green, Dalrymple, Turner, Rogers, Williver-Farr and Zach (2013) discuss their research study of an ‘enhanced’ Text4baby program which provided two additional weekly focused texts regarding the specific family health center where the research took place. The additional weekly texts in this research study discussed the family health center’s specific philosophy of health and patient education classes. This ‘enhanced’ Text4baby research also utilized ‘smartphones’ capable of internet access. The embedded URL’s (Uniform Research Locator) utilized within this research study was an additional enhancement offered to the mother in seeking additional health information independently, during the research study.

Parker, Dmitrieva, Frolov, and Gazmararian (2012) discuss the first mHealth international implementation of Text4baby, which is currently taking place in Russia.

The additional variables of a social welfare platform, as well as a 1-day Health Communication Training for all doctors who provide care to pregnant women or infants was instituted within the Russian Text4baby program. The United States collaborators worked with the Russian team to create a model and evaluation strategy that may prove useful within and across countries, ensuring monitoring and evaluation as an a priori component of the Russian Text4baby program.

In an editorial, vanVelthoven, Majeed and Car (2012) point out that exploratory trials and customary theory development processes were not followed regarding the Text4baby program. The authors note that of the research that has occurred to date, none is large scale. The authors believe the Text4baby intervention, which they describe as the largest mHealth intervention globally, could prove to be enduring, ineffective and even harmful.

External and internal evaluations of Text4baby are currently underway and will provide the necessary research regarding this innovative mHealth program. According to the Text4baby website (www.text4baby.org) current external evaluations include a mixed-method process and outcome evaluation of Text4baby, a randomized control trial measuring the changes in a number of knowledge and behavior outcomes and a small pilot evaluation assessing how Text4baby messages align with different health communication theories. Internal evaluations of Text4baby currently underway include a study to assess the impact of a text reminder intervention on adherence to a diabetes care regimen and glycemic control. Recruitment for the study is ongoing.

SECTION III

METHODOLOGY

The Text4baby program was launched in 2010 and is the first mobile information service designed to promote maternal and infant health through text messaging. Targeted health information and safety tips are communicated through text messages at no cost to participants. Text4baby delivers the health information mothers and expectant women need, reaching them directly on cell phones that 89% of young women carry at all times (www.text4baby.org). This service was developed to address the high infant mortality rate and high prematurity rates in the United States.

Evaluations of the Text4baby program are demonstrating that Text4baby is increasing participants' health knowledge, facilitating interaction with health providers, and improving adherence to appointments and immunizations, which then serve to provide a strengthened link to maternal-infant health services. Ongoing research is the earliest stages of evaluation. One recent study looks at self-enrollment (Gazmararian, Elon et al., 2013), with 51% of participants reporting that they attempted self-enrollment after being given the Text4baby program's "how to enroll" tear off sheet, which is utilized nationwide. Additionally, there are no Text4baby implementation projects which have considered implementation within a young homeless population of mothers.

The scholarly project and objectives were approved by Meghan Leigh, Associate Site Director of Covenant House, Newark, New Jersey, and serves as a Committee Member of this project. Ms. Leigh is a graduate of Columbia University School of Social Work with

a Master of Science Degree in Social Work. Ms. Leigh is a Licensed Social Worker in New Jersey and has worked with Covenant House since 2000. Ms. Leigh oversees the Crisis Shelter Residential and Day Services Program-Newark, New Jersey and Raphael's Life House-Residential Program for pregnant or new mothers with infants located in Elizabeth, New Jersey.

Dr. Mary Ellen Roberts, Assistant Professor and Director of the Doctor of Nursing Practice Program at Seton Hall University-College of Nursing is the Chairperson of this Scholarly Project Committee and Dr. Judith Lothian, Associate Professor, Seton Hall University-College of Nursing has served as a Committee member of this project. A Seton Hall University-College of Nursing clinical site contract has been in place with Covenant House-New Jersey since 2010. This contract covers both clinical sites involved in this mHealth implementation project within their respective populations of young homeless mothers.

There are no known risks regarding enrollment in the Text4baby mHealth information program for pregnant women or mothers of infants. The benefits of receiving Text4baby mHealth information would be an increase in maternal-infant health knowledge, an increase in maternal-infant health care appointment attendance and facilitation of health provider interactions.

Phase I

The Infant Mortality Rate (death occurring during the first year of life/1000 live births) is declining in New Jersey, overall. In 2008, New Jersey's state infant mortality

rate of 5.6 infant deaths per 1,000 births compared favorably regarding the infant mortality national rate of 6.6 for the United States of America. During 2006-2008, New Jersey had the 7th lowest infant mortality rate in the nation. Yet, other than Hawaii and the District of Columbia, New Jersey had the largest disparity between infant mortality rates among white and black mothers during that same time period. Among infants born in New Jersey (2000-2008), the infant mortality rate was 12.7% for black infants and 3.7% for white infants, the preterm birth (born before 37 weeks) rate was 14% for black infants and 9% for white infants, the low-birth weight (less than 2500 grams) rate was 13% for black infants and 7% for white infants (www.nj.gov/health/epht/outcome.shtml).

The nationwide Text4baby mobile health text messaging service was developed to help address the public health crisis of poor maternal-infant health outcomes among minority women, especially those with lower socio economic status. Text messaging allows Text4baby to share health and safety information through a convenient and popular communication channel utilized by most 18-24 year old women while addressing maternal-infant health inequalities for low income, women of color. Enhancing the health, safety and well-being of young homeless pregnant, new mothers and their infants is of the highest importance, especially with regard to young black women.

Phase II

Ms. Meghan Leigh, as Associate Site Director of both Covenant House-Newark and Raphael's Life House-Elizabeth was instrumental in obtaining support at each site and scheduled my clinical days at Covenant House and Raphael's Life House to maximize interdisciplinary collaboration on this project. Having a previous working relationship

with the Resident Manager's at Raphael's Life House, Elizabeth, New Jersey provided a basis of support for the implementation of this project in a collaborative manner. The Global Health Corps (GHC) Fellows, both Domestic and International, at the Covenant House Crisis Shelter, Newark, New Jersey were important stakeholders who were open-minded and interested in the Text4baby mHealth program and enthusiastic partners in creating a team approach to the implementation of the Text4baby mHealth project with both the resident and day-program 18-21 year old pregnant or new mothers that they serve. Global Health Corps (www.ghcorps.org) was founded in 2008 by six forward minded, young leaders focused on addressing health inequities through serving. Barbara Bush is CEO and co-founder, along with Andrew Bentley, a marketing executive with Google out of their New York and Boston Offices. Jenna Bush Hager, Charlie Hale, Dave Ryan, Jonny Dorsey and Katie Bollback are additional founding members. Barbara Bush had previously worked for UNICEF International Health in Botswana and sits on the Board of Directors of Covenant House International. She is a Yale University graduate. Dave Ryan, Global Health Corps Founding Director, is a graduate of Yale University and Stanford University. Charlie Hale works for Google, while Jonny Dorsey and Katie Bollbach graduated from Stanford University and are all outstanding young leaders addressing global health disparities. Their interconnectedness and shared vision of launching a new paradigm of providing young people with both domestic and international opportunities to serve in health inspired the founding of Global Health Corps and undergirds their team approach to the important work that they do. Google.org funded Global Health Corps first grant in 2008 and their first class of fellows opened in February 2009 with 22 GHC Fellows from eight countries. The corps and their

fellowships are building an ever-growing community of fellows and alumni devoted to health equity.

There are 74 placement organizations, domestic and international, within Global Health Corps. Covenant House-Newark, New Jersey is one of 3 organizations in Newark, New Jersey that partner with providing clinical placements for GHC Fellows. Newark's notable commitment to healthcare equity equals Boston's and Washington, DC's in providing clinical affiliates for Global Health Corp Fellowships. The one-year GHC Fellowship provides first-hand experience in leadership development and community building for this talented group of global healthcare change-makers. The GHC Fellows at Covenant House-Crisis Shelter in Newark, New Jersey provide direct Health Counseling to resident and day-service, 18-21 year old, homeless youth.

The yearlong GHC program fellowship at Covenant House-Crisis Shelter terms overlapped, and so I had the opportunity to work with four Global Health Corps Fellows during my implementation project. At the on-set of my project I worked with Rithi Mathias-Domestic GHC Fellow and Lovemore Muphukita-International GHC Fellow. In mid-July, the 2013-2014 GHC Fellows, Jenna Marie Mellor-Domestic GHC Fellow and Kelly Imathiu Kanando Muteti-International GHC Fellow, arrived and where they continue to support the Covenant House mission supporting the health goals of the youth in their care. I had the wonderful opportunity to meet Andrew Bentley, Founding Member of Global Health Corp, during his on-site visit on June 24, 2013. Rithi, Andrew and I discussed "Text4baby" and the importance of mHealth within underserved populations of mothers and infants. Andrew's background in technology and his employment at Google were unknown to me at that time, but now provide a firm

foundation for the promise that innovative, collaborative mobile health technology applications hold in closing healthcare gaps.

While at Covenant House-Crisis Shelter, Newark, New Jersey I had the opportunity to work with Dr. Aliparo, Attending Pediatrician with the UMDNJ Pediatric Clinic. I have 18 years of direct clinical experience as a Certified Nurse-Midwife within UMDNJ-Newark. I continue to be impressed with their commitment to addressing healthcare disparities that persist in maternal-child health. Dr. Aliparo was very open minded and helpful regarding the implementation of my DNP project. She not only rendered excellent clinical care, to all residents in her care, but generously provided outstanding teamwork and collaboration throughout the course of my DNP project.

While at Covenant House-Crisis Shelter, Newark, New Jersey I also had the opportunity to meet with Ms. Diane S. Milan, Executive Vice President of Administration for Covenant House International. Discussion took place regarding maternal-infant outcomes, both for New Jersey and the United States; healthcare disparities that exist for infants of black mothers, especially in New Jersey; and the potential benefit which mHealth holds in addressing maternal-infant healthcare needs of young pregnant or new mothers of infants served by Covenant House across the United States.

The staff and administrators of Covenant House, at both clinical sites, always listened, cared and offered to help regarding my DNP maternal-infant mHealth project in any way they could. I am very humbled at having had the opportunity to serve alongside them.

Phase III

At Covenant House Crisis Shelter, Newark, New Jersey the Global Health Fellow fills the role of health navigator and health counselor for all resident and day-services youth receiving services at this center. A thorough overview of the Text4baby program, maternal-newborn outcome disparities and this implementation project was provided as a part of the necessary staff education that must take place to ensure a collaborative approach. A notebook of Text4baby program materials was created and included samples of the Text4baby poster (Appendix C), Text4baby bilingual enrollment referral cards (Appendix D), and Text4baby enrollment tear-off pads (Appendix E) and was utilized at both clinical sites for educational purposes. The young women who are pregnant or new mothers were invited to speak with me regarding Text4baby by the Global Health Fellow at the completion of their health counseling interaction with them. Speaking with me was on a voluntary basis, as was enrollment in the Text4baby program and weekly follow-up discussions. There was no exchange of any health information between medical services and this project. An office with computer access to the internet was provided for my use and was within close proximity to the Medical Services area of the shelter. Individual support was provided on-site at the Covenant House-Crisis Shelter to all young mothers who chose to self-enroll in the Text4baby program. Confidentiality and privacy were maintained during all DNP project visits.

A Resident Case Manager is always present at Raphael's Life House, Elizabeth, New Jersey, which is exclusively designated as transitional shelter housing for 18-21 year old pregnant or new mothers with babies. A thorough overview of the Text4baby program,

maternal-newborn outcomes disparity and this implementation project was also provided to the Resident Case Manager as a necessary part of the staff education that must take place to ensure a collaborative approach. The Covering Resident Case Manager was provided with an overview of this implementation project, as needed. The resident young women who are pregnant or new mothers of Raphael's Life House were invited to speak with me regarding the Text4baby program by the case managers. A large private room with chairs and a table was provided for my use and was within close proximity to the resident case manager, who provided internet access for project purposes, if needed. Speaking with me was on a voluntary basis, as was enrollment in the Text4baby program and weekly follow-up discussions. Confidentiality and privacy were maintained during all visits. A large binder with Text4baby program graphics and information was created and useful in explaining the Text4baby program. Additionally, all women were given one-on-one support in self-enrolling "on-site" in Text4baby at Raphael's Life House.

All Text4baby posters, tear-off pads and enrollment cards were free and acquired through the Text4baby program website (www.text4baby.org). Additionally, at the beginning of my Clinical Residency, I enrolled as an individual Text4baby community supporter and signed up for their e-newsletter 'Text4baby Tuesday Weekly News'. Text4baby requested and was granted permission to include a portion of my e-mail correspondence with them in their Text4baby Tuesday e-newsletter which highlighted Seton Hall University-College of Nursing and my interest in this important mHealth program on a national level (Appendix F).

A listing of all participating Text4baby Mobile Operator Partners, as well as Federal "Lifeline" Assistance Program, "SafeLink Wireless" cell phone program applications for

income eligible households in New Jersey were brought by me and made available to mothers, as needed, at each visit.

Phase IV

Clinical site visits were conducted weekly. Covenant House-Crisis Shelter was visited each Monday and Raphael's Life House was visited each Thursday over the course of four months, May thru August, 2013. I consistently wore a Seton Hall University-College of Nursing name badge, a blue Seton Hall University t-shirt, denim blue jeans and sneakers at both clinical sites, which was approved and supported by the Ms. Meghan Leigh, Covenant House Assistant Site Manager. I dressed in this manner in an effort to have my presence be identifiable, recognizable and reliable to the young homeless residents. Their history of unreliable environments and past life events deserve my attention to detail regarding my remaining consistent and approachable during this project. Developing trust was essential and much was communicated non-verbally in both clinical site environments.

All discussion encounters of Text4baby with young homeless mothers were noted, as well as enrollment on-site. Residents who declined discussion or enrollment in the Text4baby program are also noted. Follow-up discussions regarding Text4baby were available for all homeless mothers, at both sites, on a weekly basis. Weekly follow-up discussions focused on: reception of Text4baby messages; enrollment or technical concerns or difficulties; if texts were read or not; if texts were perceived as new healthcare knowledge, and if the mother reported any change in healthcare behavior.

The application process for a free federally funded wireless phone was researched by me so that all mothers could participate. The New Jersey Certification Form for the Lifeline Assistance Program was available at each of my clinical sites. Mothers were also offered assistance in this application for a free Lifeline Assistance Program cellphone, ensuring her ability to participate in this project, if she met eligibility criteria and chose to apply. The Lifeline Assistance Program portion of my DNP project was additionally reviewed and approved of by my clinical site preceptor, Ms. Meghan Leigh, and it may also now offer the benefit of staying connected via cell-phone, to other young homeless residents within other Covenant House shelters throughout New Jersey.

During the course of this project, on May 28, 2013, the Text4baby Tuesday Weekly News email newsletter announced a new level of involvement referred to as TEAM Text4baby, wherein an enrolled mother or other interested person, agrees to refer and share Text4baby with other mothers! A TEAM Text4baby Certificate was developed by the Text4baby program which was available to print (Appendix G). Permission was granted by my Clinical Preceptor to offer this new level of participation to the homeless mothers at both clinical sites. My response to Text4baby regarding this new, empowering mother-to-mother TEAM approach to their maternal-infant mHealth program was then highlighted on the Text4baby website within their “Stories From the Community” (Appendix H) and within their TEAM Text4baby announcement within their website.

Date specific, project enrollment and feedback data provided by homeless mothers residing at Raphael’s Life House Transitional Housing, Elizabeth, New Jersey or homeless mothers obtaining residential, day services or sanctuary at Covenant House-Crisis, Newark, New Jersey was collected regarding enrollment, refusal or inability to

enroll, technical issues, perceived helpfulness of texts in gaining new health knowledge or changing maternal behavior, and TEAM Text4baby program enrollment and sharing (Table 1).

Table 1. Clinical site visit data:

Mother and child	5/23/13	5/30/13	6/13/13	6/20/13 ***_--	6/27/13 (*added)	7/04/13	7/11/13	7/18/13 (Ava)	7/25/13	8/1/13
Kahdjah 21 yo Farad 9/23/12	X Enrolled in Text4baby!	X 1 st TEAM Text4baby Ambassador !!!!!!!!!!!!!!	INASCL Confer. (Las Vegas, NV)	---	X "ROP" Next week Work & daycare	+. ✓ They have their own apt!		"Thank You..." Note is taped on the office door...		X(visiting today:)) -TEAM T4b -PPD msg. Group discussion; important!
Ouneisha 19 yo Joel 2/16/13	X Enrolled in Text4baby!	X Likes the messages -teething -crawling		--- (susp)	--- (Last day of susp)	X SafeLink appl.encour *T4b Ambassador Shared w UMDNJ	X T4b TEAM Certificate -Ped Appt reminder -Immuniz.	X Newark; f/u meds; behav. health	X -WIC Teething -Burping -Safety	
Anneiceia 21 yo Nadia 11/29/12	X			X G&D @ 6 mos.	X G&D Formula Safety		X f/u Doesn't want to meet; 'going thru changes'	X Newark (to speak with Meghan)	X f/u T4b TEAM Certif. Given -food -ped vs.	X f/u -Stranger anxiety (infant) -website
Lucille 19 yo Justin 5/7/13	X	X Enrolled after my visit last week		X Pertussis Vaccine TEAM T4b!	--- (susp)			X Transition (6 mo)		
Ny-ya 19 yo Sumaya 6/14/13	X	X "I helped Lucille enroll!"		X baby's 1 st b'day Walking/ crusing	X (court) I wish her well.				X T4b TEAM Certif. given (cousin)	
Jasmin 19 yo EDC 6/25 Twins	X	X Will enroll "later"		---	C/S on 6/25/13 Pre-eclp MgSo4	X f/u PP TWIN BOYS Feels well		X (susp)	X T4b TEAM Certif. given -BF -G&D	X PPD msg Grp disc. -Ped & PP appointm. reminder
Raven 19 yo Twin girls 4/12/13		X Not interested in Text4baby		Transitioned						

Yasmin 20 yo EDC (boy) 10/5/13					X Enrolled in T4b and NFP 1 st visit !	X T4b TEAM Certif. given Shared w NFP!!!		X -Friends & support -FM -Safety		X -BF -s/s labor -FM
Tonique 21 yo EDC (girl) 10/10/13					X SafeLink encour. -NFP -consent	X NJ SafeLink appl. given -NFP f/u	X f/u NFP - Serious medical comptions	X Out at medical appoint.	X Not feeling well today.	
Shatia 19 yo EDC 12/11/13			X CovHouse 6/17 Enrolled T4b!!!	X CovHouse 6/24 -FM -PNV -WIC	X CovHouse 7/1 -fatigue -nutrition	X CovHouse 7/8 Moving to RLH!!!	X -T4b appt. reminder -seat belt safety for preg. moms	X T4b TEAM Certif given -call 911 for emer. -talk w MD re: meds		
Shalisa 19 yo G2 P1001 EDC 10/21/13					X CovHouse 7/1 DaySr -Enrolled T4b!!! 1 st DaySv mom to enroll!!!					
Tresell 17 yo EDC 2/20/14							X CovHouse 7/22 ~Sanctuary~			
Fabrielis 20 yo EDC 4/12/14										X CovHouse 8/5 -food -pnv
Ahkeelah 20yo EDC 10/27/13										X Enrolled in T4b! -NFP consent (IEP) 3 rd shelter
Oni 20 yo Son 7/1/12										X SafeLink application discussed -interest in mHealth concept & TEAM T4B
Shawndae 20 yo EDC 10/13/13										X Enrolled in T4b! -Joined TEAM T4b! -Is bringing tear-off enrollment pads to NCHC-EO!

Collaborative efforts and dissemination of the Text4baby program were notable at both Covenant House Crisis Shelter and Raphael's Life House Transitional Housing Shelter throughout the term of this project. The overriding and notable presence of social capital that exists within both of the project clinical sites further exemplifies and highlights The Covenant House Mission of serving, protecting and safeguarding all, within the covenant community. The network of social connections that exist between all Covenant House staff members and resident youth communicates their mission, shared values and norms of behavior, which enable and encourage mutually advantageous cooperation. Throughout the clinical site visits of this implementation project, all Covenant House staff members interacted and engaged with absolute respect and unconditional love toward all. In return, they ask all residents to treat everyone they meet the same way they would like to be treated. Covenant House is a sacred place because everyone there is part of a special covenant.

During the course of Clinical Residency I, additional collaboration was initiated directly with Healthy Mothers Healthy Babies Public Relations Department, regarding Text4baby retail affiliations and marketing ideas as a new potential avenue of further developing their public-private partnership across the broadest platform. As a Text4baby TEAM Member, I was continually considering the untapped potential of the Text4baby mHealth program in addressing and lowering New Jersey's black infant mortality, prematurity, low birth weight statistics. I telephoned Rachel Griffith, the National Healthy Mothers Healthy Babies Coalition Public Relations contact person and discussed my belief that large-scale retailers, especially those with an urban market-share, could potentially be very interested in promoting Text4baby. This concept was sparked by a

visit to my local K-Mart during the month of May, 2013. The March of Dimes had a large screen television placed at the front foyer of the store that was playing a continuous-loop 3 minute promotional video overview of how the March of Dimes is promoting full-term births and working to lower birth defects of all infants. The March of Dimes also had two large foam board stand-up posters, placed on either side of the large screen television. Customers entering K-Mart were immediately met with important birth related information that impacted their community and that dove-tailed with Mother's Day. Upon check-out from the K-Mart, I was given a tear-off March of Dimes flyer and asked if I wanted to donate \$1, \$5 or \$10, which would be added to my receipt. This fund-raising strategy within the March of Dimes promotion was occurring at each cash register and with each cashier repeating the same 'checkout script'. That experience spurred me to contact the National Healthy Mothers Healthy Babies headquarters. Rachel Griffith listened to my ideas and promised to share them with Sarah Ingersoll, the National Health Mothers Healthy Babies Coalition, Text4baby Director and the Text4baby marketing team. Andrea Goodman, Maternal Child Health Director for the National Healthy Mothers Healthy Babies Coalition later contacted me regarding my ideas concerning retail partnering and the Text4baby program. It was explained to me that Text4baby did not have any retail partners, at that time, and they weren't sure if they would move in that direction. It was further explained that the March of Dimes has contracts developed with many large retailers, and so they can put on videos, posters and fund-raise. I advocated for Text4baby retail partnerships, especially with urban market shares, to be considered and developed. If the March of Dimes can do it, Text4baby can

and should strive to exemplify the best of teamwork and collaboration by growing their public-private partnership base within the retail sector.

During the course of this Text4baby implementation project, Text4baby initiated additional interactive components within their program and continues to develop new, innovative and interesting applications within their maternal-infant mHealth platform. In addition to sending accurate health and safety information, links to more information, including program videos; prompts to text back when a mom finds a message helpful, or if she would recommend the Text4baby service to someone else who is pregnant or a new mother; feedback surveys and modules with more information on immunizations, Medicaid application process, Women, Infants and Children (WIC) Supplemental Nutrition Program are all now a new part of the Text4baby mHealth program. Examples of some new program applications are the request to reply “UPDATE” to change a due date or to enter a baby’s birthdate; reply with “LIKE” after any Text4baby message that helps you and your baby; reply “REMIND” to set up a text message reminder, that way we can remind you of your next appointment; for information on Text4baby reply “HELP”; reply “MORE” to learn more about (text message content) baby’s development; and reply “STOP” to stop text messages from the Text4baby program. Fathers and significant others in the lives of families with pregnant or recently delivered women are now also able to enroll. Twitter chat, Facebook and YouTube webpage platforms have been recently created by the Text4baby program development team, which furnish additional mobile health discussion venues that have expanded and enhanced the text message service already provided.

Witnessing the Text4baby program offerings grow in tandem throughout the Text4baby implementation project has added depth to this work. Text4baby's continued growth additionally speaks to the applicability and importance of mHealth within maternal-infant healthcare at this point in time.

Phase V

Project outcome data measurements of this mHealth implementation project were both quantitative and qualitative. Encounters with all 18-21 year old homeless, pregnant or new mothers were documented. Interest and other enrollment factors were collected. Follow-up weekly visit encounter information is documented and provided in Table 1.

The percentage of 18-21 year old homeless pregnant or new mothers given "on-site" support in enrollment in Text4baby, who then went on to enroll in the Text4baby program, thru this project was determined. Change in healthcare knowledge and behavior of mothers enrolled in Text4baby, in addition to sharing and referring Text4baby to others is also considered within this implementation project.

SECTION IV

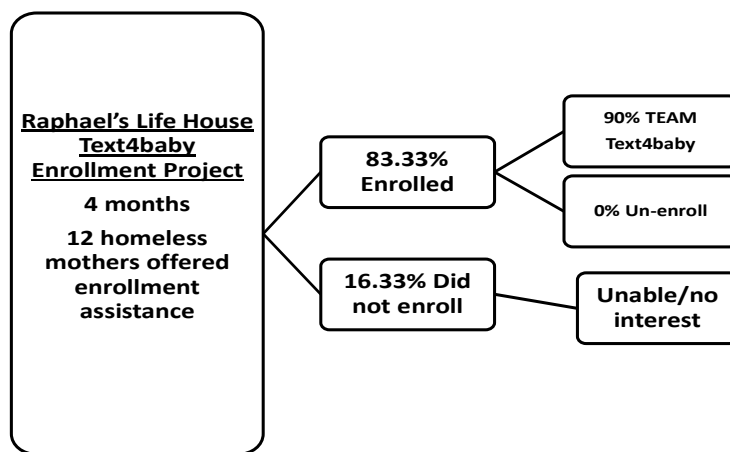
PROJECT OUTCOMES

Sixteen mothers agreed to meet with me to discuss the Text4baby mHealth program. Four pregnant or new mothers were interacted with at Covenant House-Crisis Shelter and fourteen pregnant or new mothers were interacted with at Raphael's Life House Transitional Housing shelter. One pregnant mother at Covenant House-Crisis Shelter was not eligible to enroll during her sanctuary stay due to her young age. One new resident at Raphael's Life House was not eligible for this implementation project because she was not pregnant and her son was over 1 year of age. Both ineligible mothers were given information on the SafeLink wireless application process, the Text4baby mHealth program and TEAM Text4baby involvement for their future, should they choose to apply. One Raphael's Life House new mother declined to discuss Text4baby because of disinterest in the program. This new mother 'transitioned' from Raphael's Life House two weeks later. One Raphael's Life House pregnant mother was unable to enroll because of overriding medical complications. Information on the SafeLink application process, Nurse-Family Partnership, along with Text4baby program information was offered to this pregnant mother, should she decide to enroll at some time in the future.

One Covenant House-Crisis Shelter mother transferred residence into Raphael's Life House Transitional shelter; one mother participated in day-services at the Crisis Shelter; one mother had a short stay at the Crisis Shelter and was deciding her path regarding shelter, food, healthcare and community.

A fuller discussion of Raphael’s Life House Transitional Housing project data offers important information regarding the implementation of the Text4baby mHealth program within a community of homeless young mothers. There were 12 homeless mothers eligible for Text4baby enrollment at Raphael’s Life House and 10 of the homeless mothers moved forward with enrollment, revealing an 83.33% enrollment rate. 50% of the enrolled homeless mothers in this project were pregnant at the time of Text4baby enrollment and 50% of the homeless mothers were mothers of infants at the time of Text4baby enrollment. Of the 10 enrolled mothers, 9 mothers moved forward in joining TEAM Text4baby during the course of this project, revealing a 90% TEAM Text4baby participation in referring Text4baby to other mothers, providers and healthcare facilities over four months (Figure 1).

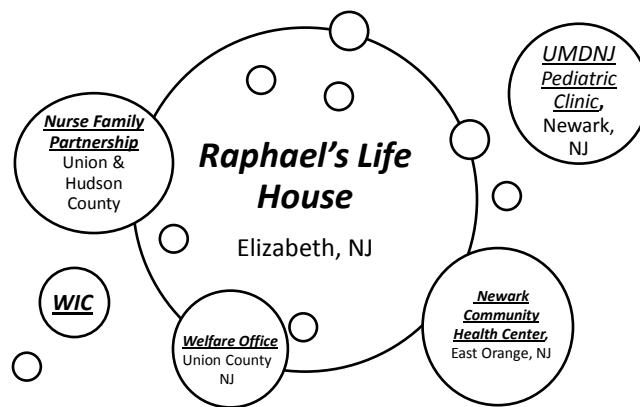
Figure 1: Project Enrollment Data - Raphael’s Life House



This cohort of 10 homeless TEAM Text4baby mothers brought the Text4baby mHealth program to the University of Medicine and Dentistry of New Jersey-Pediatric

Clinic, Newark, New Jersey; Newark Community Health Center (Federally Qualified Health Center), East Orange, New Jersey; WIC Supplemental Nutrition Program offices both in Newark and Elizabeth, New Jersey; the Union County Welfare Office, Union, New Jersey; The Nurse-Family Partnership of Union and Hudson County, New Jersey; and their cousins, friends, fathers of their babies, sisters and other family members (Figure 2).

Figure: 2 TEAM Text4baby: Shares with health programs and providers



All mothers were provided with individualized, on-site enrollment assistance, spoke English as their primary language, self-identified as single/never married and of being between 18-21 years old and minority racial status. Within this cohort of enrolled homeless mothers, 87.5% of the mothers self-identified as African-American and 12.5% of mothers self-identified as Hispanic. All mothers self-reported as participating in the WIC program. It was noted, during weekly follow-up clinical site visits, that all homeless

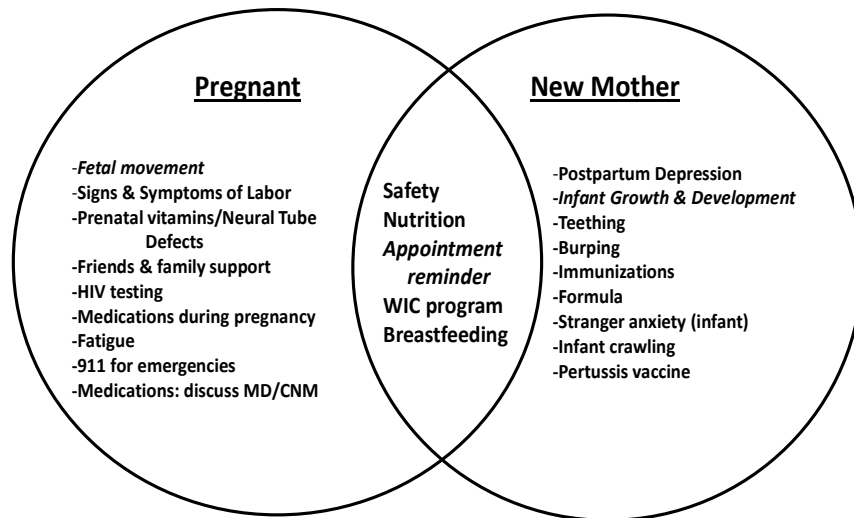
mothers in this project saved all Text4baby text messages received, although they were not asked or required to do so. Homeless enrolled mothers did not unenroll from the Text4baby program during this implementation project whatsoever, although they were sent regular prompts by the Text4baby program to reply STOP, should they no longer want to receive or un-enroll from the program. There were no technical difficulties experienced, or reported, within this implementation project either with enrolling or receiving Text4baby program text messages.

The enrolled homeless mothers were asked what texts they found interesting and helpful, containing new healthcare knowledge which helped them change their healthcare behavior as a mother. The pregnant homeless enrolled mothers most frequently mentioned the targeted text messages regarding fetal movement as being helpful. They reported following the guidance given to contact their MD/CNM/CM if decreased fetal movement was experienced. Folic acid's link with neural tube defects was also chosen as a text message with new healthcare knowledge and which changed their behavior in taking their prenatal vitamin, containing folic acid, consistently. Friends and family support, signs and symptoms of labor, fatigue, calling 911-for emergencies and discussing over the counter, and all drug use with their MD/CNM/CM were additionally chosen as being helpful. The homeless enrolled new mothers of infants most frequently chose the targeted text messages regarding infant growth and development as being most helpful. Postpartum Depression text messages were also noted as providing new, beneficial healthcare knowledge. Teething, crawling, immunizations, burping, formula use, stranger anxiety and pertussis parental vaccination were chosen as text messages that were valuable and which provided new healthcare information.

Safety, nutrition, the Text4baby appointment reminder feature, breast feeding and WIC information were chosen by both pregnant and mothers of infants as providing helpful and actionable healthcare information by this cohort of homeless young mothers (Figure 3).

Figure 3: Perception of texts received by homeless young mothers

“Texts perceived as interesting and which helped prepare you as a mother”



Because of the importance of supporting this new access to healthcare knowledge, additional reputable brochures were sought on infant growth and development and infant nutrition. New Jersey’s Regional Early Intervention Collaborative Developmental Brochure, Birth to 3 years (Appendix: I) was provided to each new mother who expressed an interest in infant growth and development. Social and emotions, movement,

vision, hearing and speech, along with a developmental health watch area are provided for the infant from birth to 4 months, 4 months to 8 months, 8 months to 12 months, 12 months to 24 months and 24 months to 36 months. Discussion with pediatric providers and an understanding of additional services provided for infants in New Jersey are all outlined in this one-page brochure which was well received by this cohort of homeless mothers of infants. The Florida Department of Health-WIC Program's: Food for Baby's 1st year brochure (Appendix: J) was provided to each new mother who expressed an interest in infant nutrition. The information, graphics and literacy level were excellently rendered and proved to be an excellent source of additional healthcare information within this cohort of homeless new mothers.

SECTION V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

To date, there are no published reports of implementing Text4baby, the largest mobile health program in the United States, within or among homeless young pregnant or new mothers. Yet, this group of young mothers faces the steepest odds in achieving optimal maternal-infant outcomes. Other implementation projects have all enrolled mothers by giving them the Text4baby tear-off enrollment instructions and later interviewing them via telephone survey regarding follow-thru on Text4baby enrollment completion. The importance of “on-site” enrollment support for this highly vulnerable, underserved population of young, pregnant or new mothers was an important finding of this implementation of mHealth among homeless mothers. This project’s findings provide important data demonstrating that despite substantial hardships, innovative “on-site” support facilitates enrollment rates in the Text4baby program, within a homeless transitional shelter for pregnant and new mothers with infants.

Enrollment concerns or difficulties, as well as whether texts were read or not, were considered and discussed during follow-up visits. This level of continuity when implementing Text4baby provides a new paradigm for homeless maternal-infant shelters within Covenant House International and other homeless maternal-infant shelters, in general. New healthcare knowledge and changes in healthcare behavior are important predictors of maternal-infant outcomes.

Insight into the enrollment process for vulnerable populations of pregnant or new mothers, especially African American women, is called for by the research and was

considered within this mHealth implementation project of the Text4baby program. Clear, concise and actionable healthcare information, provided via Text4baby is a unique mHealth platform, which proved to be an important contributor in improving maternal-infant healthcare knowledge among this young homeless mother population. Maternal driven discussions took place on a consistent basis and reflected a comfort level with sharing new healthcare information with providers at multiple health care program sites.

Stereotypical beliefs regarding homeless, young mothers have been challenged by documenting their exceptional level of generosity in sharing the Text4baby program with healthcare providers, family and friends. This finding provides fuel for further research that investigates how populations of underserved mothers actually share what they value. Within this project, the enrolled mothers, although experiencing a paucity of economic currency, were rich in social capital. The Covenant House setting may be unique in this regard and reflective of their mission (Appendix: K) on a broader scale.

Nearing the close of the project additional significant and related outcomes appeared. As an individual member of Text4baby, I continued to receive and read the Text4baby Tuesday Weekly News via email. On October 1, 2013 Sarah Ingersoll, Director of Text4baby announced Rite Aid Pharmacy as its first national retail partner via the newsletter. Rite Aid, as a trusted community health care provider, stepped forward to support Text4baby in connecting more women to the health and safety information. By implementing this project and collaborating with the public relations and director of Text4baby on considering retail market place partners, this outcome may further save lives. In celebration of the new Rite Aid partnership, Rite Aid made 10,000 free flu shots available to enrolled Text4baby members. While discussing this new level of retail

involvement during my October visit to Raphael's Life House, a young homeless dad, who was visiting his infant son and the mother of his son, was the first father to join Text4baby! He enrolled on-site and then followed the prompts to receive the "app" for his free flu shot at Rite Aid. He explained that he planned on getting his free flu shot so that he "won't miss work from calling out sick with the flu". Text4baby now provided support to homeless pregnant women and new moms and dads at Raphael's Life House!

On October 7, 2013, the Centers for Medicare & Medicaid Services (CMS) announced a competitive bidding process for a three-year contract to support the implementation of the Text4baby service in four states in collaboration with state Medicaid agencies. This was very surprising and unexpected news. If New Jersey were selected, CMS could provide the needed incentive for New Jersey to serve the vulnerable mothers and infants, especially African-American mothers and babies across the state. Having the opportunity to participate in this new maternal-infant mHealth program could be an important factor effecting the needed change in black infant outcomes across New Jersey. Thru this offer, CMS announced its willingness to work with founding partners Voxiva and the National HMHB Coalition to expand efforts to enroll Medicaid beneficiaries in the Text4baby service; customize Text4baby messages to include state-specific information and assess Text4baby's impact on improving maternal-infant health outcomes. CMS announced that it was working with both founding partners to determine the target states for the pilot project. During the previous year's Text4baby enrollment contest, New Jersey was noted as having the lowest Text4baby enrollment rate of 1.2% among states with large numbers of estimated new pregnancies and births (www.text4baby.org). CMS's offer to provide additional support to four, as yet unselected, states could be an important part of closing

New Jersey's disparate infant health outcomes. CMS held within its choice of New Jersey, the potential to do the most good, in the state with the lowest Text4baby enrollment, and with the largest disparity in race based infant mortality and other poor infant outcome markers (prematurity and low birth weight) in the United States. If there is anything at all, that can be done to mitigate these disparate outcomes, it is a moral imperative.

Research of CMS began with their Press Office. I spoke with Ms. Keya Joy-Bush, CMS Program Press Lead for Minority Health and forwarded my request for the announced Text4baby state contract information via email, as she requested and would be forwarded to people within CMS that Ms. Joy-Bush thought would be able to help me. I was promptly contacted via email by Marsha Lillie-Blanton, Director of Quality, Evaluation and Health Outcomes, Children and Adults Health Programs Group, Center for Medicaid and Children Health Insurance Program (CHIP) Services at CMS. Donna Cohen Ross, Senior Policy Advisor and Director of Enrollment Initiatives, Center for Medicaid CHIP and Survey & Certification Centers for Medicare and Medicaid Services and Lekisha Daniel-Robinson, Maternal-Infant Health Insurance Specialist for CMS were all very interested and contacted me multiple times via email. Then I was asked if I would be interested in having a conference call regarding New Jersey and CMS Text4baby.

Marsha Lillie-Blanton, Donna Cohen Ross and Lekisha Daniel-Robinson they arranged their schedules around mine and called me at home to discuss New Jersey and Text4baby CMS support. Preparation was completed at the highest level for this opportunity to converse with CMS officials. A photo of my kitchen counter nearest the

phone was obtained, so that I remember that it really happened. CMS called at the scheduled time and 30 minutes of discussion regarding my Text4baby implementation project within a community of homeless, young mothers in New Jersey. Current research regarding New Jersey's infant health outcome disparity was also discussed. They were hoping someone from the state level would contact them, due to the high need to change infant health outcomes. The only New Jersey based CMS request, to this point in time, came because of the Text4baby implementation project at Covenant House.

Donna Cohen Ross explained what would be needed if New Jersey wanted to be considered for a contract and she assured me that they knew they only had a few days in which to complete the application. The states selected must commit to cutting red-tape, capitalize on technology, create opportunities to enroll in Medicaid, focus on renewal, and be able to forge partnerships. It was explained that other states had already completed the process, yet they agreed New Jersey has the biggest need. This high level group of CMS leaders had already chosen two states for contracts. Yet, they were willing to wait on selecting the remaining two states; if someone from the New Jersey State Legislature or Division of Public Health contacts them. What a wonderful experience and opportunity was given to further advocate for New Jersey's vulnerable mothers and infants.

Governor Chris Christie's office was contacted and my call was directed to the office of Valerie Harr, Director of the Division of Medical Assistance & Health Services. The time constraints of this impending CMS contract offer were highlighted. Ms. Kim Hatch, Assistant to the Director, Division of Medical Assistance & Health Services requested an email from me which included links to the CMS and Text4baby announcement.

Advocacy is an important component of serving the healthcare needs of vulnerable populations.

Collaboration and teamwork within the community would be needed and Professor Basirah Taha was contacted immediately after discussions closed with Director Harr's office. Although this area of healthcare had never been discussed before with Professor Taha, it was well understood. Professor Taha asked me to stay by the phone.

Assemblywoman Sheila Oliver's Senior Legislative Aide, Mr. Cameron Jones, Jr. contacted me at my home that morning. Numerous phone calls and emails took place with assurances of follow-up at the state level. Assemblywoman Oliver sits on the Legislative Services Commission Committee and is the Primary Sponsor of many legislative bills concerned with women, families and children, in addition to fiscal responsibility and funding.

CMS has yet to announce which four states will be awarded contracts.

The Covenant House administrative Process Document formatting template was generously shared by Meghan Leigh, Assistant Site Director, supporting Text4baby enrollment process sustainability at both clinical sites at the conclusion of this implementation project. Jenna Marie Mellor, Domestic Global Health Fellow contributed to the collaborative creation of the Text4baby Process Document for Covenant House-Crisis Shelter and Covenant House-Transitional Housing for Mothers and Babies, at Raphael's Life House. The Process Documents which were created as a result of this implementation project provide the necessary guidelines ensuring sustainability of this maternal-infant mHealth at both Covenant House-New Jersey project clinical sites. In November, 2013, a representative of Covenant House-Asbury Park, New Jersey

unsolicitedly requested and was provided Text4baby materials in order to offer this maternal-infant mHealth program within their homeless youth day-service program offered at their site. Replication of this Text4baby implementation project is easy among those interested in meeting, accepting and supporting young, homeless pregnant or new mothers where they are. Text4baby provided the platform for this project which highlights young, homeless mother's strengths and capabilities in using technology and social capital; both of which further support their journey in achieving optimal maternal-infant health outcomes.

Yet, of more significance and value is the response that emanated from within this community of young, homeless mothers evidenced during the last clinical site visit at Raphael's Life House. This site visit took place as a small group discussion regarding sustainability of Text4baby within Raphael's Life House. Shakira was visiting and the first to advocate for the program continuing. Shakira, a former resident, so willingly shared her leadership capabilities as she began an open discussion of where and how they all could take the Text4baby program to other young mothers within the community, at Raphael's Life House and within the larger community in general. I brought Text4baby tear-off registration pads and Text4baby program posters to this last visit, in hopes of having exactly this happening. Shakira began with an offer to take Text4baby to her county's Welfare Office, Yazmin offered to take Text4baby to the WIC office in Jersey City, as an additional site. Ahkeelah offered to "take it down the street" to the Elizabeth Public Library, because "there's a lot of young mothers there". Ahkeelah, was silent and then additionally suggested that a Text4baby tear-off registration sheet be placed on the dresser, as a "Welcome to Raphael's Life House" gesture, for each new homeless mother

as she arrives and visits her new mother-infant room within this Covenant House Transitional Housing site. The sustainability suggestions offered from within this community of homeless young mothers could not be more gratifying or inspiring.

It is evident, after completing this project, that implementation of the mHealth program, Text4baby, is an appropriate and sustainable platform to inform vulnerable, underserved, homeless pregnant and postpartum 18-21 year old mothers, residing within Covenant House-New Jersey, about evidence based, actionable maternal-infant health related information. Further research is needed regarding implementation and outcomes of the Text4baby mHealth program as it pertains to homeless populations of young mothers.

REFERENCES

- Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2), 143-164.
- Bennett, S. (2012). What's a Typical Day on the Internet? Retrieved June 6, 2013, from http://www.mediabistro.com/alltwitter/internet-day_b19376
- Blumberg, S. J., & Luke, J. V. (2012). Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December 2012. Retrieved June 21, 2013, from <http://www.cdc.gov/nchs/nhis.htm>
- Evans, W. D., Abrams, L. C., Poropatich, R., Nielsen, P. E., & Wallace, J. L. (2012). Mobile health evaluation methods: The text4baby case study. *Journal of Health Communication, 17*, 22-29.
- Evans, W. D., Wallace, J. L., & Snider, J. (2012). Pilot evaluation of the text4baby mobile health program. *BMC Public Health, 12*:1031.
doi: 10.1186/1471-2458-12-1031.
- Gazmararian, J. A., Elon, L., Yang, B., Graham, M., & Parker, R. (2013). Text4baby program: An opportunity to reach underserved pregnant and postpartum women. *Maternal and Child Health Journal*, [Epub ahead of print].
doi: 10.1007/s10995-013-1258-1
- Gazmararian, J. A., Yang, B., Elon, L., Graham, M., & Parker, R. (2012). Successful enrollment in text4baby more likely with higher literacy. *Journal of Health Communication: International Perspectives, 17*, s3, 303-311.
- Green, M. K., Dalrymple, P. W., Turner, K. H., Rogers, M. L., Williver-Farr, H., & Zach, L. (2013). An enhanced text4baby program: Capturing teachable moments throughout pregnancy. *Journal of Pediatric Nursing, 28*, 92-94.
- Jordan, E. T., Ray, E. M., Johnson, P., & Evans, W. D. (2011). Text4baby: Using text

messaging to improve maternal and newborn health. *Nursing for Women's Health*, 15(3), 206-212.

Parker, R. M., Dmitrieva, E., Frolov, S., & Gazmararian, J. A. (2012). Text4baby in the United States and Russia: An opportunity for understanding how mHealth affects maternal and child health. *Journal of Health Communications*, 17, 30-36.

Remick, A. P., & Kendrick, J. S. (2013). Breaking new ground: The text4baby program. *American Journal of Health Promotion*, 27(3), s4-6.

Ryan, K., & Kelley, T. (2012). *Almost home: Helping kids move from homelessness to hope*. Hoboken, NJ: John Wiley & Sons, Inc.

Smith, A. (2010). Pew Internet & American Life Project: Mobile Access 2010. Retrieved July 2, 2013, from <http://www.pewinternet.org/Reports/2010/Mobile-Access-2010.aspx>

vanVelthoven, M. H., Majeed, A., & Car, J. (2012). Text4baby – national scale up of an mHealth programme. Who benefits? *Journal of the Royal Society of Medicine*, 105(11), 452-453.

Whittaker, R., Matoff-Stepp, S., Meehan, J., Kendrick, J., Jordan, E., Stange, P., Cash, A., Meyer, P., Batty, J., Johnson, P., Ratzan, S., & Rhee, K. (2012). Text4baby: Development and implementation of a national text messaging health information service. *American Journal of Public Health*, 102(12), 2207-2213.

World Health Organization. (2011). mHealth: New horizons for health through mobile technologies. Retrieved July 1, 2013 from http://www.who.int/goe/publications/goe_mhealth_web.pdf

Appendix A
Infant Mortality Rates by State

[Infant Mortality Rates by State.pdf](#)

Appendix B
mHealth Conceptual Model of Behavior Change for the Text4baby Project

[T4bConceptualModel.jpg](#)

Appendix C
Text4baby Poster

[T4b Poster.pdf](#)

Appendix D
Text4baby Bilingual Enrollment Card

[T4b Bilingual Enrollment Card.pdf](#)

Appendix E
Text4baby Enrollment Tear-Off Pad

[T4b Enrollment Tear-Off Pad.pdf](#)

Appendix F
Text4baby Tuesday Weekly e-Newsletter

[T4bTuesdayWeeklyNews.jpg](#)

Appendix G
TEAM Text4baby Certificate

[TEAM T4b Certificate.pdf](#)

Appendix H
Text4baby Stories From The Community

[T4bStoriesFromTheCommunity.jpg](#)

Appendix I
New Jersey's Regional Early Intervention Collaborative Developmental Brochure

www.reic_developmental_brochure.pdf

Appendix J
Florida WIC Program: Food for Baby's 1st Year Brochure

www.food_for_babys_1st_yr-eng.pdf

Appendix K
Covenant House Mission Statement

Covenant House Mission Statement

We who recognize God's providence and fidelity to His people are dedicated to living out His covenant among ourselves and those children we serve with absolute respect and unconditional love. That commitment calls us to serve suffering children of the street, and to protect and safeguard all children. Just as Christ in His humanity is a visible sign of God's presence among His people, so our efforts together in the covenant community are a visible sign that affects the presence of God, through the Holy Spirit among ourselves and our kids.