PERCEPTIONS OF HEALTH PROVIDERS
ABOUT THE COLLECTION AND USE OF DATA
RELATED TO CHILDHOOD OBESITY
BY MOBILE HEALTH UNITS

A Doctoral Thesis Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Christopher Douglas-Oguneko

May 2018

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May 2018

Dedication

Every dream comes to reality through self-perseverance, consistency, and devoted guidance. My success thus far is owed to most importantly, my family, friends and acquaintances through many walks of life.

My humble efforts are owed and dedicated to my family: My mother, Charlotte; brothers, Floyd(Kimberly), Samson (Deba), and Henry; my son, Cyler; my father, Olusegun; my aunts and uncle, Debra, Michelle, Willie Arthur, Sharon, and Tanisha; my grandmother, Ruby Robertson; my nephews/nieces (Floyd Jr., Kayla, Donshay, Noah, Isaiah), the Frazier Family (Mr. & Mrs. Charles, Samille, Cedrick (Melissa), Havelyn; and many relatives.

Lastly, I dedicate this work to the community that continues to press forward in finding solutions for childhood obesity and the previous researchers whose information is within this work. To the general population that find this work interesting and valuable, and to the people that pray for my happiness!

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Abstract

Background: Childhood obesity has become a serious medical concern affecting numerous families nationwide. One of the ways that the problem of childhood obesity is being addressed in the U.S. is through mobile health units that travel around communities to schools and neighborhoods and provide vital healthcare services to children and young adults, who might not otherwise have access to healthcare in their community. However, lack of resources, data sharing capability, and interconnectivity has often been the cause of these units not able to expand their coverage among the most vulnerable. **Purpose:** This study attempted to understand how mobile health workers' data can be used to improve services and assist in combating childhood obesity.   **Method:** The study utilized descriptive statistics to analyze survey responses and interviews to understand how mobile health unit (MHU) providers utilize collected data regarding childhood obesity. **Results:** Descriptive statistic results from fifteen healthcare providers generated meaningful recommendations that could be used by mobile healthcare units and healthcare providers nationwide, which in turn is expected to help make children healthier. It is further explained how the interaction between the mobile health worker and at-risk children must be increased, while resources must be spent in data integration, data sharing and properly training health workers. **Conclusion:** This study recommends further research into expanding mobile health workers' access to data, ushering in an environment through collaboration, where health workers can learn and expand their knowledge base to appropriately use and increase their coverage of patients both currently in need and at-risk.

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Chapter I

Introduction

Children today are more likely to be obese than they were decades ago.

According to the Centers for Disease Control (CDC), nearly 13 million children and

adolescents are obese (Ogden, Carroll, Kit & Flegal, 2012). Common factors that may

contribute to this obesity crisis include unhealthy eating patterns, lack of physical

activity, and in some cases, genetic disorders. These causes may then lead to serious

health conditions, including heart disease, type 2 diabetes, high blood pressure, and high

cholesterol (Pulgarón, 2013). Because of the comorbidities associated with obesity,

researchers have suggested that obesity in children may lead to a quality of life like

children with cancer (Wieting, 2008). In addition, the economic burden associated with

the health disorders of childhood obesity is massive, consider that nearly "$14 billion" is

spent on financial cost and care for obese youth (Duke Global Health, 2014, para.1). This

breaks down to around "$19,000 per child" who is obese, compared to a child in a normal

weight category (Duke Global Health, 2014, para.1). Given this insight into childhood

obesity, it is important to consider whether current interventions are meeting the demands

of the childhood obesity epidemic.

Background

Many school-related and home-based factors such as a lack of access to healthy

food, eating patterns, lack of physical activity and parenting style have contributed to

obesity in children (Sahoo, Sahoo, Choudhury, Sofi, Kumar, & Bhadoria, 2015). The

presence of these factors has also revealed viable solutions to this growing epidemic. For

example, WHO recommends that increasing the consumption of fruits and vegetables,

limiting the energy intake of total fats, and completing at least 60 minutes of physical activity daily, are key mechanisms for minimizing the obesity epidemic (Popkin, Adair, & Ng, 2012).

Several studies suggest that children are spending far too much time playing video games, participating in computer activities, and being captivated by television. These activities take a child's interest and time away from physical activities (American Academy of Child and Adolescent Psychiatry, 2011; Banis, et al., 1988; Whitlock, et al., 2005). Research has also reported a host of adverse health and behavioral implications for young children that watch too much television (Morowatisharifabad, Karimi, & Ghorbanzadeh, 2015). These reports also highlighted the stark reality of children spending many hours on computer games, cell phones, or video games. Participating in these sedentary activities limits the time for being physically active. Additionally, food advertisements within digital media such as Facebook or Instagram can encourage the selection of unhealthy food choices (Zimmerman & Bell, 2010). Consequently, detrimental food choices and inactivity are resulting in unhealthy weight gain and further discourages developing lifestyle habits of eating healthy and regular physical activity.

It is recommended that children obtain at least 60 minutes of daily aerobic physical activity as detailed on the Center for Disease Control and Prevention's (CDC) website (CDC, 2015). Many children are not getting enough physical exercise which has resulted in 17% of all children and adolescents now being impacted by the obesity epidemic (Ogden, Carroll, Kit, & Flegal, 2014). Some suggest that community designs may inhibit physical activities. For example, the uneven surfaces or complete absence of sidewalks makes it difficult or dangerous for children to bike or walk to school.

Recreation centers and parks are limited in some areas, and transportation to get to these activity zones may not be available. In addition, there are only 27 states that have regulations for community scale designs. As a result, almost half of the children in the United States do not have a park, recreation center or sidewalk in their neighborhoods, not to mention the number of children who do not have access to areas that have these amenities (State Indicator Report on Physical Activity, 2010).

Accessibility for adolescents to healthcare services, physical activity options, and healthy nutrition are all factors that can play a beneficial role in lessening the childhood obesity epidemic (Karnik & Kanekar, 2012). However, many adolescents do not obtain healthcare services, including visiting a physician to have their annual well-child exams (Hill, et al., 2012). This is due in part to transportation issues and can adversely impact the childhood obesity prevention efforts (Hill, et al., 2012). This background information revealed the complex nature of childhood obesity. While the issue is challenging, there are interventions that have been deployed to reduce the impact obesity on children. Let us first explore the problem statement of this research, followed by a discussion on the purpose of this study and the research question.

Statement of Problem

There is a disconnect between mobile health unit (MHU) data collection paradigm and how such data serves the health service consumer. Literature surrounding MHU data collection does not shed much light into the difficulties in the data collection and aggregation process. Demographic data surrounding this data collection process have not found much rigor in literature. With the expansion of mobile health data collection, there might be challenges in the realm of data integrity and data security paradigm that has not

been researched exhaustively. It is not known for certain whether consumer privacy is being given paramount importance against the backdrop of the existing regulatory framework and standardization process. Furthermore, there is little evidence of how such data is shared across different mobile health providers or even if such sharing process exists. This study embarked upon exploring these areas of data collection, data sharing and data usage by MHUs as it relates to the prevention of childhood obesity.

Purpose of Study

This study was designed to understand how MHUs healthcare provider perceptions of collected data can be used to improve services and assist in combating childhood obesity. The researcher wanted to understand what type of data is collected, how the data is analyzed, and how the data results are shared with others. The method and type of data collected by mobile healthcare providers may prove beneficial for other mobile health units, that could be incorporated into daily practice.

The Research Question (RQ)

The study investigated the following research question:

> What are the healthcare providers' perceptions of mobile health unit's data collection processes, as it relates to the prevention of childhood obesity?

Overview of Methodology

The study utilized data gathered from healthcare providers of MHUs across the U.S. Using online survey and telephone interviews, the researcher gained insight into the provider perception of how MHUs are affecting the childhood obesity reduction. The study utilized descriptive statistics to analyze survey responses and interviews to understand how MHU providers utilized collected data regarding childhood obesity. Descriptive statistic results generated meaningful recommendations that could be used by

mobile healthcare units and healthcare providers nationwide. Moreover, these meaningful recommendations could help make children healthier.

Besides engaging in quantitative methodology, this study employed a qualitative methodology. Qualitative research methods were used to confirm, cross-validate, or corroborate findings within a study and the data collection was also implemented concurrently (Creswell, 2012, 2013). Furthermore, qualitative research approaches yield valuable comprehensive data (Creswell, 2012, 2013). In this context, it is more appropriate to understand the complex relationship between service and experience levels of mobile health workers and their attitude and perception of childhood obesity.

It is important to note that, the qualitative nature of this study provided the selected subjects adequate opportunity to reflect on their immediate personal experiences with mobile health data collection process and how it shaped their perception related to the target population they serve. Thus, a combination of quantitative and qualitative research design imparted a more nuanced and incisive investigating framework which explored a plausible relationship between methods of data collection and incidence of obesity reduction in the affected population.

Theoretical Framework

The 1950s Health Belief Model (HBM) provided the theoretical foundation for this work as it examines the work of people having a motivation to change a behavior (Jones, Jensen, Scherr, Brown, Christy, & Weaver, 2015). Godfrey Hochbaum, Stephen Kegels, and Irwin Rosenstock are the developers of the HBM that was created to explain preventative health behaviors (Rosenstock, Strecher, & Becker, 1988). The initial focus

of the HBM was the prevention of diseases as the developers believed that there was a lack of effort on preventative measures by individuals.

The individual motivation to make a health behavior change can be divided into three categories: individual perceptions, modifying behaviors and likelihood of action (Rosenstock, Strecher, & Becker, 1988). Individual perceptions are factors of a disease that the individual believes are most severe and whether the severity is important enough that would motivate a change. Modifying factors include an individual's cultural beliefs and threats that may persist from the disease. The likelihood of action for an individual is the possibility of taking preventative health action. The grouping of all three categories is what Hochbaum, Kegels, and Rosenstock believed would spring a person into a positive action of making a change, which in this case, would be preventative health behavior (Rosenstock, Strecher, & Becker, 1988).

The current study takes support from the HBM as it sought to understand the nature and scope of data as it relates to childhood obesity. Understanding the nature of data and the circumstances surrounding the data collection process contributed to recommendations of obesity preventative measures in children. A nuanced grasp of data collection will help shape policies and procedures in health prevention methods that MHU providers could implement within their mobile platforms.

Significance of the Study

Recommendations for mobile unit providers following the study provided possible support to and solves previous challenges in relation to childhood obesity. For example, data collected and utilized in an innovative way that has resulted in lowering children's body mass index by a Californian MHU organization, the same data could be

collected and used by a MHU in Florida to see if it has the same effect. This is an overall goal of the current study. It is hoped that the study will foster an impetus for MHUs across the nation to collaborate and solve one another's challenges.

Definitions of Terms

For this study, the following definitions have been provided:

1. **Obesity:** According to the CDC, obesity is defined as **"**Weight that is higher than what is considered as a healthy weight for a given height is described as overweight or obese" (CDC, 2016, para. 1)

2. **Body Mass Index (BMI):** According to the CDC BMI is used as a screening tool for overweight or obesity (CDC, 2016).

3. **Adolescents:** According to World Health Organization (WHO) adolescents is defined as "… the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to19" (WHO, 2017, para. 1).

4. **Mobile Units:** Mobile Units are transportation vehicles utilized to provide an onsite service in a cost-effective manner. They commonly allow access and availability to the public for a needed service (Why Mobile, 2014).

5. **Sedentary Activity:** Sedentary activity is defined as sitting, watching television, and any other low energy level activities that may lead to negative health outcomes (Chomistek et al., 2013).

6. **Physical Activity**: The CDC defines physical activity as any movement of the body that expends energy, such as walking, dancing, golfing, gardening and swimming (CDC, 2015).

7. **Nutrition:** The WHO defines nutrition as the intake of food in the body and the source that provides energy. Having a well-balanced diet that leads to good health is considered proper nutrition and a diet that leads to diseases and low productivity is considered poor nutrition. (WHO, 2015).

Conclusion

Chapter 1 provided a description of the problem addressed by this study, the purpose of the study, the research question, theoretical framework, and the definitions relevant to the study. This study involved collecting and analyzing responses from healthcare providers in MHUs in select geographical areas to assist current and future MHUs navigate some unique challenges in ushering in a prevention paradigm in childhood obesity. Chapter 2 includes review of existing literature on current data collection related to childhood obesity prevention. In addition, Chapter 2 address current literature on access, quality, privacy, security and challenges surrounding the data collection process.

<center>**Chapter II**</center>

<center>**Review of the Review**</center>

Background

MHUs are exactly what their characterization calls for – they are mobile in that they can be moved from place to place. This mobility allows them to provide a host of healthcare related services to a wide stretch of community members. The mobility places MHUs in a unique vantage position to engage and support communities that are underserved (Office of Minority Health, 2016). These vulnerable populations often cannot gain access to healthcare services, but the MHUs provide the linkage between traditional healthcare facilities and the vulnerable populations. According to the Office of Minority Health, "Mobile clinics operate in every state across the country plus D.C and Puerto Rico. They serve communities that have the poorest access to health services in the U.S: rural communities as well as urban communities" (Office of Minority Health, 2016, p. 2). Because MHUs have low overhead costs, which results in the services being "cost-effective" (Hill et al., 2012, p. 1) or in many cases even free. Besides delivering traditional healthcare services in a mobile setting, these MHUs are engaged in the monitoring, assessing, collecting, and documenting of data related to the community members served via the MHUs.

To this end, MHUs acts as an extension of the traditional healthcare delivery protocol. MHUs perform most of the traditional healthcare services while accommodating community members by meeting them in their neighborhoods. This enhanced accesses to community members enables MHUs to collect additional data that may have otherwise been uncollected.

Thus, the forthcoming literature review focuses on key issues pertaining to a wide range of mobility related issues associated with MHUs. This includes smart mobility health platforms such as, cell phones, iPads, computers connected to the internet, as well as wearable digital devices, and to motor operated vehicles. Besides providing mobility, flexibility and enhanced access, these platforms have increased engagement in treatment, identification, and data collection of issues pertaining to childhood obesity. This literature review informed and guided the current research proposal on the health provider's perception about the quality of data collection process via these mobile platforms.

Current Mobile Platform Data Collection

Mobility and smartphones. As discussed earlier, mobility has extended healthcare providers ability to reach many community members that do not have access to the traditional brick and mortar healthcare facilities. With the combined power of software platforms, digital technologies, and internet services, the healthcare industry has gained powerful capabilities to connect with and collect data from a wide spectrum of populations. An example of this are the health applications used on smartphones to treat, understand, and monitor the complex issue of childhood obesity.

Tate et al. (2013) reported that digital technologies are important mobile health tools that can assist in childhood obesity interventions. According to their research findings, childhood obesity can benefit from the efficiency of electronic mobile devices to collect data, assess patients' current health, and intervene on the patients' behalf in real-time. Tate et al. (2013) emphasized the beneficial ability to personalize mobile digital devices such as, cell phones, iPads, and other smart devices. These mobile devices provide a platform for providers to monitor and collect patients' data, such as weight,

blood pressure, and exercise routine. This data can be automatically reviewed, and real-time feedback provided to adjust the intervention based on the patient's need. This mobility eliminates the need of the patient to travel to a clinic, hospital, or physicians' office. Besides mobility, the digital devices also allow for additional layers of personalization. For example, clients could choose a preferred language, increase font size, change color schemes, and even use hands free technology of any smart device. These individualized aspects of mobility and personalization increases the likelihood to reach vulnerable populations. Patients obtain a comfort and connectedness level of association with their personal smart device. This relationship with the smart device is often greater than that of the connectedness clients have in the sterile setting of a hospital clinic or physician's office.

Existing studies further reveal that youth have a preference to use digital devices while engaging in weight management interventions (Woolford et al., 2011). Woolford et al. (2011) discussed the positive findings of a study which empowered youth to engage in weight management behaviors via direct text messages. This study involved of a small population (n=24) of youths. The healthcare providers sent positive and inspiring text messages to youths in a weight loss program to influence their behavior toward nutrition and fitness. The participants were surveyed about the content and wording of the text messages received during the program. The findings revealed a preference for direct messages related to nutrition, weight loss suggestions, and direct, non-evasive feedback on individual weight loss results. All participants noted that they preferred receiving messages that included emoticons, symbols, such as popular smiley faces, and other positive images (Woolford, 2011, p. 15). While this study had a small sample size, it does

reveal encouraging results to expand the use of smart mobile technologies to a larger population.

The use of smart devices in connection to health-related interventions was explored in a study by Krebs and Duncan (2015). Krebs and Duncan conducted a cross-sectional survey of smartphone users (n=1,604) across the U.S. The survey was designed to gain insight into the preferences about individuals' reliance of downloaded health applications on their smart devices. Findings revealed that just over half of the participants (58%) had downloaded a health-based application (Krebs & Duncan, 2015, para. 3). Of those participants, daily usage of the applications was for nutrition and exercise support. Just under half of the participants (45.7%) believed the product to be trustworthy, secure, and beneficial toward improving their health (Krebs & Duncan, 2015, para. 3). Findings further reported that the younger obese participants preferred health related applications. These individuals also had more than a high school education and were members of the Latino or Hispanic population (Krebs & Duncan, 2015, para. 22).

Jensen, Duncombe, Lott, Hunsaker, Duraccio, & Woolford (2016) also studied the benefit of smartphones in a weight loss intervention program for youths. Their research studied overweight or obese youths (n=16). The average age of participants was 14 years old. The first phase consisted of a 12-week treatment program. This included healthcare providers sending text messages via smartphone applications and in-person group counseling sessions. The participants received daily health related text messages and could engage in personal monitoring of their own weight loss results via their smartphone. The first phase was followed by an additional 12 weeks of smartphone

intervention only. The results did reveal weight loss during the first phase of the program, which consisted of both smartphone intervention and in-person counseling. However, during the smartphone only phase, participants did not lose weight, and could not maintain their prior weight loss. Due to the mixed outcome of this study, further investigation into the digital only intervention should be pursued to uncover the lack of weight loss and maintenance during the digital only phase of the program.

      Mobility and wearable devices. As the above studies revealed, the smartphone device is a key component in many of the healthcare mobility programs. This is due in part to the expansive power of the smartphone to evolve and expand to meet the expectation of the consumer. Similarly, healthcare mobile platforms are attempting to evolve with digital trends. A current trend among consumers is using wearable devices.

      Wearable mobile devices require a physical component and a software component. The physical component is worn on the body, while the software working within the device collects the data. For example, the wearable device measures the heart rate, calories burned, steps taken, and even sleep and awake patterns of the individual wearing the device. Because of their capabilities, wearable healthcare devices have many applications. Some of the key goals of the wearable healthcare devices includes capture of patient medical data, assist in patient compliance, and assist in remote patient monitoring (Medical Futurist, 2016). This technology can even assist in surgeries (Farr, 2014). These wearable technologies have even been used in the treatment of overweight teenagers. By building the applications to include music, games, and child appropriate content, youth could be encouraged to use wearable devices, which in turn can help lead them toward better health. Most of the applications require parent approval and are

typically geared towards engaging the entire family toward health lifestyle behaviors. Additionally, most child-centered wearable devices are water proof when necessary, as in the case of watches or body sensors, and all attempt to be attractive in design features.

The European Union funded a project designed to develop mobile and wearable devices that were attractive, water proof if needed and could study and treat issues relating to teenage obesity (Standoli, Guarneri, Perego, Mazzola, Mazzola & Andreoni, 2016). The research included a combination of mobile technologies, such as a smart phone that could assist in transmitting data collected from a wearable device, such as a t-shirt or wrist band. The project entitled PEGASO tested their devices on teenagers hailing from Spain, Italy, and the United Kingdom (n=407). The goal of PEGASO was to collect physical fitness and behavioral activities of the participants.

PEGASO's overarching goal was to influence and treat overweight or obese participants based on the data collected. The preliminary results based on participants in focus groups reported found participants enjoyed the wearable t-shirts. The participants reported strong interest in the data collected about their fitness activities. In observing the participants' preference for stylish and trend setting apparel (Standoli et al., 2016, p11), the study opens an interesting window into the future utilization of wearable apparel and healthcare treatment protocols toward childhood obesity.

Consider another international study on wearable health devices. A study of adult Australians in 2015, revealed 70% of the sample participants (n=1501) believed wearing a sports watch or smart watch improved physical fitness (Purple Profile, 2015). This survey was conducted by a research group in Sydney, Australia. The study reported that a majority (81%) of people rely on wearable devices to improve fitness (Purple Profile,

2015, para. 2). While this study is based on the adult population, it does provide an understanding of adults' ability to influence health choices and lifestyle behaviors of children. As these adults are more apt to embrace wearable technologies, it would be likely that the children in their lives would be more apt to also rely on wearable technologies.

Like the adult Australian study of wearables on the wrist, the Centers for Disease Control & Prevention (CDC) also reported findings of a study to assess the ability to collect data from wearable wrist devices (Schaefer, Van Loan, & German, 2014). The Schaefer et al. study was conducted on young children wearing a digital wrist device. The study involved participants between the ages of 7-10 years old (n=24). The study was conducted in 2012 and lasted for 4-weeks. The goal of the research was to assess whether children would comply and wear the device based on the guidelines given, as well as collect data on heart rates of the participants. The participants tested three different digital wrist devices. Each week the children, along with their parents exchanged the worn devices for new devices. During the visits with the researchers the children and parents engaged in interviews.

The children reported that they needed devices that were comfortable, waterproof, and "cool" to wear (Schaefer et al., 2012, p.3). All devices were returned damage free. In general, the children did not like the devices that were noisy, uncomfortable, and was embarrassing to wear. Regarding the compliance rates for keeping the devices on during the full study period, the most favored device was the Polar Active (98%), followed by the Actical device (92%). The least favorite was the SenseWear (28%) (Schaefer et al., 2012, p.4). The participants noted that the decision to remove the SenseWear device was

due to discomfort. Other reason for removing any one of the devices included discomfort as well as, removal for a water or sports activities and then forgetting to put it on gain. Like the Australian adult study, this study also provided insightful findings into a population other than the target population of this study. Although these are quite young children, in less than a decade they will be teenagers. Based on existing trend, many of them will be confronted with weight issues. Understanding their preferences toward wearable devices will assist researchers and healthcare providers in treatments and mobile interventions toward childhood obesity.

Barbee and Bennet (2016) engaged in a quantitative study of Canadian fifth graders over an 11-week period (n=127). In this study, the participants engaged in monitoring, reporting, and goal-setting via the wrist devices that were connected to a monitoring software. The physical component worn on the wrist was the well-known Polar H7 Heart Rate Sensors (Polar, n.d.). The Polar device communicates with the FITSTATS software device that monitored the participants heart rate (FITSTATS, 2017). The participants wore the device during physical education class at school. The device collected data on their heart rate during this period. Additionally, the participants had the option to predetermine activity goals. If a participant achieved a goal, a virtual badge reward was delivered via the software.

The results reveal positive relationship between wearing the wrist device and increased physical fitness. Statistical evidence reported a "significant effect between the conditions of wearable vs. non-wearable, $p < .001$. The effect size, Cohen's $d = 1.09$ which is indicative of a very strong effect" (Barbee & Bennet, 2016, p.3). Additionally, adult classroom teachers noted that the wearable device increased compliance by alerting

when the student was in their target heart rate, and when they were not. This study reveals the influence that wearable technology has on improving children's knowledge about physical fitness, such as heart rate. Moreover, the wearable device acts as a non-threatening compliance monitor, which encourages the child to make specific fitness goals and strive to meet them. Even if the device is worn for one hour a day during physical fitness class, it is a right step in the direction of engaging the obese child to embrace the technology as a supportive tool toward health and well-being.

Finally, these wearable devices, just like the smart devices are driven to empower and influences the wearer of the device to actively manage health related issues such as childhood obesity. But, as revealed in many of the studies, the data collected from the wearable device had to be delivered to a physical healthcare provider's office or facility. What about the population of individuals that simply cannot get to the physician's office? How do community members that cannot travel to a healthcare facility benefit from mobility in overcoming obesity? Fortunately for this population motorized MHUs can assist individuals that cannot or will not have access to healthcare facilities in their neighborhood. In this scenario, the motorized MHU will come to these neighborhoods and deliver a host of healthcare related services. Let us consider the motorized MHU in the context of the healthcare industry and specifically in data collection of childhood obesity.

Background of Mobile Health Units

There is an approximate 1500 - 2000 mobile clinics across the U.S. and the number continues to grow (Hill, Powers, Jain, Bennet, Vavasis, & Oriol, 2014, p. 262). The Affordable Care Act (ACA) has enabled the creation of many mobile clinics, as it

provided insurance coverage to millions. With millions obtaining healthcare services, there remains barriers such as lack of transportation, no access, and limited money that hinders millions from making hospital or clinic appointments. In these cases, motorized mobile clinics provide the necessary support to these community members. Typically, mobile clinics serve the vulnerable populations that are challenged by having limited or no transportation, low socioeconomic status, and language barriers that make healthcare visits uncomfortable.

According to the American Journal of Managed Care (Hill et al., 2014) growth within the mobile clinic services and collaboration among these mobile units may prove noteworthy in sharing information (Hill, et al.; Mobile Health Clinics in the Era of Reform, 2014). This research examined the impact of mobile clinics based on access, quality, and costs due to the delivery of healthcare reform and increase in insurance coverage. The authors focused on a Mobile Health Map (Hill et al., 2014, p. 261) that provides a description of the demographics that a specific mobile clinic serves and the impact on access, quality, and costs. The Mobile Health Map intends for mobile clinics across the U.S. to register and provide details and description of data to build a comprehensive online review of current and new mobile clinics (Hill, et al., Mobile Health Clinics in the Era of Reform, 2014).

Currently, there are 644 mobile clinics registered that have provided information in relation to access, costs, and quality (Hill, et al., 2014, p. 261). Most of the registered mobile clinics provide primary care services and prevention services, while the others provide mental health, mammography, and specialty services. The primary goal of these clinics is removal of transportation barriers, financial burdens, reduce long wait times,

administrative processes, and avoidable emergency department visits and hospitalizations. By providing healthcare services to those that may not have access, mobile clinics serve around 5 million patients annually. The staggering number of patients served reveals that mobile clinics fulfill a critical role in the healthcare reform as it provides access to quality care at a low cost in vulnerable populations.

Examples of Mobile Clinics and Their Services

Family Van Clinic. The Family Van Clinic in Boston has successfully reduced high systolic and diastolic numbers from 10.7 and 6.2 mm HG by strictly providing follow-up visits (Hill, et al., 2014, p.263). The reductions were a 32% likely-hood for the risk of heart attack and a 45% likely-hood to have a stroke (H1ill, et al., 2014, p. 263). A second success story were results of a school-based asthma-care clinic in a low socioeconomic neighborhood that decreased school absenteeism and emergency room visits by providing a daily anti-inflammatory medication. These findings and background information about MHUs involvement in community healthcare service is a powerful example of their importance in healthcare mobility.

In a similar study, Hill et al. (2012) examined the success rate of mobile clinics from 2006-2009. The authors found that trust and accessibility in underserved communities yielded positive results in identifying undetected elevated blood pressure, glucose, and total cholesterol levels (Hill, et al., 2012, p. 406). The research further investigated the community based "Knowledgeable Neighbor" model, which acts as a friend in assisting community members in learning about local resources for healthcare treatment.

This community-based model was initiated by the Harvard Medical School within The Family Van services that offered health screenings followed by education, coaching and referrals to assist individuals with treatments. The Family Van built trust within community members as it allowed the individuals to control and guide their healthcare encounters. The individuals could select and choose what screenings they obtained and how they wanted to move forward with the material and advice presented by the healthcare practitioner. The individuals did not have to make an appointment, did not have a lengthy wait time, and the Family Van had a weekly presence in the community. Most of the time, patients were referred by another member in the community which fosters trust among the community members and the MHUs. Moreover, in most cases, the MHU did not charge for services, and in the cases the individuals had insurance, but failed to visit a physician due to transportation and lack of ability or trust of the system, they still received the appropriate services.

Teen Van. Turning to the west coast of the U.S. a California based MHU is dedicated to specifically providing healthcare to the homeless youth population. Dubbed the "Teen Van" this MHU has been in existence for over two decades (Romero, 2016). The Teen Van has provided healthcare services to "thousands of uninsured and homeless adolescents ages 24 and under" (Romero, 2016, para. 4). The MHU is led by Dr. Seth Ammerman and two nurses and has active support of the corporate giant Samsung, Stanford Children's Hospital and Children's Health Fund. The healthcare providers, along with a social worker and registered dietician offer services which include:

reproductive healthcare, chronic illnesses, substance abuse, depression and nutrition counseling. All services and medications are free and delivered at the time of the assessment.

Bahrain Childhood Obesity MHU. In 2008, the nation of Bahrain under the leadership of the Ministry of Health formed a task forced led by health and nutritional specialist to tackle the high rate of obesity in the country. According to a World Health Organization (WHO) report, Bahrain has one of the highest rates, "with 33% of adults aged over 20 classified as overweight, of whom 36% are obese. This was significantly higher than the global average for obesity, which in 2008 stood at 12%" (WHO, 2014, para. 3). In addition, to establishing five nutritional clinics in the most populated cities throughout the country, the government took the dedicated effort to tackle childhood obesity among school aged children.

To that effort, the Ministry created a mobile clinic which travels to schools and offers nutritional counseling and fitness information. The MHU is staffed with specialist in the treatment of obesity among children. This is important as Bahrain's children have a high rate of obesity. As of 2012, 30% of boys and 33% of girls in the age group of 6-12 were classified as obese (WHO, 2014, para.12). This obesity centric MHU demonstrates the role mobility provides in the intervention of chronic disease like childhood obesity.

Mobile Health Screening Unit. Mandated under the United Neighborhood Health Services (or UNHS) in Nashville, Tennessee, a MHU brings the "doctor's office" to community members (Rafferty, 2013, p. 2). The scope of the MHU is to offer free medical care, along with screening for hypertension, diabetes, and blood pressures, and BMI counts. Once the data is collected, the community member is provided counseling and referral to free medical services if needed. To expand the MHU to serve more members of the population, medical students, nursing students, nurse practitioner, and students-in-training manage basic blood pressures and blood sugars counts (Rafferty, 2013, p. 4).

In 2013, the MHU engaged in an initiative to improve the services offered to the community. The goal was to develop a sustained healthcare delivery model for the MHU. A free health day was marketed to community members at six locations near the Eastern Division of the UNHS clinics. These locations were selected because of their proximity to state operated healthcare clinics. The results revealed a total of 102 patients (n=73 adult, n=29 pediatric) were processed through the MHU (Rafferty, 2013, p. 8). The total number of participants were lower than planned, because of no available van driver for the MHU (Rafferty, 2013, p. 8). Data collected included BMI numbers, of which 25% of the population was overweight, 43.6% was obese, and 15% was classified as morbidly obese (Rafferty, 2013, p. 9).

Finally, these examples of MHUs reveal the importance in screening individuals with an array of health needs. These examples provide the qualitative and quantitative evidence that MHUs are needed in communities throughout the U.S. and abroad. More

specifically, these examples have demonstrated specific context to treating obesity in both adult and children populations.

Access and Quality Assessments of Mobile Units in Healthcare

Access. The review demonstrates the impact mobility has on the healthcare industry. From smartphones, to wearable devices, to motorized vans, regardless of the mode of mobility, the healthcare industry has been revolutionized. This leads to questions of access to these revolutionary modes of healthcare delivery. Are these modes accessible by all? Are they fairly distributed to all demographic populations?

Mobile clinics strive to improve access to vulnerable populations, bolster prevention and chronic disease management, and reduce costs (Hill, et al., 2014). The common goal of mobile clinics is to provide an alternative to the traditional clinic and hospital setting by eliminating barriers such as costly exams and accessibility for patients who lack transportation. (Hill, et. al, 2014).

Consider the example of The University of North Texas Science Center (UNTHSC) in Fort Worth, Texas, which created and implemented their own MHU in April 2014 (Smith, 2014). The 40-foot long mobile unit serves the underserved populations across Fort Worth and operates weekly at local elementary schools. The unit provides vaccinations, laboratory testing, sick visits, and numerous health evaluations with a focus on keeping kids healthy through health promotions and disease prevention at no cost to the patient (Smith, 2014). According to Program Director Laura Standish, "the need for the mobile pediatric unit has greatly impacted families, as there was once a time where there were barriers to healthcare, which included: financial hardship, language barriers, and a lack of transportation, insurance and U.S. Citizenship" (Smith, 2014, p. 1).

Similarly, The Junior League of Houston in 2000 donated a MHU to Texas Children's Hospital in Houston, Texas (SuperKids Pediatric Mobile Clinic, 2014). For the past 15 years, the "Super Kids Mobile Clinic," primarily serves the Hispanic population within a select low-income segment of the Houston area (SuperKids Pediatric Mobile Clinic, 2014, para.1). Additionally, The Ronald McDonald Care Mobile is an extension of Super Kids Mobile Clinic for Texas Children's Hospital and provides the same services in the southeastern part of Houston.

The University of Texas Health Science Center (UT Health) in Houston is another health system that incorporated a mobile healthcare unit into its academic setting. The Ronald McDonald House Charities (RMHC) and UT Health teamed up to provide preventive dental care and treatment to children in Houston and Galveston (Waddy, 2012). According to the Ronald McDonald House Charities President Debbie Adams, "The UT Health School of Dentistry and RMHC will deliver cost-effective, quality dental care to children in under-served communities across the area, literally opening the door to care for thousands of children" (Waddy, 2012, p. 1).

In reviewing a study concerning oral health status of children provided by a mobile clinic, it was determined that mobile clinics can be effective in decreasing tooth decay. The study mentioned in the Journal of Healthcare for the Poor and Undeserved, reviewed children (n=888) in different areas of Southern California that visited the mobile clinic two times per year versus first time visitors from 2008-2012 (Enciso, Sundaresan, Yekikian, & Mulligan, 2015). Enciso et al. reported that:

Seventy-eight children (mean age 9.6 years; 98.7% Hispanic) attended the clinic twice over a mean interval between visits of 1.5 years. These children had

statistically significant lower rates of decay in deciduous and permanent tooth

surfaces than matched children visiting the clinic for the first time (p<.05;

p<.001), and significantly less decay in their deciduous and permanent teeth than

at the first visit (p<.001; p<.05). Mobile clinics can be effective in decreasing the

decay in teeth, even when the interval between visits is longer than current

recommendations (Enciso et al., 2015, p.1).

Trust & Perceptions of Care. The above examples provided evidence of the

benefit received by vulnerable and underserved populations having access to the MHUs.

These adults and children had to trust the MHUs and the healthcare providers offering the

healthcare services. Besides healthcare services, trust must be delivered in the messaging,

marketing and engagement of community members for the MHUs to be fully accessible

by all. In many ways, the trust factor can be increased and improved if MHUs also

engage with the community members while grocery shopping, visiting a house of

worship, or attending a public gathering that community members would likely be at.

These efforts go a long way in establishing long-term trust among the vulnerable

populations.

Trust must also be present during the screening of clients. It is important that

healthcare staff ensures that the MHU has the best standards that are empathetic to the

client's hesitation to interact with the medical staff. Efforts to build trust could include

hiring and training individuals from the vulnerable populations being served by the

MHU. These newly hired individuals from the community could be important links

between the community and the MHU staff.

Additionally, establishing trust can ensure routine services are managed appropriately. For example, "The staff take care of little things like ensuring that computers are placed in such a way that health workers never have to turn their back to a patient. Nobody wears lab coats" as well as "turn up the radio during a consultation to prevent others from overhearing the patient, and methodically keep patient documents and schedules turned facedown" (Srinivasan, 2015, para.12). All these routines are important protocols that will establish a sense of trust among the members of the vulnerable populations and increase the likelihood of them visiting their local MHU.

Trust and perceptions of quality of care are linked components among those that visit MHU. Community members that decide to visit or not to visit a MHU, are often motivated by a perception that the MHU service cannot be trusted and will deliver lower healthcare services than a physician stationed in a hospital or emergency room setting. These misperceptions create significant distrust among community members and this leads to many foregoing any visit to the MHU. In a study by Kangovi, Barg, Carter, Long, Shannon, and Grande, 2013), access to MHUs were limited by the population's lack of trust and perception that healthcare is better in a hospital, than any type of ambulatory care, which would include the MHU setting (Kangovi et al., 2013, p.1199). This lack of trust and perceptions about the quality of care was a significant finding in this study conducted in 2011. The adult participants (n=44) were classified as low socioeconomic status that resided, whether homeless or not, in the greater Philadelphia, Pennsylvania region. Of the participants, nearly half (45%) had private insurance, and just under half (33%) had Medicare, with the remaining (21%) being uninsured or having Medicaid.

Two key findings were reported from the interviews, that the participants perceive "… hospital care relative to ambulatory care: better overall access across a variety of domains and higher levels of trust in the technical quality of hospital providers and services" (Kangovi et al., 2013, p.1198). The participants specifically felt that a greater level of trust in the capabilities and quality of care in a hospital versus a clinic. Many participants felt hospitals could handle challenging health issues better than a clinic setting.

The Kangovi et al. (2013) study reveals the importance of trust and perception as it relates to the MHUs ability to establish deep bonds within these low socioeconomic populations. These populations are typically marginalized because of their race, education, income, and health status. Moreover, research establishes a link between low socioeconomic status and higher rates of mortality (Shen, Wan, & Perlin, 2001, p.711). This further drives the need to ensure MHUs are positioned to build trust, overcome misperceptions on the quality of care delivered by MHU staff, and ensure the unique needs of the low socioeconomic populations are met.

Regulatory Landscape

Privacy & security. The advent of mobile healthcare has introduced a host of concerns over the privacy and security of electronic patient records. This issue impacts all modes of mobile healthcare delivery. Because, whether patient data is accessed, stored, uploaded, or downloaded via a smartphone, wearable device or on a laptop aboard a MHU – the issue of protecting it and ensuring privacy is crucial. Thus, it is important to consider the key issues of privacy and security as it relates to mobile healthcare and patient's electronic data.

Iwaya (2016) emphasized the positive contribution that mobile healthcare has made, especially in developing countries (Iwaya, 2016, p. iii). In these countries, the use of smart devices to facilitate healthcare is expanding in part, because the smartphone and device market is also expanding. However, Iwaya reported that too often the mobile healthcare platforms and devices, "… fail to address security and privacy issues" (Iwaya, 2016, p. iii). Iwaya (2016) commented that,

> Healthcare professionals can access all the relevant or needed data through many
> computer interfaces (e.g., desktops, smartphones, tablets). Likewise, the patients
> can have readily access to their medical journals by Internet. Huge amounts of
> data have to be securely transmitted, processed, and stored. Data breaches on
> patient's medical records can cause societal pressure, embarrassment and
> discrimination. Systems can be potentially misused in patient's detriment. Privacy
> infringements can be caused by, e.g., purpose misuse, vague purpose
> specification, lack of patient's consent, and privacy policies. And furthermore, in

most countries there is no legal framework that regulates privacy and protection

of personal data (p. iii).

These concerns could be further impacted by the multiple layers of custody and

control issues that data must go through via the motorized MHU. Because, the MHU has

within its mobile van, equipment to collect, transmit, and analyze patient data, this data

must be physically protected while parked in the community providing healthcare

services, as well as protected in route to the MHUs base for overnight parking and

protected during routine maintenance of the vehicle. These issues could be overlooked

when discussing issues of patient privacy and security, because focus of patient data

breaches often involves international hackers stealing patient data. But, data breaches are

also due to internal issues as revealed in the next section.

HIPPA regulation. The Health Insurance Portability and Accountability Act

(HIPAA), requires healthcare organizations to report any data breaches that impact more

than 500 people (HIPAA Breach Notification Rule, 2009). This notification breach rule

was passed as part of the Health Information Technology for Economic and Clinical

Health (HITECH) Act in 2009. This Act emphasized the need of organizations to take

patient data protection seriously. Additionally, the U.S. Department of Health & Human

Services (HHS) established a public posting website which documents data breaches that

have been reported (Breach Portal, n.d.). This website provides detailed information

about organizations that have healthcare data breaches impacting more than 500 people.

Additional reporting from the HHS reveals no company is too small or big to be

impacted by data breaches. Those impacted by data breaches have often failed in having

adequate mobile security devices. HHS data reveals that since 2010, "68% "of healthcare

data breaches were due to files lost or stolen by an employee, not taken by an international hacker (Healthcare Breach Report, 2014, p. 3). Because, only "23%" were stolen by an act of hacking (Healthcare Breach Report, 2014, p.3). Nearly half ("48%") of data breaches were due to a stolen mobile device, such as a smart phone or laptop (Healthcare Breach Report, 2014, p. 3). While the news often reports the devastating incidences of hacking, it is important for organizations to consider the mistakes, errors, or stealing of patient data by their employees.

Data breaches will happen. But, healthcare organizations must plan, prepare, and act to limit the harm to patients. Organizations must ensure their mobile platforms and MHUs are HIPAA compliant which will assist in keeping patient data secure and private. Patients have benefited and will continue to benefit from the advances in mobile platforms, but it is important that organizations invest in advanced security mechanisms and protocols to prevent data breaches. It is incumbent on the healthcare providers that manage the MHUs, to ensure the physical and software components of patient data is always secured. As the issues of security and privacy are improved, healthcare mobility will continue to provide the best in patient health outcomes. But, for many mobile healthcare platforms, there are barriers that should be considered, particularly, those limitations that impact MHUs.

Barriers of MHUs

Barriers & limitations. Increasing competition among hospitals and health systems, along with financial hardships and donor contributions are key limitations that slow the progress of mobile clinics to survive. There is evidence that mobile healthcare units have helped to satisfy the healthcare demand of society and the growing population (George, 2014; Hill, et. al, 2014; Hill, et. al, 2012). "Despite this potential, many mobile clinics often struggle to forge financially sustainable arrangements with care delivery organizations and payers" (Hill, et al., 2014, pg. 263). As every dollar is accounted for in a fluctuating economy, funding is a major issue for mobile units seeking profits and a return on investment. As stated, mobile healthcare units are operated in several ways. Over 45% operate as independent entities, 25% as a segment of the hospital, 16% are attached to community health centers, and 15% are aligned with academic hospital medical centers (Hill, et al., 2014, pg. 262). The majority depend on philanthropy, while others rely on grants and insurance providers (Hill, et al., 2014, pg. 262).

As mobile clinics expand, competition will develop in the fight for patients with hospital and clinic settings (Clark, Soukup, Govindarajulu, Riden, Tovar, & Johnson, 2011). Competition will be a key factor between the two segments of mobile units and stand-alone healthcare systems in the pursuit of patient volume. This fight however for patients will also include the many retail walk-in health clinics, which offer affordable fee-pay services. These types of clinics include Walgreens, Walmart, Target, and CVS. As of 2014, CVS had more than 1000 walk in Minute Clinics (CVS Pharmacy, 2017). While these services are not free, most are quite inexpensive and the convenience to customer-patients is extraordinary. Whether it is corporate run clinics or hospital

managed clinics, questions will be raised about the role and viability of MHUs in providing free healthcare service.

These barriers are challenges that must be considered as MHUs continue to distinguish themselves as a necessary tool to serve the vulnerable and low socioeconomic populations throughout the U.S. While there are competitors such as walk-in clinics and mobile smart devices that also serve this population, the MHUs have a role to play in each community. But, it is important that MHUs become experts in offering the unique services that community members need, while ensuring the respect for patient's records, cultural nuances, and ensuring all information is secured by the best physical and software protection mechanism. This will then encourage and engage community members to take advantage of the services offered through their local MHUs.

Conclusion

There is ample data which reveals that childhood obesity is not a passing childhood problem, nor can it be out grown. Rather, overweight and obese children, mature into overweight and obese adults. These obese children tackle low self-image, shame, and bias for being obese. Because of the devastating impact of childhood obesity, healthcare providers have pursued the latest in interventions methods with the hope to stop the childhood obesity crisis. These interventions have included incorporating the different mobile platforms to assist in the battle against childhood obesity. Chapter 2 concentrated on the literary issues involving the different mobility platforms used in treating childhood obesity. The literary discussion included findings on mobility platforms such as smart devices, wearable devices, and motorized MHUs. Additionally, Chapter 2 reviewed issues impacting the privacy and security of patient data.

Finally, this review concluded by detailing some of the barriers impacting MHUs, which include popular walk-in health clinics found in retail stores all throughout the U.S. While these barriers must be considered, the research also revealed many opportunities exist to continue the fight against childhood obesity. As identified in this chapter, MHUs have been instrumental in ensuring healthcare access to the most vulnerable populations. This precedent provides the impetus for MHUs to specifically target those suffering from childhood obesity to improve the health outcomes for this population as well.

Chapter III

Methodology

The study utilized data gathered from fifteen providers of mobile health units

(MHUs) across the U.S. Using online surveys and telephone interviews, the researcher

gained insight into the provider's perception of how MHUs affected childhood obesity

reduction. The study utilized descriptive statistics to analyze survey responses and

interviews to understand how MHUs collected data regarding childhood obesity.

Descriptive statistics generated meaningful recommendations that could be used by

MHUs and healthcare providers nationwide, which in turn could help make children

healthier.

Research Design

The study design originated from the researcher's personal knowledge, personal

contacts, and the internet in finding participants for this study. In total, there were thirty

mobile healthcare units that the researcher recognized and contacted for this study.

Twenty-five of the mobile healthcare units were identified using an Internet search

engine. The search process used key phrases related to mobile healthcare; they were:

mobile health units, *mobile healthcare units*, *mobile vehicles*, *mobile transportation*,

mobile healthcare transportation, *mobile healthcare services*, *healthcare in the*

community, and *healthcare near you*. In addition to using the search engine, two mobile

health units were identified through personal contacts that either worked on a mobile unit

or knew of a contact that had an affiliation of a mobile health unit. The final three mobile

health units were identified through the researcher's personal network in the mobile

healthcare industry, as the participants were local and within the same state as the researcher.

Following the identification of the thirty MHUs, the researcher created a contact list for all the MHUs with all vital contact information that the researcher could find. This information included: address, phone number, fax number, email address of directors and/or management level personnel that could be obtained without speaking to the MHU. Once all vital information was obtained, the researcher listed all MHUs with their contact information on a spreadsheet in alphabetical ascending order (A-Z) by state. The researcher contacted each MHU to identify a good contact member within the MHU that would be of great assistance in completing the survey and, if necessary, the interview.

Each MHU contact member that was contacted consisted of the medical director, program manager, program director, epidemiologist, veteran employee with many years' experience or chief officers, who play an instrumental role in the operation of the MHU. These healthcare providers were contacted through a phone call and was solicited for their participation in the online survey. This phone call informed these potential participants about the study and its implications, the research question, and what information the researcher hopes to provide following the study. If potential participants agreed verbally to participate, the researcher asked for their email address and then sent them a link to the online survey that included an informed consent document as the first page (See Appendix A). The MHU provider had to agree to participate by clicking a link following the review of the consent document, which led to the survey being accessible.

The survey consisted of demographic questions about the participants' job title and years of experience, questions about the MHU data such as, the type of data that was

being collected and the usage of data collected, and questions about the challenges faced

within the mobile healthcare industry. Telephone interviews were conducted with

participants who had agreed to be contacted after the survey was completed. These

telephone interviews resulted in an additional layer of insight into the completed survey.

The topics of the interview questions included:

    a) The role of the healthcare professional that operates the mobile health unit.

    b) Expectations of the organizations who run the mobile health unit.

    c) The method of data collection, collaboration between other mobile health

        units, and opportunities for future mobile health units.

The data from the survey and the telephone interviews were analyzed to understand

mobile healthcare provider's perception related to childhood obesity prevention, which

can be utilized by MHUs across the nation. The researcher will send the list of

recommendations and suggested actions to the healthcare providers who participated in

the survey or interview for their organization to consider in their ongoing actions to

prevent childhood obesity.

Data Collection and Instrumentation

        The email listed in Appendix E was sent to each MHU provider after their verbal

agreement to partake in the study. After reviewing the email, the email link would take

them directly to the survey that is listed in Appendix A. Later, the research participants

who had agreed to be interviewed were contacted for a phone interview. The questions

used in the interview are listed in Appendix B.

The Process

The study utilized both survey questions and semi-structured interviews to gather information from mobile health workers that have been exposed to treating or interacting with obese children in a clinical setting. There were fifteen participants that did take part in the study from start to finish. All fifteen participants completed the online survey and phone interview. Each participant was assigned a number as their identifying pseudonym. This pseudonym served to both protect interviewee's anonymity and eliminate bias from the process.

Demographic Characteristics of the Participants

All research participants that agreed to be interviewed and completed the survey were employed as mobile health workers within an MHU and involved in clinical capacity in dealing with obese children. These participants ranged in age from 30 to 55 years old. Five out of the fifteen were females, and the rest were males. Race or ethnicity was not collected since the majority declined to provide this information.

The interview proceeded in two stages. The first stage consisted of filling out an eight-question set questionnaire (Appendix A). The second stage consisted of giving semi-structured open-ended question set, which allowed the participants to discuss freely areas that had been examined in the first set of questionnaires. All the participants consented to participate in a telephone interview. While conducting telephone interviews with the participants, the researcher took notes and had more interactive discussions with the subjects. Initially, the researcher reached out to 30 participants, out of which 20 agreed. The researcher never heard back from 10 participants after continuous follow-up. Ultimately, the researcher collected survey and interview data from 15 participants, as the

other 5 that initially agreed over the phone, never completed the survey and could not be reach thereafter.

Report on Semi-Structured Interview

The online survey and telephone interviews were the only data collection method. The responses were elicited specifically to identify: (a) whether subjects were involved in a clinical setting dealing with obese children, (b) whether subjects had a strong and significant perception related to childhood obesity, and (c) whether the participants' direct experience was germane to the childhood obesity epidemic. Subjects satisfying these initial screening criteria were kept in a pool of potential participants from which a subject had the choice to perform a phone interview. After the first phase of the surveys were completed, the researcher proceeded with the second phase – the semi-structured telephone interview, that lasted up to 20 minutes.

The researcher attempted to accommodate the subject's preferred interview date and time. Before the telephone interview process started, all participants were assured that their identities would only be known by the researcher. Few participants were anxious about their identities being disclosed to their supervisors or their health clinics, at which time they were assured that the study was strictly confidential. They were assured that all names would be strictly confidential and only the researcher will know about the participants. This enabled the participants to discuss freely and without reservations, as few were concerned that speaking candidly could jeopardize their job. On the other hand, the researcher was interactive during the semi-structured interview sessions, which allowed the participants to stay on the context and not lose specificity of the topic and content being explored. The subjects were advised to be direct and

instructed to answer each question with specificity. The subjects were given specific

verbal instructions related to their responses on questions exploring their perceptions and

attitudes on MHU's effectiveness and efficacy.

Data Analysis

The data collected included a mixture of quantitative and qualitative data.

Quantitative data from the survey instrument included: (a) Likert-scale type multiple

choice questions with predetermined responses, and (b) binary answer choices. To

interpret the data, the researcher followed a series of steps.

(i)   The data was divided into two broad categories of quantitative and qualitative

        to impart different treatments.

(ii)   Quantitative data was analyzed using descriptive statistics. Some of the

        questions used in the study can be described as a cross-sectional study

        designed to elicit responses from a multi-dimensional perspective and to

        extract personal knowledge and experiences of individuals who have been at

        the forefront of obesity prevention framework as a collector of basic health

        data. There are specific questions in the survey that were used to explore

        whether healthcare provider's attitude is associated with such provider's

        perception related to childhood obesity prevention. Descriptive analysis of the

        demographic variables of the participants was conducted to understand both

        the bivariate relationships and characteristics of the data distribution.

(iii)   Qualitative data gathered via open-ended questions through some of the

        specific interview questions were organized and analyzed to develop valuable

findings and information (Merriam, 1998). This qualitative data analysis
process focused on selecting and organizing elements from the open-ended
interviews and identifying which elements were most important and
determining how they can be used to gain meaningful information about the
provider's perception of mobile health data collection process that can
enhance obesity prevention process. For this, the data gathered via open-ended
interviews were analyzed through a thematic approach. Thematic approach
enabled the researcher to allow patterns and themes to emerge from the data,
while new knowledge was developed through a continuous interplay between
selection of interview elements and analysis of those selected elements. This
iterative process consisted of preprocessing the qualitative data for analysis.
The resulting analysis combined with the results from the quantitative data
analysis developed an interpretation of the larger meaning of the data
(Creswell, 2013).

To adequately investigate the provider perception of MHU data collection process as it
relates to childhood obesity prevention, the researcher engaged in a data reconstruction
process to uncover a series of themes along the following broader lines of inquiry and
analysis.

(i)   It explored whether individual perceptions are associated with certain
        individual beliefs that may be either conducive or adverse to the objective of
        obesity prevention. In this context, the interview questions measured various
        categorical variables, such as provider's attitude regarding childhood obesity,
        provider's perception regarding organizational effectiveness, provider's

perception of the linkages between cultural belief and effectiveness of the prevention protocol, etc. By extracting the existing relationships among these variables, the researcher identified discernible trends and patterns in mobile healthcare provider's engagement within the broader obesity prevention framework.

(ii)   Upon identification of the various themes, patterns and linkages among attitudes, behavioral patterns and perception assisted in uncovering whether it is incumbent upon healthcare providers to enhance or modify their training and data collection protocols in order to make the data collection process effective or more conducive towards obesity prevention.

(iii)   Lastly, information gleaned, and tendencies uncovered in the above-mentioned process charted a future trajectory for both policy enhancement and efficient implementations of issues regarding childhood obesity.

Conclusion

This study explored the perceptions of mobile healthcare workers as it relates to childhood obesity prevention protocols. By exploring associations between these healthcare provider's attitudes towards obesity prevention, organizational effectiveness, client's belief system and overall effectiveness of the programs, the study embarked upon charting a more effective prevention protocol for childhood sufferers of obesity. Along the way, this study resolved existing difficulties, dilemmas and challenges the mobile healthcare workers may be facing in their day-to-day data collection efforts. Chapter 4 includes results derived from mobile health providers via their survey and telephone interview responses.

Chapter IV

Results

The purpose of the study was multi-fold. First, through the immediate experiences of mobile health workers, the study explored whether linkage between data collection process and perception of effectiveness in treating childhood obesity exists. Second, the study examined how the data collection process experience and service levels of mobile health workers influenced the perception and attitude of such workers in childhood obesity. Lastly, the study explored how mobile health workers' perceptions and attitudes can be used to reduce childhood obesity in the United States. In this research framework, experience related to the number of years the healthcare provider worked on a mobile health unit (MHU). Service levels referred to the number of visits and patients treated within the MHU. The study examined how these two antecedents corresponded to the MHU workers perceptions and attitudes about childhood obesity prevention.

Demographic Breakdown

There were fifteen participants that were surveyed and interviewed. The basic demographic profile collected included: age, gender, and educational background. The demographic profile of the respondents is elegantly presented in Table 1. The interviewees were divided disproportionately by gender. Of the fifteen participants, five (one-third) were female and ten (two-third) were male. Majority (seven) of the participants were in the 21 – 30 age group, four in the 31-40 age group, and four was in the 41 – 50 age group. These participants were asked about the type of education they had. The majority, seven participants, had at least bachelor's degree and five had a

master's degree or higher. One participant did not respond to this question and two

participants stated they had at least a high school degree.

Table 1

Demographics of Research Participants

	Number
Age Category	
21-33	7
31-40	4
41 -50	4
Education	
High School / Some College / No Degree	2
Bachelor's Degree	7
Graduate Degree and Higher	5
Did Not Respond	1
Gender	
Female	5
Male	10

Interview Questions

This study focused on comparing interviewees' opinions and experiences on (a)

the data collection process of the mobile health clinic, and (a) how such clinics positively

influenced childhood obesity intervention. Appendix A provides the discussions and

detailed list of the eight specific interview questions that were asked. The eight specific

interview questions centered on responses and opinions of mobile health worker's

experience and how such experience shaped their perceptions and attitudes regarding

childhood obesity. The semi-structured interview questions are presented in Appendix B.

Results of these respondents' interviews have been summarized below separately under

quantitative and qualitative segments.

Survey and Interview Results

The results of surveys and interviews are presented below in multiple segments. One segment of the results focused on mobile health workers' perceptions and opinions related to how data was collected within the mobile health unit. The other segments examined their perceptions on data capture and sharing, available support and perceived need for improvement. Results also explored how increases in mobile workers experience and service levels may have impacted their perceptions and attitudes regarding the effectiveness and efficacy of the mobile framework in preventing childhood obesity.

Finding: Mobile health workers feel that their data collection and management process need improvement.

In responding to whether mobile health unit data collection can reduce obesity, 40% responded in the affirmative, while 55% responded in the negative and the rest did not have a view. In responding to whether the current data collection methods need to be either modified or enhanced, the response was equally balanced, 45% opting for modification, 55% siding with enhancement. This segment of questions indicated that mobile health workers feel that their data collection and management process need improvement.

Table 2 – *Finding 1*

MOBILE UNIT DATA COLLECTION PROCESS REQUIRED MORE SUPPORT	
Yes	35%
No	50%
Undecided	15%
CURRENT DATA COLLECTION PROCESS IS ADEQUATE	
More Data Collected	65%
Not More Collected	25%

Data Collection Process and Sharing vs Capturing

In responding to whether mobile unit collection of data has changed the way

organization operated, 35 % responded in the affirmative in some fashion, while 45%

responded in the negative and 20% did not have a view. In responding to whether the

current data collection methods should include wide data sharing, the response was

overwhelmingly in favor of data being shared at 85%, whereas 15% were non-committal.

This segment of questions indicated that across the mobile health unit organizations,

issues of data sharing and whether such data changes organizations for the better, there

were no consensus view.

Table 3 – *Finding 2*

MOBILE UNIT DATA COLLECTION PROCESS REQUIRED MORE SUPPORT	
Yes	35%
No	50%
Undecided	15%
CURRENT DATA COLLECTION PROCESS IS ADEQUATE	
More Data Collected	65%
Not More Collected	25%

Finding: More Data is Better: Data Collection Process and Support

In responding to whether mobile unit data collection process required more

support, 35% responded in the affirmative, while 50% responded in the negative and a

significant 15% did not have a view. In responding to whether the current data collection

process was adequate, or whether the workers involved should collect more data, the

response were in favor of more data needing to be collected at 65%, whereas 25% were

in favor of not collecting more and 10% were non-committal. This segment of questions

indicated that across the healthcare organizations, the issue of whether collected data was adequate, the consensus view was that the more data collected the better.

Table 4 – Finding 3

MOBILE UNIT DATA COLLECTION PROCESS REQUIRED MORE SUPPORT	
Yes	35%
No	50%
Undecided	15%
CURRENT DATA COLLECTION PROCESS IS ADEQUATE	
More Data Collected	65%
Not More Collected	25%

Observations from Semi-Structured Interviews

In this segment, the mobile health workers' perceptions and opinions related to childhood obesity based on semi-structured interviews were analyzed. Appendix C and Appendix D provide a snapshot of participants' responses. The interview questions were categorized into two macro or broader themes: (i) mobile health workers' service level and (ii) experience. Responses to these interview questions resulted in repeated themes that were further granulated and categorized. The forthcoming section details the macro and micro themes that were discovered during the interviews.

Finding: Perception of obesity incidence in children based on service level size and experience of healthcare provider

Analysis of the semi-structured interviews revealed in ten themes have been presented below. The themes provided insight into the mobile unit operators' perception and attitudes regarding obesity rates among children. The findings from the interviews were designed to assess what impact that years of experience of the healthcare provider, as well as, the mobile clinic service level size of patients treated had on perception about

incidences of obesity in children. In the following, each of the ten themes are discussed and the interviewees response have been presented. Themes one through five revealed the impact that work experience had on perception of obese children. Themes six through ten revealed the perception of obesity incidences in children as it related to service level size.

      Theme 1: Mobile health workers' perceptions about the childhood obesity epidemic are changing. This theme explored whether increase in experience increases mobile health workers' perception that childhood obesity will increase. As the interview responses were aggregated, an opposing view of the theme emerged. It was revealed that as the mobile clinic operator gained years of work experience, their perception that obesity incidences in children will increase has decreased. In response to this question, respondent two, four, and six firmly believed that obesity would continue to decrease among children. Respondent four who had nine years of work experience stated that, "Although children are surrounded by fast-food that is cheap and they seem to be lacking regular exercise, the obesity prevention awareness will continue to increase." This was a similar attitude held by Respondent six who had twelve years of work experience. Respondent six stated that, "Obesity in children will naturally decrease because they will begin to stay away from their current lifestyle where they sit for many more hours in school and have strong habits of using smartphones while eating unhealthy snack foods." But, it was Respondent two that summed it up best by stating, "Over the years I have seen more and more children in my clinics, they are more obese and less habituated to exercise, yet they all want to change." Respondent two had nine years of mobile health clinic work.

Theme 2: Mobile health workers' attitude that only obese children should be treated is changing. This theme focused on examining whether work experience changes some settled perception among health workers. The question stem asked whether only obese children should be treated at the mobile health clinic. The results revealed that most respondents were concerned by their lack of resources and the need to focus services on the neediest individuals that need care. Respondent two had nine years of work experience stated, "I wish I could care for them all, but if a child comes through my door that is asthmatic and obese, I better focus on him as I have limited resources." This same attitude was held by Respondent seven who has eight years of work experience. Respondent seven stated that, "If a mother comes to me with a young and very obese child, I have a great opportunity to try to help, but it might come at the cost of sending others to their local community clinic."

Theme 3: Mobile health workers' perceptions that mobile clinics are effective in treating childhood obesity levels is changing. This theme was revealed by asking the respondent's perception about the effectiveness of mobile clinics to treat obese children. Work experience was correlated with positive perception about the effectiveness of mobile clinics ability to treat obese children. Respondent three who has six years of work experience felt, "To impact obese children at our mobile clinics, we don't get to the opportunity to build long-lasting connections with these patients." Similar, Respondent one who had ten years of work experience stated that, "It is very frustrating actually, we can't help our obese patients very much."

Theme 4: Mobile health workers' perceptions about the effectiveness of a MHU usage in combating children obesity is enhancing. This theme is represented by asking the respondents whether obesity in children can be improved or not. The goal of this question was to gain an understanding about work experience and perception about obesity. The respondents mostly felt that obesity in children could be improved. Respondent four who has nine years of work experiences noted, "It is hard, but obesity can be improved, whether by service we provide or other healthcare givers." Respondent ten had fifteen years of work experience remarked, "I recall a few young children that I met, that over the years did get to healthy body weights. They all were involved in organized health plans at school."

Theme 5: Mobile health workers' perceptions that referral programs are effective is enhancing. This theme sought responses about whether referring obese children to different programs was effective or not. Respondents did feel that referring children to various health programs was effective. Respondent one remarked that, "I always try to connect my obese clients with other school, city or even community programs so they are locked in a system, this will help them." This perception was also echoed by Respondent ten. Respondent ten stated, "since we have limited resources, I am always excited about referring children and their parents to programs that I know will help them." See Table 5 for details and comments of themes 1-5.

Table 5

Perception and Attitude on Childhood Obesity Prevention as a Function of Participants' Experience Level

Level of Experience	Comments
1. Mobile health workers' perceptions about the childhood obesity epidemic are changing.	With experience, mobile clinic operators tend to feel that obesity may decrease.
2. Mobile health workers' attitude that only obese children should be treated is changing.	Experience impacts the attitude of mobile clinic workers regarding the treatment of obese children.
3. Mobile health workers' perceptions that mobile clinics are effective in treating childhood obesity levels is changing.	Experience levels positively impacts the perception of referral program effectiveness.
4. Mobile health workers' perceptions about the effectiveness of a MHU usage in combating children obesity is enhancing.	Experience impacts the perception of improving obesity in children.
5. Mobile health workers' perceptions that referral programs are effective is enhancing.	Experience impacts the perception of effectiveness of referral programs.

Theme 6: Mobile health workers' perceptions that childhood obesity will increase, as number of children treated increases, is changing. This theme was revealed through responses about the size of service level. As respondents' size of service level increased, findings revealed that incidence of obesity in children would decrease. Those respondents that provide service for more than 5,000 children, believed that obesity in children would decrease. Respondent two commented that, "The more and more I treat, I feel hopeful and see that children are impacted by the message of healthy eating." Similarly, respondent three noted, "Most of the children I treat are obese, but each year, I see success in the healthy eating and exercise plans, and I am confident obesity will be tackled."

Theme 7: Mobile health workers' attitudes that only obese children should be treated, as number of children treated increase, is changing.. This theme examined whether increase in service level changes the attitude that only obese children needs treatment. Mobile health workers' responses did not reveal meaningful insight into as to whether increase in service level changes workers' attitude about treating non-obese children. In general, respondents did feel that referring children to various health programs was effective, however, their responses as to whether non-obese but at-risk children should be referred to similar programs were inconclusive. For example, respondent one remarked that, "We are so resource constrained, I wish we could treat them all." It is not clear what "all" means. This vague retort was also echoed by Respondent ten. Respondent ten stated, "Since we have limited resources, I am always excited about referring children and their parents to programs that I know will help them, and I know if we don't refer them, we may have a childhood obesity epidemic."

Theme 8: Mobile health workers' perceptions that mobile clinics are effective in treating childhood obesity, as number of children treated increases, is changing. This theme was revealed by asking the respondent's perception about the effectiveness of mobile clinics to treat obese children. While earlier we observed, work experience was correlated with positive perception about the effectiveness of mobile clinics ability to treat obese children, here we observe that, with increase in service level, perception regarding the efficacy of mobile clinics may not be that positive. Respondent six who has serviced over 1000 patients felt, "After serving such large numbers of children, I am not so sure if we can effectively treat obese children in this set up. Because, it is hard to impact obese children at our mobile clinics, we don't get to the opportunity to really know their needs." Similar, Respondent three who has treated more than 2000 children observed that, "I must say, I just don't see how, mobile clinics could be a long-term solution to this crisis. I am re-evaluating my belief in mobile clinics as a long-term solution for obese children." It is rather interesting to see somewhat dissimilar results on the same focused topic separated by service level and experience.

Theme 9: Mobile health workers' perceptions about the childhood obesity epidemic, as number of children treated increases, is changing. This theme is represented by asking the respondents whether obesity in children can be improved or not. The goal of this question was to gain an understanding about service level and perception about obesity. While in the earlier theme with experience, respondents mostly felt that obesity in children could be improved, here, the respondents generally felt somewhat opposite. Respondent three who has serviced more than 1500 patients was ambivalent about whether childhood obesity can be improved through mobile clinic

intervention as he noted, "It is hard. I have seen so many, obesity can be improved with long-term clinical setting, mobile clinics are just stop-gap arrangements." Respondent six who has seen over 1500 patients echoed, "What we are doing is just giving a band-aid, I am not sure we can combat the epidemic without in-patient treatment for a large population of at-risk kids."

Theme 10: Mobile health workers' perceptions that referral programs are effective, as number of children treated increases, is enhancing. This theme explored the relationship between the size of service level and respondents' perception about the efficacy of referral programs. More specifically, as respondents' level of serving obese children grew, they seemed to feel that referral programs simply do not work. These respondents cited many rationales and reasons for their formulation of this line of thinking. For example, respondent five commented that, "more I treat, I question any referral program's ability to eradicate childhood obesity. This is a much deeper issue, which requires broader policy perspective as opposed to band aid." Respondent three captured it well, "I treat obese children, but we simply do reactive measures. It simply does not work sending referrals. Without a broader planning, it will not benefit society in the long run." It is obvious that, these respondents are looking for long-term, policy-based solutions.

This theme sought responses about whether referring obese children to different programs were effective or not. Respondents did not feel that referring children to various health programs was effective. Respondent two who has serviced more than 1000 children felt, "I connect my obese clients with available city or community programs, so they can be supervised through a system, but often the results are not there." This

perception was also echoed by Respondent six who has serviced over 2000 at-risk or

obese children, observed, "I am always trying to connect at-risk kids to a formal program,

but we just simply do not have the resources to track, monitor and follow-up. We end up

losing much more kids than we anticipate. I have come to the realization that referral

programs within our existing system may not be working." See Table 6 for details and

comments of themes 6-10.

Table 6

*Perception and Attitude on Childhood Obesity Prevention as a Function of Participants'
Level of Service Rendered*

Service Level	Comments
6. Mobile health workers' perceptions that childhood obesity will increase, as number of children treated increases, is changing.	As the service levels increase, mobile clinic operators tend to believe that obesity in children are going to decrease.
7. Mobile health workers' attitudes that only obese children should be treated, as number of children treated increase, is changing.	Based on service level, no meaningful insight can be gleaned as to the attitude that only obese is to be treated.
8. Mobile health workers' perceptions that mobile clinics are effective in treating childhood obesity, as number of children treated increases, is changing.	With increase in service level, perception regarding the efficacy of mobile clinics may be waning.
9. Mobile health workers' perceptions about the childhood obesity epidemic, as number of children treated increases, is changing.	With increase in service level, perception regarding reduction of childhood obesity may be in jeopardy.
10. Mobile health workers' perceptions that referral programs are effective, as number of children treated increases, is enhancing.	Based on service level, no meaningful insight can be gleaned as to the perception that referral programs are effective.

The themes discussed above offer insight into the perception and attitude of MHU workers based on their experiences and service levels. Several interesting insights can be gleaned. With experience and increase in service levels, respondents predominantly felt childhood obesity can be successfully combated. Furthermore, with experience, respondents felt all children should be brought under the umbrella of obesity prevention framework. On the other hand, there are some contradictory perceptions come to the surface when attitude and perception change because of both experience and service level is compared. With experience respondents generally felt these programs work. However, with increased level of service, their attitude does not seem to favor that these programs work.

Finally, the aim of this study was to understand how collected data can be used to better understand MHUs data collection process and how it could be utilized more effectively for childhood obesity prevention. The research question of this study was to explore MHU providers' perception of the data collection process. Semi-structured interviews of the MHU participants uncovered some interesting themes. In general, with experience and enhanced level of service delivery, providers feel childhood obesity can be successfully combated. Experience and level of service rendered further changed these providers' perception in believing that outreach much go beyond only obese children to include non-obese and at-risk children. With increased experience, MHU workers predominantly feel that referral programs and MHUs are effective. However, with increased level of service delivered, MHU workers' perception does not seem to favor referral programs and MHUs. This study only scratched the surface of a very interesting

framework Thus, additional follow-up studies will provide more insight to the question of how to improve obesity prevention service to at-risk children.

Chapter V

Discussion, Recommendations, Conclusion

Discussion

The 1950s Health Belief Model (HBM) provided the theoretical foundation for this work. The model's initial focus was to close the gap on a lack of preventive measures in treating diseases by individuals (Jones, Jensen, Scherr, Brown, Christy, & Weaver, 2015). Similarly, we learned from this study that mobile health units (MHU) were developed to close the gap on lack of transportation, lack of availability and accessibility. Based off our findings, we identify the need for data sharing, data integration, and collaboration among mobile health units to aid in the primary prevention focus of childhood obesity and treating the disease.

For this study, a convenient sample of 15 mobile health workers were selected and two sets of questions – survey questions and semi-structured interview questions – were given. These mobile health workers have been exposed to dealing with treating or interacting with obese children in a clinical setting. Based on interview, the study sought to explore (a) whether there is a linkage between data collection process and perception of effectiveness in treating childhood obesity, (b) how the data collection process experience and service levels of mobile health workers influence the perception and attitude of such workers in childhood obesity, and (c) how mobile health workers' perceptions and attitudes can be used to reduce childhood obesity in the United States. Table 6 below provides a summary of observations from the study and how the recommendations come from such observations.

The Research Question and the Hypothesis

The research question for the study examined what the provider perceptions of MHU data collection process as it related to childhood obesity prevention. This question was explored via multiple dimensions. Each of these dimensions provided some insight into childhood obesity prevention framework. This study was prompted by the stark realization that childhood obesity is not a passing childhood problem, it cannot be out grown. More importantly, overweight, and obese children, mature into overweight and obese adults. Yet, not all obese children can be treated in a hospital or permanent clinical setting. Thus, MHUs provide an immensely innovative and expedient intervention mechanism. MHUs can be a solution against the escalating childhood obesity crisis. Various mobile platforms can intervene and assist in the battle against childhood obesity.

Results of the study revealed some significant challenges in using MHUs in combating childhood obesity. Despite research suggesting the overwhelming need for universal data sharing and integration, MHUs are neither sharing data, nor being benefitted from what's happening in another geographical location. For example, if results had indicated that innovative use of MHU data in a county yielded positive results in lowering children's body mass index, the same data could not be used in applying to another county due to regulatory and system bottlenecks. Thus, despite significant technological progress made in data science, MHUs across the nation cannot effectively collaborate to solve one another's problems. Some of the significant observations in this regard can be summarized as follows.

Current Data Collection Framework

      Issues and bottlenecks . The study supports the contention that existing mobile units are not adequately supported. A consensus view has emerged that MHU operators do not like the feeling of isolation, as they feel they are unable to examine whether innovative ways of dealing with prevention and maintenance has been successful in other parts of the country. Most MHU operators dealing with obese or at-risk for obesity children desire more data.

      The issue of more data, however, is complex and study revealed several dimensions through which this problem needs to be approached. First, there is a lack of effective data collection and management process. Consensus view is that existing process needs improvement. Mobile health workers feel their current data collection process can be improved. Since majority believed, instead of whole sale change, slight modification or specific improvement can yield better clinical results for the servicing patients. This is an area that needs to be investigated. Furthermore, lack of infrastructure enhancement has been cited as one of the roadblocks towards universal data sharing. Since workers overwhelmingly support data sharing, it must be taken up as an issue that must be tackled in the immediate future.

Health worker perception and attitude based on experience and service level.

In this perception-based study, how the mobile health workers view the existing landscape of childhood obesity prevention framework has been the focus of investigation. In two predominant threads of workers' experience and service level, the study has dissected some of the individual elements to assist in future intervention. Experienced mobile clinic operators predominantly believed that obesity incidences in children will decrease. Although children are surrounded by cheap fast-food and seem to be lacking regular exercise, the workers believed that current campaign is being effective. They genuinely felt that obesity prevention awareness will continue to increase.

While the workers believed in future where childhood obesity may be combated effectively, they were skeptical about how this can be achieved. Most workers were concerned with their lack of resources, as they could not care for all who needed the treatment and intervention. These limited resources have been the central theme in the experience and perception of mobile healthcare workers tasked with combating childhood obesity. This calls for exploring this issue further with sustained rigor and to ensure resources are distributed efficiently to care for all at-risk obese children. The workers did not like the idea of selecting one at-risk kid over the other, as they wanted to extend the benefit to all that came to them.

It is important to note that, with experience, mobile health workers developed a positive perception about the effectiveness of mobile clinics ability to treat obese children. This belief in the mobile clinic's efficacy in treating obese children is significant, as if the workers believed in the cause, they are more likely to succeed in bringing the effect being sought.

On the otherhand, it is important to note the opposing view of mobile health workers based on service levels. Some of these observations were somewhat contradictory when looked through the lens of service level. While more experience in terms of years a mobile worker had, resulted in the belief that only obese children needed to be treated. However, more children a worker treated, the workers view tended to change. The workers believed now that both currently obese and at-risk children need to be treated. This is significant, as it encapsulated or attempts to encapsulate more under the treatment umbrella, which brings us to confront the stark reality of resource constraint. Issue of limitation in resource must be followed up vigorously to allow the system to care for all at-risk obese children.

Recommendations and Implications for Practice

There is an association between mobile health workers working condition and their perception about how best to intervene in childhood obesity. The strong association is uniform across the service levels and experience levels for these workers. Looking at the association between data collection and resource constraint, it can be argued that the better data collection process, more resource and more training will enable these health workers to both effectively treat obese children and attend to more at-risk children. However, the lack of resources, lack of access and sharing of data has been the scourge against wider and more effective treatment for all, which must be corrected to reverse course on fight for childhood obesity prevention.

First, the interaction between the mobile health worker and the at-risk children must be increased. This can be done by bringing more health workers at the lower end of career ladder, whose job would mainly focus on outreach. This will allow more at-risk to

be brought under the system and yet not be burdened with escalating cost as the salary

requirements of counselor and clinical workers is very different. Therefore, future

programs should focus on procuring workers from a wider academic and clinical

background, which may impact more positively in childhood obesity prevention.

Second, to better understand and inculcate a wide range of innovative approaches that

may have worked in various systems and jurisdictions, resource must be spent in data

integration, sharing and appropriately training health workers. Policy makers and budget

planners must explore avenues and triggers various prevention mechanism that can

convert the awareness into preventive practice among at-risk children. Future research

must examine whether the relationships of training-awareness interactions, healthy

lifestyle-reward system could be utilized in combating childhood obesity across a wider

range of populations. Table 6 presents these recommendations and links them with the

findings from the study.

Table 7

Findings & Recommendations

Significant Findings	Recommendations
1. With experience, mobile clinic operators tend to feel that obesity may decrease if outreach is increased. Similarly, as the service levels increase, mobile clinic operators tend to believe that obesity in children will decrease if the availability of MHUs increases.	The interaction between the mobile health worker and the at-risk children must be increased. This can be done by bringing more health workers at the lower end of career ladder, whose job would mainly focus on outreach.
2. Experience level impacts the attitude of mobile clinic workers regarding the treatment of obese children, the workers feel the outreach must increase beyond only obese children.	Need to focus on procuring workers from a wider academic and clinical background, which may impact more positively in childhood obesity prevention.
3. Experience levels positively impacts the perception of referral program effectiveness, and the more resources need for data sharing and data integration.	Resources must be spent in data integration, sharing and appropriately training health workers. Policy makers and budget planners must explore avenues and triggers various prevention mechanism that can convert the awareness into preventive practice among at-risk children.
4. Experience levels impact the perception of improving obesity in children if resources are available.	Better data collection process, more resource and more training will enable health workers to both effectively treat obese children and attend to more at-risk children by increasing their outwork.

Implications for Practice

To put emphasis on the recommendations and observations from MHU's nationwide, the researcher has a list of implications that should be considered and other suggestions that should be implemented among current MHU's nationwide, the general public that might be interested in starting or operating a MHU, a hospital system or academic institution looking to partner with a MHU, and insurance providers that might want to expand their membership.

What are the implications for? Mobile Health Unit Providers

Currently, one of the main problems among current Mobile Health Unit (MHU's) nationwide is data sharing. The solution to this could be a streamlined and large-scale collaboration effort through a cloud-based Electronic Medical Record System (EMR). A software system of this magnitude could be utilized by MHU's nationwide to collect and tabulate data into useful and specific results for each MHU. Furthermore, the data can be useful in many ways: to support grant applications, quarterly/annual development campaigns, private donor communications, and fundraising meetings. This also has implications for coalitions.

Regarding collaboration, the software system could provide evidence of what other MHUs nationwide are doing through webinars, a suggestions page, and monthly trend reports accessible through the software system. To support the privacy and security of sensitive information, a limitation can be programmed in the EMR to limit information to include only the location (state) of the MHU. However, other information, such as the city and name of the company, could be obtained through a portal request within the software system. The webinars could be brief presentations about the MHU industry and

the challenges or results that other MHUs are going through. Lastly, there could be a

suggestions page and/or Q&A page for MHU's nationwide that are looking for best

practices from other organizations on the platform.

Another collaboration effort for MHUs could be attending conferences geared

towards MHU's target markets such as the American Academy of Pediatrics National

Conference and Pediatric Hospitalist Conference. At these conferences, the MHU's could

sponsor a booth to exhibit and advertise their services. The attendees would be able to

observe and visit all the exhibiting MHU's. This would provide key resources and

opportunities for their work. For example, a Pediatric hospital may want to add to their

service offerings by partnering with a MHU to provide services to many of their patients

in rural areas or utilize a MHU for weekend outreach events in providing health

screenings. Additionally, these MHUs can see what other exhibitors are doing for the

same target audience that could lead to additional lines of business. A real-life example

that came through much collaboration efforts, was a MHU that provides and contracts

their radiology services directly to nursing homes but wanted to expand and start

providing comprehensive healthcare related services to prisons and jails. This MHU

partnered with a healthcare group and for every new jail/prison for which the healthcare

group obtained a contract, it brought in the radiology MHU to provide radiology services.

This collaboration made it easier for the radiology company, and thereby the MHU, to aid

in adding on additional revenue and allowed the healthcare group to have a larger

comprehensive footprint when going after new contracts.

What are the implications for the Public interested in MHU

In order to create an MHU there are three factors to consider: understanding the

payor source, knowing the target market, and researching partnerships with hospitals or

academic settings. Undoubtedly, the most important factor is in securing or finding a payor. As previously mentioned, many of the MHU's complaints center around the funding and lack of resources, including private donations. Identifying the payor source and the longevity of the disbursements

will provide a major foundation for the initial and continual success of the MHU. If the payor source is commercial and private insurances, it is necessary to ensure the reimbursement rates have been thoroughly budgeted out and the financial statements of expected results for the coming year(s) have been accounted for. This will ensure the proper forecasting analysis based on a set of circumstances and conditions. It is therefore advisable to partner with and build a foundation with a hospital or an institution in an academic setting.

Not only is it helpful with shared costs and resources, but the prestige of a corporate name goes a long way with customers' trust and loyalty. Also, a major hospital or institution typically has already won patients trust; therefore, there is a streamline of business since the beginning. This perception of prestige, especially for the MHU, helps in ensuring a greater number of customers and clients. It also creates less risk for clients hoping to partner with and obtain the services of MHU's that may be new on the market.

Lastly, market knowledge is essential to success. The target market serves as the baseline of the business because it is necessary in anticipating future changes in the market that affect the patient population. It also helps in writing contingency plans and being prepared for any major changes in the marketplace.

What are the implications for Hospital and Academic Institutions Interested in MHU's

Hospital or academic institutions that are interested in partnering with MHU's, should consider engaging with non-compliant patient population and studying how such patients could lead to downstream referrals of onsite services. Here, non-compliant patients are defined as patients with no insurance, patients who have geographical constraints, and patients without the convenience of work-life balance. Many of these patients are part of the population of Americans who are unable to see a physician or obtain annual medical check-ups due to not having insurance, transportation, or just the financial means. By being mobile, a healthcare system can combat the volume of patients in healthcare-deficient areas or hospital deserts, by creating community outreach synergies and setting up in communities or rural areas to serve this patient population at self-paying pricing and close the gap on transportation constraints.

Furthermore, in doing this, MHU's may be at the forefront of discovering other medical necessities. This could look like a social worker, working alongside the MHU, being able to influence the patient to come in and arrange for transportation to the healthcare system's onsite services that are broader. Not only does the healthcare system obtain a downstream referral from the MHU, but also makes an impact to the community in gaining the trust and treating a patient that would otherwise not have been treated.

Lastly, there are many parents and patients who do not have the luxury of a work-life balance to take-off work to attend a doctor's appointment. Thus, by bringing a MHU onsite to provide healthcare screenings MHU's could provide a way for patients to get their healthcare needs met without the inconvenience of taking off work or school. It can be a selling point and viewed as an added benefit to an employer's benefit package that they offer to employees.

Insurance providers expansion of coverage

There are three factors that insurance providers should take into consideration within the MHU environment: lower costs, expansion of care, and accessibility to its members. MHUs could be a cost-effective way for insurance providers that are typically the providers of primary prevention methods and diagnosis. For example, many childhood obesity cases are identified at more advanced stages, which lead to higher medical costs. However, by recognizing these cases on the front end and providing health screenings quarterly and/or annually, the costs could drastically decrease and the chances of combating the epidemic could decrease. Furthermore, in making this care mobile, insurance providers, using MHU's, can reach a population that may or may not be a member of their health plans. This gives the insurance provider a means to reach their patients in vulnerable and rural areas, but also a way to attract new clients and customers. This access to care from the insurance provider allows for convenience and potential lifesaving treatment to current and new members.

Conclusion

The study contributed to the existing literature by examining the responses from various mobile healthcare workers dealing with obesity prevention among children. The results of this study enhanced the current knowledge on bottlenecks towards childhood obesity prevention, while exploring intervention framework in MHUs via exposure, education, and treatment. Childhood obesity is a debilitating social malaise which can lead to adult obesity and overall loss of human potential. This study examined whether changes in service level and experience level of mobile health workers contributed towards meaningful workers' perspective in first identifying issues, then re-designing

intervention mechanism and finally, effectively combating this growing menace. This study established the association between technical framework, data sharing fundamental, and efficacy of prevention mechanism in the context of childhood obesity prevention. Alarmed by the lack of attenuation of childhood obesity across the populace and recognizing the perceptions and attitudes of mobile health workers, this study recommended further research into expanding mobile health workers' access to data, ushering in an environment where health workers can learn and expand their knowledge base to appropriately use and expand their coverage of patients both currently in need and at-risk.

Finally, this study listed implications for practice aimed at current MHU providers, entrepreneurs interested in a MHU, hospital and academic institutions, and insurance providers as an outlook to the MHU industry from the researcher's point of view. This study closes on a hopeful tone, a hope that more research into the social malaise of childhood obesity and how technology can assist in tackling this complex issue, and pave the way for reduction in the incidence of obesity among the most precious and the most vulnerable among us.

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Appendix A

Survey Questions

Survey Questions

1. How much experience do you have as a healthcare professional within the mobile health unit industry?
2. What segment of business is your mobile unit considered? (Private, Non-Profit, etc.)
3. What is the number of people that your mobile unit services annually as first-time visits and also as repeated visits?
4. Does your mobile unit collect data that may trigger overweight or obesity levels?

If Yes,
   a) For the data that you are collecting, how are you capturing that data?
      a. What is the data utilized for?
   b) Has the data changed your organization? If so, in what ways?
      a. What results have you seen with the data that is being collected?
   c) What further opportunities have the data brought to the organization, if any?
   d) What other data would you like to capture, if any?
      a. If you would like to see more data, why would that type of data be of interest to you?
   e) Are you sharing your data collection with any state, national, or accreditation agency? If so, which entity?

If No,
   a) Would you like to collect data?
   b) What type of data would you be interested in collecting?
   c) What type of support would you need to begin to collect data?

5. Please rate your attitude regarding Childhood Obesity and briefly explain why?
   a. Utilize Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.
      i. Childhood Obesity remains to increase?
      ii. Only obese people should be treated for weight loss?
      iii. Mobile clinics are effective in reducing obesity levels?
      iv. Referral programs are set-up to treat obese patients?
6. On a scale of 1-10 (1 Being Not At All Likely and 10 Being Extremely Likely)
   a. Can you improve health outcomes of childhood obesity through the use of mobile health units? How?
7. How do you currently measure the effectiveness of your organization's mobile unit? What type of outcomes are you hoping to obtain through these measurements?
8. Are you willing to discuss more in-depth within a 20-minute phone interview? If so, please provide your email and phone number.

Appendix B

Phone Interview Questions

Open –Ended Interview Questions.

Participant can stop at any time.

Thank you for completing the survey questionnaire. The data from collected surveys will provide information for my dissertation. In addition, it is hoped that this data will lead to publication(s) on these issues.

I am happy to send you a copy of the results following completion of my dissertation. Please indicate whether you would like to be sent a copy of the results.

1. Please tell me a little about your role with the mobile health unit?
2. Do you collaborate with other mobile healthcare units? If so, how often? On what issues/problems/opportunities do you collaborate?
3. What are your suggestions for future research in regard to mobile healthcare and obesity?
4. Based on your current experience, would you have done anything differently? If the answer is "yes," what would you change? Please also indicate why you believe this change will create a better process.
5. Before other entrepreneurs move into the MHU industry, what advice would you give them?

Appendix C

Sample Responses to Survey Questions

Survey Questions

| 1. How much experience do you have as a healthcare professional within the mobile health unit industry? | 2. What segment of business is your mobile unit considered? (Private, Non-Profit, etc.) | 3. What is the number of people that your mobile unit services annually as first-time visits and also as repeated visits? | 4. Does your mobile unit collect data that may trigger overweight or obesity levels? | a) For the data that you are collecting, how are you capturing that data? What is the data utilized for? | b) Has the data changed your organization? If so, in what ways? What results have you seen with the data that is being collected? |

| c) What further opportunities has the data brought to the organization, if any? | d) What other data would you like to capture, if any? If you would like to see more data, why would that type of data be of interest to you? | e) Are you sharing your data collection with any state, national, or accreditation agency? If so, which entity? | a) Would you like to collect data? | b) What type of data would you be interested in collecting? | c) What type of support would you need to begin collecting data? |

| i. Childhood obesity remains to increase? | ii. Only obese people should be treated for weight loss? | iii. Mobile clinics are effective in reducing obesity levels? | iv. Referral programs are set-up to treat obese patients? | Can you improve health outcomes of childhood obesity through the use of mobile health units? How? | 7. How do you currently measure the effectiveness of your organization's mobile unit? What type of outcomes are you hoping to obtain through these measurements? | 8. Are you willing to discuss more in-depth within a 20-minute phone interview? If so, please provide your email and phone number. |

Appendix D

Sample Responses to Interview Questions

Sample of Responses

Respondent 1	16 years	Non-Profit Academic Medical Center	first-time visits: 3,110; repeated visits: 7,466	Yes	Transferring hand count into Excel spreadsheet; Excel data transferred into grant report for Walmart Foundation via the Children's Health Fund. Data utilized for grant report, nursing research project at medical center, patient care quality improvement	need for ongoing support and resources for childhood obesity prevention and interventions. We added a school and summer nutrition education program and expanded to provide monthly adult BMI and blood pressure screenings at a Housing Development community center.	We presented the data at our medical center's annual nursing research symposium. We are looking into an opportunity to further our PI project into a research project.
Respondent 2	7 years	No Profit	approx 1500	yes	We initiate BMI screenings to help calculate and classify specific BMI scores. The data is utilized to help recommend healthier lifestyle choices for children.	We have had parents become more involved in getting their children to primary care physicians as well as being able to have them promote the 85210 initiative.	n/a
Respondent 3	9 years	Non-Profit	2300 individuals through nearly 13,000 visits	Yes	Data captured through the electronic health record (EHR) and used for patient care. Our department currently does not have any research projects relating to obesity.	Our department currently does not have any research projects relating to obesity.	Capacity to apply for grants related to obesity, capacity to change service delivery relating to positive health outcomes
Respondent 4	7 years	state teaching institution	1500	No			
Respondent 5	3 years	Academic	2500	yes	Hand documented then uploaded to laptop which houses the EHR software.	Makes more work because we must be correct in our documentation.	none so far
Respondent 6	12 years	Private	4500 approximately	no	n/a/		
Respondent 7	2 years	Religious	2000	no	n/a/		

Appendix E

Email to Participants

Email to MHU Contact Personnel

Subject Line:
MHU Feedback Request – Thank You for Sharing Thirty Minutes of Your Time.

Dear Healthcare Professional,

Thank you for agreeing to complete this short 30-minute survey of 8 questions that will be utilized for my dissertation research.

As an expert in the field of mobile health units, your input is very valuable. Your specific survey responses will be anonymous and will assist me in developing recommendations for current and future Mobile Healthcare Units.

As we discussed during our telephone call, the required criteria are that you must be over the age of 25 years old and hold a leadership position within the mobile health unit.

Please utilize the link found below to access the Consent form and Survey.
https://goo.gl/forms/jnpmJI4JkBqWBJcB3
The Link will expire in 14 days.

After the study is completed, I will compile the results from all respondents and utilize them in my dissertation. This information will allow me to offer recommendations that you can utilize for your organization.

In addition, I would like to arrange a short 20-minute optional telephone interview as a follow up to your survey responses. Please respond to the last question on the survey if you are available for a 20-minute interview and provide your contact email and phone number.

In closing, the link will expire after 14 days starting today. I will send a reminder email and a reminder phone call if necessary.

Thank you again and I look forward to speaking with you!

Appendix F

IRB Approval Letter

UNIVERSITY of
HOUSTON
DIVISION OF RESEARCH
Institutional Review Boards

APPROVAL OF SUBMISSION

March 29, 2017

Christopher Douglas-Oguneko

cadouglas@uh.edu

Dear Christopher Douglas-Oguneko:

On 3/29/2017, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	PERCEPTIONS OF HEALTH PROVIDERS ABOUT THE COLLECTION AND USE OF DATA RELATED TO CHILDHOOD OBESITY BY MOBILE HEALTH UNITS
Investigator:	Christopher Douglas-Oguneko
IRB ID:	STUDY00000269
Funding/ Proposed Funding:	Name: Unfunded
Award ID:	
Award Title:	
IND, IDE, or HDE:	None
Documents Reviewed:	• Introduction Email with Survey Link, Category: Letters of Cooperation / Permission; • Reminder Email - 7th Day, Category: Other; • Phone Interview Questions, Category: Study tools (ex: surveys, interview/focus group questions, data collection forms, etc.); • Cover Form Consent 502a, Category: Consent Form; • Dr. Hausmann CITI Certificate, Category: Other; • Reminder Phone Call -12th Day, Category: Other; • Recruitment Letter, Category: Recruitment Materials; • Cover Letter Consent, Category: Consent Form; • Survey Questions, Category: Other; • Christopher Douglas - Mobile Health Units, Category: IRB Protocol;
Review Category:	Expedited
Committee Name:	Not Applicable

Page 1 of 2

UNIVERSITY of
HOUSTON
DIVISION OF RESEARCH
Institutional Review Boards

IRB Coordinator:	Danielle Griffin

The IRB approved the study from December 31, 1969 to March 28, 2018, inclusive.

To ensure continuous approval for studies with a review category of "Committee Review" in the above table, you must submit a continuing review with required explanations by the deadline for the November 1970 meeting. These deadlines may be found on the compliance website (http://www.uh.edu/research/compliance/). You can submit a continuing review by navigating to the active study and clicking "Create Modification/CR."

For expedited and exempt studies, a continuing review should be submitted no later than 30 days prior to study closure.

If continuing review approval is not granted on or before March 28, 2018, approval of this study expires and all research (including but not limited to recruitment, consent, study procedures, and analysis of identifiable data) must stop. If the study expires and you believe the welfare of the subjects to be at risk if research procedures are discontinued, please contact the IRB office immediately.

Unless a waiver has been granted by the IRB, use the stamped consent form approved by the IRB to document consent. The approved version may be downloaded from the documents tab.To document consent, use the consent documents that were approved and stamped by the IRB. Go to the Documents tab to download them.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

Sincerely,

Office of Research Policies, Compliance and Committees (ORPCC)
University of Houston, Division of Research
713 743 9204
cphs@central.uh.edu
http://www.uh.edu/research/compliance/irb-cphs/