A Mobile Application for Locating Treatment and Support

Abstract

In collaboration with the City of Worcester Health and Human Services Department, our team created an accessible directory of substance use treatment services and related resources through the creation of a functional mobile application. Prior to our project, there was a lack of communication between service providers and those seeking treatment. Through in-person visits, semi-structured interviews, focus groups with potential users, and a survey, our team collected information and received feedback related to app features and designs. We determined what features were most useful while keeping the app simple and user friendly. Our application will help those seeking treatment and support by easily communicating organizations and services in the City of Worcester.

Team Members

Walker Christie

Kyle Foley

Natasha Honcharik

Michael Kola

B Term

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Advisors

Professor Thomas Balistrieri

Sponsor

City of Worcester Department of Health and Human Services

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WPI

Substance Use Disorders in the United States

The United States has faced an escalating epidemic of substance use disorders for decades. The excessive use of drugs or alcohol is often fatal, and is currently the leading cause of death for Americans under 50 (Reynolds, 2017). Substance use disorders became a much more prevalent problem beginning in the 1990s when pharmaceutical companies convinced doctors to heavily prescribe opioid pain relievers by claiming they were not addictive. The National Institute on Drug Abuse states that "This subsequently led to widespread distribution and misuse of these medications before it became clear that these medications could indeed be highly addictive" (National Institute on Drug Abuse, 2018). As a result, the total number of overdose deaths increased rapidly, as shown in Figure 1. As shown in Figure 2, the increase came primarily from synthetic opioids, and 33,000 people died of opioid overdose in 2015 alone.

Mental health disorders often parallel substance use. Increases in substance use can cause a person's mental health to deteriorate. Conversely, an untreated mental illness may escalate a substance use problem. About half of the individuals in the United States with a severe mental illness are negatively impacted by substance use, and roughly 37% of people with an alcohol use disorder and 53% of people with a drug use disorder also have a mental health disorder (Saisan, Smith, Robinson, & Segal, 2018). Mental illness is just one of several issues that are deeply interconnected with substance use.

Homelessness is another common result of drug and alcohol use. Many people who suffer from substance use disorders are left homeless (Figure 3) and oftentimes are unemployed. According to the National Coalition for the Homeless, substance use can also be a "result of homelessness rather than a cause" (National Coalition for the Homeless, 2009). A significant portion of the homeless population turn to drugs and alcohol as a coping mechanism. Roughly 38% of the homeless population in the United States uses alcohol excessively, and about 28% use other drugs (Michael's House, n.d.). With an alarmingly large percentage of homeless cases attributed to substance use, city governments and treatment centers are collaborating to help mitigate the crisis and implement effective solutions.
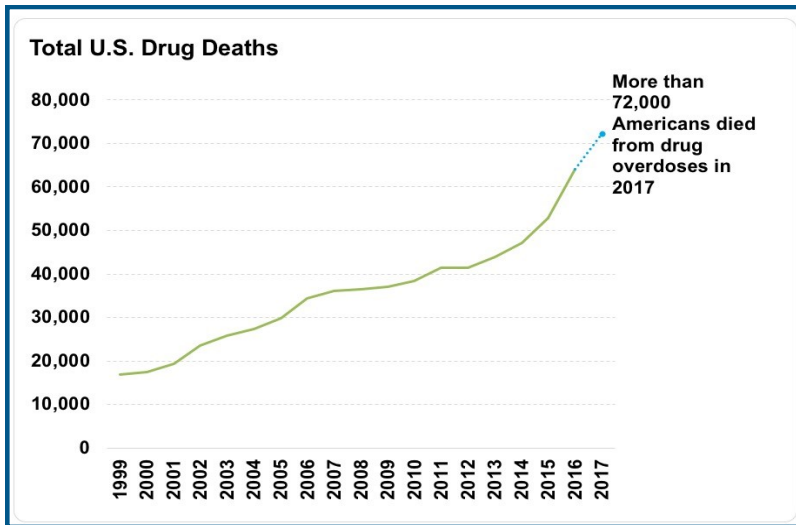

Figure 1. Graph of total US overdose deaths from 1999-2017 (National Institute on Drug Abuse, 2018).
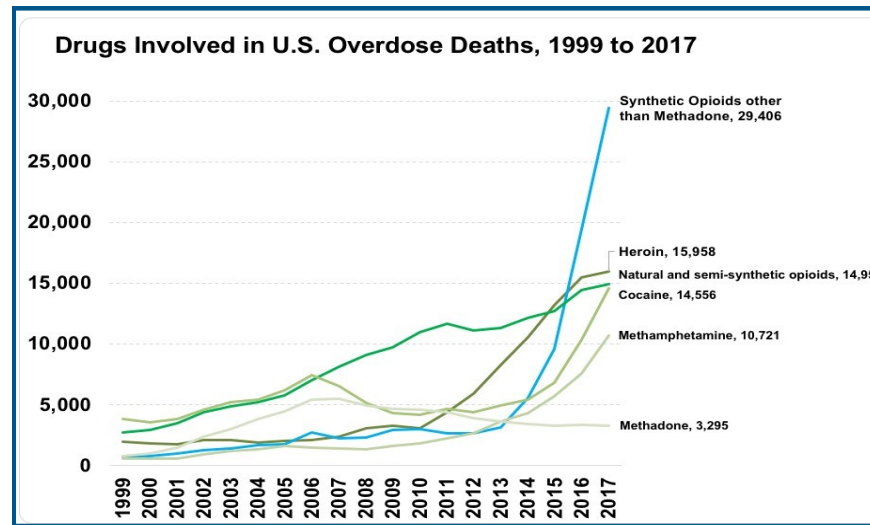

Figure 2. Graph of overdose deaths for different drugs from 1999-2017 (2018).

Substance use disorders affect every individual differently, therefore the National Institute on Drug Abuse outlines five different types of treatment. These treatment modalities include long-term residential treatment, short-term residential treatment, outpatient treatment, individualized drug counseling, and group counseling. Long-term residential treatment programs provide a non-hospital setting and 24

Figure 3. This image depicts a homeless person who also has a substance use disorder

hour care focused on rehabilitation. Therefore, long-term residential treatment is usually the most expensive option. Short-term residential treatment programs last three to six weeks and typically take place in a hospital, often "followed by extended outpatient therapy and participation in a self-help group, such as AA" (Principles of Drug Addiction Treatment: A Research-Based Guide, 2018). The cost of short-term housing, however, is still too expensive for many people. Some outpatient centers provide intensive treatment comparable to that of a residential program and are almost always less expensive. Finally, group and individual counseling can help someone struggling with substance use design and implement a recovery plan, improve social relations, and find employment. "Research has shown that when group therapy either is offered in conjunction with individualized drug counseling or is formatted to reflect the principles of cognitive-behavioral therapy or contingency management, positive outcomes are achieved" (2018).

Worcester

In the Worcester Community Health Assessment (CHA) from 2015, stakeholders for the city of Worcester ranked the top health challenges for the city. Opiate and prescription drug use was ranked second, and general substance use followed in third. The only health challenge that ranked higher was behavioral and mental health, which itself can be both a contributing cause and an effect of substance use. Despite these problems being top priorities for the city, only a very small number of patients are served by Worcester area substance use treatment facilities. In 2013, only 294 patients were served by substance use treatment centers in Worcester (Central MA Regional Public Health Alliance, 2015).

The complex problem of substance use can cause many long-term side effects including mental health problems and homelessness. For people who are already struggling to pay their bills, the onset or exacerbation of an addiction may cause them to lose their housing (National Coalition for the Homeless, 2019). This consequence of substance use has influenced the growing rate of homelessness. According to the most recent report from the National Alliance to End Homelessness, approximately 1,500 homeless people live in Worcester. The 12 local shelters don't have the capacity to handle Worcester's homeless population. This has led to the formation of tent cities depicted in Figure 4. Combating substance use needs to simultaneously address homelessness as it seems the two issues are not mutually exclusive.

Worcester, MA is a diverse city with high populations of immigrants, non-English speakers, and people of color. The Hispanic/Latinx community represents 20.8% of the Worcester population, which exceeds the national average of 16.9%. Twenty-one percent of its residents were born outside the US, whereas the national average is only 13%. According to The Foreign-Born Population of Worcester, Massachusetts, a study commissioned by the Seven Hills Foundation, more than half of immigrants in Worcester have low English proficiency (UMass Dartmouth and UMass Donahue Institute, 2015). Any proposed solutions to the epidemic of substance use disorders will need to take into account Worcester's diversity in order to reach the most people.

The Barrier: Locating Treatment

Although treatment for substance addiction can be very effective, it is often difficult to locate. According to Substance Abuse and Mental Health Services Administration (SAMHSA), 22.5 million Americans needed treatment for substance use in 2015, and only 4.2 million, or 18.5%, received treatment (National Institute on Drug Abuse, 2018). Based on an inventory of barriers to treatment, seven major factors were identified that prevented substance users from receiving treatment: denial of the problem, stigma, fear of treatment, privacy concerns, time conflict, admission difficulty, and poor treatment availability (Rapp, Xu, Carr, Lane, Wang, & Carlson, 2006).

Figure 4. This image depicts the Worcester Government's Quality of Life Task Force visiting a homeless encampment (The Episcopal Diocese of Western Massachusetts, 2018).

Within the barrier of poor treatment availability, locating treatment is a major factor that prevents individuals from receiving treatment. By improving awareness and access among organizations and the public, more people will be capable of receiving medical care. In the inventory of barriers to treatment survey, 7.7% of people responded stating they did not know where to go for treatment (SAMHSA, 2013). By increasing treatment availability and awareness, many more substance users will be able to receive treatment.

The current system used by the Department of Health and Human Services (HHS) to provide information about substance use treatment services involves two paper booklets pictured in Figure 5 distributed to various professionals. One of the booklets is a resource published by the Massachusetts Organization for Addiction Recovery (MOAR). First responders and some health professionals have copies of the booklets which list available services in Massachusetts for treatment of addiction and related needs like housing. The booklets are large and difficult to search through because they contain listings for all of Massachusetts instead of just the Worcester area. They are also somewhat out of date as the booklets were published in 2016. Another problem is that the books are too large to be easily distributed to the entire community of substance users, their friends, and families (Castiel, 2018). Treatment centers also distribute paper resources such as the ones pictured in Figure 5 to recommend other places people can go to for help.
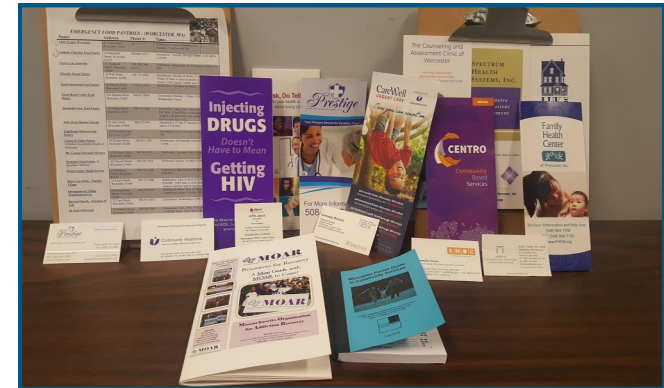

Figure 5. A Collection of some of the paper resources currently used to distribute information about treatment for substance use disorders and related issues. Every location has a different subset of this literature.

Sponsor

The sponsor of this project, the City of Worcester Health and Human Services Department, manages the health resources of the city. The organization also ensures that all residents have equitable access to health services without prejudice by providing information, education, outreach, and advocacy. The commissioner, Dr. Matilde Castiel, leads the department and acted as the liaison to our project team (City of Worcester, 2018-c).

HHS runs a Community Health Assess-

ment (CHA) every several years to determine the health needs of Worcester and assemble a Community Health Improvement Plan (CHIP) (Central MA Regional Public Health Alliance, 2016). One of the priority areas of the plan is reducing substance use. Other relevant parts of the plan include mental health, economic opportunity, and access to care, which aims to provide care to low-income and diverse communities. HHS needs a solution to reduce substance use, improve mental health, and reduce homelessness by making treatment more accessible.

Purpose

The purpose of this project was to create an accessible directory of substance use treatment services and related resources in Worcester through the creation of a functional mobile application. This application improves access to resources by compiling all the information in one directory that is easy to search through and keep updated.

Mobile Applications

As of January 2017, more than 2.2 million apps are available in the iOS App Store, while its Android counterpart, Google Play, has over 3 million (Dogtiev, 2018). Additionally, Android has a nearly 80% market share worldwide, but in the US, iOS has a slightly higher market share. A major factor in Android's popularity is the operating system's low-cost smartphones. According to ABI Research and The Wall Street Journal, the average price of an iPhone was $687 in 2014

compared to just $254 for Android, allowing more people to afford Android smartphones (Chowdhry, 2015). Figure 6 shows that more Android users are low-income than iPhone users. According to The U.S. Mobile App Report by comScore, "the median iPhone app user earns $85,000 per year, which is 40% more than the median income of Android users of $61,000 (Lella, 2014). In addition to Android phones being affordable, there are also government programs that provide smartphones and cellular service plans at a discount or no cost to people who qualify (Federal Communications Commission, 2018).

Users are able to easily find most of the applications they wish to download, including health apps. Some health service providers have their own mobile apps, which feature the ability to schedule appointments, view staff contact information, and more. However, there are not many applications that provide users with information about different health providers, such as their locations and services provided. One specific topic that is not widely covered in these categories is the communication of health services within the realm of substance use (Lella, Lipsman, & Martin, 2015). Now that mobile applications are popular and widely used, it is critical to create applications that solve problems in society rather than simply provide entertainment.

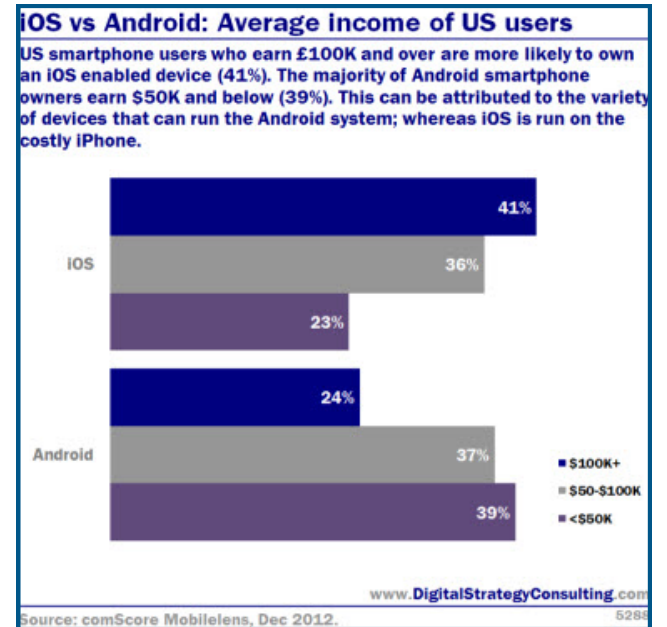A majority of mobile applications pertaining to substance use are either educational or

Figure 6. Android and iOS users by income (StatCounter, 2018).

provide tracking tools. Educational apps provide users with information regarding drug addiction and alcohol use while tracking apps allow users to keep an updated calendar throughout their recovery and sobriety. A handful of applications are made specifically for users in recovery that give tips on how to resist urges, contain community discussion boards, and present frequently asked questions. By increasing the number of applications that communicate substance use treatment services, it may be possible to increase the number of people who receive treatment and eventually recover from a substance

use disorder.

"GetHelpNow Montgomery County" is one application that "helps connect patients in need of alcohol, drug addiction or mental health help with a network of service providers in Montgomery County, Ohio and the Dayton region" (Ascend Innovations, 2018). This app provides the user with four categories to choose from: 24/7 urgent services, treatment services, support services, and housing services as shown in the first screenshot of Figure 7. The second screenshot conveys that selecting a specific category will bring the user to a screen where they can select a specific type of treatment service. Choosing one of the services will provide a list of locations in the Montgomery County Area as shown in the third screenshot of Figure 7.
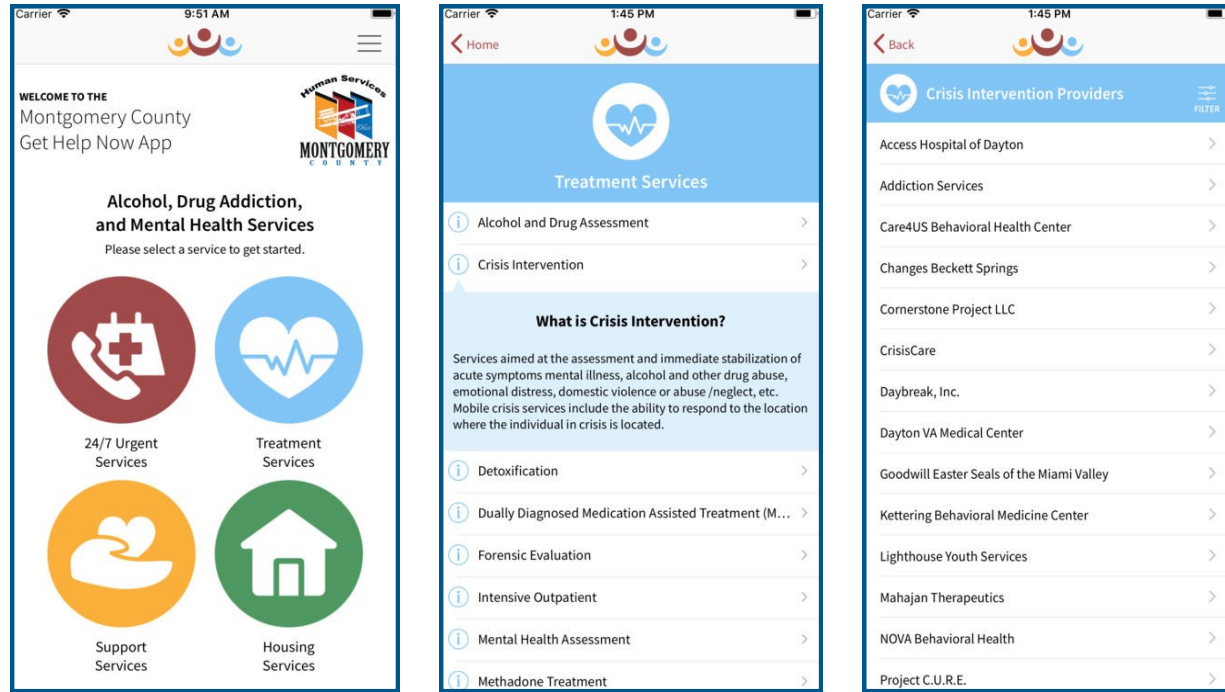

Figure 7. Screenshots of the GetHelpNow Montgomery County mobile application (Ascend Innovations, 2018).

Objectives

To achieve our purpose of designing, developing, and compiling a directory app, we completed three objectives using various methods detailed in Figure 8.

Objective One

Research substance use treatment centers, homeless shelters, and related resources in Worcester and catalog their basic information. We gathered information via in-person visits, phone calls, online research, collection of paper resources, information previously gathered by the HHS, and a survey on Google Forms, pictured in Figure 9. We collected information from over 70 locations to list in the application. We first collected basic information such as contact information, hours, and address. We then collected more detailed information about services provided, community events, eligibility, and accessibility. Accessibility included not only wheelchair access, but also language and special support services for LGBTQ+ clients, veterans, undocumented clients, and other underserved groups.
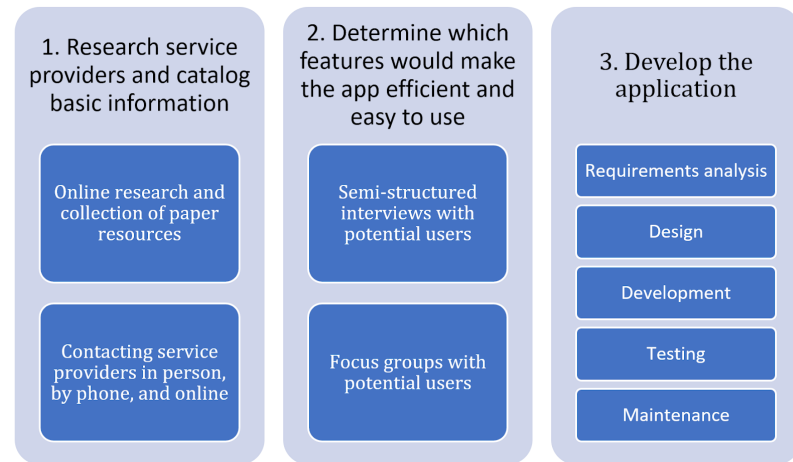
The survey (See Appendix C)

Figure 8. Chart of our three objectives and the methods used for each one.

was emailed to several organizations with a brief description of the project. Organizations that did not respond to the survey were called or contacted in-person. We informed them about the project and its benefits and requested they complete the survey with us present.

Large organizations that provide substance use services, homelessness services, and related services often have their information available online. Other smaller organizations were listed in paper resources that we found scattered at many locations. One of these paper resources was the Worcester Parent Guide to Community Services "Blue Book", a broad guide providing information for many types of services, not just substance use and related services. Our sponsor also had a spreadsheet of information about some locations based on a previous survey. We entered relevant information from this spreadsheet into the Google Form survey for consistency purposes.

Objective Two

Determine which features and designs would make the app simple and most useful for potential users. In order to meet this objective, our team utilized focus groups and semi-structured interviews as research methods to gather opinions. Subjects of the focus group and interviews included substance users, including those in recovery, treatment center directors and staff, and the homeless.

We led our first focus group with clients at Everyday Miracles Peer Recovery Center. This

Figure 9. Screenshot of part of the survey.

initial focus group served as a pilot to test the focus group questions. Results from the pilot provided clarification on what features potential users desired, and we learned how to efficiently lead a focus group and structure it to be as beneficial as possible. After changes were implemented, we then started conducting focus groups on a weekly basis at Everyday Miracles. We structured other focus groups, like those shown in Figures 10 and 11, into three sections: introducing our project and deliverable, discussing our progress on the app, and receiving suggestions and questions from the participants.

In addition to focus groups, our team received critical feedback by conducting semi-structured interviews. The subjects of the interviews included homeless people to get a sense of what is important and useful to them. Our original plan was to schedule interviews with treatment center staff, however, scheduling proved difficult. As an alternative, we held informal conversations with staff while visiting their centers to gather information. We asked them about how their organizations function and their opinion on what could make the app, given their profession and knowledge of the subjects and clients themselves.

In order to receive useful input from focus groups and interviews, we created a ranking sheet for participants to complete. First we asked participants to prioritize the information that would appear under individual listings, including name, address, services provided, etc. This would allow us to gather data and determine the order in which information should appear for a specific listing. Next we asked the participants to prioritize filtering options such as treatment types, language, and accessibility. This would allow our team to determine what important filters were visible and what filters would be available through a drop-down menu. Finally, we asked directors and staff of the different organizations to compose frequently asked questions (FAQ) that they receive to potentially include in the application. This ranking sheet provided our team with quantitative data to

Figure 10. Focus group at the Department of Public Health.

Figure 11. Focus group at Everyday Miracles Peer Recovery Center.

determine what is important to potential users when seeking information about a listing, including the order of information and the filtering options. By conducting these focus groups with dozens of potential users, we were able to receive feedback about the application and learn what is most important to people struggling with substance use or homelessness.

Our team created an analytical model to determine the value of all of the potential features that could have been included in the application (See Appendix D). Using this model, we listed and ranked each benefit, cost, danger, and development time factor for each feature on a scale from zero to six, with "cost" including financial, complexity, screen space, and future maintenance costs. Benefits were counted

positively with six being the most beneficial, and costs, dangers and development time were counted negatively with six being the most costly, dangerous, or time consuming. Using this model, we were able to determine which features create the most problems and which features were feasible. This helped us decide which features should be included in the app, which should be recommended for future extensions, and which ones should be discarded.

Objective Three

Develop a functional mobile application and publish it on the Google Play Store. To develop the functional app, we used the software development life cycle detailed in Figure 12:

- We analyzed the requirements of our users based on the information gathered in objective two
- We created design mockups of the app that met these requirements.
- We implemented the code for the app in several steps, starting by developing the layout of the pages of the app in Android Studio.
- We implemented the backend of the app by creating a database in Google's Firebase to store the data about service locations.
- We added functionality to the layout and buttons on the app and connected it to the database.
- We tested the functionality of the app concurrently during development and held a final focus group near the end of development that served as a user test.

We recognized that our team will not be involved in future maintenance of the app beyond our project term, so we developed a simple website that serves as an update manager. This website allows HHS to add, edit, and review listings within the database. Lastly, in the latter weeks of the project we held several meetings with the City of Worcester's Technology Department to ensure a smooth and secure transition of ownership of the app, database, and website.

Results From Objective One

Initially, our team gathered and compiled data into a Google Sheets file on all individually discovered Worcester resources for substance use disorders, homelessness, and medical emer-

gencies. By creating a Google Sheets file, every project team member was able to research organizations and enter information for the different categories that would be published in the mobile application. These categories were initially substance use treatment centers (inpatient, outpatient, residential treatment, and peer recovery), homeless shelters, and urgent care centers which included hospitals for medical emergencies. However, by speaking with potential users and HHS, our project team discovered that removing urgent care and having additional substance use-related categories would greatly benefit potential users. The categories within the application later expanded to include substance use treatment centers, housing/shelters
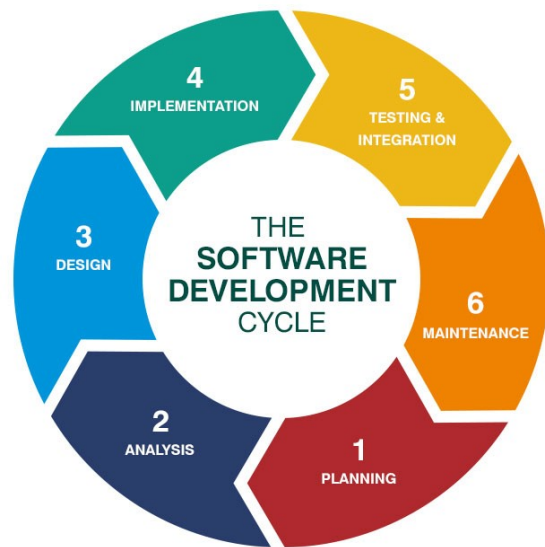

Figure 12. The software development life cycle (Husson University, 2018).

(including services such as how to complete an application for supportive housing), mental health providers, and food pantries. Team members were able to individually research locations within a specific category and enter information into the spreadsheet simultaneously.

The Google Sheet contains 20 different columns for information critical for both our project team and listings themselves. It also includes 128 resources, over 70 of which will be included in the application. The discarded resources included social services, hotlines, and state-wide services. A link to the Google Sheets file containing all of the information for the mobile application is provided (See Appendix A).

Results from Objective Two

Determining what features were most beneficial and easy to use gave our group a lot of insight into what was important in the mobile application. By speaking with various groups that could potentially use the app, we were able to determine what features to include, what features were not necessary, and how to design the application to best-fit the potential users. This objective was completed mainly by providing a ranking sheet (See Appendix B) to individuals including treatment center and homeless shelter staff, as well as members of Everyday Miracles Peer Recovery Center. By distributing the sheet, we were able to gather critical data based on 28 different responses. This ranking sheet initially contained three sections: Information order ranking, filtering options ranking, and feature

selection. Information order ranking included eight different pieces of information: phone number(s), address/map, parking situation, hours, services provided, payment/insurance info, flags for special accommodations, and pictures of location. Our team explained that prioritizing this information would determine the order in which it was displayed. The ranking results, numbered 1-8, were compiled into a Google Sheets file and the average ranking for each piece of information was calculated (See Appendix B). Through this data, our group determined that services provided, phone number(s), and address/map were most important to potential users. This spreadsheet also contained the results of the second section of the ranking sheet, filtering options ranking. This section contained seven different filters that we could potentially include in the application, including: treatment type, insurance/payment info, language, accessibility, populations served, special support (undocumented friendly, LGBT+ friendly, etc.), and hours (open now, open weekends). These filters would allow a user to specify a certain need and the application would only provide listings that accommodate the user. Based on the 28 different responses, it was determined that treatment type, hours, and insurance/payment information were the top three filters for potential users. All other filter options would be included by providing a "show more" button. The third and final section of the first iteration of the ranking sheet included the

option to select three of the responder's most desired features. These features included: Save filters option, suggestions for treatment, submit edits, share listing, events calendar, feedback system, Good Samaritan law message, and insurance activation assistance message. Of the 26 responses for this section, 20 selected "events calendar", 16 selected "insurance activation assistance message", and 13 selected "suggestions for treatment". 77% of potential users wanted an events calendar, telling our group that community engagement was of high importance. To satisfy potential users, our team implemented an events calendar by providing HHS access to add events, both hosted by the City of Worcester and by organizations listed within the app.

After finalizing what features were important using the third section, we created a second iteration of the ranking sheet to give to staff of different organizations. This iteration replaced the third section, the feature selections, with a "Frequently Asked Questions" (FAQ) section. Our project team believed that providing potential users with an educational tool within the app would be beneficial, however, upon speaking with staff we determined that it was not of high priority. We discovered that the main question treatment centers, shelters, etc. receive is simply where to go for a certain service. We asked approximately 10 staff members from different treatment centers and homeless shelters about frequently asked questions they receive and all responded that clients simply want to know where to go. The mobile application is a directory of all relevant resources and could be navigated by specific services, so our team determined that a FAQ section was not needed.

Through the objective of determining the features of the application, our group learned several things regarding the potential users and the application itself. The most common suggestion from the people we spoke to was that simplicity is key. A lot of potential users do not have an extensive background with smartphone application use and it was important that someone with little knowledge of filters, buttons, etc. could easily navigate the application and find what they were searching for. By sharing mockups of the application and later showing actual screenshots, we learned that the application was easy to navigate and was simple enough for the target population to use. Our team wanted the app to be accessible to as many people as possible, which is why we also tailored the color scheme and font to suit those with impaired vision. Our team ensured that the contrast in colors passed the Web Content Accessibility Guidelines (WCAG) 2.0 AA test, combining the colors with both small and large text. After researching the Worcester population, our team decided that having the application in multiple languages would be highly beneficial, allowing those who do not speak English to use the app as well.

As our project progressed, we learned that the application would be beneficial to many people, not just those seeking treatment. Family members of substance users could use the application to help a loved one find treatment based on their specific situation. Additionally, many organizations provide referrals for services that are not offered at their specific location. The mobile application would be an efficient means to determine what organizations nearby offer the services that a client is looking for. EMTs and first responders could also potentially use the application to be made aware of nearby organizations and what services they offer. By determining the most important and easy to use features, we were able to expand the potential user population and create the simplest and suitable mobile application design.

Results from Objective Three— The Deliverable

The completed and published mobile application contains an eye-catching medical emergency message at the top of the home screen. Because the application is not intended for medical emergencies, the message tells the user to call 9-1-1 if the situation is urgent. The message also refers to the Good Samaritan Law when it states that "The law protects you." At the end of the message, there is an option to "Tap for more," leading users to a mass.gov webpage. This webpage provides step-by-step instructions on what to do if you witness some-

one experiencing an overdose including the symptoms of an overdose, what to say when calling 9-1-1, what to do while waiting for the ambulance, and how to perform rescue breathing. The bottom of the page explains the Good Samaritan Law in further detail, stating that "The law protects victims and those who call 9-1-1 for help from charge, prosecution, and conviction for possession or use of controlled substances" (Commonwealth of Massachusetts, 2018).

The home screen has five buttons, one for each major category. As seen in Figure 13, these categories are labeled substance use, housing & shelter, mental health & support, food & clothing, and events calendar. Selecting one of the five major categories will lead users to a listings page, seen in Figure 14, with all of the organizations that provide a service in that category. These listings are automatically sorted by distance, showing the user nearby locations first. The three most important filters as determined in objective two (services offered, hours, and insurance/payment information) are included at the top of the listings page, while the remaining filters are available by pressing the "show more" button in the top left corner. Selecting a filter, such as a specific service, will highlight the button in green and only show organization listings that provide that service. Multiple filters can be selected to narrow results based on the user's individual needs. Upon selecting a filter using the "show more" option, the additional filters can be collapsed again by

Figure 13: Screenshot of the home screen of the mobile application.
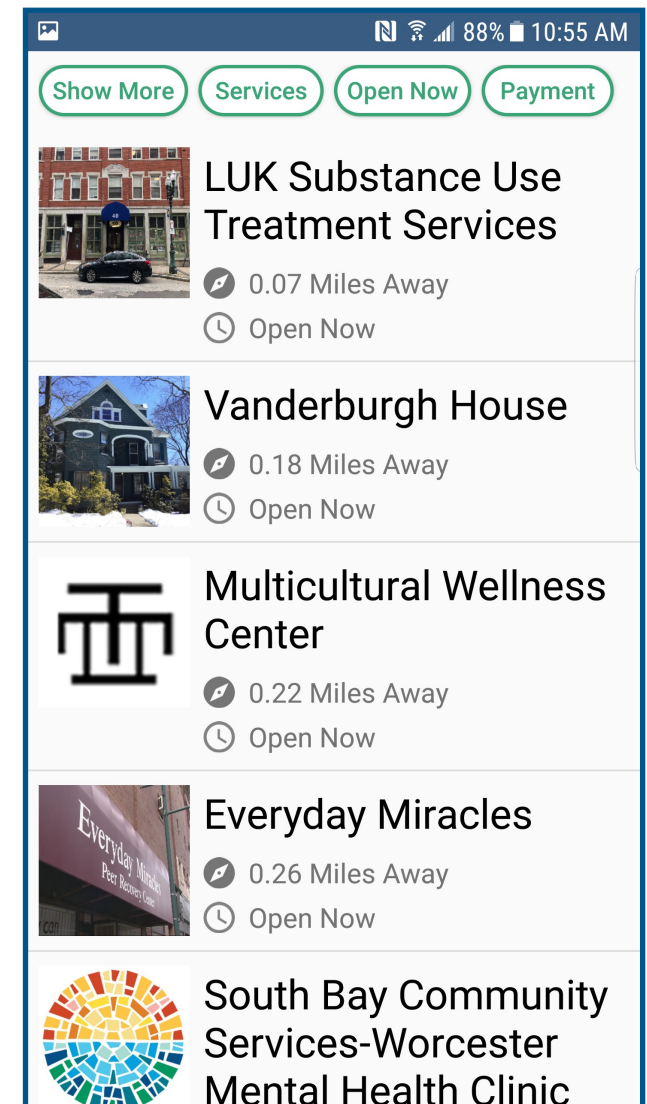

Figure 14: Screenshot of the listings page.

pressing the "show less" button that appears in the top left corner. Deselecting a filter will cause the filter to return to white and display the initial listings.

If a listing is selected, the application will provide the organization's information obtained from objective one, such as address and services provided. The organization's individual page, displayed in Figure 15, was organized using the results of the ranking sheets in objective two. For display purposes, pictures (if provided) of the organization are included at the top of the page so users of the app can recognize the organization. If multiple pictures are provided, users can swipe to view each picture. The following order of information for each listing is a result of ranking sheet data and overall appearance: name, address, services provided, contact information, hours, payment and insurance information, special accommodations, parking options, and an embedded map of the organization in Google Maps. If there is missing information for an organization, the listing will only display sections for information that is present.

An events calendar is included as the last home screen button as a means to incorporate community engagement into the application. This events calendar, shown in Figure 16, includes events held by Health and Human Services as well as any other event that HHS desires to add. These events can include: public meetings, volunteering opportunities, clothing drives, food drives, and other community events. Shown in
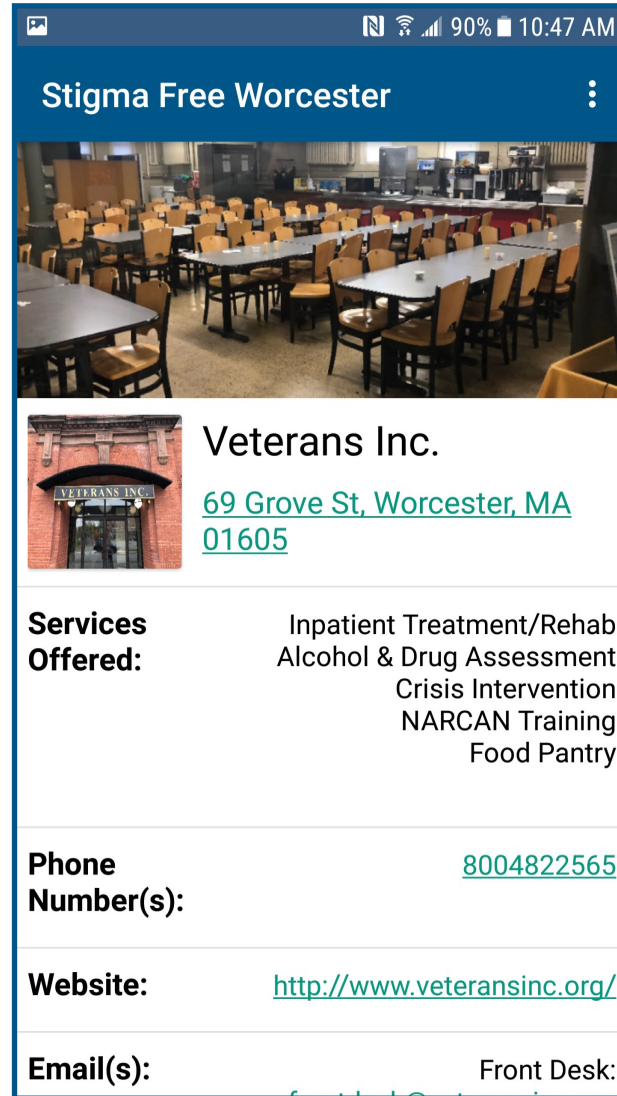

Figure 15: Screenshot of the organization's page.
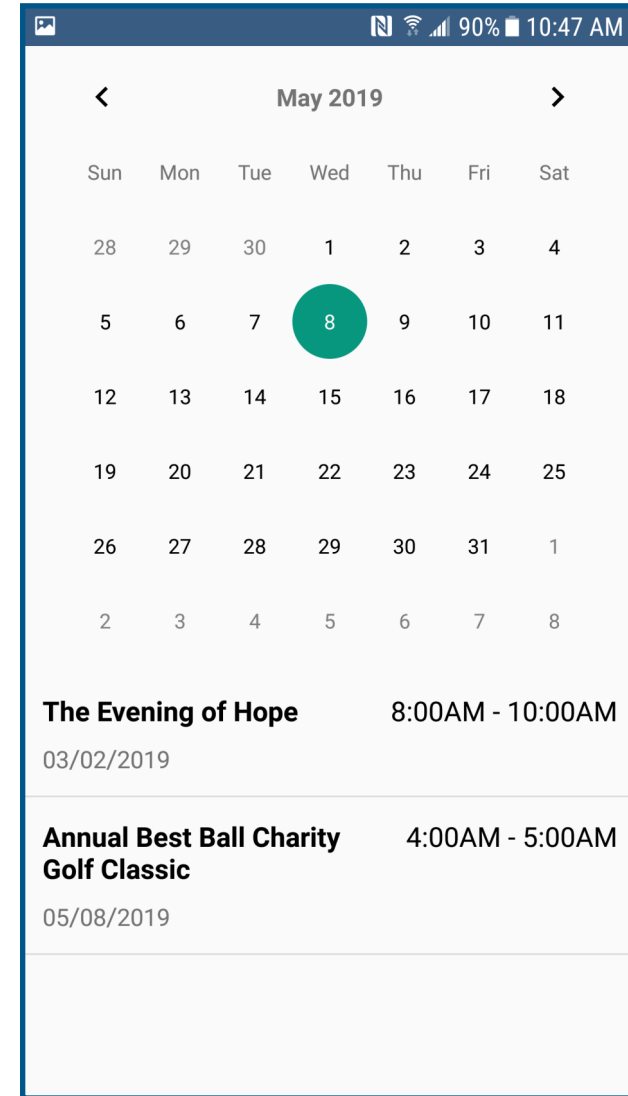

Figure 16: Screenshot of the events calendar.

Appendix G, the individual event listings include the name, date(s), time(s), and description of the event. By including this feature, we hope to reduce the stigma among substance users and the homeless city-wide and help engage the Worcester community.

Additional features of the application include the ability to share a listing and provide feedback for a listing or the application itself. To share a listing, a user must press the menu button in the top right corner of the app. This menu will drop down, containing both features. The user can select "share listing" and a menu will pop up, headed "share with". This menu allows a user to share a listing via different platforms, such as their default email app or messaging app. Users also have the option to "copy to clipboard", allowing them to paste the text anywhere they desire within their phone. To provide feedback, a user can select "suggest an edit". The user will then be directed to their default email app with HHS set as the recipient. The user can provide their input into the text field (i.e. "The phone number provided is incorrect") and it will be delivered via email to the Department of Health and Human Services. These

While determining the features of the application, our team learned that translating the app into multiple languages would be highly beneficial. To make the application accessible to as many people as possible, our team translated the application into Spanish and Albanian, two

common languages among the Worcester community. These versions are shown in Figures 18 and 19.

Figure 18: Spanish version of the application.

Figure 19: Albanian version of the application.

The app can be easily kept up-to-date in the future by using an Update Manager website that our team created. Information is entered into the Update Manager and uploaded to a database. All phones with the app installed will then download and display the information from the database. We created an account for the Department of Health and Human Services so that they will have the ability to add, edit, and review listings without having to edit the app's code.

To add a listing, a member of HHS must select "New Listing" in the upper right-hand corner of the website. This will lead to a listing page with various empty fields. All information (name, address, etc.) must be entered using checkboxes and text fields. Upon completion of information entry, there is a "submit" button at the bottom of the page to display the listing in the application.

There is also a feature to review and edit existing listings. By selecting the "Home" tab in the upper right-hand corner, all existing entries will be displayed in a list format. A staff member of HHS can then select a listing to edit the existing entry or add new information.

We provided HHS with a document (see Appendix H) explaining in detail how to use the Update Manager to make changes to the information in the app.

Recommendations

The mobile application will be published and the ownership and account access will be transferred to the Department of Health and Human Services' technical department. We offer the following recommendations to further improve and expand upon the app:

1. *We recommend that an iOS version of the application is published in the App Store.* Our team created an Android application because the majority of people who suffer from substance use disorders and homelessness have Android phones. However, we learned that an iOS version of the application would also greatly benefit the Worcester community. Government employees: city officials, police officers, etc. are provided with iPhones and could use the application if an iOS version is created.

2. *We recommend that the listing area is expanded beyond the city of Worcester.* Though we gathered critical information for treatment centers, shelters, etc. in Worcester, the application could be expanded to include listings for organizations in nearby cities and towns. If listings are added for organizations outside of the city, residents of Shrewsbury, Millbury, Leicester, etc. could use the application for their specific needs.

3. *We recommend that the categories within the application (substance use, housing/shelter, food, etc.) are expanded to include all mental health providers, social service providers, and other related resources.* We gathered information for all substance use and homelessness services we were able to find, but we only included mental health resources that were already in another category. There are many more resources in Worcester specific to mental health that can be included in the app.

4. *We recommend that the mobile application is marketed at highly frequented public locations (Union Station, Worcester Public Library, City Hall/Common, etc.).*

5. *We recommend that an Android device is provided at these highly frequented public locations with the mobile application pre-installed for increased accessibility.*

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