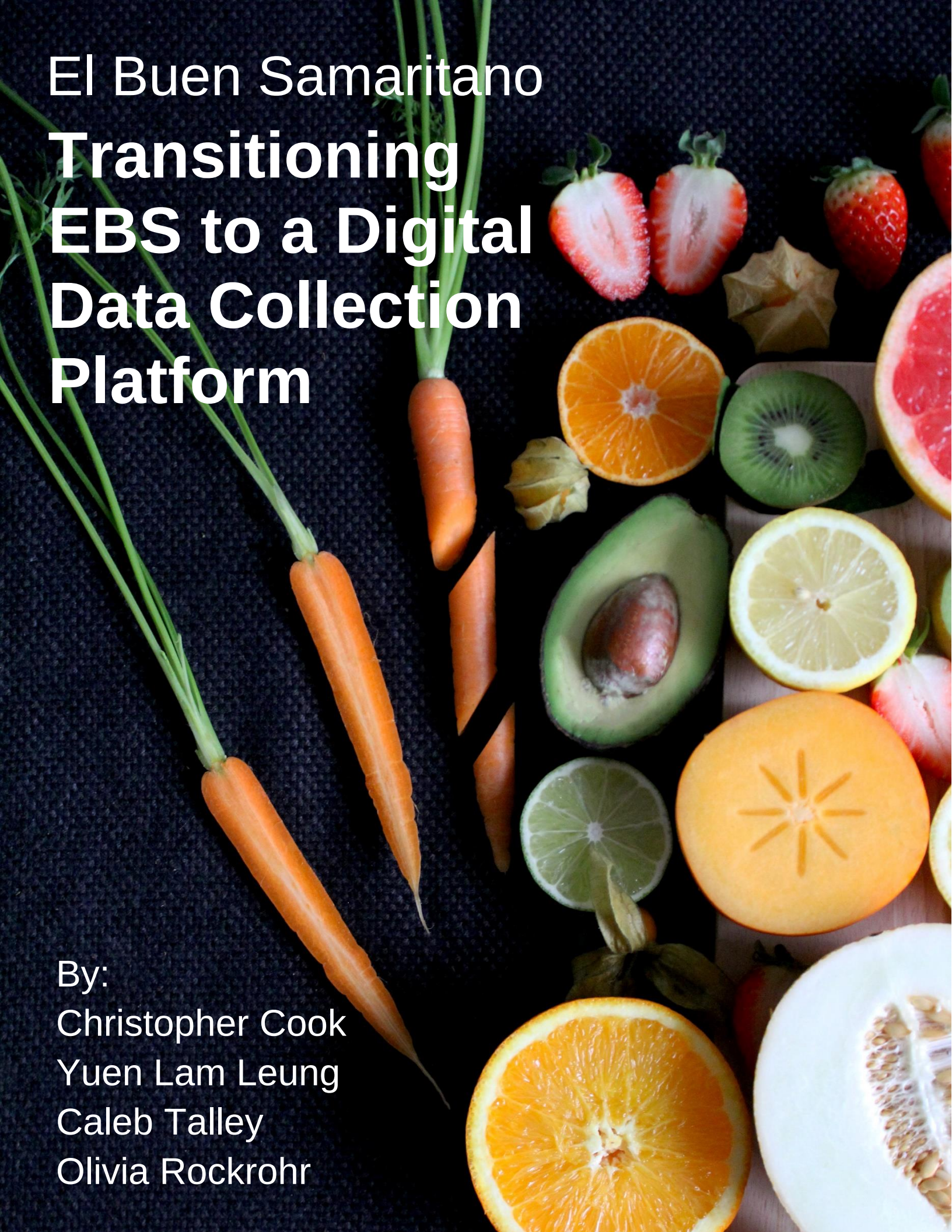
El Buen Samaritano

Transitioning EBS to a Digital Data Collection Platform



By:
Christopher Cook
Yuen Lam Leung
Caleb Talley
Olivia Rockrohr

Transitioning El Buen Samaritano to a Digital Data Collection Platform

An Interactive Qualifying Project

submitted to the Facility of

Worcester Polytechnic Institute

in partial fulfillment of the requirements for the

degree of Bachelor of Science

in cooperation with El Buen Samaritano

Submitted 5/2/2022

Submitted By:

Christopher Cook

Yuen Lam Leung

Caleb Talley

Olivia Rockrohr

Project Advisors:

Dr. Aaron Sakulich

Ms. Ruth McKeogh

Abstract

Food insecurity is an ongoing issue in the city of Worcester. We facilitated and simplified the data management process for a local food pantry by replacing pen-and-paper data collection with a more efficient digital system. Utilizing a survey platform and Excel, we minimized repetitive work, provided useful data visualization, and translated the surveys to make them more accessible to EBS's diverse client base. The new digital system has helped the food pantry apply for grants and expand its services.

Executive Summary

Immigration following industrialization has shaped the demographics of Worcester. Today's Worcester houses a diverse community made up of people of different races and ethnicities. Among them, a particularly vulnerable population lives below the poverty line, some of which include dependent populations (children, disabled individuals, elderly), single parents, ethnic minorities, and low literacy households. Low levels of education, poor health or disabled status, and lack of resources are affecting these individuals' ability in receiving basic needs to live without poverty (Buhi, 2004). Among several struggles, one that these people face is food insecurity as they are unable to obtain enough nutritious and healthy food.

An individual is food insecure when they lack physical or economic access to enough food for sustaining a healthy life (Buhi, 2004). Insufficiency in food can lead to malnutrition and poor physical and mental health. El Buen Samaritano (EBS) is a nonprofit organization in Worcester. They have been distributing food and clothes to the community for 30 years. We recognize the significance of addressing food insecurity in the Worcester community, therefore, we collaborated with EBS to help improve and expand their services in this project.

Our goal and methods

Our project goal was to develop a technological solution for El Buen Samaritano that facilitates data collection, storage, and analysis. We aimed to provide an improved system that will simplify the daily operation in El Buen Samaritano and assist in gaining increased funding and grants. To design and implement the solution, we identified the following objectives**:** Understand logistical operations at EBS, Identify EBS requirements for data collection, Learn about data collection tools at other food pantries, Determine the best digital platform for data collection, and, Develop a plugin to interface the data submission portal.

First, to truly understand the problem EBS is trying to solve, we conducted participant observation with EBS. Some activities that we participated in included the food distribution event, food pickup, and collecting and inputting data using their current system. These activities allowed us to collect detailed information on how EBS operated, not just as a food pantry but as an organization that is solely operated based on donations and volunteers. Second, we identified

the requirements for the data collection by conducting semi-structured interviews and participant observation. The Director of Operations and the EBS staff are some individuals that we interviewed to get their perspective on the current pen-and-paper system. All the activities previously mentioned helped us identify the shortcomings of the original system. Third, to determine how to implement the most applicable system for El Buen Samaritano, we learned about the data collection tool used at other food pantries, which provided a helpful framework and template for our project. For our fourth objective, after researching different digital platforms and working with EBS to identify a solution, we determined the best online digital platform that can be used to collect and store all of the spreadsheet data. This way, members of EBS will have easy access to their data, while having said data be secure and ordered. Finally, we planned on developing a digital plugin that would allow EBS to transfer their data from a digital spreadsheet to the Worcester County Food Bank (WCFB) portal. We asked Computer Science professors, via semi-structured interviews, to give us guidance on what routes we may have wanted to pursue. We also conducted semi-structured interviews with the WCFB, in order to see if any solutions already existed, and for their future plans on updating the portal.

Results

By participating in food pickup and food distribution hosted by EBS, we learned about the logistical operation of the food pantry. EBS obtains most of their food from the WCFB, therefore, the EBS staff would drive to the WCFB warehouse and pick up food every Wednesday. Without a formal system that tracks and organizes their food inventory, they can only determine what type of food and estimate their stock by visual. For example, as cartons of milk were scattered throughout the storage rooms, it led to an overstocking problem because the staff wasn't aware of how much milk there already was. To organize their inventory, we rearranged their food storage by grouping food under the same category and labeling each shelf with laminated cards. The food is then distributed every Friday. We learned that EBS staff would prepare about 100 - 125 food baskets, which usually contain fresh fruit, frozen meat, canned vegetables/fruits, and pasta. As EBS collaborated with multiple organizations, they were able to have volunteers over to help with food distribution.

Apart from distributing food, the other important process during the food distribution is collecting demographic data of their clients. The WCFB requires each partner agency to submit a monthly report summarizing the following data of all their clients: the zip code of where they live, whether they have been to EBS before, the size of their household, ages of each household member, the primary source of household income, and whether they are receiving federal program benefits. The data collection solution that we developed not only should be able to collect the above data, but it should also effectively replace EBS's pen-and-paper system, which is easy to use but difficult to organize. Therefore, the usability and accessibility of the solution we developed need to be on par with the current pen-and-paper system.

We interviewed several food banks and food pantries in the city of Worcester to learn about different solutions implemented at these organizations. A few food pantries utilize specific software to manage their data and track their inventory. However, the software may limit the accessibility of the food pantry because each client will have to register an account. We determined that it is not a feasible option for us, as the services that EBS provides are open-door and easily accessible even by those that lack internet access. Another food pantry brought up the idea of utilizing survey platforms during data collection. We adopted this approach after evaluating the usability and suitability of different survey platforms

We researched ten survey platforms, evaluating whether each of them was able to meet the requirements we determined: affordability, adequate number of surveys and responses per month, offline access, ability to export as excel files, and tablet and mobile compatibility. We eliminated six of the survey platforms, leaving four choices: SoGoSurvey, Jotform, Quick Tap Survey, and FEEDS form. We created sample surveys on each platform and presented them to the executive director of EBS. With Jotform's affordable pricing ($19.50 per month), and its functionalities, we determined that Jotform was the most feasible option for them.

To further automate the process of submitting data to the WCFB portal, we researched ways to improve the interface between food pantries and the WCFB. We interviewed a computer science professor and a representative from WCFB, during which we found out that it isn't feasible to develop a solution for interfacing with the WCFB portal. The portal is also hosted by WCFB so we didn't have access to the back-end of the website and therefore were not able to test nor develop a solution.

Recommendations and Conclusion

We determined three recommendations for EBS based upon the research, interviews, and participant observations that we conducted. Our first recommendation is that WCFB could consider providing a platform to efficiently transfer data to the WCFB portal. As part of our objectives, we planned to develop a plugin to interface the WCFB portal, but were not able to do so due to lack of access. We suggest WCFB modify their current portal and include functionality for food pantries to input data more easily. For our second recommendation, we suggest EBS to divide workload and provide clear volunteer guidelines to boost efficiency. Despite not being directly related to our goal, we believe EBS would benefit from having an organized work distribution among volunteers. Our final recommendation is to record food inventory data for applying to grants. As a lot of grant applications request data regarding the amount of food that the food pantry has distributed to the community, it would be beneficial for EBS to have that piece of data. We suggest EBS to weigh one of the food baskets during food distribution, and multiply the weight by the number of baskets. In this way, EBS can obtain a close approximation of how much food they have distributed out, and use that data to apply to grants.

These recommendations were made for the potential of EBS or other outside organizations to implement, for example, an IQP could work with WCFB to upgrade the portal. With these recommendations implemented, there will be further improvements on the operations at EBS. It would also help facilitate them in expanding their services.

With the new digital data collection system in place and the provided materials (documentation, translations), we have made data collection not only more efficient but also more accessible, allowing EBS to focus on their mission of decreasing food insecurity in the Worcester community.

Acknowledgments

We would like to extend our gratitude to everyone for guiding and assisting us in this project.

We would like to express our sincere thanks to Mari Gonzalez, the Director of Operations of El Buen Samaritano. Thank you for accommodating our ideas and motivating us to power through the project.

We would like to thank the representatives at the food pantries and food banks that we interviewed for spending time to share their knowledge and information regarding their food banks and food pantries.

We would like to thank Professor Hektor Kashuri who assisted in verifying and correcting our Albanian translations for the survey translation document. We would also like to express special thanks to Professor Mohamed Eltabakh for answering our questions and brainstorming possible solutions for our project.

We would like to offer sincere appreciation to our advisors, Dr. Aaron R. Sakulich and Ruth McKeogh, for providing ideas, feedback, and encouragement throughout the project. We would like to thank Professor Zoe Eddy, for providing guidance and feedback so we were able to start the project with a strong foundation.

Authorship

Section		Primary Author	Primary Editor
Abstract		Yuen Lam Leung	All*
Executive Summary		Yuen Lam Leung/ Caleb Talley	All*
Acknowledgments		Yuen Lam Leung	All*
Introduction		All	All*
Background	History	Yuen Lam Leung	All*
	Food Insecurity	Olivia Rockrohr	All*
	Food Pantry	Caleb Talley	All*
	El Buen Samaritano	Caleb Talley	All*
	Technology in Food Pantries	Christopher Cook	All*
Methods	Objective 1	Olivia Rockrohr	All*
	Objective 2	Olivia Rockrohr	All*
	Objective 3	Yuen Lam Leung	All*
	Objective 4	Caleb Talley	All*
	Objective 5	Christopher Cook	All*
Results	Objective 1	Olivia Rockrohr	All*
	Objective 2	Yuen Lam Leung	All*
	Objective 3	Yuen Lam Leung/ Olivia Rockrohr	All*
	Objective 4	Yuen Lam Leung/ Olivia Rockrohr	All*
	Objective 5	Olivia Rockrohr	All*
Recs	Recommendation 1	Caleb Talley	Caleb Talley
	Recommendation 2	Yuen Lam Leung	Yuen Lam Leung
	Recommendation 3	Christopher Cook	Christopher Cook
Conclusion		Olivia Rockrohr	All*

*The first available team member would look over and edit the section and check off the comments to indicate it had been looked over and edited. After all the edits were made, at least one team member would proofread the whole paper.

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1 Introduction

In 1987, Maria and Osiris Reyes moved to Worcester, Massachusetts, with their four children after experiencing a major earthquake in Los Angeles, California. While unemployed and looking for help, organizations such as Friendly House provided them with assistance. Shortly afterwards, Osiris Reyes was forced into disability retirement due to chronic arthritis. When this happened, Osiris and Maria both reflected on their journey and saw other people worrying about providing food for their families. They decided that they wanted to make a positive impact on people who are desperately in need. This led them to approach Gordon Hargrove, the executive director at Friendly House, for his assistance in establishing an independent non-profit organization that would help people who need food and care. They decided to name their organization El Buen Samaritano, which is Spanish for "The Good Samaritan", focusing on relieving food insecurity.

Food insecurity is "when people lack sustainable physical or economic access to enough safe, nutritious, and socially acceptable food for a healthy and productive life." (Buhi, 2004). The U.S. Department of Agriculture (USDA) categorizes the severity of food insecurity as either low food security or very low food security. They define low food security as "reduced quality, variety, or desirability of diet. Little or no indication of food intake" while very low food security is "multiple indications of disrupted eating patterns and reduced food intake" (Definitions of Food Security, 2021). The USDA describes food insecurity generally as "…a household-level economic and social condition of limited or uncertain access to adequate food" and hunger may be experienced when food is insecure.

Food insecurity is a persistent problem in all parts of the world. The COVID-19 pandemic has worsened the inadequacies of the global food systems, obstructing food production and distribution (United Nations, n.d.). An estimated 161 million people have gone hungry since the pandemic, resulting in approximately a total of approximately 811 million people suffering from hunger at the end of 2020. The presence of food banks and food pantries has been remodeling the food distribution process within the global food system, helping vulnerable populations that are currently food insecure. Through our project, we aimed to improve the accessibility and availability of food in the Worcester community by facilitating food distribution in El Buen Samaritano (EBS).

Even with the establishment of El Buen Samaritano, 71,000 households in Worcester County faced food insecurity in 2018 (Community Health Assessment, 2018). This is about one in every 11 people living in Worcester County. Since its inception in 1991, EBS has grown significantly, expanding the services they provide. But in its current capacity, they are only able to serve 1,000 households per month. This figure is largely dependent on the amount of funding they receive. EBS has expressed that it is difficult to apply for funding grants without proper data.

We helped transition their current data system to be more effective and provide the needed data for any grant applications EBS is interested in. This maximized the number of funding sources to which they could apply. In turn, this helped them improve and expand the services they provide, increasing the quality of how they help the vulnerable communities of Worcester while also expanding the number of people for whom they can provide. With food security comes improved mental and physical health and a better quality of life in which one is not limited due to a lack of healthy food. We developed a technological solution for EBS that is not only effective but also sustainable..

Through working with EBS, we wanted to contribute to the United Nations Sustainable Development Goals and work toward achieving zero hunger and reducing inequality (United Nations, n.d.). With an improved system, El Buen Samaritano could significantly expand its inventory and obtain more resources to give back to the vulnerable community in Worcester. By reconstructing data management, we aimed to facilitate daily operations and maximize the impact of El Buen Samaritano, bringing changes in resource distribution and bridging the social gap between different populations.

2 Background

Located east of Springfield and west of Boston, Worcester is known as the “Heart of the Commonwealth". Between 2010 and 2020, Worcester’s population increased from 181,045 to 206,518 and became the fastest-growing city in New England. Within the growing population, some groups lack access to adequate and safe food. As of 2020, 22.8% of the total households in the City of Worcester rely on the Supplemental Nutrition Assistance Program (SNAP), also known as food stamps (U.S. Census Bureau, 2020). By learning about what has shaped today’s Worcester community, we can understand why some populations are particularly vulnerable and how to improve resource availability for these populations.

2.1 History

The industrialization and urbanization of Worcester began in 1825 (Worcester in the 19th Century, 2013). Merchants and Worcester residents suggested building transportation infrastructure to capitalize on Worcester’s accessible location. The Blackstone Canal was built in 1825 and started operating in 1828, connecting Worcester and Providence. The Boston and Worcester Railroad was opened in 1835, reducing the travel time from Boston to Worcester from seven hours to three hours. Many rail lines passed through Worcester; ten trains traveled from Worcester to Boston every day. As a result, Worcester was a significant transportation and enterprise hub in New England. The introduction of transportation infrastructure and the central location attracted manufacturers to build factories in Worcester.

Because of the work opportunities in these factories, successive waves of immigration led to a diverse city. The majority of this immigrant population was made up of French, Polish, Swedish, and Irish immigrants that came to build the Blackstone Canal and the Boston and Worcester Railroad (University of Massachusetts Dartmouth Public Policy Center et al., 2015). As Worcester’s manufacturing industry continued to approach its peak, the immigration wave carried over into the 20th century. Worcester continued to attract immigrants, mainly Turkish, Armenian, and Syrian, to take root in the city.

Starting in the 1960s, there was a drastic increase in the immigrant population, further diversifying Worcester with the arrival of Latin American, Asian, and African immigrants (Table 1). The increase in arriving Latin Americans was driven by a few major national immigration events, particularly the Bracero Program that the United States initiated in 1942 (Immigration and

Relocation in U.S. History, n.d.). During World War II, most local workers had to work for military production, resulting in a national agricultural labor shortage. To address the shortage, the United States reached an agreement with the Mexican government on recruiting experienced Mexican farmers to fill the void (Marentes, 1997). Almost 4.5 million Mexicans were temporarily employed through the Bracero Program, many of whom continued to reside in the United States after the termination of the Bracero Program in 1964.

Table 1. ***Foreign-born population in Worcester city by decade of entry (U.S. Census Bureau. ,2019)***

1940s	185
1950s	738
1960s	1,379
1970s	2,285
1980s	5,847
1990s	10,406
2000s	12,459
2010s	21,915

The incoming foreign population also included Asian and African immigrants who arrived in the United States after the enactment of the Immigration and Naturalization Act of 1965. The act eliminated the quota system that imposed a limit of 20,000 immigrants per country. The abolishment of the quota system allowed immigrants from Asian and African countries to seek job opportunities and unite with families in the United States. These immigrants primarily came from Vietnam, China, India, Ghana, and Kenya. Among today's Worcester population, about 69.2% identify themselves as White; 13.3% as Black or African American; 7.4% as Asian; 0.6% as American Indian and Alaska Native; 0.06% as Native Hawaiian and other Pacific Islander; and 4.% as multiracial (Fig. 1). About 22% of the total population also identify themselves as Hispanic or Latino (U.S. Census Bureau, 2021b).

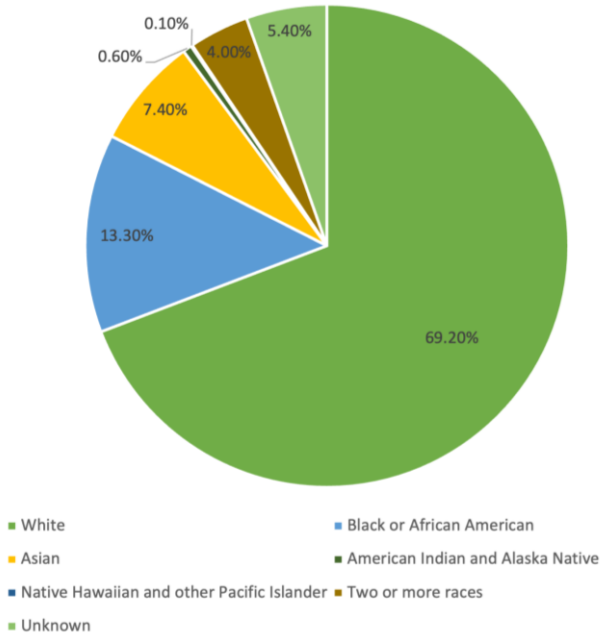


Figure 1. ***Worcester demographics, 2021 (Source: U.S. Census 2021)***

2.2 Food insecurity

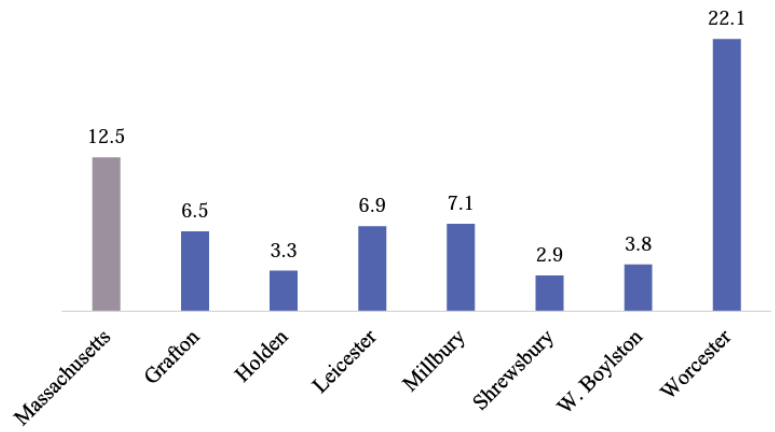
There are particularly vulnerable groups that experience food insecurity more prevalently, and one of them is people of color. These groups also include "marginal populations" (e.g., school dropouts, unemployed people, homeless people, and orphans); dependent populations (e.g., elderly people, children under five, and disabled and ill people); women of reproductive age; and low literacy households (Buhi, 2004). Data confirm this, with one report detailing how households of color and households with a single mother were food insecure at levels statistically significantly higher than the national average, 19.1%, and 28.7%, respectively, compared to 10.5% on average (Household Food Security in the United States in 2020, 2021). Although this report indicated that the total population that experienced food insecurity stayed the same from previous years, it did indicate that the pandemic has made more households experience increased uncertainty and volatility in being food secure. This pattern is especially evident in the U.S. Hispanic population.

In 2020, the USDA estimated that one in ten Americans face food insecurity. That is roughly equal to 38 million people, among them, 12 million children (Household Food Security in the United States in 2020, 2021).

There has been an increasing disparity in food insecurity among households of color during the last couple of years. While the national food insecurity rate has remained at 10.5% from 2019

to 2020, the food insecurity rates in Black households and Hispanic households have increased. About 21.7% of the Black non-Hispanic households and 17.2% of Hispanic households were food insecure, while only 7.1% of non-Hispanic White households and 8.8% of other non-Hispanic households faced food insecurity (Coleman-Jensen et al., 2021). There is a negative correlation between the likelihood of being food insecure and the household median income, as it is more likely a household will be food insecure with a lower median income. The median household income of non-Hispanic White households in the United States in 2020 was $74,912, whereas that of Hispanic households was $55,321 and $45,870 in Black non-Hispanic households (U.S. Census Bureau, 2020). A similar trend is also present in the state of Massachusetts and the City of Worcester, in which Black and Hispanic households are more likely to experience food insecurity due to their low median income.

In Worcester, there are many households experiencing food insecurity, about 71,000 out of 300,000 households in Worcester County in 2018 (Community Health Assessment, 2018). This translates to roughly one in every 11 people, or about 9%, of Worcester County, slightly below the national average. This is a stark contrast compared to 22.1% of people experiencing food insecurity in the City of Worcester itself (Fig. 2). This percentage is most likely much higher as there are many undocumented immigrants living in Worcester City as citizenship status is a factor that affects food insecurity. Non-refugee immigrants have to wait for five years to be eligible for government programs such as the Supplemental Nutrition Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF) (University of Massachusetts Dartmouth Public Policy Center et al., 2015). Even if the immigrants are eligible for the above benefits, a stigma exists that discourages people from applying for these benefits. This figure also depicts the large difference in food insecurity experienced compared to neighboring communities, thus there is a much greater share of households that are food insecure in Worcester City compared to all of Worcester County. This disparity can be attributed to the fact that Worcester City has a poorer population, many of whom are part of underrepresented and vulnerable communities. Thus, they are more prone to be food insecure. These numbers are quite dismal and indicate that there is still much work to be done to eliminate food insecurity.



Source: U.S. Census Bureau, 2016 5-Year American Community Survey.

Figure 2. ***Percent of population receiving Food Stamp/SNAP benefits, 2012-2016***

Food insecurity has been widening the health disparity between different races and ethnicities, thus intensifying the socioeconomic disparity. By studying what these vulnerable populations experience under such unfavorable circumstances, we can understand the significance and the impact that our project would bring to the community.

Food insecurity is a complex issue that extends beyond just the condition of one's self or one's family. In the annual report on Household Food Insecurity that is published by the USDA, they detailed the conditions that households face when food insecure and also highlight the experiences of children in such households. The report also described that most food-insecure households do not experience prolonged food insecurity, rather, it is intermittent throughout the year. This unstable environment would be especially stressful for children. Those that experience food insecurity describe that they would skip a meal, not eat for the whole day, experience hunger, and/or worry about food running out. In almost all cases this is due to not having enough money to pay for an adequate amount of food that is nutritious and healthy.

There are many detrimental effects of experiencing food insecurity with the most obvious being malnutrition. Malnutrition can cause "decreased energy levels, delayed maturation, growth failure, impaired cognitive ability, diminished capacity to learn, decreased ability to resist infections and illnesses, shortened life expectancy, increased maternal mortality, and low birth weight" (Buhi, 2004). Food insecurity also impacts an individual's mental health. Stress and anxiety are two things that can develop and adversely affect how one behaves. This includes

"reduced productivity, reduced work and school performance, and reduced income earnings" (Buhi, 2004). It may even result in one losing their job, the main source of income for most people.

As stated by Buhi, "Malnourished children in the United States suffer from poorer health status, compromised immune systems, and higher rates of illnesses such as colds, headaches, and fatigue". Besides the health problems associated with food insecurity, Shankar et al. (2017) studied the harmful effects of food insecurity on the development of children. They indicated that there are many repercussions of food insecurity on children that negatively impact their behavior, academics, and emotions. Shankar et al. (2017) found that children experiencing food insecurity were more prone to have suicidal thoughts and behaviors. Looking past their childhoods, this would most likely have long-term effects on their adulthood as they could be academically, emotionally, and physically stunted.

Food insecurity is experienced by many different people due to varying circumstances that they many times cannot control. There are many similarities between the causes and effects of food insecurity like poor health status and reduced performance in education. Once a person gets to these circumstances it is very difficult to escape from them as they seem to only compound with food scarcity. An article published by Feeding America depicts this phenomenon of the cyclic nature of food insecurity (Fig.3). Due to this phenomenon, there should be preventive measures taken instead of interventive methods. Preventing food insecurity is critical to improving the community and the lives of those who experience it, providing them opportunities that would otherwise be difficult to achieve.

Figure 3. ***A conceptual framework: Cycle of food insecurity & chronic disease***

In the United States, there have been different forms of government intervention to address this issue. The USDA implements some of the largest federal nutrition assistance programs like the Supplemental Nutrition Assistance Program (SNAP); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); and the National School Lunch Program (Household Food Security in the United States in 2020, 2021).

There have also been charitable food sectors like food banks, food pantries, soup kitchens, and feeding programs that attempt to address food insecurity and promote health. A food pantry is a distribution center where food is distributed to families who are in need. Food pantries get their food from food banks, which are non-profit organizations that store millions of pounds of food obtained from state and federal food assistance programs. For example, in 2021, The Worcester County Food Bank distributed 6.1 million pounds of food (Worcester County Food Bank, n.d.).

2.3 Food Pantries

St. Mary's Food Bank, the first American food bank, was founded by John van Hengel in the late 1960s (Feeding America, n.d.-b). The success of the St. Mary's food bank led to multiple non-profit organizations establishing their own food pantries. By 1977, food banks had been established in 18 cities across the country (Feeding America, n.d.-b). Two years later, due to the massive increase in the number of food banks, van Hengel decided to create a national organization of food banks. He called this organization "Second Harvest", known today as "Feeding America".

Feeding America secures donations from national food and grocery manufacturers, retailers, government agencies, and various other organizations and then distributes these donations to their network based on each food bank's specific needs (Feeding America, n.d.-c). After receiving the food and grocery items, the food banks categorize and sort these items into manageable quantities. The food banks then distribute these items to food pantries and meal programs that directly serve families who are in desperate need.

Today, Feeding America is the nation's largest domestic hunger-relief organization and serves as a network for 200 food banks and 60,000 food pantries across all 50 states (Feeding America, n.d.-b). According to their website, Feeding America feeds 40 million people at risk of hunger, including 12 million children and seven million seniors (Feeding America, n.d.-e). Among the food pantries that they serve is El Buen Samaritano.

2.4 El Buen Samaritano

Established in 1991, El Buen Samaritano (EBS) is a non-profit organization offering food, clothes, and services to the Worcester community (Franco, 2021). The organization was founded by Maria and Osiris Reyes, a couple relocating from Los Angeles to Worcester after a major earthquake. During their unemployment period, they received assistance from non-profit organizations in Worcester. Witnessing others worrying about food, they felt the need to give back to the community. Maria and Osiris Reyes also provide immigration assistance for Spanish-speaking families, which make up the majority of the population that EBS serves (Shih, 2021b).

Serving more than 3,000 individuals every month, EBS distributes food twice a week and gives out family meals during special holidays (Shih, 2021b). EBS also provides housing support, translation service, immigration assistance, and COVID-19 supplies in recent years. Maricelis Gonzales, the current director of operations, has continued her parents' legacy by taking over the organization. El Buen Samaritano currently works with Feeding America, the Worcester County Food Bank, and local markets and farms. As a volunteer-based, non-profit organization, EBS is looking to obtain grants and funding to expand its services, which is why they are looking to implement a system that facilitates the process of inventory tracking, data collection, and data analysis. With such a system, EBS will gain a better understanding of the community needs and demographics, allowing them to be eligible for grants and scale-up.

2.5 Technology in Food Pantries

As we have long ago entered the digital age, one would expect that food pantries have also made this transition. Unfortunately, this is not always the case. Many food pantries are struggling to adapt to the use of the internet for many reasons, but one of the most prevalent reasons is a lack of funds. Most food pantries are operating on a yearly budget of less than $25,000, and therefore can't afford computers. As donors look for more data and demographic information before donating, it becomes harder for these food pantries to provide this data while still using pen and paper. It is inefficient and inconvenient when showing said data to the donors.

EBS's major goal is to properly track their inventory and demographics so they can better serve their community and have the data to show the donors as well as to be able to apply for more grants. As of now, EBS gets their demographic data by trying to ask every person questions as they come in to get food/clothing. As they were collecting data on paper, they had to spend a good

amount of time summing the values and inputting them into a spreadsheet. One way some food pantries are solving this issue is by having people fill out a short survey as they enter the food pantry. If this survey was done digitally, it would be easier to organize all of the data collected and for showing potential donors their visualized data. The other major issue EBS faces is its inventory tracking. As of now, they keep track of their inventory through pen and paper. If EBS was able to implement a system that keeps track of the inventory and records the number of items going in and items coming out, it would increase the number of grants they can apply to.

Figure 4. Depiction of current data collection system

As EBS is looking to streamline their data management system to facilitate their operations, we focused on helping them integrate these systems into their organization. In the next chapter, we will describe our process of determining ways of designing the system.

3 Methodology

To serve the population of Worcester, El Buen Samaritano (EBS) has to keep track of its food inventory, food distributed to the community, and the recipients' demographics. Being a volunteer-based organization, EBS would like to minimize the time spent on completing repetitive procedures to maximize their manpower. Without a digital system for data collection, they have been utilizing a pen-and-paper approach to manage their inventory and data (Appendix B). The current Director of Operations for EBS spends about a day per month transferring a month's worth of data from paper to her computer. In addition to the improvements in data collection, they are looking to optimize data analytics. If they had statistical demographic data on the populations they serve, they would be able to apply for additional funding. Also, EBS is looking for more efficient ways to input data into the Worcester County Food Bank Partner Agency Portal. There are limitations in the existing portal in which EBS has to manually fill out a form with more than 200 data fields. Being able to automate the process will not only save time, but also reduce transcription errors. Therefore, EBS is looking to make the transition from an analog system to an efficient digital system for data collection, analytics, and submission.

Our goal was to develop a system for EBS that facilitates data collection, analysis, and submission. We provided an improved system that simplifies the daily operation in EBS and assists in the process of gaining funding and grants. We worked toward these five objectives:

1. Understand logistical operations at EBS
2. Identify EBS requirements for data collection
3. Learn about data collection tools at other food pantries
4. Determine the best digital platform for data collection
5. Develop a plugin to interface the data submission portal

When conducting interviews with individuals, we ensured confidentiality by telling the interviewees the following things:

Procedures to be followed: This will be a semi-structured interview in which we will ask you some guided questions related to our project. The interview is scheduled to be no more than 60 minutes. We may ask for additional information including your background.

Record keeping and confidentiality: By verbally agreeing during the beginning of the interview, you are consenting to help us learn about the subject matter. It is under your discretion to the degree you wish to disclose. Your responses will be anonymous unless indicated otherwise. We will also be sharing the information anonymously with our advisors for evaluation purposes. This interview is not mandatory and your consent is given freely of your own choice. You have the right if, at any point during the interview, you would like to stop the interview and not be included in our study. Any publication or presentation of the data will not identify you unless you agree to be identified.

3.1 Objective 1: Understand logistical operations at EBS

Before designing a digital solution for EBS, we first had to understand how they operate. This included the services they provide as well as the administrative work they perform. By first analyzing and observing how EBS operates, we better understood the problem at hand and gained insight into the current issues faced by EBS. This allowed us to identify other issues that were not expressed by EBS but are important to address to achieve our goal.

We conducted participant observation to understand how EBS operates and the challenges they face. This method was chosen because it allows us to learn about EBS by joining and sharing in its activities without being too intrusive. In particular, some activities in which we participated include the food distribution event, food pickup, and getting involved in current data collection and input. A food distribution event is a weekly event that occurs every Friday from 10 AM to 1 PM in which EBS volunteers hand out food to their clients. During this time, demographic data are collected through a pen-and-paper system. Volunteers ask individuals about their family, age, etc. After the event is over, these data are manually inputted into the computer. Volunteering at the food distribution event and partaking in data collection will be beneficial in understanding their current data collection system and learning how the clients respond and interact with volunteers.

The other activity in which we participated was helping pick up food for EBS. They get the majority of their food from the Worcester County Food Bank, which supplies food for most of the Worcester food pantries. EBS picks up their allotted food, which is then distributed during the food distribution event on Fridays, every Wednesday. EBS gets a certain weight of food allocated to them based upon the demographic data they supply. We accompanied them in picking up the food to learn more about this process.

Figure 5. Participating in food pickup at EBS facility

3.2 Objective 2: Identify EBS user requirements for data collection

Once we understood what EBS does, how they operate, and we defined the problems they face, we started identifying the requirements for their data collection. This helped narrow down the most effective digital approach for transitioning their pen-and-paper data collection method. We conducted participant observations and semi-structured interviews to be able to formulate the requirements. These requirements were based upon what we learned from Objective One but also included interviews with those involved in EBS like staff and the volunteers. This method was chosen in order to allow us to analyze the situation for ourselves and allow EBS to have a voice and be part of solving their problem. Completing Objective Two also helped us in making this project sustainable and effective, allowing EBS to apply for more grants and have a data system that is adaptable, user friendly, and that meets their needs.

There is much overlap with Objectives One and Two in terms of the method of participant observation. This is because this method helps us in understanding EBS and identifying requirements. Thus, the activities like food pickup and distribution described in Objective One also pertain to Objective Two. Each of the activities helped in identifying shortcomings of the

current data collection method and thus developed requirements for the new solution to avoid those issues.

As mentioned previously, semi-structured interviews allowed for an informal and comfortable environment for the interviewee. They can speak more freely but still have some guided questions for the main topics. We conducted semi-structured interviews with the Executive Director of Operations of EBS and EBS staff members. These interviews were conducted at the EBS facility or over a video call. The interviews lasted no longer than an hour and were focused on the interviewees' opinions on the current data collection method and suggestions on how to improve said method (Appendix A). By conducting interviews with EBS staff, we worked together with them to develop the requirements for the new data system.

3.3 Objective 3: Learn about data collection tools at other food pantries

To determine how to implement the most applicable system for EBS, we learned about the data collection methods employed at other food pantries. Investigating what digital systems, if any, are being utilized by other food pantries in Worcester provided a helpful framework for our project. In addition, we learned about how other local food pantries submit their data to the Worcester County Food Bank. The data collection system should also be equipped with the functionality to submit data to the portal hosted by the Worcester County Food Bank. To learn about the approaches that other food pantries have taken, we conducted semi-structured interviews with the directors and staff members at local food pantries, which also allowed us to gain insight into the available resources and potential approaches that we can utilize for the project.

3.4 Objective 4: Determine the best digital platform for data collection

Once we formulated the requirements and needs of EBS and identified how other food pantries have implemented a digital approach for their respective data collection, we were able to start researching various digital data collection platforms to use for EBS. This digital platform will replace the current pen-and-paper system and be used mainly for collecting information from clients at EBS.

Research into the platforms included preliminary testing that allowed us to gain a deeper understanding of the digital platform and the user interface. Based upon our research and recommendations from Google search, we chose ten digital platforms. In order to determine the

best digital platform for EBS, we used a comparison table. We developed the table based upon the requirements that were determined previously to help generate the categories used to compare each platform. The table helped us to evaluate each of the digital platforms that we researched and how well they meet the determined categories.

This approach allowed us to narrow down the number of potential digital platforms for EBS. At this point, we consulted with the Director of Operations of EBS and selected the digital platform that best fits the needs of EBS. We would like the Director of Operations of EBS to be part of the process in our final decision as she is most familiar with the data collection process. Once the decision has been made, we guided her on how to use the digital platform. We gave her a hands-on tutorial with this platform as well as provide documentation explaining how to use the platform and the steps we took in creating it for data collection. This will ensure that the digital platform is being utilized in the way it is intended and make it as effective and useful as our team has determined.

Before cementing the final choice of EBS' digital platform, it will be advantageous to test the digital platform during a food distribution event. We helped set up the digital platform to be able to collect all the information that was originally collected through pen and paper. We then had an EBS volunteer who is familiar with the pen-and-paper system use the digital platform during a food distribution event. After the event was over, we demonstrated the process of retrieving the data and conducted an unstructured interview to collect their opinions on the digital platform and suggestions for improvement or modification.

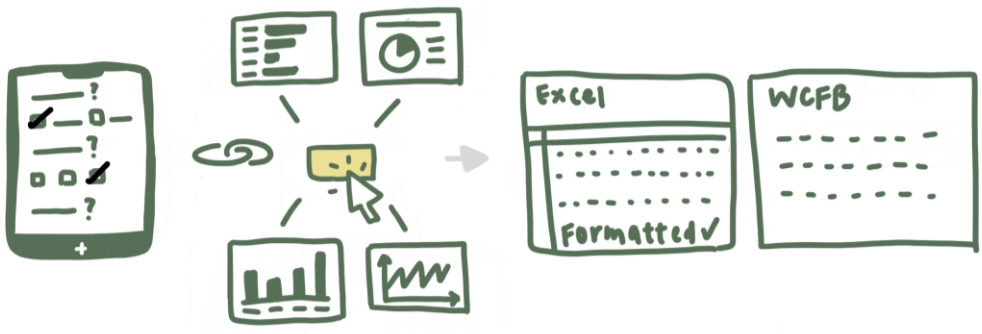


Figure 6. Depiction of new data collection system

3.5 Objective 5: Develop a plugin to interface the data submission portal

After gathering all the data from weekly food distribution, EBS has to report monthly household demographics to the WCFB through the Partner Agency Portal. The current process of submitting the data is redundant because EBS have to manually fill out a form with more than 200 data fields when they already have all the data formatted and stored in Excel. We conducted participant observation with EBS to understand how they would interact and utilize the portal as part of Objective One. By exploring the functionality and the structure of the portal, we better identified the limitations of the current portal and designed a more effective solution instead of manually filling out the web form for data submission.

Through the semi-structured interviews as part of Objective Three, we learned about how other food pantries that are partnering with WCFB submit their data to the Partner Agency Portal. By learning how other food pantries handle the problem with data submission, we determined whether we can come up with a solution that works around the current portal or we have to communicate with Worcester County Food Bank to implement a plugin on their end.

To determine how to simplify the process and gain a professional perspective on developing a technical solution to interface the data submission portal, we conducted a semi-structured interview with a professor in the Computer Science department. We first asked them a few pre-determined questions, and as they suggested a few solutions, we then asked follow-up questions to get more details on routes that we may want to pursue. Designing a technical solution to interface between Excel and the WCFB Partner Agency Portal would not only help EBS to simplify their data submission process but also help all the food pantries partnering with the WCFB.

4 Results

Once we defined our methods and objectives to achieve the goal of transitioning EBS's data collection system, we were able to collect results. We did not work through each objective sequentially, instead working on Objectives One, Two, and Three simultaneously. Objectives Four and Five were executed consecutively after collecting information from the previous objectives.

4.1 Objective 1: Understand logistical operations at EBS

We were able to learn about the logistical operations at EBS by participating in various activities, mainly food distribution and food pickup. Each activity helped us in understanding the operations at EBS, potential improvements that can be made, and guided us in determining the best solution for the data collection system.

When participating with the food pickup we learned that EBS has a van that they utilize to transport the food from WCFB to EBS every Wednesday. Currently, there are COVID-19 guidelines in place, allowing only up to three people from a food pantry to go inside the WCFB building. The three people allowed in the building select the food that is allocated to EBS and move it to the loading area. In this loading area, an employee of WCFB tracks and writes down the amount of each food being taken. There is a conveyor belt that is used to conveniently move the food from inside to outside, where the van is parked. Once all the food is loaded into the van, EBS staff sign a receipt summarizing what they have taken and go back to EBS to unload the food and restock their storage.

EBS currently has no formal system that tracks their food inventory; they determine what they need to get based on their visual analysis of their food storage. This can be an issue as when we initially started working with EBS, similar food products would be scattered across different shelves and even different rooms at the facility. This caused overstocking in milk, which has an expiration date, since the staff weren't able to easily determine how much was already on hand. Thus, the individual who determines what and how much to pick up from WCFB based on visual analysis can risk food expiring if they stockpile too much of it. We decided to reorganize and improve their food storage so that it will be easier and more accurate based on visual analysis. We grouped and consolidated similar foods in particular areas of the storage facility. This will not only improve the food pickup process but also the packaging of food boxes as each food group has its own storage spot. We also made laminated cards with general labels as EBS receives various types

of food that can change from week to week. Because these cards are laminated and have Velcro on the back it is also easy to remove or change what it says if there is a type of food unaccounted for. By improving the labeling, this will make it more easily discernible by the naked eye how much inventory EBS has of each type of food and what they would need when doing food pickup.

Figure 7. Organized food storage shelf with laminated card

When participating at the food distribution event we learned that one volunteer usually packages 100 - 125 boxes before each Friday. One of these boxes should be able to feed a family of four for about seven days. All the boxes are packaged with similar items and quantities. The boxes usually consist of some fresh fruit, frozen meat, canned fruit/vegetables, and pasta. Other items that are not consistently provided, like cookies and fresh vegetables, are packaged as well. The main source from which EBS obtains its food is WCFB but it also receives donations from some local grocery stores and food drives that it holds. During food distribution day, clients line up at the entrance of the EBS building. There are many volunteers that help out during the event, coming from a variety of schools and organizations. While the clients are waiting to receive their food, a volunteer outside will ask and collect demographic information about them. EBS also provides other household products like pet food, diapers, etc. that are given out if the client asks for it. After all the boxes have been given away, EBS ends food distribution.

4.2 Objective 2: Identify EBS user requirements for data collection

To identify the requirements for data collection, we conducted participant observation and interviews with the staff and volunteers in EBS. Understanding the types and format of data that needed to be collected allowed us to design a solution that can be easily incorporated into EBS's current data collection process.

Through navigating the process of submitting data to the WCFB, we identified six necessary demographic data points that EBS needs to collect from each person in their weekly food distribution: the zip code in which they live, whether they have been to EBS before, the size of their household, ages of each household member, the primary source of household income, and whether they are receiving federal program benefits. These data need to be collected and recorded as EBS is required to submit a monthly report to the Worcester County Food Bank.

We also identified a few additional pieces of data to collect that would help when applying for grants. Through interviews with EBS and other local food pantries, we learned that the contribution to Diversity, Equity & Inclusion (DEI) is becoming more important in non-profit organizations. The 2019 Donor Survey conducted by the Charities Review Council has pointed out that 91% of donors think a nonprofit's commitment to DEI is important (Charities Review Council, 2020). Based on the diverse population that EBS serves, we brainstormed with the EBS staff that collecting data about ethnicities and family status, for instance, single-parent households, will be beneficial in applying for grants.

Due to the diverse population that EBS serves, they sometimes encounter language barriers when collecting demographic data. From interviews with EBS, we learned that some of their clients do not speak English or Spanish. Not being able to communicate with the clients, EBS was not able to collect accurate data. We determined that adding short descriptions or creating multiple versions of surveys in different languages will help EBS effectively communicate with their clients. We translated survey questions into different languages that the clients use, including Portuguese, Albanian, Vietnamese, Chinese, Spanish etc (Appendix D). We translated some languages on our own, for example, Vietnamese, Chinese, and Spanish, and contacted native Portuguese and Albanian speakers in WPI to help with translation.

By observing the process of collecting data during food distribution and managing the data, we identified the requirements for the structure of the digital survey and data format. EBS serves about 1,000 households per month, thus, the survey solution needs to be able to handle more than

1,000 responses per month. A volunteer at EBS pointed out some benefits of the current pen-and-paper system, which are the speed and the ability to record data without the internet. Having to serve more than 100 households within two hours, the process of data collection should be quick and easy. With pen and paper, the volunteers were able to write and check all the required boxes within seconds. To retain usability, the digital survey will be designed so that the volunteer can complete a survey with a minimal number of taps on the screen. The volunteer also pointed out that some parts of the EBS facility lack access to the internet, for example, the parking lot where people line up to collect food. Being able to complete digital surveys without the internet is one of the key factors when selecting a survey platform. Therefore, the usability and accessibility of the survey solution we developed should be on par with the current pen-and-paper system.

In conclusion, the data collection platform that we had to find needed to have the ability to collect all the necessary data for the food bank, be easy to use, be translated in multiple languages, and not require an internet connection.

4.3 Objective 3: Learn about data collection tools at other food pantries

To learn about data collection tools at other food pantries, we conducted interviews with multiple local food pantries and food banks in Worcester. Looking at existing solutions implemented by other food pantries provided us with a reference on how to develop a solution for EBS.

From the interviews, we found that some food pantries utilize online survey tools to collect data, while some utilize software to manage all their data, for example, PantrySoft. One of the food pantries stores their client demographic data and inventory status on the software. The clients would have to submit an order using an existing account before picking up the food at the food pantry. We determined that it is not a feasible option for us, as the services that EBS provides are open-door and easily accessible even for those that lack internet access. Another food pantry demonstrated the process of collecting and exporting data using the survey platform SurveyMonkey. Utilizing a digital survey form when collecting data is efficient because each response is recorded and stored on the platform. Some of the survey platforms have the option to export all the responses as an Excel file, allowing users to manipulate the data. Most survey platforms have interfaces that are easy to use, so it would be easier for the staff and volunteers in EBS to transition to a digital system. Subscriptions for survey platforms are also more affordable,

they mostly cost around $10 - $30 per month while the subscription for PantrySoft would cost $55 per month. From our findings and discussion with EBS staff, we determined that using a survey platform would be the most feasible option.

Apart from learning about data collection methods at different food pantries, we also identified that data submission to the WCFB Partner Agency Portal is a common problem among the food pantries. All interviewees mentioned that they were able to automate most of the process except filling out the data form for data submission to the Worcester County Food Bank.

Food Pantry A is a non-profit organization in Worcester. They provide support to youth and families, and also host weekly food distribution for the Worcester community. The interview mainly focused on how they collect the demographics of their clients. They introduced us to the survey platform SurveyMonkey. This is the platform that they use to collect information of the people that they help, create statistical graphs made up of the data that have been collected, and export their data. They also talked about the inefficient parts of Survey Monkey. Even though they use SurveyMonkey to export their data to a spreadsheet, they still have to edit the spreadsheet to meet the requirements of the WCFB portal. This is due to Survey Monkey adding additional fields that are unnecessary, such as the respondent ID or the IP Address, and subpar formatting. They also have to individually put every field into the WCFB portal, just like EBS.

Food Bank B is a volunteer-based food bank in Worcester that distributes food to 33 shelters such as soup kitchens and food pantries. This interview was mainly focused on grants and what kind of data are needed for grants. The interviewee wasn't familiar with the actual method of inputting and storing the data but had some advice to help EBS apply to grants. They suggested a good grant application is one in which EBS can make a distinction from the rest of the local Worcester food pantries. The first thing that comes to mind is that EBS serves a large Hispanic population; if data could be compiled showing this, it could help in getting grants. They also suggested that EBS should be more accessible by offering more hours of service for food distribution. This may not be feasible due to the limited number of staff and volunteers at EBS. The last major point they made was that EBS should definitely track their food inventory as these data are frequently needed in many of the food pantry grant proposals.

Food Pantry C is open five days a week and mainly serves college students. About 500 students utilize the food pantry. By providing food for students, it is beneficial to their academic

performance and health. They provide community resources like classes/workshops to help advocate about different services that can help students.

This food pantry has a unique system not commonly implemented in Worcester food pantries in which they let their client select what they would like to eat, similar to the grocery delivery app Instacart. This reduces the amount of food waste as the clients are only receiving food that they want and need. This system is only possible due to the dedicated food pantry software they use, which is called PantrySoft. This software keeps track of food inventory in real time and has saved profile accounts for every client.

We determined this software not to be an applicable solution for EBS as it would be difficult to keep track of their food inventory in real time given how EBS currently operates. Also, EBS receives more new clients weekly compared to Food Pantry C as their motto is to allow anyone to have access to food without barriers such as filling out an application, etc. Using the PantrySoft software would thus make it more difficult for EBS to easily give out food.

Another interviewee directed us towards Food Pantry D. They are one of the larger food pantries serving the Worcester community five days a week. They used to have a pen-and-paper system like EBS, but they have transitioned to a digital system. They now collect information using a tablet and software created by CSG, a software company. They only collect demographic data and don't keep track of their inventory. To handle the pantry operation, they have roughly five staff on site every day; one person greets clients and inputs data, two or three people organize food baskets/bags, and one person organizes fruit. They visit and collect food at the WCFB warehouse every week. Regarding the WCFB Partner Agency Portal, they are also facing the same problem where they have to manually input data. They provided a few tips on applying to grants: a food pantry should keep track of the number of people they serve and the amount of food that they give out; explain in what way grant money will be used; and show that the money will be contributing to DEI.

4.4 Objective 4: Determine the best digital platform for data collection

Based upon interviews and conversations with the Director of Operations and staff of EBS, we were able to identify key requirements that the digital platform should have. We looked into various survey platforms as we learned that some food pantries utilize them as tools for collecting

data. Overall, we researched ten different survey platforms, and aggregated and compared the information onto an unweighted decision matrix.

Based upon our findings in Section 4.2, we determined the different categories that we included in the comparison table. We would require the survey platform to have at least 1,000 responses available per month, offline access, and compatibility with tablets. To automate the process of counting the data, we determined that the data collected from the survey platform should also be able to be exported as an Excel or .csv file since EBS already utilizes Excel software to analyze and consolidate their data. Preserving the procedure that EBS is used to, which is organizing data using Excel, helps reduce the challenge of transitioning to a new system because it retains some of the qualities of the older system.

We were able to eliminate survey platforms Survey Monkey, Question Pro, Survey planet, Datascope, Typeform, and Crowdsignal survey platforms as each of them had an important requirement that was lacking, such as not supporting offline access, limiting numbers of responses, and/or no compatibility with tablets. These are critical features that helped us narrow it down to three choices: SoGoSurvey, Jotform, and QuickTapSurvey.

Each survey platform has its benefits and downsides. SoGoSurvey is the most affordable option as it provides a free plan for nonprofit organizations, yet it does not offer offline access. Jotform, which costs about $19.50 per month, offers offline access and an application compatible with tablets. It has a limit of 10,000 responses per month, which is adequate for EBS. QuickTapSurvey not only offers offline access, but also has no limitation on the number of survey responses. It is the most expensive option, costing about $30 per month. We created sample surveys on each platform and presented them to the executive director of EBS. With Jotform's affordable pricing and its functionality, it was determined that Jotform is the most feasible option for them.

Table 2. Comparison Table of Different Survey Platforms

Name	Final price with non-profit discount	>= 5 Surveys per Month	>= 10 Questions per Month	>= 1000 Responses per Month	Offline Access?	Export to Excel?	Excel Layout Similarity to WCFB portal (out of 5)	Device Compatibility
SoGoSurvey	Free	Unlimited	998	Yes (4000/mo for Plus, 10,000/mo for Pro)	No	Yes	3	Desktop Tablet Mobile App
Jotform	$19.50	100	Yes	Yes (10,000)	Yes	Yes	5	Desktop Tablet Mobile App
Quick Tap Survey	$30.75	Unlimited	1000	Unlimited	Yes	Yes	5	Desktop Tablet Mobile App
FEEDS Form	Free	Unlimited	Unlimited	Unlimited	Yes	Yes	5	Desktop Only

To help EBS transition to using Jotform, we provided an instruction manual and taught the EBS staff on how to navigate the Jotform web interface and app. This manual included instructions and graphics on basic operation of the survey platform, including how to fill out a form; how to download the form for offline access; how to export survey responses to Excel; etc. (Appendix E). Having an instruction manual may allow Maricellis to more easily offload and distribute some work related to data collection and submission to other volunteers/staff. We set up and installed the application on the tablet provided by EBS. We participated in several food distributions to test out the usability of the digital survey solution. We observed how the volunteers interacted with the survey and conducted unstructured interviews about their experience and opinions on the new data collection method, and finally demonstrated the process of retrieving the collected data.

4.5 Objective 5: Develop plugin to interface data submission portal

Once we determined the best platform for data collection, the second phase was to improve data submission on the WCFB portal. We conducted semi-structured interviews and research to develop a solution to make data submission more streamlined and efficient.

We interviewed a computer science professor at Worcester Polytechnic Institute. After describing the current state of the WCFB portal system they suggested three approaches to interface with the portal:

1. Learn how WCFB stores their data after submitting through the portal. If they use a database, a program could be written to submit data directly to the database and bypass the portal;
2. Research and learn about the .php file format and see if there are current solutions on the web that automatically fill in the data; or,
3. Directly edit the source code for the portal by inputting data from the .csv file into the source code, loading the page and submitting.

We also interviewed WCFB to learn more about their online portal that their partner agencies use to submit their demographic data of the clients they serve. In terms of their logistical flow, they track their inventory using proprietary software. This allows them to track the pounds of food they receive and where they get it from, and also the pounds of food they give away and to whom they give it away. They have a completely separate system to collect information from their partner agencies. This system is completely web-based. They are interested in updating and improving their overall system but are hesitant and want to ensure the new system will be a smooth transition for everyone affected.

We determined that it is not feasible for our group or EBS to improve the WCFB portal. Since all of the software that the WCFB uses is proprietary software, this means that we do not have the access needed to create an application that inputs data into their database.

5 Recommendations

Based on our research, we have three recommendations that would further improve work efficiency and supplement the process of obtaining more grants at EBS.

Providing a platform to efficiently transfer data to the WCFB portal

We were unable to find a way to improve the transfer of food distribution data to the WCFB portal. The WCFB portal has been the main problem for most of the food pantries we interviewed, mainly due to having to import one cell of data at a time, and the lack of being able to upload data in the form of a spreadsheet. Solving this issue would not only help EBS but would also help all of the food pantries that have to use this portal.

This project should be done by the WCFB. They are the people responsible for the portal and for years have been wanting to create a more efficient version of said portal.

Dividing workload and providing clear volunteers guidelines to boost efficiency

As part of our participant observation, we noticed something that could be improved, but it is not directly related to our goal of the project. As a volunteer-based nonprofits organization, one of the most important resources for EBS is staffing. We suggest there are two ways to improve operational efficiency: distributing workload among volunteers and writing up guidelines for volunteers.

Redistributing the workload among volunteers allows EBS to have adequate staffing during both food pickup and food distribution. EBS currently lacks staffing that regularly helps out during food pickup, but has more than enough staffing during food distribution. As recruiting additional drivers and staff would affect how EBS allocate their budget, the most feasible option is to recruit volunteers to participate in food pickup. We suggest EBS communicate with their partnering organizations or recruit separate volunteers in order to split up the workload among the volunteers.

Coming up with general guidelines would reduce confusion for the volunteers participating in food distribution. Different groups of volunteers participate at EBS every week, and being unfamiliar with how to package each food basket, they often have to ask for help. Due to uncertainty, volunteers package the food basket without following a specific standard, which causes disparity in the sizes of the food baskets. There are baskets with a lot of food, baskets with not too much food, and baskets with redundant items. We suggest that EBS put up a list of items

that go into each basket as a reference for the volunteers. For example, they could utilize a whiteboard to write down what items should go in each basket based on their availability of the week. We recommend the use of a whiteboard because of its versatility: EBS could edit their list based on their weekly inventory. Having a list of what goes into each food basket will give the volunteers a better idea when packing food, reducing redundancy when communicating and maximizing efficiency.

Recording food inventory data for applying fundings

Non-profits require funding to stay operational and to expand. One way that EBS could get more funding through grants would be to keep accurate food inventory data. They could do this a number of ways, for example, weighing the food baskets or keeping track of incoming food. We determined the easiest being to weigh one of the average-size baskets of food they give out, and multiply by the number of baskets they give out. Instead of having to weigh every basket, this method is more efficient and would provide a close approximation of the total amount of food they distribute out every Friday, which will be very beneficial to know when applying for grants.

6 Conclusion

Food insecurity is an issue that is prevalent among communities around the world. It can severely impact the health of those who experience it. The rate of food insecurity in the City of Worcester is higher than either the state or national food insecurity rate due to the city's demographics. It is thus critical to address food insecurity in Worcester to decrease the number of food insecure people. One intervention method is establishing food pantries like El Buen Samaritano. Due to the limited funding and resources EBS currently faces, it is difficult for them to improve and expand upon the services they provide. One particular issue that they have identified is the lack of sufficient data for grant applications because of their current pen-and-paper data collection system.

We were able to develop a digital data collection method for El Buen Samaritano utilizing an existing survey platform and Excel (Appendix C). In addition to transitioning their data collection method, we were also able to evaluate and develop several recommendations from the research, interviews, and participant observation conducted throughout this project. These resources should permit EBS's operations to run more efficiently, allowing more time to focus on improving and expanding their services to the Worcester community.

Our approach would be applicable to food pantries or other smaller organizations that are currently using a pen-and-paper system and would like to transition to a digital platform for the purpose of increasing efficiency and accessibility. Our solution is designed so that an individual can easily collect data but does not need to know the ins and outs of the whole data collection and submission process. Analyzing and aggregating the data can be done by an individual with more experience and knowledge with the system. Thus, there only needs to be a minimum of one person for our solution but ideally our solution would work best with two people, each given the roles described previously.

We hope this project will inspire others to think of unique ways of utilizing technology to decrease food insecurity. The solution we have developed is sustainable and effective to increase the revenue of EBS and assist in the goal "towards total food security in the region" of Worcester (Community Health Assessment, 2018).

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Appendix A : Interview Questions

This appendix consists of the guided questions that will be asked during interviews.

Semi-structured interviews with EBS staff

1. What do you think about the data collection system that is currently being implemented at EBS?
2. How often do you use the data collection system and is it user-friendly?
3. Is there any information that you believe should be collected that is not currently being tracked?
4. What improvements or changes would you want to see in the new system?

General Questions for Volunteers

1. What do you do at EBS?
2. How long have you volunteered with EBS?
3. Do you have any suggestions for areas of improvements for EBS?
    a. Food pickup
    b. Food distribution

Semi-structured interviews with local food pantries and food banks

1. Can you describe the logistic flow of collecting and inputting inventory data for your food pantry?
2. How do you collect data of the people that come to your food pantry?
3. How is work distributed among the staff, and is there work that has been automated?
4. How do you bridge the data communication between the Worcester County food bank and the food pantry?

Semi-structured interviews with Computer Science and Data Science professors

1. The current form submission requires the user to manually input each data, what would be the best way to simplify this?
2. Would the solution be implemented on the user's end or integrated to the portal?
3. Does a solution already exist? For example, an extension or an add-on that we can install?

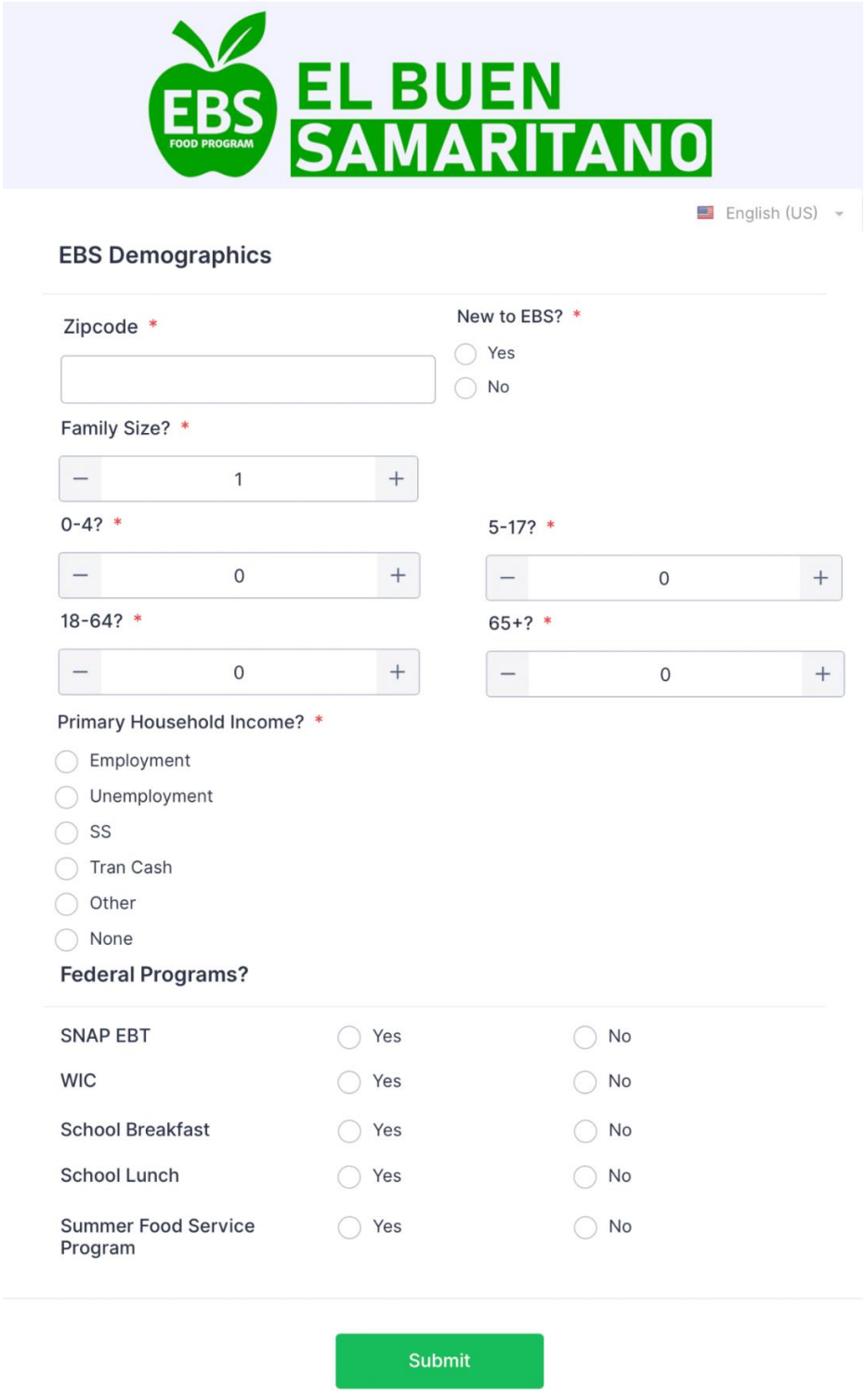
Appendix B : EBS Pen-And-Paper Survey

El Buen Samaritano Food Program Inc.

Ask the Client if this is the first at time at EBS or a food pantry			Ask how many children, adults, elderly , put the number on the box.				Principle Household Income Source (check only 1)						Federal Programs you can check all if the client receives all				
Zip Code	New Client	Fam Size	0-4	5-17	18-64	65 - up	Employment	Unemployed	SS	Tran Cash	Other	None	SNAP EBT	WIC	School Brkfst	School Lunch	Summer Free Schl Lunch program

Appendix C : Digital Collection System

Digital survey



Exporting survey responses to Excel

Submission Date	Zipcode	New to EBS?	Family Size?	0-4?	5-17?	18-64?	65+?	Primary Household Income?	SNAP EBT	WIC	School Breakfast	School Lunch	Summer Free School Lunch Program
2022-04-29 12:59:31	01610	Yes	4	1	2	1	0	Employment	No	Yes	Yes	No	No
2022-04-29 12:58:19	01609	No	3	0	0	1	2	SS	Yes	No	No	No	No
2022-04-29 12:57:53	01610	No	2	0	2	0	0	SS	No	No	Yes	Yes	No
2022-04-29 12:53:17	01605	No	1	0	0	0	1	SS	Yes	No	No	No	No
2022-04-29 12:51:54	01609	No	4	1	1	2	0	Unemployment	No	No	No	No	No
2022-04-29 12:51:11	01609	No	3	0	2	2	0	Unemployment	No	Yes	No	No	No
2022-04-29 12:50:05	01609	No	2	1	2	0	0	Unemployment	No	No	No	No	No
2022-04-29 12:45:46	01610	No	1	0	0	1	0	SS	Yes	No	No	No	No
2022-04-29 12:44:06	01607	Yes	4	0	1	2	1	Unemployment	Yes	No	No	No	Yes
2022-04-29 12:42:25	01610	No	3	0	2	1	0	Unemployment	No	No	Yes	Yes	Yes
2022-04-29 12:41:48	01605	No	2	0	0	0	2	Unemployment	No	No	No	No	No
2022-04-29 12:40:18	01610	Yes	1	0	0	1	0	Unemployment	No	No	Yes	Yes	Yes
2022-04-29 12:39:33	01610	No	4	0	1	2	1	SS	Yes	No	No	No	No
2022-04-29 12:38:44	01610	No	3	1	0	2	0	SS	Yes	No	Yes	Yes	No
2022-04-29 12:37:40	01609	No	2	0	2	2	0	SS	Yes	No	Yes	Yes	Yes
2022-04-29 12:36:12	01610	No	1	0	0	1	0	Employment	No	No	No	No	No
2022-04-29 12:35:10	01610	Yes	4	0	1	2	1	Unemployment	No	No	No	No	No
2022-04-29 12:34:24	01609	No	3	0	1	2	0	SS	Yes	No	Yes	Yes	Yes
2022-04-29 12:31:59	01604	Yes	2	0	0	1	1	Unemployment	No	No	No	No	No

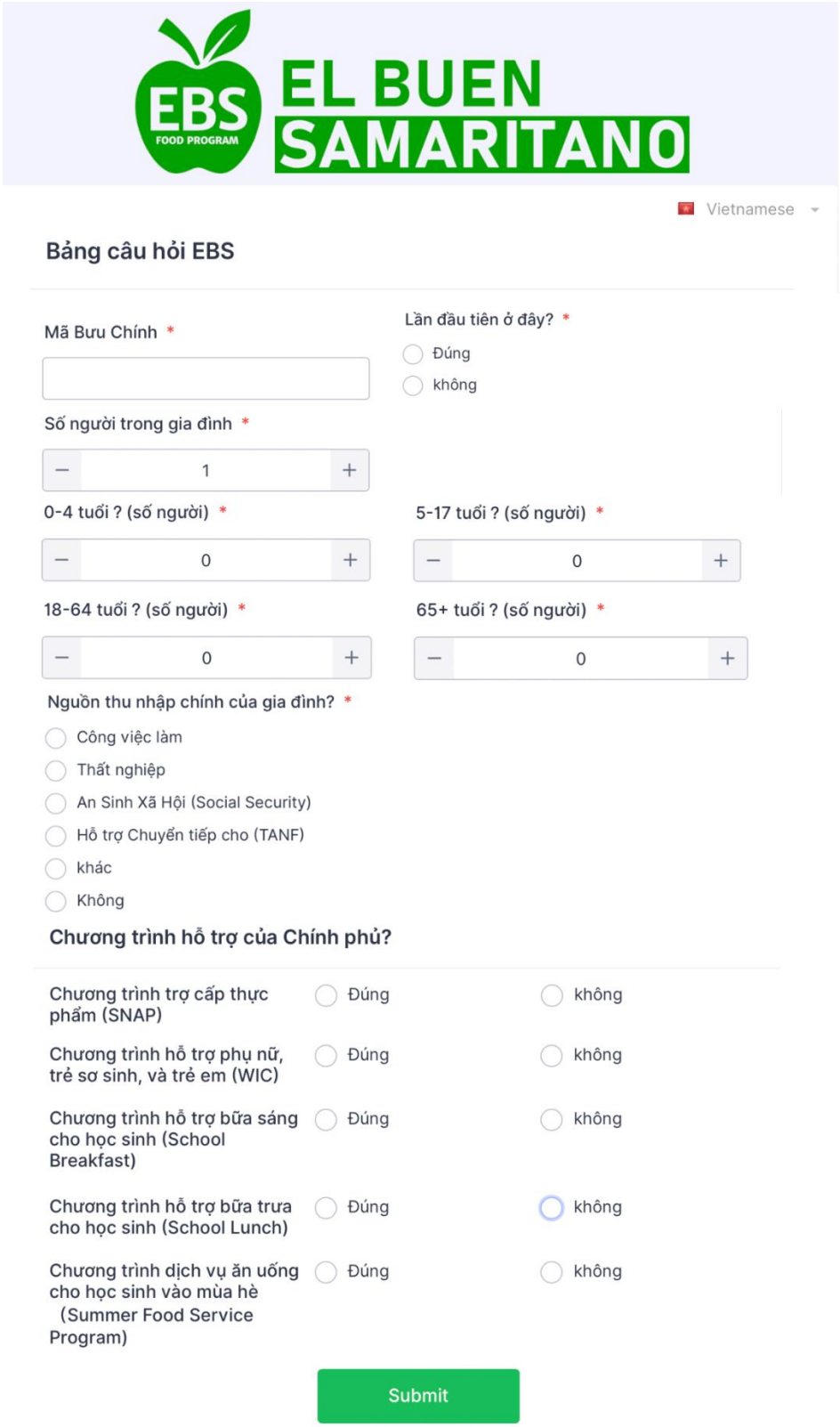
Formatting survey responses for report submission

DCS Report																				
Month:	4	Year:	2022																	
Zip	New HH	New People	Total HH	Total People	0 to 4	5 to 17	18 to 64	65 &over	Emp	Unemp	SS	TANF	Other	None	SNAP	WIC	Breakfast	Lunch	SFSP	
01604	1	2	1	2	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	
01605	0	0	2	3	0	0	0	3	0	1	1	0	0	0	1	0	0	0	0	
01607	1	4	1	4	0	1	2	1	0	1	0	0	0	0	1	0	0	0	1	
01609	0	0	6	17	2	8	9	2	0	3	3	0	0	0	3	1	2	2	2	
01610	3	9	9	23	2	8	11	2	2	3	4	0	0	0	3	1	5	4	2	
Summary	5	15	19	49	4	17	23	9	2	9	8	0	0	0	8	2	7	6	5	

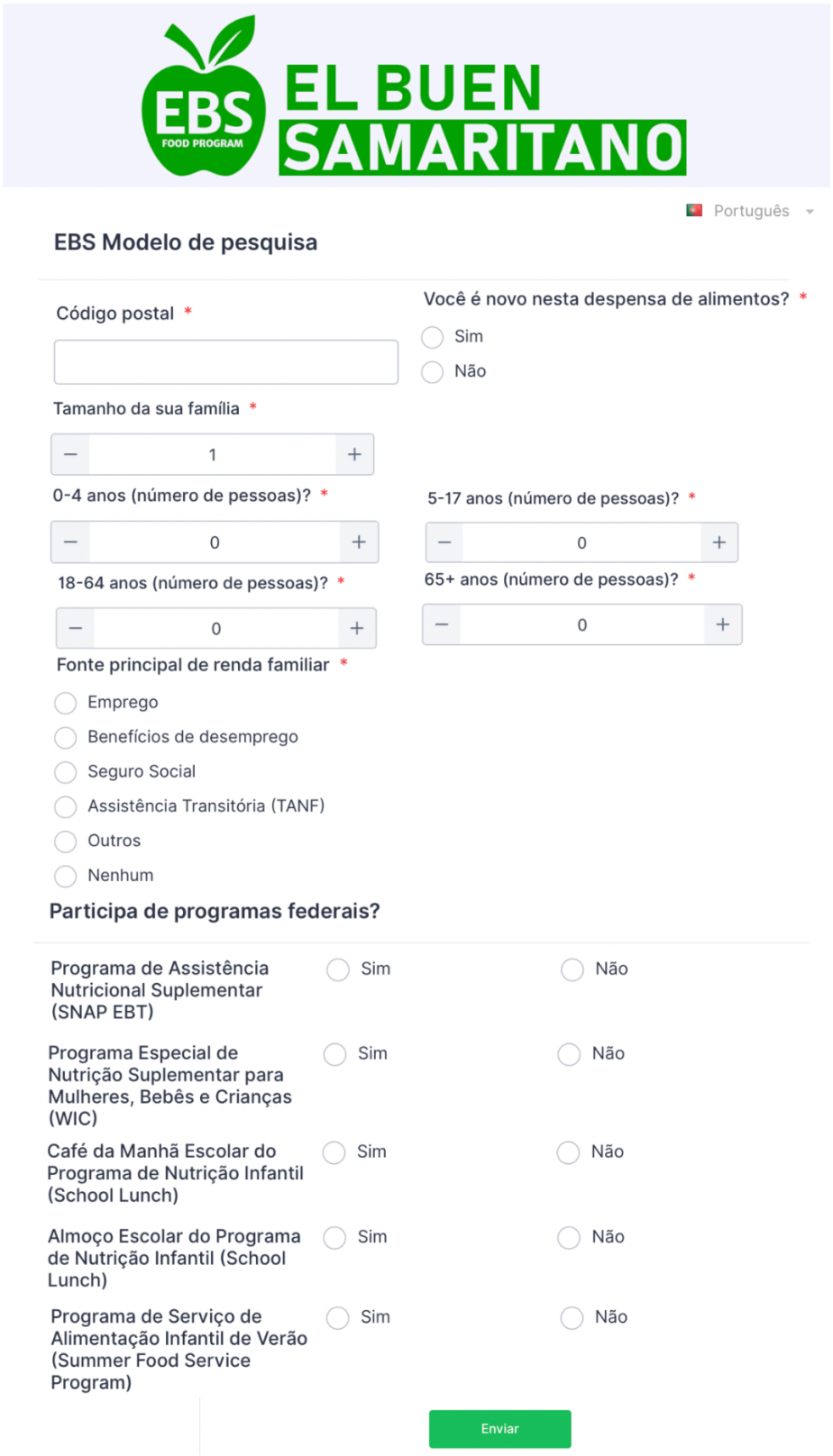
Appendix D : Translation for Survey

Chinese

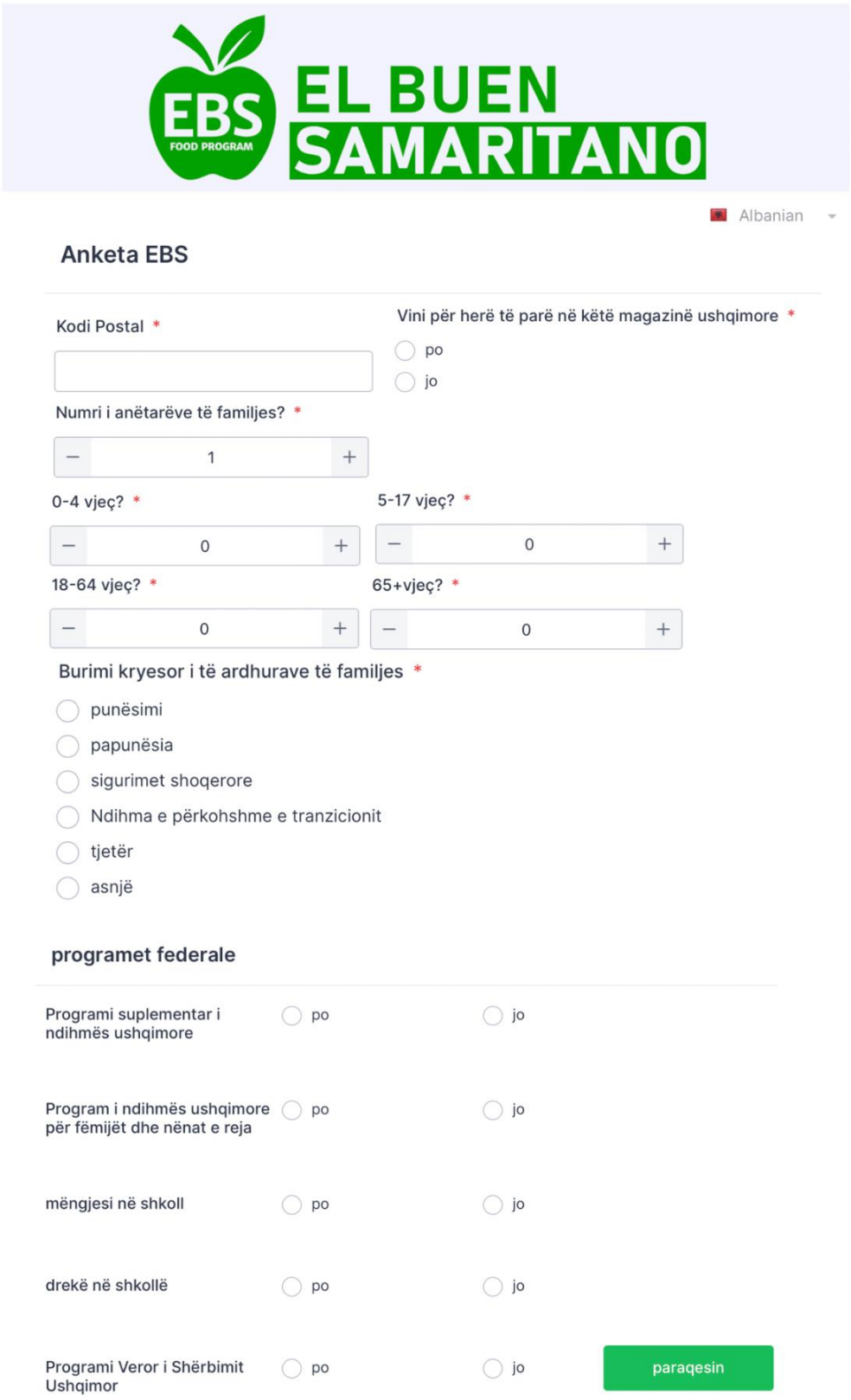
Vietnamese


EBS
FOOD PROGRAM
EL BUEN SAMARITANO
Vietnamese
Bảng câu hỏi EBS
Mã Bưu Chính *
Lần đầu tiên ở đây? *
Đúng
không
Số người trong gia đình *
1
0-4 tuổi ? (số người) *
0
5-17 tuổi ? (số người) *
0
18-64 tuổi ? (số người) *
0
65+ tuổi ? (số người) *
0
Nguồn thu nhập chính của gia đình? *
Công việc làm
Thất nghiệp
An Sinh Xã Hội (Social Security)
Hỗ trợ Chuyển tiếp cho (TANF)
khác
Không
Chương trình hỗ trợ của Chính phủ?
Chương trình trợ cấp thực phẩm (SNAP)
Đúng
không
Chương trình hỗ trợ phụ nữ, trẻ sơ sinh, và trẻ em (WIC)
Đúng
không
Chương trình hỗ trợ bữa sáng cho học sinh (School Breakfast)
Đúng
không
Chương trình hỗ trợ bữa trưa cho học sinh (School Lunch)
Đúng
không
Chương trình dịch vụ ăn uống cho học sinh vào mùa hè (Summer Food Service Program)
Đúng
không
Submit

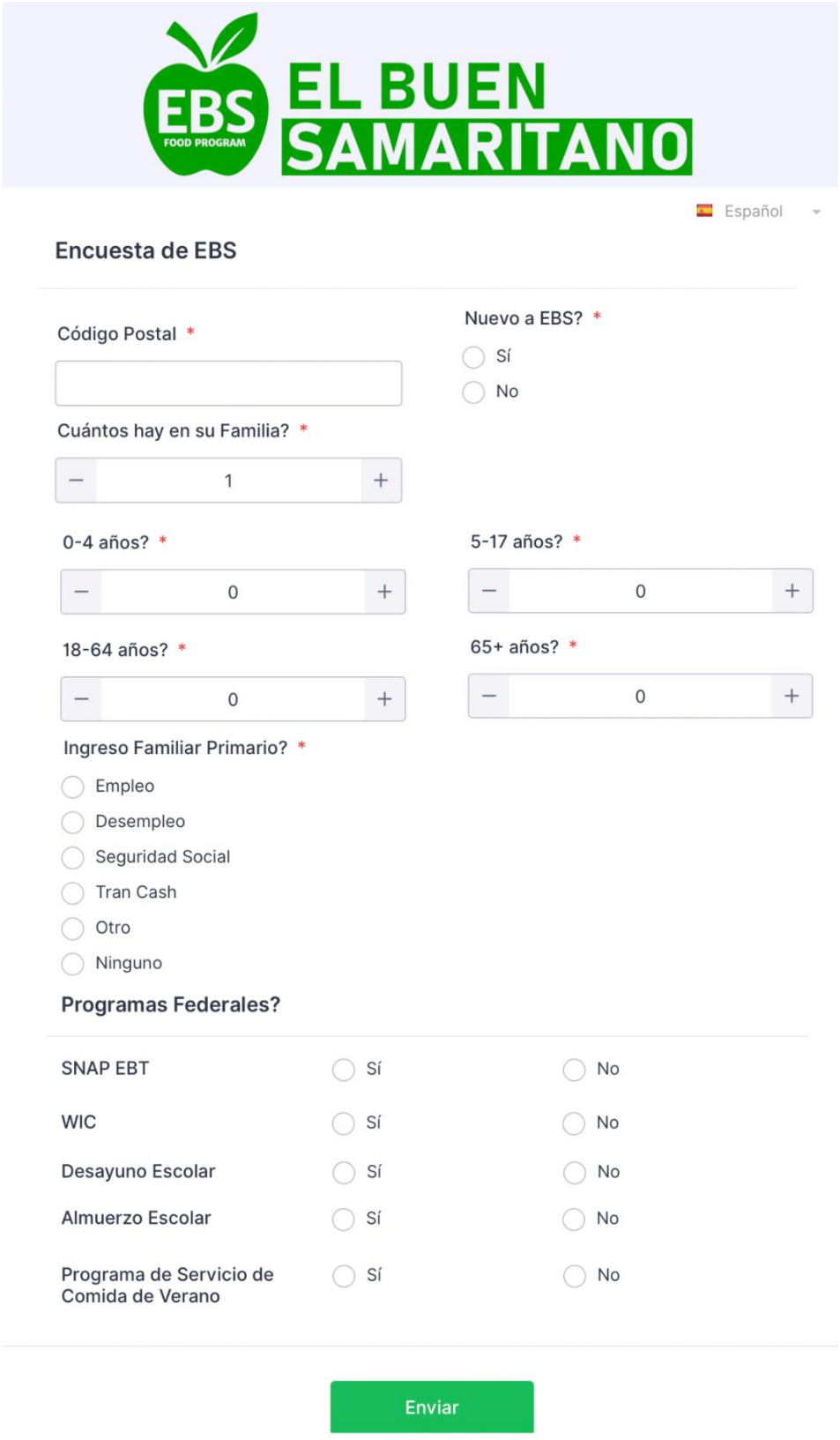
Portuguese


EBS
FOOD PROGRAM
EL BUEN SAMARITANO
Português
EBS Modelo de pesquisa
Código postal *
Você é novo nesta despensa de alimentos? *
Sim
Não
Tamanho da sua família *
1
0-4 anos (número de pessoas)? *
0
5-17 anos (número de pessoas)? *
0
18-64 anos (número de pessoas)? *
0
65+ anos (número de pessoas)? *
0
Fonte principal de renda familiar *
Emprego
Benefícios de desemprego
Seguro Social
Assistência Transitória (TANF)
Outros
Nenhum
Participa de programas federais?
Programa de Assistência Nutricional Suplementar (SNAP EBT)
Sim
Não
Programa Especial de Nutrição Suplementar para Mulheres, Bebês e Crianças (WIC)
Sim
Não
Café da Manhã Escolar do Programa de Nutrição Infantil (School Lunch)
Sim
Não
Almoço Escolar do Programa de Nutrição Infantil (School Lunch)
Sim
Não
Programa de Serviço de Alimentação Infantil de Verão (Summer Food Service Program)
Sim
Não
Enviar

Albanian


EBS
FOOD PROGRAM
EL BUEN
SAMARITANO
Albanian
Anketa EBS
Kodi Postal *
Vini për herë të parë në këtë magazinë ushqimore *
po
jo
Numri i anëtarëve të familjes? *
1
0-4 vjeç? *
0
5-17 vjeç? *
0
18-64 vjeç? *
0
65+vjeç? *
0
Burimi kryesor i të ardhurave të familjes *
punësimi
papunësia
sigurimet shoqerore
Ndihma e përkohshme e tranzicionit
tjetër
asnjë
programet federale
Programi suplementar i ndihmës ushqimore
po
jo
Program i ndihmës ushqimore për fëmijët dhe nënat e reja
po
jo
mëngjesi në shkoll
po
jo
drekë në shkollë
po
jo
Programi Veror i Shërbimit Ushqimor
po
jo
paraqesin

Spanish

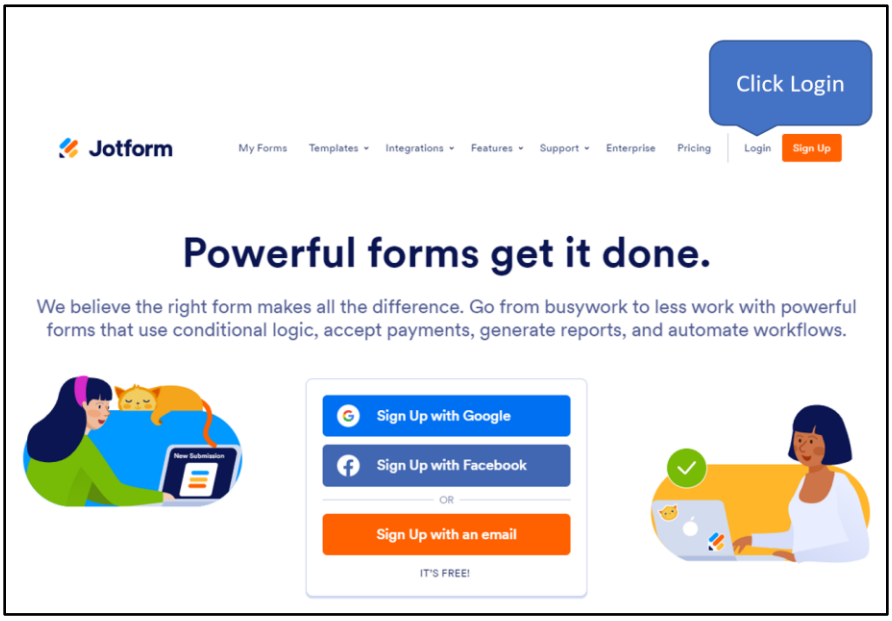

EBS
FOOD PROGRAM
EL BUEN SAMARITANO
Español
Encuesta de EBS
Código Postal *
Nuevo a EBS? *
Sí
No
Cuántos hay en su Familia? *
1
0-4 años? *
0
5-17 años? *
0
18-64 años? *
0
65+ años? *
0
Ingreso Familiar Primario? *
Empleo
Desempleo
Seguridad Social
Tran Cash
Otro
Ninguno
Programas Federales?
SNAP EBT Sí No
WIC Sí No
Desayuno Escolar Sí No
Almuerzo Escolar Sí No
Programa de Servicio de Comida de Verano Sí No
Enviar

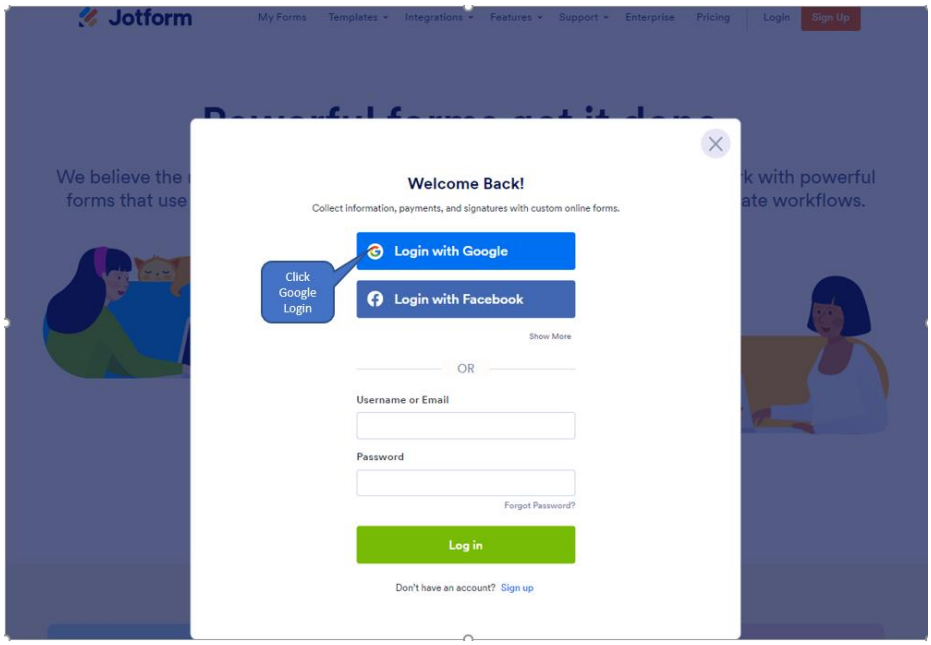
Appendix E : Instruction manual for EBS

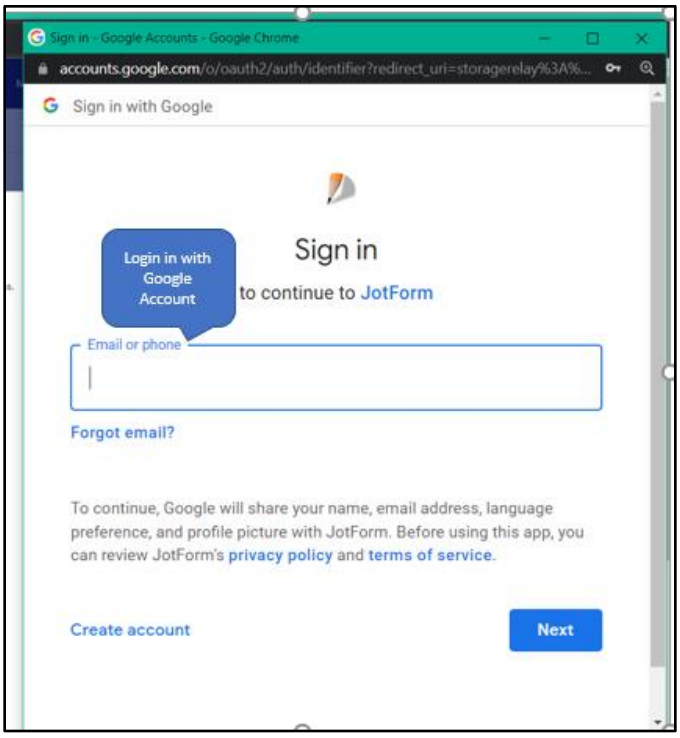
1. Logging in

Follow the steps below to login
Go to **jotform.com** > Select **Login >** Enter your credentials

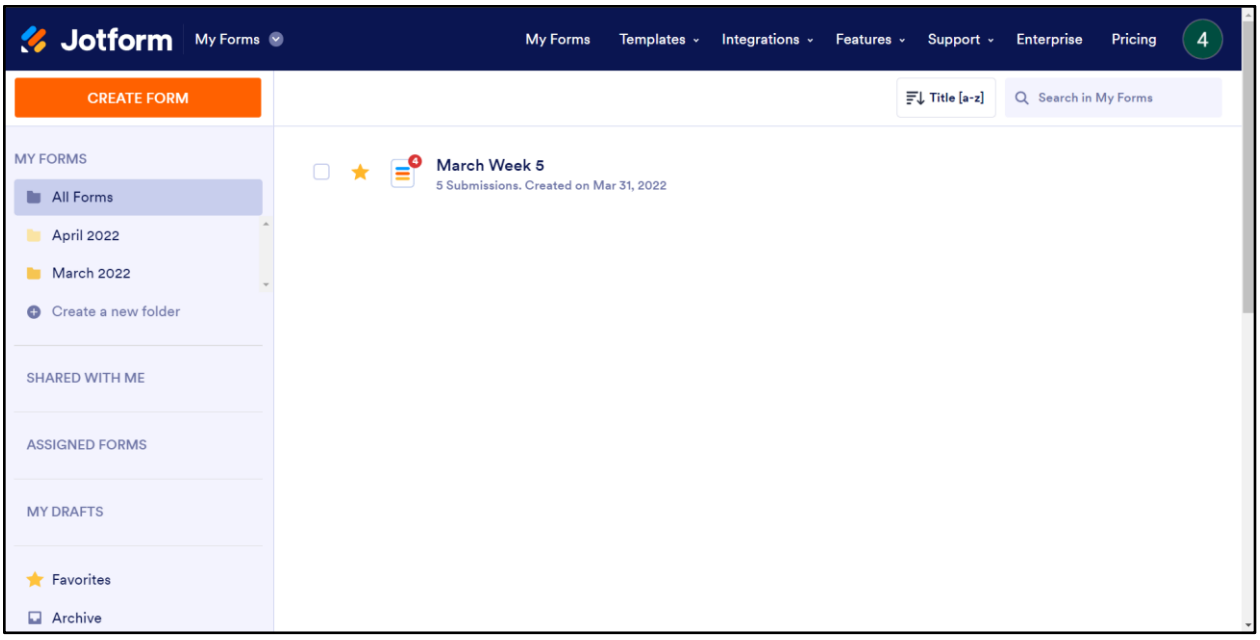
If you created an Jotform account using Google, you can login directly by:
Go to **jotform.com** > Select **Login >** Login with **Google Account**





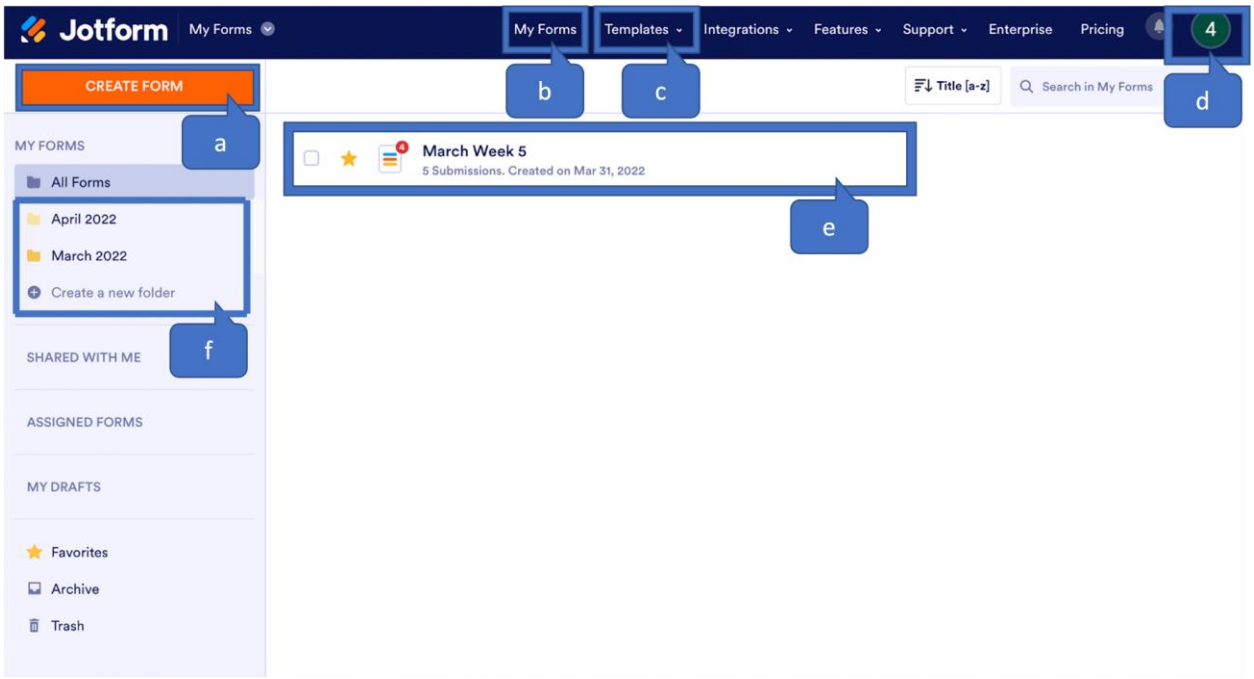


After logging in, you will see the default homepage.



2. Introduction to Homepage

Once you log in to your Jotform account, the default home page should look like this:



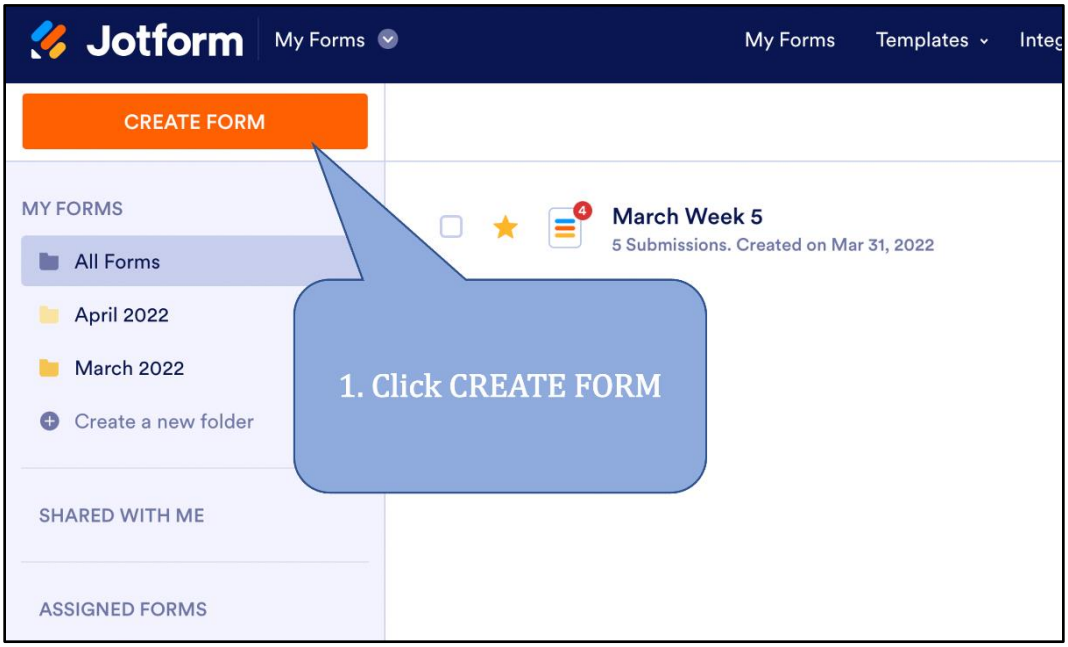
In the screenshot above, we have marked the following features:

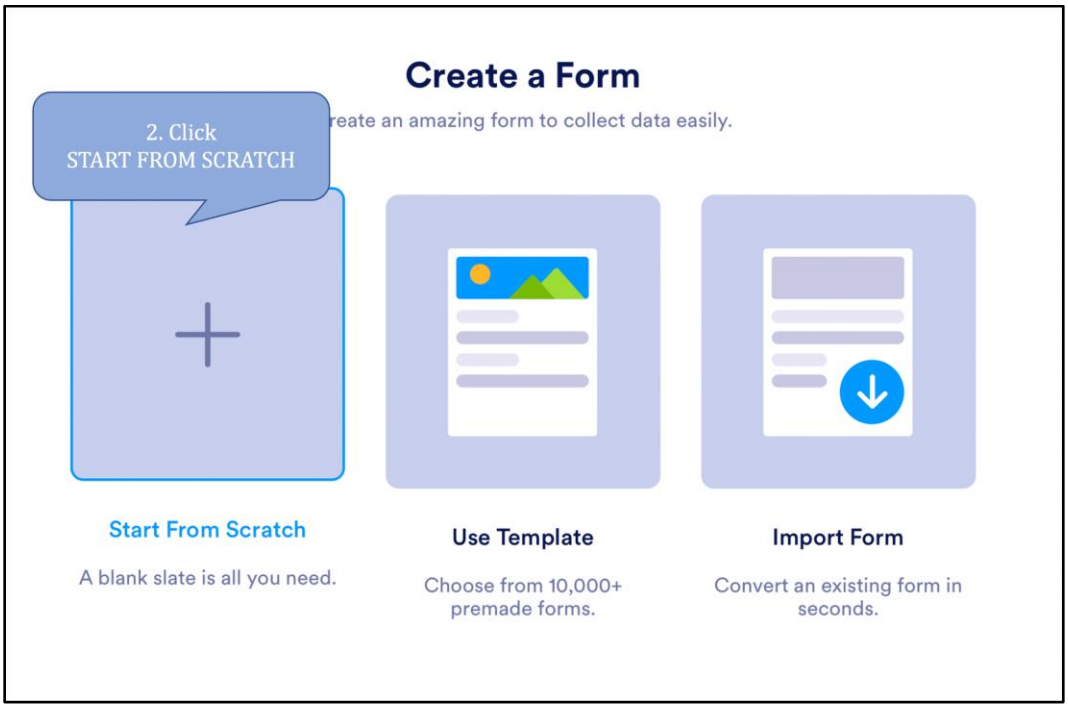
a. Button to create a form
b. Button to access your forms
c. Button to access templates
d. Button to access your account
e. The forms you've created
f. Folders storing different forms

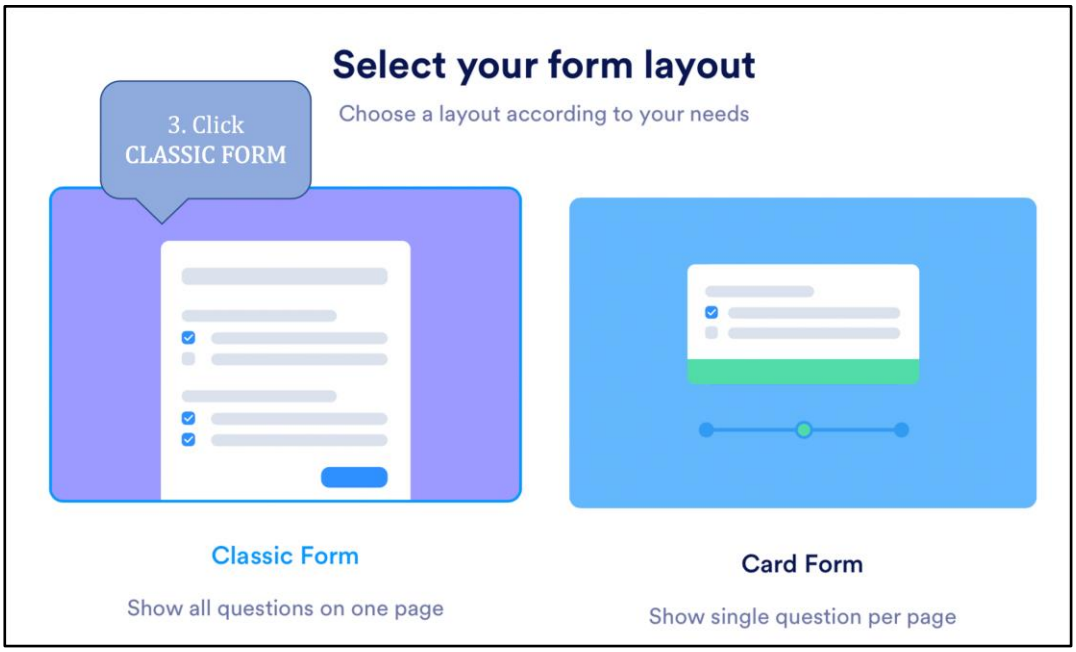
3. Creating a Survey

3.1 Create a Survey from scratch

Go to **Home Page (My Forms)** > Step 1. Select **Create Form** > Step 2. Select **Start From Scratch** > Step 3. Select **Classic Form**

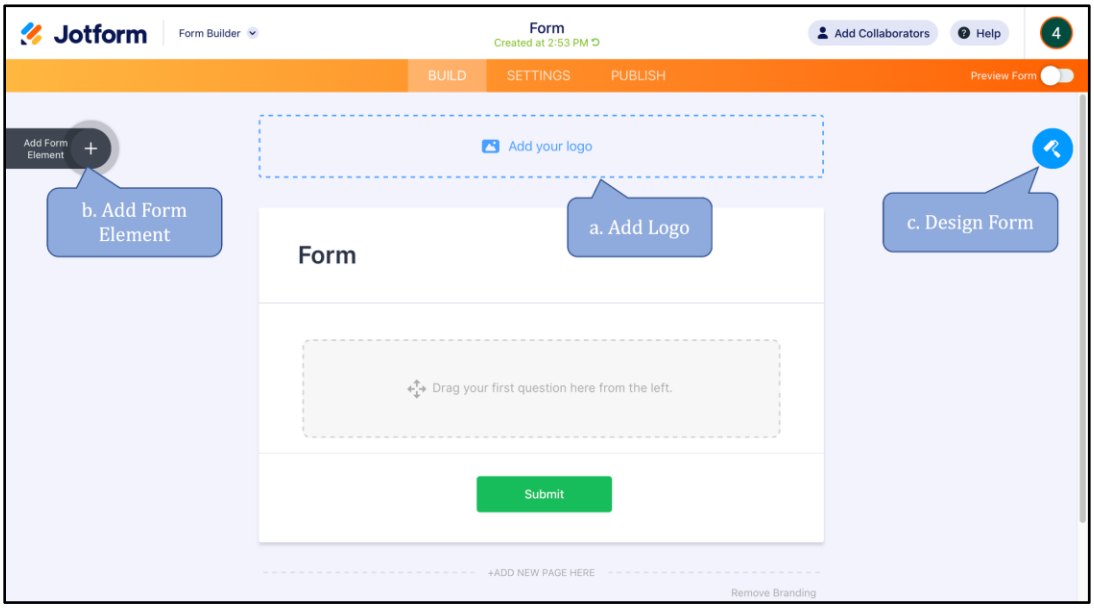




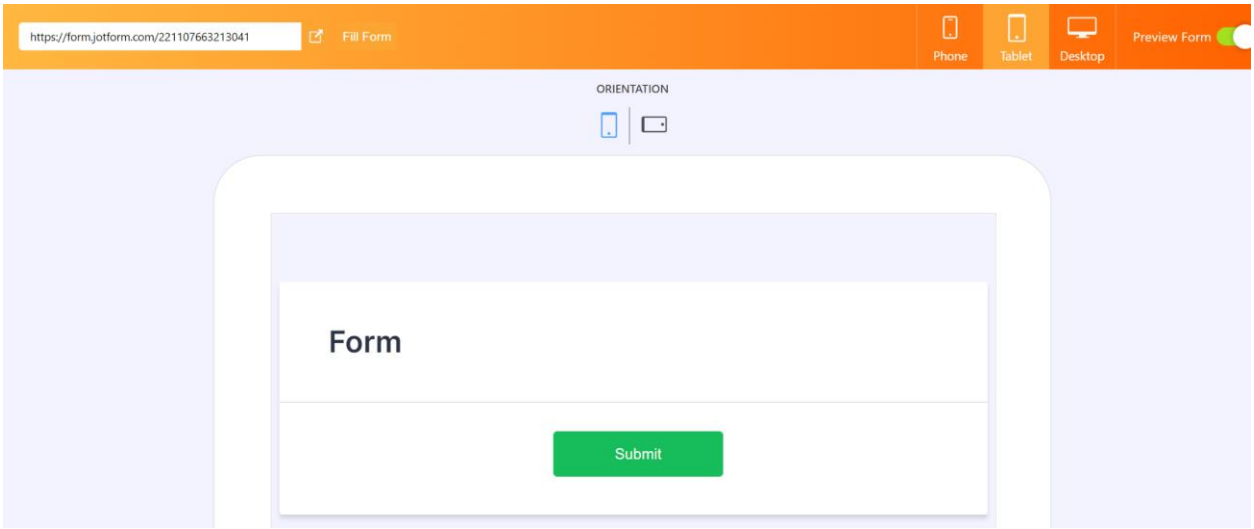


As you enter the **Form Builder**, you will see several options including:

a. Adding a logo: You can add the EBS logo here by dragging and dropping an image file inside the dotted line, or uploading an image from your computer
b. Adding form elements You can add form element such as multiple choice, drop down list, short text, etc
c. Designing form: You can change font style, page color, theme of the form, etc.



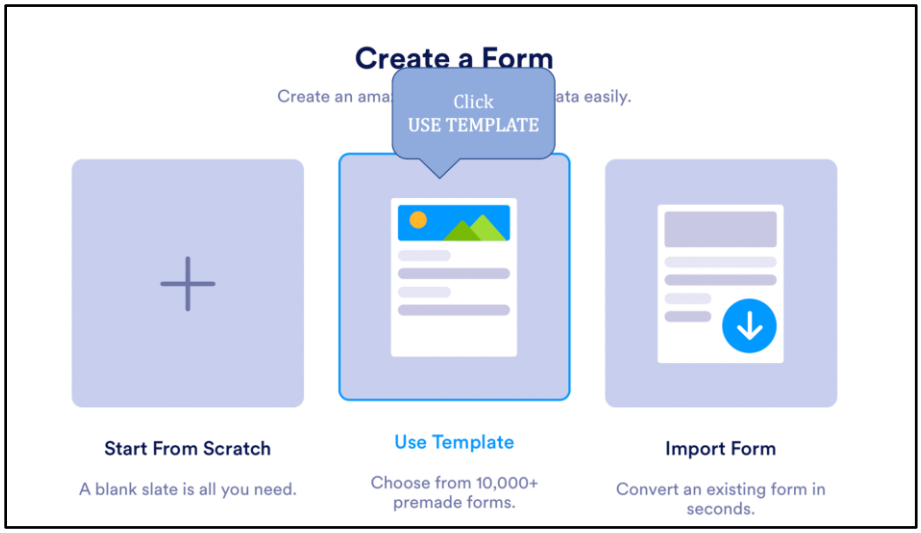
If you toggle the switch “Preview Form”, you will be able to see what your survey will look like on a phone, tablet or desktop.



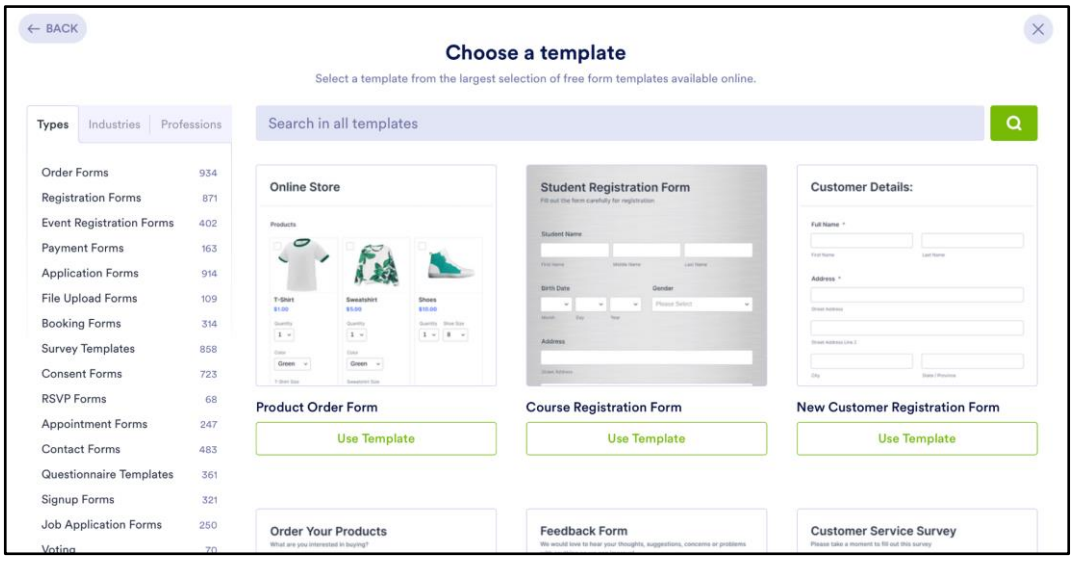
3.2 Create a Survey from a template

You can create forms using one of the templates provided by Jotform. Available templates include order, registration, contact, RSVP forms, etc.

Go to **Home Page (My Forms)** > 1. Select **Create Form** > 2. Select **Use Template**

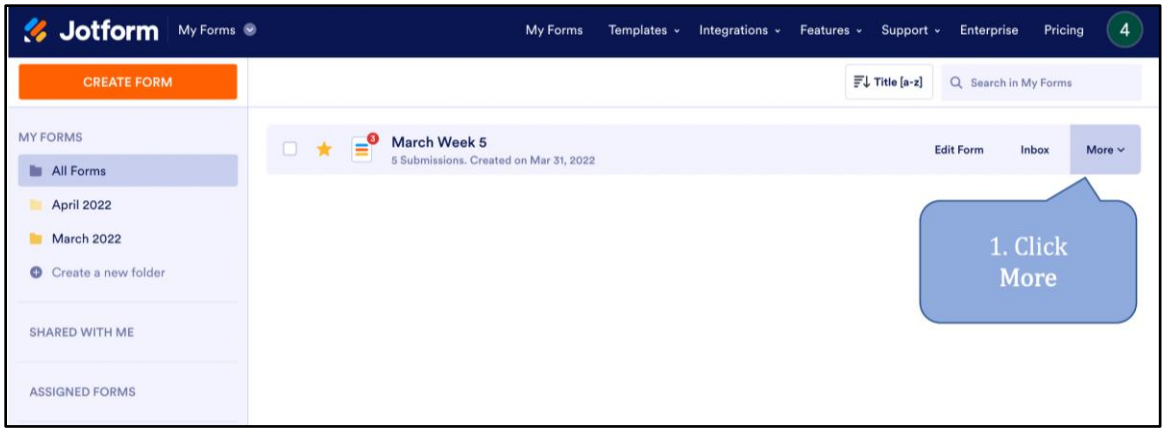


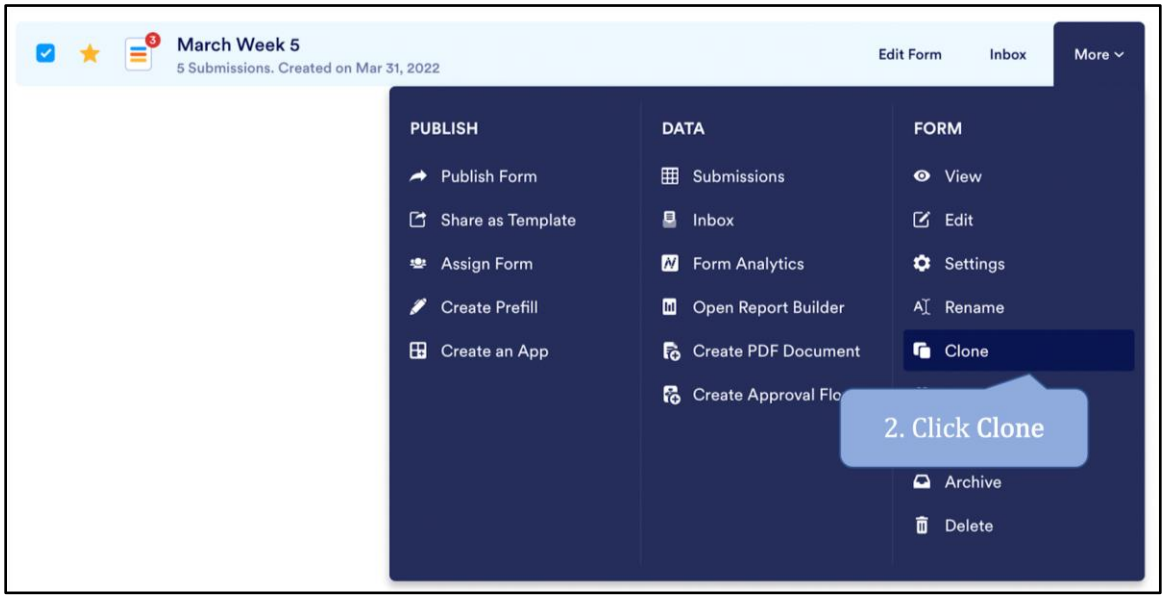
You will then see a variety of templates available, and you can look up templates with the search bar as well. Hover your mouse over the icon, and you can preview the template. Click **Use Template** to use the template.

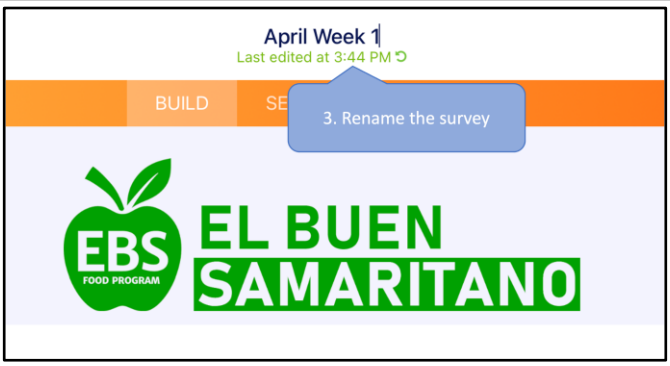


3.3 Create a survey by copying previous survey

As EBS is mostly reusing the same form for collecting demographics data, we can simply clone the previous survey. Go to **Home Page (My Forms)** > 1. Select **More** on the form that you would like to clone > 2. Select **Clone**. You should see a cloned version of the survey named "Clone of …" > 3. Select **Edit Form** to rename the survey



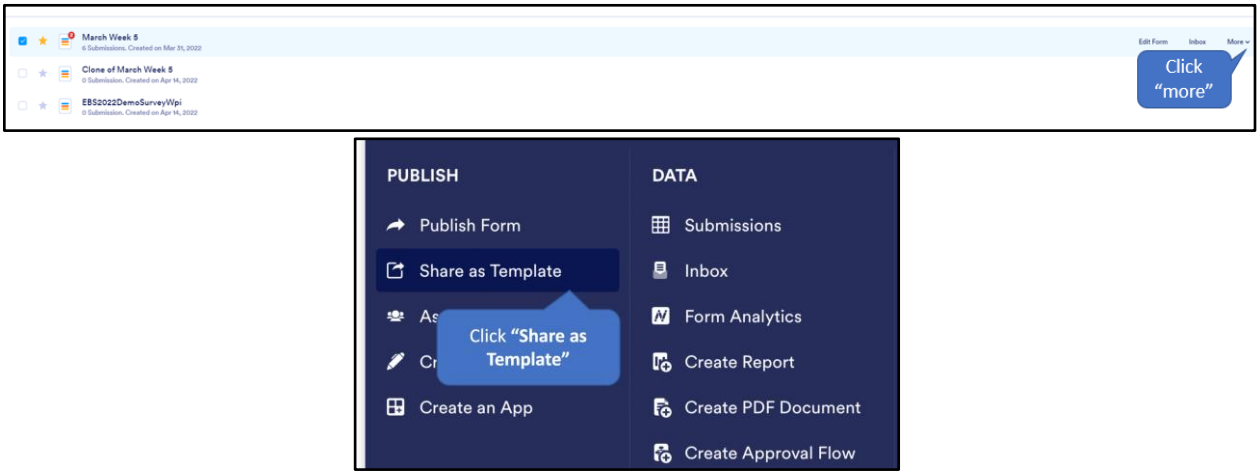




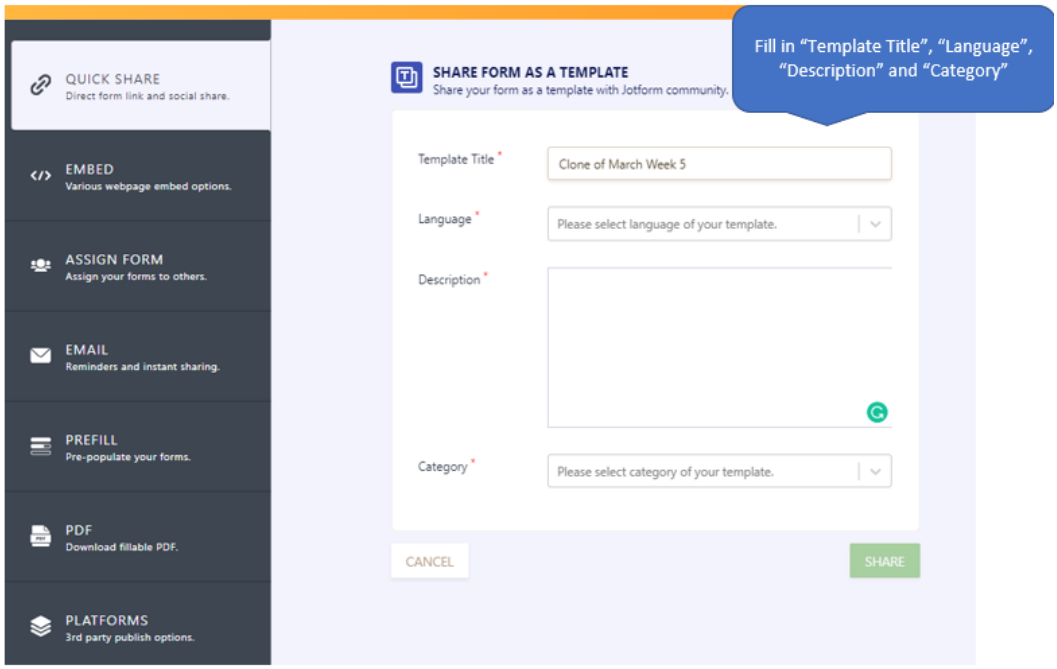
3.4 Creating a template from a survey (Optional)

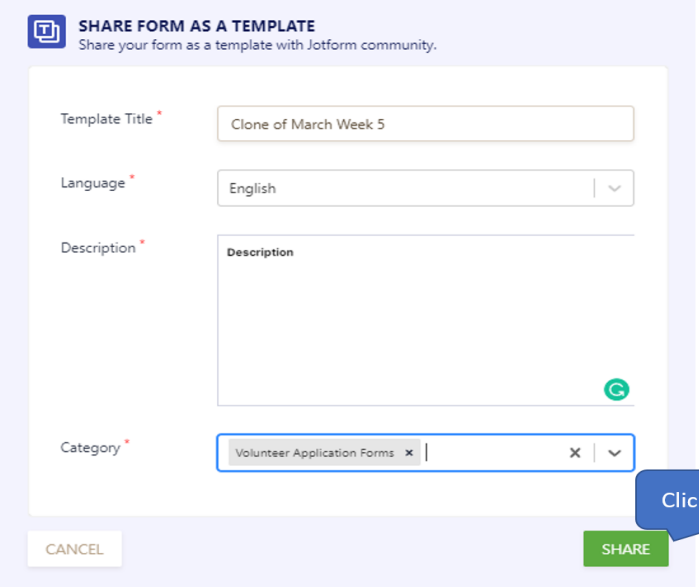
In addition to creating your own survey, you can make it into a template so that you can use it in the future.

On the Home Page, click **More,** then click on "**Share as Template".**



In the **Quick Share** form, fill in the **Template Title, Language, Description,** and **Category** fields. After that, hit the **Share** button.



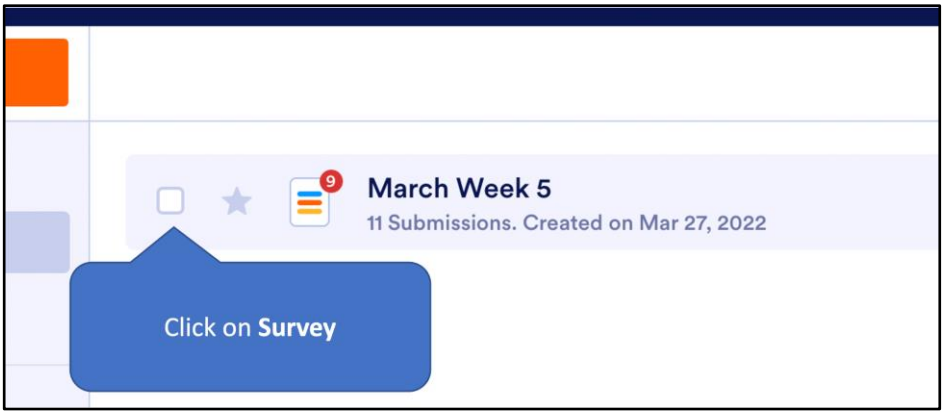


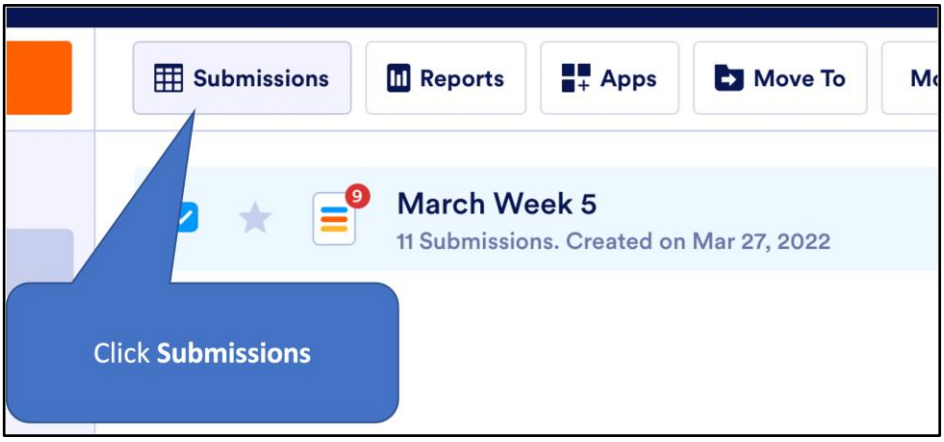
After this is done, your template will be shared globally. Now simply follow the steps in 3.2 to find and use the template you made. To find your survey, type your survey’s name in the search bar.

4. Editing Survey Fields

If you want to change the fields for one or more survey submissions, you can change the values on Jotform's native spreadsheet page.

Home Screen > Select All Forms > Click **Survey** > Click **Submissions**



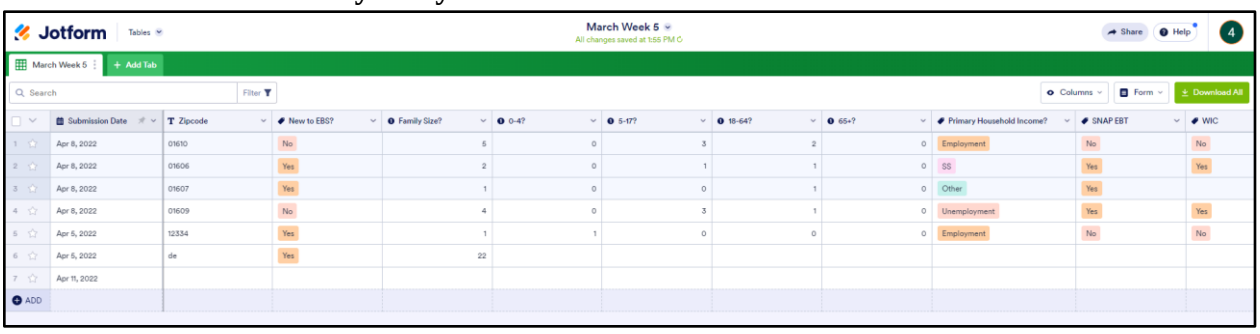


4.1 Submissions section features

The Submissions Spreadsheet interface is similar to Excel

In the **Submissions,** you will be able to

- **Edit the fields of any individual survey**
- **Add another survey entry**



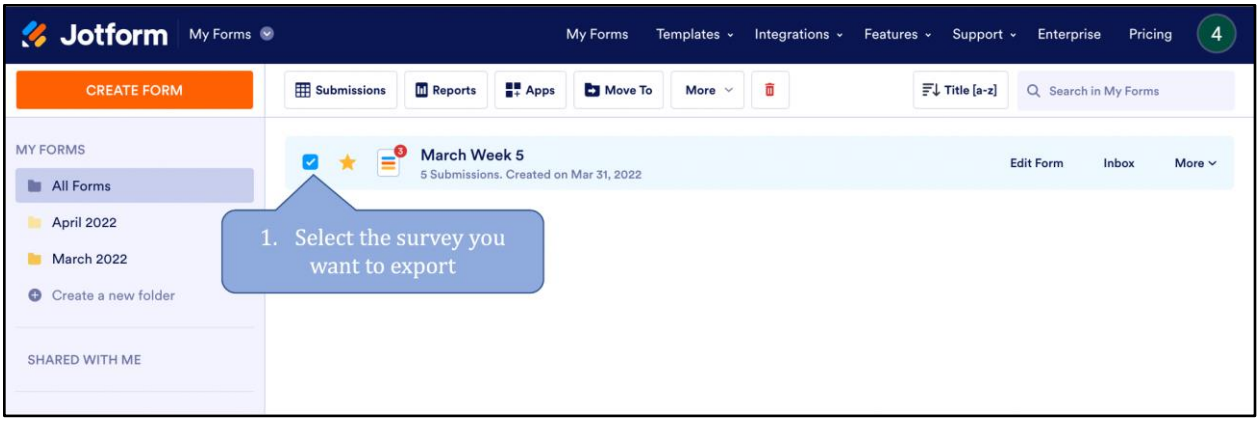
5. Exporting and Analyzing Data

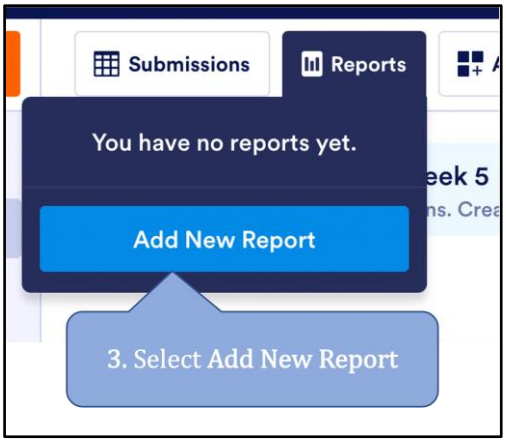
5.1 How to export data to excel

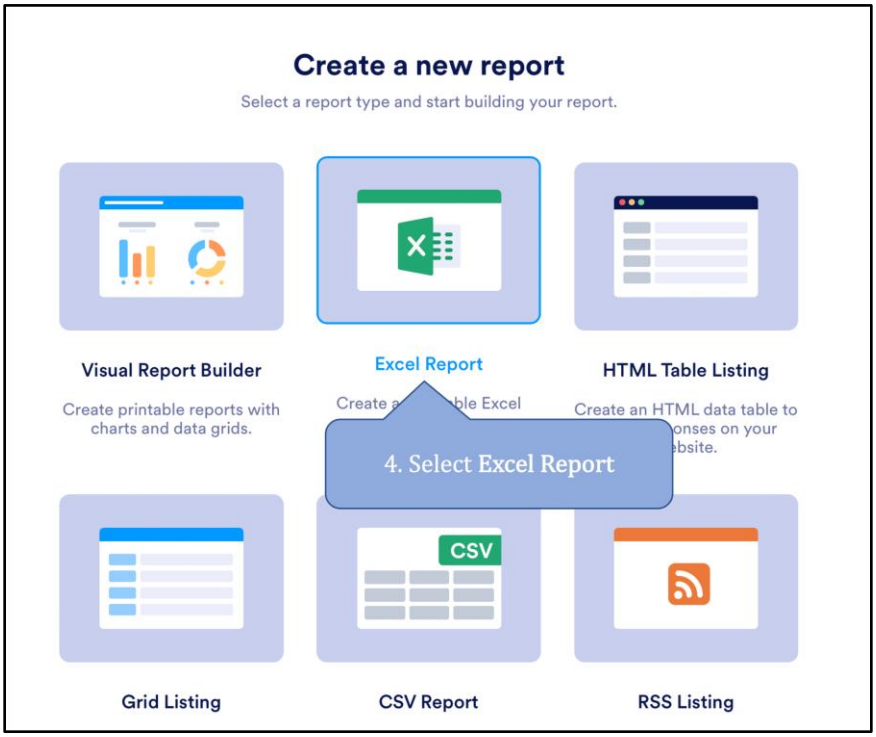
In Jotform, the responses of each survey can be exported in several formats, including excel and .csv file. The following steps show you how to export data as an excel file.

Go to **Home Page (My Forms)**

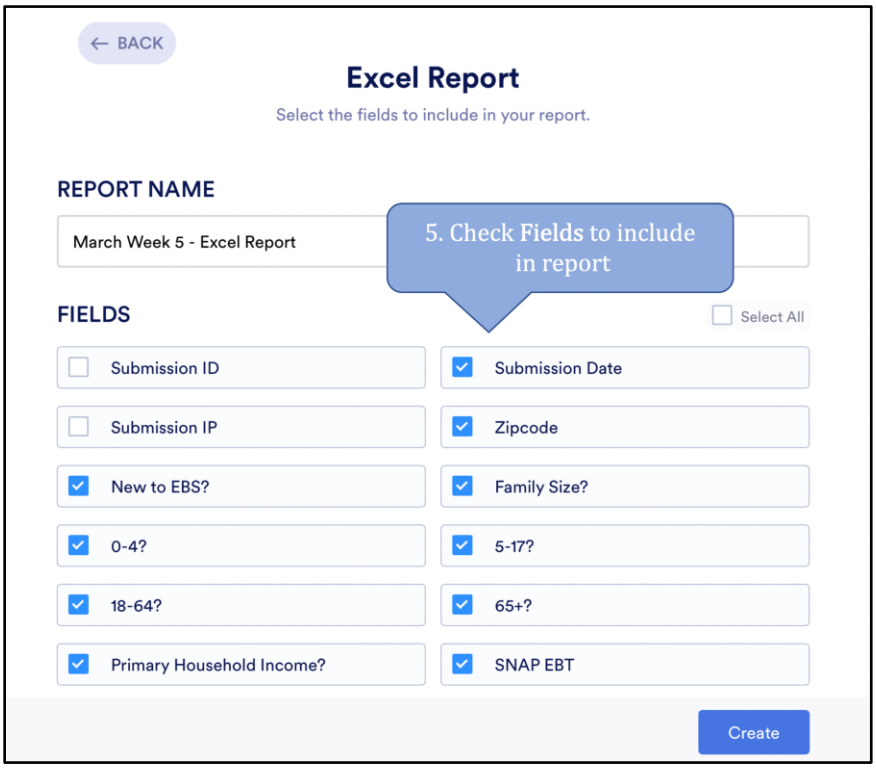
Step 1. Select **the survey you want to export**
Step 2. Select **Reports**
Step 3. Select **Add New Report**
Step 4. You should now see several options to create a new report, select **Excel Report**
Step 5. Create an excel report, select **Create**
Step 6. Select **Download Report**
Step 7. Revisit generated report in the **My Report** section



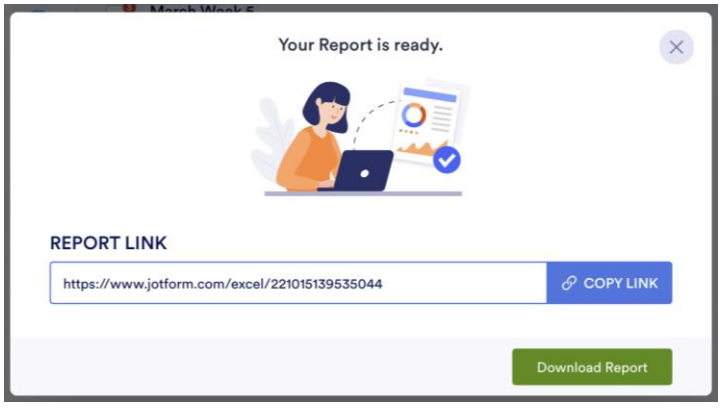

Submissions
Reports
You have no reports yet.
Add New Report
3. Select Add New Report


Create a new report
Select a report type and start building your report.
Visual Report Builder
Create printable reports with charts and data grids.
Excel Report
HTML Table Listing
Create an HTML data table to
4. Select Excel Report
CSV
Grid Listing
CSV Report
RSS Listing

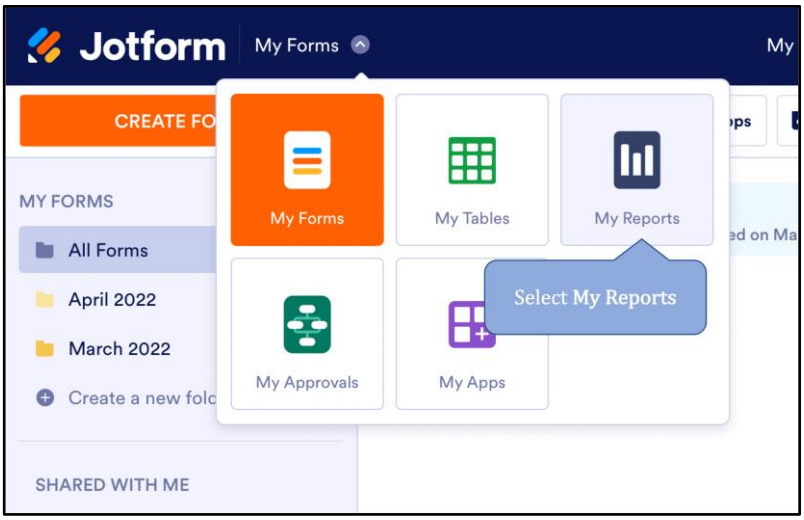
You can now rename the report and select fields to include in your excel report. We recommend selecting every field **except Submission ID and Submission IP** to match with the excel template that we provided.



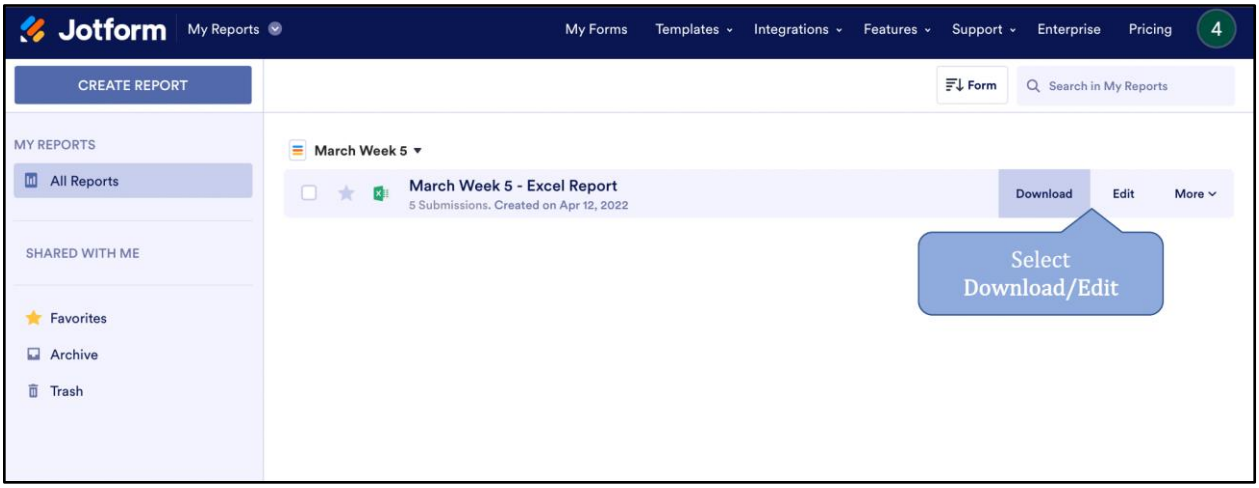
Simply click **Download Report** to download the excel file.



You can revisit, edit, and download the form by going to **My Reports**, which shows all the reports you have created.



Select **Download** to download the report, and **Edit** to change setting of the report

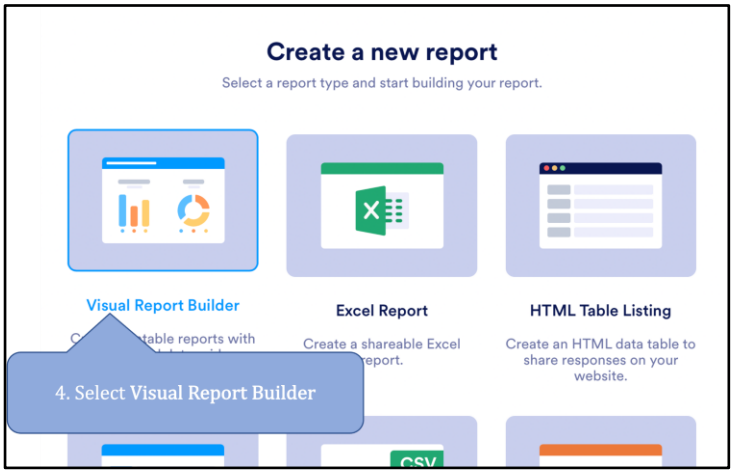


5.2 Visualize data

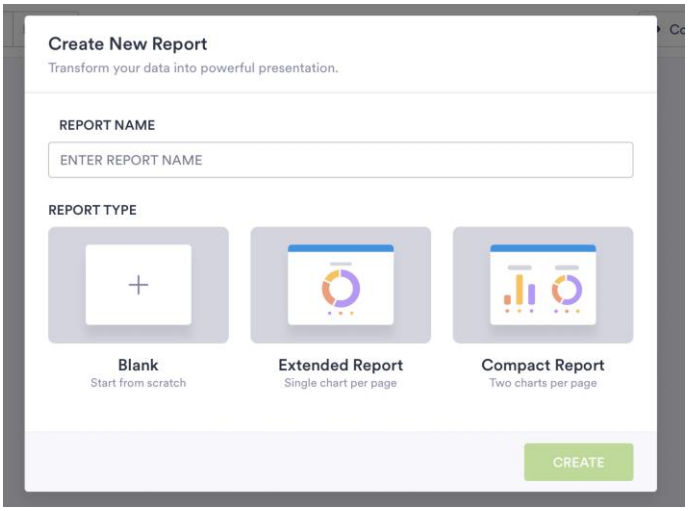
Jotform provides colorful and clear data visualization. You can export the charts and graphs as a PowerPoint or take screenshots.

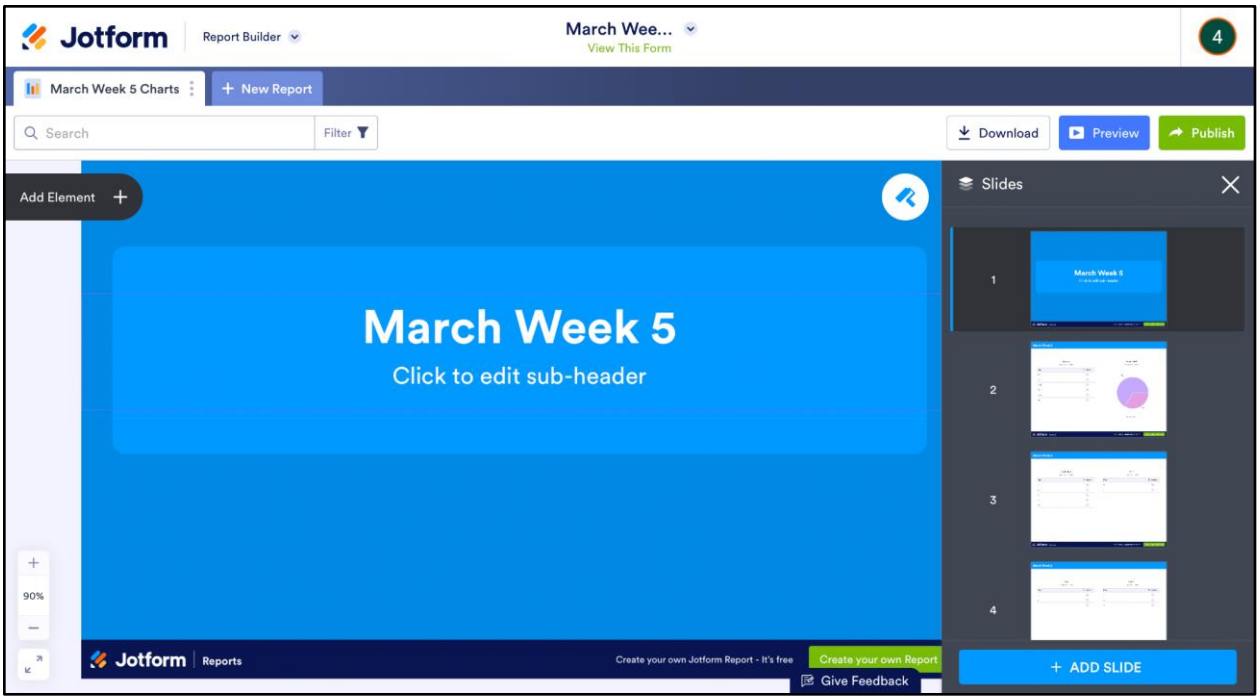
Follow the previous step in Section 5.1 to add a new report:
Go to **Home Page (My Forms)** ***The first three steps are the same as in section 5.1**

Step 1. Select **the survey you want to export**
Step 2. Select **Reports**
Step 3. Select **Add New Report**
Step 4. Select **Visual Report Builder**
Step 5. Enter a report name, and click **Create**

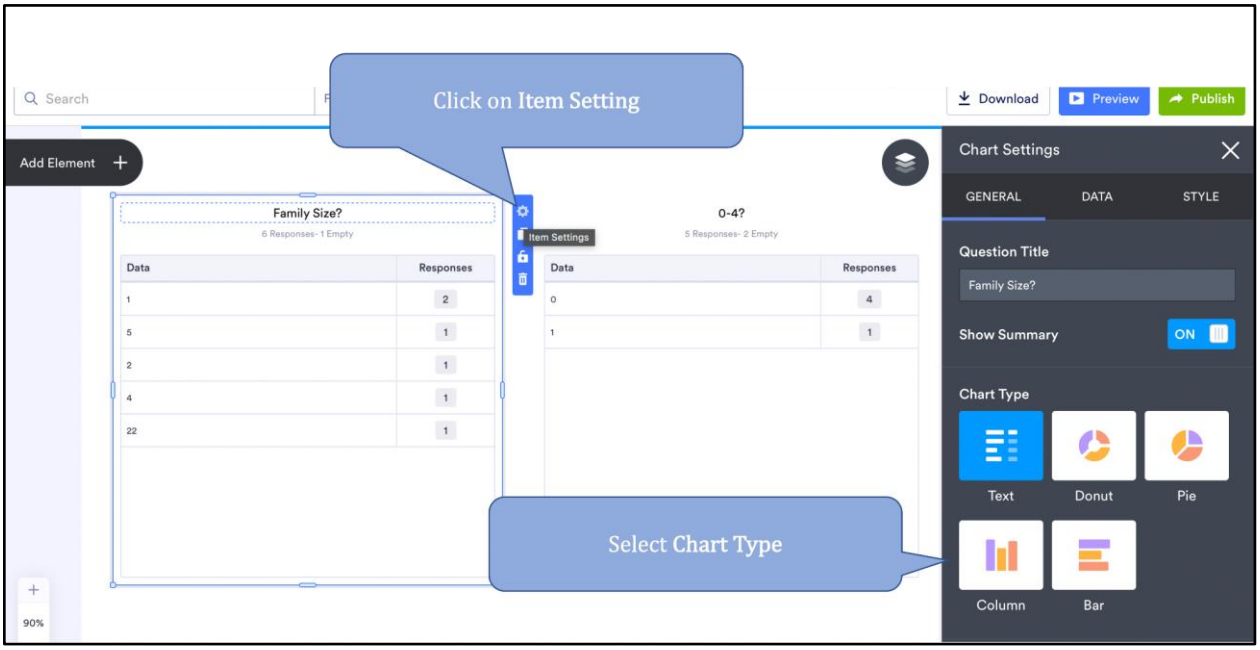


Give the report a name and select the report type. An extended report contains one chart per slide, while a compact report contains two charts per slide.

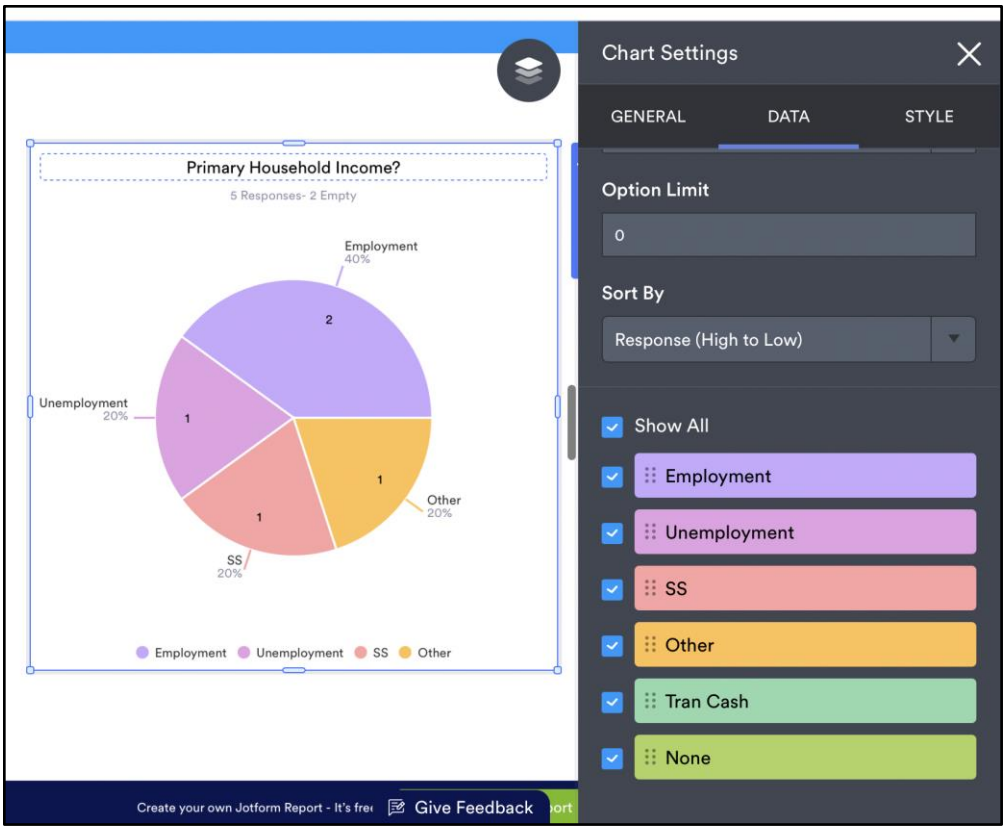




A slideshow containing charts and graphs will appear. You can rearrange the slide and add additional slides. The default chart type of each response varies, but you can easily change the chart type by hovering over the data element and selecting **Item Setting (Gear icon)**. A **Chart Settings** window should pop up on the right, allowing you to make changes.

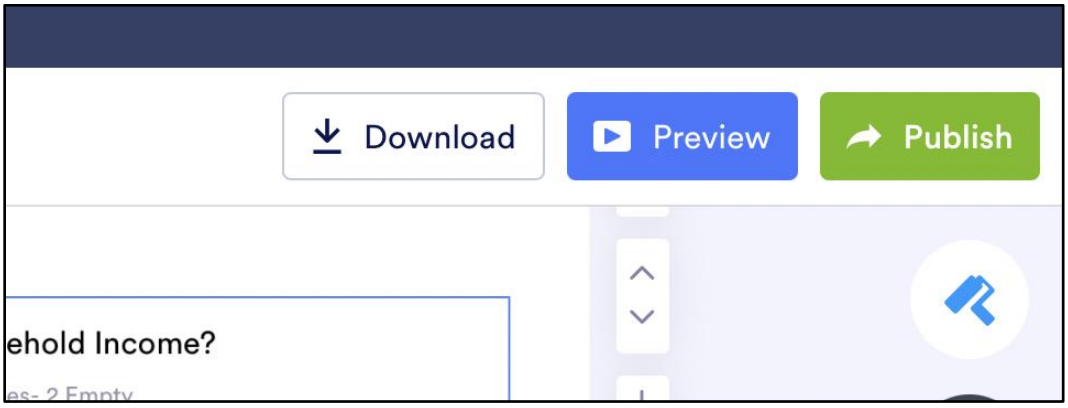


You can select colors for each sector, select fields to include in the chart, and customize how the chart looks.



Once you are done editing the charts, you can take screenshots of the charts or download the slides as a PDF:

- Download - Download slides as pdf
- Preview - Preview the slides in web browser
- Publish - Get a URL link to the published slides



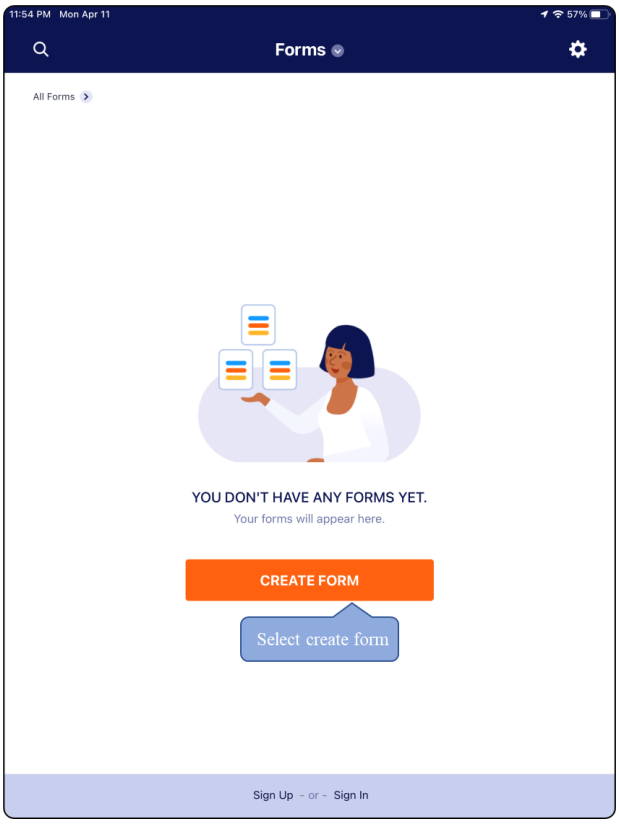
6. Using the App

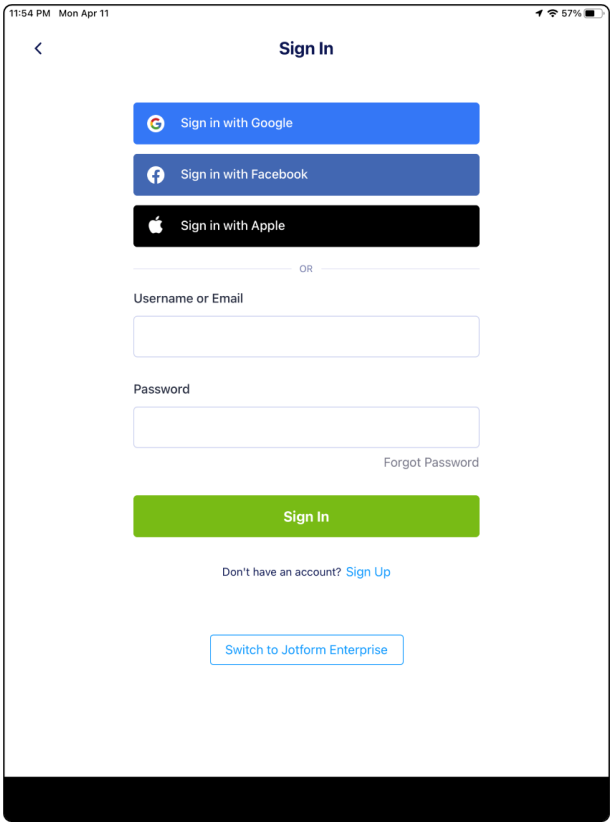
6.1 Introduction

Jotform has its own app that is available on the Apple App Store or the Google Play Store. The app allows you to create, fill, and export surveys. We suggest that the app should mainly be used for filling and sharing survey data. Creating surveys is better in Jotform's web platform.

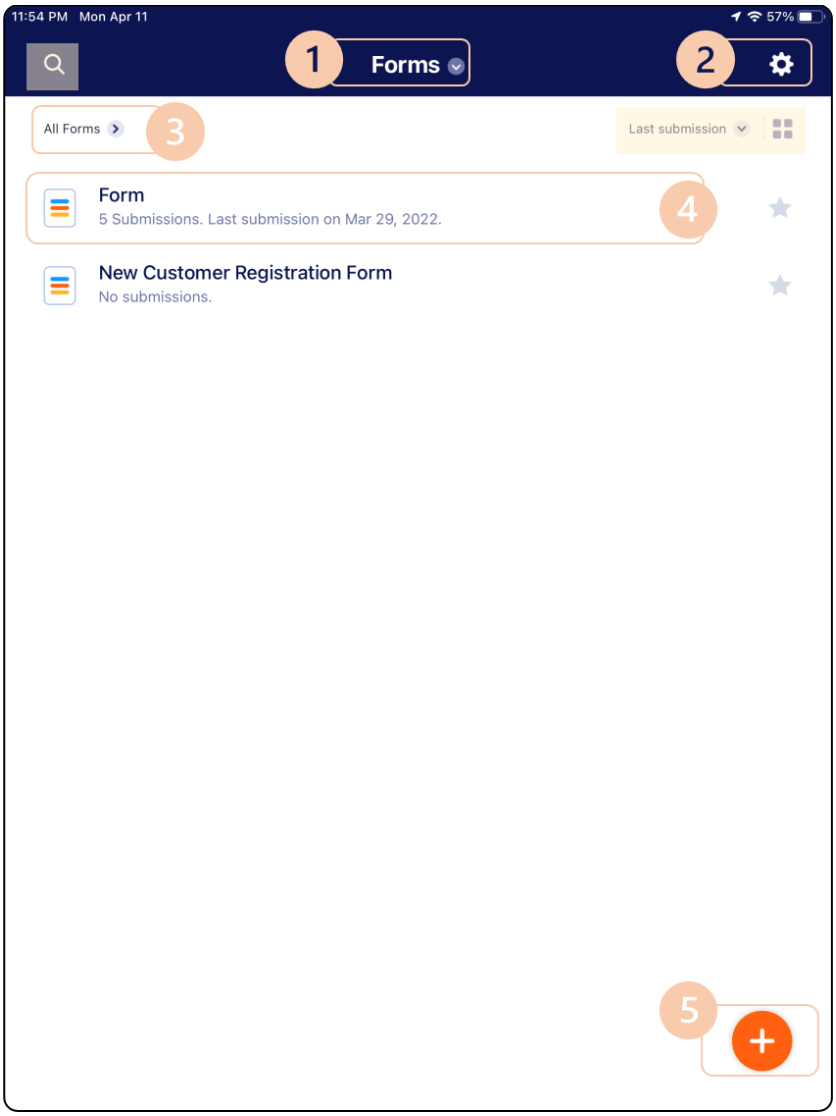
When you first download and install the Jotform app, you will need to sign into your Jotform account. This allows you to seamlessly work and share all information and data between different devices.

Open **Jotform App** > 1. Select **Create Form** > 2. Type Username/Password and select **Sign In**



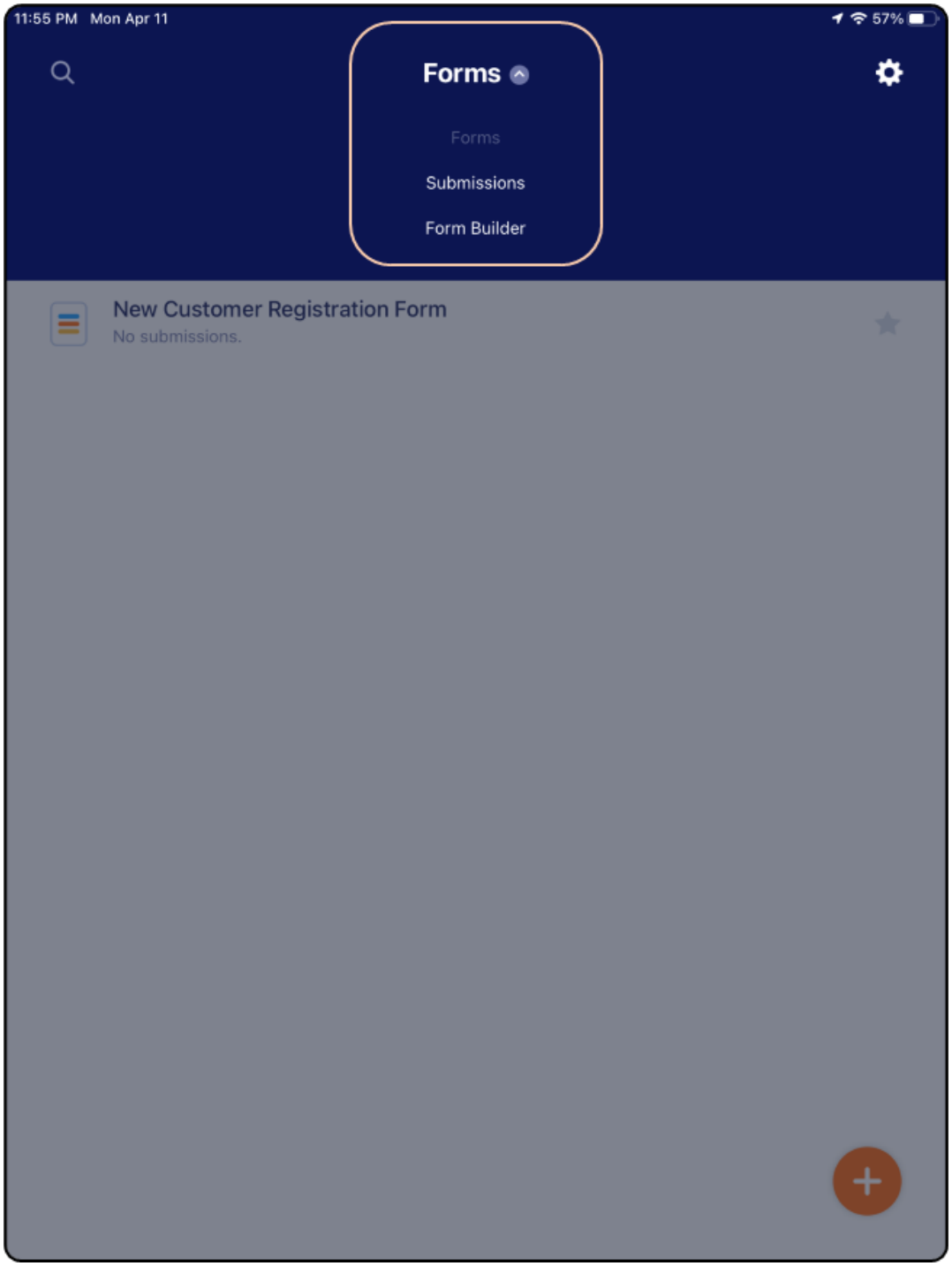


After logging in, you should now have access to all the surveys and data associated with your account. The app should now show you this.

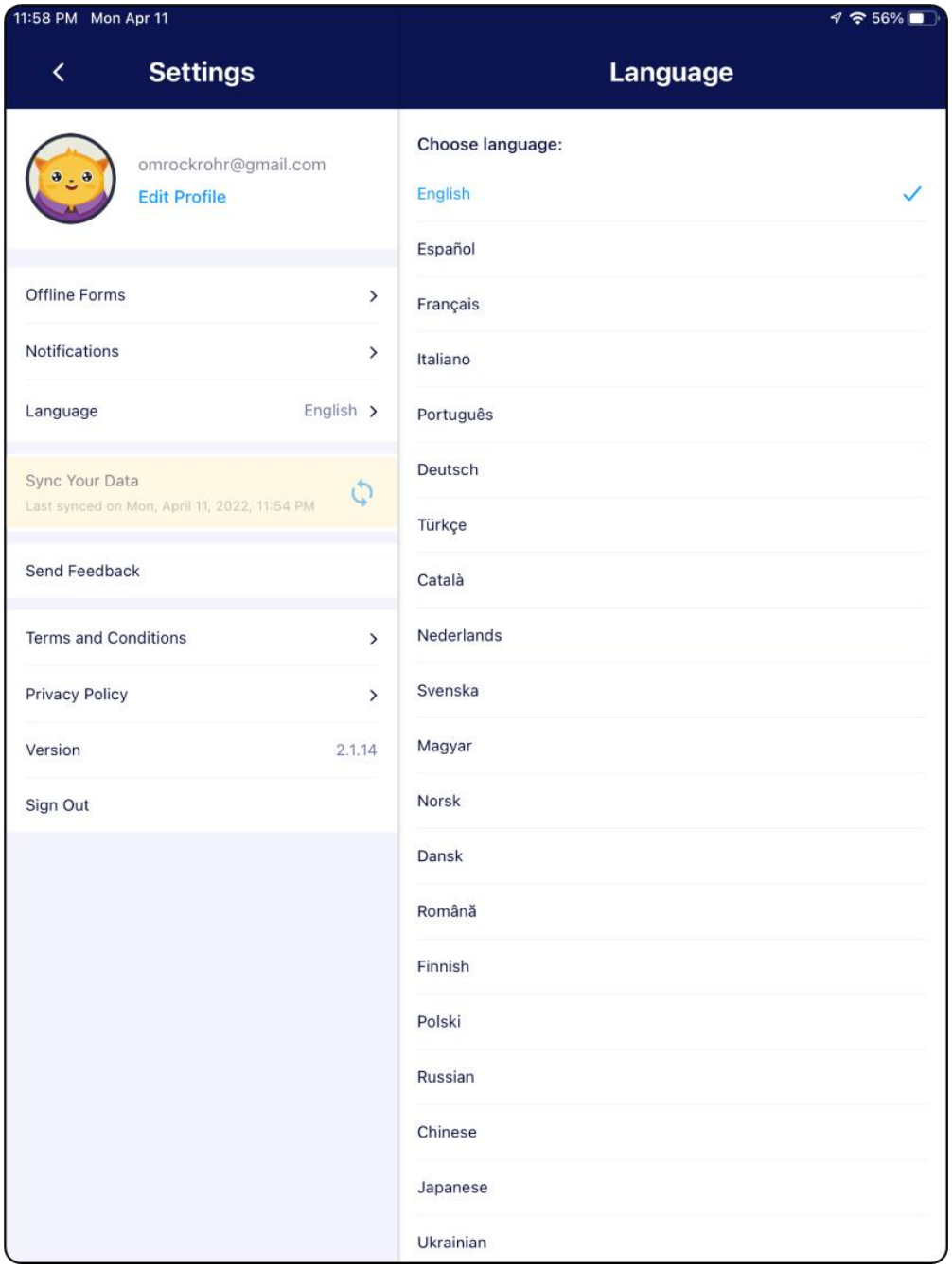


This is the homepage of the app. Indicated in the picture are various features that we will cover in this section. The things highlighted in yellow (late submission and search icon) are different ways to filter, view, search, and sort the forms homepage.

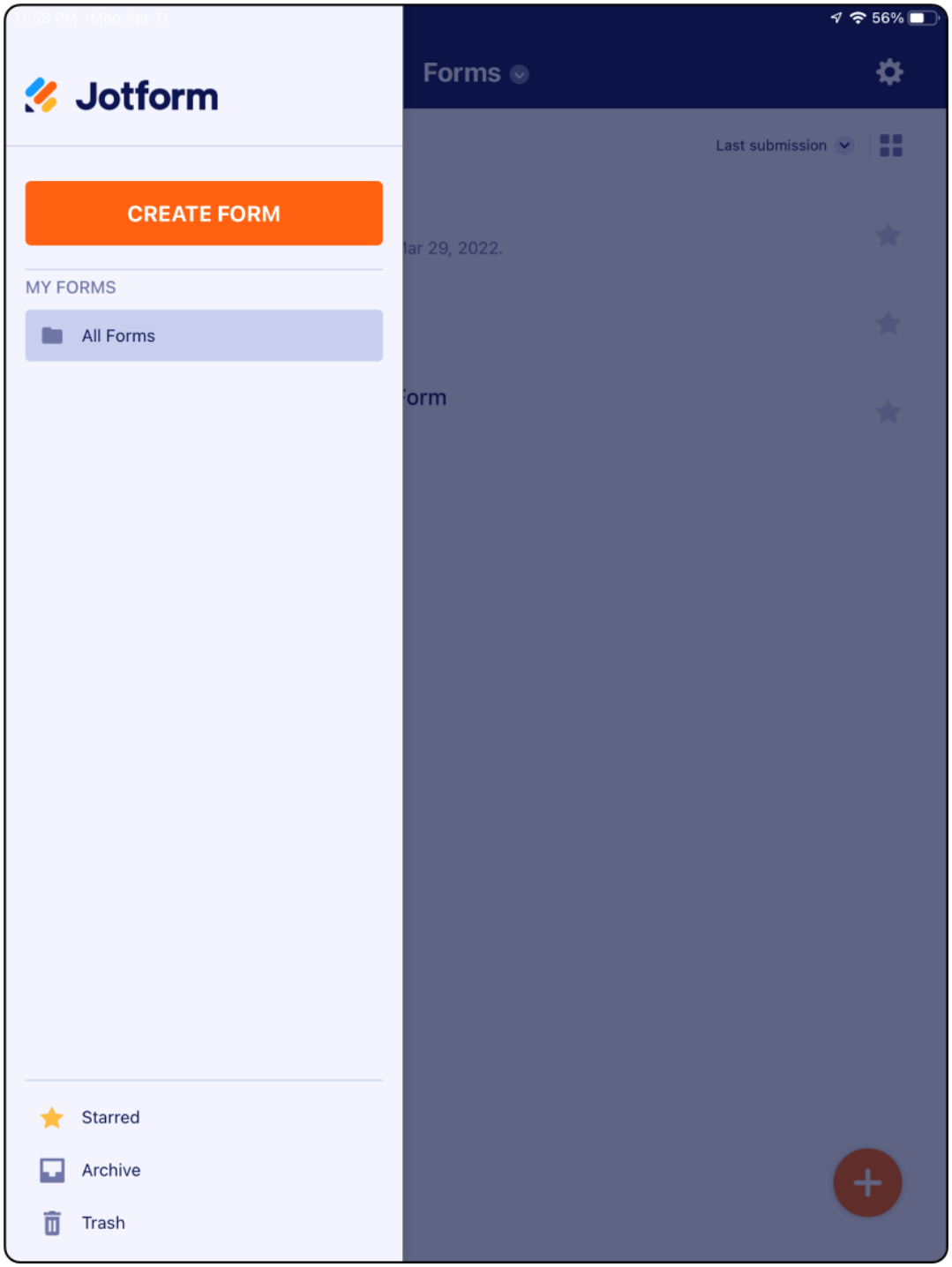
1. Mode Selection - Select **Forms** to select what mode you want. There are three modes: Forms, Submissions, and Form Builder. By default, you are in the Forms mode. We will go into more detail about Submissions and Form Builder in 6.2 and 6.3



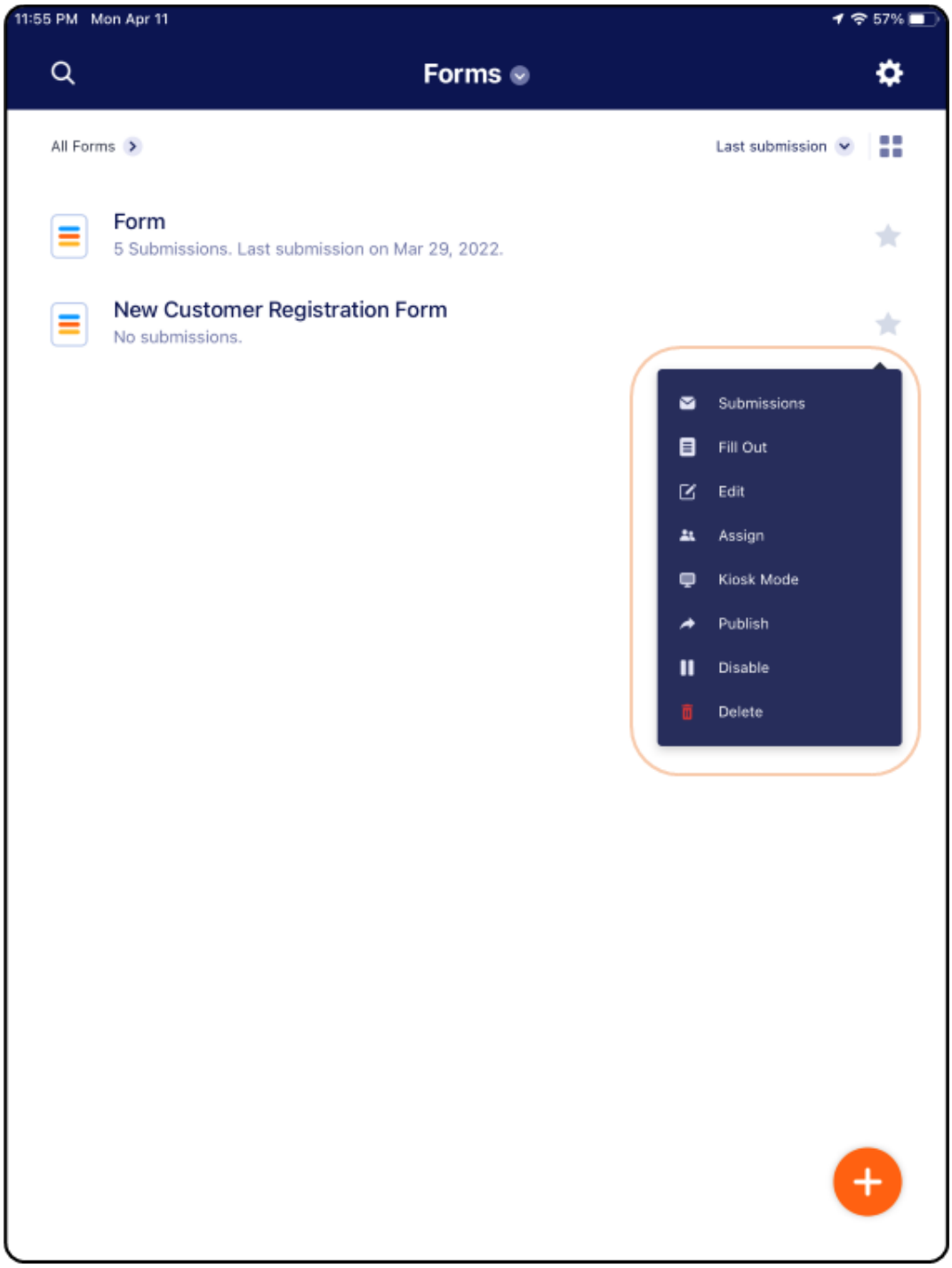
2. Profile and Settings - Select the **Gears Icon** to access your profile and app settings. Here you can control notifications, language, and offline forms. You will also find the terms and conditions and can sign out from this page. Sync Your Data, highlighted in yellow, is very important when filling forms offline. Once connected to the internet again, click this button to update and sync all your data so that you can access it on a desktop computer.



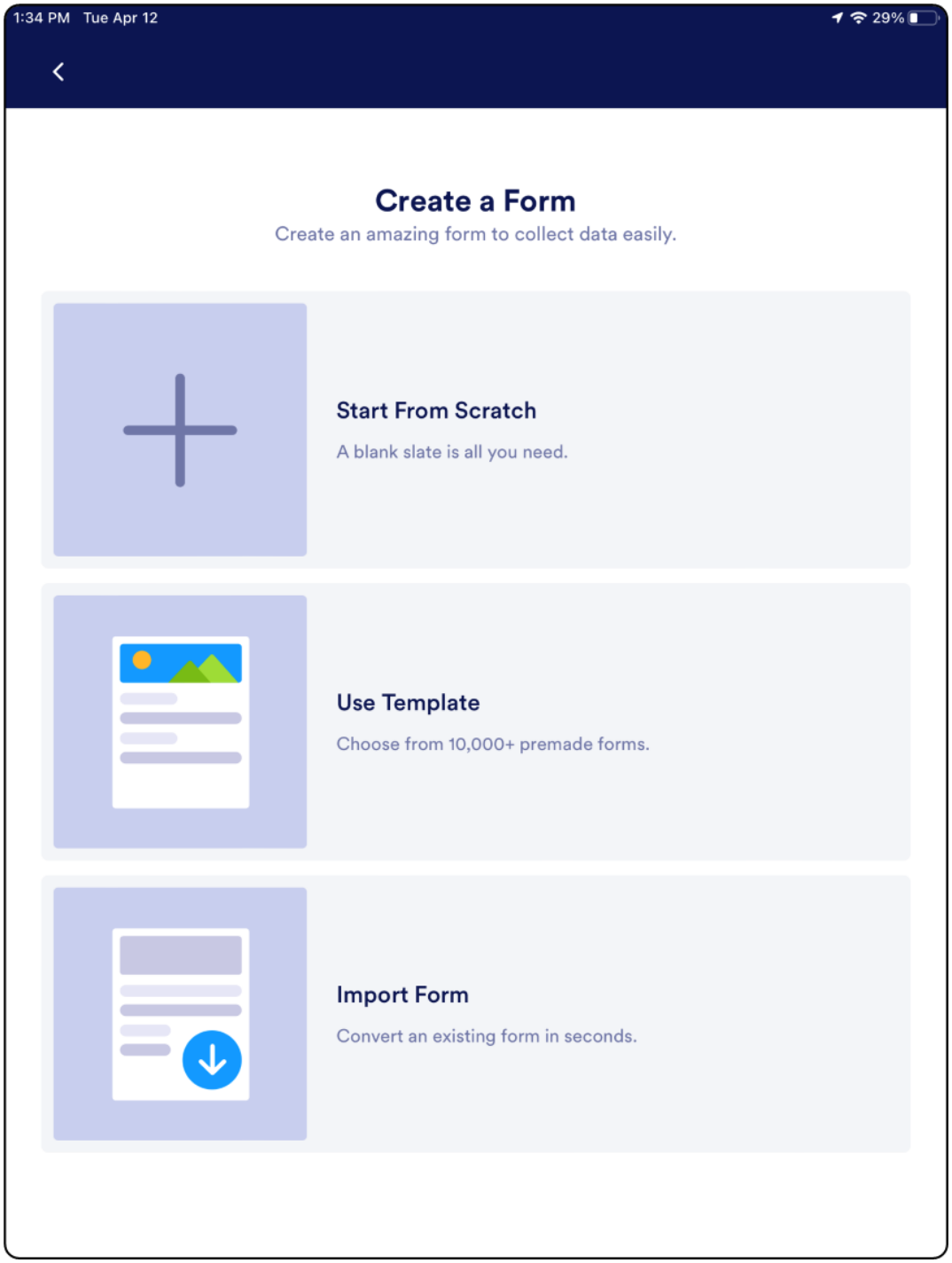
3. All Forms List - Select **All Forms** to see a list of all forms that you have created, starred, archived, and trashed. By default you will start with one folder called All Forms. You can make new folders to organize and sort the surveys that you create. Thus you will also see all the folders you have created and can navigate and sort your surveys with these folders.



4. Form Settings - Select **anywhere over the form name** to open a menu for that specific form. This menu allows you to see the submissions, fill out the form, edit, etc.



5. Create Form - Select the **Red plus Icon** to create a new form. This process is very similar to the web platform in section 3. You can also create a new survey by selecting form builder under forms or going to all forms list and selecting create new form. Once you see the menu for creating a form, follow the instructions in section 3.



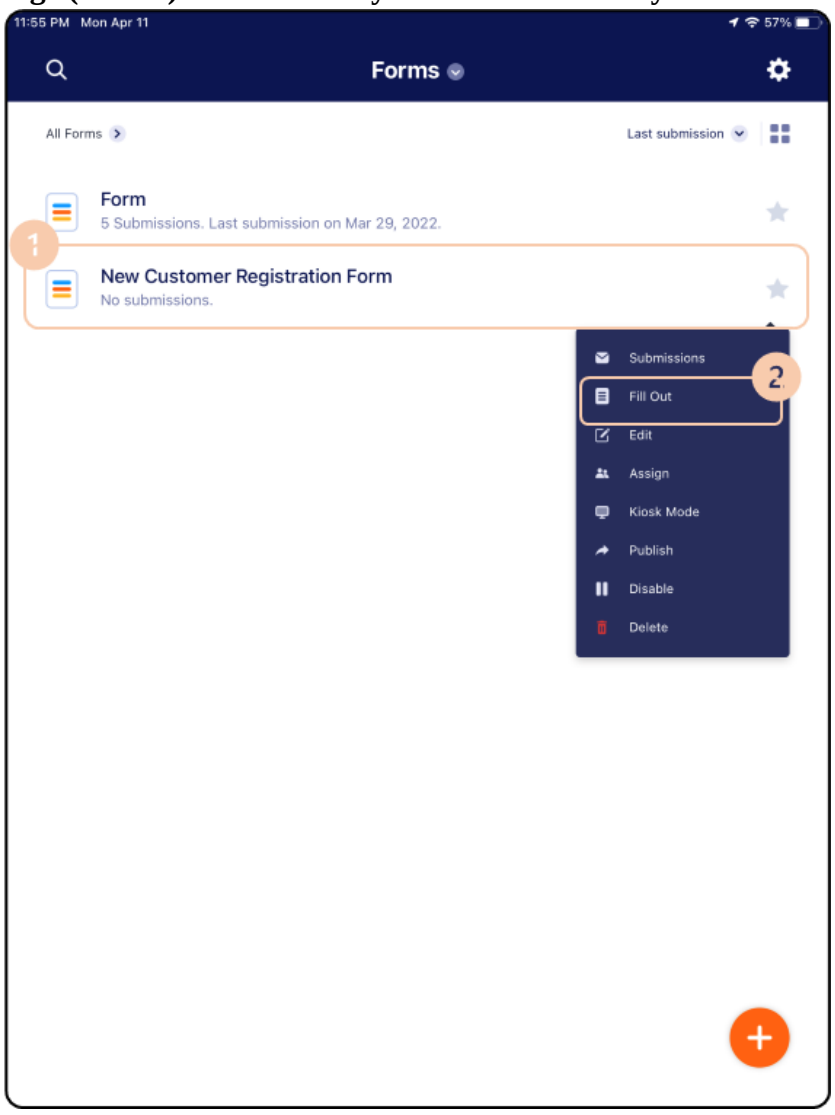
*If filling surveys offline, without internet, the data will only be saved locally on the device. You must connect the device to the internet, once available to sync and upload that data to your account and have access to it across all your devices.

6.2 Filling out surveys (Kiosk mode)

This is the main feature that will be utilized the most from the Jotform app. You must have a survey created before being able to fill it out. Once you create a survey it should appear on the homepage as shown in section 6.1.

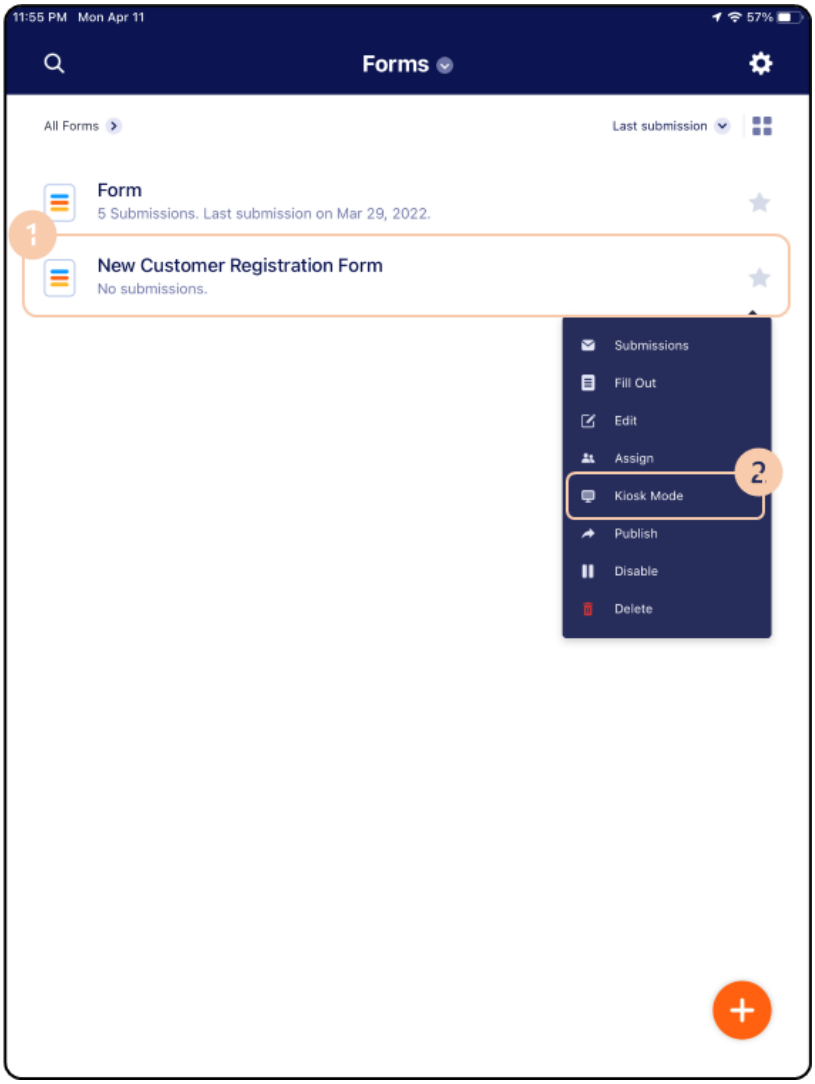
Fill Out, One Time Submission: only allows one submission for a survey per time

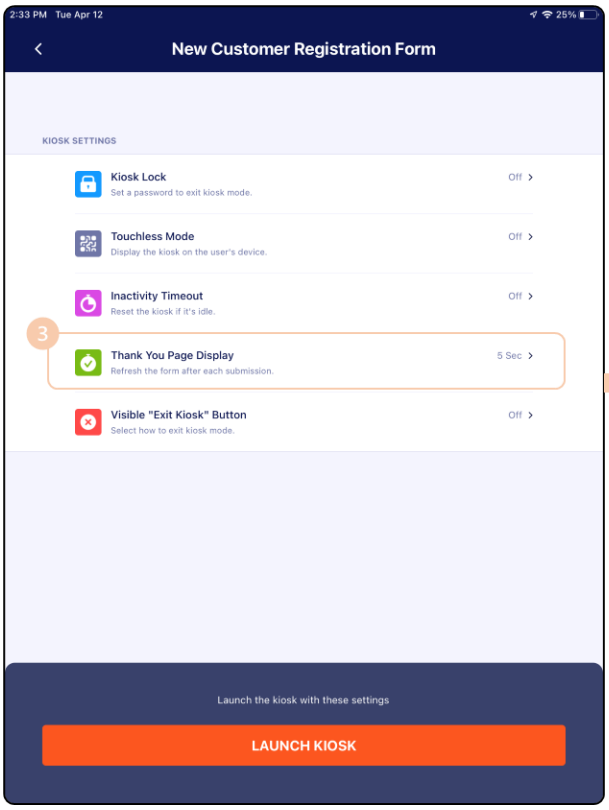
Go to **Home Page (Forms)** > 1. Select **Anywhere on the Survey name** > 2. Select **Fill Out**

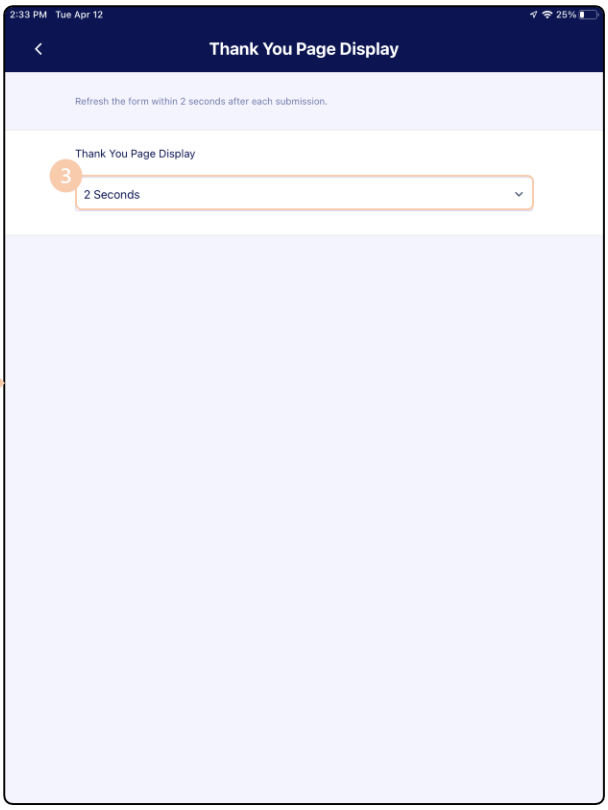


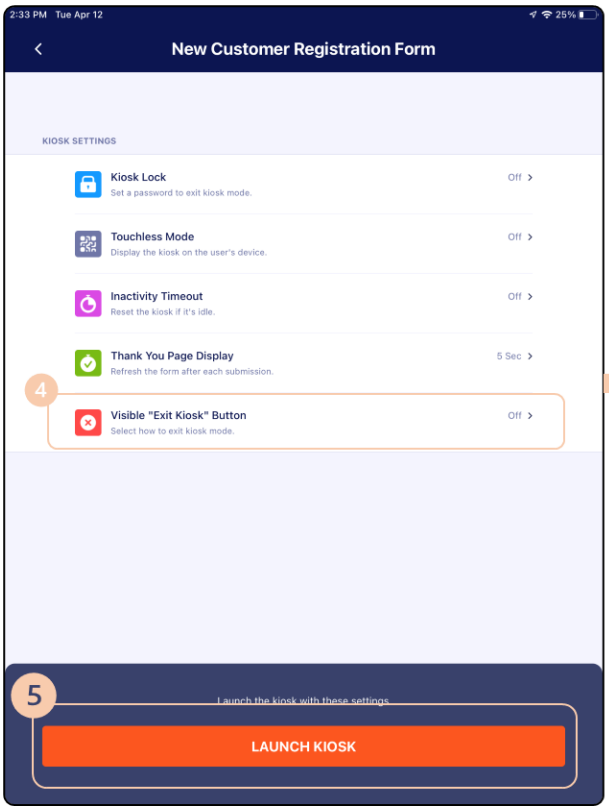
Kiosk Mode, multiple submissions: allows multiple submissions for a survey by refreshing automatically

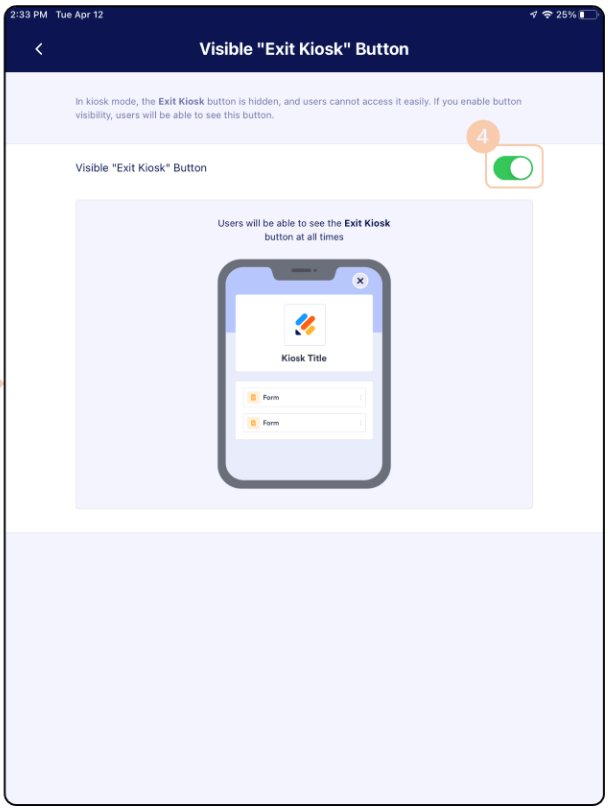
Go to **Home Page (Forms)** > 1. Select **Anywhere on the Survey name** > 2. Select **Kiosk Mode** > 3. Select **Thank You Page Display** and set for 2 Seconds > 4. Click the back arrow and Select **Visible "Exit Kiosk" Button** and toggle it on > 5. Select **Launch Kiosk**



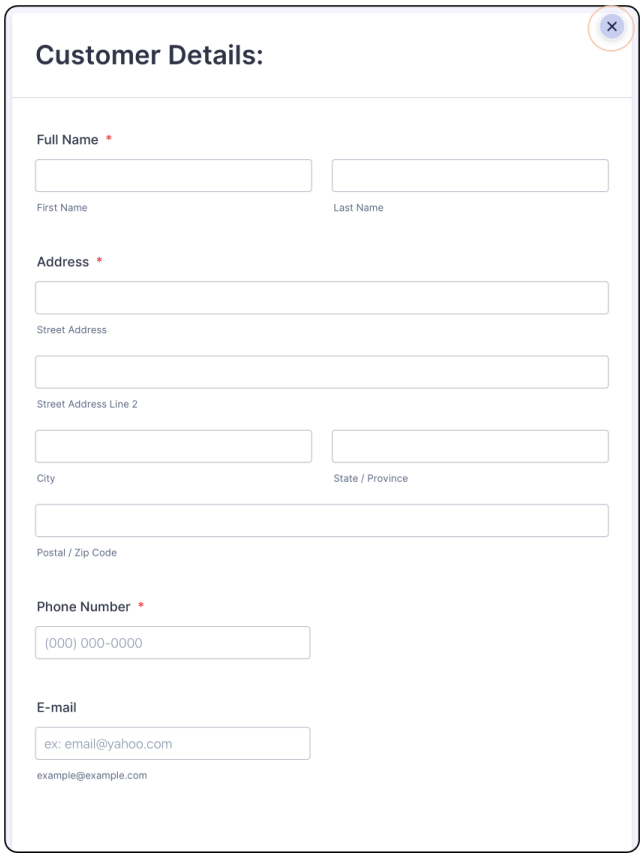

2:33 PM Tue Apr 12
25%
New Customer Registration Form
KIOSK SETTINGS
Kiosk Lock
Set a password to exit kiosk mode.
Off
Touchless Mode
Display the kiosk on the user's device.
Off
Inactivity Timeout
Reset the kiosk if it's idle.
Off
3
Thank You Page Display
Refresh the form after each submission.
5 Sec
Visible "Exit Kiosk" Button
Select how to exit kiosk mode.
Off
Launch the kiosk with these settings
LAUNCH KIOSK


2:33 PM Tue Apr 12
25%
Thank You Page Display
Refresh the form within 2 seconds after each submission.
Thank You Page Display
3
2 Seconds


2:33 PM Tue Apr 12
25%
New Customer Registration Form
KIOSK SETTINGS
Kiosk Lock
Set a password to exit kiosk mode.
Off
Touchless Mode
Display the kiosk on the user's device.
Off
Inactivity Timeout
Reset the kiosk if it's idle.
Off
Thank You Page Display
Refresh the form after each submission.
5 Sec
4
Visible "Exit Kiosk" Button
Select how to exit kiosk mode.
Off
5
Launch the kiosk with these settings
LAUNCH KIOSK


2:33 PM Tue Apr 12
25%
Visible "Exit Kiosk" Button
In kiosk mode, the Exit Kiosk button is hidden, and users cannot access it easily. If you enable button visibility, users will be able to see this button.
4
Visible "Exit Kiosk" Button
Users will be able to see the Exit Kiosk button at all times
Kiosk Title
Form
Form

You will now be able to fill out your survey and submit multiple times as it refreshes automatically. To exit kiosk mode, click **the x icon**



6.3 Viewing Submissions

After filling out a survey, you will be able to see the submissions for that survey. You can view submissions two ways:

Viewing all Submissions: This allows you to see all submissions for all surveys in a list view

Go to **Home Page (Forms)** > 1. Select **Forms** > 2. Select **Submissions**

Viewing Submissions for one Survey: This allows you to see only the submissions for the selected survey

Go to **Home Page (Forms)** > 1. Select **Anywhere on the Survey name** > 2. Select **Submissions**

You can select each individual submission to edit, delete, or share it.

7. Formatting Data in Excel Spreadsheet

To put the exported data into the format of the WCFB portal:

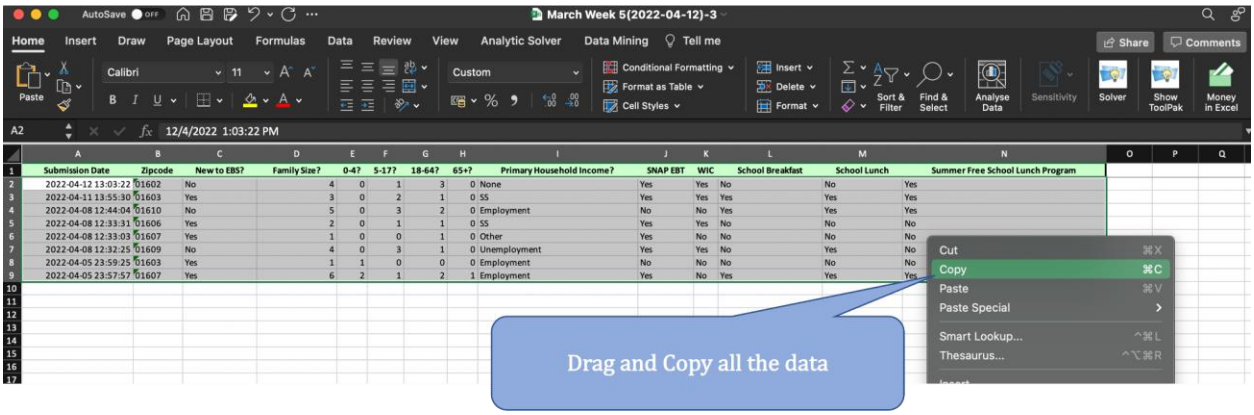
Important note: We recommend that you save an empty version of the template, and only duplicate the template when filling in data for a new month!

Have two files ready:

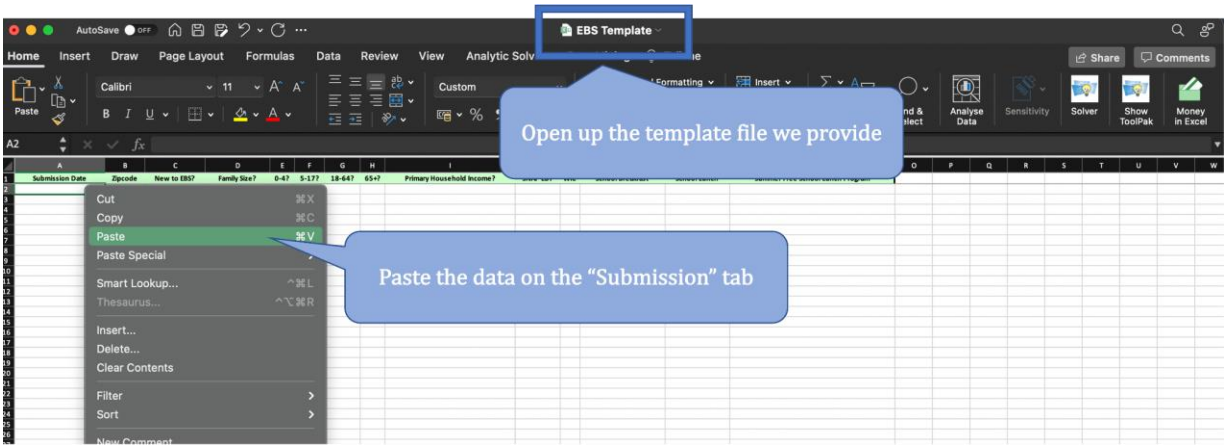
(1) Excel file exported from Jotform

(2) Template file that we provided, contains two tab: "Submission" and "Report"

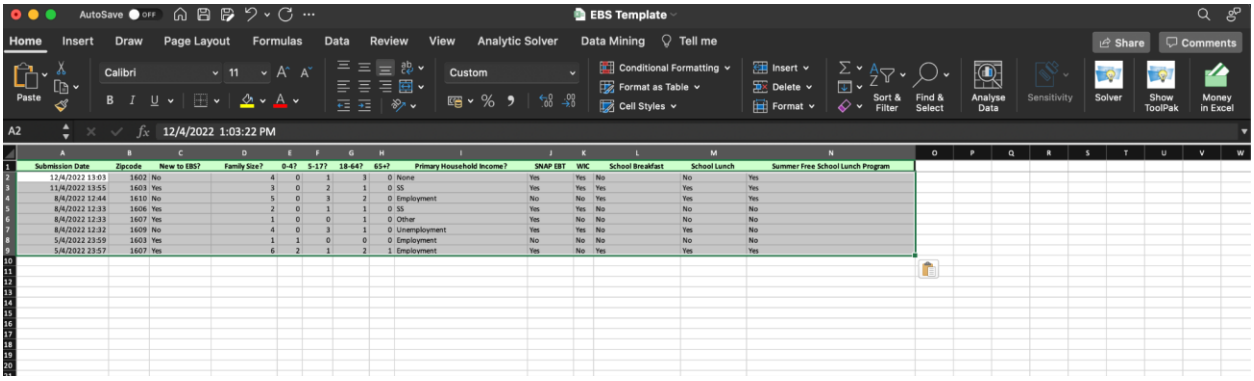
1. Open the **downloaded excel file**, drag and copy all the data



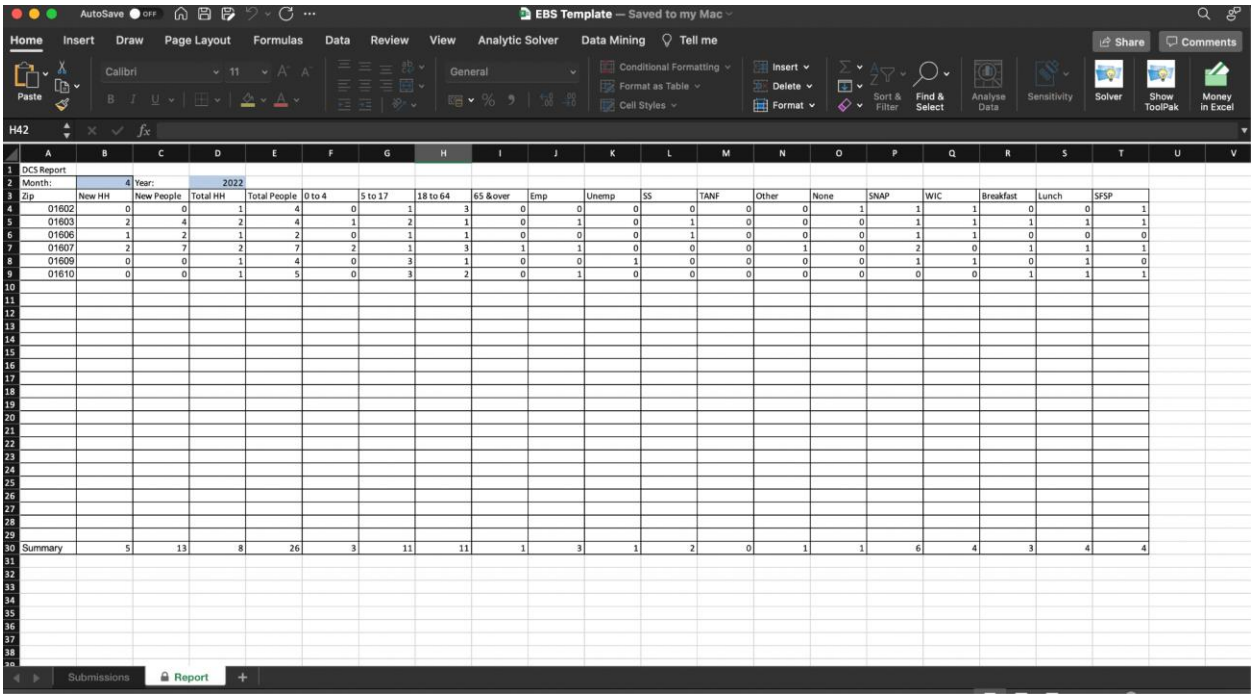
2. Open the **template file** we provided, paste all the data onto the "Submission" tab



3. The **template file** should now look like this, with all the data from the survey



4. Navigate to the "Report" tab on the **template file**, you should now see all the data formatted!



You can now fill out the Worcester County Food Bank according to this table.