Discovering Potential Technological Innovations to Improve Food Access

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I. Executive Summary

In this report, we will discuss the lack of accessible healthy food options in low-income neighborhoods and the challenges faced by both residents of these neighborhoods and the organizations dedicated to addressing issues of food access. To better understand this problem, we conducted field observations of residents in low-income, low-access areas, held interviews with leaders of organizations focused on food access in low-income communities, and released a digital survey to examine the digital operations and data collection capabilities of these organizations. The goal of this research was to use the findings from these three methods to propose opportunities for human-centered design work and technological solutions to improve the operations of organizations working to improve these communities.

We began our investigation by completing five observations in four varied environments. Three of these observations took place in neighborhoods in Chicago designated as low-access by the USDA Food Access Research Atlas. These particular observations were conducted at a McDonald's and an Aldi grocery store. We also observed a meeting with e.a.t. Inc., a Chicago-based nonprofit focused on the intersection of education, agriculture and technology. Our fifth observation took place at a Panera Bread in St. Augustine, Florida, which provided us with an analogous perspective on people's food choices in a different community with better access to healthy food options. The main factors we observed impacting peoples' choices were 1) Price; 2) Quality; 3) Options (or lack of options) available; 4) Influence of family and friends; and 5) Access to information about healthy food options.

After conducting our field observations, we decided to narrow our focus to the efforts of organizations in low-access, low-income communities, with the goal of better understanding the challenges that already-established organizations focusing on this problem were facing. We interviewed six professionals from five different organizations. Of these organizations, four were smaller in size and scope, and their efforts were primarily focused on improving their immediate local communities. In contrast, one of the organizations we interviewed was larger, with a more national, policy-orientated scope. Through these interviews, we found that organizations in this realm focus their work on addressing the following four themes: 1) Improving access to healthy food, specifically in regard to price and location; 2) Bettering education, particularly in changing negative perceptions of healthy food; 3) Advancing data collection capabilities; and 4) Strengthening relationships within the communities they aim to serve.

We further explored some of the themes from our interview findings by creating an online survey, sent to over 100 organizations focused on food access across the country. Through our survey, we learned more about nonprofits' technological capabilities and data collection abilities, and investigated whether organizations with less

ability to collect and analyze data had less indicators of program success. Some of the main findings from our survey data were that 1) Organizations are actively collecting data, although their systems for organizing or analyzing this data are not particularly robust; 2) Organizations value and maintain an online presence; and 3) Organizations do have some tech infrastructure, but generally lack staff with expert computer proficiency skills. Additionally, we discovered that nonprofits view discounts on healthy food, community support, and taste as major motivators for supporting changes in eating habits in these communities.

Our survey results were limited by a small population pool of only 28 respondents. This led to statistically insignificant findings regarding our two hypotheses. We were not able to suggest a correlation between operating budget and types of data collected by organizations. We also were not able to suggest a correlation between satisfaction with data collection and data collection abilities. We were limited by recruiting resources and time.

Based on the findings from our observations, interviews, and surveys, we found that, perhaps unsurprisingly, improving access to healthy foods in low-income areas remains the biggest challenge for residents and nonprofits alike. Changing negative perceptions through food education initiatives and building support within affected communities were also prevalent findings across all research methods. Finally, when it comes to improving the operations of nonprofits dedicated to improving healthy food access, we found that more sophisticated data collection capabilities could have a significant positive impact. In terms of potential design implications, this area is fraught with opportunity for further development, but significant additional research on nonprofits' current operations would have to precede any such solutions. Further research opportunities on healthy food access should also involve interviewing and surveying not just nonprofits, but the "end" users, or residents of low-access areas. Future work on this subject may also benefit from narrowing the focus of this project, to obtain more directly relevant findings.

II. Introduction

Across low-income areas in the United States, there is inequitable access to healthy food options. For those living in these communities, this lack of access leads to higher rates of obesity and diabetes as well as other health issues, especially when compared to higher-income neighborhoods that have access to fresh produce and more nutritious products (Treuhaft & Karpyn, 2010). As obesity rates have tripled in the past decades, policymakers and local communities can no longer ignore this issue (Flournoy, 2011).

Access to healthy food options is defined in several different ways. Distance is frequently cited as an issue, as many major supermarkets fled the inner city to the suburbs in the 50s and 60s and left gaps in food options (Treuhaft & Karpyn, 2010). Growing costs of healthier foods, poor food literacy, and access to information further the divide (Walker

et al., 2011). Food may appear as a healthy option, but produce may be of poor quality or products sapped of nutritional value. People may not know how to prepare healthy meals or may even perceive healthy options as distasteful. Local residents of such areas may have limited access to sources that could potentially provide them with useful information (e.g., Internet).

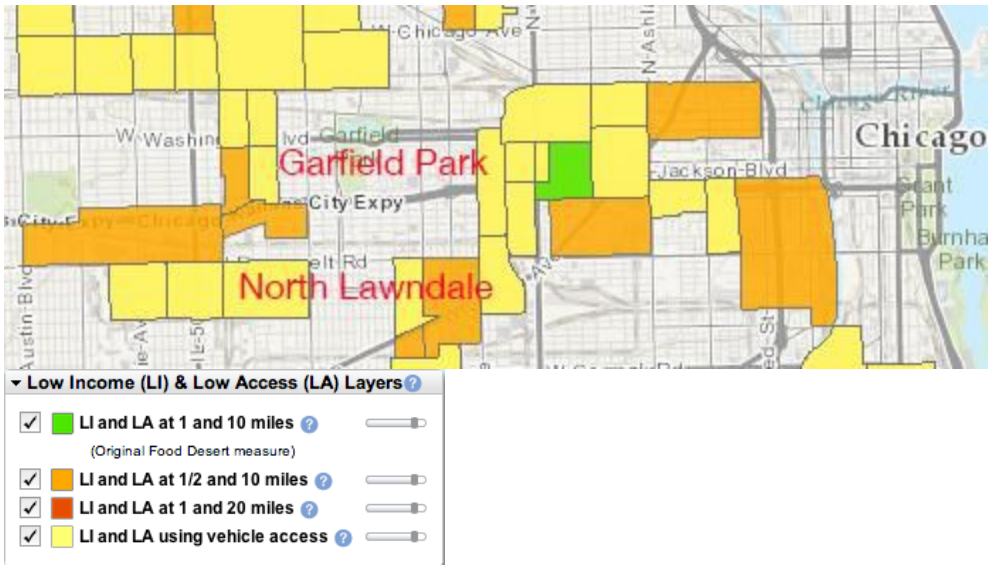
Nonprofits and government agencies in Chicago are focused on issues of food access yet have a fractured impact. The city has encouraged convenience stores like Walgreens to carry fresh produce options. Local farmers markets have opened on the south side of Chicago. Nonprofit groups like Growing Home encourages urban farming; Fresh Moves transformed former public school buses into fresh produce stalls; e.a.t. (education, agriculture, technology) is working to turn magazine vendor stands into produce stalls. Many of these nonprofits include education as a key component of their programming.

Researchers have experimented with the role of HCI in healthy food access. In a case study of urban farming, researchers found that technology should be designed to support education, face-to-face communication, collectives, and inclusion rather than raise an individual's efficiency to farm (Heitlinger & Bryan-Kinns, 2013). In another study of mapping healthy food access, researchers designed a participatory sensing system. Individuals would track their food purchases to create a larger map of information of what food is available and where (Yu & Nahapetian, 2013). However, this has not been deployed on any scale.

III. Methods

Observation

To better understand the food options available in low-access communities and the choices residents made based on this availability, our group conducted observations in various locations where people purchased food, including a McDonald's in North Lawndale, an Aldi grocery store in West Garfield Park, and a Panera Bread in St. Augustine, Florida. North Lawndale and West Garfield Park are both low-access, low-income neighborhoods in Chicago, as designated by the USDA Food Access Atlas, and St. Augustine is a middle-class neighborhood in Northeast Florida. To gain a better understanding of how established non-profit organizations are working in this problem space, we also observed a meeting with e.a.t., a Chicago-based nonprofit whose mission is to provide access to healthy food through innovative solutions.



A map of the Chicago neighborhoods where the McDonald's and an Aldi we observed were located. North Lawndale and Garfield Park are situated within designated "Low Access" and "Low Income" Areas.

Recruitment

To recruit participants, we traveled to the aforementioned locations in Chicago and Florida and emailed nonprofit groups. At the sites where food was purchased, we approached individuals who appeared open and willing to have someone follow them around the store. We obtained verbal consent for observation. When we observed the nonprofit e.a.t, we obtained written consent from Ken Waagner, Executive Director (see Appendix).

Participants and Procedure

We observed a total of 16 participants at four different locations.

At the Aldi in West Garfield Park, two members of our group observed three individuals and one mother and daughter pair on their grocery shopping trips on a Saturday morning. The three individuals shopping alone were women; two were shopping for families and one for her client and for herself. Two of the three individuals were African-American, and one appeared to be Hispanic. The mother and daughter shopping together were African-American. One individual appeared to be in her late 30s or early 40s, and the other women appeared to be in her 20s and 30s. The girl with her mother appeared to be 10-13 years old. We noted what individuals looked at when they purchased food, how they navigated the grocery store, and what types of interactions they had with other family members while making food-purchasing decisions. We also asked brief follow-up questions to try and understand the reasons behind some of their purchasing decisions, and why they had chosen to shop at Aldi.

One of our group members observed individuals at a McDonalds in the North Lawndale neighborhood of Chicago during a weekday noon lunch hour. Two individuals were

observed as they ordered food from the inside checkout counter. The first individual was an African-American male who appeared to be in his mid- to late- 70s. He was at the establishment alone, getting lunch. The second individual observed was an African-American woman who appeared to be in her mid- to late- 20s. She was with two young boys (her sons), also African-American, who both appeared to be around 5-7 years old. They were also there to get lunch. We closely noted what the individuals ordered and let them speak freely if they chose to. We documented what the establishment looked like, both externally and inside, taking note of cleanliness, landscape, etc. Upon completion of the observation, we discussed the intent of the observation with those observed and recorded the participants' feedback. To gain a better understanding of the neighborhood itself, we noted what the surrounding area looked like, including infrastructure, vacant land, cleanliness (litter), pedestrian activity, landscape, and building appearance.

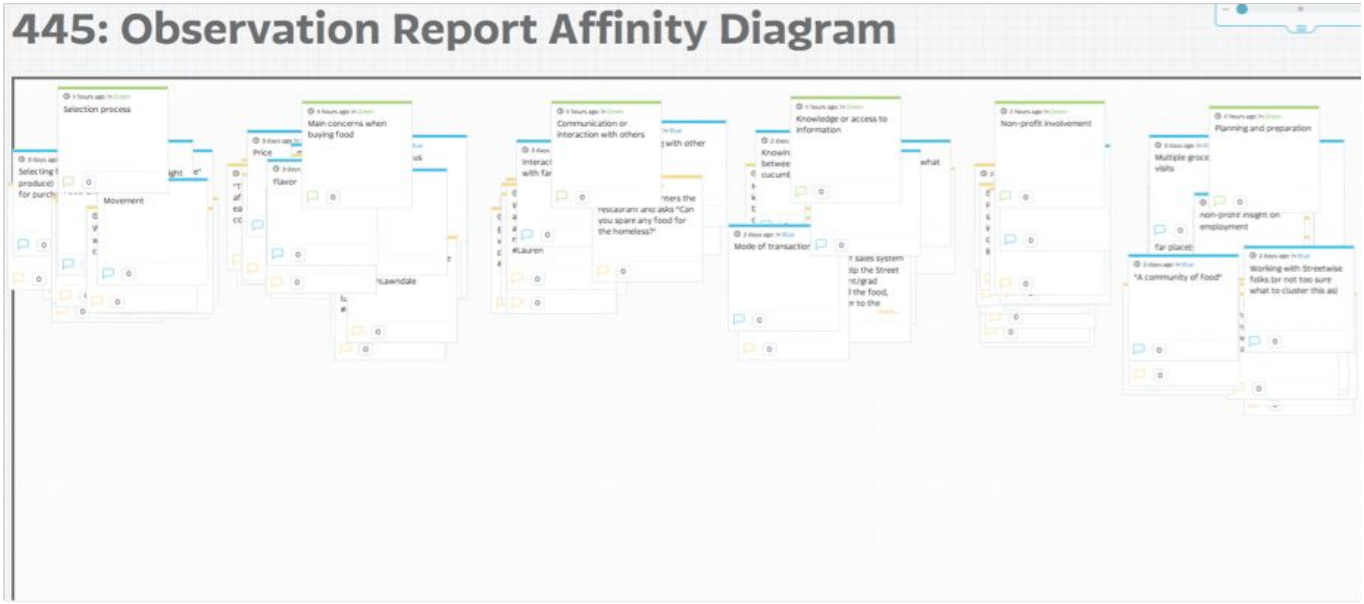
Two members observed an e.a.t. meeting for the organization's current project, e.a.t. Food Spots. E.a.t. Food Spots is a pilot program that repurposes the city's newspaper stands as fresh, organic produce stalls. StreetWise staff will be trained as vendors of these stands. The meeting included two executives from StreetWise and the founder of Irv and Shelly's Fresh Picks. Another employee of e.a.t. was also present, but had very little interaction with the meeting. The meeting attendees were Caucasian men, in their 30-60s.

The meeting was informal, and the participants spoke to us directly, as there was not a set agenda for the meeting. E.a.t. was coordinating and designing the physical spaces, StreetWise was coordinating the human resources, and Fresh Picks was developing the inventory. We focused on the information exchanged in the meeting, including details of the project, the history of the project, and the current challenges each party was working through. We also noted the interactions between participants, but these were limited. We split note-taking responsibilities equally and met afterwards to debrief. A thorough compilation of notes was completed within a day of the meeting.

Finally, one of us went to a Panera Bread in St. Augustine, Florida, a middle-income neighborhood, and observed 5 individuals enter the restaurant. The first two participants were a couple, one male and one female, both 25 years old. We observed the verbal and nonverbal communication involved in their decision making process. The next participant was a 65 year-old woman who engaged the ordering process quickly. She, in particular, referenced the prices. Next a homeless man about 45 years old was observed. We took notes on his interaction with the cashier/manager. The fifth and final participant in our observation was a 21 year-old female college student. We recorded comments she made to the cashier in regards to her monetary status and how it affected her ordering choices.

Analysis

We used contextual inquiry as the framework for four of the five observations and the AEIOU framework to complete our observations at the Panera Bread. We analyzed notes from our observations using an affinity diagram through stormboard.com. After all the basic ideas or lower-level notes were posted, we sorted our codes into higher categories, or themes.



Interview

After our observations, our team decided to concentrate exclusively on organizations that address issues involving food accessibility and literacy. This was in part because we did not have direct access to low-income residents of low-access neighborhoods. Thus, we created interview questions to learn more about organizations' efforts to solve this problem. These questions focused on the organization's strategies, the modes of communication used to connect with their target audiences, and the ways these organizations utilize technology to advance their goals.

Recruitment

We identified and interviewed six professionals from five different organizations with careers dedicated to addressing the issues of food accessibility and literacy in low-access neighborhoods in Chicago and the United States.

We recruited participants by reaching out to our networks, family and friends for possible connections to leaders in this sector. We also thoroughly researched different organizations in the Chicago area that are dedicated to the issues of food accessibility and literacy and emailed or called to see if anyone from the organization would be willing to be interviewed.

The interviewees were not the same people we interacted with during our observations, as most of those individuals were low-income residents who we lacked access to. We

also excluded professionals who were solely policymakers or who were in academia. We looked for individuals who primarily worked directly with low-income residents and connected them to healthy food.

Each researcher obtained a signed consent form prior to conducting the interview (see Appendix), with the exception of two interviews that needed to be conducted by phone. In these instances, the researcher obtained verbal consent before the interview began.

Participants

Participant identifier	Gender	Ethnicity	Age	Years of experience addressing healthy food access	Organization type	Interview (individual or group)
P1	Female	Asian	30-40	about 5 years	Grocery corner store	individual
P2	Male	Mixed	35-45	20+ years	National policy	individual
P3	Male	Caucasian	40-50	10-15 years	Cooking-based consultancy	individual
P4	Female	Caucasian	30-40	about 10 years	Farmers Market	individual
P5	Female	Asian	30-40	about 5 years	Community garden	group
P6	Male	African American	60s	20+ years	Community Garden	group

Procedure

Two interviews were conducted by phone, one through video conferencing, and two were in-person. Four of the five interviews were audio-recorded and transcribed. We transcribed three of the four audio recordings using transcribe.wreally.com and one with iTunes for playback and Microsoft Word. For one of the interviews conducted by phone, the researcher took notes on her laptop computer during the interview. She later compiled these notes into a format consistent with the other researchers' notes in order to facilitate analysis.

Analysis

For the first round of coding, we used inductive qualitative analysis and applied In Vivo and descriptive coding methods to stay as close to the interviewees' data as possible. We used over 100 In Vivo codes. Next, we grouped these codes into 16 different categories that emerged from the data. We then grouped these into larger themes, and selected the four themes most frequently mentioned by our interviewees: accessibility (in

terms of price and location), education, community building and data collection. The below chart illustrates a sample of how we grouped our codes.

Themes	Categories (Sample)	Codes (Sample)
Price & Location	Access	"most customers do not have car" "cheaper and easier to buy much unhealthier food" "no healthy quality produce in underserved communities" "time and energy required" "nowhere to buy food" "corner stores, year round, convenience" "markets can be expensive" "people don't have good transportation"
Price & Location	Offsetting Cost	"double value coupon program-no hitch" "accept link at the market" "fruit and vegetable prescription program" "food stamps" "produce has a negative profit"
Education	Changing Perception	"a lot of it is tasting" "showing the realities of processed food is a motivation for target population" "fear of change from the conventional" "the fastest way to get people to move is through a flood of insights"
Education	Education Challenges	"education process takes a really long time" "literacy problems" "expertise required for urban agriculture" "training doctors to understand eating healthfully"
Data Collection	Tech challenges and opportunities	"app based system for gathering data" "technology is often turned off" "very little designed from customer pov" "customers use phones but don't know how to use email" "fun and exciting technology but missing elements to actually make it work"
Data Collection	Data Collection	"data gathering essential" "manual data collection" "tracking sales" "collect public data for research"
Community Building	Community Building	"create all sorts of relationships in neighborhoods" "hands-on engagement strategy" "whole family getting healthier together" "community of healthy eaters" "building relationships with farmers as equals"

Survey

We created a 21-question online survey to explore the themes uncovered during our interviews as well as test two hypotheses around data collection and technology**.** These hypotheses were based on our interview finding that technology can play a salient role in data collection. These hypotheses were:

1. Organizations collecting fewer types of data have smaller operating budgets (<$100,00);

2. Organizations collecting more than one type of data are more satisfied with their data collection abilities.

Recruitment

We created a email database of approximately 100 organizations located in urban areas whose mission focused on food accessibility and literacy. We included those organizations interviewed. We were somewhat limited in our ability to reach out to these organizations because we hadn't established relationships with people in their organizations. Also, the surveys were administered during a short week after a holiday, which may have affected our response rate.

Procedure

A team member sent the survey to this email database using Google Form from his Gmail account. We decided to use Google Form so that the survey would show up directly in the body of the email and encourage a higher response rate. The survey consisted of 21 questions, which were grouped categorically using multiple choice, short answer, and Likert scale formats. The survey also included our team member's contact information. Once a participant marked their answer, the response was saved and recorded in the body of the email through Google's analytics. The responses were sent to our team once the participant hit "submit". Responses from the survey were then automatically recorded in a Google Spreadsheet.

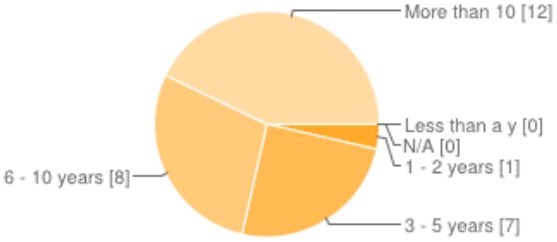
Participants

Participants who responded to the survey were only able to complete the survey once.

28 respondents completed our survey. The respondents were employees at the organizations we reached out to.

The organizations surveyed varied in "age". 16 of the respondents worked for organizations less than ten years old, while 12 respondents worked for organizations that had been established for 10 years or more.

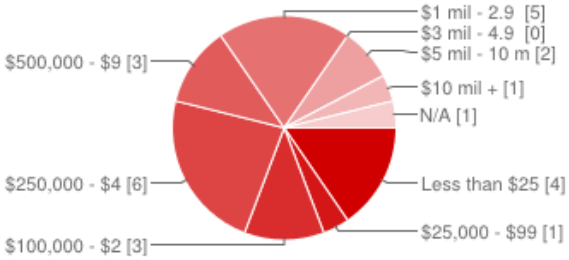
How old is your organization



Less than a year	0	0%
1 - 2 years	1	4%
3 - 5 years	7	25%
6 - 10 years	8	29%
More than 10	12	43%
N/A	0	0%

The breakdown of the yearly operating budgets of the organizations that responded to our survey varied from less than $25,000 to more than $10 million.

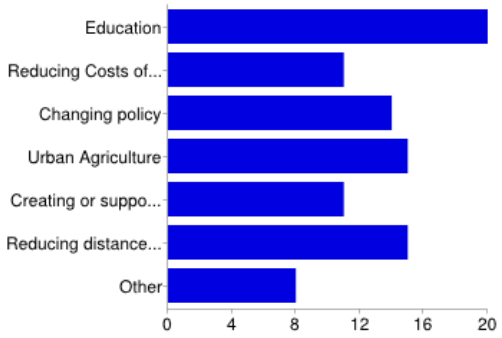
What is the yearly operating budget of your organization?



Less than $25,000	4	15%
$25,000 - $99,000	1	4%
$100,000 - $249,000	3	12%
$250,000 - $499,000	6	23%
$500,000 - $999,000	3	12%
$1 mil - 2.9 mil	5	19%
$3 mil - 4.9 mil	0	0%
$5 mil - 10 mil	2	8%
$10 mil +	1	4%
N/A	1	4%

The organizations who responded to us had varied approaches to helping people access healthy food, with some organizations focusing on more than one angle of the problem.

How does your organization help people access healthier food?



Education	20	21%
Reducing Costs of Food	11	12%
Changing policy	14	15%
Urban Agriculture	15	16%
Creating or supporting new locations	11	12%
Reducing distance to healthy food	15	16%
Other	8	9%

Analysis

Through our surveys, we ended up with data from a pool of valuable, diverse respondents. After a Google Hangout brainstorming session, our team analyzed the graphs and charts associated with our survey results (created by Google Forms), and talked through our interpretations of the data. We also exported the Google Spreadsheet to compare and sort the data in Excel, to see if this process generated any new insights. Finally, we broke our qualitative data from specific questions down into appropriate numerical "buckets", which enabled us to run t-tests on specific variables to test our hypotheses. More on this process is discussed in the survey findings section below.

IV. Results/Findings

Observation Results and Findings

Based on our observations, we found that many factors immediately impact the choices made by residents of low-income, low-access neighborhoods, including the price of items, the quality of the selection, the options available (or lack thereof), the needs and desires of family members, and knowledge of what constitutes a "healthy" choice. We also took note of how the nonprofit we observed pursues their efforts, particularly in regard to increasing food literacy.

1) Price

Price is a major consideration in food selection, particularly at Aldi. The shoppers we observed carefully noted the prices of items before adding to their carts, and on occasion even put something back on the shelf after selecting it once they noticed the price and deemed the item "too expensive."

We saw that many of the shoppers were armed with lists of necessary items and did not browse extensively or seemed to make any impulsive purchases beyond the scope of the items listed. However, whether this was to avoid going over budget or was just to assist in planning was not immediately obvious.

Price also seemed to be a factor for several participants in the Panera Bread observation. For example, the couple who entered the restaurant appeared to enter with the intention of ordering two meals. However, after the couple conversed, it appeared as if they agreed they weren't very hungry and could be satisfied with splitting a meal. Whether or not hunger was the true trigger here is debatable; it is very plausible that the social convention of not "over-ordering" when you know one person is paying for the entire meal may have been at play.

The final participant in the Panera Bread also made a food choice that was dictated by price. After walking into the restaurant and asking if there were any specials going on,

the female looked over the menu for 20-30 seconds and shook her head. She ordered a blueberry scone saying, “That’s all I can afford, this is why I never eat out.”

2) Quality

We found that even when limited by budgetary constraints, the quality of the food purchased was still a significant concern for residents. Individuals shopping for food at Aldi told us that they typically went to 2-3 other grocery stores in order to get everything they needed. As the mother shopping with her daughter told us, Aldi was good for “odds and ends” but was otherwise not where she did the bulk of her grocery shopping. This woman, along with a few of the other shoppers we spoke with, voiced concerns with the quality of the food available at Aldi. Items that felt “cheap” were undesirable.

The mother shopping with her daughter also looked at the nutrition facts for almost every item she picked off of the shelf. When asked what she was looking for, she said that she is very careful about sodium levels, and will not purchase food to bring into her home that has high sodium content.

Our participants at Panera Bread may have made their quality decision simply by choosing Panera. The student who ordered the scone may have decided that she would be willing to sacrifice quantity for the benefit of Panera quality. The consumers who chose Panera Bread had an idea of what quality or healthy meant to them, and compromised on other factors for the quality Panera could provide.

3) Options available

Overall, the individuals observed at the McDonald’s chose the establishment based on availability. We were told by one of the men we observed there that “there isn’t much to pick from in the neighborhood.” He continued to explain that if there were more options (restaurants), then he would probably go elsewhere, because the service at this particular McDonald’s was not good. He did not voice concerns over the actual food at McDonald’s, however.

Another individual observed at McDonald’s voiced the same discontentment over the lack of options in the area. However, she also expressed to us that she did not see McDonald’s as a place where people order healthy food, even when such options, such as salads and wraps, are available.

Thus, when making decisions at fast food restaurants, people did not seem as concerned with the nutritional value or the quality of the food they were consuming. While lamenting the lack of other options in the area, people did not make an effort to choose healthy options, even when available. This may have been evidence of a lack of food literacy.

4) Needs and desires of family members / friends

Family members heavily influenced those we observed or other loved ones when making choices on what to buy, in both the grocery store setting and the restaurants.

Many of the people we observed at the grocery store were purchasing food for people other than themselves. We saw shoppers on the phone with family members in order to make sure that they were buying everything needed for the household. Also, the mother and daughter pair were very careful about nutritional information, and the mother expressed to us that it was because she tried to make healthy choices for her daughter's benefit.

At Panera Bread, people also influenced each other during the food selection process. When the couple entered the restaurant, they seemingly had their own agendas. However, after some brief communication, they ended up making a food choice that acted as a middle ground between the desires of each member.

For example, the male in the relationship made some non-verbal cues, such as rubbing his stomach, that would indicate a higher level of hunger. However, in the end, they ended up splitting a meal, as per the suggestion of the female. It seems as if the social norm of satisfying / agreeing with your mate was a more influential factor than personal desire in this situation.

5) Non-profit approach to availability of healthy options

As for non-profit involvement in attempting to provide healthier options to low-access areas, we found that e.a.t. recognizes the challenges people in these neighborhoods face in accessing healthy food, and their approach involves combining established organizations to create a new retail experience for improving food access.

"Food Spots" utilize structures previously used as sidewalk newsstands, provided by the City of Chicago. Food Spots will sell items from Irv and Shelly's Fresh Picks, a network of local farmers and producers. Graduates from StreetWise's job skills training program will staff the Food Spots, enabling a "hard to employ" population.

The initial Food Spots will not be in areas lacking access to healthy options; rather, they will be located in Chicago's central business district. e.a.t. hopes to use these as a sort of "playground" to grow a sustainable infrastructure. Their goal is to recreate these small sidewalk retail spaces in inopportune neighborhoods once the idea has been further developed. However, they do not believe Food Spots will be successful if they initially launched in an area lacking in grocery stores.

6) Food literacy, or knowledge of what constitutes a healthy choice

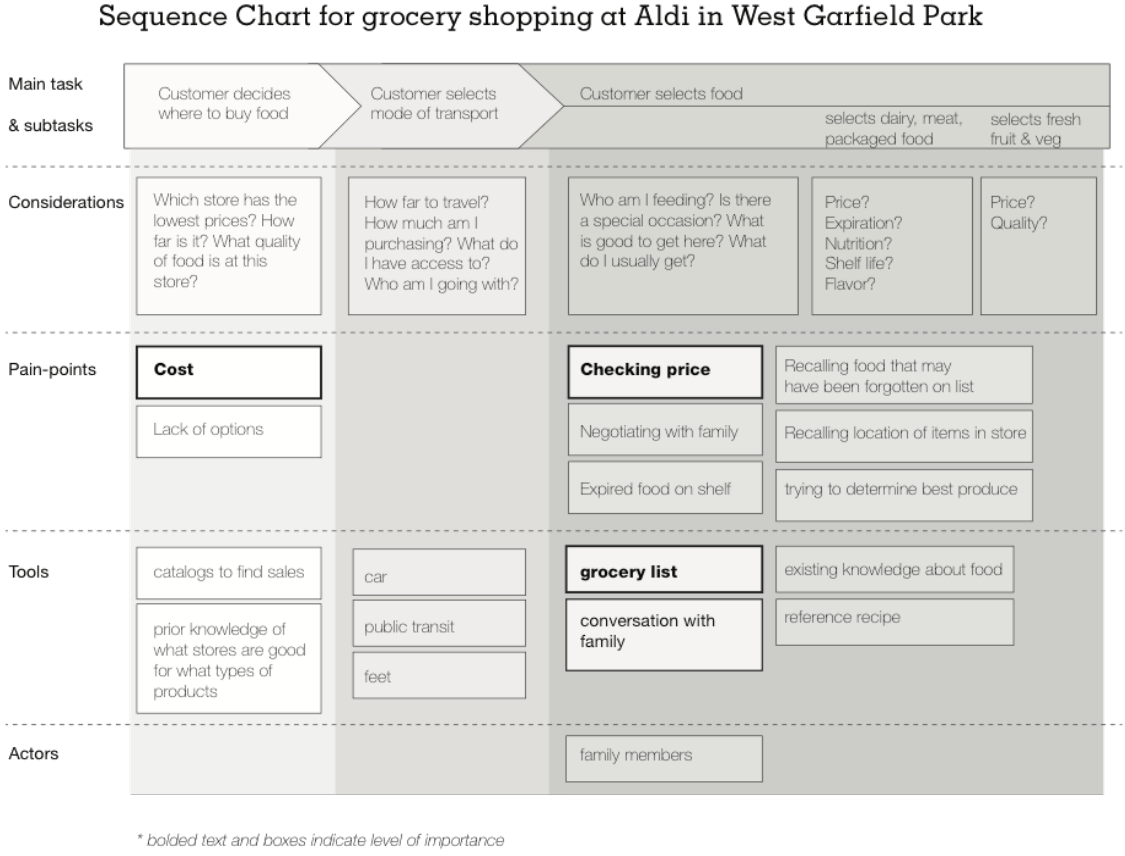
e.a.t. acknowledges the challenge their program Food Spots faces in providing food literacy to those who have poor food access. The leaders of the organization feel that providing people with access to information enables them in accessing better food, and therefore a better life.

There are two ways in which e.a.t. hopes to improve food literacy with Food Spots. Each vendor (StreetWise staff) would be trained to talk in detail with customers about the inventory of fresh produce. These vendors would also have access to a smartphone, and thus access to the Internet. They would visit Fresh Picks' packing warehouse, and Irv would teach them what organic produce was, as he had done with food packers in the past. As a byproduct, vendors would become healthy food ambassadors in their communities.

e.a.t.'s secondary effort to improve food literacy is to utilize the customer-facing walls of the Food Spots. Customers will interact with poster-sized touch screens that were formerly the newsstands' exterior walls. e.a.t. has not finalized the specific content of the touch screens, but the screens could provide further information about healthy food choices, how to prepare items, and other areas of food access.

Sequence Chart

Below is a sequence chart for customers shopping at Aldi in West Garfield Park, based on information found in our observations:



** bolded text and boxes indicate level of importance*

Interview Results and Findings

Based on our interviews, we found that organizations that focused on healthy food access identified multiple approaches to achieving their respective goals in

relation to these problem areas. Improving accessibility to healthy food options and educating residents of low-access neighborhoods on what constitutes healthy food choices were two main themes uncovered during our conversations. The desire to increase their organizations' data collecting capabilities and strengthen community-building efforts also emerged as important themes.

1) Accessibility (Location and Price)
Every organization interviewed mentioned food access as a key issue, primarily discussing access in terms of price and location.

Five of the six interviewees mentioned that some residents simply don't have the physical means to access good, healthy food in their area. When interviewing P1, she mentioned that "Most of our customers do not have access to a car." Our interview with P2 yielded a similar comment: "People are busy. And they often don't have good transportation." The reality is that many communities have very few (or sometimes zero) healthy food options in their bounds. Interviewee P6 mentioned this of her own community: "This place here [The Green Tomato] is probably the healthiest place to buy food", she told us, but places that offered less healthy food, like Aldi and Save a Lot, were the typical go-to stores in these low-access neighborhoods.

If the physical proximity to healthy food options was deemed an important factor, there was another factor at play: cost. All interviewees stated that cost was a concern for low-access populations. Even when there are healthy food options nearby, some will actually travel farther distances to reach food options that are less expensive. P6 stated, "No, the problem was the cost. They would go to other stores outside of the community." P2 noted "It's cheaper and easier to buy much unhealthier food," giving the example that it's easier to stop and pick up meals from a nearby McDonald's to feed hungry kids than it is to go home and cook a meal, or go to a place with healthy foods. P1 stated affordability as a main issue, with 50% of their revenue coming food stamp customers.

There are some systems in place to help people, particularly those in need, be able to afford food. One example is Illinois' Supplemental Nutrition Assistance Program (SNAP) – a service that provides those in need with a LINK card, which serves at a debit card at many grocery stores and participating vendors. In an effort to support healthy eating habits, SNAP states that the LINK card cannot be used for tobacco, alcohol, hot foods ready to serve, and a few other items. While this is good in theory, the program still supports the purchase of many unhealthy items. "There's all this money that's built into SNAP that right now subsidizes unhealthy foods", P2 told us.

Another program in place to help those in need access healthy food is Wholesome Wave's Double Value Coupon Program. This program provides people with incentives that match the value of their federal nutrition benefits when their LINK card is used to purchase fresh local food at a farm-to-retail venue. P2 noted that this essentially gives the consumer twice as much money to spend. "So depending on what the limit would be,

if a customer spent $10 from their LINK or SNAP card, we would match it up to that amount and then they would have twice the amount of money to spend on the food." P4 stated, "The double value component is a really big thing...we promote that constantly and people will initially think that there is some trick or some hitch to it, and then once they realize there is no hitch they come!" With incentives like this in place, our interviewees are hoping to both make healthy food options more affordable, and to make residents aware of this affordability to so that they actually take advantage of the option.

2) Education (Changing perceptions and improving food literacy)

Five of the six interviewees described how they have to overcome the common perception of healthy, fresh food as prohibitively expensive. As P2 told us, farmer's markets, for instance, are commonly perceived as "playgrounds of the wealthy", but with more and more markets now hooked up to EBT (electronic benefits transfer) terminals, this is no longer necessarily the case. P4, founder of the South Side farmer's market, said that much of her focus is on "trying to help people understand that this food only appears to be more expensive". As P1 stated, "it's not that people don't want fresh produce, but it is that they…think that they cannot afford it". Indeed, almost every organization we spoke with voiced a need for altering this perception, which speaks to how significant of a roadblock it can be for those working to increase access to healthy foods.

Interviewees used different tactics to educate residents that high-price was a perception, not necessarily fact. P4 stated that consumers "get so much more out of their dollar" because the food at the local farmer's market has so much more nutrition and flavor. Similarly, P5 and P6 are using the BRIX index to show how "nutrient dense" food from their community garden is. The BRIX index typically correlates with taste.

Another way interviewees educated low-access communities was by providing hands-on experiences with food. Cooking classes and growing food were mentioned by 5 of the 6 interviewees. P4 hosts "market school" every week, which consists of everything from visiting guest lecturers from other Chicago-based organizations to cooking demos and is free to all shoppers at the market. There is also an effort in place to make healthy eating and cooking classes available for adults and families in the area.

Youth were cited as a particular target market for hands-on education. Two of the six interviewees are specifically involved in K-5 education efforts at schools and another two interviewees incorporated youth in their programs. Both P4 and P3 said that by promoting more hands-on involvement, they hoping to foster an interest in the entire process of generating healthy, locally sustainable food in younger children. Our interviewee from the national organization mentioned that organizations targeted involving youth because they had more spare time.

Education is also an obstacle for organizations. The education process "takes a very long time" as P4 mentioned. Some lament the limited actual impact national, USDA-based nutrition education seems to have in terms of nutrition intake and real accessibility for low-income people. P5 stated that their organization had difficulty securing funding for educators. Indeed, P1 stated that her organization has experienced literacy problems in regard to some of their marketing efforts, which may be a widespread issue. Incorporating education administrators causes issues as well. P3, who runs a cooking-based consultancy for healthy food said, "the sale to public schools has just become too hard. [It is] too difficult to convince them how important this change is for the kids, and they can't see a way out of their own thinking." Systematic challenges involving other institutions in particular can be extremely difficult for nonprofits to overcome.

3) Data/evidence collection capabilities

All interviewees commented on the importance of collecting data to build evidence to support the success of their work. Data is a necessary component to their strategies. Our organizations used data to change policy, "create business cases," compare "what's real and what's not in the kitchen," collect consumer health data, and show people how locally grown food has higher nutritional value as measured by the BRIX index, which "correlates with taste." Data provides evidence to gain additional funding and change perception.

The organizations interviewed are at varying levels in their ability to successfully collect data. The cooking-based consultancy has a "zero-waste" goal and measures waste in the kitchens and dining rooms. P3 noted, " – like I'm comparing waste and trying to increase sustainable content while decreasing waste, so I'm building these drafts. But it's all done in a way that's not automated….right now we have to figure it all out on cocktail napkins and with an abacus… ." P2 is "now pushing to tie that together with a much more effective app-based system where we can gather data and connect it through different clinics and the farmers markets and our own analysis centers as well as the clinical providers." The Chicago South Side farmer's market has their consumers complete one survey a year, in part because asking them to complete more than this would be taking away from the market experience.

Data collection and analysis is a challenge. All interviewees recognize a need to build better infrastructure for collecting data and for making connections between different data points. Three of the six interviewees specifically mentioned technology as a potential solution. The South Side farmer's market will be launching a mobile app, in an attempt to better capture health information about the consumers, and P3 "definitely need[s] more technology." P2 recognized that technology could track and show "their patient's progress in real time" and could enable more efficient food systems if designed appropriately. P5 and P6 are working with students at DePaul University to build a new website that would allow gardeners to share information and for the committee to create a revenue source through membership fees.

4) Community Building

Four of the five organizations commented on community building as a means and outcome to supporting local food systems. Residents start to build relationships with the farmers at the market, teachers and kitchen staff build relationships with the farmers, and people build a relationship to the land. As P2 told us, "It's incredible, [the] interactions between the consumers and farmers. You're building social capital, you're building community, you're building buzz--lots of great highs happen." To describe the motivation for this approach, P3 told us, "We are starving to connect, we are starving for community-ness". This idea that "food is community" was a phrase echoed in several interviews.

When describing how her farmer's market was able to get up and running, P4 stressed the importance of building relationships with people in the community in order to achieve any measure of success. "Helping to create all sorts of relationships within those neighborhoods and churches and community centers and hospitals and clinics and alderman offices and anyone teacher anything having to do with food and nutrition, all of them have to be on board, understand that the market is there, support it, tell people about it, and get them there." One of the grassroots organizations we spoke to on the West Side collaborates with other organizations to teach gardening to underserved populations such as at-risk youth and young adult men as a means to support community building. The vitality of having all members of a community engaged and aware of the organizations' efforts was a sentiment expressed by several of our interviewees.

Additionally, this same West Side organization teaches the importance of creating food security for yourself before sharing it with others. An individual's "food security" may be a necessary step before they feel comfortable sharing and connecting more deeply with a community. P5 teaches backyard gardening to families by showcasing her own well-developed backyard. She maintains her own backyard before contributing to the gardens close to her home. "That way I never felt like someone took my stuff" she said.

Survey Results and Findings

We hoped our survey data would help deepen our understanding of how organizations dedicated to improving healthy food access employ technology to further their efforts. We explored their data collection capabilities and the import placed on these capabilities, how these organizations maintained and valued their online presence, and what types of software they utilized.

We based our inquiry on the following two hypotheses:

1. Organizations collecting fewer types of data have smaller operating budgets

From our survey, we found t(26) = .28, p = .78, meaning that we could not determine if there is a relationship between the operating budgets of organizations and the amount of data they collect.

2. Organizations collecting more than one type of data are more satisfied with their data collection abilities.

From our survey we found t(26) = .8, p =.43, meaning again that we could not say there was a significant difference between groups. In other words, we could not say that organizations collecting more data were more satisfied with their data collection abilities.

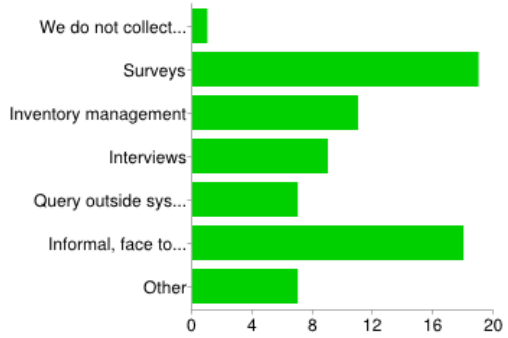
Our surveys responses may be unclear due to our low response rate. We did not survey enough small organizations (n=8) with operating budgets <$100,000, in comparison to the (n=20) organizations with budgets >$100,000. Also, the questions we asked could have been unclear, leading to inaccurate responses. Additionally, the responses to our survey demonstrated such a strong variance of organizations' efforts, age, and operating budgets that it was difficult to draw distinctions.

The results may have been more accurate if we had targeted organizations with a specific effort and specific operating budget range. Also, we were limited by our ability to recruit participants due to time constraints and an inability to offer meaningful compensation. A more accurate survey could be administered with supplemental recruitment help.

However, our surveys still provided valuable descriptive information on our respondents. Through analysis of these findings, we established the following themes. The themes provides great insight, but also presented even more questions for further research.

1) Data collection

We found that of the organizations that responded to our survey, 71% said that they collect data on their target population. The most popular method of data collection was the use of surveys (26%), followed by informal, face-to-face interactions (25%). For some of the respondents, inventory management was also a popular strategy, with 15% of respondents employing this tactic.

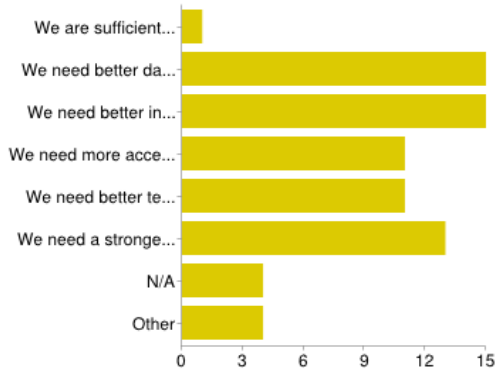


When it came to organizing this data, however, only 21% of respondents utilized either an advanced spreadsheet analysis technique or a statistics program. 61% just used simple spreadsheet analysis, and another 7% said that they do not analyze data at all. It seems that while most of our respondents recognize the vitality of collecting data on their target populations and thus do so, the majority of these organizations do not engage in sophisticated analysis of the information they collect. Indeed, when asked to rate their satisfaction with their organization's data collection capabilities on a Likert scale, with 1 being very dissatisfied and 9 being very satisfied, 61% of respondents ranked themselves in the middle (range 4-6), potentially indicating recognition that more could, and should, be done.

This was the data we used to support our second hypothesis. While it didn't prove to be significant when compared to budget sizes, it was still insightful to see that organization of all sizes mainly rely on simple spreadsheet analysis. The wording of this question may have affected the accuracy of the responses. Each organization might have a different definition as to what "simple spreadsheet" analysis means, for example.

We asked organizations if the information they collect is sufficient for funding opportunities. 53% of respondents indicated that they felt that it was, while 32% felt that it was not enough. Interestingly, most of the organizations feel that improving their technological capabilities in some capacity would increase funding opportunities. As seen below, over half of the respondents believe they need better data collection on their target population and internal data collection. Of those surveyed, only 1 organization felt that they had realized their full potential when it came to accessing funding. We wondered why over half of the organizations felt that their data collection was sufficient, yet then noted so many areas where they needed something to access more funding opportunities. The wording or order of the questions may have caused paradoxical responses.

"To access more funding opportunities…"



We are sufficient for our funding oppertunities	1
We need better data collection of our target population	15
We need better internal data collection	15
We need more accessible software (Cost, ease of use, ect.)	11
We need better technology	11
We need a stronger web presence	13
N/A	4
Other	4

2) Online presence

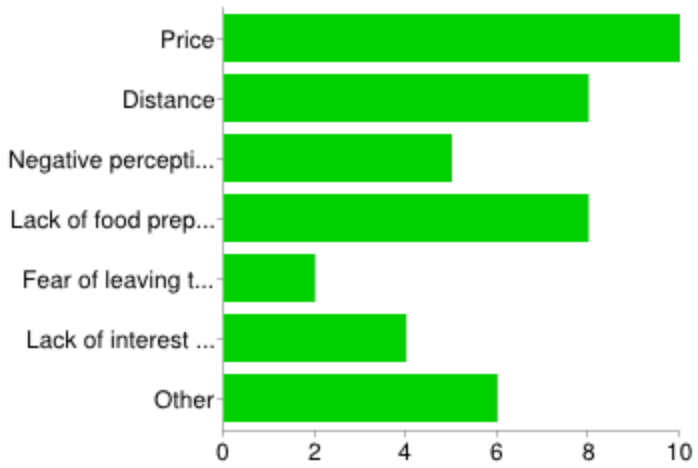
Our respondents that had some sort of online presence because we recruited using contact information from the organizations' websites. All respondents had websites, with 85% developing websites internally. When asked how important their online presence was to the success of their organization, 100% felt that it was at least "somewhat necessary", with 50% of respondents declaring it to be "absolutely necessary". When it came to having a social media presence, 28% of the responding organizations maintain active Facebook pages, 23% are on Twitter, and 9% have LinkedIn pages for their organizations. If might have been beneficial to make "internally" and "externally" developed websites more explicit. It may have been possible that some organizations might consider managing a Facebook page as internally developing their website.

3) Tech infrastructure (gauged by access to computing skills and software)
During our interviews, many of the organizations we spoke with talked about their desire to more effectively and efficiently handle and analyze data, and lamented insufficient software or tech savvy-ness within their organizations as two major hindrances. We decided to see if this sentiment applied to a wider population through our survey. Of our survey respondents, only 32% claimed advanced to expert computer proficiency skills, which would include advanced spreadsheet knowledge, some ability to manage network technology, use of professional software, and coding.

These findings are interesting in comparison to 71% of respondents claim to collect data on both their target population and individual programs. This leads us to wonder how they are collecting and analyzing their data. We wonder how much of their data is being utilized, and how much is lost that could be utilized to create stronger evidence for more funding.

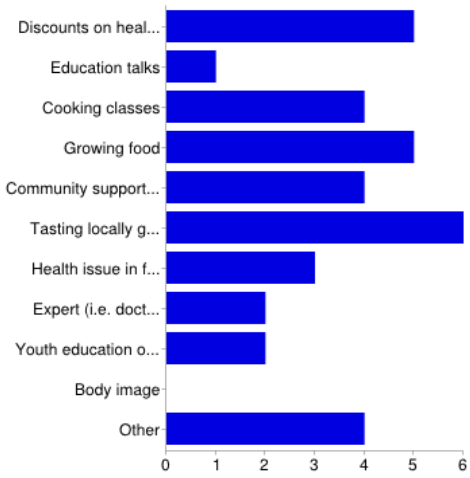
When asked if the organizations use cloud-computing services such as Google Drive or Office 365 to operate, 87% said that they did at least somewhat frequently. Only 6% marked that they do not use cloud computing services, but indicated that they would consider doing so in the future.

4) Additional Findings
Some interesting findings arose from various organizations' perspectives on the specific problems involved in accessing healthy food in low-income areas, and what they felt was the best approach to attempt to solve these issues. Price, distance, negative perceptions and lack of food prep knowledge were the four main roadblocks cited by our participants.



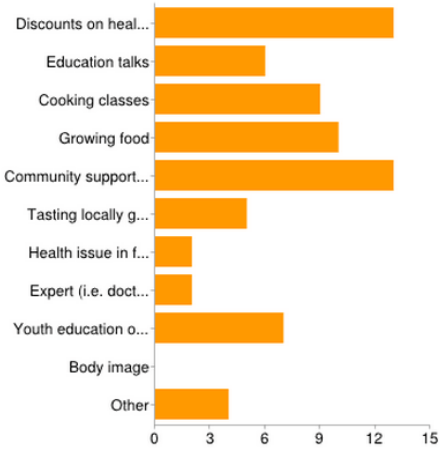
Consequently, we asked organizations what they thought motivated people to start eating healthy foods and continue to eat healthfully. They listed community support and tasting locally grown food as the top motivators to start, and discounts on healthy food and community support as motivators for continuing to eat healthy.

"What have you found most successful in getting people to START eating healthy food?"



Discounts on healthy food	9
Education talks	4
Cooking classes	10
Growing food	11
Community support involved in healthy food	13
Tasting locally grown food	13
Health issue in family	5
Expert (i.e. doctor, nutritionist) advice	4
Youth education on food at school	9
Body image	1
Other	6

What have you found most successful in getting people to CONTINUE eating healthy food?



Discounts on healthy food	13
Education talks	6
Cooking classes	9
Growing food	10
Community support involved in healthy food	13
Tasting locally grown food	5
Health issue in family	2
Expert (i.e. doctor, nutritionist) advice	2
Youth education on food at school	7
Body image	0
Other	4

We thought it was interesting that Body image, Family Health Issues, and Expert Advice were low motivators for their target population. This made us wonder if we were lacking the understanding of value systems in low-income/low access communities. Coming from communities not similar to these communities, us as researchers may have a cultural barrier preventing our understanding of effective motivators. Additionally, we have noted a potential problem with organization's ability to collect and analyze data on their target populations. There may be validity issues with the responses to the motivator questions due to organizations' data limitations.

Personas

The following three personas are based on user spectrums our group created from the interviews (located in the Appendix). These personas also represent broader trends discovered during our observations and from our survey results. Each persona embodies characteristics of organizations dedicated to improving healthy food access and literacy in low-access areas.

Jeremy Pereira

Exec. Director, Food Access America

"Millions of dollars in Federal Food Assistance Aid programs goes to subsidizing unhealthy food. We have to change that."

- Male, late 40s, Caucasian
- Education: BA Urban Development; MBA
- 15+ years experience in healthy food access, both on the ground and in the office

When Jeremy was a teenager, he started to grow and sell fruit and vegetables in the vacant lots of his poor neighborhood outside of Boston. Now, he is the Executive Director of a national nonprofit organization whose goal is to change food policy in the United States. His organization has nearly 30 full-time staff and an operating budget of over 10 million, and it serves over 10,000 people. In the last 2 years, they've focused building out their tech infrastructure, and databases, as well as spent more time and resources in trying to navigate the different governmental agencies that should find value in this issue.

He spends 60% time at his office in meetings, creating business cases and writing reports. He spends the other 40% of his time traveling to Washington DC or around the country to meet investors and potential partners who work directly with underserved communities.

To prepare for these meetings, he pulls information from databases and from his analyst to create presentations. He prefers to have investors and potential partners meet existing partners on the ground, but sometimes that isn't always the most convincing information. He thinks there is a lot of potential for technology to change this problem space, but hasn't seen any good solutions from Silicon Valley.

Goals	Values & Activities	Technology Use
• Change federal food-related policy • Partner with for-profit companies and venture capitalists • Build solid cases of evidence to demonstrate impact and profitability	• Cooking, playing baseball and gardening with the family • Looks forward to the summer pig roast in the neighborhood	• Cloud computing: Google Drive • Devices: Mobile, Laptop • Software: Salesforce, Powerpoint

Sandy Lowe

Educator & Founder, Growing Love

"We are all seeking to connect. Food brings us together. It brings us community."

- Female, late 40s, African-American/Caucasian (mixed)
- Education: BA Education; MA Education
- 10 years experience in healthy food access; 35+ years experience gardening

Sandy has always loved to garden. When she was young, she would spend hours helping her mother plant flowers, fruits and vegetables at her family's home in Michigan. This passion is what led Sandy to start her own nonprofit organization out of her local community center on the West Side of Chicago ten years ago. Her organization, called Growing Love, is dedicated to growing fresh food and attempting to foster community involvement in gardening, particularly in neighborhoods like her own, where fresh food is not always easy to come by. Sandy runs the organization in addition to her full-time job as a teacher, and her staff otherwise consists of two paid part-time associates. Much of the work they do relies on a dedicated volunteer base.

In terms of funding, Growing Love receives less than $50,000 annually from various grants. Partially because of the organization's limited size and financial resources, their scope is hyperlocal. Growing Love is primarily focused on increasing the number of community gardens in their immediate neighborhood. Their approach to achieving their mission is very hands-on, and while the organization uses basic technology, such as cell phones for communication and Microsoft Office to document some of their transactions, they do not possess sophisticated data collection capabilities, and tend to measure their impact by participation and general sentiment regarding their efforts in the community.

Goals

- Grow fresh, healthy food options
- Increase the number of, and consequently the involvement with, community gardens in her immediate neighborhood

Values & Activities

- Cooking, gardening with her family
- Church events and other community-building social events that take place in her neighborhood are very important to her

Technology Use

- Software: Microsoft Office (Word and Excel, mostly)
- Devices: Mobile, Laptop

Ryder Stille

Tech Startup Founder, The Grow Network

"Technology can level the playing field with food like it did with music - giving people access in creating and sharing."

- Male, 28 years old, Caucasian
- Education: BA In Philosophy; MBA
- 4 years experience in Advertising Consultant Work, 2 years working on his start up

Ryder left his job as a consultant last summer to work full time on the start up Grow Network that he founded with his former classmate Danielle. They wanted to use their skills to support nonprofit organizations working to increase food access by connecting the organizations with resources to create innovative projects. Ryder is great at marketing strategy and his co-founder, Danielle, has some solid programming skills. Together, they spend time pitching their business, raising funds, and partnering with other organizations.

While Grow Network is a for-profit, Ryder's main focus is to help organizations like farmers markets and independent grocery stores succeed at their missions. They currently work out of a collaborative office space near Fulton and Damen. Ryder spends about 60% of his time in meeting with people, and about 40% of his time at his office writing up proposals and researching his ideas.

Ryder understands how important it is to collect data for the projects he's running, he finds deep data collection overwhelming to do by himself. Also, Ryder doesn't really know what kinds of technology his target users use. He wishes there were more resources for navigating relationships at government institutions and for finding vacant, retail spaces. Ryder is looking to hire two paid summer interns to help him with these tasks.

Goals

- Establish his new business through partnerships
- Help organizations leverage tech to help them grow their current initiatives and innovate
- Learn how target population uses tech

Values & Activities

- Getting involved with his Logan Square community, racing his heavily modded '03 Volkswagen GTI, kayaking with his friends
- Ryder brews his own beer and occasionally travels the country to visit small breweries with his fiance

Technology Use

- Uses his iPad, HTC One, and Macbook for work and personal life
- Uses Google Docs and a web based client for his email service
- Software: Microsoft Office, Omni Graffle

Scenarios
We created three scenarios that reflect typical user tasks and responsibilities uncovered during the observations, interviews and the survey. The scenarios depict how each organization approaches their mission of improving healthy food access and literacy in low-access areas.

Scenario 1
Jeremy, head of Food Access America, has traveled to Washington DC today to meet with the planning committee of the Healthy Food Incentives Pilot program of SNAP. The head of the committee has several questions about the data that Food Access America has gathered on its various pilot programs that cut the cost of locally grown, organic food to underserved communities. To prepare for the meeting, Jeremy pulled information from Salesforce that shows the location of several pilot programs, the number of people they serve, some health metrics of those people, and how much money local farms and food-related businesses have benefited from these programs. Jeremy knows that the health metrics are biased because they are only self-reported. He's had trouble consistently getting local physicians to provide exact information on risk for heart disease, diabetes, and obesity levels.

Jeremy meets with four individuals on this issue for about 90 minutes. They ask many questions about other ways Food Access America has attempted to track information and how they might scale this. They also discuss how they might target certain cities of particular in interest to the Senate Committee on Agriculture, Nutrition and Forestry. They would like to have Food Access America signed on as a consultant to this pilot program, but they are not too sure what those future interactions would look like. Jeremy says the he can put together a proposal and consultation fee and will send it to them.

After the meeting, Jeremy calls his COO to update him. He'll work on the proposal this afternoon, and when he returns to his office, plans to set up brainstorm sessions with three current, local partners, on how to and improve scale some of this data collection. He also plans to involve his Data analyst, who could setup a database and architecture to collect and access the information.

Scenario 2
Sandy is planning an educational event with a church in her community. The event is meant to engage families in gardening. She knows there are some families involved in her gardens, but they do not represent the majority of the community. She wants to figure out how to involve more families in gardening through this event. She advertises the event with flyers at the church and community center, tells people to pass the word around, and posts some pictures and an event invitation on Facebook. She's hoping for 20 or more people, but doesn't have a good idea of how many people are coming. She works with her volunteers to prepare demonstrations.

The church helps her prepare some delicious food to serve during the day of her event. She has a fantastic turnout with over 50 people. She passes out a pamphlet with basic information pointing to her organization's website and Facebook page. The pamphlet also has a map of community gardens and contact information for her organization. Sandy collects a list of emails on a piece of paper for families that are interested in gardening. She notices it's only about 15-20 emails in total.

After the event, Sandy follows up by posting a "thank you" note on Facebook and Twitter. Next, she wants to invite the people that came to the event to an upcoming workshop for first-time gardeners. She has a volunteer enter the emails collected into an Excel document on an old computer and send a simple mail-merged email without much formatting. Sandy wishes should could find out more about why her event at the church was so successful so she can replicate that turnout for her workshop, but she's doesn't have the time to collect and analyze the data. However, she knows that if she kept better records, there are a couple grants she could apply for to help fund more events. She makes a sticky note to remind herself to look into sending out surveys over the next week and places it on her computer monitor next to 25 other sticky notes.

Scenario 3

Ryder is working on a very lean, mobile-tech based point of sales system to be used by small food retailers such as farmers markets and corner grocery stores. He's also working with farmers markets to create an inventory management system that reflects their needs. Additionally, Ryder's new system will be supported by a nonprofit that teaches IT skills to ex-convicts. Ryder, and occasionally Danielle, meet with several people at their Fulton Market office.

Ryder faces several challenges with this project. The most significant is knowing what technology the target population has access to. He's not sure if they would have access to smartphones and could scan QR codes. He's also not sure how complex the system could be for both the shopper and the vendor. Additionally, he's hoping to find support from the city, but he's not sure what resources are available. There are also a lot of opportunities in this new system to collect data for organizations, but he's not sure how he can make that data meaningful for them.

Sandy's Experience Map

	Get inspired	Get Resources	Implement Program			Reflect & Report
			phase 1	phase 2	phase 3	
Doing	Sees a vacant lot Talks with one of her volunteers At a local meetup Students talking about food Browsing through a gardening website Reads an article in a magazine Building out an existing program	Connects with free, government available resources like empty lots, composting materials Writes successful grants Partners with other local groups donate materials and resources Gets a local business to provide sponsorhip funds	Emails their sign-up list and posts on Facebook news of the new program, including start dates times Finds one part time staff member and 2 volunteers to run the program Meets with the program team to finalize schedule and strategy for program	Starts preparing the land for gardening, plant seeds, and start education component Collects baseline information about participants (either what they know or what they are eating) Updates Facebook	Tracks participant information over time, including participation rates, health improvements, and food consumption and knowledge of what healthy food is Oversees and meets with staff to make sure that progress is being made Talks with participants to get anecdotal insights Add additional hours for staff and volunteer as interest in program grows Updates Facebook	Interview participants Analyze participant information Write and present to funders and sponsors regarding program outcomes Collects enough information to gain further funding
Feeling	excited	nervous thrilled	focused	excited & inspired	excited & inspired	nervous relieved & excited
Dig Touchpts						
Opportunities		Creating a map/director to navigate city resources and potential grants Create "dating site" for non-profits to partner with one another in this space	Leverage more free social media tools to spread the word	Create data collection systems, tools and methods where users can easily input information	Create data systems that communicate to one another	Create some automated reporting systems when appropriate

V. Discussion

Across low-income areas in the United States, there is inequitable access to healthy food options. Through our research, we sought the discovery of human-centered design opportunities for implementing positive change in low-income or low-access communities. We found that there are indeed opportunities to foster positive change, particularly for the hundreds of established nonprofits and government agencies working on various issues of food access. These organizations face a myriad of challenges that could benefit from more appropriately designed tools.

Through observations, interviews and surveys, we established a number of themes that should be considered in any proposed solution, technological or otherwise, to increase access to healthy food options in low-access areas. Perhaps the most prevalent theme across all levels of our research was accessibility, in regard to both price and location. During our observations, we noted that price tended to heavily dictate people's choices when it came to purchasing food, more so than healthiness. All of our interviewees also stated that cost was a concern for low-access populations. Our survey respondents indicated that discounts on healthy foods would be the most effective way to help people start and continue to make healthy food choices.

Additionally, our observations and interviews revealed that people in low-access areas are also concerned with the quality of their food, which creates the additional hassle of locating quality foods. The nonprofit leaders we interviewed also recognize this issue. As P2 told us, "You're just not finding healthy, attractive, high-quality produce in underserved communities", a statement echoed by P5 and P6. More needs to be done to meet the food access needs of community members. As more nonprofits begin to get involved in this particular problem space, we think that building upon the small-scale, non-profit grocery store model employed by one of our interviewees could potentially be very successful. However, some healthier foods, such as produce, create a "negative profit margin" as stated by P1. Small-scale retail would need to generate revenue from other offerings or garner funding to stay afloat.

Tech-based or human-centered design solutions to the accessibility problem could focus on reducing the cost of healthier food by disrupting aged distribution and retail models. A great example is e.a.t.'s Food Spots project, which uses low cost tech and innovative retail spaces to create better access to fresh produce. A cloud-based delivery service could provide pop-up retail locations for areas with the highest demand. Small retail stores could reward customers for eating healthy food through a SMS-based rewards program. An well designed smartphone app could compare the costs and nutritional density of food to the cost of food-related diseases to motivate the user to try healthier options. As these ideas suggest, there are many opportunities to examine the path between food production and the consumer in low-access areas for potential innovations.

Another important theme from our findings involves education, and combating harmful perceptions involving healthy food. During our observations, we found that even when healthy options are available in stores in these communities, they may still be considered inaccessible to some, as the price of the items is expected to be too high. Also, the shopper might not know what the food tastes like or how to prepare it, which can discourage purchases. In an effort to combat this, some of the organizations we interviewed are focused on teaching people to grow their own food, or providing opportunities for residents to taste locally grown food. In our survey responses, we found that many respondents employ similar tactics to motivate people to eat healthier food. In general, any solution to improving food access would need to involve a superior way of communicating that healthy options are indeed affordable in order to counteract this perspective. We feel that a convergence of education and technology could produce impactful results. For example, building an online educational toolkit of sorts that includes interactive games or online lessons involving healthy food choices could be a way to engage younger children who are more active online than their adult counterparts.

Through our interviews and survey findings, community support was also a very important factor in changing behaviors. Our survey respondents echoed the sentiments of P5 and P6 from our interviews. The community gardens these interviewees organized were areas where people got together to encourage each other to grow and eat healthier food. The gardens provided a space within communities to learn more about food. A potential design solution would need to create opportunities to engage community members, possibly through social media.

Finally, when it comes to improving the efforts of nonprofit organizations focused on healthy food access, a common theme revealed during our interviews and from our survey involves data collection. All of our interviewees commented on the importance of collecting data. Many noted that technology could be of great assistance in the data collection and analysis process, particularly if separate databases or spreadsheets could relate to each other in meaningful ways. Yet through our survey, we discovered that overall the responding organizations lacked both the sophisticated software and the advanced computer proficiency skills on-staff to truly complete thorough data analysis, although the vast majority of those who participated said that their organizations did collect data of some kind.

Our survey results on organizations' data collection and analysis capabilities was fascinating but also difficult to interpret, as there was such variance in the size, scope, and budget of the organizations in our participant pool. Also, while the majority of respondents did claim that they collected data on their target population and had some knowledge of how their target population accessed the internet, how this data was collected and whether it was utilized in an effective manner is unclear from our survey results. Truly understanding organizations' data collection and analysis capabilities and

how it impacts their operations would require much more in-depth investigation, and a survey might not be the best research method to accomplish this.

In terms of potential design implications, we would need further inquiry and analysis of how nonprofit leaders are accomplishing tasks. Each organization has unique needs and requirements. A tool would need have a wide range of capabilities but very clear and visible affordance that translates to the organization's leaders.

Future Work

We see substantial opportunity to develop mechanisms that could facilitate organizations' ability to gather and analyze data in furthering their missions. Data provides concrete evidence that can be used to garner support and forge relationships, and can provide insights to organization leaders to help them better govern and manage their organizations. While limited resources in organizations' funding, technology, and technical knowledge are certainly hurdles, a tool or solution designed within these limits is likely achievable. Deeper research into how nonprofits actually are collecting, analyzing and showcasing data could be highly impactful in uncovering ways that they can improve upon these efforts and increase funding opportunities.

Inquiry into low-access and low-income communities could provide invaluable insight, and is an understudied area in human-centered design. Examining the stakeholders and food systems in these communities could open up opportunities for better designed solutions. Interviews and surveys of people in these communities could define what motivators exist for engaging in healthy eating behaviors. It might also open up a better understanding of how food systems operate in the larger landscape of other challenges faced by a community. Several of our interview participants noted that basic human needs, like safety, need to be met first for people in these communities before they can embrace healthy food. We were limited in our understanding of these communities, separated by a "cultural gap". More deeply understanding the experience of living in a low-access, low-income community would be paramount to creating effective tools.

Additionally, organizations might also be separated by a "cultural gap" from their target population. A interview respondent noticed that the majority of their participants were "white" people in a predominantly African-American community. Providing organizations with better data on the populations they are hoping to serve could help them create programs that are more effective. We would recommend an ethnographic study of communities in addition to focus groups, observations, and interviews in low-income, low-access neighborhoods.

Future research may also benefit from narrowing the focus on one particular issue. For example, examine one type of organizational approach, such as farmer's markets in low-income areas or urban community gardens. This could likely yield more relevant insights that would help that particular type of organization achieve greater success in

their specific endeavor. Certainly not all organizations focused on this issue operate the same way or even necessarily have the same specific goals, so attempting to create a solution for all to employ is too far-reaching. Examining one moment in the process of food production, distribution, and preparation (so specifically the growing of food, the pricing of it, or the cooking of it) is another possible research opportunity. Finally, focusing on how technology has been used to provide access to healthy food (for example, crowdsourcing food access locations, discussing healthy food options over social media, or posting YouTube videos of cooking demos) and how this technology can be expanded or further developed is another interesting idea worthy of further exploration.

VI. Bibliography

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Appendix: Consent Form

ADULT CONSENT TO PARTICIPATE IN RESEARCH

EQUITABLE ACCESS TO HEALTHY FOOD STUDY

UX Research Team: Dashiel Neimark, Lauren Lucchese, Laura Paradis, & Shane Sweeney
Institution: DePaul University, Chicago, Illinois, USA
Department (School, College): Human and Computer Interaction
Faculty Advisor: Sheene Erete, PhD.

What is the purpose of this research?
We are asking you to be in a research study because we are trying to learn more about how people in need can gain access to healthy food options. This study is being conducted by a student research team at DePaul University, as part of a requirement to obtain our Masters degree. This research is being supervised by faculty advisor, Sheena Erete, PhD.

We hope to include about 50 people in the research.

Why are you being asked to be in the research?
You are invited to participate in this study because you are member of a community located in an area of Chicago where healthy food access is limited, or you are an expert in providing healthy food access, either through grassroots, nonprofit work or through city initiatives.

What is involved in being in the research study?
If you agree to be in this study, you will be asked to participate in one or more of the following:
- An observation, where members of the student research team observe your everyday activities and interactions regarding food purchasing or preparation decisions.
- An interview. Up to 2 members of the student research team will ask questions about how you make decisions about food purchases, or how you support food accessibility. The interview will take no longer than 60 minutes. The interview will be audio recorded and transcribed into written notes later in order to get an accurate record of what you said.
- A survey. The survey will consist of questions about how you make decisions regarding food purchasing and preparation. It will take no longer than 20 minutes to complete.

Are there any risks involved in participating in this study?

Being in this study does not involve any risks other than what you would encounter in daily life. If you feel uncomfortable or embarrassed about answering certain questions, you do not need to answer the question. There is the possibility that others may find out what you have said, but we have put protections in place to prevent this from happening.

Are there any benefits to participating in this study?

You may benefit from the research by reflecting on your food purchasing and preparation decisions. If you are an expert participating in this study, you may benefit from any of our team's findings.

We hope that what we learn will help identify solutions for providing access to healthy food options to those in need.

Can you decide not to participate?

Your participation is voluntary, which means you can choose not to participate. There will be no negative consequences, penalties, or loss of benefits if you decide not to participate or change your mind later and withdraw from the research after you begin participating.

Who will see my study information and how will the confidentiality of the information collected for the research be protected?

The research records will be kept and stored securely. Your information will be combined with information from other people taking part in the study. When we write about the study or publish a paper to share the research with other researchers, we will write about the combined information we have gathered. We will not include your name or any information that will directly identify you. We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. However, some people might review or copy our records that may identify you in order to make sure we are following the required rules, laws, and regulations. (For example, the DePaul University Institutional Review Board). If they look at our records, they will keep your information confidential.

The audio recordings will be kept until accurate written notes have been made, then they will be destroyed.

Who should be contacted for more information about the research?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study or you want to get additional information or provide input about this research, you can contact the a member of the research team, Laura Paradis, 312-590-6381, laurayparadis@gmail.com and Faculty advisor Sheena Erete, PhD, 312-362-6020, serete@cdm.depaul.edu.

This research has been reviewed and approved by the DePaul Institutional Review Board (IRB). If you have questions about your rights as a research subject you may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, in the Office of Research Services at 312-362-7593 or by email at sloesspe@depaul.edu.

You may also contact DePaul's Office of Research Services if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You will be given a copy of this information to keep for your records.

Statement of Consent from the Subject:

I have read the above information. I have had all my questions and concerns answered. By signing below, I indicate my consent to be in the research.

Signature:_____

Printed name: _____ Date: _____

Appendix: Interview Script

Introduction:
Hi, I'm _____, and I'm currently a student at DePaul's Human and Computer Interaction program. For our class on research methods, our team decided to look at how different groups or organizations provide access to healthy food for those in need. At this stage, we're just focused on understanding the problem, and we thought that you would have some insight. We're interested in learning about your organization's strategy, its obstacles, successes, and the landscape of this field in general. The interview should take no longer than 30 minutes.

Before we start, I have a consent form for you to complete [Show consent form]. I want you to know, that none of the information you provide us will be identifiable in any public form. [Wait for them to read through] Do you have any questions for me? [Wait for them to sign]

Will it be alright if I record this, to make sure that we can refer to what you say without misinterpreting it?

Warm-up questions:
Tell me about your professional background.

What prompted you to start [or start working with] this organization? What made you interested in this issue?

What was your initial impression of the work you thought this organization would be doing? Has it changed since?

Strategy
Tell me about [name of organization's] mission. Who created the mission statement, and how does this mission statement impact the processes used?

What does [name of organization] do to address this mission?

Tell me about [name of organization's] structure. How do you staff your efforts?

Describe to me what success looks like for [name of organization] and how you measure it.

Describe one of [name of organization's] biggest successes.
- Why was it so successful?
- [Continue to probe and prompt them until several factors arise]

Was there ever a project or initiative that did not work?
- If there was, what happened?

What are [name of organization's] immediate needs to achieve success?

What upcoming challenges do you anticipate addressing?

Serving population and services

Can you give me a general profile of [name of organization's] target audience? What's the range of people that are impacted from your organization's efforts?

How much did you know about [name of organization's] target audience that you're serving before you started (your position/this organization/your latest project)?

Have there been ways in which people accessed [name of organization's] services that wasn't expected?

Does [name of organization] reach out to residents in the community? If so, how?

Does [name of organization] market the program? If so, how?

Communications

How does [name of organization] communicate its work?
- (Probe - why does your organization approach it in this way?)
- (Probe - who communicates to whom?)
- (Probe - how does the board relate to the organization?)
- (Probe - what materials and resources to you use?)

Could you tell me about how you communicate with funders--organizations, government, or individual? What are their expectations from your organization?

Use of technology
Does [name of organization's] target population use technology?

How does [name of organization] use technology in your daily work?

Do the people you work with, your other staff, volunteers, or the people you serve use technology in ways that would help [name of organization's] mission? If so, how?

The overall landscape
Where do you see [name of organization] in 1 year? 3 years? 5 years? What's it going to take to get there?

What or who do you see as competitors in your problem space?

-(Probe: What does that competitor do better/worse in reaching the needs of your target population?)

Final questions

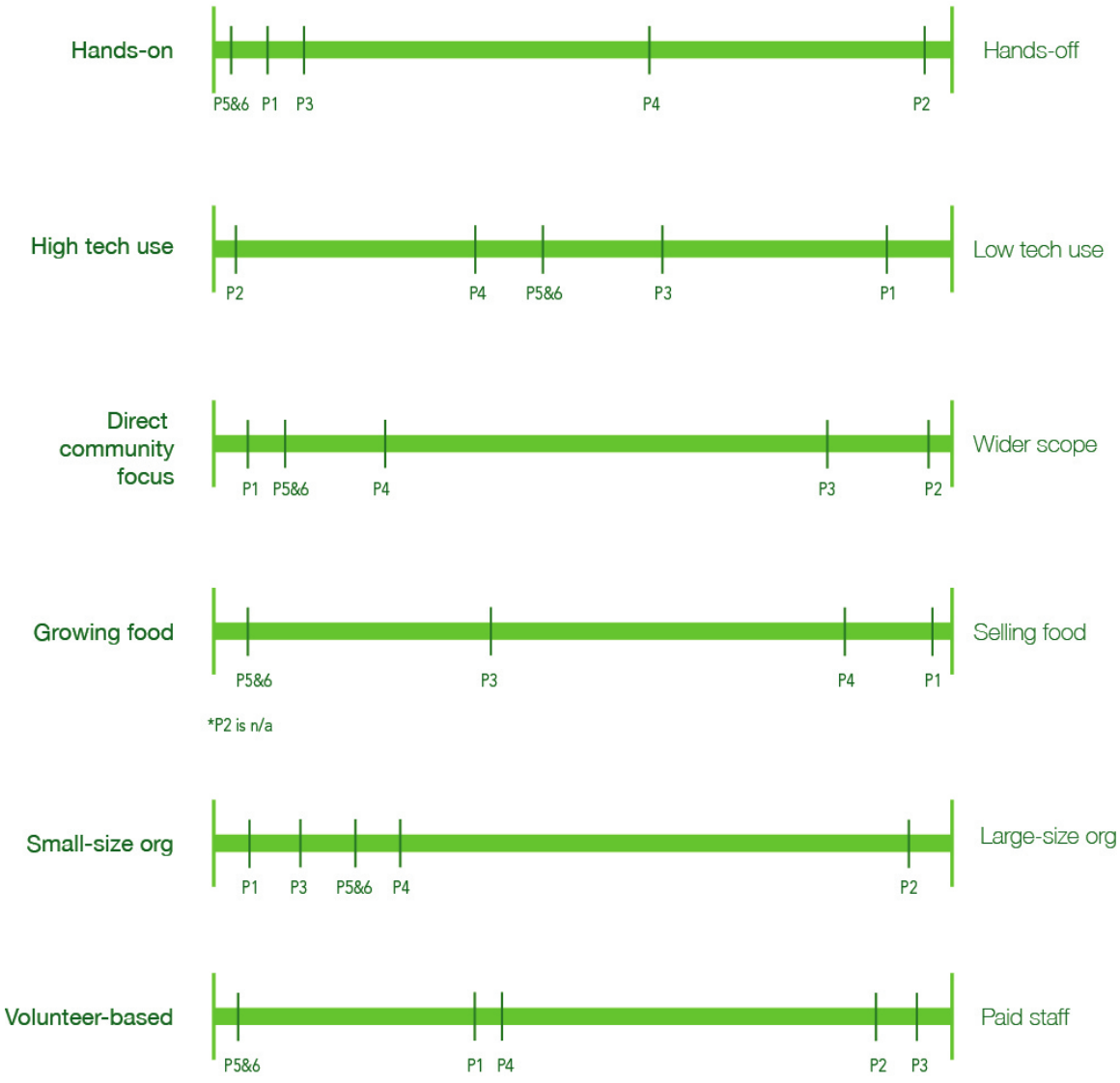
Do you recommend I speak to anyone else?

We're close to the end of the interview. Do you have any questions for me?

Closing statement.

Thank you for taking time to speak with me today. My colleagues and I greatly appreciate the time you've taken to help us with our school project. Please feel free to contact me afterwards if you have any further comments or questions. Again, thank you for your time.

Persona Spectrums



Survey Questionnaire

Dear Awesome Organization,

We are a small group of graduate students at DePaul University looking at how food access organizations use technology as part of a class project. We would be so appreciative if you could take 5-10 minutes to fill out the following survey.

We are attempting to map out the experience of organizations focused on getting healthy food to people that need it. Your input helps us build a more complete picture and might provide some valuable insights to the community.

Your information will be kept confidential. All data will be stored in a password protected electronic format. To help protect your confidentiality, this survey will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only.

Also, If you could please forward this survey to other people in your organization and other organizations, we would be very appreciative. Different people might have different perspectives even within an organization.

Thank you for your time! We would appreciate any input. Please feel free to contact us if you wish to know more about our project and our findings.

[Hypothesis:
1. Organizations with less tech infrastructure capture less data for evidence (program indicators of success?)
- so we have to measure their "tech infrastructure" -- I don't think this is the right word. It might more be around data gathering, storage and analysis skills
- and we have to measure how much data they collect

2. Organizations with less data collection abilities get less funding]

#	Question	Instruction	Answers	Reasons	Comments
1.	**How does your organization help people access healthier food?**	*Check all that apply*	Checklist: -Education -Reducing Costs of Food -Changing policy -Urban Agriculture -Creating or supporting new locations -reducing healthy food	Demographic	

2.	**How old is your organization**	*none*	Radio buttons: Less than - $25,000 -$25,000 to$99,000 -$100,00 to $249,000 -$250,000 to $499,000 -$500,000 to $999,000 -$1 mil to $2.9 mil -$3 mil to $4.9 mil -$5 mil to $10 mil -$10 mil +	Demographic	
3.	**Does your organization have an online presence?**	*Check all that apply*	Check box -Website, internally developed and managed -Website, developed outside organizatio n -Facebook Page or Group -Twitter -Tumblr -LinkedIn -Other	Gauge the tech infrastructure of an organization	
4.	**How important is your online presence for the success of your organization?**	*none*	How important is your online presence for the	Gauge organization' s online awareness	

			success of your organizatio n? - Completely Unnecessa ry -Somewhat Unnecessa ry -Neither Necessary or unnecessa ry -Somewhat necessary -Absolutely Necessary		
5.	**How would you gauge your organization's computer proficiency?**	*none*	Radio button: -Very little to no computer proficiency -Basic computer proficiency (Word Processing , Email, Can Access the Internet) - Intermediat e computer proficiency (Social Media, Basic Website Maintenan ce, Moderate Spreadshe	Gauge internal tech knowledge infrastructure	

			et usage) -Advance to expert computer proficiency (Advance spreadsheet knowledge, some ability to manage network technology use of professional software or coding -N/A		
6.	**How Does your target population access the internet**	*none*	Checkbox -They do not access the internet -Smartphones -Personal Computers -Public computers -Not Sure -N/A	Gauge understanding of target population and gain insight in target population	
7	**What is the size of your target population**	*none*	What is the size of your target population ? -1 to 99 people -100 to 499 people -500 to 999 people - 1000 to 4,999 people -5,000 to 10,000	Guage understanding of target population	

			people -Greater than 10,000 people -N/A		
8	**Does your organization collect data on your target population?**	*None*	Radio buttons: -Yes -No - N/A	How does the organization gather data?	
9	**Does your organization collect data on individual programs?**	*None*	Radio buttons: -Yes -No - N/A	How the organization to gathers data	
10	**In what ways does your organization collect data?**	*Check all that apply*	Checklist: - We do not collect data -Surveys -Inventory management -Interviews -Query outside systems (national databases, ect.) -Informal, face to face -Other	To see if or how organization are looking at their data.	
11	**Does your organization use Cloud Computing services like google Drive or Office 365?**	*None*	Radio buttons: Frequently Somewhat frequently	Gauge tech understanding	

			Infrequently No cloud services, but considering future use No cloud services, not considering using them -I don't know what "The Cloud" is N/A		
12	**Does your organization analyze data?**	*None*	Radio buttons: -We do not analyze data -Simple spreadsheet analysis -Advanced spreadsheet analysis -Statistics programs -Other	Gauge how much an organization does to analyze data	
13	**How satisfied is your organization with its data collection and analysis abilities?**	*None*	Radio buttons: Completely satisfied 1-9	To create a baseline for how established data collection is	

			Totally Satisfied		
14	**The information you collect is sufficient for your funding opportunities.**	*None*	Radio Buttons -Strongly Disagree -Disagree -Neither Agree nor Disagree -Agree -Strongly Agree	Have organization self report their own data collection capabilities	
15	**To access more funding opportunities:**	*None*	Check boxes -We are sufficient for our funding opportunities -We need better data collection of our target population -We need better internal data collection -We need more accessible software (Cose, ease of use, ect) -We need better technology -We need a stronger web presence	To see what organizations think need for better data collection	
16	**Is there anything**	*None*	[Open Text		

	more you would like to share about your organization's tech experience		Box]		
17	**What problems do you think still persist with healthy food access?**	*Select all that apply.*	Checkboxes -Price -Distance -Negative perceptions of healthy food -Lack of food preparation knowledge -Fear of leaving the house for safety reasons -Lack of interest in cooking -Other	See what organizations see as a barrier	
18	**What has been the most successful means of communication?**	*Select all that apply*	Checkboxes -Email -Paper flyers, brochures, pamphlets -TV Ads -Facebook page -Word of mouth -Newspaper ads -Twitter -Other	See where the success have been	
19	What have you found most successful in getting people to START eating healthy	*Select all that apply*	Checkboxes -Discounts on healthy	See what is successful in the field	

	food?		food -Education talks -Cooking classes -Growing food -Community support involved in healthy food -Tasting locally grown food -Health issue in family -Expert (i.e. doctor, nutritionist) advice -Youth education on food at school -Body Image -Other		
20	What have you found most successful in getting people to START eating healthy food?	*Select all that apply*	Checkboxes -Discounts on healthy food -Education talks -Cooking classes -Growing food -Community support involved in healthy food -Tasting locally	See what is successful in the field	

			grown food -Health issue in family -Exper (i.e. doctor, nutritionist) advice -Youth education on food at school -Body Image -Other		
21	What is your organization's name?	*none*	[Text box]		

Thank you again for your time! Again, please feel free to contact me if you have any questions whatsoever.