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Minimizing Food Waste at Food Pantries

An Interdisciplinary Qualifying Project Report

Submitted to the Faculty of

WORCESTER POLYTECHNIC INSTITUTE

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ABSTRACT

This report presents and discusses the results from a project that was aimed at establishing measures that could be implemented to reduce food waste at the Stow Food Pantry. By reviewing scientific studies, contacting food manufacturers, contacting food pantries in Massachusetts, and through surveys, information was gathered and used to develop possible ways to prevent food waste in the pantry.

Results of surveys conducted show that most volunteers at the pantry are happy about the work they do. It was determined that there is a need for a night pantry to serve people in the community who may be in need of assistance, but work during the day. A new system was also developed to streamline the activities of the pantry preparation day to make it easier, faster and more efficient. Also, the method of self-reference was recommended to be a better criterion for checking the eligibility of people to benefit from the services of the pantry.

It was determined that the date labels on canned foods do not necessarily convey food safety information. Instead, dates on food products show when the food is at its peak quality and freshness. Apart from baby formula, canned foods are indefinitely safe for consumption if they are kept within the proper temperatures and handled properly. Surveys conducted in this project suggested that most pantries are unaware of this fact, and therefore discard food that may be perfectly fine for consumption. An awareness of this fact will go a long way to save pantries a lot of food.

ACKNOWLEDGEMENT

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We also acknowledge Alison Kaufman, director of the Jewish Family and Children's Services for helping us in reaching out to the pantries who took part in the surveys done in this project.

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TABLE OF CONTENTS

Executive Summary	v-vii
Introduction	1-16
The Need for Food, Food Insecurity, and Controlling Waste	1-5
The Food Pantry	5-16
Problems of the Stow Food Pantry	7-16
<i>Expiration Dates</i>	7-13
<i>Qualifying Criteria</i>	13-14
<i>Space and Storage</i>	14-16
<i>General Operation of the Pantry</i>	16
Objectives	16
Methodology	17-22
Expiration Dates	17-19
<i>Scientific Studies</i>	17
<i>Government Agencies</i>	17-18
<i>Contacting Other Pantries</i>	18
<i>Contacting Food Manufacturers</i>	19
General Operation of the Pantry	19-22
<i>Changes in the Preparation Day Procedure</i>	19-20
<i>Number of Food Distribution Days</i>	20-21
<i>Qualifying Criteria</i>	21-22
Results	23-34
Expiration Dates	23-24
<i>Survey of Other Pantries</i>	23
<i>Government Agencies</i>	23
<i>Contacting Food Manufacturers</i>	23-24
General Operation of the Pantry	24-34
<i>Preparation Day</i>	24-31
<i>Steps of the flowchart process</i>	30-31
<i>Number of Distribution Days</i>	31
<i>Qualifying Criteria</i>	31-34
Discussion	35-38
Expiration Dates	35-37
<i>Scientific Studies</i>	35
<i>Government Agencies</i>	35-36
<i>Contacting Food Manufacturers</i>	36-37
General Operation of the Pantry	37
Surveys	37-38
Conclusions	39-40
Recommendations	41
References	42-44
Appendices	45-47
Appendix A: Mission and Organization of the Stow Food Pantry	45
Appendix B: Numerical Results of Surveys	46-47

LIST OF FIGURES

Figure 1: Maslow’s Hierarchy of needs1

Figure 2: Accessibility to food in 2014 by the population of US2

Figure 3: Examples of various types of food expiration date labels12

Figure 4: Map of 3 of the locations where the Stow Food Pantry stores food15

Figure 5: Results of the survey for the volunteers of other food pantries about expiration dates 24

Figure 6: Final flowchart with weighing area excluded29

Figure 7: Results of the survey for the volunteers of the Stow Food Pantry about increasing the
number of pantry distribution days33

Figure 8: Results of the survey for the volunteers of Stow Food Pantry about referrals34

Figure 9: Results of the survey for the volunteers of other food pantries about referrals34

LIST OF TABLES

Table 1: Processing Times in minutes for canned tomatoes by can size11

Table 2: Survey questions for other pantries about expiration dates18

Table 3: Survey questions asked about an increase in the number of pantry days21

Table 4: Survey questions for Stow Food Pantry volunteers about qualifying criteria22

Table 5: Survey questions asked to other pantries on the use of referrals22

Table 6: Examples of food and their shelf life after labeled expiration date.....25-27

Table 7: Information obtained from various manufacturing companies about expiration dates...28

EXECUTIVE SUMMARY

Food is one of the most important physiological needs of humans. It is therefore necessary to avoid wasting it. The food pantry is one of the many organizations that functions to ensure that supplementary food does not go waste, but is given to the people who do not readily have access to it. Hence, it becomes a serious issue when the same organizations trying to save food face the problem of food waste. For this project, the Stow Food Pantry was used as a case study to help find solutions to the problem of food waste by pantries.

The Stow Food Pantry identified problems such as expiration dates of food, general operation of the pantry, qualifying criteria based on which people can benefit from the services of the pantry, and space and storage as the problems that lead to food waste in the pantry. The overall objective of this project was to find possible solutions to these problems in order to help the pantry minimize the amount of wasted food. Generally, four major methods were used in order to achieve this aim: scientific and government research, creating and testing a new system of procedures for the activities during the food distribution preparation day, contacting food manufacturers and the use of surveys. The main problems tackled were expiration dates and general operation of the pantry. The volunteers in the pantry considered qualifying criteria, and space and storage issues to be lower priorities. Despite this, the research team determined one possible way of solving the problem of qualifying criteria, and partially tackled the problem of space and storage by developing measures that improved material handling.

To investigate food expiration dates, major food manufacturing companies were queried about their views on the consumption of canned foods that have passed their expiration date. Almost all the manufacturers contacted did not recommend that food that has gone beyond the labeled expiration date be consumed. However, none of them made this decision based on the

safety of the food. Each one of them stressed instead the decrease in the quality and freshness of food.

Two main surveys were conducted in this project, and each of them was internet based. These surveys were created using Survey Monkey (www.surveymonkey.com). The purpose of the first was to determine the number of months or years after which canned foods that have passed their expiration date are still distributed in various pantries in Massachusetts, and how much food is wasted in those pantries. The purpose of the second survey was to determine the views of the volunteers of the Stow Food Pantry concerning issues such as the number of pantry operation days, and client eligibility. The surveys were sent to their respective recipients via emails and Yahoo Groups.

At the end of the project, a new system of procedures was created to be used on pantry preparation days to make the work easier and more efficient. A flow chart of this system was designed and tested to make sure it worked as anticipated. The system enhanced the preparation day process by making it simpler and more efficient. Before the new system was introduced, donated food was handled by more than two volunteers before it was stored. The new process streamlined food handling so that no more than two volunteers were involved prior to being sent to storage. This made the preparation day procedures faster thereby saving volunteer time at the pantry.

It was also determined that there is the need for an increase in the number of food distribution days in the pantry through the organization of night pantries. This is necessary so that people in the community who may be in need of assistance but work during the day can also benefit from the services of the pantry. A new qualifying criteria was also developed to provide an easier way of making sure the right people are served at the pantry. This method involved the client filling

and signing a form in the form of an affidavit to show that they are in a position to receive services from the pantry.

It was determined that expiration dates on canned foods had nothing to do with safety, but rather, quality, freshness and flavor. The processes that are used in making canned foods render them free of the effects of any microorganisms that may be present in the raw or cooked material. Hence, canned food is generally considered to be indefinitely safe for consumption, although its quality, flavor and freshness may not be at peak after the can expiration date. Apart from baby food, the only time that one must discard canned food is when the container in which the food is stored has a hole in it, is swollen, rusty, or if the food has a foul odor or unfamiliar color upon opening the can.

From surveys of other Massachusetts pantries, it was determined that most pantries are unaware that canned foods can be consumed for an indefinite number of years after their labeled expiration date. Hence, most of the pantries surveyed (68.42%) discarded such foods at most six months after the label date. From survey comments, only one pantry mentioned they were aware that canned food can be consumed indefinitely. Extension of can food storage will save a lot of food.

In conclusion, this study showed that canned food can be stored indefinitely, operations at the Stow Food Pantry can be efficiently streamlined to save volunteer time, and volunteers are willing and able to work more hours often at night so that more clients can be served.

Introduction

THE NEED FOR FOOD, FOOD INSECURITY, AND CONTROLLING WASTE

According to Abraham Maslow, the first and most important needs of humans, which must be met before any other need, are physiological needs (Maslow, 1943). In his needs pyramid as shown in Figure 1, which shows the hierarchy of needs in ascending order, physiological or physical needs are found at the bottom and comprise the greatest part. This suggests how important these type of needs are. Hence, food which is one of the needs that falls under physiological needs is very important to mankind.

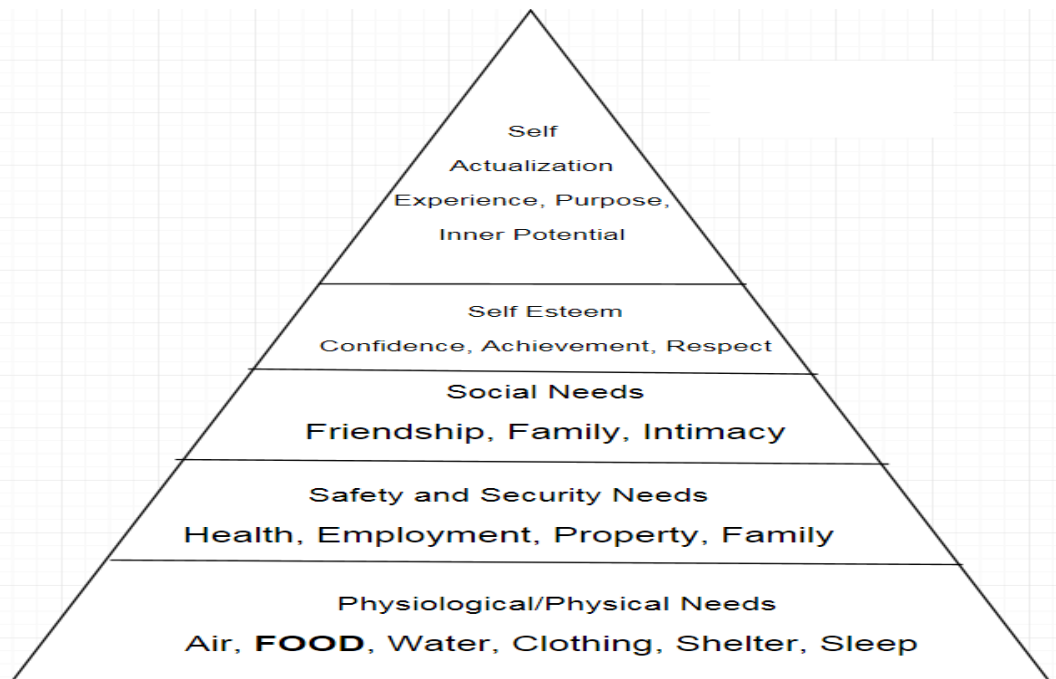


Figure 1: Maslow's Hierarchy of needs

Food refers to any material consisting essentially of protein, carbohydrate, and fat and usually together with supplementary substances (minerals, vitamins, and fiber) used in the body of an organism to sustain growth, repair, and vital processes and to furnish energy. Inadequate access to food can lead to malnutrition, which is a major cause of illness and even death. In all, a

total of 795 million people in the world, equivalent to 10.7% of the population, do not have enough food to lead healthy, active lives, and poor nutrition causes nearly half the deaths of children under five. This is equivalent to 3.1 million children (WFP, 2015). Usually, when most Americans hear of such statistics, they tend to think that it is in reference to the developing world and not so much to the United States of America. It is true that compared to the developing world, the United States is more stabilized as far as food security is concerned. However, a sizable percentage of the population of the US still experiences food insecurity. In 2014, 14% (17.4 million households) of the US population experienced food insecurity and 6% (6.9 million households) experienced severe food insecurity. That is 20% of the population that either did not have any access to food (severely insecure) or did not have enough food (insecure) at any time in the year to provide the minimum amount of food to lead a healthy life. Of the 17.4 million, households with children headed by a single parent, women living alone, African Americans and Hispanic Americans formed the majority. These households either had a low income or an income below the Federal poverty line, which is based on family size and family income (Coleman-Jensen, 2015). For example, for a family of eight, the expected gross yearly income was \$40,090 in 2014.

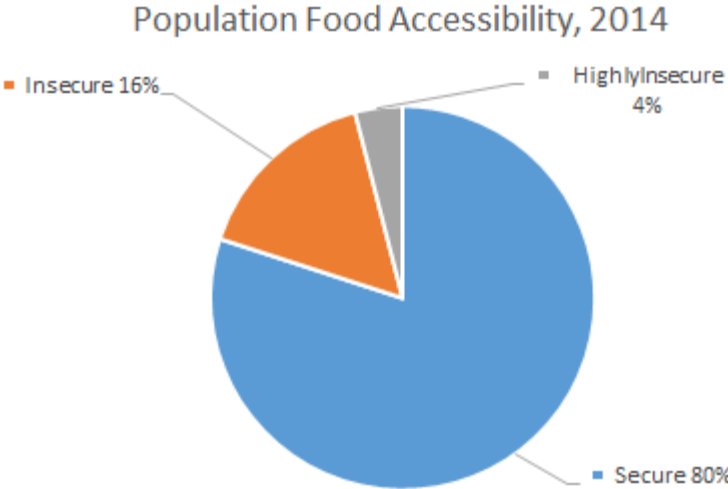


Figure 2: Accessibility to food in 2014 by the population of US

Food shortage that results in food insecurity is experienced in various regions and counties in the United States. Some of the occurrence of the shortage of food is the result of food deserts. Food deserts are defined as counties or communities in the country in which residents must drive more than 10 miles to the nearest supermarket chain or supercenter in order to obtain food. This situation is mostly experienced in rural areas and in the Great Plains and Rocky Mountain regions of the country. Food deserts are also prevalent in certain areas of the Deep South and in the Appalachian region of Kentucky and West Virginia (Morton and Blanchard, 2007). Some of the major characteristics of areas described as food deserts are: large percentages of individuals without a high school degree, high individual and family poverty rates, low median family incomes, large percentages of residents living in sparsely populated areas outside cities, large shares of people who are older owing to the exodus of younger adults (especially those aged twenty to twenty nine), and a higher number of small grocery and convenience stores per capita. In all, there are more than 800 of these food deserts across the country (Morton and Blanchard, 2007).

The US government has over the years instituted programs such as the Supplemental Nutrition Assistance Program (SNAP), Nutrition Services Incentive Program (NSIP), National School Lunch and Breakfast Program (NSLBP), and the Women, Infant and Children Program (WIC), which operate in diverse ways to help reduce food insecurity across the country. SNAP provides nutrition assistance to eligible, low income individuals and households by providing them with a special “debit card” called the Electronic Benefits Transfer (EBT). This card can be used to buy food from some supermarkets, convenience stores and farmers’ markets. The NSIP is specially made for the elderly, and provides grants to states, territories and eligible tribal organizations to help care for the elderly in various home delivered programs (programs that take care of the elderly in reserved houses). The NSLBP operates in most public schools, some non-profit private schools

and child care institutions to provide nutritionally balanced, low-cost or free breakfast and lunches to students. WIC provides various forms of assistance to pregnant or breastfeeding women, non-breastfeeding postpartum women, and children (up to their fifth birthday). Offered assistance includes provision of supplemental nutritious foods, nutrition education and counseling in WIC clinics, and screening and referrals to other health, welfare and social services (USDA, 2015b).

Some private agencies through their own programs also contribute to the effort to provide enough food for every household. Most of these private programs are in the form of food pantries organized by religious groups. Aside from food pantries, the soup kitchen (sometimes called a community kitchen) is one of the popular private programs that provides nutritional assistance. Unlike the food pantries that provide uncooked food, soup kitchens provide cooked food. Many historical food kitchens serve only soup and bread but others serve a variety of food such as rice, beans and meat (Frongillo, 2010). Another program called meals-on-wheels provides food for senior citizens who are sixty years and above, are homebound, and have difficulties in preparing their own food. Cooked food is delivered to their homes. For example, in New York City, 40% of the people who receive this service rarely leave their homes, 25% leave two to four times a week and 35% leave five or more times a week (Frongillo, 2010).

Inasmuch as these organizations try to reduce food insecurity across the US, there is one thing that is problematic and makes the goal of food security for households challenging. This is the problem of food waste. Food waste occurs when wholesome edible materials intended for human consumption are discarded, lost, or degraded in subsequent stages of the food supply chain. The United States Department of Agriculture (USDA) has been trying to reduce the amount of food that is wasted every year through programs such as the U.S Food Challenge, which provides an avenue for leaders and organizations to develop best practices to prevent food waste (USDA,

2015c). There is even a software application called Food Keeper that was designed by the USDA to help consumers store and understand food labels in order to reduce food waste (FMI, 2013). An average family of four leaves more than 2 million calories uneaten each year; this is equivalent to about \$1,500 of food per family. In general, food loss or waste accounts for approximately 31 % (133 billion pounds) of the overall food supply available to retailers and consumers in the US (USDA, 2015c), and causes huge losses of about \$165 billion every year to the American economy (MDH, 2003). It is therefore not surprising that the USDA is doing everything possible to tackle the issue of food waste. However, it is very difficult to reduce food waste, especially in private homes. Most of the means by which organizations are trying to minimize waste are aimed at passing on surplus food that may otherwise go to waste to people who may not have ready access to it due to financial instability or because they live in food deserts.

One of the most vibrant of the social intervention systems that has contributed to increasing food security and decreasing food waste across the country is the food pantry. However, what happens when the agencies who strive to solve the problem of food waste are also faced with the problem of food waste within their operations? What happens when the agencies who want to make life comfortable for people go through situations that hinder their smooth operations?

THE FOOD PANTRY

Food pantries are small agencies that collect, store and distribute food to people who do not have access to enough food to live healthy lives. These agencies are found in almost every community across the United States. Usually, food pantries work together with food banks in the distribution of food. Food banks are larger organizations that store food in greater quantities and

make it readily available to smaller agencies for distribution to people in the community. In other words, food pantries are the channels through which food banks provide services to the people.

According to the Feeding America Organization (previously known as the Nation's Food Bank Network), the concept of food banking was developed by John van Hengel in Phoenix, AZ in the late 1960s. As a retired businessman, van Hengel volunteered to work in a soup kitchen and encountered a woman who was going through garbage to find food for herself and her kids. The lady suggested to van Hengel that there should be a place where food is stored for future use just as money is stored in banks. It was this suggestion that led to the establishment of the first food bank, the St. Mary's Food Bank. After successfully serving the people of the community, other states began taking notice of the St. Mary's Food Bank and the federal government gave van Hengel a grant to assist in developing such banks throughout the country. This led to the spread of food banks across the country and created an avenue for food pantries and other food distribution agencies to acquire food easily for redistribution (FAO, 2015). Food banks are identified as the backbone of food pantries. There are currently more than two hundred food banks in the country with about sixty-three thousand affiliated distribution agencies including food pantries, soup kitchens and meals-on-wheels. This network of foodbanks and food pantries distributes about 2.5 billion pounds of food to Americans each year (USDA, 2013). Food pantries may also obtain the food they distribute through other means such as donations from individuals and businesses in the community, and food drives.

Food pantries, like most establishments face a number of problems, which sometimes hinder their effectiveness. As an operation that involves volunteers, it is expedient to provide well-structured and easy to follow operational procedures in order to streamline the work. This helps to ensure that volunteers feel comfortable working at the food pantry and clients do not feel

intimidated or uncomfortable “shopping” there. For this project, the Stow Food Pantry was used as a case study to try and gather information about the problems that food pantries may face which lead to food waste and to develop possible solutions to these problems. Although the Stow Food Pantry serves its clients very well, it faces certain problems that affect its overall operations, and which, when remedied, would go a long way to make it more effective. The key problems that all lead in one way or the other to food waste and were identified by the leaders of the pantry focused on expiration dates, the general operation of the pantry, qualifying criteria for participation, space and storage.

Problems of the Stow Food Pantry

EXPIRATION DATES

Most, if not all food products, are composed of biological raw materials that spoil and deteriorate over time. Spoiled food then becomes unacceptable because it may cause illness or sometimes death to consumers. Generally, there are three types of food spoilage: physical, microbiological, and chemical spoilage (Steele, 2004). In most cases, food spoilage can occur when there is a change in some factors such as temperature, pH, water activity, exposure to oxygen and light, and nutrients or chemicals available in the food product.

Physical food spoilage is likely to be noticeable to the human eye. Most of the time, physical food spoilage occurs when food is not handled with care. This is very likely during the transportation, handling and distribution processes. Therefore, dry or fragile food such as pasta and cereals may be crushed or may break, fresh vegetables and fruits may be bruised and damaged, and canned foods may have dents, leaks, or may be swollen. When physical damage happens to food including canned food, its color may start changing due to enzymatic browning which is

related to the breaking of the cells of the biological material comprising the food (Steele, 2004). Such damage usually warrants immediate disposal.

Bacteria are one type of microorganism that threaten the food production industry. They are abundant and difficult to control in terms of the enzymes they excrete, which may affect the condition of food. Many bacteria can double as fast as every twenty minutes (Gould, 1997). The most common bacterial risk in the food production industry, especially the canning industry, is *Clostridium botulinum*. *C. botulinum*, an anaerobic spore former, is very resistant to heat, cold, and many chemicals, and can survive temperatures above 212°F. If *C. botulinum* is not destroyed, it can grow in the absence of oxygen and produce a deadly toxin or poison (Gould, 1997). In canned food production, non-acidic types of food, with pH greater than 7.0, undergo pressurized processing over a set time, and temperatures sufficient enough to destroy the spores of this organism. For instance, canned meat in its processing stage is subjected to heat that destroys vegetative microorganisms, some spores and sub-lethally damages other spores. The spores that are not thoroughly destroyed are treated by the combined effect of salt and nitrite (ICMSF, 2005). Although *C. botulinum* will not grow in an acidic environment, acidic foods still need to be pressure and temperature processed to destroy other microorganisms that may be present. Also, if it happens that toxins are produced before or during the process of destroying these organisms, some can be deactivated by boiling temperatures (ICMSF, 2005).

Besides physical and microbiological spoilage, there is chemical food spoilage which occurs due to chemical reactions that take place between different components of food such as proteins, lipids, and carbohydrates. The chemical reactions that lead to food spoilage depend on factors such as glass transition temperature and water activity. Each factor behaves differently in the way it affects chemical reactions. The glass transition temperature of a product is the

temperature required to change a product from its glassy state to a rubbery state depending on its moisture content and composition. Glass transition temperature plays a major role in food spoilage. For example, when crispy crackers are stored in high humidity environment, they reach their glass transition temperature state and become soft. On the other hand, cakes are moist but tend to lose that moisture when they reach the glass transition temperature state, and therefore become glassy or hard. Water activity is the equilibrium relative humidity for a product divided by 100. For products like bread, moisture can cause the product to become stale. This makes the crumb dryer, moisture moves from high to low water activity, and the crust becomes tougher (Steele, 2004).

The need to make food last longer has existed for millennia and dates back to fermentation of fruits, milk and wine. For many years, people used various indigenous means such as sun drying and smoking to preserve food. However, these methods usually kept the food for only a limited amount of time, e.g. over a winter. In 1795, the French Directory realized the need for a better method of food preservation for their military. Through the Society for the Encouragement of Industry, an award of 12,000 francs, was offered for a breakthrough in the preservation of food. Fourteen years later, Nicolas Appert, who had worked for the French nobility, won the prize after developing the method known today as canning. Appert's discovery either removed air or preserved food by heat but could not do both (Nummer, 2002).

Today, the processes used in producing canned foods are improved from Appert's original method because besides the simultaneous removal of air and preservation by heat, our knowledge of how food spoils has vastly improved. Other processes have been designed to totally eliminate the effects of microorganisms. For instance, the canning of whole peeled tomatoes goes through a long process to make sure the final product meets all expectations and requirements such as quality, taste, and more importantly, to insure safety for consumers. The steps taken to make canned whole

tomatoes are: filling, use of firming agents, acidification, exhausting, and application of high temperatures in the form of heat (Downing, 1996).

Filling is the process by which the cans that contain the whole tomatoes are made. Usually, this process is done using mechanical machinery, and the cans are made with the 75-25 differential electrolytic tinplate with enameled bodies and ends, high tin fillet (HTF) side seam, and an inside side seam stripe of enamel. The cans are first passed through huge containers and sprinkled with salt along with other ingredients, then, a small portion of acid is added to reduce the pH of the product.

The next step is adding the tomato juice by volumetric fillers and then the peeled whole tomatoes are added. During this process, the weight of the can and its contents, the pH level, and the ingredients are carefully monitored. When placed under high temperature, tomato tends to lose its texture and becomes soft. Therefore, small amount of firming agent is added to the tomato in order to keep it firm. Some firming agents that have been approved by the Food and Drug Association (FDA) are: purified calcium chloride, calcium sulfate, monocalcium phosphate, or the combination of any two not to exceed 0.045% of the entire product. The use of firming agents is required by law to be declared on the can label. The tomatoes are then acidified to bring down the pH level of canned tomatoes during sterilization to 4.3 or lower by adding edible organic acids, e.g. citric acid. The cans then go through the process of exhaustion to keep them from spoiling during storage. Exhaustion is done to increase the temperature of the can and eliminate trapped gases. This also helps tomatoes pick up heat easily when the can moves into the heat application stage since solid tomatoes need time to heat. Usually, the exhaust temperature is between 190°F and 200°F (Downing, 1996).

The next step of the production cycle involves the application of heat. This process eliminates any microorganisms that may be present in the product, and the heat applied depends on the size of the can. Shown in Table 1, are various sizes of cans that are used and the amount of time it takes to process.

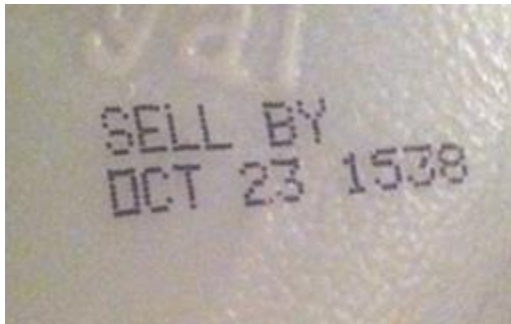
Table 1: Processing Times in minutes for canned tomatoes by can size (Downing, 1996).

Can Size	Still Retort @ 212°F/100°C		Agitating Cooker @ 212°F/100°C	
	Water Cool	Air Cool	Water Cool	Air Cool
303x406	45	35	14	9
307x409	45	35	14	9
401x411	55	45	18	13
603x700	100	80	25	20

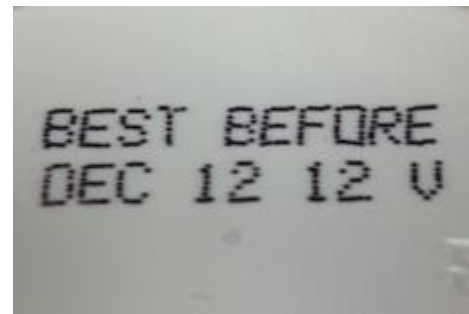
It is important to consider the issue of expiration dates when distributing food to a large population. Food that is too old to be consumed could do greater harm than the intended good. It could lead to sickness and possibly, death. Such instances of sickness or death could lead to a complete shutdown of food pantries. Hence, food pantries usually set up rules to guide what food is good for consumption and what is not, usually based on expiration dates. In the Stow Food Pantry, there is a six month grace period for which canned food that has passed its expiration date could still be consumed. As a result, the pantry throws away food that might be perfectly fine for consumption. For instance, if someone donates a can of food that is passed its expiration date by six months, the current policy requires that the food be discarded. Determining how long such foods can be kept and still be safe for consumption was one aim of this project.

Date labels come in various forms including “use by,” “best before,” “sell by,” and “enjoy before” dates (Figure 3), yet these dates are poorly understood. Some products even have two or more of these dates at a time. “Best before” and “Enjoy before” dates serve to notify consumers of when the quality and taste of food start to decline. “Sell by” dates notifies the retailers of when to

pull food off the shelves (Wong, 2013). A thorough understanding of these dates is essential to deciding what rule should be instated to regulate consumption safety.



Sell By Date Label



Best Before Date Label



Two Date Labels on One Product



Use By Date Label

Figure 3: Examples of various types of food expiration date labels.

There is also the issue of freezing of food; different product dates for various food products need to be taken into consideration when these rules are being set. Most perishable foods are temperature sensitive and their shelf life is therefore a function of the product characteristics, conditions under which the product is maintained, and time (Wang, 2012). In other words, food can be kept from expiring by freezing, but different types of food have a different number of days for which they can be kept frozen or even refrigerated and still be safe for consumption. For

example, soups and stews can be kept frozen at 0°F for two to three months, while processed bacon can be kept at the same temperature for up to one month (MDH, 2007).

QUALIFYING CRITERIA

For every social intervention, there is the need for a set standard to ensure that the program serves the right people. This is not an easy task since it has to do with people being honest, and a client might be intimidated if their need qualification analysis is not properly done. The purpose of the food pantry is to provide food for the people within the community who do not have access to enough food. As such, most pantries put in place qualifying criteria to determine the individuals with legitimate needs to access the pantry. For the Stow Food Pantry, a person needs a recommendation from either a clergyman, social worker or anyone who can vouch for a client's need before they will be allowed to access the pantry. The problem with the recommendation is that not everybody will be able to get one. Hence, there may be people who are genuinely in need of the services of the pantry, but without a recommendation, are denied access. For example, some pantries require the recommenders to give referrals to clients who provide documentation such as proof of income, to prove that they are really in need. However, not all clients may be able to provide such documents. Although the food pantry makes provision for such people by giving them particular food items, they may end up getting items they do not need and not getting items that they desperately need since they do not have a choice. Some other pantries organized by religious groups require the recommenders to give referrals to people who belong to the group or take part in the activities of that religious group. This makes it even more difficult for people who do not belong to any of those religious groups to get a recommendation.

The system of providing a recommendation also generates an issue of uncertainty since the clients may not be well known to the clergymen and social workers. This uncertainty invalidates the whole point of the qualifying criteria because people can still circumvent the system. It also puts the recommenders in a very difficult situation if they do not know the client seeking the recommendation too well. They feel compelled to give such clients a recommendation since it will be difficult to reject someone who seems in need. All of these considerations affect the number of people who could potentially benefit from the pantry. Furthermore, food that could be given to people who may really need it, may expire and be discarded. Thus, food waste and qualifying criteria requirements can be linked together.

SPACE AND STORAGE

Most food pantries are normally organized in the basement or vestry of churches. These vestries are usually small and do not provide the optimum needed space for the pantries to operate. As a result, there are often inconveniences that lead to the pantries not functioning to their fullest potential. For example, the Stow Food Pantry uses four different places for its inventory: a private residence, St. Isidore's Church, Council on Aging, and the First Parish Church (Figure 4). First Parish is the distribution site, so the diversity of storage sites causes inconvenience in the coordination of the pantry, and transportation of the products to the main pantry site becomes difficult. Some pantries, like the Stow Food Pantry, compromise and try as best as they can to meet the needs of the people despite all the problems they face. Other pantries remain in whatever space they can find to perform their operations.



Figure 4: Map showing 3 of the 4 locations where the Stow Food Pantry stores food (Designed with Google Maps). St. Isidore Church (left), Council on Aging (middle), and First Parish Church (right)

When a food pantry gets too much food, especially perishable foods, and is not able to distribute all within a particular time, waste may increase. For pantries with small infrastructure, this becomes very challenging. Such pantries have to take in these donations, since rejecting them might drive away donors. However, the pantry has no more storage space, and the extra food is reluctantly discarded when it is deemed bad for human consumption or there is no room for storage.

There is also the problem of storing foods that need refrigeration or freezing. Since huge refrigerators and freezers cannot fit into places like the vestry of churches, most food pantries have to resort to external places to store foods that may not fit in the small refrigerators they have. This is very inconvenient and causes volunteers to do extra work. The vestry used by the Stow Food Pantry happens to have a rock wall foundation that is cool and has been used to store some foods such as onions, carrots, and some fruits. This is not the best place for storage, however, because mice intermittently come in and feed on the food. This leads to extra expenses for vermin

extermination by a pest control company and extra checking for rodent damaged food. The high cost of refrigeration also adds to these expenses.

GENERAL OPERATION OF PANTRY

Since everyone who works in the pantry is a volunteer, it is necessary to structure the operation of the pantry so that the work will be easy to do. Every volunteer that offers to help at the food pantry takes time off their otherwise busy schedules to help. As Theophrastus said, “Time is the most valuable thing a man can spend” (Alan, 2002). It is better to streamline the operations of the pantry so that they are undertaken within the allocated time than to go beyond it.

Most pantries get new volunteers during either pantry preparation days or distribution days; some become regular workers. When the operation of the pantry is fairly simple and easy to follow, new volunteers find it easy to learn the procedures and that makes them more effective. Otherwise, these volunteers tend to ask questions at every stage, which slows the work flow. The work would be much easier if just by entering the pantry one could know what exactly to do without asking too many questions. This would make it easy not only for the volunteers, but also for the clients because they would not have to spend too much time at the pantry on distribution days.

OBJECTIVES

The main goal of this project was to research and develop measures that could be put in place to ensure that food waste at the Stow Food Pantry is greatly minimized. This project was done so that the measures developed could be used by other pantries that may be in situations similar to those in Stow.

METHODOLOGY

At the beginning of the project, we visited the Stow Food Pantry a couple of times on days that volunteers were preparing the place for the distribution day, and also on the distribution day. It was on one of these days that we had our first meeting with the volunteers of the pantry. At this meeting, the volunteers were asked to choose the most critical problems they thought needed the most immediate attention. The team mainly focused on two major problems: expiration dates, and general operation of the pantry.

EXPIRATION DATES

Four major activities were used in understanding the issue of food expiration and to develop better rules to guide volunteers and clients to make the right decision about food distribution in the pantry: gathering information in food science from scientific studies, gathering information from government agencies, contacting other food pantries, and contacting food manufacturers.

Scientific Studies

To make good decisions about expiration dates of food, it is necessary to obtain information that will validate changes in storage decisions made at the pantry. The research team used databases accessible at the George C. Gordon Library and via Google Scholar to establish known scientific facts about food spoilage, its effects on food, and to find out if there are any processes used in the canning of food that makes the food not susceptible to spoilage.

Government Agencies

One of the most important places to investigate any potential social intervention is the government and its major institutions. Information on expiration dates was gathered to see if the

grace period of six months could be extended. This research was in the form of searching the internet to find government documents or articles that discussed food expiration dates. We also communicated with a representative of the United States Department of Agriculture (USDA) through their online chat system called, “Ask Karen”, and asked about their stand on the consumption of canned foods that have passed their expiration dates. A reference chart was developed to help volunteers determine how long different food categories could be consumed after their label expiration dates.

Contacting Other Pantries

Other pantries already may have faced and found solutions to some of the problems identified by the Stow Food Pantry. Hence, a survey was designed and sent out by email to pantries mostly across Massachusetts to seek their view on food expiration dates and to learn what procedures are being used at those pantries. In the survey, participants were asked to indicate after how many months expired canned food could be consumed in their pantries, and the relative amount of canned food that is discarded (Table 2).

Table 2: Survey questions for other pantries about expiration dates.

Questions	0 - 3	4 - 6	7 - 9	10 - 12	More than 12	N/A
After how many months are expired canned foods kept for distribution to clients after their expiration date in your pantry?						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
A lot of canned foods are thrown away at my pantry.						

Contacting Food Manufacturers

It is important to consider food manufacturers when it comes to food expiration. They establish their product dates, so they are one of the best groups to consult. Six major food production companies were contacted: General Mills, Heinz, Vaneer Foods, Dole Food Company, Kraft Foods, and Tyson Foods. These companies produce foods for breakfast, lunch, and dinner. Contacting these companies involved calling them and speaking to their representatives. The purpose of contacting the food manufacturers was to determine if they would recommend consuming their products after an expiration date has passed. Emphasis was placed on canned goods since that was of greatest concern for this project.

GENERAL OPERATION OF THE PANTRY

As far as the operation of the pantry was concerned, we investigated changes that could be made in the operation of the pantry to make its activities more organized while also not wasting food. Three major operations of the pantry were examined: the preparation day, the number of food distribution days, and qualifying criteria for clients to receive services from the pantry.

Changes in Preparation Day Procedures

To understand and experience what occurs during pantry preparation day, we visited the pantry on two different occasions. We identified a need for more organization of procedures that the volunteers followed. We realized that the food passed through the hands of quite a number of volunteers before it entered the storage room. There was also no specific place that was allocated for some of the activities of the preparation day, and this caused volunteers (especially new volunteers) to be confused about food that was placed at certain places. As a result of this, there

seemed to be more procedures than sorting, date-checking and storing of food. The task at hand was to provide a more structured process that would combine some of the procedures and create stations where each of the procedures would take place so that each food item is handled once after receipt from donors. To make preparation for the food distribution day faster and more efficient, a flowchart was designed to show various stations and describe which procedure was to be undertaken at each station. This process chart was shared with the pantry volunteers and revised with their feedback. Subsequently, the new sorting process was tested and further feedback obtained from pantry volunteers.

Number of Food Distribution Days

The Stow Food Pantry has only two food distribution days per month. Hence, there was a suggestion to extend the days to three or four so that more food could be distributed before it had to be discarded. During the first meeting that the team had with the volunteers of the pantry, it was noted that the issue of increasing the number of pantry distribution days is complicated because the pantry is organized in the vestry of a church that has its own programs. As such, increasing the number of pantry distribution days was given a lower priority. We were told that the Stow Food Pantry had been able to acquire a new place where they would move in the summer of 2016. The team therefore went ahead and did a brief online survey of the pantry volunteers. The survey was done using a survey maker called Survey Monkey on the website: www.surveymonkey.com. The purpose of the survey was to determine if volunteers would work more days, and if they thought the number of food distribution days had to be increased. They were also queried on their overall thoughts about increasing the number of days food is served at the pantry.

This survey was conducted in consideration of the pantry move into its new location. That way, the leadership of the pantry will have a good idea of how many food distribution days they can support. Questions asked of the volunteers are shown in Table 3.

Table 3: Survey questions asked about an increase in the number of pantry days.

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
The volunteer work at the pantry is meaningful to me.						
I would volunteer more days if the pantry extend its days of operation.						
The pantry can accommodate an increase in the number of pantry distribution days.						
Please indicate in the box any comments you have about the number of pantry distribution days.						

Qualifying Criteria

Finding out if a client really needs or deserves to use the pantry is a challenge. Care must be taken so that clients do not feel offended or leave with a negative view of the pantry.

The pantry identified the problem caused by using referrals as the criteria for admitting clients as a low priority one. However, the team also surveyed the volunteers of the pantry and other surrounding pantries to gather data on the value and use of referrals. For the surveys sent to other pantries, the main aim was to understand the different qualifying criteria that are used and to see if one or more of them can be adopted by the Stow Food Pantry. The survey questions are shown in Table 4 and Table 5.

Table 4: Survey questions for Stow Food Pantry volunteers about qualifying criteria

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
I think clients should show proof of their eligibility to receive the services of the pantry through referrals.						
If you think referrals should not be used to show clients' proof of their eligibility, please provide a suggestion of any other way apart from referrals.						

Table 5: Survey questions asked of other pantries on the use of referrals.

Questions	Yes	No	No Idea	N/A		
In my pantry, referrals are used to determine the eligibility of clients to receive services.						
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
I think clients should show some form of proof of their eligibility to receive the services of the pantry.						
If your pantry does not use referrals, please explain briefly in the box provided how you handle the issue of eligibility of clients to receive services from the pantry.						

RESULTS

EXPIRATION DATE

Survey of Other Pantries

Results from the survey of various food pantries in Massachusetts about expiration dates of canned foods show that most of the pantries surveyed (thirteen out of nineteen, 68.42%) have a grace period between zero and six months within which canned foods whose expiration dates have passed may be consumed. Four of the pantries (21.05%) have a grace period above ten months (Figure 5a). Despite this, most of them (thirteen out of nineteen, 68.42%) disagreed that they discard a lot of canned food (Figure 5b).

Government Agencies

Table 6 shows data on various types of foods and the time period (grace period) within which they can still be consumed after their expiration date. This information was obtained from food guides from the Greater Pittsburgh Food Bank and the Greater Boston Food Bank. The table shows food stored in three different conditions: at room temperature, cool, and frozen. “Not available” is used for some of the foods that cannot be stored in a particular condition. For example, since baby formula must be kept either dry or cool, no grace period is given for it in a frozen condition. It can be observed that most foods have different grace periods under different conditions.

Contacting Food Manufacturers

Table 7 summarizes the responses of the six food manufacturing companies that were contacted about food expiration dates. Out of the six companies, only one gave a grace period (six months) after which canned food that has passed the date on its expiration date label can be

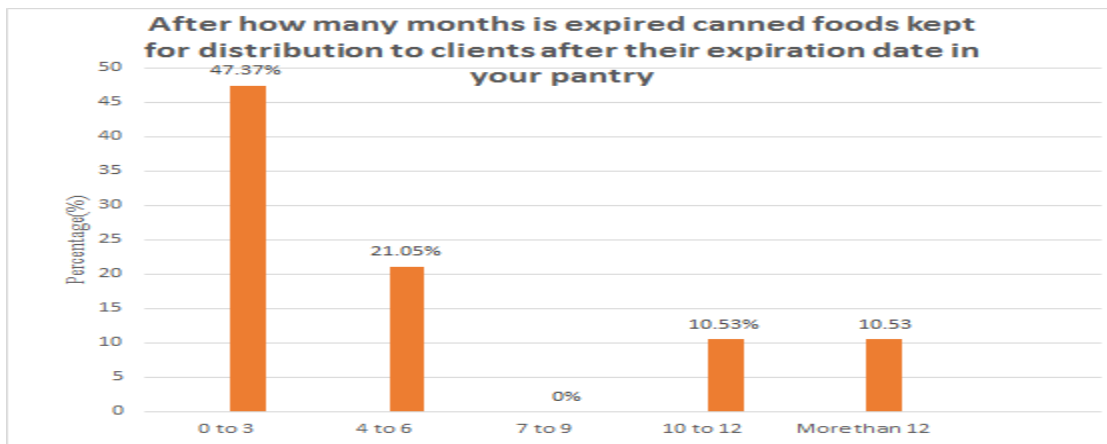
consumed. The five companies that did not encourage the consumption of such foods based their decision on a decrease in quality, freshness and flavor of the food, but not on safety.

GENERAL OPERATION OF THE PANTRY

Preparation Day

In the newly developed pantry preparation day procedure, donated foods are to be date checked, sorted, and then sent to the storage room to be stored (Figure 6). There should be between

(a)



(b)

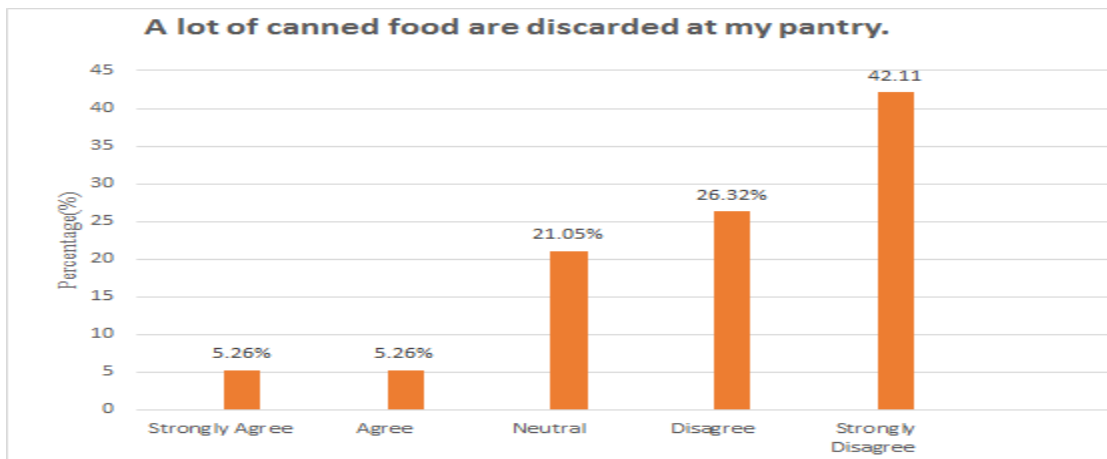


Figure 5: Results from 19 out of 40 pantries (47.50% response) in Massachusetts who were surveyed about expiration dates.

Table 6: Examples of food and their shelf life after labeled expiration date.

Food	Room Temperature	Cooler	Freezer
Baby Food & Formula	Expiration date	Expiration date	N/A
Baking mix (e.g. brownie, cake, muffin)	18 months	N/A	N/A
Baking soda	Indefinite	N/A	N/A
Beans - Canned	3 years	3-4 days after opening	N/A
- Dry	2 years	N/A	N/A
Beverage - Liquid	9 months	3 weeks	2 years (concentrated juice)
- Powder	2 years	N/A	N/A
Bouillon (e.g. beef, chicken, or vegetable)	2 years	N/A	N/A
Bread	5 days (wrapped, no mold)	N/A	5 months
Bread Crumbs	1 year	N/A	1 year
Bread Stuffing	1 year	N/A	1 year
Butter	N/A	3 months	1 year
Candy - Caramel	9 months	N/A	N/A
- Chocolate	18 months	N/A	N/A
- Hard	36 months	N/A	N/A
Casserole Mix	1 year	N/A	N/A
Cereals	1 year	N/A	1 year
Cheese - Cottage, Cream	N/A	2 weeks	N/A
- Hard	N/A	6 months	8 months
- Processed	N/A	4 weeks	6 months
- Soft	N/A	2 weeks	6 months
Coffee - Ground (Whole beans)	4 months	N/A	N/A
- Instant	1 year	N/A	N/A
- Ready to drink, Canned	9 months	N/A	N/A

Food	Room Temperature	Cooler	Freezer
Condiment - Mayonnaise, Cream sauce, Tartar sauce - Mustard, Ketchup, Relish - Salad Dressing, Commercial Bottled	1 year 6 months 1 year	2 months after opening Expiration Date 3 months after opening	3 months 3 months N/A
Cornmeal	1 year	N/A	2 years
Crackers - Graham Crackers - Other Crackers	2 months 8 months	N/A N/A	N/A N/A
Cream - Half & Half - Heavy - Light	N/A N/A N/A	4 days 10 days 1 week	4 months 4 months 4 months
Cream sauce (Canned)	3 years	N/A	N/A
Dough	6 months	Expiration date	6 months
Eggs - In shell - Pasteurized	N/A N/A	5 weeks 10 weeks	N/A 1 year
Fruits - Dry - Canned	6 months 2 years	N/A N/A	N/A N/A
Fish (Canned)	3 years	N/A	N/A
Grain (e.g. dry pasta, rice)	2 years	N/A	N/A
Gravy, Soups (broths that are not tomato based)	3 years	N/A	N/A
Macaroni and Cheese, mix	12 months	N/A	N/A
Meat - Canned - Poultry - Seafood - Other Meats	3 years 180 days N/A 1 year	N/A Expiration date N/A N/A	N/A 9 months 10 months 6 months
Milk	N/A	1 week	3 months
Non Dairy Milk	6 months	6 months (unopened)	3 months (unopened)
Nuts	12 months	N/A	N/A
Nutrition Supplement (e.g. Ensure or Boost)	90 days	Expiration date	N/A
Oatmeal	12 months	N/A	N/A

Food	Room Temperature	Cooler	Freezer
Oil	6 months	N/A	N/A
Pancake	9 months	N/A	N/A
Pasta (Canned)	3 years	N/A	N/A
Peanut Butter	2 years	N/A	N/A
Pie filling (Canned)	3 years	N/A	N/A
Pickles (Canned)	2 years	N/A	N/A
Sauces and Syrups: - Spaghetti sauce (canned/jarred)	18 months	N/A	N/A
- Chocolate, Corn, and Pancake syrups	2 years	N/A	N/A
- Worcestershire sauce	2 years	N/A	N/A
Sauerkraut (Canned)	2 years	N/A	N/A
Snack (e.g. chips, granola bars, packaged cookies)	4 months	N/A	60 days
Spaghetti sauce (Canned)	18 months	N/A	N/A
Stews (Canned)	3 years	N/A	N/A
Sugar: - White	2 years	N/A	N/A
- Brown	18 months	N/A	N/A
Tomatoes, tomato-based soups and sauces (Canned)	2 years	N/A	N/A
Tofu	6 months	N/A	5 months
Vegetables (not tomatoes) - Canned	3 years	N/A	N/A
- Frozen	N/A	N/A	8 months
Yogurt	N/A	2 weeks	2 months

Data Obtained from GPCFB (2013) and GBFB (2015).

three and ten volunteers at each sorting area depending on the number of volunteers present. Posters will also be posted at various locations with arrows on them to direct volunteers, especially new ones, as to what to do at each stage.

Table 7: Information obtained from various manufacturing companies about expiration dates.

Food Company/Foods Produced	Grace Period after Canned Food Expiration Date	Reason for Period Given
Company 1 (cereals, snacks, soup)	Do not use after expiration date	Cannot guarantee freshness and quality.
Company 2 (ketchup, mustard)	Do not use after expiration date	Freshness and flavor are at their peak up to the expiration dates on canned food.
Company 3 (fruits, salads)	Do not Use after expiration date	All of our canned foods have a shelf life of 3 years.
Company 4 (gravies, sauces, broths)	Six months	Cannot guarantee freshness after that period.
Company 5 (meats, cheese, sauces, mayonnaise)	Do not use after expiration date	The freshness of food decreases after its expiration.
Company 6 (meats, stews, salads)	Do not use after expiration date	Cannot guarantee the quality of food.

It was also observed that the sorted food was put on tables and later sent to the storage room. Upon talking to the coordinator of the pantry about this, a suggestion was made to use five bins with labels on them instead of just putting the items on the tables. The five bins are to have the labels as follows: cereal/pasta, canned goods, domestics, expired/discards (over the given grace period), and out of date (within the given grace period). Food that does not have an expiration date on it or is not regularly donated to the pantry is considered miscellaneous. Such items are date checked and put on a “pick cart.”

STOW PANTRY PREPARATION DAY FLOW CHART

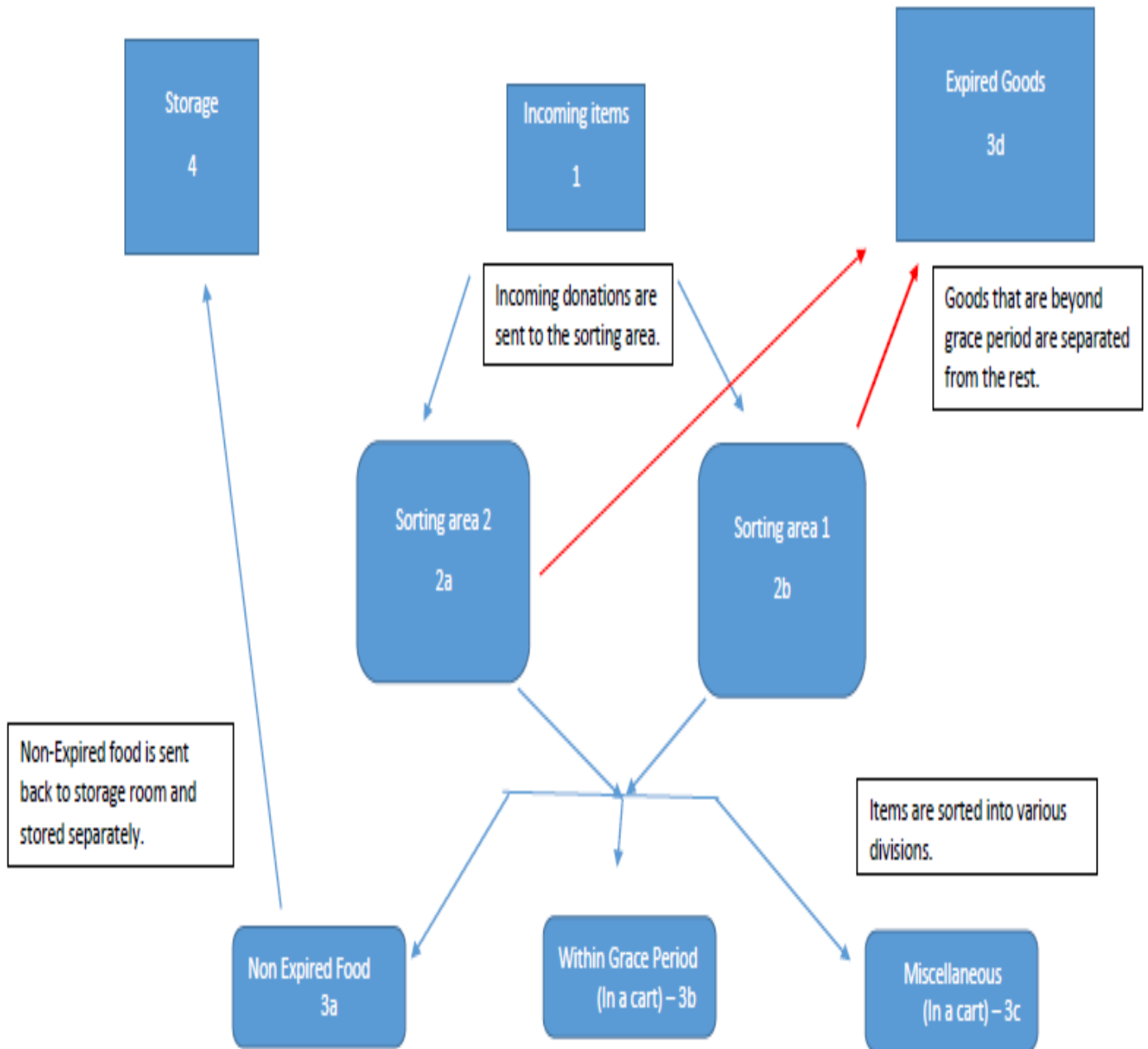


Figure 6: Final flowchart with weighing area excluded.

The flowchart was tested on one of the pantry's preparation days in order to find out if there was the need for any adjustments. The team visited the pantry on two occasions to see how well the new process would work. On the first visit, there was not a lot of food to be sorted because one of the distribution days had been postponed and took place the week before we visited. However, the second visit was fruitful because there was more food to be sorted and the steps in the flowchart were used. During testing of the sorting process flowchart, the food items were sorted into five cardboard boxes labelled as: cereal/pasta, canned goods, domestics, expired/discards (over the given grace period), and out of date (within the given grace period). These served as transport bins. One problem that was identified about the process was time delays between sending the filled boxes to the storage room and bringing them back after they were emptied. When the boxes were full and then sent to the storage room to be emptied, there were no other containers into which the food would be sorted. However, the whole process made the overall preparation time shorter and more efficient.

Contrary to previous visits where there seemed to be a lot of activities at the same time and people asking lots of questions, the volunteers seemed to have accommodated the new sorting process. The only thing that sometimes confused some of them was in which box to place some of the food items.

Steps of the Flowchart Process

1. All donations are sent to the sorting area one or two to be sorted.
2. Volunteers at the sorting area date-check them and then place them in the appropriate sorting bins.
3. Once the bin is full, a volunteer carries it to the appropriate station where each item is placed in its appropriate location.

4. When a bin is emptied, the volunteer brings it back to the sorting area and the process is repeated from step one.

Number of Distribution Days

Results from a survey of Stow Food Pantry volunteers about food distribution days showed that 100% of the volunteers are happy with the work they do at the pantry (Figure 7a). Thirteen out of twenty seven volunteers (48.15%) agreed to work more days if the pantry extends the number of days of operation, eight (29.63%) were neutral, and six (22.22%) of them disagreed with adding more days (Figure 7b).

Also, of twenty five volunteers, eight (32%) think that the pantry can accommodate an increase in the number of food distribution days, sixteen (64%) were neutral, and only one (4%) disagreed (Figure 7c). In their comments, some of them (six out of seventeen) suggested the inclusion of a night pantry to give opportunity for other low income workers who work during the day to participate in the pantry.

Of the thirteen who agreed to work more days, five agreed that the pantry could accommodate an increase in the number of pantry days, none of them disagreed, seven remained neutral, and one skipped the question. Of the eight that were neutral about working more days, three agreed that the pantry can accommodate an increase in the number of pantry days, none of them disagreed, four remained neutral, and one skipped the question. Of the six that disagreed to working more days at the pantry, none of them agreed that the pantry can accommodate an increase in the number of pantry days, one of them disagreed, and five of them remained neutral.

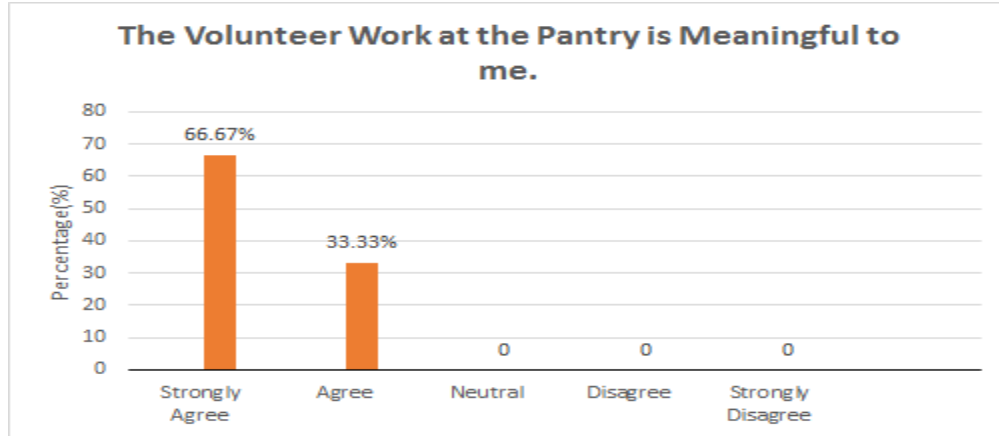
Qualifying Criteria

Results from a survey of volunteers at the Stow Food Pantry about client qualifying criteria showed that eighteen out of twenty-seven (66.66%) think that clients should show proof of

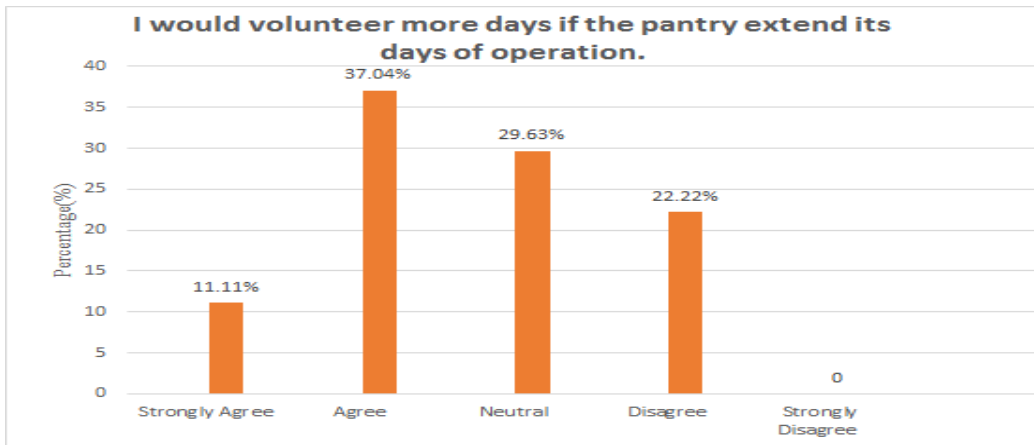
eligibility to receive the services of the pantry through referrals, five (18.52%) of them were neutral, and four (14.82%) disagreed (Figure 7). Results from the survey of various food pantries in Massachusetts about client eligibility showed that the number of pantries that require referrals (eight out of nineteen, 42.11%) is very close to the number that do not (eleven out of nineteen, 57.89%) (Figure 8a). Also, nine out of nineteen (47.37%) of the volunteers who responded to the survey agree that clients should show some form of proof of their eligibility to receive service of the pantry (Figure 8b).

For the pantries that use referrals, the volunteers either agreed (five out of eight) or remained neutral (three out of eight) about the use of referrals. Of the pantries that use referrals, the volunteers of five of them agreed to the use of referrals, while for three of the pantries, the volunteers were neutral. Also, for four of the pantries that do not use referrals, a majority of the volunteers agreed that referrals should be used. Another three, however, thought that referrals should not be used. The remaining volunteers from the other four pantries remained neutral about the issue.

(a)



(b)



(c)

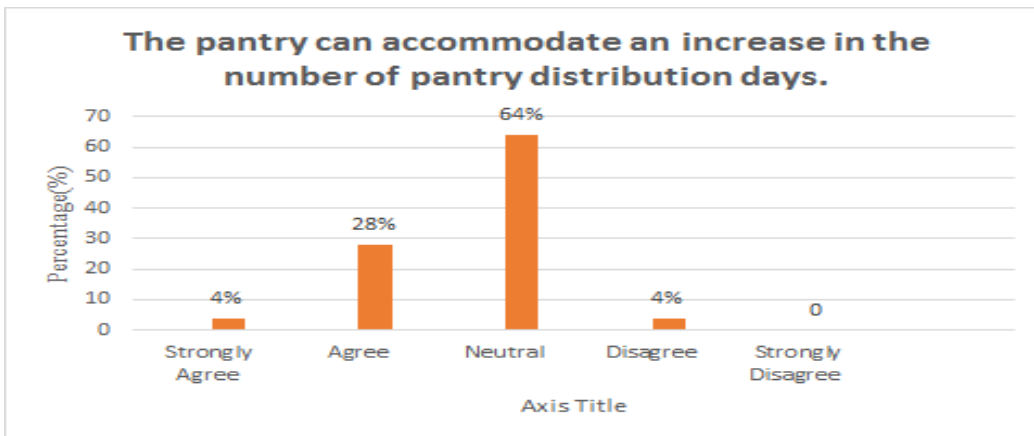


Figure 7: Results from 27 out of 34 (80% response) volunteers of the Stow Food Pantry who were surveyed about increasing the number of pantry distribution days.

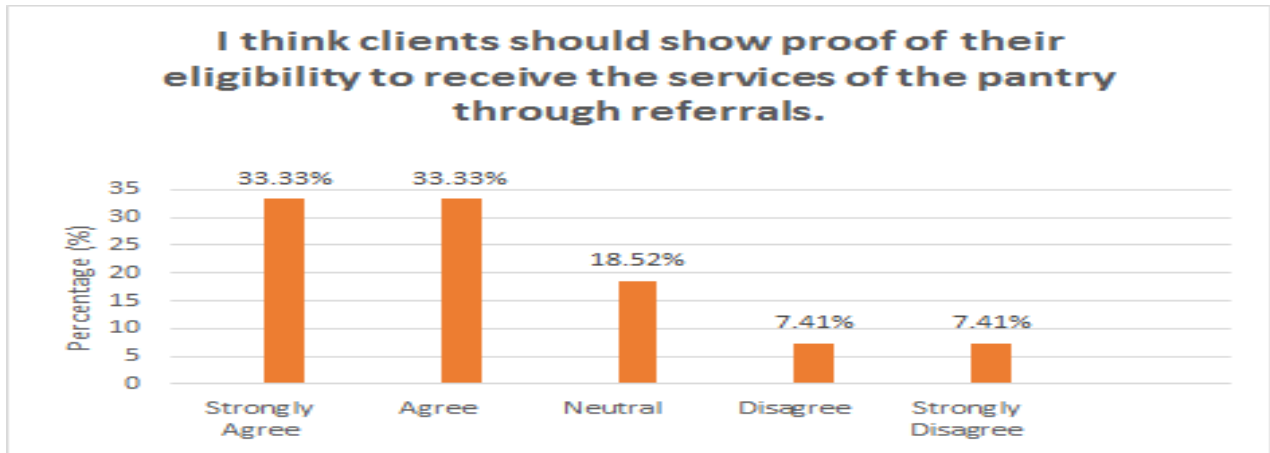
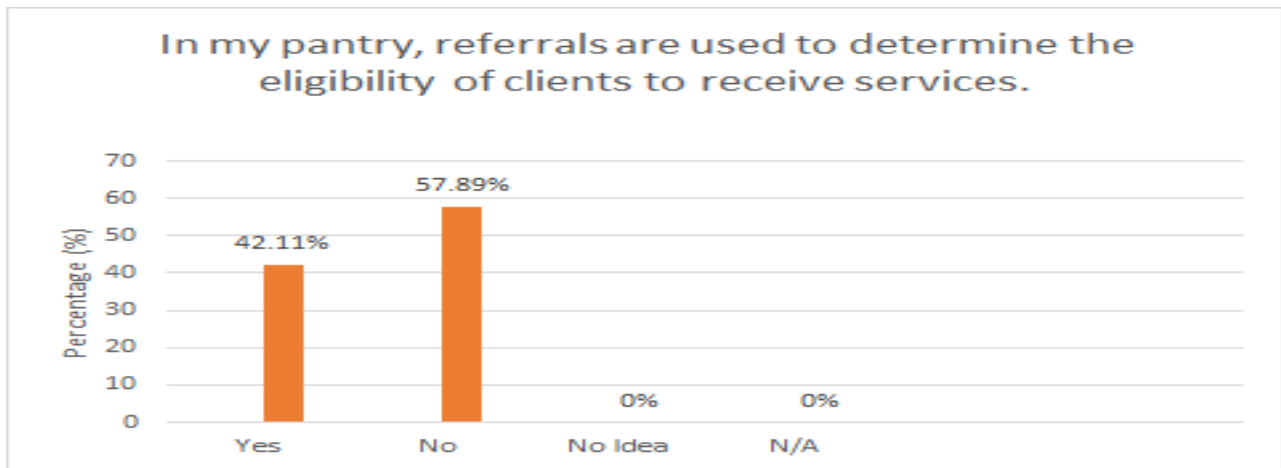


Figure 8: Results from 27 out 34 volunteers (80% response) of the Stow Food Pantry who were surveyed about referrals.

(a)



(b)

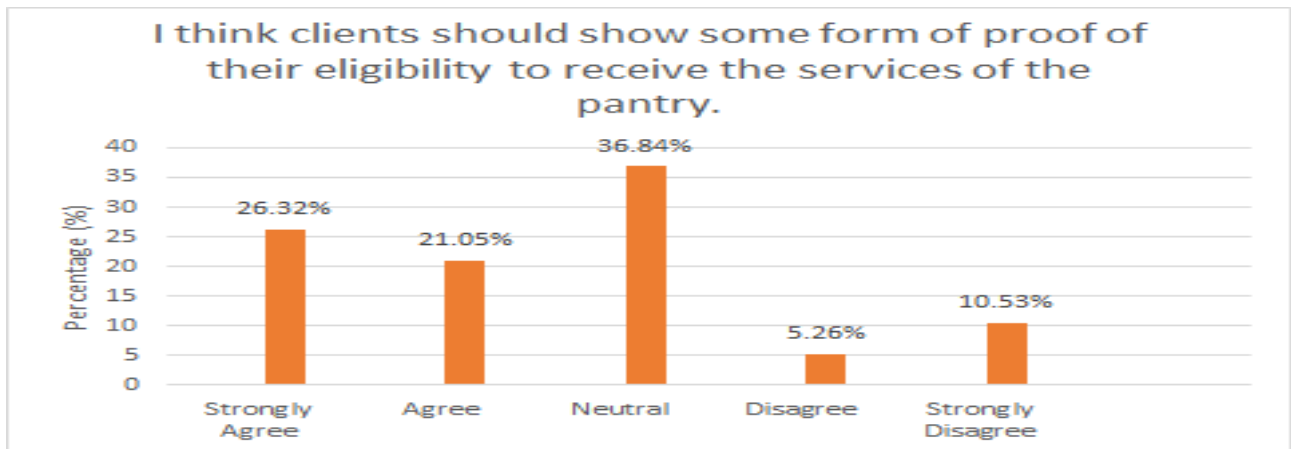


Figure 9: Results from 19 out of 40 pantries (47.50% response) in Massachusetts who were surveyed about client eligibility.

DISCUSSION

EXPIRATION DATE

Scientific Studies

Canned food manufacturing requires careful step-by-step procedures in order to produce food that will last for a long time. The procedures that are used in the production of canned foods are aimed at producing a product with high quality, flavor and freshness. However, these qualities begin to decline with time. As far as safety is concerned, if a container of canned food is intact and does not have any dents, holes, rust, or is not swollen, it is perfectly fine to consume regardless of the expiration date.

Government Agencies

The United States Department of Agriculture states emphatically on their website that ***“canned foods are safe indefinitely as long as they are not exposed to freezing temperatures, or temperatures above 90 °F (32.2° C)”***(USDA, 2015a). The only exception given was for baby formula, which is to be discarded if it is expired. There are no federal regulations that demand food manufacturers have expiration labels on the food they produce. However, many states do require food products to have expiration dates on labels with a brief statement that says “use by”, “best if used by”, or “use before.” Baby formula is the only product that federal regulations require an “expired by” date. Misunderstanding of the date labels that are printed on canned food as well as other types of food has caused many consumers to discard a lot of food, some of which might have been in a perfectly good condition for consumption. Below are the definitions of some of these date labels:

- A "Sell-By" date tells the store how long to display the product for sale. You should buy the product before the date expires, or else it will be removed from sale. This type of label

is mainly seen on refrigerated foods such as milk, yogurt, cottage cheese, eggs, lunch meat, and packaged salad mixes (MDH, 2003).

- A "Best if Used By (or Before)" date is recommended for best flavor or quality. It is not a purchase or safety date (MDH, 2003).
- A "Use-By" date is the last date recommended for the use of the product while at peak quality. The manufacturer, packer or distributor of the product on the basis of product analysis, tests, or other information, selects the use-by date. It is also based on the conditions of handling, storage, preparation and use printed on the label. This type of label is normally found on crackers, cookies, cold cereals, and other dry shelf-stable food (MDH, 2003).
- "Expired-By" date is commonly found on baby food and formula, medicines, vitamins, yeast, and baking powder. Such items are not to be distributed or consumed after the date indicated on them (MDH, 2003).

With the exception of "Expired-By" dates, most of the expiration date labels we see on canned foods do not convey a date when the food is no longer safe for consumption. Instead, they advise when the food's quality, freshness and flavor begin to deteriorate. For example, the least amount of time after which mayonnaise could be consumed is three months, but that is not an "unsafe date." Rather it is a marketing or business decision that the manufacturer has determined. Most of the foods listed can be consumed at least one year after the expiration date. Hence, *canned food in the right conditions can be kept and consumed indefinitely* (USDA, 2015a).

Contacting Food Manufacturers

Although almost all the manufacturers did not recommend that food that has gone beyond the expiration date be consumed, *none of them made this decision based on the safety of the food.*

Each one of them stressed instead the quality and freshness of food. Food consumed before the expiration date is considered to be of the highest quality, flavor and freshness. After the expiration date, the quality and freshness of the food declines with time. Some of the companies stated emphatically that such food when eaten will likely not cause any harm (health-wise) to a person but may not taste as it would when freshly canned or packaged.

GENERAL OPERATION OF THE PANTRY

The outcome of the visit to the pantry to test the flowchart informed us of some needed changes. Although the overall workflow of the preparation day greatly improved, larger bins were needed to carry the accumulated food items. Two bins for each category of food were recommended for efficiency between emptying the bins and returning them to be filled. That way, while one filled bin was being emptied, a second was being filled. This will make the preparation time faster and more efficient than as previously executed. To solve the issue of which product goes into which bin, lists of food items under five categories (cereal/pasta, canned goods, domestics, expired/discards, and out of date) are to be added as a description to the category names on the bins.

SURVEYS

From the results of the survey of the volunteers at the Stow Food Pantry, it was determined that the percentage of volunteers who agreed to work more days if the number of days of operation were extended was higher than the percentage who think an increase in the operation days was possible. This was the same with the volunteers who disagreed in both questions. More of the volunteers were neutral when asked if they thought the number of pantry days should be increased. This suggested that there may be some volunteers who will be available to work if the days are

extended but do not think it is necessary to extend the number of days. Also, there could be some of them who think that it will be necessary to extend the number of days, but will not be available to work. It could also be that some of the volunteers think that it is not their decision to make whether the number of pantry days should be increased or not.

The results of the survey of other food pantries showed that most of the pantries have a grace period of six months or less after which food that passed the expiration date was discarded. This suggested that most pantries are unaware of the fact that canned foods can be consumed indefinitely. Despite this, most of the pantries indicated that they did not discard a lot of canned foods. This could be the result of factors such as the size of the pantry, the amount of donations received, and the number of distribution days. For example, if a pantry receives enough donations to feed their clients, there would be less canned food waste compared to a pantry that receives donations that far exceed the number of clients. Likewise, if a pantry has enough food distribution days that makes them distribute all food that is donated to them, there would be less incidence of canned food waste.

CONCLUSIONS

Food waste in the food pantry could be caused by a lot of factors. A better understanding of food spoilage is necessary in making decisions that will result in saving food. In this project, it was identified that every volunteer in the Stow Food Pantry is happy about the work they do, and most of them are willing to work more hours at the pantry. However, these volunteers were concerned about the waste of food in the pantry. At the end of this project, measures were developed that will greatly minimize food waste at the pantry.

If the activities of the pantry are organized by taking food waste into consideration, proper procedures can be developed so that as much food is saved as possible and not wasted. A new system of procedures was created to be used on pantry preparation days to make the work easier and more efficient. A flow chart of the system was designed and tested. The test resulted in a positive outcome, and the volunteers of the pantry gave positive remarks. Based on the responses from volunteers in the survey conducted, it was also realized that there is likely a need for a night pantry. If implemented, this would provide opportunity for clients who work during the day to benefit from the services of the pantry.

Generally, most volunteers thought it was important to check if people qualify to benefit from the pantry. Creating an easy means by which this check is done is necessary to avoid any inconveniences. Self-referral is one method that will ensure that clients do not go through the difficulty of getting recommendation from other people in the community. This could also lead to an increase in the number of clients because clients would only have to fill and sign documents in the form of an affidavit indicating their food need.

Food in cans that do not have any leakage, dents, holes, rust, or are not swollen can be consumed indefinitely. Although canned food may not have passed the expiration date, if the can

is not in its original shape as when it was manufactured, it should be discarded for safety. In any case it is still always the responsibility of the consumer after opening a can of food to analyze and check if there is anything unusual with the food. For example, if the canned food has an unusual color or smell, it should be discarded.

This project showed that other pantries also wasted some food. Hence, the measures described here will not only benefit the Stow Food Pantry, but could also be adopted to benefit other food pantries to improve the quality of their services to the community.

RECOMMENDATIONS

The procedures for the pantry preparation described in this report should be followed even when the Stow Food Pantry moves to their new, larger location. The primary change is to have multiple sorting stations with at least two bins for each category of food. When the pantry moves to its new location, the survey of the volunteers about the extension of the number of distribution days should be considered in deciding the number of days of operation.

As far as client eligibility and number of distribution days are concerned, it is recommended that the pantry considers using self-referral and organizing night pantries. Both of these changes could be tested for two months to see how effective they would be. With the self-referral, clients could be asked to fill and sign a document in the form of an affidavit. The pantry could also pick a day to organize a night pantry within the two-month trial period. The day that is picked should be conducive for the majority of the volunteers and the clients as well. Based on the outcome, the leaders of the pantry can decide whether to go ahead with the self-referral or stick to using recommendations, and whether the night pantry should be implemented.

There should be no grace period after which canned food that has passed their expiration dates would be discarded. Instead, the cans should be checked for corrosion, dents, holes, leakages, and swelling. In other words, volunteers need to check carefully to see if the cans are in their original manufactured shape. Any canned food that is not in the correct shape should be considered expired and must be discarded. Clients should also be informed not to eat any canned food that may have an unusual odor, color or taste after it is opened.

If these recommendations are considered in making decisions about the pantry, the volunteers will be more satisfied with the work they do than they are now because the work will be easier and faster, and there will be less wasted food.

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APPENDICES

APPENDIX A: Mission and Organization of the Stow Food Pantry

The Stow Food Pantry has served the people of Stow and the surrounding towns of Acton, Bolton, Lancaster, Maynard and Boxboro in Massachusetts for over twenty five years. Since its opening in 1990, the pantry has helped over 800 families. The pantry is currently located in the vestry of the First Parish Church and operates two Fridays for a maximum of three hours (each day) every month.

The Stow Food Pantry has a board of directors that sets its policies. This board consists of the president, treasurer, and secretary. There are about thirty-four volunteers in total who work in the pantry. Some of these volunteers work on the first food distribution day and the others work on the second distribution day to serve about eighty families each month. The food served ranges from canned foods to cereals, fresh produce, bread, dairy products and even snacks. The pantry not only offers food, but also toiletries and sometimes baby products.

The long term goal of the pantry is “to put the pantry out of business.” That is, at a point where they give out so much food that they have no more food, and everyone will have enough food to eat. Meanwhile, the short term goal is to provide its clients with items for the domestic upkeep of the family so that they can live healthy lives.

APPENDIX B: Numerical results of survey showing responses from individual responders for the various questions asked.

Individual responses from volunteers at the Stow Food Pantry

Respondent #	Meaningful¹	More days²	Accommodation³	Referrals⁴
1	Strongly Agree	Agree	Neutral	Strongly Agree
2	Agree	Agree	Agree	Strongly Agree
3	Strongly Agree	Agree	Neutral	Agree
4	Agree	Neutral	Neutral	Neutral
5	Strongly Agree	Agree	Neutral	Agree
6	Strongly Agree	Strongly Agree	Strongly Agree	Agree
7	Agree	Neutral	Neutral	Strongly Agree
8	Strongly Agree	Agree	Neutral	Strongly Agree
9	Strongly Agree	Neutral	Agree	Strongly Disagree
10	Strongly Agree	Disagree	Neutral	Strongly Agree
11	Strongly Agree	Strongly Agree	SKIPPED	Strongly Disagree
12	Agree	Neutral	SKIPPED	Neutral
13	Agree	Agree	Agree	Neutral
14	Agree	Disagree	Neutral	Neutral
15	Strongly Agree	Neutral	Neutral	Strongly Agree
16	Strongly Agree	Agree	Neutral	Disagree
17	Strongly Agree	Neutral	Agree	Agree
18	Agree	Disagree	Neutral	Agree
19	Strongly Agree	Disagree	Disagree	Strongly Agree
20	Strongly Agree	Neutral	Neutral	Disagree
21	Strongly Agree	Strongly Agree	Neutral	Agree
22	Strongly Agree	Agree	Neutral	Agree
23	Agree	Agree	Agree	Strongly Agree
24	Strongly Agree	Disagree	Neutral	Agree
25	Strongly Agree	Neutral	Agree	Strongly Agree
26	Strongly Agree	Agree	Agree	Neutral
27	Agree	Disagree	Neutral	Agree

1. The Volunteer work at the pantry is meaningful to me.
2. I would volunteer more days if the pantry extends its days of operation.
3. The pantry can accommodate an increase in the number of food distribution days.
4. I think clients should show proof of their eligibility to receive the services of the pantry through referrals.

Individual responses from other pantries in Massachusetts

Respondent #	Months ¹	Discarded ²	Referrals in pantry? ³	Agree to referrals? ⁴
1	More than 12	Disagree	Yes	Agree
2	N/A	Strongly Disagree	no	Neutral
3	0 to 3	Agree	No	Disagree
4	0 to 3	Strongly Disagree	Yes	Strongly Agree
5	4 to 6	Disagree	No	Strongly Agree
6	4 to 6	Strongly Agree	Yes	Neutral
7	10 to 12	Neutral	Yes	Strongly Agree
8	0 to 3	Neutral	No	Strongly Disagree
9	0 to 3	Strongly Disagree	Yes	Agree
10	0 to 3	Disagree	Yes	Agree
11	More than 12	Strongly Disagree	No	Strongly Agree
12	N/A	Strongly Disagree	No	Strongly Disagree
13	0 to 3	Disagree	No	Neutral
14	0 to 3	Strongly Disagree	No	Strongly Agree
15	4 to 6	Neutral	No	Neutral
16	0 to 3	Strongly Disagree	No	Neutral
17	10 to 12	Strongly Disagree	No	Agree
18	4 to 6	Disagree	Yes	Neutral
19	0 to 3	Neutral	Yes	Neutral

1. After how many months is expired canned foods kept for distribution to clients after their expiration date in your pantry.
2. A lot of canned foods are discarded at my pantry.
3. In my pantry, referrals are used to determine the eligibility of clients to receive services.
4. I think clients should show some form of proof of their eligibility to receive the services of the pantry.