Applying MyPlate to Procurement in Food Banks:

Implications for Policy

by

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ABSTRACT

Food banks are the foundation of the emergency food network, and while their chief mission is to mitigate hunger, the rise in obesity and other diet-related diseases among clientele has incited the need for better nutritional control with regards to procurement of inventory at food banks. The purpose of this research was to determine if procured inventory at United Food Bank in Mesa, Arizona could meet minimum MyPlate recommendations for a typical food bank client and what implications the results could have for future policy. Inventory data was obtained from United Food Bank for fiscal year 2013-2014 and analyzed utilizing the MyPlate Analysis Program to determine contributions of each food category to MyPlate recommendations. Inventory was separated by MyPlate food category and analyzed to determine contribution towards a meal built around MyPlate recommendations. Results showed that the inventory could meet the minimum requirements for protein and grains for a family of four for at least three days, the amount of time an emergency food box is designed to last. On the contrary, the inventory did not meet minimum vegetable, fruit or dairy requirements. These results indicate that typical food bank inventory does not meet USDA MyPlate recommendations and that having nutritional policy in place could potentially drive donations and purchases to enhance the nutritional quality of future food bank inventory.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Figure Page

INTRODUCTION

Overview

Food insecurity is the state of being without consistent access to a sufficient quantity of nutritious food, due to a lack of adequate finances or other resources (Definitions of Food Security, n.d.). Nearly 15 percent of American households were food insecure in 2012, amounting to 49 million people, of which nearly 16 million were children. Five percent of these households (6.2 million) received emergency foods from a food pantry or soup kitchen at least once (Coleman-Jensen, Gregory, & Singh, 2014). Arizona is the fifth ranking state in the U.S. for overall food insecurity and is tied for first place for child hunger (Feeding America, n.d.). Arizonans struggling with hunger equates to one in every four children, one in every five adults and one in every seven seniors. United Food Bank of Arizona distributed over 22 million pounds of food during 2012-2013 through their network of agencies and various programs (Feeding America, n.d.).

Hunger is defined as "the uneasy or painful sensation caused by a lack of food" (Tanumihardjo et al., 2007). The feeling of hunger, or absence of food in the stomach, is universal, however there are different indices of hunger:

- Undernourishment, which the Food and Agriculture Organization (FAO) of the United Nations defines as the status of people whose food consumption does not include enough kilocalories to meet minimum physiological needs (Undernourishment Around The World, 2012).
- Malnutrition, characterized by inadequate intake of macronutrients and micronutrients and is associated with increased infections and disease.

Hunger and malnutrition can result from food insecurity. When the term hunger is used in program evaluations, the lack of access to food, which can cause hunger, must be involuntary (Tanumihardjo et al., 2007). When people lack access to sufficient safe and nutritious foods to meet their needs for an active and healthy lifestyle they are considered food insecure. The key dimensions of food insecurity include food availability, food access and food utilization (Riley F, Mock N, Cogill B, Baily L, Kenefick E., 1999).

Food banks and their network of emergency food organizations contribute to the nutritional status of their clients through the foods they provide. Food banks receive their inventory of grocery products through donations, government food programs and their own purchases. Feeding America, the nation's leading hunger-relief charity, provides emergency food assistance to approximately 37 million low-income people annually, distributing more than three billion pounds of grocery and food products a year (Feeding America, n.d). Feeding America is comprised of a network of 200 food banks that supply food pantries and soup kitchens across the United States.

Some food assistance programs within the national food safety net, such as the National School Lunch and Breakfast Programs and the Special Supplemental Nutrition Program for Women, Infants and Children, have defined nutrition standards based on the 2010 Dietary Guidelines for America. Regrettably, emergency foods provided through food banks are not subject to these standards. Consequently, the majority of the nation's food banks do not have set policy that regulate which foods are considered nutritionally acceptable for distribution (Handforth, Hennink, & Schwartz, 2013). Additionally, employees and volunteers may not have adequate knowledge or training in managing inventory from a nutritional standpoint. Knowledge and training is an important key with

regards to packaging foods in a fashion that would allow recipients to build nutritious meals.

Studies have demonstrated an association between food insecurity and undesirable health consequences, most notably diabetes (Holben & Pheley, 2006; Seligman, Bindman, Vittinghoff, Kanaya, & Kushel, 2007; Seligman, Laraia, & Kushel, 2010). Stress and depression are also detrimental consequences of food insecurity (Gundersen, Mahatmya, Garasky, & Lohman, 2011; Hamelin, Habicht, & Beaudry, 1999; Laraia, Siega-Riz, Gundersen, & Dole, 2006; Weinreb et al., 2002). Additionally, eating behaviors influenced by food bank usage have been shown to have a negative effect on overall macro and micronutrient intake. Elderly clients of food banks have a lower intake of energy, protein, fat and vitamins and minerals (Lee & Frongillo, 2001). Compared to women from food secure households, women from food insecure households were more likely to have poorer dietary quality (Basiotis & Lino, 2002).

Consumption patterns that are higher in processed foods with long shelf stability, and lower in fruits and vegetables, (such as the foods commonly distributed by food banks) (Hoisington, Manore, & Raab, 2011; Ross, M, Campbell, EC & Webb, K, 2013), partially contribute to the risk for obesity and other diet-related diseases (Drewnowski & Specter, 2004; M. Ross, Campbell, & Webb, 2013). According to the Centers for Disease Control and Prevention, 35.7 percent of U.S. adults were classified as obese in 2009-2010 (Prevalence Of Obesity In The United States, 2010). Food banks may unwittingly be contributing to the risk for obesity and chronic disease in the very people they are designed to help by way of the foods they are providing.

To date, only a few studies have been conducted on the nutritional quality of food bank inventories (Hoisington et al., 2011; Paulhamus & Cotugna, 1998; Ross, M, Campbell, EC & Webb, K, 2013). Researchers at the Atkins Center for Weight and Health, University of California at Berkeley, examined trends in the nutritional quality of emergency foods at six California food banks. This study found that from 2007 to 2010, donations of fresh fruit and vegetables significantly increased, contributing to half the weight of total inventory. While this is encouraging, results also indicated that snack foods and sugary drinks contributed substantial empty calories (Ross, M, Campbell, EC & Webb, K, 2013). At the Oregon Food Bank, soda, desserts and snack foods contributed 2.9 million pounds (8 percent of inventory total) distributed during one year, from 2004-2005 (Hoisington et al., 2011).

In June 2011, the United States Department of Agriculture, Food and Nutrition Service launched MyPlate as an easy-to-understand icon to help consumers understand how to adopt healthier eating habits that would be in line with the 2010 Dietary Guidelines for Americans (ChooseMyPlate.gov, n.d). The image uses a familiar graphic of a place setting that emphasizes fruits, vegetables, grains, and protein displayed as portions per plate, with dairy depicted as a cup. The associated website, ChooseMyPlate.gov, highlights practical information that helps consumers construct healthier diets. Previous studies investigating the nutritional aspects and/or ability of a food bank to meet client's needs, whether in volume or nutritionally, have used previous Department of Agriculture (USDA) guidelines as their measures. In 1993, Cotugna et al used the Food Guide Pyramid to determine the number of people that could be provided the minimum recommended number of servings per day from the Pyramid (Cotugna,

Vickery, & Glick, 1994) and in 1996 that research was expanded upon to refine and simplify the analysis and break foods down into serving sizes (Paulhamus & Cotugna, 1998). Hoisington et al also used MyPyramid and the Dietary Guidelines for Americans in 2005 to analyze food distributed at Oregon Food Bank (Hoisington et al., 2011). Ross and colleagues took a different approach in 2010 when they examined the inventory at six California food banks. Rather than serving sizes, they looked at the inventory as a whole to determine if nutritional quality had improved (Ross, M, Campbell, EC & Webb, K, 2013).

Using a familiar measure such as MyPlate to assess the nutritional quality of food bank inventory would give a more detailed and accurate picture of whether foods donated and procured at a food bank can meet the nutritional guidelines set forth by the USDA.

Purpose

The primary objective of this study is to assess how well food donations at United Food Bank are meeting USDA MyPlate recommendations. United Food Bank was selected for the analysis because it serves a large clientele base within a large network of agencies (260+) in Arizona, including Eastern Maricopa County, Gila County, Pinal County, Southern Navajo County, and Southern Apache County.

This study has practical implications for addressing the nutritional quality of food bank inventory and identifying avenues in which nutritional quality can be improved. Indeed, in order to improve the nutritional quality of the end product – whether it is an emergency food package or a meal at a soup kitchen – nutrient-dense foods must be

procured. This study can add to the knowledge and available literature regarding the nutritional quality of food within the emergency food network for guiding the development of future nutritional policies in food banks. With nutritional policies in place, inventories can be better procured, managed and processed, allowing clients to construct nutritionally sound meals, inline with national Dietary Recommendations.

Research Question/Hypotheses

Research question: Does United Food Bank's food inventory meet minimum MyPlate recommendations for a 19-30 year old female client?

- *H1*: United Food Bank inventory for 2013-2014 will fail to meet MyPlate recommendations for fruit for a 19-30 year old female client.
- *H2*: United Food Bank inventory for 2013-2014 will fail to meet MyPlate recommendations for vegetables for a 19-30 year old female client.
- *H3*: United Food Bank inventory for 2013-2014 will fail to meet MyPlate recommendations for protein for a 19-30 year old female client.
- *H4*: United Food Bank inventory for 2013-2014 will fail to meet MyPlate recommendations for dairy for a 19-30 year old female client.
- *H5*: United Food Bank inventory for 2013-2014 will exceed MyPlate recommendations for grains for a 19-30 year old female client.

Definition of Terms

1. Food Bank: a non-profit organization that solicits and warehouses foods for distribution within the emergency food network.
2. 2010 Dietary Guidelines for Americans: jointly issued and updated every five years by the USDA and the Department of Health and Human Services (HHS). Provides advice about consuming fewer calories, making informed food choices, and being physically active to attain and maintain a healthy weight, reduce risk of chronic disease, and promote overall health.
3. Obese: BMI > 30 kg/m^2

Assumptions, Limitations and Strengths

The research conducted in this study focused on United Food Bank in Mesa, Arizona. No other food banks were studied. The inventory received is not all-inclusive of received/distributed foods at United Food Bank. The foods were analyzed based on the USDA MyPlate recommendations for a 19-30 year old female, therefore result are not generalizable to all food bank clientele. Assumptions were made regarding the size, type and packaging of some foods. Assumptions are further described in Appendices A-H.

Strengths of this study include addressing gaps in the literature regarding the nutritional quality of food bank donations and purchases. The structure of the MyPlate Analysis Program allows for a more accurate picture of the actual weight of donations as packaging weights have been accounted for and foods have been broken down to edible

portions. This study will provide insight into how well the food banks of America are meeting the USDAs nutritional guidelines and recommendations. This will prove especially informative, given that food banks purchase commodities through the USDA.

CHAPTER 2

REVIEW OF LITERATURE

Food Insecurity is a Global Problem

Food insecurity is present worldwide. In 2012, the World Health Organization, in conjunction with the World Food Program, and the International Fund for Agricultural Development, estimated that nearly 12.5 percent of the world population and 14.9 percent of those living in developed countries (870 million people) are undernourished (McGuire, 2013).

In 2000, the United Nations commissioned the Millennium Project to devise a distinct plan for reversing the poverty, hunger, and disease that affects billions of people worldwide by 2015. The Project consists of eight specific Millennium Development Goals: (1) eradicate extreme poverty and hunger; (2) achieve universal primary education (3) promote gender equality and empower women (4) reduce child mortality (5) improve maternal health (6) combat HIV/AIDS, malaria, and other diseases (7) ensure environmental sustainability (8) develop a global partnership for development (UN Millennium Project, n.d.). Embedded within theses goals are specific target points and nested under goal number (1) is target point (2), to "halve, between 1990 and 2015, the proportion of people who suffer from hunger (UN Millennium Project, n.d.).

Determining Food Insecurity

The 18-item U.S. Household Food Security Scale measures food insecurity and food security levels are based on the number of positive answers to the questionnaire. If respondents positively answer less than three items they are considered food secure. If they affirm eight or more items they are considered severely food insecure (Coleman-Jensen et al., 2014). Food security is further broken down based on the degree and character of the adjustments the household has to make to its eating patterns and food intake. For instance, a household is classified as *low food security* if they report reduced diet quality but not reduced food intake. On the other hand, a household is reported to be *very low food security* if they display reduced food intake or disturbed eating patterns in response to insufficient means for obtaining food (Coleman-Jensen et al., 2014).

Health Consequences of Food Insecurity

The impact of food insecurity is multi-dimensional. Through nutritional, mental health and behavioral channels, it shapes individual actions and health outcomes. Food insecurity functions at the household level and is influenced by family structure as well as social support.

Food insecurity is multifaceted and the illogicality is that not only can it lead to undernutrition; it can also result in overnutrition (Tanumihardjo et al., 2007). Overnutrition is frequently associated with the substitution of highly palatable, low-cost, energy-dense foods high in sugar, salt and fat such as chips and pastries, for nutrient-

dense foods such as fruits and vegetables (Ebbeling, Pawlak, & Ludwig, 2002). The food environment has changed radically with the incursion of these hyper-palatable foods. These foods have been engineered in ways that appear to surpass the traditional rewarding properties of nutrient-dense foods by increasing the salt, fat and sugar and the addition of additives and artificial flavors (Gearhardt, Grilo, DiLeone, Brownell, & Potenza, 2011). Over-nutrition serves as a catalyst for a host of undesirable health outcomes through its path to overweight and obesity. Ironically, it is estimated that by 2015 – also the date the Millennium Project has projected to meet it's goal of halving the occurrence of hunger worldwide – diseases associated with overnutrition will surpass undernutrition as the leading causes of death in low-income communities (Tanumihardjo et al., 2007).

Food insecurity and lack of adequate food supply leads to a variety of compensatory behaviors, including decreasing portion sizes or skipping meals altogether, eating the same foods throughout the day, reduced food budgets, and changes in the types of foods consumed (Laraia, 2013). Some low-income households increase their food supply by participating in USDA Food and Nutritional Service programs such as the Supplemental Nutrition and Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), and the National School Lunch Program (NSLP). Involvement in these programs may be correlated with lower body mass index (BMI) and an increase in the intake of nutrients (Jones, Jahns, Laraia, & Haughton, 2003). However, households that participate in these programs may experience a shortage of food during the last week of the month when benefits run out (Kendall, Olson, & Frongillo, 1996). These individuals and households may face periods

of food deprivation followed by overconsumption. This type of eating pattern has been referred to as cyclic eating and is documented among food insecure households and is thought to play a direct role in dietary compromise, resulting in nutrient deficits and physiological changes that result in greater energy efficiency, leading to increased storage of body fat and weight gain (Finney Rutten, L, Yaroch A, Colon-Ramos, U, Johnson-Askew, W & Story, M, 2010; Lee, Gundersen, Cook, Laraia, & Johnson, 2012). Cyclic eating has also been associated with an increase in disordered eating patterns in women living in food insecure households (Hoisington et al., 2011; Kendall et al., 1996).

Low-income individuals typically spend a larger percentage of their pay purchasing food compared to households with greater income. There is evidence that the higher price of more nutritious foods contributes to poor diet quality among low-income populations (Neff, R, Palmer, A, McKenzie, S, Lawrence, R, 2009). To be sure, nutrient-dense foods such as fresh fruits and vegetables are more expensive than less expensive energy-dense foods with higher fat and sugar content, due in part to the longer shelf life of these foods (Drewnowski & Specter, 2004; Tanumihardjo et al., 2007; Wiig & Smith, 2009).

Food insecure individuals are more likely to suffer from nutritionally deficient diets despite adequate and even excess caloric intake, compared with food secure individuals (Laraia, 2013). Observational research has shown an association between household food insecurity and inadequate consumption of fruits, vegetables and micronutrients (Bhattacharya, Currie, & Haider, 2004; Dixon, Winkleby, & Radimer, 2001; Kendall et al., 1996; Tarasuk, 2001). Kendall et al found that the percentage of persons consuming less than the Recommended Dietary Allowance (RDA) for vitamin C

and less than five fruits and vegetables a day was significantly greater among the food insecure as compared to the food secure (Kendall et al., 1996). Tarasuk discovered that consumption of fruit, vegetables and meat was lower among food insecure women compared to food secure women (Tarasuk, 2001). Elderly adults from food insecure households have appreciably lower intake of energy, protein, saturated fat, carbohydrates, magnesium, iron, zinc and the B vitamins niacin and riboflavin. They were also found to have significantly lower skinfold thickness (Lee & Frongillo, 2001). Data from NHANES III (1988-1994) suggest that 8 to 18 year old Americans who reported eating excessive amounts of low-nutrient dense foods are more likely to report less than the estimated average daily requirements of nutrients essential for optimal health (Kant, 2003). Food insecure adults aged 20 to 59 years had lower intake of calcium and older adults age 60 and over had lower intake of energy, niacin magnesium, iron and zinc (Dixon et al., 2001). Indeed, it is not just about how much food a person consumes, but the nutritional quality of the food consumed.

Food Insecurity and Obesity

United States healthcare related costs associated with being overweight or obese is estimated to exceed 850 billion dollars annually by 2030 (Gearhardt et al., 2011). Obesity is connected to several grim health consequences and people who are obese or overweight are at increased risk for type-2 diabetes, hypertension, dyslipidemia, coronary heart disease, certain cancers, stroke, respiratory disease, gallbladder and liver disease and sleep apnea (*Clinical Guidelines On The Identification, Evaluation, And Treatment*

Of Overweight And Obesity In Adults, 1998; Thompson, Edelsberg, Colditz, Bird, & Oster, 1999). Minorities, single parent households and low-income households are among the populations at greatest risk for obesity and food insecurity (Kursmark & Weitzman, 2009).

Obesity rates in the United States have increased steadily for the past four decades, from approximately 13 percent in the 1960s to over 35 percent in 2006 (Finney Rutten, L, Yaroch A, Colon-Ramos, U, Johnson-Askew, W & Story, M, 2010). Interestingly, trends in food insecurity in the United States parallel the rise in obesity (Coleman-Jensen A, Nord M, & Singh A, 2013).

The prevalence of obesity among the food insecure has garnered much attention lately and several studies have investigated the connection between food insecurity and obesity (Drewnowski, 2004; Seligman et al., 2010; Tanumihardjo et al., 2007). As a whole, the literature on the association between household food insecurity and obesity is inconsistent (Laraia, 2013). The childhood obesity epidemic has also drawn significant attention, resulting in the White House Task Force on Childhood Obesity instituting a goal to eliminate child obesity within a generation (*Solving The Problem Of Childhood Obesity Within A Generation, 2010).*

Food Insecurity and Diabetes Management

A review of existing literature reveals that food insecurity among adults with diabetes varies from 6 percent to 15.5 percent in population-based samples, to 14 percent to 51 percent in clinical samples (Laraia, 2013). Clinic-based samples using glycosylated

hemoglobin ($HbA1_c$) as the outcome measure consistently find associations between hypoglycemic events, poor glycemic control and food insecurity (Seligman, Davis, Schillinger, & Wolf, 2010).

Self-management of diabetes is demanding and requires close attention to diet and in some cases, the use of medications. Food insecure individuals may alter their diets, relying on nutritionally poor, energy-dense foods such as refined carbohydrates with added fats and sugars to maintain caloric intake (Drewnowski & Specter, 2004; Gucciardi, Vahabi, Norris, Del Monte, & Farnum, 2014; Laraia, 2013). These are the very foods that diabetics are counseled to avoid in order to maintain glycemic control. These types of foods are inexpensive as compared to nutrient-dense foods such as fruits, vegetables and dairy. In addition to poor food choices, daily energy intake may fluctuate widely depending on food availability, thereby affecting blood glucose levels. To exacerbate the problem, the cost of food may very well compete with the cost of diabetes medications and supplies (Gucciardi et al., 2014).

In a study of households in Nova Scotia with children with type 1 diabetes it was found that food insecurity was significantly higher at 21.9 percent than in the general population (14.6 percent) and Canada (9.2 percent) (Marjerrison, Cummings, Glanville, Kirk, & Ledwell, 2011). The children living in food insecure households were 3.7 times more likely to have been hospitalized than children from food secure households as well as having a higher $HbA1_c$ (Marjerrison et al., 2011). Parents in the study revealed that in order to manage the financial aspect of the child's disease, they resorted to purchasing lower-cost foods and/or eating less so the child would have enough food.

Continued poor control of diabetes can result in chronic complications such as diabetic retinopathy, nephropathy and neuropathy as well as an increased risk of developing cardiovascular disease (Marjerrison et al., 2011). Adherence to healthy eating habits intended to improve diabetes outcome is undeniably a struggle for food insecure households. Of greater concern are the families whose financial strategies include risky behaviors such as reusing needles, or testing blood glucose less often.

Food Access

Food access describes the ability of people or households to procure or produce food (Finney Rutten, L, Yaroch A, Colon-Ramos, U, Johnson-Askew, W & Story, M, 2010). Areas with limited access to nutritious and affordable foods via retail food stores such as supermarkets and grocery stores are known as food deserts (Mabli, J, Jones, D & Kaufman P, 2013). (Eradicating food deserts was designated a "benchmark of success" in a report by the White House Task Force on Childhood Obesity (*Solving The Problem Of Childhood Obesity Within A Generation, 2010)*). Also to be considered is how individuals can get to places where they can acquire food (i.e. driving, walking, public transportation). In the context of food insecurity, access could hinge on the financial state of the individual or household in addition to the matter of food availability. Food availability refers to the adequacy of the food supply to a geographic region or community as well as the choices of venues in which to purchase food.

Mabli, Jones and Kaufman conducted a study in which the locations of food pantries were plotted against the map of supermarkets in 47 states and the District of

Columbia (Mabli, J, Jones, D & Kaufman P, 2013). Results showed that in areas without supermarkets but with food pantries, a greater percentage of the population was low-income individuals (income below 200 percent of the federal poverty threshold), female-headed households with children, non-white individuals and households receiving SNAP benefits. This study found that food pantries helped to address food access limitations in a good portion of areas without supermarkets. They also discovered that the pantries tended to be located in areas of lower socioeconomic status and higher poverty rates. These findings indicate that food pantries play an important, although limited, role in providing geographic as well as economic access to low-income populations. While food pantries are not a substitute for sources of healthy, affordable foods such as those found in a supermarket, they have the capability to address some of the needs in areas of limited food access.

Food Assistance Programs

Food assistance programs increase food security and reduce hunger by providing low-income individuals and children access to food, a healthy diet and nutrition. The origination of food assistance programs dates back to the 1930s when the United States Department of Agriculture (USDA) sought to help needy people by acquiring surplus commodities and distributing them to schools and other institutions. The USDA's Dietary Guidelines for Americans 2010 is the foundation for several food assistance programs.

- In 1946 the National School Lunch Act, now known as the National School Lunch Program (NLSP) was created. The program provides free or reduced price school lunches to children from households with earnings between 130 percent and 185 percent of the federal poverty threshold in an effort to promote learning readiness and healthy eating habits.
- The Food Stamp Act, now known as the Supplemental Nutrition Assistance Program (SNAP), was established in 1964 and assists households earning less than 130 percent of the federal poverty threshold by offering nutritional assistance through monetary benefits via an Electronic Benefit Transfer (EBT) card. SNAP is the largest program in the domestic hunger safety net.
- In 1975 the School Breakfast Program (SBP) was established. It provides free or reduced price breakfasts within the same guidelines of the NLSP.
- Also established in 1975 was the Special Nutrition Program for Women, Infants, and Children (WIC), which helps to protect the health of low-income mothers and their children below the age of five who are considered nutritionally at-risk by providing healthy foods to supplement their diets, nutrition education and healthcare referrals.
- The Child and Adult Care Food Program (CACFP) was created in 1978 and finances food provided through child and adult care facilities and homeless shelters, with eligibility determined at facility level.

- The Emergency Food Assistance Program (TEFAP) was established in 1983 and provides food through food banks, food pantries and soup kitchens, with eligibility determined at state level.

Nutritional Quality of Emergency Foods

The emergency food network (EFN) has evolved from a temporary solution to an intricate and sophisticated organization with food banks serving as the core of the system. Food banks acquire their inventory of grocery products through donations, government food programs and their own purchases. There are over 200 food banks in the United States, and the majority of them are members of Feeding America, a national network organization of food banks (Feeding America, n.d.). Feeding America's national office serves as a broker and negotiator. Regional food banks procure some of their donated products through the Feeding America national choice system. Through this system food banks order donated foods based on the shares they hold. Shares are based on the number of pounds of inventory they distribute, relative to the prevalence of poverty in their particular area. The food banks store their inventory and forward orders to their associated local agencies of food pantries, soup kitchens and emergency shelters. Volunteers normally staff emergency agencies (Campbell, EC, Ross, M, Webb, Karen, 2013). Local churches and government agencies can direct potential clients to area food pantries and soup kitchens.

While the USDA's food assistance programs such as SNAP, WIC and school meal programs are built around the USDA Dietary Guidelines for Americans, inventory

procurement at food banks is not directed by specific policy that guides their nutritional profile and few food banks have voluntary nutritional policy in place (Campbell, EC, Ross, M, Webb, Karen, 2013). While the ability of the EFN to assist in mitigating hunger has long been recognized, it has gained little attention as an avenue in which to influence dietary quality among the millions of people it serves. The demand on food banks and its network will likely increase significantly in view of recent funding cuts to SNAP (FRAC Action Council Farm Bill, 2014). Addressing the ability to which the EFN can influence the diets of clients is timely, given this threat to the food safety net.

In February 2012 the Center for Weight and Health at UC Berkeley (CWH) and the California Food Policy Advocates (CFPA) assembled 20 stakeholders from within the EFN to develop policy and practice recommendations aimed at improving the nutritional quality of emergency food (Shimada, T, Ross, M, Campbell, EC, Webb, K, 2013). Stakeholders examined and discussed food bank inventory trends and features of culture and practice. Policy and practice recommendations resulting from this gathering include:

- Establish nutrition standards to align the federal food distribution programs with the Dietary Guidelines for Americans.
- Explore possible tax benefits for corporations that donate to EFN.
- Provide incentives to donors to optimize healthy donations and limit or eliminate unhealthy donations.
- Develop nutrition policy with Feeding America that discourages distribution of nutrient-poor foods.

The CWH conducted a national survey of Feeding America food banks to assess the characteristics of their organization, including the extent to which they focused on the

nutritional quality of their inventory. While a majority of the food banks reported a considerable level of commitment to nutrition, only seven percent of respondents reported actually having formal, written nutritional policies in place. Fifty five percent reported having some form of guidelines (formality unknown) referring to increasing healthy foods and 30 percent reported policies or guidelines to *decrease* distribution of unhealthy foods (Campbell, EC, Ross, M, Webb, Karen, 2013).

Client Food Preferences

Food pantries were initially designed to provide short-term ancillary food to households experiencing shortages of food and were not designed for dependent use. Food pantry clients are diverse and meeting the unique needs of all is a challenge. Data consistently show that a disproportionate number of food insecure people are from minority populations and households with children. Clients from different ethnic backgrounds have expressed the need for more familiar foods (Mello et al., 2010; Verpy, Smith, & Reicks, 2003) and a major concern of food pantry clients is the inability to choose their foods and receiving foods that they are unfamiliar with and do not know how to use (Mello, et al, 2010; Campbell, EC, Ross, M, Webb, Karen, 2013). Food banks are a major food supplier to the chronically food insecure and nutritionally at-risk and should be able to cater to the specific needs of clients. Religious food restrictions need to also be considered.

It has been established that food insecurity is associated with lower consumption of fruits and vegetables, and that the nutritional profile of food bank inventory needs

improvement. Criticism of nutritional policy implementation in food banks includes fear that food banks may lose major donators if restrictions are put on what they can donate

Most food pantries prepack grocery bags according to family size. A common complaint is that clients are not familiar with and could not use some of the food items. The clients surveyed indicated that they either donated the food they could not use to another person in need or returned it to the pantry (Verpy et al., 2003). Additionally, clients were concerned about the inconsistent size of food cans. A family of four may each have to eat something different at the same meal since one small can of vegetables cannot feed four people. In some instances, clients receive food they do not know how to cook, such as dried beans or items they do not know how to incorporate into a meal (Verpy et al., 2003). Lastly, clients of food banks indicate that they prefer fresh produce, dairy products (not powdered) and more meat products to snack foods, candy or soda (Campbell, E, Hudson H, Webb, K, Crawford, P, 2011; Verpy et al., 2003).

Client Choice pantries are designed much like a grocery store and are becoming more prominent (Cabili, Eslami, & Briefel, 2013). These pantries provide clients with a more dignified experience by allowing clients to browse the aisles and choose foods that meet their needs and cultural preferences (Cabili et al., 2013). The development of choice pantries will also allow for the promotion of nutrition and food security by allowing clients to choose foods their family will actually eat, thereby eliminating the waste associated with traditional pre-bagging (Remley, D, Kaiser, M, Osso, T, 2013).

Individual Donor Perceptions

The motives underlying the drive to donate to food pantries are diverse, with the major factor being the knowledge that there are hungry people who need food, especially children (Verpy et al., 2003). Deciding what type of item to donate is based on whether the item is specifically purchased for donation or if it comes from existing supply. Some donations are based on what the donor can afford to buy, while others donate to provide food specifically meant for children (Verpy et al., 2003). Nutrition is not usually a deciding factor for most donors.

Need for Further Research

Research shows that dietary nutritional quality falls as the intake of less expensive energy-dense foods rise (Drewnowski, 2004). These foods are readily available and data shows that household cost restrictions result in a diet higher in carbohydrate and fats, such as industrialized snacks and sweets (Darmon, Ferguson, & Briend, 2002; Drewnowski & Specter, 2004). Worse, as use of these foods rise, the consumption of fruits, vegetables, and dairy decrease, resulting in a decrease in the intake of micronutrients, including calcium, zinc, iron, magnesium, and B vitamins (Dixon et al., 2001).

A key issue among food banks is limited resources and lack of adequate technology needed to thoroughly classify donations. Classification of donations would allow food banks to assess the nutritional quality of their inventory (Shimada, T, Ross, M, Campbell, EC, Webb, K, 2013), with the overarching goal of improving the diets of their clients. The CWH survey revealed that over 80 percent of food banks do not employ a systematic method for distinguishing the nutritional quality of foods (Campbell, EC, Ross, M, Webb, Karen, 2013).

To date, few studies have been conducted on the nutritional quality of inventory at food banks (Hoisington et al., 2011; Paulhamus & Cotugna, 1998; Ross, M, Campbell, EC & Webb, K, 2013; Vaughan, Martin III, & Evan Jr., 2005). In 1996 Paulhamus and Cotugna conducted a study that examined the nutritional outcome of the Food Bank of Delaware. They converted donated foods into serving sizes based on the National Food Labeling and Education Act of 1990 or the Food Guide Pyramid. The research

determined the breakdown of distribution of foods and set the stage for future nutritional profile studies (Paulhamus & Cotugna, 1998).

In 2005, a study was conducted at the Oregon Food Bank to develop a procedure for analyzing nutritional quality of emergency foods. They used as their measurement the 2005 Dietary Guidelines for Americans and MyPyramid. The food bank received 36.4 million pounds of food in one year. About 24.2 million pounds (66 percent) of the food made up the five MyPyramid food groups, with fruit and dairy distributed in the smallest quantities. The remainder of the foods, 12.2 million pounds (34 percent) was made up of variety, condiment, combination and discretionary foods. The bottom line was that fewer servings of fruits and milk group foods were available on a per day basis (Hoisington et al., 2011).

Most recently a study by the Center for Weight and Health at UC Berkeley of the nutritional quality of inventory at six food banks in California identified that government-acquired grains were the greatest contributors to the grain inventory, accounting for 53 percent of total grain acquisition (Ross, M, Campbell, EC & Webb, K, 2013). Fresh produce acquisition grew significantly over a four-year period, however approximately 50 percent of the vegetable donations were from onions and potatoes. Food bank directors actively seek out the "hard seven" – produce varieties that are heartier, travel well, are less perishable and require less refrigeration (onions, potatoes, apples, carrots, broccoli, cauliflower, and oranges). Moreover, these items are heavy and increase the weight of inventory (Ross, M, Campbell, EC & Webb, K, 2013). Despite the large amounts of grains and less nutritious variety of vegetables, the six food banks did show a consistent upward nutritional trend in inventory by showing a decline in donations of

sugary beverages and energy-dense snack foods (Ross, M, Campbell, EC & Webb, K, 2013).

Given that California is the top producer of fruits and vegetables in the United States, other food banks are not likely experiencing large increases in their fresh fruit and vegetable donations. Research conducted at the Food Bank of Central New York found that fresh vegetable donations actually decreased by nearly 2.5 percent from 2003 to 2006 and made up only 13 to 22 percent of total donated pounds (E. Campbell, Webb, & Crawford, 2009). Additionally, fresh fruit donations were naught in 2003, rose less than one percent in 2004, and dropped 0.6 percent in 2005. The solution for the Food Bank of Central New York was to offset the lack of donations through the use of grant dollars to purchase and distribute fresh produce (Ross, M, Campbell, EC & Webb, K, 2013).

Summary

The United States has transitioned from a country battling infectious and communicable diseases to one battling the effects of chronic disease and obesity (Laraia, 2013). Food insecurity is associated with an increased risk of nutrition-related disease and these populations experience a higher occurrence of chronic conditions, including heart disease, diabetes, high blood pressure and obesity (Hoisington et al., 2011).

In a period of increased demands for their services, food banks are attempting to address the health issues of their clients. Feeding America recently developed their nutrition guidelines, “Foods to Encourage” to define nutrition standards and develop and maintain a consistent system for their network (Webb, 2013). Additionally, they have

recently employed private sector funding to introduce a diabetes initiative to be delivered in food pantries, soup kitchens and other programs (Webb, 2013).

Food banks within the Feeding America network, including United Food Bank of Arizona, feed millions of people annually; therefore it is of the utmost importance to improve the nutritional quality of donated foods. Research shows that food banks are evolving toward a system more cognizant of nutrition, however there is much room for improvement. While most U.S. food banks report a definite commitment to improving nutritional quality of inventory, only 39 percent of food banks reported actual policy in place, whether written or informal (Campbell, EC, Ross, M, Webb, Karen, 2013).

In order to improve services and better illustrate community impact, food banks require a better method for evaluating their inventory and processes. Food banks, their agencies, and most importantly, their clients can benefit from improved documentation and tracking of the nutritional quality of food inventory. The first step in improving nutritional quality of foods distributed is to implement an effective inventory control system. In order to improve what is going out to clients, food banks need to know exactly what is coming in. Additional research on best practices within the food bank network is needed to guide development of effective systems.

CHAPTER 3

METHODS

Study Design

This was a retrospective, descriptive study utilizing inventory records obtained from United Food Bank of Arizona. Twelve months of inventory was analyzed using the MyPlate Analysis Program to evaluate the nutritional quality of food bank donations and the ability of donations to meet MyPlate recommendations. The twelve-month period was chosen to capture variability and seasonality in donations and purchases.

Methods

A MyPlate Analysis Program was developed to assess the nutritional quality of foods procured by the food bank. The program was developed to categorize foods into the specific categories of USDA's MyPlate and include (1) fruit, (2) vegetables, (3) protein, (4) grains, (5) dairy, and (6) oils. Additional categories are distinguished to account for the entire inventory and include: (1) mixed/combination foods; (2) empty calories (to separate foods that are higher in fat and sugar, thereby contributing little nutritional value;) (3) beverages other than dairy; (4) condiments; (5) infant/child specific products such as formula and electrolyte drinks; (6) miscellaneous foods (foods that could not be analyzed due to inadequate information.) (Table 1) Because beans and peas are a unique food that can be classified as a protein or a vegetable they were analyzed separately as (1) a protein and (2) a vegetable to get the most accurate nutritional picture

of the inventory. The final analysis used beans and peas as a protein, as is standard procedure in food banks.

Table 1
Examples of foods included in the MyPlate Analysis Program. Foods are categorized per MyPlate for grains, protein, vegetables, fruits, oils, dairy and mixed foods. Other categories are designed to contain foods not included in the analysis. Beans and peas are unique and their total contribution is included in the protein category.

Category	Examples of foods included
Grains	Cereal, pasta, rice, oats, nutrition bars, corn, pretzels, crackers, frozen breakfast foods (waffles, pancakes, etc.)
Protein	Fresh beef, poultry, pork, eggs, beans-peas, canned meats including tuna and chicken, peanut butter, nuts, seeds, lunchmeat, hotdogs, sausage (all types)
Vegetables	Fresh, canned and frozen vegetables, spaghetti sauce
Fruits	Fresh, canned and frozen fruit, juice, dried fruit (raisins, prunes, etc.)
Dairy	Fresh and canned milk, cheese, yogurt, sour cream
Oils	Canola oil
Beans-Peas	Canned and dried beans
Mixed Foods	Processed foods that combine multiple categories, including boxed meals, frozen entrees, soups, canned entrees (chili, stew, etc.), mac and cheese.
Empty Calories	Foods that contain high amounts of added fats and sugars and contribute little nutritional value. Cookies, chips, frozen treats, toaster pastries, flavored popcorns, meat snacks, pastries.
Beverages	All beverages, excluding milk
Condiments	Salad dressings, dips, jams, jellies, ketchup, mustard, mayo, spices, bouillon, broth, canned chilies.
Infant/Child Specific	Formula, Pedialyte, Pediasure
Miscellaneous	Any product that cannot be analyzed due to insufficient data or product information.

Twelve months of inventory was obtained from United Food Bank of Arizona detailing the type and amount of product distributed for one year during 2013-2014. The

inventory was analyzed as a whole regardless of procurement source. The justification is that inventory is packaged and distributed as a whole and not determined by food source.

Analysis

Inventory was received via electronic transfer and separated into separate Microsoft Excel spreadsheets that were developed to analyze the contributions of each food category separately. Each spreadsheet included a description of each food/beverage; an item number; pack size; gross weight; UFB category (food type and/or procurement source (e.g. protein, TEFAP, baby, produce, etc.); percent yield of each item; edible portion in ounces; MyPlate servings per day (group); total servings provided (based on ounces) for each item; and MyPlate servings distributed. Each food and beverage item listed on the spreadsheet was individually analyzed and placed into the appropriate food group category. Each spreadsheet is unique to the food group and method of analysis, resulting in slight differences between spreadsheets.

The inventory received from UFB was not all-inclusive of the entire inventory for 2013-2014. Therefore, this analysis was based on a number of persons as a percentage of actual inventory accounted for. Total pounds of food collected and distributed per UFB 2014 annual report was 22,328,747; inventory analyzed accounted for 14,882,380 pounds of food, which is 66 percent of total inventory received. The number of people served per UFB 2014 annual report was 1,821,800. Sixty-six percent of this number is 1,208,988.

Each food item in the inventory was broken down into measurable units based on the information provided by the pack size and gross weight columns. In cases where a

pack size was not listed, an internet search using Google search engine was used to find the closest possible match for that item. It was assumed that gross weight is the total pounds of food, including packaging. This assumption is made based on standard food bank procedure of weighing food as it is received, without regard to package weight. Given the variability in reporting of package sizes and item descriptions, assumptions were made regarding product specifics (e.g., canned in light syrup, size of individual cereal boxes, etc.). Assumptions for products as well as details regarding calculations and/or analysis are listed in the notes section of each spreadsheet (Appendices A–H).

The spreadsheet calculates the total ounces of each food separately after accounting for package weight (edible portion.) The gross weight in pounds is multiplied by 16 to determine ounces and this number is multiplied by the percent yield. Percent yield was determined based on (1) estimated package weight of the item or (2) actual percent yield of produce using *The Book of Yields* and *chefs-resources.com*. The edible portion was estimated for each individual packaged food, based on packaging type. Package weight was determined by referring to the *Consolidated Container Company Stock Mold Catalog* for plastic bottles and containers, and to the *USDA Weights, Measures and Conversion Factors for Agricultural Commodities and Their Products* for glass bottles and containers. Cardboard package weights were estimated by referring to *The Environmental Register of Packaging PYR LTD.* The net weight of a package was divided by the total package weight to determine percent yield. For example, a box of crackers with a net weight of 14-ounces weighs 16.5 ounces when the package weight is included. Percent yield = 14/16.5 = .848, rounded to 85. The percent yield is determined

to be 85 percent. In cases where package weight could not be located through the glass, plastic or cardboard references, the package was weighed on a Salter home kitchen scale.

Total servings provided were determined by dividing the edible portion by the recommended MyPlate serving size. MyPlate serving size was calculated by taking the recommended serving size from choosemyplate.gov and converting that to ounces. For example, a 1-cup serving of Apple Jacks cereal weighs 1.1 ounces. In the case of fruits and vegetables, the average weight in ounces of each item's MyPlate serving size was determined and then that number was multiplied by the number of daily MyPlate servings. For example, the average weight in ounces of all fruit items is 223 ounces, divided by the number of line items, 36, amounts to 6.21 ounces per MyPlate serving. This number is multiplied by 2 to reflect the recommended number of MyPlate servings of fruit for a 19-30 year old female. The result is a number that is reflective of the total average ounces in 2 cups of fruit servings per day. The same calculation is performed for grains, and the average ounce for a serving is 7.3 ounces. Protein is divided by 5.5 as the average ounces of all items was 1 ounce and to account for the recommended daily ounce-equivalent servings in this group. Dairy was determined by dividing the total servings by the average MyPlate serving size in ounces of all items, which equated to approximately a one-cup serving.

Given that MyPlate recommended serving size vary based on age and gender, the serving size/calorie recommendation for 19-30 year-old women was used as the measure. Per ChooseMyPlate.gov, recommended daily calorie needs for 19-30 year old women is 2,000. The rational behind this decision is based on (1) 65 percent of food bank users are women (*Hunger In America*, 2014); and (2) nutrition label information is based on a

2,000 calorie-per-day diet. The final analysis looks at how well UFB can meet the needs of a family of four over a three-day period. The justification is that the temporary emergency food box that is built using inventory procured is designed to feed a family of four for three days.

An outcome measure defined as the number of days each client could potentially be provided the minimum number of MyPlate recommended servings for each food group was determined. This measure was labeled MyPlate Servings days. The figure was derived by dividing the total number of servings calculated for each food group by the minimum recommended number of MyPlate servings for that category.

The food category contributions provided by mixed foods was determined by using the MyPlate mixed foods chart. Since all foods are not accounted for on this chart, assumptions were made based on the food and its similarity to existing items on the chart. Each mixed food was analyzed to determine its contribution to each of the food categories and then each food category contribution was totaled. See Appendix I.

Results

Table 2 delineates the breakdown of MyPlate servings the 2013-2014 UFB inventory would meet. The weight of the inventory is shown in edible portion ounces. The amount of servings provided by each food group is represented as servings. The recommended MyPlate servings per day are represented as MyPlate Recommendations and are shown in cups, ounces, or ounce equivalents. The number of days or portion of a day a family of 4 could meet MyPlate recommendations is shown as MyPlate Servings

Days. Finally the percent of MyPlate that is met for 3 days is listed as Percent of MyPlate met for 3 days.

Table 2 MyPlate Fulfillment Based on Net Weight

Food Category	**UFB Inventory for 2013-2014**				
	Ounces[1]	**Servings[2]**	**MyPlate Recommendation[3]**	**MyPlate Servings days[4]**	**Percent of MyPlate met for 3 days[5]**
Fruit	513,396	6,371,531	2 cups (~ 12.4 oz./day)	0.41	14
Vegetables	1,006,823	11,965,811	2.5 cups (~ 11.6 oz./day)	0.82	27
Grains	4,143,318	24,859,908	6 oz. equivalents	3.38	113
Protein	5,353,347	18,915,473	5.5, 1 oz. equivalents	4.36	145
Dairy	203,301	2,771,574	3 cups (or equivalent)	0.17	6

[1]Total ounces after calculating for edible portion
[2]Number of servings in inventory
[3]MyPlate recommended serving size for 19-30 year old female client and corresponding ounces
[4]Number of days each person could meet MyPlate minimum servings
[5]Percent of MyPlate servings met for a family of 4 over the course of 3 days

Table 3 demonstrates in percentage how much of the gross weight of the inventory fulfills MyPlate recommendations. The Percent of Total Inventory shows how much of the inventory (based on gross weight in pounds) is made up of each food category. The Percent of Total Inventory that Fulfills MyPlate Servings is the percent of the gross weight inventory that actually fulfills MyPlate recommendations for each food category.

Table 3 MyPlate Fulfillment Based on Gross Weight (lbs.)

Food Category	Gross Weight	Percent of Total Inventory	Percent of Total Inventory that fulfills MyPlate Servings[1]
Grains	1,567,852	11	10
Protein	1,357,216	9	1
Vegetables	3,619,277	24	20
Fruits	3,174,180	21	14
Dairy	1,190,512	8	8
Oils	391	0	___
Beans-Peas	396,576	3	3
Mixed Foods	206,773	1	1
Empty Calories	872,661	6	___
Beverages	1,297,356	9	___
Condiments	71,354	0	___
Infant/Child Specific	114,944	1	___
Miscellaneous	1,014,288	7	___

[1]Percent of Inventory that fulfills MyPlate Servings based on gross weight
(net weight in group / total gross inventory weight)

Findings suggest that inventory procured could meet, on average, the minimum recommended protein and grain requirements for a family of four for three days, but fell short in vegetable, fruit and dairy servings. (Figure 1)

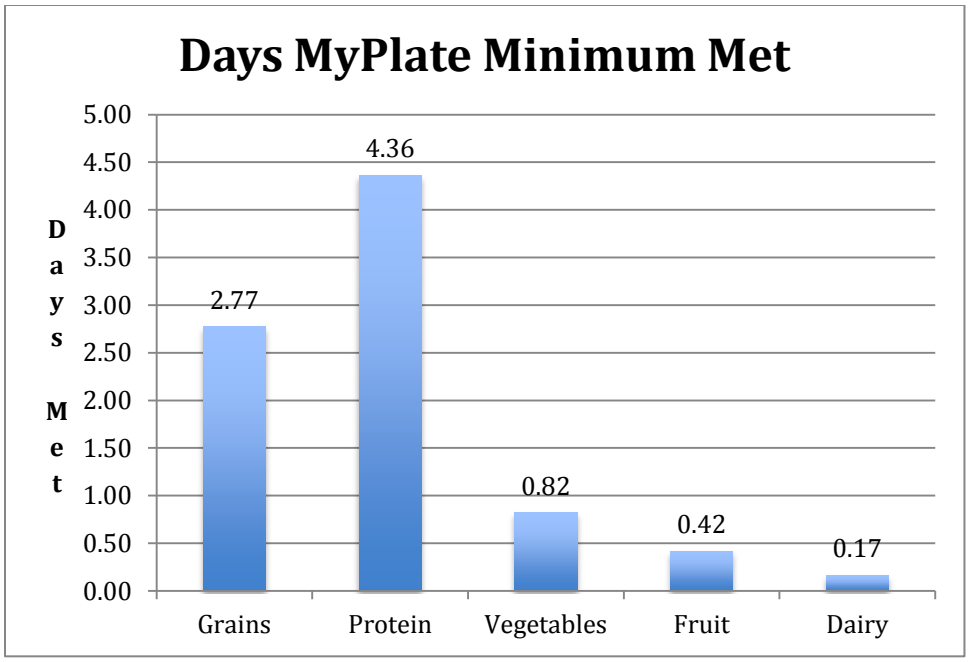

Figure 1 Number of Days Inventory Could Meet MyPlate Minimums

Figure 2 depicts a representation of an ideal MyPlate, showing fruits, vegetables, grains and protein as a portion of a pie chart. The figure gives a good representation of the amount of each food category, if shown as a percentage of a plate. Figure 3 shows the 2013-2014 UFB inventory in the same manner.

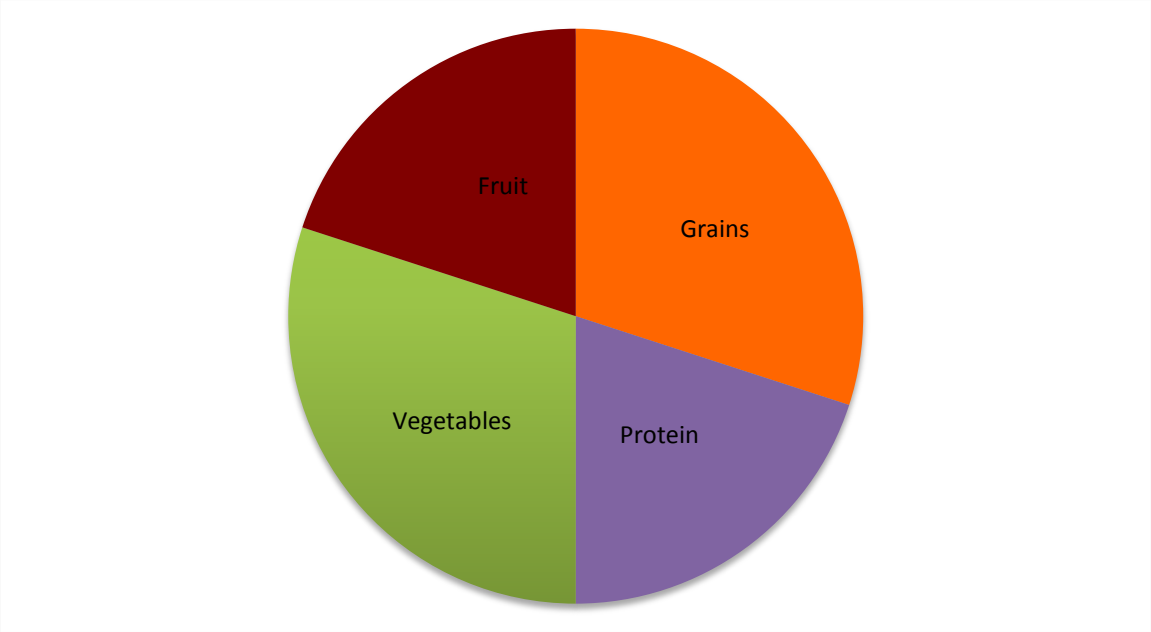

Figure 2 Ideal MyPlate Representation

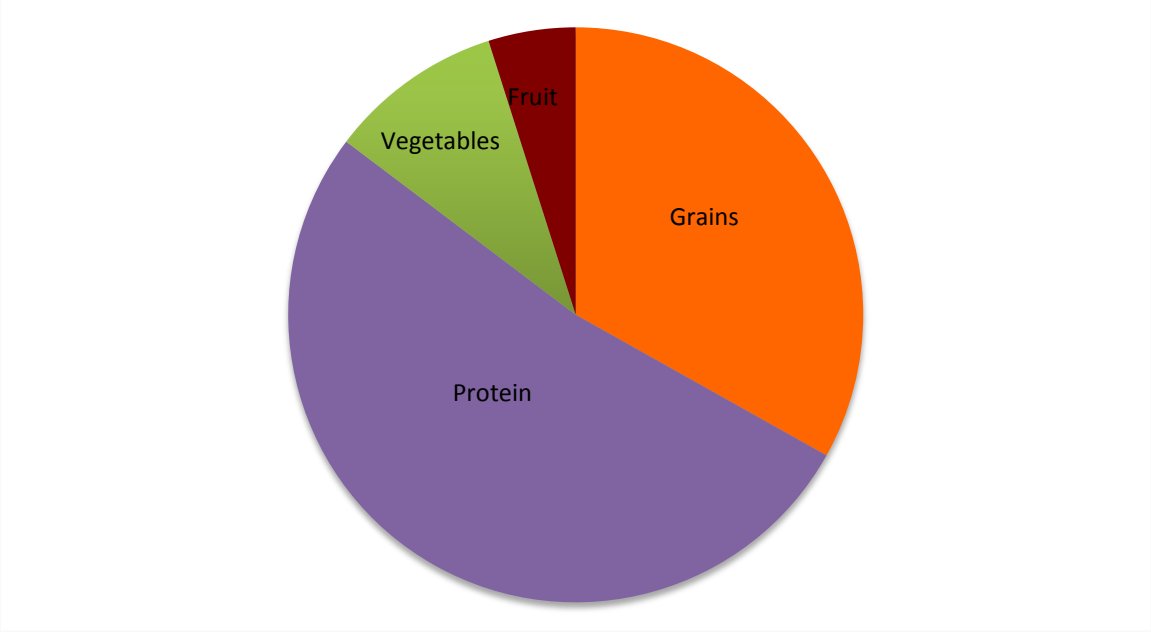

Figure 3 UFB MyPlate Representation

Of the almost 15 million pounds of food in the inventory, the food category from which the greatest amount of servings could be distributed was protein (1,357,216 pounds); followed by grains (1,567,852 pounds); vegetables (3,619,277 pounds) and fruit (3,174,180 pounds.) The least amount of MyPlate servings was dairy (1,190,512 pounds.)

Analysis for number of servings of each food category per-person showed the following results: 24 protein servings; 20 grain servings; 10 vegetable servings; 5 fruit servings; and 2 servings of dairy. When analyzed for MyPlate fulfillment, it was found that a family of four could potentially meet MyPlate recommendations for protein for 4 days, and grains for almost 3 days. This same family of four would meet less than one day's worth of vegetable servings; less than half a day's worth of fruit servings and virtually no dairy servings.

CHAPTER 4

DISCUSSION

This study assessed the ability of food donations and purchases in a large food bank in Arizona to meet MyPlate recommendations. As such, the MyPlate Analysis Program was developed to convert foods into serving sizes based on MyPlate recommendations. Servings from the various food categories represented by MyPlate were measured to provide an outcome evaluation for the potential nutritional impact food bank inventory has on its clients.

The results of this research provide a "real time" picture of how food bank inventory is meeting the nutritional needs of clients and demonstrates, in a tangible fashion, where the shortfalls actually occur. This research, combined with previous research, provides a foundation from which nutritional policy can be written and applied. Certainly, policy should be client-centered, with the ultimate goal of guiding purchases and donations in order to provide each and every food bank user a healthy, balanced meal. The methods behind the study provide an alternative method for nutritional profiling, and can be applied to existing nutritional profiling programs, as well as future systems, to enhance the ability of food banks and their agencies in providing meals that meet USDA minimum recommendations.

The MyPlate servings for each category represent a volume of food from one food category and the portion of a day or days it could fulfill MyPlate minimum recommendations. Although MyPlate helps American's determine the proportion of food needed from each food category according to age, gender and activity level, there is no one common measure for all categories (e.g., cups) using this tool, therefore the methods

used in this study averaged serving sizes for each food category into identifiable measures, i.e. ounces and cups.

Results of this study agree with previous research that also demonstrated shortfalls in fruits and dairy (Hoisington et al., 2011). A recent study of nutritional quality of inventory at six food banks in California showed an overall increase in fresh fruit and vegetables however, it must be noted that despite the increase, over half the donations were of less nutrient-dense varieties, such as onions and potatoes (Ross, M, Campbell, EC & Webb, K, 2013). These hardy types of produce are desirable as they are less perishable, readily available and contribute more to the weight of inventory. Additionally, they require less refrigerated storage.

To our knowledge, this is the first study to comprehensively explore the ability of a food bank inventory to meet USDA MyPlate recommendations. Additionally, it is only the second known study to account for food packaging weight in the analysis (Cotugna et al., 1994). This is meaningful in that food packaging contributes a significant amount to total pounds, a noteworthy matter when speaking in terms of nutritional value of inventory and foods distributed. Of the 15 million pounds of food analyzed, only 64 percent could actually fulfill MyPlate recommendations. A complete picture of total food bank inventory is difficult to capture as a considerable amount of the total inventory could not be analyzed due to incomplete information or unclassified items (i.e., any, assorted, mixed.) Furthermore, foods that do not contribute to MyPlate recommendations (beverages, condiments, empty calories, infant/child specific – approximately 24 percent of the gross weight in pounds of inventory) were not included in the analysis. While these foods do not fit MyPlate criteria, they are essential components of household food

pantries: they add flavor, variety and in the case of infant formula, these items are at times, necessary.

More than 80 percent of food banks do not employ an organized method for distinguishing the nutritional quality of procured foods (Shimada, T, Ross, M, Campbell, EC, Webb, K, 2013). The healthfulness of foods acquired and distributed cannot be assessed if food banks do not review and classify inventory with regards to nutritional contribution. Food banks have limited resources available to thoroughly classify inventory, in particular the tons of donated items that include a plethora of items. To enable better inventory tracking, Feeding America is exploring options to develop new systems and enhance existing inventory control systems that would allow for improved nutritional quality monitoring (Shimada, T, Ross, M, Campbell, EC, Webb, K, 2013). Feeding America has already taken steps towards improvement by releasing their booklet *Foods to Encourage*, a framework designed to evaluate and describe the nutritional contributions of food categories in their network of inventories (Nutrition Initiative, n.d).

There are food banks with nutritional monitoring systems in place, developed by forward-thinking food bank leadership. The Greater Pittsburgh Community Food Bank developed their Choose Healthier Options Program (CHOP) to classify inventory into an easy-to-understand 3-point scale so that clients can make informed decisions about what to eat. The scale is simple – foods that are recommended frequently, such as fresh produce, are ranked at 1; foods that offer some nutrition are ranged 2 for occasionally; foods that have little nutritional value are ranked as 3 and consists of empty calorie type items that should rarely be eaten. The Greater Pittsburg Community Bank makes the

program available to food banks and other agencies that are interested in monitoring the nutritional quality of their inventory.

St. Mary's Food Bank in Phoenix, Arizona is developing a nutrient profiling system for use in their warehouse, however it is still in its infancy, according to Ben Bradley, Director of Business Intelligence. Much like CHOP, it will assign a numerical value to foods.

In 2004, United Food Bank collaborated with Arizona State University and launched a project called the Nutrient Tracking and Enhancement System (NTES). The system is a nutrient database, designed to determine the nutritional quality of food and focuses on eight key nutrients (vitamins A and C, protein, folate, fiber, iron, calcium and zinc) but with the ability to track 13 vitamins and 16 minerals, as well as carbohydrate, and fat content. The goal of NTES is to enhance the nutrient content of food distributed, as well as to assist UFB in food procurement decisions. Ideally, this program could be expanded upon and converted to an automated web-based platform and include the ability to determine servings per item, and based on net weight rather than gross weight.
to more adequately reflect the recommendations of the USDA and MyPlate and therefore be more likely to fully meet the nutritional needs of clients.

Improved inventory tracking systems built with nutrition in mind are a must and would enable food banks to keep nutrition-based goals at the forefront of operations. Incorporating the *Dietary Guidelines for America 2015* into such a system would allow for streamlined operations, given that there is nutrition guidance already available through the USDA. It makes sense to build a nutritionally based inventory system around existing nutritional guidance (such as MyPlate) set forth by the very agency that provides

a portion of the inventory. Doing so would enable food banks and their agencies to construct emergency food boxes and meals that more adequately reflect the recommendations of the USDA and MyPlate and therefore are more likely to fully meet the nutritional needs of clients.

Presently, information regarding how well emergency food boxes meet the gaps in household food resources is lacking. This study will add to the limited information on this subject and, ideally, spur further studies into the ability of food banks to meet the nutritional needs of their clients. This research contains practical procedures that can easily be incorporated into existing spreadsheets and/or nutritional profiling systems. Doing so would give food banks a better understanding of how well their inventory stacks up, nutritionally.

The strengths of this study lie within its structure – breaking down inventory to individual servings based on USDA MyPlate recommendations. This gives a far more accurate and user-friendly picture of what a typical food bank inventory actually looks like when put on a plate. Previous studies on the nutritional quality of food bank products have provided "big picture" information – information such as increases or decreases in donations in particular food categories; pounds of product distributed, even micronutrient analysis. These studies provide invaluable information, and the research presented here adds to this knowledge and affords more detailed information from which future policy can be created.

A considerable portion of inventory was not classified or described (i.e., unidentified canned foods, "assorted") thereby limiting the ability of this study to give a more accurate picture of MyPlate fulfillment.

Indeed, if food banks are to succeed in offering nutritious foods to their clientele, it is crucial to measure the nutrient profile of the donations it receives and the purchases it makes. Purchasing food for inventory provides an opportunity to proactively choose foods with greater nutritional quality. Food banks can take advantage of their buying power and make bulk purchases when monetary donations are given.

CHAPTER 5

CONCLUSION

The findings of this study illustrate how this and similar methods of nutritional analysis can play a role in evaluating a food bank inventory to determine its ability to meet the minimum nutritional requirements set forth by the USDA. Moreover, the results of this research encourage the continued push for implementation of nutrition policy at the national or food bank level in order to improve the quality of foods distributed from food banks and their agencies. Currently, distributing agencies are only required to keep a summary of commodity specifications available to recipient agencies, upon the agency's request (Distribution And Control Of Donated Foods, n.d.). Recent change proposals to legislation regarding donated foods will require distributing agencies to keep record of the types and quantities, as well as the specifications and nutritional value of foods (Food And Nutrition Service, n.d.). Consequently, policy initiatives will certainty be at the forefront of food bank agendas.

The majority of the hypotheses for this study were defended, when looked at in relation to an emergency food box, which is meant to feed a family of four for thee days. The first hypothesis, which stated that inventory at UFB would fail to meet MyPlate recommendations for fruit for a 19-30 year old female was accepted. Results showed that of the 1.2 million clients served, only two clients would receive the minimum recommended servings, for one day from a typical food box. Stated as number of days met per person, each person in a four-person household could not meet, on average, even half a day's recommended fruit for one day. The second hypothesis was also accepted,

and stated that the same female would fail to meet recommended vegetable servings. The third hypothesis stated that inventory at UFB would fail to meet protein recommendations for a 19-30 year old female client, was not accepted; protein recommendations were met for four days. Hypothesis four stated that dairy recommendations would not be met; this hypothesis was also accepted as diary servings were extremely low, failing to meet the needs of even one person for one day. The fifth hypothesis was rejected; the inventory did not meet grain servings for one client for three days.

At present, food banks measure their success by pounds of food received and distributed. While this kind of gauge gives a sense of progress, it measures most accurately the output of product and not the impact on the health of its client community. Gone is the day when the common thought was that if clients were provided adequate calories, regardless of form, it would equate to good nutrition. The nutritional quality of foods provided by food banks through the emergency food network has considerable influence on the nutritional status and health of the low-income population that utilize food banks and their agencies. Policy setting forth nutritional quality parameters is absolutely necessary in order to protect the health of the already nutritionally compromised emergency food network clients. At the very least, food banks and their agencies should be able to meet the minimum nutritional recommendations set forth by the DGA when providing emergency foods to their clients. Policy should include guidelines for acceptable nutritional quality and set limits on acceptance of nutritionally void foods. If the volume of empty calorie products is reduced, the volume of more nutritional dense foods can be increased. Further research should be conducted to evaluate the storage space required for empty calorie foods such as sodas and other sugar-

sweetened beverages, compared to the storage required for more nutritious foods. Perhaps more cold storage space could be built if the space required to temporarily hold tons of soda is reduced.

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APPENDIX A

PROTEIN

Pack Size	Description	Notes
24/1 lb	Bacon-HY	40% product yield + packaging 5%. Given the high fat/sodium content of bacon, a 2-slice serving was used vs. the 1 oz. equivalent. MyPlate makes not specific recommendations for bacon.
	EGGS	Average weight of one egg is 2 oz. Yield accounts for shell and packaging. Weight per bowers.
	Grocery Rescue Meat	Assumed to be in styrofoam/plastic meat packaging.
24/1# Chubs	Ground Beef-HY	Yield based on packaging. Assumed to be 80/20
24/1# Chubs	Ground Sausage-HY	Assumed to be pork sausage
15 lb individual	Hams - ANONY GRANT	Whole, fully cooked, unheated
24/1# pckgs	Hot Dogs-HY	Oscar Mayer beef frankfurter used
40 lb case	Lamb Shoulder Chop	CalorieKing (Bowers has cooked versions)
5 lb case	Lunchmeat	Luncheon Loaf (Bowers)
	Turkeys, Frozen, Donated	http://www.eatturkey.com/foodsrv/manual/purch6
4/10 lb bags	Chicken, Frozen	52% product yield, + packaging
1 Bird	Pork Patty	Assumed to be pork sausage and that "1 bird" is an error
	Meat	Assumed to be beef
12/12 oz.	Peanut Butter, Creamy	1 TBS
24/15 oz cans	Pork and Beans	Considered a protein food based on mixed foods MyPlate mixed foods chart.
200/2.12 oz.	Peanut Butter & Jelly Squeezers-BP	Heinz food products: Squeezers Peanut Butter and Jelly in 2.12 oz package. 1 oz pnut butter, 1 oz jelly.

APPENDIX B

GRAINS

Pack Size	Description	Notes
6, 12 ct 9.54 oz	Bar, Special K	Number of bars @ 1.59 ounces per bar.
20/1.58 oz	Bars Zone Dk Chocolate	1 bar = 1 ounce equivalent. Assumed based on g CHO, g servings, etc.
192/1.3 oz.	Bars, Cherry-BP	Amount of packaging can significantly change the net weight of product.
	Bars, Choc PB	Estimated per bar weight 1.5 oz based on average of comparable products
12/5 oz pkgs	Bars, Granola Dk Chocolate	Based on nutritional/weight info for Nature Valley Oats & Dark Choc
9-6/5oz	Bars, P.B. Crunch	Assumed to be nutrition bar vs. candy bar. Used Usana Nutrition Bar in CalorieKing. Representive of similar pnut butter crunch nutrition bars
	Bread and Pastry***	Assumed to be white. Original entry for "Bread and Pastry." Assumed to be at least half bread product. Split the amount, and added half to empty calories based on the assumption that half is pastry and desserts.
270/1.5oz	Cereal Bowls, Assorted	Assumed to be ready-to-eat/assumed 1.1 oz by comparison
120/8 OZ PKGS	Cereal Handi Pak BP	Each individual box = 1 serving size
70/.88-.95 OZ.	Cereal, Kellogg's 70 CT INDV-BP	Google search for "cereal, Kellogg's….. 70 ct" revealed single serve Raisin Bran at 1.52 oz each.
12/14 oz.	Cereal, Active Start Vanilla Almond	Ounces/serving not available, assumed to be 1 ounce
12/13.8 oz.	Cereal, Fiber Active	No cup equivalent specified by MyPlate. Assumed cup based on comparable cup equivalents
12/11.4 oz bags	Cereal, Krave	Grams converted to ounces for consistency in measure
52 packets	Cereal, Oatmeal	~ 1.55 oz packets
12/14 oz.	Cereal, Rice Flakes	Assumed serving size based on other flake-type cereal
	CEREAL-M	Assumed to be 14 oz box of popular cereal and assumed serving sizes
	COOKING/BAKING MIXES-M	Based on nutritional information on package.

200/2ct	Crackers, Cheese on Cheese	Based on 3 cracker sandwiches since MyPlate serving size is 7 crackers
45/1.38 oz.	Crackers, Peanut Butter on Toast-BP	Based on 3 cracker sandwiches since MyPlate serving size is 7 crackers
4/11 oz boxes	Crackers, Ritz	Cross reference Bowers/ CalorieKing/Ritz nutrition info indicate serving size is 16 g which amounts to 5 crackers - .6 oz
6/8oz	Crackers, Wheat Thins	Cross reference Bowers/ CalorieKing/Ritz nutrition info indicate serving size is 30 g which amounts to 16 crackers - 1.1 oz
12/12 oz	Eggo	Assumed to be Eggo waffles
12/32 oz	Pasta Spaghetti Wheat	Pasta assumed to be in boxes - EP 95%
40/3.24 oz	Popcorn	Assumed to be microwave based on packaging. Pop Secret brand used for analysis.
8/1.5 oz	Popcorn, Kettle	Pop Secret Kettle Corn used
12/10 oz	Pretzels	Assumed to be soft based on packaging

APPENDIX C

DAIRY

Pack Size	Description	Notes
12/8 oz	Cheese, Mozzarella	Allowing .5 oz for container. Assumed to be part skim, low moisture.
	Dairy	Assumed to be milk based on item number
	Yogurt	Assumed to be low-fat fruit variety.
10 lb. case	Yogurt/Cottage Cheese/Sour Cream	4 oz serving selected. 1/2 C 2% cottage = 1/2 C 2% milk, 1/2 C low-fat fruit variety yogurt. Averaged all to determine kcal.
	Milk	Assumed to be 2%
	MILK,CANNED,DRY-M	Assumed to be non-fat dry milk. Used Carnation. 1/3 cup powder (23g) = 1 cup fluid milk
6/24 oz	Quesadillas, Cheese	Assumed to be quesadilla cheese vs. cheese quesadillas. Extensive web search did not reveal any type of pre-made quesadilla in a 24 oz package. Web search revealed Supremo brand Quesadilla Cheese in a 24 oz container. Walmart.com

APPENDIX D

FRUITS

Pack Size	Description	Notes
	Apples, Fresh	Converted to servings by multiplying by .30 (138 g = serving size) Rounded down to 4 oz (MyPlate) BOWERS
	Bananas, Fresh	Convert to serving ounces
12/2.5	Blueberry Cultivated Frzn	Blueberry not specifically mentioned on MyPlate. Used Bowers
12/32 oz.	Juice, Apple	Packaging assumed to be plastic bottle
	JUICES-M	Assumed to be apple juice
	Citrus, Fresh	No type specified. Averaged orange and grapefruit
24/15 oz cans	Fruit Mixed, Canned	Assumed to be canned in light syrup
24/15 oz cans	Peaches, Clingstone, Canned	Assumed to be canned in light syrup
24/15	Pears, Canned	Assumed to be canned in light syrup
24/14 oz cans	Sauce, Cranberry, Jellied	Serving size estimated based on Bowers and CalorieKing
	Oranges, Fresh	Yield from "the book of yields". Serving from MyPlate. Ounces/calories from CalorieKing
24/15 oz cans	Pineapple Chunks, Canned	One cup, drained

APPENDIX E

VEGETABLES

Pack Size	Description	Notes
12/14.5 oz. cans	Beans,Green	Nutritional/ounce info from CalorieKing. Servings amounted to < 1.
	Cabbage,Fresh	Info for raw product
	Carrots, Fresh	Based on 2 medium carrots per MyPlate
24/15 oz.	Peas & Carrots-HY	CalorieKing - info not in Bowers. Estimated weight at 5 oz based on similar veg
24/15 oz.	Peas, Sweet-HY	CalorieKing - info not in Bowers. Estimated weight at 5 oz based on similar veg
	Vegetables, Mixed, Fresh	Assumed to be frozen, not stated. CalorieKing
24/16 oz cans	Vegetables,Canned-Donated	Assumed to be mixed vegetables
	Squash, Fresh	Used butternut. CalorieKing info.
	TOMATO PRODUCTS-M	Assumed to be sauce. CalorieKing
	Salad Mix, Fresh	CalorieKing
	Potatoes, Fresh	CalorieKing
	Onions, Green, Fresh	Also called Welsh Onion
	Peppers, Fresh	Assumed to be bell
12/24 oz	Sauce, Marinara	CalorieKing
12/26.5 oz.	Sauce, Spaghetti	CalorieKing
24/15 oz cans	Sauce, Spaghetti, Meatless	CalorieKing
	Produce, Assorted	Orig line item total # 916220. Split between fruit/veg and averaged ounces

APPENDIX F

OILS

Pack Size	Description	Notes
3 gallon case	Cooking Oil	AP based on 3, 1 gal jugs oil. Weight of jugs 4.9 oz each. Used vegetable oil, all variety.

APPENDIX G

MIXED FOODS

Pack Size	Description	Notes
24/11 oz cans	Soup, Chicken Noodle	Assumed to be condensed based on can size.
24/ oz cans	Soup, Cream of Mushroom	Assumed to be condensed based on cases size and cream version.
12/15 oz.	Soup, Dumplings & Chicken	Assumed contribution to categories based on comparison of other mixed foods. Google searched revealed Marie Callender's chicken and dumplings soup in 15 oz can, 2 servings per can, 240 g (8.5 oz) per serving.
24/14.9 oz.	Soup, Garden Vegetable	Assumed contribution to categories based on comparison of other mixed foods. Google search of garden veg soup 14.9 oz can revealed Muir Glen.
24/11 oz cans	Soup, Vegetable	Assumed contribution to categories based on comparison of other mixed foods
24/11 oz	Soup, Vegetable Beef	Assumed contribution to categories based on comparison of other mixed foods
24/15 oz cans	Ravioli	Comparable to vegetable lasagna. Search of 15 oz can ravioli revealed Chef Boyardee
24/24 oz cans	Beef Stew, Canned	Serving size 1 cup / 236 g / 8 oz. Search revealed Dinty Moore, 3,8 oz servings (CalorieKing)
12/7.5 oz.	Beef Stew, Microwavable Meals	Compared to soup and based on common knowledge of beef/vegetable contents of beef stew
24/15 oz	Chili W/ Beans-HY	Beans counted as protein. Could also be counted as vegetable
4 lb	Enchilada, Chicken	Google searched: Heinz Foodservice Baja Chicken Enchiladas. Serving size 8.6 oz. Equivalents estimated based on similar food: Lasagna http://www.heinzfoodservice.com/espanol/productos/sopas-y-frijoles/baja-chicken-enchilada#78001479
12/7.5 oz.	Lasagna, Microwavable Meals	Assumed to contain meat
8-7.5 oz bowls	Chef Boyardee Variety	Comparable to spaghetti and meatball meal based on package size
6 pk	Hamburger Helper	Compared to mac and cheese for grain contribution.
12/5.6 oz.	Pasta, Beef Dinner-HY	Comparable to lasagna dinner (below) based on size of package
12/6.5 oz.	Pasta, Lasagna Dinner-HY	Assumed to be boxed mixed based on package size. Googled size and product; resulted in Sam Mills Beef Lasagna dinner, serves 5. Serving size and calories based on dry weight, no meat.
24/7.25 oz	Pasta, Macaroni & Cheese-HY	Assumed to be boxed type, based on packaging size. (Kraft is 7.25 oz). Serving size based on dry weight.
8/11 oz	Meal, Ckn and Rice	Assumed that chicken portion is ~ 3 oz and rice portion is ~ half cup based on known serving sizes in frozen meals
24/7.25 oz.	Macaroni & Cheese	Assumed to be boxed type, based on packaging size. (Kraft is 7.25 oz). Serving size based on dry weight. Servings per unit based on assumption that product prepared per package recommendations.
12/11 oz	Tamale Dinner	Googled: Goya Beef Tamales, 6 burritos in 11 oz package.

APPENDIX H

BEANS AND PEAS

Pack Size	Description	Notes
	BEANS, CANNED, DRY-M	Assumed to be bagged dry pinto based on gross weight. Dry beans triple volume so 1/2 cup dry beans = ~ 1.5 cup cooked. To manage for MyPlate: Calculation: 96 g x 2 = 192 / 3 = 64 g per 1/3 cup
12/2 lb bags	Beans, Great Northern	Dry beans triple volume so 1/2 cup dry beans = ~ 1.5 cup cooked. To manage for MyPlate: Calculation: 92 g x 2 = 184 / 3 = 61 g (2.15 oz) per 1/3 cup dry beans