

THE AVAILABILITY OF PUBLIC TRANSPORTATION AND ACCESS
TO GLUTEN-FREE PRODUCTS IN A RURAL COMMUNITY
IN THE NORTHWEST

by

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ABSTRACT

Access to gluten-free foods among elderly individuals with celiac disease or an intolerance to gluten, is a growing concern in the United States. Because of the inability of individuals with celiac disease to absorb nutrients appropriately, the potential for a variety of other physiological problems, such as malnutrition, neurological complications, vitamin K deficiency and osteoporosis exist. The purpose of this project was to describe the availability of public transportation as well as the availability and cost of gluten-free food products in stores within a rural community in the Western United States. Managers of five rural stores that sold grocery products provided written permission for a survey titled *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores* to be used in their store. The tool identified unprocessed fruits, vegetables, fish, meats, cheeses and dairy products and a variety of alternatives to wheat containing products. Food items were assessed at each of the stores within a one-week time period. Information about hours of service, as well as, cost and location of rider drop-offs were obtained from the community bus station that offers three services. Findings from this project may serve as a resource to local community health care providers who provide information for persons on limited incomes, with limited access to transportation, and special dietary needs.

CHAPTER 1

INTRODUCTION

Purpose

The purpose of this project was to describe the availability of public transportation as well as the availability and cost of gluten-free food products in stores within a rural community in the Western United States.

Background

The overall health of elderly individuals is significantly impacted by nutritional status (Chen, Schilling, & Lyder, 2001). Nutritional status among elderly individuals is unique, as it is compounded by a multitude of issues. The ability to prepare meals, medical conditions that require therapeutic diets, financial ability to purchase nutritious foods and or adhere to a therapeutic diet, access to transportation to purchase nutritious and dietary specific foods, as well as the ability to consume such foods impact the nutritional status of this sub-population (Chen et al., 2001; Frongillo & Horan, 2004; Lang, 2002). As a result, hunger and malnutrition are serious threats facing millions of seniors living in the United States (Ziliak, Gunderson, & Haist, 2008). Further compounding this complex dilemma are the mal-absorptive disorders found among this population. This project will focus on celiac disease, a primary contributor to malnutrition among the elderly.

Celiac Disease

Mal-absorptive disease processes, such as celiac disease, contribute to the incidence of malnutrition among elderly individuals (Bolin, Bare, Gideon, Daniells, & Holyday, 2010). Celiac disease is also known as “celiac sprue, non-typical sprue, gluten intolerance, or gluten-sensitive enteropathy” (Horowitz, 2011, p. 92). Celiac disease is an immune-mediated inflammatory disease of the small intestine that is precipitated by the ingestion of gluten in wheat, barley and rye (Johnson, Ellis, Asante, & Ciclitira, 2008). Recent studies indicate that oats may also illicit an immunologic response in individuals with celiac disease (Murray, 1999).

Celiac disease is characterized by a chronic inflammatory process of the small-intestinal mucosa as a result of a genetically based immunologic intolerance to gluten (Murray, 1999). Celiac disease is more prevalent in individuals with other immune-mediated conditions, such as diabetes, thyroid disease, primary biliary cirrhosis and Sjögren’s disease (Johnson et al., 2008). Three factors must be present for this autoimmune disease to cause damage: an environmental trigger (the ingestion of gluten), heightened immune reactivity and intestinal permeability (Fasano, 2009). Increased intestinal permeability in individuals with celiac disease permits gluten to seep out of the gut where it then interacts freely with genetically sensitized elements of the immune system (Fasano, 2009). An autoimmune response is then initiated in response to ingested gluten, resulting in inflammation of the epithelial cells lining the small intestine (Johnson et al., 2008). The small “fingerlike” villi of the small intestine become chronically inflamed and damaged with repeated gluten ingestion and become unable to carry out

their normal function of breaking down food and transferring nutrients across the intestinal wall into the bloodstream (Fasano, 2009). As a result, vital nutrients such as iron, folate, calcium, magnesium and fat-soluble vitamins D, E, A and K are not absorbed (Murray, 1999; Johnson et al., 2008).

Prevalence of Celiac Disease

Roughly one percent of the global population and over two million Americans are diagnosed with celiac disease (Fasano, 2009). Older Americans, who had previously tolerated gluten, are being diagnosed with celiac disease at much higher rates, as a result of increased intestinal permeability (Fasano, 2009). Individuals often present with one or more of the following symptoms: altered bowel habits, atypical dyspepsia, abdominal pain, bloating, oral aphthous ulcers, weight loss, iron deficiency anemia, stomatitis, glossitis, lethargy, osteomalacia, osteoporosis, fractures, dermatitis herpetiformis, infertility, myopathy, neuropathy, anxiety and depression (Johnson et al., 2008). Elderly individuals most frequently present with diarrhea or symptoms of malabsorption such as anemia or osteoporosis (Green & Bana, 2006). Specifically, carpo-pedal spasms, a symptom unique to this sub-population, can be identified in elderly individuals with celiac disease (Johnson et al., 2008).

Complications of Celiac Disease

Because of the inability of individuals with celiac disease to absorb nutrients appropriately, the potential for variety of negative symptoms exist. “Vitamin D deficiency is seen in 68% of elderly patients with celiac disease” (Asante, Ciclitira, Ellis, & Johnson, 2008, p. 697). Elderly individuals predisposition to osteoporosis coupled with a diagnosis of celiac disease significantly increases the risk of developing osteoporosis and osteoporosis-related premature fractures (Johnson et al., 2008). Calcium and vitamin D malabsorption, commonly found in celiac disease, can also cause secondary hyperparathyroidism, which leads to a high rate of bone remodeling and marked bone loss (Johnson et al., 2008).

Neurologic complications occur in up to 35% of individuals with celiac disease (Johnson et al., 2008). Celiac disease is associated with the development of early onset dementia, described as, dementia occurring before age 60, (Johnson et al., 2008), however, strict gluten-free diet has been known to reverse longstanding cognitive decline in these instances (Hadjivassiliou & Gibson, 1996). Approximately four percent of patients with celiac disease have been known to develop epilepsy (Gobbi & Pizzardi, 1992). Sensorineural deafness and other rare neurologic conditions may also occur as a result of celiac disease and occur more frequently among elderly individuals (Leggio et al., 2007).

Vitamin K deficiency is also commonly experienced in individuals with celiac disease. In fact, 20% of adult patients treated for celiac disease exhibit a prolonged prothrombin time and international normalized ratio (INR) as a result of this deficiency

(Cavalloro et al., 2004). Studies show that when a strict gluten-free diet is followed, a resolution of symptoms occurs (Cavalloro et al., 2004).

Splenic atrophy is found in up to 80% of individuals diagnosed with celiac disease (Vazquez et al., 1991). Antibiotics and immune prophylaxis are necessary in cases of splenic atrophy. Splenic atrophy is so widespread in cases of celiac disease that it is standard for individuals found to have splenic atrophy to be tested for celiac disease, as this is often the underlying cause (Johnson et al., 2008). Thrombocytopenia is the most common hematologic disorder identified in individuals with celiac disease, and thrombocytosis is of even higher incidence among elderly individuals (Carroccio et al., 2002).

Dermatitis herpetiformis, a symmetrical pruritic vesicular rash, is found in two to three percent of individuals with celiac disease. Of these individuals, 10% are greater than 60 years of age (Christensen, Hindsen, & Svensson, 1986). Because dermatitis herpetiformis is so strongly associated with celiac disease, it is the standard for individuals with this rash to be tested for celiac disease (Christensen et al., 1986).

Ulcerative jejunoileitis is a pre-malignant condition that may also occur in patients with celiac disease and can lead to enteropathy-associated low-grade lymphoma (Koutrotsos et al., 2006). This condition can improve with a gluten-free diet (Koutrotsos et al., 2006). The incidence of intestinal lymphoma is most prominent in individuals in their sixth, seventh and eighth decade of life and malignancy occurs more frequently in those with poorly controlled diseases (Cooper, Holmes, & Cooke, 1982). The largest numbers of lymphomas are found in individuals with celiac disease that is

diagnosed between 51 and 80 years of age (Cooper et al., 1982). Elderly individuals newly diagnosed with celiac disease are more prone to developing lymphomas and should be followed very carefully as they have a one in 10 chance of developing a lymphoma (Cooper et al., 1982).

Importance of a Gluten-Free Diet

As a result of the permanent intolerance to gluten and resultant complications, individuals with celiac disease must adhere to a life-long gluten-free diet (Corrao, 2001 & Cooper et al., 1982). More importantly, it is imperative that elderly individuals with celiac disease follow a strict gluten-free diet as the incidence of gastrointestinal lymphoma and carcinoma is heightened among this sub-population (Corrao, 2001 & Cooper et al., 1982).

Individuals with Celiac disease are to avoid all wheat, rye and barley (Ciclitira, Johnson, Dewar, & Ellis, 2005; Murray, 1999). Oat products should be ingested with caution and their elimination should be based on individual symptoms (Ciclitira et al., 2005). Beer should also be avoided as it frequently contains barley and gluten derivatives (Ciclitira et al., 2005). For the greatest health benefit among individuals with celiac disease, Decher & Parrish suggest

a variety of “nutrient dense” foods, which are rich in vitamins, minerals, and/or phytonutrients (such as fruits, vegetables, nuts seeds, dried beans, legumes, whole grains, lean meats and lean dairy products), and few foods with “empty calories,” calories but very little nutrients (such as sodas, baked goods and alcohol) (Decher & Parrish, 2010, p.76).

Problem

Strict dietary adherence can be difficult as restricting gluten intake can be inconvenient, unpalatable, and confusing to individuals (Ciclitira et al., 2005). These problems are magnified for elderly individuals as many are on fixed incomes, have limited transportation and often have additional co-morbidities that make strict dietary adherence a challenge (Ciclitira et al., 2005). Additionally, there are many hidden sources of gluten, as seen in pre-packaged cereals (Ciclitira et al., 2005). A wide range of gluten-free products is now available but has proven to be more expensive and less nutrient dense than regular products (Ciclitira et al., 2005; Lee, Ng, Zivin, & Green, 2007). Because of the decreased nutrient density of these foods, nutritional supplementation is often necessary, further driving up the costs of a gluten-free diet (Lee et al., 2007). Gluten-free diets can also be low in roughage and may precipitate constipation (Ciclitira et al., 2005), which is often already a problem for elderly individuals and may lead to decreased compliance with this therapeutic diet.

If celiac disease goes untreated, or individuals are unable to adhere to a gluten-free diet, the serious complications previously discussed are more likely to occur. As mentioned, elderly individuals with celiac disease are at great risk for developing the devastating effects of the disease as they harbor many risk factors for non-compliance with a gluten-free diet. The prevalence of celiac disease is on the rise and it is imperative that the issues related to compliance with a gluten-free diet be addressed.

CHAPTER 2

REVIEW OF LITERATURE

Celiac disease presents a host of problems. Of these problems, malnutrition as a result of malabsorption significantly impacts the overall health of elderly individuals. Malnutrition is often overlooked and is an issue of clinical concern, particularly for the elderly population (Mirmiran, Hosseinpour-Niazi, Mehrabani, Kavian, & Azizi, 2011). Malnutrition leads to prolonged hospitalizations and increased hospital costs due to higher infection rates, increased muscle loss, poor wound healing, increased incidence of pressure ulcers, increased incidence of hip fractures, increased incidence of cognitive abnormalities as well as increased morbidity and mortality and decreased quality of life (Mirmiran et al., 2011; Barker, Gout, & Crowe, 2011). The risk for malnutrition is a particularly significant among the elderly population (Mirmiran et al., 2011) as nutritional status is influenced by poor dentition, neuropsychological problems, limited mobility and other health concerns which are prevalent among this population (McGee & Jensen, 2000). Therefore, nutritional status among this sub-population requires special attention. More specifically, elderly individuals with celiac disease have specific nutritional requirements as a result of the many risk factors associated with this disease.

The risk for malnutrition among this population is further compounded by the issue of food insecurity. Nutritional status is greatly impacted by the level of one's food security. The World Food Summit of 1996, defined food security as "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy active life"

(World Health Organization, 2012, p.1). Messner & Ross, (2002) state that “food insecurity may negatively affect adherence to therapeutic diets” (p. 168). “Food insecurity is experienced by millions of Americans and has increased dramatically in recent years. Due to its prevalence and many demonstrated negative health consequences, food insecurity is one of the most important nutrition-related public health issues in the U. S.” (Gunderson, Kreider, & Pepper, 2011, p.281).

Food insecurity is a serious challenge facing millions of Americans. In 2009, more than 50 million persons in the United States lived in households classified as food insecure, with over one-third of these households experiencing a more serious level of food insecurity termed “very low food security.” These rates have soared to unprecedented levels, having increased by more than one-third since 2007 (Gunderson, Kreider & Pepper, 2011, p. 281).

A critical review of the literature was conducted to identify the information available regarding the elderly and the many components that contribute to the nutrition status of this population with specific regard to celiac disease. In the process of completing a comprehensive review of the literature, the following search terms were identified: *elderly, food insecurity, community nutrition programs, federal food programs, nutritional needs, poor nutrition, chronic illness, perception of nutritional assistance, seniors, hunger, malnutrition, gluten-free diet and celiac disease*. Each of these terms was searched individually and in combination with all other search terms using two search engines, the Cumulative Index of Nursing and Allied Health Science Literature (CINAHL) and the Academic Search Complete search engine available through the Montana State University Library, to ensure the most extensive and accurate review of the literature. See Table 1 for the combination of search terms.

Table 1. Search Terms

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Elderly	84,809	24,266
Food Insecurity	997	291
Community Nutrition Programs	154	3
Federal Food Programs	205	1
Nutritional Needs	1076	202
Poor Nutrition	773	176
Chronic Illness	1	0
Seniors	5,176	1,386
Hunger	12,498	220
Malnutrition	9,619	716
Gluten-Free Diet	1,078	25
Celiac Disease	3,571	200
Elderly + Food Insecurity	9	2
Elderly + Community Nutrition Programs	3	0
Elderly + Federal Food Programs	2	0
Elderly + Nutritional Needs	22	5
Elderly + Poor Nutrition	34	8
Elderly + Chronic Illness	1	0
Elderly + SeniorsElderly + Perception of Nutritional Assistance	1440	710
Elderly + HungerElderly + Seniors	95144	471
Elderly + MalnutritionElderly + Hunger	64895	644
Elderly + Gluten-free DietElderly + Malnutrition	10648	064
Elderly + Celiac DiseaseElderly + Gluten-free Diet	3310	30
Food Insecurity + Community Nutrition ProgramsElderly + Celiac Disease	633	03
Food Insecurity + Federal Food ProgramsFood Insecurity + Community Nutrition Programs	06	00
Food Insecurity + Nutritional NeedsFood Insecurity + Federal Food Programs	320	00
Food Insecurity + Poor NutritionFood Insecurity + Nutritional Needs	032	00
Food Insecurity + Chronic IllnessFood Insecurity + Poor Nutrition	120	00
Food Insecurity + Perception of Nutritional AssistanceFood Insecurity + Chronic Illness	012	00
Food Insecurity + HungerFood Insecurity + SeniorsFood Insecurity + Perception of Nutritional Assistance	28300	1100
Food Insecurity + MalnutritionFood Insecurity + HungerFood Insecurity + Seniors	1592830	2110
Food Insecurity + Gluten-free-DietFood Insecurity + MalnutritionFood Insecurity + Hunger	0159283	0211
Food Insecurity + Celiac DiseaseFood Insecurity + Gluten-free-DietFood Insecurity + Malnutrition	00159	002

Table 1. Search Terms Continued

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Community Nutrition + Nutritional NeedsCommunity Nutrition + Federal Food ProgramsFood Insecurity + Celiac DiseaseFood Insecurity + Gluten-free-Diet	2000	0000
Community Nutrition + Poor NutritionCommunity Nutrition + Nutritional NeedsCommunity Nutrition + Federal Food ProgramsFood Insecurity + Celiac Disease	0200	0000
Community Nutrition + Chronic IllnessCommunity Nutrition + Poor NutritionCommunity Nutrition + Nutritional NeedsCommunity Nutrition + Federal Food Programs	1020	0000
Community Nutrition + Perception of Nutritional AssistanceCommunity Nutrition + Chronic IllnessCommunity Nutrition + Poor NutritionCommunity Nutrition + Nutritional Needs	0102	0000
Community Nutrition + SeniorsCommunity Nutrition + Perception of Nutritional AssistanceCommunity Nutrition + Chronic IllnessCommunity Nutrition + Poor Nutrition	48010	0000
Community Nutrition + HungerCommunity Nutrition + SeniorsCommunity Nutrition + Perception of Nutritional AssistanceCommunity Nutrition + Chronic Illness	224801	0000
Community Nutrition + MalnutritionCommunity Nutrition + HungerCommunity Nutrition + SeniorsCommunity Nutrition + Perception of Nutritional Assistance	9022480	0000
Community Nutrition + Gluten-Free DietCommunity Nutrition + MalnutritionCommunity Nutrition + HungerCommunity Nutrition + Seniors	1902248	0000
Community Nutrition + Celiac DiseaseCommunity Nutrition + Gluten-Free DietCommunity Nutrition + MalnutritionCommunity Nutrition + Hunger	019022	0000
Federal Food Programs + Nutritional NeedsCommunity Nutrition + Celiac DiseaseCommunity Nutrition + Gluten-Free DietCommunity Nutrition + Malnutrition	00190	0000
Federal Food Programs + Poor NutritionFederal Food Programs + Nutritional NeedsCommunity Nutrition + Celiac DiseaseCommunity Nutrition + Gluten-Free Diet	1001	0000
Federal Food Programs + Chronic IllnessFederal Food Programs + Poor NutritionFederal Food Programs + Nutritional NeedsCommunity Nutrition + Celiac Disease	0100	0000
Federal Food Programs + Perception of Nutritional AssistanceFederal Food Programs + Chronic IllnessFederal Food Programs + Poor NutritionFederal Food Programs + Nutritional Needs	0010	0000
Federal Food Programs + SeniorsFederal Food Programs + Perception of Nutritional AssistanceFederal Food Programs + Chronic IllnessFederal Food Programs + Poor Nutrition	0001	0000

Table 1. Search Terms Continued

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Federal Food Programs + Hunger Federal Food Programs + Seniors Federal Food Programs + Perception of Nutritional Assistance Federal Food Programs + Chronic Illness	25000	0000
Federal Food Programs + Malnutrition Federal Food Programs + Hunger Federal Food Programs + Seniors Federal Food Programs + Perception of Nutritional Assistance	62500	0000
Federal Food Programs + Gluten-free Federal Food Programs + Malnutrition Federal Food Programs + Hunger Federal Food Programs + Seniors	06250	0000
Federal Food Programs + Celiac Disease Federal Food Programs + Gluten-free Federal Food Programs + Malnutrition Federal Food Programs + Hunger	00625	0000
Nutritional Needs + Poor Nutrition Federal Food Programs + Celiac Disease Federal Food Programs + Gluten-free Federal Food Programs + Malnutrition	1006	0000
Nutritional Needs + Chronic Illness Nutritional Needs + Poor Nutrition Federal Food Programs + Celiac Disease Federal Food Programs + Gluten-free	0100	0000
Nutritional Needs + Perception of Nutritional Assistance Nutritional Needs + Chronic Illness Nutritional Needs + Poor Nutrition Federal Food Programs + Celiac Disease	0010	0000
Nutritional Needs + Seniors Nutritional Needs + Perception of Nutritional Assistance Nutritional Needs + Chronic Illness Nutritional Needs + Poor Nutrition	0001	0000
Nutritional Needs + Hunger Nutritional Needs + Seniors Nutritional Needs + Perception of Nutritional Assistance Nutritional Needs + Chronic Illness	47000	0000
Nutritional Needs + Malnutrition Nutritional Needs + Hunger Nutritional Needs + Seniors Nutritional Needs + Perception of Nutritional Assistance	2824700	9000
Nutritional Needs + Gluten-Free Diet Nutritional Needs + Malnutrition Nutritional Needs + Hunger Nutritional Needs + Seniors	6282470	0900
Nutritional Needs + Celiac Disease Nutritional Needs + Gluten-Free Diet Nutritional Needs + Malnutrition Nutritional Needs + Hunger	8628247	0090
Poor Nutrition + Chronic Illness Nutritional Needs + Celiac Disease Nutritional Needs + Gluten-Free Diet Nutritional Needs + Malnutrition	086282	0009
Poor Nutrition + Perception of Nutritional Assistance Poor Nutrition + Chronic Illness Nutritional Needs + Celiac Disease Nutritional Needs + Gluten-Free Diet	0086	0000
Poor Nutrition + Seniors Poor Nutrition + Perception of Nutritional Assistance Poor Nutrition + Chronic Illness Nutritional Needs + Celiac Disease	0008	0000

Table 1. Search Terms Continued

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Poor Nutrition + Hunger Poor Nutrition + Seniors Poor Nutrition + Perception of Nutritional Assistance Poor Nutrition + Chronic Illness	18000	1000
Poor Nutrition + Malnutrition Poor Nutrition + Hunger Poor Nutrition + Seniors Poor Nutrition + Perception of Nutritional Assistance	1241800	10100
Poor Nutrition + Gluten-free Poor Nutrition + Malnutrition Poor Nutrition + Hunger Poor Nutrition + Seniors	0124180	01010
Poor Nutrition + Celiac Disease Poor Nutrition + Gluten-free Poor Nutrition + Malnutrition Poor Nutrition + Hunger	0012418	00101
Chronic Illness + Perception of Nutritional Assistance Poor Nutrition + Celiac Disease Poor Nutrition + Gluten-free Poor Nutrition + Malnutrition	000124	00010
Chronic Illness + Hunger Chronic Illness + Seniors Chronic Illness + Perception of Nutritional Assistance Poor Nutrition + Celiac Disease Poor Nutrition + Gluten-free	110000	00000
Chronic Illness + Malnutrition Chronic Illness + Hunger Chronic Illness + Seniors Chronic Illness + Perception of Nutritional Assistance Poor Nutrition + Celiac Disease	12011000	30000
Chronic Illness + Gluten-Free Diet Chronic Illness + Malnutrition Chronic Illness + Hunger Chronic Illness + Seniors Chronic Illness + Perception of Nutritional Assistance	81201100	03000
Chronic Illness + Celiac Disease Chronic Illness + Gluten-Free Diet Chronic Illness + Malnutrition Chronic Illness + Hunger Chronic Illness + Seniors	248120110	20300
Perception of Nutritional Assistance + Seniors Chronic Illness + Celiac Disease Chronic Illness + Gluten-Free Diet Chronic Illness + Malnutrition Chronic Illness + Hunger	024812011	02030
Perception of Nutritional Assistance + Hunger Perception of Nutritional Assistance + Seniors Chronic Illness + Celiac Disease Chronic Illness + Gluten-Free Diet Chronic Illness + Malnutrition	00248120	00203
Perception of Nutritional Assistance + Malnutrition Perception of Nutritional Assistance + Hunger Perception of Nutritional Assistance + Seniors Chronic Illness + Celiac Disease Chronic Illness + Gluten-Free Diet	000248	00020
Perception of Nutritional Assistance + Gluten-Free Diet Perception of Nutritional Assistance + Malnutrition Perception of Nutritional Assistance + Hunger Perception of Nutritional Assistance + Seniors Chronic Illness + Celiac Disease	000024	00002
Seniors + Hunger Perception of Nutritional Assistance + Celiac Disease Perception of Nutritional Assistance + Gluten-Free Diet Perception of Nutritional Assistance + Malnutrition Perception of Nutritional Assistance + Hunger Perception of Nutritional Assistance + Seniors	15500000	100000

Table 1. Search Terms Continued

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Seniors + Malnutrition Seniors + Hunger Perception of Nutritional Assistance + Celiac Disease Perception of Nutritional Assistance + Gluten-Free Diet Perception of Nutritional Assistance + Malnutrition Perception of Nutritional Assistance + Hunger	210155000	310000
Seniors + Gluten-Free Diet Seniors + Malnutrition Seniors + Hunger Perception of Nutritional Assistance + Celiac Disease Perception of Nutritional Assistance + Gluten-Free Diet Perception of Nutritional Assistance + Malnutrition	9210155000	031000
Seniors + Celiac Disease Seniors + Gluten-Free Diet Seniors + Malnutrition Seniors + Hunger Perception of Nutritional Assistance + Celiac Disease Perception of Nutritional Assistance + Gluten-Free Diet	10921015500	003100
Hunger + Malnutrition Seniors + Celiac Disease Seniors + Gluten-Free Diet Seniors + Malnutrition Seniors + Hunger Perception of Nutritional Assistance + Celiac Disease	4721092101550	1100310
Hunger + Gluten-Free Diet Hunger + Malnutrition Seniors + Celiac Disease Seniors + Gluten-Free Diet Seniors + Malnutrition Seniors + Hunger	0472109210155	0110031
Hunger + Celiac Disease Hunger + Gluten-Free Diet Hunger + Malnutrition Seniors + Celiac Disease Seniors + Gluten-Free Diet Seniors + Malnutrition	00472109210	0011003
Malnutrition + Gluten-Free Diet Hunger + Celiac Disease Hunger + Gluten-Free Diet Hunger + Malnutrition Seniors + Celiac Disease Seniors + Gluten-Free Diet	1700472109	1001100
Malnutrition + Celiac Disease Malnutrition + Gluten-Free Diet Hunger + Celiac Disease Hunger + Gluten-Free Diet Hunger + Malnutrition Seniors + Celiac Disease	33170047210	2100110
Gluten-Free Diet + Celiac Disease Malnutrition + Celiac Disease Malnutrition + Gluten-Free Diet Hunger + Celiac Disease Hunger + Gluten-Free Diet Hunger + Malnutrition	819331700472	24210011
Community Nutrition Programs + Chronic Illness Poor Nutrition Gluten-Free Diet + Celiac Disease Malnutrition + Celiac Disease Malnutrition + Gluten-Free Diet Hunger + Celiac Disease Hunger + Gluten-Free Diet	1819331700	0242100
Elderly + Federal Food Programs + Nutritional Needs Community Nutrition Programs + Chronic Illness Poor Nutrition Gluten-Free Diet + Celiac Disease Malnutrition + Celiac Disease Malnutrition + Gluten-Free Diet Hunger + Celiac Disease	0181933170	0024210
Elderly + Federal Food Programs + Poor Nutrition Elderly + Federal Food Programs + Nutritional Needs Community Nutrition Programs + Chronic Illness Poor Nutrition Gluten-Free Diet + Celiac Disease Malnutrition + Celiac Disease Malnutrition + Gluten-Free Diet	0018193317	0002421

Table 1. Search Terms Continued

Search Term	Academic Search Complete (Number of Results)	CINAHL (Number of Results)
Elderly + Federal Food Programs + Community Nutrition Programs Elderly + Federal Food Programs + Poor Nutrition Elderly + Federal Food Programs + Nutritional Needs Community Nutrition Programs + Chronic Illness Poor Nutrition Gluten-Free Diet + Celiac Disease Malnutrition + Celiac Disease	000181933	0000242
Elderly + Federal Food Programs + Chronic Illness Poor Nutrition Elderly + Federal Food Programs + Community Nutrition Programs Elderly + Federal Food Programs + Poor Nutrition Elderly + Federal Food Programs + Nutritional Needs Community Nutrition Programs + Chronic Illness Poor Nutrition Gluten-Free Diet + Celiac Disease	00001819	0000024
Elderly + Federal Food Programs + Food Insecurity Elderly + Federal Food Programs + Chronic Illness Poor Nutrition Elderly + Federal Food Programs + Community Nutrition Programs Elderly + Federal Food Programs + Poor Nutrition Elderly + Federal Food Programs + Nutritional Needs Community Nutrition Programs + Chronic Illness Poor Nutrition	000001	000000

The inclusion and exclusion criteria were defined so that the most current and pertinent research articles were reviewed. Dates of publication were limited to the past eleven years, spanning from 2000-2011, with the exception of sources within these articles that were reviewed to further expand the depth of information presented on the subject. Only peer-reviewed, full-text documents were reviewed.

The basis of the inclusion and exclusion criteria selected was to narrow the focus of the literature review to the most recent and relevant information available on this subject as well as to identify any gaps in the literature that may exist. In total, ten peer-reviewed journal articles met inclusion criteria and were carefully analyzed in this literature review. The research articles, authored by Nord, 2003; Myer, 2004; Krassie, Smart & Roberts, 2000; Klesges, Pahor, Shorr, Wan, Williamson & Guralnik, 2001;

Frongillo, Valois & Wolfe, 2003; Nord, 2002; Guthrie & Lin 2002; and Frongillo & Horan, 2004; Brownie, 2006 and Chen, Schilling & Lyder, 2001, will be discussed in detail in the following paragraphs.

Prevalence Rates of Food Insecurity

Nord (2003) conducted a study to determine the accuracy of the United States Food Security Scale, for assessing the food security system of elderly persons. Most specifically, Nord assessed whether measured prevalence rates of food insecurity and hunger were likely to be biased, relative to the prevalence rates of non-elderly persons. The author analyzed three years of data from the Current Population Survey Food Security Supplement (CPS-FSS), an annual, nationally representative survey of approximately 42,000 households, and reported that the Food Security Scale fairly represented the food security of elderly persons. Each item of the CPS-FSS was statistically analyzed. The author stated that “the U.S. Food Security Scale fairly represents the food security of the elderly, compared with that of the non-elderly” (Nord, 2003, p. 44). This analysis identified new concerns. The author reports that “the standard scale under-reports the prevalence of food insecurity and hunger among the elderly because of the differences in how they interpret and respond to the questions in the Food Security Survey” (Nord, 2003, p.44). Nord’s findings clearly support the importance of carefully selecting survey questions, with consideration of the interpretation of those being surveyed, to accurately assess information.

Malnutrition

Myer (2004) suggests that there is “more than one cause of malnutrition” (p. 92). Myer (2004) states that “older adults can be at high nutritional risk as a result of health, socioeconomic, or psychosocial factors” (p.92). Additionally, the author reports that “poverty, social isolation, psychological difficulties like depression, chronic illness, problems with mouth or teeth, and physical limitations all increase the risk of malnutrition” (Myer, 2004, p.92). Approximately 80% of individuals over the age of 60 have one chronic illness, and 50% of individuals over the age of 60 have two chronic illnesses (CDC, 2003).

Myer (2004) continues to argue that elderly individuals may be unaware of the signs of deteriorating health, should they become malnourished. The author adds that “when nutritional needs are not met, the person’s physiological reserves slowly diminish” (Myer, 2004, p.92) and that additional stress from surgeries, illness, trauma or death of a loved one can lead to life-threatening physical problems when coupled with malnutrition. Finally, the author reports that seniors can benefit nutritionally from interventions by social services, such as congregate dining centers (Myer, 2004).

Factors Contributing to Nutritional Status

Krassie, Smart & Roberts (2000) report that factors such as limited mobility, social isolation, decreased physical activity, poor oral health, polypharmacy, depression, impaired cognition and underlying disease all negatively impact the nutritional status of the elderly. “Many elderly Americans do not get enough to eat, simply because they lack

the mobility to prepare their own meals. Others lack funds to purchase nutritionally adequate meals” (Lang, 2002, p. 24).

Krassie et al. (2000) referenced a Canadian study that measured “meal utilization,” which includes the specific details and quantities of the delivered meal that was consumed (Owen, 1992). Fogler-Levitt, Lau, Csimá, Kronl & Coleman (1995) found an 81% average meal utilization of the meals provided by Meals on Wheels, in this Canadian study. It was found that soups and desserts were the most utilized components of the meals that were delivered (Fogler-Levitt et al., 1995). As a result, the authors suggested that additional nutrients be incorporated into these items (Fogler-Levitt et al., 1995). The study indicated that the reasons for non-utilization of the delivered meals were poor taste, dislike of cooking method, and unfamiliarity and disagreeable texture of the food (Fogler-Levitt et al., 1995).

Klesges, Pahor, Shorr, Wan, Williamson & Guralnik (2001) report that the number of older American’s is increasing in conjunction with increasing life expectancy. Additionally, reductions in national food assistance and welfare programs are also in place. Klesges et al. (2001) state that “one critical aspect of securing good health and well-being in older persons is providing for adequate nutritional intake” (p.68). Furthermore, “national evaluations indicate that older persons are at significant risk for poor access to nutritionally adequate diets” (Klesges et al., 2001, p. 68). Klesges et al. (2001) suggest that food assistance programs are not fully meeting the needs of this population with current measures and that the un-met need for nutritional assistance is projected to increase. The authors indicate that elderly individuals often have reduced

dietary intake of calcium, zinc, manganese, magnesium, and vitamins A, B₆, B₁₂, C and E as reported from nutritional surveillance programs (Klesges et al., 2001). Additional support was provided to indicate that such reductions in nutrient intake lead to increased morbidity and mortality among this population and an estimation of one third to one half of conditions experienced among this population are linked to malnutrition (Klesges et al., 2001). The authors report that malnutrition is a risk factor for multiple health conditions such as osteoporosis related to decreased calcium intake, iron deficiency anemia, coronary heart disease due to low serum albumin and iron levels, and neurovascular diseases as a result of low cholesterol levels (Klesges et al., 2001).

Klesges et al. (2001) analyzed the baseline data from the Women's Health and Aging Study, a population-based survey of 1003 community-dwelling, disabled women 65 years and older from Baltimore, MD and found that "psychologic, social and health status were related to difficulty acquiring food" (p.74). Klesges et al. (2001) found that "financial difficulty acquiring food was common, and receipt of nutritional services were rare, in community-dwelling older disabled women" (p. 68). It was recommended that "nutrition assistance programs for elderly should re-examine their effectiveness in preventing nutritional deficits in older disabled women" (Klesges et al., 2001, p. 68).

A study by Frongillo, Valois & Wolfe (2003) examined the relationships between social support and food security of low-income elderly in New York that previously participated in a nutritional research study. Frongillo et al. (2003) and Nord (2002) mention that seniors often experience hunger and food insecurity as a result of low incomes, limited mobility and poor health. Additionally, poor nutritional status among

these individuals contributes to poor diet and malnutrition, leading to disease exacerbation, increased disability, and longer hospital stays (Frongillo et al., 2003). Frongillo et al. (2003) utilize Davis & Tarasuk's (1994) operational definition of food insecurity "the inability to acquire or consume an adequate diet quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (p. 57). The authors report that weekly telephone interviews provided a better understanding of food insecurity among elderly individuals and the importance of a "food exchange" as a social and food support among elders (Frongillo et al., 2003).

Use of Food Assistance Programs

Nord (2002) analyzed data from the United States Department of Agriculture's (USDA's) Economic Research Service (ERS) nationally representative food security survey, conducted in September of 2000. The author reported that "94 percent of all households with an elderly person (age 65 and older) present were food secure throughout the year. The remaining 6 percent of households were food insecure" (Nord, 2002, p. 19). The individuals falling into this six percent were "unable to acquire enough food to meet basic needs of all of their members because they had insufficient money or other resources for food" (Nord, 2002, p. 19).

One in four of the food-insecure elderly households (1.5 percent of all elderly households) were food insecure to the extent that one or more household members were hungry, at least some time during the year, because they could not afford enough food. The other three fourths of food-insecure elderly households obtained enough food to avoid hunger by using a variety of coping strategies, such as eating less varied diets, participating in Federal food assistance programs, or getting emergency food from community food pantries (Nord, 2002, p.19).

Nord (2002) also stated that “the rates of food insecurity among elderly households were about half those of households with no elderly members” (p.20). Nord (2002) attributes the lower food insecurity rates of the elderly to a lower level of poverty. In 2000, the United States Census Bureau reported a poverty rate of 10.2 percent for individuals of age 65 and older and a poverty rate of 11.4 percent for those under the age of 65.

Nord (2002) discusses that the elderly often supplement their food resources through Federal offered community assistance programs when finances are limited. Most commonly, the Food Stamp Program, Meals on Wheels, and similar services delivering prepared meals to the home, meals at community centers and food pantries are also utilized.

Forty percent of food-insecure elderly households reported using one or more of these Federal or community food assistance resources. Twenty-six percent of food-insecure elderly households received food stamps; 11 percent received meals, either delivered to their home or in community centers or senior centers; and 15 percent received emergency food from food pantries, food bank or similar community food programs (Nord, 2002, p.24).

Among the elderly that utilize food assistance, “community food programs largely substitute for, rather than supplement, the Food Stamp Program” (Nord, 2002, p.24). This research provides useful information as to the programs elderly individuals tend to utilize.

Unique Challenges

Guthrie & Lin (2002) report that the dietary well being of elderly individuals is of increasing concern and particularly, lower-income elderly face unique challenges in maintaining a healthy diet. “This group makes up a sizeable proportion of the elderly population; we estimate that almost 1 in 5 (19%) of the elderly have household incomes at or below 130% of the federal poverty level, the income level that generally qualifies a household to participate in the federal Food Stamp Program” (p. 31). Guthrie & Lin (2002) analyzed data from the United States Department of Agriculture’s Continuing Survey of Food Intakes by Individuals (CSFII) from 1994-1996 and food security data from the 1999 Current Population Survey (CPS) conducted by the United States Census Bureau. Guthrie & Lin (2002) examine dietary intake and related behaviors of individuals of varying incomes and food security status. The subjects examined were age 60 and older, living in community settings.

The authors reported that “lower-income elderly consume significantly fewer calories than higher-income elderly, fewer servings of major Food Guide Pyramid food groups, and most nutrients” (Guthrie & Lin, 2002, p.31), and that “approximately 6% of elderly households report some degree of food insecurity. Although food and nutrition assistance programs can benefit elderly individuals, many do not participate” (Guthrie & Lin, 2002, p.38). Additionally, “many lower-income elderly also face physiological and social obstacles to obtaining a healthful diet” (Guthrie & Lin, 2002, p. 38). In conclusion, “programs that address such issues as transportation limitations, food preparation

difficulties, and self-feeding may be critical to meeting the needs of the most vulnerable elderly” (Guthrie & Lin, 2002, p. 40).

Frongillo & Horan (2004) report that despite the wealth of our country, hunger remains a pressing issue among our elderly. The authors explain that many factors such as economic and social resources as well as functional status contribute to one’s level of food security (Frongillo & Horan, 2004). The authors continue to report that “food insecurity can limit dietary intake and lead to hunger, distress, alienation, and changes in familial and social behaviors and interactions, thereby negatively affecting well-being in a number of ways” (Frongillo & Horan, 2004, p. 28).

Frongillo & Horan (2004) report that elderly individuals rely heavily on private assistance to help alleviate food insecurity. Elderly individuals are more likely to choose the food pantry system of private charities than the government Food Stamp Program (Daponte, 2000). Additionally, it has been found that different sub-populations of elderly individuals have varying preferences for assistance. For example, urban black elders have been found to be more receptive to using government programs that provide congregate meals or food stamps rather than pantries. Hispanic households were more than twice as likely as non-Hispanic households to feel uncomfortable using food stamps. Depending on the form of assistance chosen, elderly individuals tend to choose one option or another and not both (Nord, 2002).

Many elderly choose not to utilize the Food Stamp Program. Many do not understand the program or think they are ineligible or some individuals are eligible for a small amount of money through this program and do not take steps to obtaining the

benefit. Some elderly individuals decide to utilize private assistance rather than public as they feel they are taking a “government handout” or taking resources away from other individuals that may need it more than they do.

Risks of Nutritional Deficiency

Brownie (2006) discusses the risk of nutritional deficiency among the elderly population. The author states that “the older population is the single largest demographic group at disproportionate risk of inadequate diet and malnutrition” (p.110). A decline in physiological functioning related to increased age such as a reduction in lean body mass, decreased metabolic rate, decreased digestive juices and changes in oral health, sensory deficits, alteration in fluid and electrolyte balance as well as chronic illness negatively impact nutritional status to a great degree (Brownie, 2006).

Malnutrition is a serious problem in the elderly. It often arises as a result of insufficient intake of macro- and micronutrients (Chen, Schilling & Lyder, 2001). Brownie (2006) indicates that “the prevalence of malnutrition is 5-10% of independently living older individuals, 30-60% of institutionalized patients and \leq 35-65% of hospitalized patients” (p.110) and that “the effects of under-nutrition on this sub-population is devastating” (p.110). Malnutrition increases the risk of respiratory and cardiac problems, infections, deep venous thrombosis and pressure ulcers, peri-operative mortality and multi-organ failure (Omron & Morley, 2000) and nearly all aspects of the immune system are impacted by inadequate nutrition (Brownie, 2006).

Contributing Factors

With increased age, distinct changes in body composition are evident. The most significant are decreases in intracellular fluid and lean body mass with and in increase in the amount of fat stores (Brownie, 2006). As a result of these changes, the body has a reduced capacity to store water, decreased strength and muscle mass and increased truncal obesity (Brownie, 2006). “These changes predispose older people to dehydration, reduced basal metabolism, falls and injury, and central weight gain” (Brownie, 2006, p.111). Blumberg (1997) reports that “a critical risk factor for under-nutrition in older adults is their declining need of energy because of a reduction in the amount of lean body mass and a more sedentary lifestyle” (p. 517). In light of these decreased nutritional needs, it is essential for aging individuals to consume more high-quality, nutrient-dense foods (Bernstein, Tucker, & Ryan, 2002). In addition to the increased prevalence of celiac disease among this population, age-associated changes in the gastrointestinal tract also impact nutrient ingestion, absorption, metabolism and elimination (Brownie, 2006). “Aging is associated with a diminished efficiency of the gastrointestinal tract because of atrophic gastritis and hypochlorhydria, decreased peristalsis and altered oesophageal motility” (Brownie, 2006, p. 110). Additionally, diminished taste sensation experienced with increased age contributes to poor nutritional intake (Brownie, 2006).

Changes in the oral cavity such as loss of teeth, ill-fitting dentures, gingivitis and decreased saliva production are often experienced in older individuals and profoundly affect their ability to swallow and chew many foods (Curran, 1990). Additionally, 20-50% of older people also have atrophic gastritis, a partial loss of fundic glands and a

corresponding decrease in parietal cell mass that significantly impacts gastrointestinal physiology and nutrient bioavailability (Russell, 2001). Consequently, many older people are at risk for decreased absorption of folic acid, vitamin B12, calcium, iron and betacarotene (Brownie, 2006). The elderly population is particularly vulnerable to nutritional deficiencies related to these changes in physiological function.

A Multifactorial Issue

Chen, Shilling & Lyder (2000) clearly define malnutrition as “faulty or inadequate nutritional status; undernourishment characterized by insufficient dietary intake, poor nutritional absorption, poor appetite, muscle wasting and weight loss” (p. 131). It is evident that malnutrition has serious effects on the function of virtually every organ system (Silberman, 1989). The authors discuss the multidimensional aspects of the physiological and psychosocial elements of malnutrition among this population. The authors report that “loss, dependency, loneliness and chronic illness are identified as antecedents of malnutrition in the elderly” (Chen et al., 2000, p.131).

Elderly individuals often experience the loss of many psychosocial aspects of living in addition to the loss of physiologic function. Losses in role function after retirement and loss of family members and friends is often overlooked as a contributor to malnutrition among this age group. Support networks are often lost, loss of independence due to decreased functional capacity and economic resources all impact the psychosocial well being of the elderly (Newburn & Krowchuck, 1994). When these support networks are lost, it is common for elderly individuals to have difficulty forming new attachments

and coping mechanisms which often leads to a decline in nutritional status (Chen et al., 2000).

Financial dependency is also very common among this population. “As many as 40% of the elderly are reported to have incomes of less than \$6,000 per year (in 1990) and are spending \$25 to \$30 per week on food” (Chen et al., 2000, p.137). The authors also state “when the elderly experience difficult economic circumstances, utilities and medications may take precedence over food purchases” (Chen et al., 2000, p.137).

Consequences of Malnutrition

“The alarmingly high rate of malnutrition among elders has severe consequences for both the individual and the health care system” (Chen et al., 2000, p. 137). According to Hart Research Associates (1993), the elderly accounted for 48% of all days of care in hospitals, with an average length of stay three days longer than younger individuals. Malnourished elderly individuals experienced two to twenty times more complications and compile hospital costs of \$2000 to \$10,000 per hospital stay (Hart, 1993). These lengthened, costly hospitalizations, a high frequency of hospital re-admission, prolonged recovery times, and early nursing home placements escalate societal costs to a great degree (Sullivan, 1992).

Malnutrition impacts the individual on many levels. Not only does malnutrition decrease quality of life by contributing to serious illness, and loss of function, it also affects emotional well being and self-perception (Millen, 1999). Malnutrition among the elderly is a serious issue of concern that requires further attention.

This focus of this project was narrowed to the elderly population of rural Western state. Specific to this state, a 2008 report by the Food Security Council and the local food bank network concludes that hunger and food security are pressing problems for the state chosen for this project. The report indicates that the rate of poverty in this state was 13.2% compared to the national average of 12.5%, in a three year average of the years 2005-2007. The report indicates that 308,934 residents of this state are at risk for food insecurity (Bradford & Medora, 2008).

The information gleaned from the literature review provides a basis for understanding malnutrition and food insecurity. The research discussed provides valuable information that could be useful for providing guidance, support and further development of nutritional assistance programs and support to elderly individuals with celiac disease. Further research is necessary to build upon this body of knowledge so that current programs can best be tailored to fit the needs of America's elderly.

CHAPTER 3

METHODS

Introduction

The purpose of this project was to describe the availability of public transportation as well as the availability and cost of gluten-free food products in stores within a rural community in the Western United States. The author, a family nurse practitioner student, was interested in learning about some of the challenges facing elderly individuals that must adhere to a gluten-free diet, and who may also rely on public transportation. Findings from this project will be shared with health care providers and local community agencies with the goal of assisting persons who must adhere to a gluten-free diet. Information such as the availability and cost of gluten-free items carried at local grocery stores as well as the availability of public transportation services and the proximity of these services to grocery stores carrying gluten-free products will be provided. Prior to data collection, this project was submitted to the Montana State University Institutional Review Board and received “exempt status” in accordance with the Code of Federal regulations, Part 46, section 101” (Quinn, 2013, p.1).

Project Plan for Data Collection from Local Stores

The rural community of focus has a population of 28,190 individuals (United States Census Bureau, 2011). Of this population, 15.6% or approximately 1,762 persons

are over the age of 65. This number is about 0.8% higher than the national average (United States Census Bureau, 2011). Data indicating the number of persons over age 65 that use public transportation were not available. However, informal estimates from local health care providers indicated that the majority of their clients are age 65 or older. Of concern to the health care providers was the number of older persons who relied on public transportation for their health care appointments.

Prior to data collection, the investigator completed the required Collaborative Institutional Training Initiative (CITI) educational programs from the National Institutes of Health (NIH). Following completion of CITI education, the author developed a tool entitled *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This tool was adapted from Decher, N. & Parrish, C. R. (2010) and also from the *Safe Gluten-Free Food List* created by Adams (2007). This tool includes a list of unprocessed fruits, vegetables, fish, meats, cheeses and dairy products, in addition to a variety of alternatives to wheat-containing products and is arranged so that the availability and cost of the food item listed can be recorded.

The author determined that data would be collected from five stores within rural city limits, which provided gluten-free grocery items. This determination was made so that a representative of each grocery store in the community of study would be included. One national chain grocery store in this community elected not to participate in this study. As a result, the grocery stores included in this project were two national chain grocery stores, one locally owned grocery store, one national chain health food store and

one locally owned health food store. Therefore, findings from this project are not generalizable.

After the author designed the data collection tool and received verbal permission from each of the five grocery store managers, on-site appointments were scheduled with each store manager for the purpose of explaining the project and the data collection process. A follow-up letter, detailing the project and an explanation that data would be coded and stored in a locked file to protect the identity of each grocery store, was sent to each store manager. Store managers were also informed that they would each receive a copy of the final project. Each store manager responded to this letter providing written permission for participation in the project.

Data Collection from Local Grocery Stores

After obtaining written permission from each of the five store managers, this investigator surveyed each store during a one week time period in July 2013, at a time set by each store manager. The author used the survey tool entitled *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores* for data collection. Following the completion of data collection in each of the five grocery stores, the author calculated the unit price of each food item based on the results obtained through the survey so that a comparison between stores could be measured. Data were coded and stored in a locked file and were destroyed after the completion of this project.

The investigator maintained active engagement with each store manager and data were recorded conscientiously with consistent and persistent observation. Store managers

and employees were treated with respect, and data were collected during early mornings and late evenings, to be least disruptive to the store customers. The investigator spent between 45-90 minutes completing the survey at each store. The investigator was attentive to detail and demonstrated accuracy through a careful data collection and review. Gluten-free items in each of the stores were identified. The author compared the availability and the cost per item by a frequency count of products in each of four major food categories: produce, canned and packaged goods, dairy products and deli products. After data collection was completed for all of the grocery stores, the investigator met with each of the store managers to provide information gleaned from this project.

Project Plan for Data Collection from Local Bus Services

The author conducted an online search of local transportation resources within the local rural community. The author was interested in learning the availability of services, hours of operation and relative distance required for an individual to walk from the bus stop to one of the five local grocery stores that provided gluten-free food products.

Data Collection Concerning Local Public Transportation Services

The author reviewed general data about the availability of public transportation within the community of study. This rural community covers a total area of 16.39 square miles (United States Census Bureau, 2012). Three local bus services provide the only available public transportation within the city limits. The author then reviewed the

information available for each of the bus services and calculated the distance from the bus stop nearest each grocery store to each storefront.

Summary

This chapter discussed the plan for identifying and collecting data about the availability of gluten-free foods in five local grocery stores in one rural community. The author also discussed general information about the availability of local transportation within the community. The findings from this project will be discussed in Chapter Four.

CHAPTER 4

RESULTS

The purpose of this project was to describe the availability of public transportation as well as the availability and cost of gluten-free food products in stores within a rural community in the Western United States. The results from this project will be discussed in two sections. The first section will focus on the findings regarding the availability of gluten-free food products in the five local grocery stores. The second section will discuss the findings concerning the availability and ease of access to the public transportation in this rural community.

Five grocery stores were examined in the community of study. Two national chain grocery stores, one national chain health food store, one locally owned health food store and one locally owned grocery store were surveyed for this project. Each of the five grocery stores examined was located within city limits, and sold gluten-free foods.

Grocery Store Number One

Grocery store number one is a locally owned health food store. This store provided 81 of the 100 (81%) food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This store provided 21 of the 26 items (81%) from the produce category; 44 of the 56 items (79%) from the canned and packaged goods category; 11 of the 11 items (100%) from the dairy category; and five of the seven items (71%) from the deli category.

Grocery Store Number Two

Grocery store number two is a locally owned grocery store. This store provided 77 of the 100 (77%) food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This store provided 25 of the 26 items (96%) from the produce category; 34 of the 56 items (61%) from the canned and packaged goods category; 11 of the 11 items (100%) from the dairy category; and seven of the seven items (100%) from the deli category.

Grocery Store Number Three

Grocery store number three is a national chain health food store. This store provided 72 of the 100 (72%) food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This store provided 19 of the 26 items (73%) from the produce category; 38 of the 56 items (68%) from the canned and packaged goods category; 11 of the 11 items (100%) from the dairy category; and four of the seven items (57%) from the deli category.

Grocery Store Number Four

Grocery store number four is a national chain discount store that also carries grocery products. This store provided 68 of the 100 (68%) food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This store provided 23 of the 26 items (88%) from the produce category; 27 of the 56 items (48%)

from the canned and packaged goods category; 11 of the 11 items (100%) from the dairy category; and seven of the seven items (100%) from the deli category.

Grocery Store Number Five

Grocery store number five is a national chain grocery store. This store provided 71 of the 100 (71%) food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. This store provided 23 of the 26 items (88%) from the produce category; 31 of the 56 items (55%) from the canned and packaged goods category; 10 of the 11 items (91%) from the dairy category; and seven of the seven items (100%) from the deli category.

Discussion

Each of the five grocery stores provided gluten-free products in each of the four major food categories: produce, canned and packaged goods, dairy and deli products. The most readily available food product was from the dairy category, with four stores providing 100% of the gluten-free dairy products and one store providing 91%. Produce was also readily available in four of the grocery stores. The availability of produce may have influenced the time of year the survey was completed. The survey was completed in July when produce is readily available in this rural state. A variety of deli products were also available, with three of the four grocery stores carrying 100% of the items. It is interesting to note that the canned and packaged goods were least available in all five grocery stores.

Public Transportation

Three bus service options are available to individuals residing within the city limits. All of the buses are wheelchair accessible. The buses run Monday through Friday from seven in the morning until five in the evening. Each bus service costs 85 cents per ride. For persons over the age of 65, each bus service also sells a single purchase punch card for 16 dollars that allows the rider to have 21 rides. The services are the “Check-Point” bus service, the “East Valley” bus service and the “Curb-to-Curb” bus service.

The “Check-Point” bus provides a service that follows nine specific routes with designates stops. The bus service runs from seven in the morning through five in the evening, Monday through Friday. The service is not available on weekends or holidays. Each route of the “Check-Point” bus stops at the local hospital, a local nursing home, the City County Health Department, grocery store number four and grocery store number five. Services such as health care check-ups, care for illness and injury, mental health services, immunizations, prevention and wellness education and other dental and health care needs can be met along this route. “Check-Point” bus also stops 0.26 miles from grocery store number three.

The “East Valley” bus is also available and has multiple stops, which include the City County Health Department and grocery store number four. This bus operates from seven in the morning until six in the evening. The last bus begins at five in the evening. The bus company expects that the rider reserve the service the day prior to requiring the service, otherwise the service is subject to availability.

The “Curb-to-Curb” bus service is also available. This service provides buses that will stop for the rider at a curb closest to their home or location. The rider is dropped off at the curb closest to their destination. The bus company expects that the rider reserve the service the day prior to requiring the service, otherwise the service is subject to availability.

CHAPTER 5

DISCUSSION

The purpose of this project was to describe the availability of public transportation as well as the availability and cost of gluten-free food products in stores within a rural community in the Western United States. This chapter includes a summary and discussion of the results. Also included in this chapter are the limitations to the study, implications for practice, recommendations for future research and a conclusion.

Summary

The availability and the percent of gluten-free foods varied by food category and also from grocery store to grocery store. The five grocery stores carried between 68% and 81 % of food items listed in the *Tool for Analysis of the Availability of Gluten-Free Foods in Local Grocery Stores*. The locally owned health food store was the grocery store with the highest availability of gluten-free foods and was the most expensive. This store was less convenient for persons who use public transportation, because the distance from the bus stop to the store was approximately a half mile. The national chain discount store that also carries grocery products provided the fewest gluten-free foods and was the least expensive. Bus service was available and convenient for this store.

All five grocery stores are located within the city limits. The only available public transportation in this community was provided by three local bus services. The fare to

ride the bus is the same for each of the bus services: a single bus fare is 85 cents per ride. Persons over age 55 may purchase a 21-ride punch card for 16 dollars. There are three available bus services: the “Check Point” bus service, the “East Valley” bus and a “Curb-to-Curb” bus service. Each of the bus services are wheelchair accessible. None of the bus services run on weekends or holidays.

The “Check Point” bus provides a service that follows nine specific routes with designated stops. The bus service runs from seven in the morning to five in the evening, Monday through Friday, and does not run on weekends or holidays. Each route of the “Check Point” bus stops at the local hospital, a local nursing home, the City County Health Department, grocery store number four and grocery store number five. Services such as health care check-ups, care for illnesses and injury, mental health services, immunizations, prevention and wellness education, and other dental and health care needs can be met at locations along this route.

Each “Check Point” route also stops 0.51 miles from grocery store number one, 0.7 miles from grocery store number two and 0.26 miles from grocery store number three. There would be a considerable amount of walking required for an individual taking the Check Point bus to these stores. As discussed previously, grocery stores number one and two have the greatest availability of gluten-free foods yet they are the farthest distance from the bus stop.

The “East Valley” bus also has multiple stops, including the City County Health Department and grocery store number four. This bus operates from seven in the morning to six in the evening; the last bus run begins at five in the evening. This bus company

expects the rider to reserve the service the day prior to requiring the service. Otherwise the service is subject to availability.

The “Curb-to-Curb” bus service will stop for the rider at a curb closest to their home or location. The rider is dropped off at the curb closest to their destination. This bus company expects that the rider reserve the service the day prior to requiring the service. Otherwise the service is subject to availability.

Implications for Practice

“Gluten-free foods are considerably more expensive than their gluten-containing counterparts and are not easily accessible in many mainstream grocery stores” (Cureton, 2007, p. 75). Additionally, gluten-free meals are not available through the local food share in this community. For these reasons, it would be beneficial for health care providers to provide resources for patients. Such resources could include: daily food suggestions for adequate nutrition, information on securing financial assistance, creative meal planning, a comprehensive list of gluten-free foods and a list of local locations that offer gluten-free food products to promote adherence to a gluten-free diet. Educational pamphlets could be utilized to present this information.

It is also important for the patient to know that the cost difference between gluten-containing food products and specialty gluten-free alternatives is tax deductible for persons with celiac disease, while the cost of other items (eg. Xanthan gum) is completely deductible. Shipping costs for these items are also tax deductible. However, in order to qualify for the deductions, medical expenses must exceed 7.5% of the

patient's adjusted gross income. A letter from the medical provider must state the diagnosis and that the diet is medically necessary. Finally, a flexible spending account for employed persons may be used to help defray the cost of specialty foods (Cureton, 2007).

Community organizations such as farmers' markets, community gardens and home delivery services that provide gluten-free food items could also be utilized to increase accessibility to gluten-free foods in this rural community. Community programs and services often are able to provide less expensive food options. The goal of these interventions is to provide increased availability of gluten-free foods to the elderly individuals within this rural community.

Limitations

These findings and implications for this project are limited to one rural community. However, it is important for health care providers to be aware of the availability and access to gluten-free products for patients who require gluten-free diets. Attaining these foods may be problematic for older persons who rely on public transportation. Health care providers are in a unique position to provide adequate information about gluten-free products as well as assisting the patient in obtaining these products.

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APPENDIX A

TOOL FOR ANALYSIS OF THE AVAILABILITY OF
GLUTEN-FREE FOODS IN LOCAL GROCERY STORES

Tool for Analysis of the Availability of Gluten-free Foods in Local Grocery Stores

Grocery Store Code: _____

Available transportation to store: _____

Recommended food list adapted from Decher, N. & Parrish, C. R. in Dennis, M. & Leffler, D. A. (2010). Real life with celiac disease: troubleshooting and thriving gluten free. AGA Press: Bethesda, MD.

Item	Available: Yes/No	Price
PRODUCE		
Apricots		
Apples		
Artichokes		
Asparagus		
Bananas		
Beets		
Bell Peppers		
Blueberries		
Broccoli		
Brussels Sprouts		
Cabbage		
Cantaloupe		
Carrots		
Celery		
Cherries		
Coconut		
Collard Greens		
Corn		
Dates		
Figs		
Grapes		
Green Beans		
Honeydew Melon		
Kale		
Mango		
Mustard Greens		
Nectarines		
Onions		
Oranges		
Parsley		
Peaches		
Pears		
Peas		
Pineapple		
Plums		
Prunes		

Item	Available: Yes/No	Price
Pomegranates		
Potatoes		
Radish		
Raisins		
Raspberries		
Romaine Lettuce		
Spinach		
Squash		
Strawberries		
Sweet Potatoes		
Tomatoes		
Turnip Greens		
Yams		
Zucchini		
Gluten-Free Whole Grains		
Amaranth		
Arrowroot		
Brown Rice		
Buckwheat		
Corn Flour		
Corn Grits		
Corn Meal		
Flax		
Millet		
Potato Flour		
Rice Flour		
Quinoa		
Sorghum		
Tapioca		
Tapioca Flour		
Teff		
Whey		
Wild Rice		
Yam Flour		
Legumes & Beans		
Black Beans		
Black-Eyed Peas		
Cannellini Beans		
Edamame		
Garbanzo Beans		
Kidney Beans		
Lima Beans		
Lentils		
Pinto Beans		
Soy Beans		
Nuts & Seeds		

Item	Available: Yes/No	Price
Almonds		
Cashews		
Flaxseed		
Peanuts		
Pecans		
Pistachios		
Pumpkin Seeds		
Sesame Seeds		
Sunflower Seeds		
Walnuts		
Dairy		
Bleu Cheese		
Butter		
Cheddar Cheese		
Eggs		
1% Low-Fat Milk		
2% Milk		
Low-Fat Fruit Yogurt		
Mozzarella Cheese		
Non-Fat Milk		
Non-Fat Plain Yogurt		
Parmesan Cheese		
Romano Cheese		
Ricotta Cheese		
Skim Milk		
Swiss Cheese		
Tofu		
Meat, Poultry & Seafood		
Chicken		
Clams		
Crab		
Beef Steak		
Flounder/Sole		
Ground Beef		
Halibut		
Herring		
Mackerel		
Oysters		
Salmon		
Sardines		
Shrimp		
Tuna		
Turkey		