

Research Proposal: A Crossover Trial to Determine the Healthfulness of Grocery
Purchases when Shopping Online Verses In-Person

by

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Abstract

As the food environment continues to change and adapt to the desires of consumers it is important to understand its effect on the health of the nation as the prevalence of obesity and chronic diseases related to obesity continue to rise. Over the past few years online grocery shopping has increased exponentially and fewer customers are stepping foot in store. There is currently little research on the influence this change has had on the food that is purchased and how it could be impacting the health of customers. The purpose of this proposal is to determine the difference in healthfulness of grocery purchases when participants are shopping in store versus shopping online. The 10-week crossover trial will include 382 participants. Data will be collected from receipts and orders linked to each participant through their loyalty card. Anticipated results indicate the healthfulness of grocery purchases will be significantly greater when shopping online ($p < 0.02$) compared to shopping in person. The proposed study will provide foundational information about online grocery shopping. Future research should expand upon it and use it to develop interventions to assist customers in purchasing healthier groceries to improve the health of the nation.

Keywords: online grocery shopping, FAST score, supermarket nutrition, food environment

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Chapter 1: Introduction to the Study

America continues to face an obesity epidemic that is not slowing down. According to the Centers for Disease Control and Prevention, from 1999 through 2018, the prevalence of adults with obesity rose from 30.5% to 42.2% of the US population (2020). What people eat plays a large role in their health and overall wellness. Jebb, shed a light on the impact grocery stores can have on consumer health emphasizing that many dietary habits start in the grocery store because once the food is brought into the home, it is likely to be eaten (as cited in Southey, 2020). Jebb and her team are a part of a project known as Collaboration of Healthier Lives UK with their pilot study revealing very encouraging results related to supermarket promotions positively impacting obesity (as cited in Southey, 2020). However, methods of purchasing groceries are rapidly changing and continued research is needed to understand how the methods and promotions are impacting the food consumers are buying.

Over the past few years, grocery shopping has become increasingly more available online. According to Supermarket News, online grocery shopping increased 22% in 2019 and 40% in 2020 (Redman, 2020). Online grocery shopping provides a quick and convenient method of purchasing groceries without having to spend time walking through the store. It is probable that the changing methods of grocery purchasing, from in-store to online, is influencing the purchases people make and also their health.

There are many ways the food market can be manipulated to influence consumers to buy something. For example, grocery stores deliberately price items to make it seem like money is being saved, when in reality it's not (Noman, 2017). They also often have an overwhelming number of options to choose from and place popular items in the center of aisles to make the

customer walk by more products in the hopes they might buy some (Noman, 2017). Gaining research-based conclusions on how consumers can be influenced to purchase certain items can help to create and promote an environment that promotes nutritious food purchases and healthy eating, and therefore may reduce the rate of obesity and allow grocery stores and registered dietitians to make an impact on the health of the nation.

Background

Although we consider online grocery shopping to be relatively new, nearly 30 years ago, in 1989, Thomas Parkinson started accepting online orders for groceries through his company, Peapod (Wyher, 2019). This was at a time when only 15% of Americans had computers and majority used dial up (Wyher, 2019). Despite online grocery shopping being around for over 30 years, there is limited research in the area of online grocery shopping due to its minimal use until recent years. Online shopping made up just 2% of total food and beverage sales in 2019, per eMarketer, but many US consumers have turned to online grocery shopping services for the first time during the coronavirus pandemic (as cited in Keyes, 2021). The pandemic is influencing consumers to buy essential products online, which is rapidly accelerating the development of online grocery, curbside pickup, and same-day delivery in the US (as cited in Keyes, 2021). Prior to the pandemic, Jilcott Pitts et al. (2018) noted that most individuals were motivated to begin online shopping due to the convenience and time saving aspect of it.

With the research in this area very recent and at small scale levels, including small sample sizes and limited diversity, there is a great need for future research to gather conclusions that can be applied at the population level. Current research provides both positive and negative effects related to the health of food purchased using online grocery shopping versus shopping in-store. A major negative of online grocery shopping is that consumers are less likely to purchase

produce online due to not trusting employees to pick out quality produce (Jilcott Pitts et al., 2018). We don't know whether these consumers are ordering groceries online and getting their produce in person or not getting produce at all. Potential positives of online shopping include increased healthy meal planning through the ability to create grocery lists on some retailer websites and apps and fewer impulse purchases of unhealthy foods (Jilcott Pitts et al., 2018). Jilcott Pitts et al. (2018) compiled these common opinions from participants in their qualitative study, but quantitative data is needed to determine what consumers are purchasing using each method of grocery shopping to determine if one method of shopping leads to healthier food purchases.

Problem Statement

With a staggering obesity rate of 42.2% of the adult US population, the need for easily assessable nutrition interventions is greater than ever (CDC, 2020). A practical place where a large amount of consumers can be reached, while making pivotal nutritional decisions, is in the grocery store. However, online grocery shopping has exploded in recent years and fewer people are stepping foot in-store. Instead many are picking out their groceries from the convenience of their phone or computer. To determine practical nutritional interventions in the grocery store setting, research must first be conducted on the habits of shoppers and how grocery shopping online has impacted the purchases they make compared to shopping in-store. Nutritional grocery store interventions have been researched in the past, but with the spike in online grocery shopping more research is needed to provide insight into the healthfulness of consumer purchases. This will help to provide a foundation of information to develop grocery store based nutritional interventions from. Since online grocery shopping has grown exponentially in recent

years, there is currently little research in the area and more is granted to determine how it impacts the food consumer's purchase, which ultimately impacts their health.

Purpose of the Study

In this crossover trial, the purpose of the study is to determine the difference in healthfulness of grocery purchases when participants are shopping in store versus shopping online.

Research Question and Hypotheses

Research Question: Does ordering groceries online versus shopping in person impact the healthfulness of food purchased?

H₀: There will be no difference in the healthfulness of grocery purchases between shopping in person and shopping online.

H_a: Online grocery shopping will lead to an increase in healthful food purchases when compared to shopping in person.

Nature of the Study

A crossover trial will be used so that the same participant will shop both in person and online and their grocery purchases can be compared between the two shopping methods. Each item purchased will be placed into one of the thirteen FAST categories, which will be used to assess the healthfulness of the overall purchase. Steps in this process include: (1) sorting foods into the defined categories, (2) weighing the food in each category, (3) calculating a gross weight share for each category by dividing its gross weight by the total weight of all scored food, (4) multiplying each gross weight share by a model parameter that reflects its healthfulness, and (5)

summing together the categories for a total score. The higher the score, the healthier the purchase (Caspi et al., 2018). A paired t-test will be used to compare grocery purchases of the same individual during each intervention and is appropriate because it is used to compare means between two groups.

Definitions

Beverages- All non-dairy beverages including 100% juice and <100% juice. Bottled water is not included in the FAST calculation (Caspi et al., 2018).

Dairy- Milk and milk substitutes, all types of yogurt and butter (Caspi et al., 2018).

Food Assortment Screening Tool (FAST)-consists of 13 food categories and calculates a score of healthfulness of food ranging from 0–100, with higher scores being healthier. Fifty and below will be considered an overall unhealthy grocery purchase, while 51 and above will be considered a healthful grocery purchase (Caspi et al., 2018).

Non whole grains- grains that do not list a whole grain as the first ingredient (Caspi et al., 2018).

Online grocery shopping- A way of buying food and other household necessities using a web-based shopping service (Caspi et al., 2018).

Mixed meals and side dishes- highly processed, packaged meals or side dishes including boxed or frozen mixed meals (Caspi et al., 2018).

Assumptions

Participants will understand questions asked in the survey and answer them honestly. Participants will buy their usual groceries during both methods of shopping despite knowing they are participating in the study. Participants will have a sincere interest in participating in research and do not any other motives for doing so. Participants will not purchase groceries from outside

sources during the two periods due to the incentive to participate in the study. Lastly, due to the two-week washout period, there will be no carry over effect from one period to the next.

Limitations

The sampling procedure decreases the generalizability of findings since all individuals will be from the same geographic location in Iowa and shop at the same grocery store. The survey methods may result in biased answers due to self-report from participants. The study may not be representative of all online grocery shopping chains due to variability in the website/app used to order, the promotions and sales each conduct, as well as the variety of food and brands offered. Due to the crossover design, there is potential that participants may only complete the first evaluation phase and therefore contribute little to the analysis. Participants are also unblinded, as they know the difference between the two phases is the method of grocery shopping, which could cause them to modify their purchases. The Food Assortment Screening Tool has also not been validated for the intended population of this study.

Delimitations

There are several delimitations to address in this research proposal. First, the study will exclude college students that live in dorms since they may get a majority of their food from campus sources, as well as older adults that may have more trouble using the online grocery ordering system. Second, participants receiving nutrition counseling from an outside source or following a specific diet at the time of the study will not be included to avoid this influencing their typical grocery purchases. A single grocery store will be used to shop from to reduce variability in grocery options, sales and/or promotions and provide convenience. Last, online

grocery shopping and in person grocery shopping will be separated into two different periods and will be the only method used within each period to provide distinct comparison between the two methods, although many individuals outside the study may participate in both simultaneously.

Significance

The results of this study will benefit the field of nutrition and dietitians in the retail setting by providing data on what foods consumers purchase in store versus online. This will provide insight into how online grocery shopping may influence people's health and could lead to future studies that can test why one method of shopping produces healthier grocery purchases and interventions to influence grocery purchases in order to sway individuals to buy healthier items. Surveys completed at the end of the study period will provide feedback from participants on how each method of grocery shopping influences grocery purchases.

Summary

Online grocery shopping has grown exponentially in the last two years and research is needed to provide substantial data on the topic. This crossover study will provide data on how purchases differ in regards to healthfulness when individuals shop for groceries online versus in store. The next chapter will examine the current literature in online grocery shopping and retail dietetics, including best practices for grocery shopping retailers, possible interventions to influence grocery purchases, as well as the importance of registered dietitians in the retail setting. Chapter 3 will then discuss the methodology of the proposed research study on the effects of in person versus online grocery shopping and the healthfulness of grocery purchases. Chapter 4 will cover the anticipated results of the study and lastly, Chapter 5 will provide a discussion on the proposed study.

Chapter 2: Review of Literature

America continues to face an obesity epidemic that is not slowing down. According to the Centers for Disease Control and Prevention, from 1999-2000 through 2017-2018, the prevalence of adults with obesity rose from 30.5% to 42.2%. Grocery stores are a pivotal point where consumers make decisions about what foods are going to be brought into their house. The purchase of food is the first step in determining what is ultimately going to be consumed and what is consumed can greatly impact an individual's health. With the grocery store being such a pivotal place to potentially impact health outcomes, it is a convenient place to market and educate consumers about making nutritious food purchases, healthy eating practices and the importance of both. Having a registered dietitian present in the store allows customers to receive education and advice on the spot. In a survey conducted by Progressive Grocers in 2016, half of retailers reported having a registered dietitian on staff (Dudlicek, 2016). Registered dietitians in the retail setting are expected to come up with new approaches to improve the health and nutrition of busy customers that are spending less time in the grocery store and kitchen and more time shopping for groceries online and eating convenience meals that don't meet their nutritional requirements. With the growth of online grocery shopping and need for new methods to reduce the rate of obesity, registered dietitians and supermarkets need to understand consumers' needs and best practices in order to make an impact at this pivotal time.

Online grocery shopping is growing exponentially across the nation as it saves time and provides optimal convenience (Redman, 2020). According to Supermarket News, online grocery shopping increased 40% in 2020 alone (Redman, 2020). Consumers can now order groceries and pick them up at a number of big name supermarkets such as Walmart and Hy-Vee. Is the change

from grocery shopping in store to online grocery shopping impacting people's health? The literature provides both positive and negative effects associated with online grocery shopping versus shopping in-store. According to Jilcott Pitts et al. (2018) Millennials and Generation Z are the most frequent users of online grocery shopping. With technology-savvy generations growing older and becoming a part of the main customer population, supermarkets are finding new ways to cater to their customers. The following chapter will cover the recent and developing research on supermarket health incentives, dietitians in the supermarket and how online grocery shopping is changing what groceries consumers purchase and therefore, their health.

Literature Research Strategy

Literature was found using PubMed and Mount Mary University Primo databases with publish dates filtered to include articles published within the last 15 years. Initial search terms included “retail dietetics”, “grocery and dietetics”, “grocery and dietitian”, and “grocery and nutrition”. This search generated many articles that ranged from research on grocery store-based dietary advice to understanding what consumers are looking for in grocery stores and the role of dietitians in the retail setting. A number of relevant articles were meta-analyses from which original research articles could also be found. The abstracts of potential articles were read to determine if appropriate to use as a source in the literature review. While many of these articles provided a good basis, they lacked data on recent and upcoming changes in the grocery store setting that ultimately impact registered dietitians in the retail setting.

After reading and selecting multiple articles, the search terms transitioned to include “nutrition and technology”, “online grocery shopping”, and “grocery health incentives”. These searches produced innovative and unique research on interventions in grocery stores to influence healthier purchases, simulated virtual grocery shopping experiences, and qualitative feedback on

online grocery ordering services. This helped to narrow the search process and focus the literature review on the present changes occurring in grocery stores and different ways that health and nutrition advice can be provided despite these changes.

Supermarket Interventions and Health Impact

The purchasing of food is a key step prior to consumption. Grocery stores market and place food in a certain way to appeal to customers in hopes they will buy more. With that being said, grocery stores can have a huge impact on what consumers purchase, eat and therefore, their overall health. Grocery store interventions can focus on changing food behavior to promote healthy eating. These interventions benefit the customer and their health, but they also can benefit the grocery store as well (Hartmann-Boyce et al., 2018). On the other hand, some interventions do not benefit the grocery store, whose main gain is to increase profit. This was seen in research conducted by Cawley et al. (2014) testing the impact of a supermarket nutrition rating system on purchases of nutritious and less nutritious foods. The rating system was developed by Hannaford Supermarkets and was similar to the three-star approach recommended by the Institute of Medicine where foods were assigned 0, 1, 2 or 3 stars depending on their nutritious value, with 3 being the highest and therefore most nutritious (Cawley et al., 2014).

The algorithm that assigned the number of stars took into account the vitamins, minerals, fiber, and whole grains (which raised scores) as well as saturated fat, trans fat, cholesterol, added sodium and added sugar (which lowered scores) (Cawley et al., 2014). The study was conducted in a chain of 168 supermarket stores in the north-east United States with the nutrition rating system put on the shelves of each of these stores (Cawley et al., 2014). Information and educational materials about the program were available throughout the supermarket to educate customers (Cawley et al., 2014). Sales data was collected from 102 categories of food on a

weekly basis from 2005-2007, including sales prior to the nutrition rating system being put in place (Cawley et al., 2014). Results indicated that after introduction of the rating system, overall weekly food sales dropped by an average of 3637 units of food per category (Cawley et al., 2014). Sales on less nutritious foods fell by 8.31% while sales on more nutritious foods did not change significantly (Cawley et al., 2014). Instead of consumers buying more nutritious foods, they in turn bought fewer less nutritious foods, which is not rewarding for a supermarket whose overall goal is to increase sales and number of items purchased (Cawley et al., 2014). The results indicate that future research needs to focus on the whole grocery basket, not just the sales of nutritious foods.

Another method of targeting the purchase of specific foods is through discounts. Waterlander et al. (2013) researched the use of different levels (10%, 25% and 50%) of discount on healthy foods as well as different labels ('special offer', 'healthy choice' and 'special offer and healthy choice') on healthy foods. The experiment took place at a three dimensional web based supermarket and included 109 participants with low socioeconomic status (Waterlander et al., 2013). Participants did not actually purchase the groceries they were picking out, but were told to complete grocery shopping that mimicked their typical week. Results indicated that participants who received the 50% discount purchased significantly more healthy foods than the 10% or 25% discount groups (Waterlander et al., 2013). However, the discount also led them to purchase more food overall. While the discounts had some significant effects, the labels did not (Waterlander et al., 2013). The research shows that discounts can increase healthful purchases, but more research needs to be done on directing customers toward swapping unhealthier items for healthier alternatives instead of buying more food overall.

From a review of the literature, we see that types of interventions that have shown to impact purchasing behavior include manipulating price and suggesting a swap to a similar, but healthier item and manipulating the availability of items (Hartmann-Boyce et al., 2018). These factors can ultimately contribute to the health of customers by impacting the food they purchase and choose to eat day in and day out. Purchasing foods that contain more vitamins, minerals, and fiber and less sugar and artificial sweeteners will lead to the consumption of healthier foods that nourish the body and can aid in overall health and wellness of individuals (Hartmann-Boyce et al., 2018). With the grocery store being a very community-based operation that provides necessities for individuals, it is a location that has the potential to make a big impact on the health of a community as a whole through positively influencing each individual that walks through the door.

The current environment greatly promotes obesogenic behaviors with very affordably priced unhealthy foods at the supermarket. The supermarket environment makes it hard to nourish our bodies appropriately and avoid treats, especially for people struggling with obesity. Papies et al. (2014) aimed to investigate the effectiveness of priming participants with a health or diet recipe flyer prior to grocery shopping to reduce purchases of energy dense foods in overweight individuals. Initiating the prime prior to purchasing groceries was a key factor in setting participants up for success since it is much harder to avoid unhealthy foods once they are purchased and in the home (Papies et al., 2014). At the time of grocery shopping, participants either received a recipe flyer containing a health and diet prime or just a recipe (Papies et al., 2014). Participants then shopped as usual and once they checked out they provided their receipt for research and filled out a questionnaire regarding their concern for dieting. While shopping, participants were not aware that they would be turning in their receipt and their groceries would

be analyzed. Results showed that the health prime reduced the purchase of unhealthy snack foods such as cookies, chips, and sweets, among overweight and obese participants when compared to the control group (Papies et al., 2014). Among normal weight participants, no significant difference was noted between the health prime and control group. When primed, overweight and obese participants bought almost 75% fewer snacks than those who were not primed (Papies et al., 2014). In order for the priming to work, participants had to pay attention to the flyer they received, but results from the questionnaire showed that participants did not have to have conscious awareness of the prime throughout their shopping in order for fewer snacks to be purchased (Papies et al., 2014). Results show that priming may be a good possible intervention to facilitate the purchasing of healthier food choices (Papies et al., 2014). With 99 participants included in the study and only five men, more research is needed to assess the effectiveness of priming at the population level.

As previously mentioned, swapping foods that contain fewer nutrients and health benefits with foods that contain more while keeping the item similar, can impact food purchasing and overall health, Payne Riches et al. (2019) investigated food product swaps in an online supermarket in order to reduce salt intake of 947 participants. Researchers found that when items with significantly less salt were offered, in both similar and dissimilar products to the original, acceptability of the product was maintained and there were significant reductions in overall salt content of food purchased (Payne Riches et al., 2019). Many chronic diseases can be improved through nutritional interventions and food swaps similar to this.

Considering many age ranges shop at grocery stores it is a task to market towards each age range, especially when it comes to purchasing healthier foods. Hardin-Fanning and Gokun (2014) researched how demographic factors impact the purchasing of healthful foods with the

use of a grocery voucher. Age, gender, education, and income level were all assessed in the 311 participants of a rural community with high rates of chronic disease (Hardin-Fanning & Gokun, 2014). Five dollar grocery vouchers were provided to participants and could be used at one of two community grocery stores (Hardin-Fanning & Gokun, 2014). Foods associated with reduced risk of cardiovascular disease were labeled with blue stickers in the store (Hardin-Fanning & Gokun, 2014). Participants received a list of these foods and then went shopping as normal and provided their receipts to be analyzed (Hardin-Fanning & Gokun, 2014). Results showed that neither education or income level had an impact on the purchasing of a labeled food, however, both age and gender did show significance (Hardin-Fanning & Gokun, 2014). Forty-seven percent of male participants purchased at least one labeled item compared to 63% of women (Hardin-Fanning & Gokun, 2014). Results showed that for every 10 year increase in age there was a 29% increase in the likelihood of at least one labeled food purchased (Hardin-Fanning and Gokun, 2014). Overall, 58% of participants purchased at least one labeled item (Hardin-Fanning & Gokun, 2014). Results indicated that age and gender should be considered when developing strategies to improve health, but this cannot be applied to other areas of the nation due to its small sample size and taking place in a small rural food desert. Further research is needed to address these findings in a more generalized population.

It has been shown that one way to improve diet quality at point of purchase is through front of the package labeling. Finkelstein et al. (2019) and Shin et al. (2020) looked into the use of front of package nutrition labeling methods on online grocery shopping sites. Shin et al. (2020) followed 125 participants who were each exposed to a no label control, as well as a dynamic food label with real time feedback once in random order while online grocery shopping. Diet quality was measured by a Nutri-Score (Shin et al., 2020). The real time feedback showed

participants the quality of the food in their cart with each addition through a visual graph (Shin et al., 2020). The visuals were easy to interpret and consisted of five colors based on the different levels of how nutritious the food was. Results showed that the dynamic food label with real time feedback showed the Nutri-Score was 12.6% higher compared to the control and decreased the amount of sugar per serving by 0.9 (Shin et al., 2020). Relative to standard online grocery shopping, the food labels resulted in significant improvements in the nutritional quality of foods purchased (Shin et al., 2020).

Finkelstein et al. (2019) also researched the effects of Nutri-Score, but compared it to another front of package labeling method known as Multiple Traffic Light. Nutri-Score presents a single summary ranking of the overall quality of the food from A-E with A being the best and E being the worst (Finkelstein et al., 2019). The Multiple Traffic Light method presents key nutrient information on the front of the package with color coded ratings for each nutrient. Green being the best, yellow average and red being worst. Both of these methods were compared to a no label control in an online grocery store with 154 participants (Finkelstein et al., 2019). Both label types showed significant improvement in Alternative Healthy Eating Index scores over the control, but not one over the other (Finkelstein et al., 2019). It seems that both labeling methods can produce beneficial outcomes, but since they highlight different features it may depend on the preferred outcome as to which one to use (Finkelstein et al., 2019). For example, Nutri-Score scored a better average among all factors assessed, so it may be more useful when trying to improve the overall diet (Finkelstein et al., 2019). Multiple Traffic Light, on the other hand, significantly reduced calories, and sugar from beverages, so it may be more useful in reducing total energy intake (Finkelstein et al., 2019). Overall, these types of features may be of benefit to

the online grocery shopping market to personalize each customer's experience and aid in improving their health.

Another use of technology researched in the retail setting is providing consumers with a default cart filled with nutritionally sound foods that they can then edit and customize to their liking when purchasing groceries online (Coffino and Hormes, 2018). This gets nutritionally dense food into people's carts that they may have not picked out in the first place and allows them to create a healthier meal. Fifty-nine undergraduate females participated in the study by virtually selecting foods online that fit into the allotted budget they received. The females were split into three groups, the first received a \$10 incentive for selecting nutritious groceries, the second received nutrition education and the third received a default grocery cart (Coffino and Hormes, 2018). Coffino and Hormes (2018) examined factors the micro and macro nutrients in the foods participants purchased and found that individuals who had a default cart purchased significantly more whole grains, fruits, and foods lower in cholesterol, saturated fat, sodium, and overall calories compared to participants who only received dietary education. Coffino and Hormes (2018) also noted that participants in the default cart option made significant changes to the pre-selected items in their cart. This shows that customization of healthy options can still have a positive impact on the grocery order for health. The downfall of the study was that the research took place on 59 undergraduate females, which greatly limits the ability for conclusions to be applied to much of the population.

Even with the help of technology, it is still hard to change individual habits and behaviors. Gopalan et al. (2019) realized this through providing financial incentives and text message feedback to increase healthy food purchases. In a six-arm study, all 2841 participants received varying amounts of cash back based on the difference between the healthy foods they

purchased and the unhealthy foods (Gopalan et al., 2019). The bigger the difference, the more cash back. Participants also received text messages that varied from general healthy eating guidance to the amount of cash the participant lost out on due to unhealthy purchases (Gopalan et al., 2019). Gopalan et al. (2019) found that between the varying level of financial incentives and types of text message feedback, neither of them affected food purchasing. Even with free money at stake, participants still fell into usual habits and had a hard time changing their behaviors surrounding food purchases. Food is a lot more than just energy for the body. It can have meaning or provide comfort to people. It can be a joyful part of each day or just something to provide energy to get through a busy day. Everyone's perception of taste and definition of healthy foods also varies. All these factors make food a lot more than just energy for the body to function and create many reasons as to why changing behaviors is hard, because it requires changing perceptions, schedules and so much more. These findings from research and the connotation surrounding food indicate the need for innovative strategies like more technological developments and increased use of dietitians in grocery stores to change health behaviors and grocery shopping habits.

Technology such as the use of phone applications and internet websites are another innovative method of changing people's actions and behaviors around the purchasing food and food consumption. There are a number of applications available to consumers today that can track their food, fitness, and weight loss, and also provide nutritional guidance and recipe ideas. Palacios et al. (2018) tested the effects of an innovative app called "MyNutriCart" which generates healthy grocery lists based on the Dietary Guidelines for Americans within a budget set by the user. The Dietary Guidelines for Americans are set to help Americans stay healthy and know what macronutrients and micronutrients they need (Dietary Guidelines for Americans,

2020). Much of the population has a difficult time processing the Dietary Guidelines for Americans, which consists of nutrients and numbers, into food and meals (Palacios et al., 2018).

The “MyNutriCart” app aimed to help with understanding the Dietary Guidelines for Americans and impact the foods users purchased (Palacios et al., 2018). It also assisted consumers in realizing that healthy foods often deemed expensive can in fact fit into their budget by allowing customers to set their budget on the app. The usefulness of the app was assessed against nutrition counseling (Palacios et al., 2018). Results showed that participants who used the app had a significant increase in the purchase of healthier foods (Palacios et al., 2018). When compared against nutrition counseling, the app was equally as successful at changing participants’ purchases (Palacios et al., 2018). Despite small differences between using the app and receiving nutrition counseling, the app is still an innovative use of technology to improve health, and can save resources and time for dietitians by explaining concepts and providing healthy recipes (Palacios et al., 2018). Though the results had some positives, there were many limitations in the study including over 88% of participants female, only 51 participants total, all of which were Hispanic, and an eight-week study period (Palacios et al., 2018). The study by Palacios et al. (2018) using the “MyNutriCart” app was also weakened by not analyzing the levels of macro and micro-nutrients that participants purchased. These factors greatly limit the ability to apply the study to other populations and increase the need for more research in the area to determine best practices.

The Role of Registered Dietitians in the Supermarket

A pivotal piece in helping to change behaviors and shopping habits is through having dietitians in the supermarket. In a survey conducted by Progressive Grocers, half of retailers that responded reported that their company has registered dietitians, with an average of 25 per

company (Dudliceck, 2016). Specific ways retail dietitians can bridge gaps in community health include: guiding customers toward healthier options, educating at the point of purchase, making healthier choices more affordable, teaching basic culinary skills, offering samples to increase the exposure to new foods and providing shopping lists and menus for specific health concerns related to nutrition (Webb, 2015). Supermarkets attract people of all ages and states of health making it a central location that can influence a wide variety of individuals. Having registered dietitians present in the supermarket can make a big impact in this area.

Registered dietitians are traditionally thought to work in the clinical setting, and therefore counsel patients at these types of locations. Lewis et al. (2015) determined through their research that both grocery store-based and traditional clinic-based nutrition education and counseling can improve the quality of participants' diets. The 25 participants in their study that received store-based education and counseling showed a greater increase in knowledge compared to the 25 participants who received clinic based education and counseling (Lewis et al., 2015). Even though the results were positive, the research was greatly limited by only including 50 participants, a lack of long-term follow up, and a \$50 grocery gift card incentive provided to participants at each of their three in-person sessions (Lewis et al., 2015). The store is an ideal place to educate patients on food because it allows the ability to walk through the store and show patients where healthy food items are or how to put them together to create a realistic meal. Coming to a grocery store where the patient regularly shops can also be less intimidating and help them to feel more at ease during the session compared to a clinic setting. More research needs to be done in this area and cost effectiveness needs to be assessed for each of these methods, but grocery store based nutrition counseling and education is a promising approach for positive health changes. With that being said, grocery stores need to ensure that they provide a

positive environment where registered dietitians and workers are friendly, helpful and take care of each customer to create an environment where positive change can happen.

Taking this a step further, Schultz and Lichfield (2016) researched the difference of impact between store-based nutrition education conducted by a registered dietitians versus virtual technology-based education. The study was conducted in six grocery stores over a four month period and included eight total lessons (Schultz & Lichfield, 2016). Each lesson in the store was conducted over a three hour period with a 2-3 minute demonstration for each customer led by the registered dietitian (Schultz and Lichfield, 2016). Technology-based education included a 2-3 minute video, on apps such as Facebook, explaining and showing how to make a recipe with key messages similar to that of the in-store education (Schultz & Lichfield, 2016). Customer awareness and engagement was assessed using a ten question survey (Schultz & Lichfield, 2016). Results showed that shopper awareness was greater for the in-store aisle demonstration compared to the technology based demonstration and there was a significant difference in engagement with 90% for in-store and 13% for technology-based (Schultz & Lichfield, 2016). It was seen that the more engagement the participant had in the lesson, the more knowledge they retained (Schultz & Lichfield, 2016). Results indicated that despite similar content, technology-based lessons may not provide equivalent engagement and experiences compared to in-store lessons. Although the study only included six stores and more research needs to be done in this area, the results indicated the benefit of registered dietitians in the store versus technology-based education. An area of weakness is lack of follow up to see whether these lessons transferred into desirable outcomes among participants.

Dietitians have access to a lot of helpful tools when located in a supermarket, the most important being the specific foods their customers buy. This is helpful to show clients how to

shop and pair foods to make a balanced meal directly in the store. This is often termed a grocery store tour and Jung et al. (2019) set out to examine the effectiveness of the Produce for Better Health Foundation grocery store tour in changing consumers' intentions in consuming various forms of fruits and vegetables. The tours took place in ten grocery stores in the Southeast United States and included 147 grocery shoppers (Jung et al., 2019). The program was advertised near the produce section at each store, recruiting customers to join through a small incentive (Jung et al., 2019). At the completion of each tour customers were requested to take a short voluntary survey to assess the impact of the grocery store tour on their attitude, subjective norm, perceived behavioral control related to fruits and vegetables and their intention to consume different types of fruits and vegetables (Jung et al., 2019). Results showed that customers' mean value of attitude, subjective norm and perceived control were significantly increased after the store tour (Jung et al., 2019). Participants' intentions to consume different types of fruits and vegetables also increased significantly, but there was no follow up conducted to see if they actually did (Jung et al., 2019). Registered dietitians are the best leaders for these types of programs due to their extensive knowledge of food and its impact on health. More research needs to be done as this study only addressed fruits and vegetables and was limited in its geographical area, but overall, grocery store tours are a promising approach that can be incorporated into a registered dietitian's tools as a retail dietitian.

In order for dietitians to make an impact at the grocery store level, they must know their clientele and grocery shopping behavior. The way individuals shop has changed over the years from stock piling food for the freezer or pantry to recipe based shopping (Peregrin, 2015). A growing group of shoppers these days are millennials. Millennials are known to influence others through social media and are more likely to shop multiple places versus a single store (Peregrin,

2015). Millennials are also changing the game for how and who does the shopping by an increasing number of online shoppers. With such a fast-paced life millennials want quick, convenient foods, but these don't always go hand in hand with health. Men are also accounting for 40% of main household shoppers according to a survey conducted by the Food Marketing Institute on 2,116 primary shoppers in the United States between the age of 18-74. (Hennesey, 2014). Registered dietitians in the grocery store can help to show how to pair a convenience food with a vegetable or teach how to make a quick and healthy recipe.

There are many factors that influence what the population perceives as "healthy" these days. Registered dietitians need to stay up to date on trends that customers will be looking for, such as hot new food items that are healthy and social media that consumers are using to find healthy recipes in order to best serve customers. They also need to make sure consumers know that not everything health and nutrition related on the internet is true. Overall, registered dietitians can make a big impact in the grocery store setting, but knowing and catering to the type of customer is a vital component to success. With grocery stores' main goal of selling more food, they aren't always concerned about what food is selling and if it is healthy. Making grocery stores aware of all the ways registered dietitians can help increase sales of healthy foods and the importance the grocery store has for improving the health of the community is vital in getting more dietitians into supermarkets and making an impact.

Online Grocery Shopping

Consumers are making decisions to online grocery shop, but what is expected of the retailers to gain customers and keep them coming back? Jilcott Pitts et al. (2018) noted that most individuals are motivated to begin online shopping due to the convenience and time saving aspect of it. According to a survey of 536 online grocery shoppers by Bauerova (2018), the

services provided are the most important factor in making a decision to online grocery shop. Some of these factors include a delivery fee, minimum order value, delivery time, and delivery passes (Bauerova, 2018). Most of these factors are dependent on the consumer's perception and what they deem as ideal. The condition of the food or having orders filled incorrectly also plays into the satisfaction of the customer and as a result how likely they are to purchase again (Jilcott Pitts et al., 2018). There are many factors that determine the ultimate decision to online grocery shop and supermarkets providing online grocery shopping should consider all of those mentioned and more when determining how to best serve their customers and gain their loyalty.

The decisions consumers make regarding food purchases also impacts their health. According to a review by Jilcott Pitts et al. (2018) there are both positive and negative health impacts associated with online shopping. A drawback is that many consumers are less likely to purchase perishable foods online, such as fruits and vegetables, due to concerns about freshness, quality, and food safety (Jilcott Pitts et al., 2018). It is unknown whether those who don't purchase these items online make a trip to the store for them or just go without. Participants noted that potential positives of online shopping include increased healthy meal planning through list functions on some retailer websites and apps and fewer impulse purchases of unhealthy foods (Jilcott Pitts et al., 2018). This research is relatively new and somewhat subjective, leaving a lot of room for growth in order to determine best practices for online retailers. It is important to determine best practices because the foods people eat can greatly impact their health, weight, and risk for disease.

Knowing the importance of nutritious foods in the diet, Olzenak et al. (2019) researched how online grocery stores are supporting the purchase of nutritious foods through showcasing nutrition related information and including specific search features on their online site. Twelve

different grocery sites were assessed for this information, as well as the availability of the nutrition facts label for 26 different foods across a variety of food categories (Olzenak et al., 2019). They found a number of common nutrition related search filters among the websites with 83% of the grocery websites including an organic filter, 75% including gluten-free, 50% including low fat and 42% including sugar-free/no sugar added (Olzenak et al., 2019). These types of filters make it easier for consumers to search through foods within that category and know that they will meet certain health goals they are trying to follow.

For food label information, results varied from 42%-100% of packaged foods having a label available to view online (Olzenak, et al., 2019). Lastly, researchers found that among the 12 grocery stores, 25%-100% of packaged foods and 50%-58% of produce items had ingredient lists (Olzenak et al., 2019). Both the food label and ingredient list are available to view when in store and can greatly help customers make informed decisions about the food. The research was limited with only 12 grocery stores assessed, but the design of this research is greatly needed with the growth of online grocery shopping. Another downfall is that Olzenak et al. (2019) did not research whether these types of filters were utilized regularly by customers and found to be helpful. Retailers have the potential to support and influence shoppers to make healthier purchases with this extension to online grocery shopping and need to take advantage of this opportunity to help improve the health of the nation.

Looking into the perspective of the customer, Harnack et al. (2020) met one on one with 25 adults, who reported they were trying to lose weight, to gain insight on their online grocery shopping needs to support their weight loss goal. Information from each interview was gathered and used to brainstorm helpful tools that could be added to the online grocery website to support weight loss goals of consumers. Researchers reported four ideas from the customers' needs.

First, reporting the nutritional quality rating of the foods in the shopping cart and providing suggestions for improvement. Second, a menu planning tool that allows customers to individualize their preferences, find recipes and plan their meals. Third, an interactive virtual grocery aisle to discover healthy products and meal ideas as if they were in the aisle at the store. Fourth, the option of a healthy shopping preference to only allow foods that align with the shopper's health and nutrition goals to be viewable. While all of these ideas may not be viable, each one provides assistance to the customer and may make a difference in food purchases. These conclusions and ideas have great importance while online grocery shopping websites are still developing and expanding in order to create the most beneficial experience for customers to support their health and needs.

One of the positives noted about online grocery shopping was the reduction in impulse purchases of unhealthy foods (Jilcott Pitts et al., 2018). Hollis-Hansen et al. (2019) determined the effect of impulse purchasing on 57 overweight and obese females. They found that consumers who used episodic future thinking were able to make better choices when purchasing groceries online. Episodic future thinking involves imagining future events and how choices now will affect them. Study participants purchased significantly fewer overall calories per person in the household compared to no intervention in individuals shopping for groceries online (Hollis-Hansen et al., 2019). The researchers determined that episodic future thinking may be an effective component in behavioral change programs for diseases such as obesity (Hollis-Hansen et al., 2019). Unfortunately, these conclusions cannot be applied at the population level due to a small sample size of all females.

Thinking into the future also appears to lead to less overall spending on groceries. Milkman (2020) found that when grocery orders were placed multiple days in advance,

participants purchased more items that they needed for specific meals and recipes and fewer items that they wanted, but didn't need when compared to groceries ordered for the next day (Milkman, 2010). Ordering groceries in advance allows individuals to meal plan and add to their virtual cart gradually. Orders that were reviewed included those that were placed online between one and five days in advance throughout January 1, 2005-December 31, 2005, resulting in a total number of orders over one million (Milkman, 2010). Participants in the study rated their purchases based on if the item was a "want" or a "should" in their mind and were paid for responding to the questionnaire (Milkman, 2010). Results showed that when the customer placed an order 2 to 5 days in advance they purchased fewer items that they "want" and more items that are specifically needed for their meals and nourishment compared to placing it one day in advance (Milkman, 2010). The researchers found that people spent money more freely when making decisions for the immediate future while participants spent \$2.70 less on groceries per day of additional order lead time, meaning the further in advance they ordered groceries, the less money they spent (Milkman, 2010). Although a difference was seen, it was not statistically significant (Milkman, 2010).

Another way online grocery shopping has been researched is its usefulness in treating obesity. Gorin et al. (2007) examined the impact of eight weeks of standard behavioral weight loss versus standard behavior weight loss plus home food delivery in overweight individuals. Twenty-eight participants were included in the study and randomly assigned to one of two groups. Standard behavior weight loss focused on behavioral change and cognitive skills where groups met for 60 minutes each week, were prescribed a low calorie diet of 1200-1500 kcal/day and instructed to increase exercise to 150 minutes per week. Participants self-monitored their calorie intake and daily exercise and received feedback from interventionists. The group that also

received grocery delivery during the eight weeks was instructed to purchase and order all groceries online. Participants were required to pay for their groceries, but the delivery fee was reimbursed by the study.

While standard behavior weight loss can be effective, it often lacks instruction on what foods are in the household and how that can make an impact on what is eaten and therefore, health. Results showed that the standard behavioral therapy plus home grocery delivery group had significant reductions in the total number of foods in the home and the number of foods that were high in fat. There was not, however, a significant difference in weight loss between the two groups. Participants that received the home grocery delivery service said that it did help decrease impulse purchases and led to healthier choices when compared to their usual in-store shopping experience. While participants felt there was a benefit to the grocery delivery service, the majority of them said they would likely not continue to use the service after the study period was over (Gorin et al, 2007). The study was only conducted in 28 participants leaving a lot of room for development upon this research and a need for more in depth responses from participants to better understand why grocery delivery led to less food in the house. The grocery delivery fee was also waived in the study which leads to missing information on whether or not consumers are willing to pay for this service. Follow up would also be beneficial to report long-term weight loss, and what participants learned from the study and incorporated into their routine. This area of research is greatly needed as the obesity epidemic continues and grocery shopping methods are changing.

Comparison of Literature

When looking into online grocery shopping specifically, there are a number of factors that impact what ultimately is purchased. Hollis-Hansen et al. (2019), Jilcott Pitts et al. (2018), and Gorin et al. (2007) all note one positive aspect of online grocery shopping is the decrease in likelihood of impulse buying that occurs while shopping in-store, and instead more thought-out food purchasing decisions. Thinking into the future also appears to lead to less overall spending on groceries (Milkman, 2020). Purchases planned in advance resulted in more needed items and fewer wanted items when compared to grocery orders that were placed for delivery the next day (Milkman, 2010). A major negative of online grocery shopping is that consumers are less likely to purchase produce online (Jilcott Pitts et al., 2018). This is where many of the factors that Bauerova (2018) and Jilcott Pitts et al. (2018) discuss such as quality of food and delivery time come into play and can sway consumers one way or the other on where to purchase food from and what food to purchase, which ultimately impacts their health. Participants showed there was a benefit to the grocery delivery service, but the majority of them said they would likely not continue to use the service after the study period was over (Gorin et al, 2007). While we don't know why this is, Bauerova (2018) mentioned that delivery fees may have an impact on willingness to use the service.

With regard to what is needed to assist customers in purchasing healthier groceries online, Harnack et al. (2020) found through feedback interviews that menu planning support tools and healthy shopping preference option were both highly rated and believed to be effective in helping support healthy food choices by most participants. However, Olzenak et al. (2019) researched what support tools there currently are to help customers pick healthy foods and found that the Nutrition Facts panel and ingredient statement information was available for the majority of foods online and most stores also offered a way to filter food choices by a nutrition related

attribute. While the information and filter may helpful, it seems from research by Harnack et al. (2020) that there are tools that consumers would find more helpful. The basic nutrition information that Olzenak et al. (2019) found on online grocery sites is information that can already be used to navigate a grocery store in person as most grocery stores have labeled aisles and often put similar products together. While it is necessary to provide it online as well, there are many more capabilities that online websites have to provide more advanced tools. Further research in this area along with the expansion and development of online grocery shopping websites in order to make online grocery shopping the best experience it can be and aid customers in making healthier food choices.

When shopping in the store there are a number of factors that contribute to what customers end up buying. Types of interventions that have shown to impact purchasing behavior include manipulating price, suggesting a swap to a similar, but healthier item and manipulating the availability of items (Hartmann-Boyce et al., 2018). Research on incentives to sway purchases to healthier options are less known and provide varying results. These type of nutrition interventions often benefit the customer and their health, but they also can benefit the grocery store as well (Hartmann-Boyce et al., 2018). On the other hand, some interventions do not benefit the grocery store as seen in research by Cawley et al. (2014) who found that after the introduction of a rating system of the overall nutritional quality of food items, weekly food sales dropped by an average of 3637 units per category. Sales on less nutritious foods fell by 8.31% while sales on more nutritious foods did not change significantly (Cawley et al, 2014). Instead of consumers buying more nutritious foods, they in turn bought fewer less nutritious foods.

One of the interventions Hartmann-Boyce et al. (2018) found to have an impact on purchasing behavior was manipulation of price, which Waterlander et al. (2013) specifically

researched. Results showed that participants who received the 50% discount purchased significantly more healthy foods than the 10% or 25% discount groups (Waterlander et al., 2013). However, the discount also led them to purchase more food overall which could lead to the consumption of more calories which could in turn lead to weight gain if this extra energy was not utilized. As the research on incentives in grocery stores is compared, it is evident that there are conflicting conclusions and a “best method” for encouraging the purchase of healthful foods is far from being reached, indicating the need for further research and developments in this area.

Research shows that registered dietitians in the retail setting have the potential to make a big impact on health and nutrition education as noted by Lewis et al. (2015) and as cited in Webb (2015). With more customers now shopping online, retail dietitians must find new ways to reach customers that never step foot in the store. This is where nutrition apps such as “MyNutriCart”, social media and other forms of technology can help dietitians reach these customers and influence their purchasing decisions to improve their health as Gopalan et al. (2019) and Peregrin (2015) mentioned.

There are many ways the food market can be manipulated to influence consumers. Multiple studies addressed various interventions, as well as the use of technology to influence consumers behavior and decision making to try to improve health. A few studies had promising hope in regard to influencing healthier choices, such as food swapping (Payne Riches et al., 2019) and default grocery cart options (Coffino & Hormes, 2018). Palacios et al. (2018) had mixed results with the use of a nutrition app and finally, Gopalan et al. (2019) showed consumers made little change to the health of their diet even with financial incentives and text message feedback. It appears use of technology alone may be insufficient in helping individuals make the behavioral changes needed to improve their health, which was largely seen through the study by

Palacios et al. (2018) on the app “MyNutriCart”. Much of the research in this area is recent and limited in size, diversity, and longevity. These factors, along with mixed findings prove the need for more research to determine best practices and long-term outcomes in the retail setting.

Another way customers can be influenced to purchase items is through information that is showcased on the front of packages. Finkelstein et al. (2019) and Shin et al. (2020) both investigated the use of front of package nutrition labeling methods in on online grocery shopping sites. Shin et al. (2020) researched the use of the Nutri-Score system, while Finkelstein researched both the Nutri-Score system and the Multiple Traffic Light system. Shin et al. (2020) found that the Nutri-Score was 12.6% higher in the group that received dynamic food labels compared to the control and decreased the amount of sugar per serving by 0.9 (Shin et al., 2020). On the other hand, Finkelstein et al.(2019) found that both label types showed significant improvement in Alternative Healthy Eating Index scores over the control, but not one over the other. It seems that both labeling methods can produce beneficial outcomes, but since they highlight different features it may depend on the preferred outcome as to which one to use. This also may mean more research needs to be done to determine the best labeling method.

Regarding the role of registered dietitians in the supermarket, much of the research compares in-store registered dietitian counseling to other methods of education. Lewis et al. (2015) determined that both store-based and traditional clinic based nutrition education and counseling can improve the quality of participants diets. Taking a slightly different approach, Schultz and Lichfield (2016) researched the difference of impact between store-based nutrition education conducted by a registered dietitians versus virtual technology based education. Results indicated that despite similar educational content, technology-based lessons may not provide equivalent engagement and experiences compared to in-store lessons (Schultz &Lichfield, 2016).

It seems physically being in a store, surrounded by food, is the ideal place to learn about nutrition. This education can come in many different forms, but one that seems to have success is grocery store tours. Jung et al. (2019) found that customers mean value of attitude, subjective norm and perceived control were increased after the store tour. Participants' intentions to consume different types of fruits and vegetables also increased significantly (Jung et al., 2019). This is not only beneficial in aiding customers in choosing healthier options when shopping for groceries, but it also shows the value dietitians can bring to grocery stores through the revenue they bring in from their clients purchasing groceries at their store.

Research Methodology

The methods used among these studies varies greatly, but the following studies have particular components that increase the reliability of the results and provide a more comprehensive picture on the topic. Palacios et al. (2018) conducted a pilot randomized trial to test the efficacy of using the "MyNutriCart" app compared to one face-to-face counseling session in Hispanic overweight and obese adults. Although only including the Hispanic population limited the study, the randomization was appropriate in order to minimize the difference between groups by equally distributing the people with similar characteristics among the different interventions.

Schultz & Litchfield (2016) conducted a quasi-experimental study in rural/Midwest grocery stores over a 4-month period. By conducting the experiment in the grocery store they were able to recruit a variety of people from the community that shop at a particular store. They also conducted a 1-month post intervention survey to gain insight on long term effects and gain perspective from the participant. Similarly, part of Lewis et al. (2015) study took place in a grocery store setting to determine how it compared to the clinical setting in delivering dietary

education. Bauerová (2018) and Harnack et al. (2020) focused on qualitative research and got their data solely from conducting interviews. These one-on-one interviews allowed participants to express their true feelings and opinions without the influence of others. An alternative, less time-consuming approach would be the use of focus groups where a group of 5-8 people discuss the topic. While both of these methods mean the results are subjective, they are vital in providing insight from consumers on what they expect or experiences they have had, which can ultimately help to determine how improvements can be made and how customers can be served better.

Gorin et al. (2007) conducted their research on overweight participants who were randomly assigned to 8-weeks of standard behavioral weight loss (SBT) or to SBT plus home food delivery (SBT+Home). Using overweight participants only limited the study, but allowed the research to reveal the effectiveness of the interventions on the typical person that may be requesting these types of services. Lewis et al. (2015) also conducted their research on patients with obesity in a non-blinded pilot randomized controlled trial of a moderate-intensity behavioral intervention. In the SBT + home food delivery group, participants were instructed to do their household grocery shopping via an online service affiliated with a regional supermarket chain and were reimbursed for delivery charges. This allowed the participants to get familiar with the online ordering system and foods that were offered from that grocery chain, which could lead to them being more or less likely to use it in the future depending on their experiences.

The use of a crossover design in the supermarket setting was seen in two recent studies by Vadiveloo et al. (2020, 2021). The crossover design was selected to enhance their ability to recruit community-based participants and increase statistical power (Vadibeloo et al., 2021). Two 4-week washout periods were also in place between each 3 month intervention period to prevent carry over from one intervention to the next. Benefits of a cross over trial are that

participants are exposed to all levels of the independent variable and each participant can serve as his or her own control. Along with this, cross over studies reduce the effort one must make for participant recruitment and associated study expenses as Vadiveloo et al. (2021) stated.

Overall, these studies highlight a number of components that create an appropriate methodology for this type of research. Optimal components include randomization, a controlled trial or cross over study with a washout period, an appropriate setting, and the inclusion of both quantitative and qualitative data.

Summary

Food purchasing is a pivotal first step in determining what people are putting in their body and therefore, their health, which is a huge reason why it is a vital point to have a registered dietitian present to educate and provide resources to customers to help them make nutritious choices. The obesity epidemic in America is just one of the major reasons why nutrition and health education need to be more widely available and accessible to the population. It is probable that the changing methods of grocery purchasing, from in-store to online, is also changing people's health.

As the research shows, a number of interventions that can assist shoppers in purchasing healthier foods, but continued research needs to be done to determine best practices regarding these interventions. The customer market is also rapidly changing with the growing number of Millennials and Generation Z now shopping for groceries. With the increase in use of technology and the need for convenience not slowing down any time soon, supermarkets and registered dietitians in the retail setting are going to continue to have to be innovative in finding ways to cater to their customers and create new approaches to improve the health and nutrition of busy customers that are spending less time in the grocery store and kitchen. With the literature in this

area very recent and at small scale levels, including small sample sizes and limited diversity, there is a great need for development upon these studies to gather conclusions that can be applied at the population level. Identifying research-based recommendations to these issues can help to create an environment that promotes nutritious food purchases and healthy eating to reduce the rate of obesity and allow grocery stores and registered dietitians to make an impact.

Registered dietitians have been present in the retail setting for a number of years and yet there is minimal research on best practices and the need for them in this setting. While registered dietitians in this area are paving the way with new and innovative methods to reach and improve the health of the community, much of it is under-researched for effectiveness and best methods of reaching different populations in varying geographical locations. The need for increased health and nutrition education in many areas of life is evident with the rising rates of obesity. The next chapter will provide the research protocol and other details on the proposed study, comparing the healthfulness of purchases from instore and online grocery shopping.

Chapter 3: Methodology

Grocery stores are a pivotal point where consumers make decisions about what foods are going to be brought into their house and consumed. Over the past few years, grocery shopping has become increasingly available online. According to Supermarket News, online grocery shopping increased 22% in 2019 and 40% in 2020 (Redman, 2020). Online grocery shopping provides a quick and convenient method of purchasing groceries without having to spend time walking through the store. The literature provides both positive and negative effects associated with online grocery shopping versus shopping in-store in terms of the health of foods purchased. This chapter will introduce the proposed research study comparing the healthfulness of purchases from both instore and online grocery shopping providing details on the methodology for the study.

Research Protocol

Research Question and Hypotheses

Research Question: Does ordering groceries online versus shopping in person impact the healthfulness of food purchased?

H₀: There will be no difference in the healthfulness of grocery purchases between shopping in person and shopping online.

H_a: Online grocery shopping will lead to an increase in healthful food purchases when compared to shopping in person.

Table 1*Research Questions and Variables*

Research Question	Independent Variable	Dependent Variable	Confounding Variables
Does ordering groceries online versus shopping in person impact the healthfulness of food purchased?	Type of grocery shopping	Healthfulness of grocery purchase based on FAST score	Income/socioeconomic status Education Weather Time

Study Design

The study will be a 10-week randomized crossover trial with recruitment from the Lincoln Center Hy-Vee in Ames, IA. The study will consist of two, 4-week study periods, with a 2-week washout in between the two shopping methods. Participants will be required to get 100% of their groceries from the Lincoln Center Hy-Vee using their designated shopping method. Randomization of participants will reduce bias among the two groups. The crossover design will allow each participant to serve as their own control, which will reduce error from arising due to natural variance between individuals.

Setting and Sample

A sample size of 382 participants must be obtained to maintain a margin of error of 5 and a 95% confidence interval (Raosoft, 2004). This was calculated using Raosoft sample size calculator and the population of Ames for individuals aged 18-65 years, which is 58,009. The sample will consist of adults age 18-65 years who do not live in college dorms and are the main shopper of their household. Participants must agree to shop at the Lincoln Center Hy-Vee for all groceries and have the ability to use the Hy-Vee Aisles Online ordering platform through the

web or a mobile device in order to be participate in the study. Participants will be excluded if they are following a specialty diet for health or weight loss purposes or plan to start one in the next 10 weeks. Participants will also be excluded if they are receiving nutrition counseling at the time of the study or currently living in college dorms.

Recruitment will occur during March 2022 through May 2022 by emailing current Hy-Vee customers that are in the database about the study and advertising through posters in store and flyers in shopping bags (Appendix A). A \$50 Hy-Vee gift card at the completion of the study will be used to recruit participants. An incentive of 5% off each grocery purchase with use of a loyalty card will be used as incentive for participants to avoid purchases outside of the study store during the study period. Screening of potential participants will occur in person to determine study eligibility and informed consent will be signed (Appendix B).

Data Collection Process

All participants will receive a loyalty card to scan after each purchase or include in their online grocery profile in order to link their purchases with them. Loyalty cards will provide a 5% discount on groceries. Participants will be randomly divided into two groups and will be assigned to shop for groceries by way of online or in person during the first 4-week period. After that there will be a 2-week washout period that participants can shop in any form they would like. The last 4 week period, participants will switch to the alternative method of shopping. At completion of the study, surveys will be sent to all participants via email to assess their thoughts on each method of buying groceries and how they felt the health of their food purchases was with each method (Appendix C).

Instrumentation

Food Assortment Screening Tool (FAST) will be used to calculate the healthfulness of grocery purchases. FAST is a valid tool as it includes a large number of categories and those categories align with other nutritional standards. FAST also correlates with HEI-2010 (healthy eating index), but is not validated in the current population of this study (Caspi et al., 2018). FAST consists of 13 food categories and 31 subcategories as shown in Table 1 (Caspi et al., 2018). The total weight of foods in each category is calculated and entered into the tool under that category. The tool divides the weight of each category by total weight of the entire food purchased to calculate the percent of food in each category. The tool then automatically multiplies this by its healthfulness parameter and all are summed together to total the FAST score. The overall FAST score ranges from 0–100, with 100 being the healthiest (Weiss et al., 2020). FAST has frequently been used to assess the nutritional quality of food at food pantries, but not on the population of the proposed study (Caspi et al., 2018). A snapshot of FAST can be found in Appendix D.

Qualtrics will be used to create and conduct a short survey at the completion of the study to gain insight into participants' thoughts on the two shopping methods (Qualtrics, 2021). Qualtrics is a web-based software company that allows the creation of surveys and generated reports to analyze data. It has been used in numerous research studies in which a survey need to collect data. Karlsen et al. (2018) used Qualtrics to create and conduct a survey as part of their research on a feasibility survey to assess the practicality of web-based research methods to gather data and to maximize response rates among followers of popular diets. Results showed the web-based methods to be feasible. Survey questions are not validated and can be found in Appendix C.

Table 2
FAST Categories and Subcategories

	Category	Subcategory
1	Fresh fruits and vegetables	1.1 Fresh vegetables 1.2 Fresh fruits
2	Processed fruits and vegetables	2.1 Canned fruit 2.2 Canned vegetables 2.3 Dry fruit 2.4 Dry vegetables
3	Whole grains	3.1 Whole Grains
4	Non-Whole grains	4.1 Non-Whole grains
5	Beverages	5.1 100% fruit juice 5.2 Dry beverages and soda 5.3 Other beverages
6	Dessert and snacks	6.1 Salty desserts and snacks 6.2 Sweet desserts and snacks
7	Dairy	7.1 Fluid milk and cheese 7.2 Yogurt 7.3 Other Dairy
8	Vegetable protein	8.1 Canned vegetable protein 8.2 Dry vegetable protein and spreads
9	Meat, poultry, fish, and eggs	9.1 Beef, pork, and lamb 9.2 Canned Meat and fish 9.3 Poultry and eggs 9.4 Fish
10	High processed meat	10.1 High Processed Meat
11	Mixed meals and side dishes	11.1 Canned mixed meals 11.2 Dry, Refrigerated, and frozen mixed meals
12	Condiment, baking and cooking	12.1 Flour 21.2 Baking and cooking mixes

12.3 oil

12.4 other condiments and baking

13 Baby food

13.1 Baby food

Data Analysis Plan***Descriptive Statistics***

Participants will be randomly assigned to one of two groups; one will start shopping in-person and the other, online with a switch to the opposite method for period 2 of the study. The two groups will be compared to determine if a significant differences exist between them using a sociodemographic health survey that will be completed prior to the first study period (Appendix E). A Chi-Square will be used to compare the results and determine if any significant differences exist. IBM SPSS statistics software will be used to analyze data. IBM SPSS statistics was the most common statistical software package used among a literature review on software used in nutrition and dietetics research (Coenen, Batterham, & Beck, 2021). The mean and standard deviation will be presented in a table.

Inferential Statistics

Inferential statistics will include a paired t-test to compare the FAST score of grocery purchases from the same individual during each method of grocery shopping. Study results will be considered statistically significant if the p-value is less or equal to 0.05.

Table 3***Description of Variables***

Variable type	Variable name	Potential Responses	Level of measurement
Independent	Shopping method	Online or in person	Nominal
Dependent	Healthfulness of grocery purchases	01-100	Continuous

Threats to Validity

Internal threats to validity include attrition and unknown events that may occur within one of the periods. External threats to validity include sampling bias, in which the sample is not representative of the population. The Hawthorne effect is also a threat due to participants having the tendency to change their behaviors simply because they know they are being studied. There also may be a social desirability bias where participants respond to surveys in a manner that will be viewed favorably by others or purchase healthier foods than they normally would. Lastly, the time of year may affect what foods participants purchase based on what is in season at the time of the study. Although participants are only supposed to buy groceries from the study supermarket, there is no way to completely control for outside purchases.

Ethical Procedures

Each participant and their orders will be compartmentalized using their loyalty card number. This is the number that will also be used as the “name” for the participants to protect privacy. This electronic data, along with others, such as Excel spreadsheets containing qualitative data, will be saved, and stored on a flash drive that will be placed in a manila envelope. This envelope, along with the informed consent forms (Appendix B) will be kept in a locked filing cabinet in an office at the Lincoln Center Hy-Vee. Any laptop or computer utilized for study purposes will be password protected and will be programmed to time out after 10 minutes of inactivity. Online grocery orders will be stored in Retail Product Management (RPM), an application Hy-Vee uses to view, shop and tender orders. This application requires a

login that only certain employees have access to, and each employee's login is different. An IRB application will also be completed for the study and can be found in Appendix F.

Summary

With the recent and exponential growth of online grocery shopping, more research is needed in the area to determine how it is affecting grocery purchases. A 10-week crossover study will be conducted at the Lincoln Center Hy-Vee in Ames, IA, to determine if there is a difference in the healthfulness of food consumers buy when shopping in person versus online. FAST will be used to calculate the healthfulness of purchases using their categorical criteria and the data will be compared between both shopping methods for the same participant, as well as among all participants. Results of the study will provide further research that can benefit the field of retail dietetics and insight into how grocery shopping methods may be affecting the population's health. In the chapters to follow, the anticipated results of the research study will be covered, followed by a discussion.

Chapter 4: Anticipated Results

Characterization of Study Population

A total of 382 participants will be recruited from the Lincoln Center Hy-Vee in Ames, IA between March 2022 through May 2022. The 382 participants will be randomly assigned to one of two groups and will serve as their own control in this crossover trial. Group 1 will shop in person during period 1, while group 2 will shop online. For period 2, the method of shopping among each group will be switched. It is estimated a total of 10 or more participants may drop out of the study for personal reasons. Anticipated designations of study participants are shown in Figure 1.

Figure 1

Flowchart Illustration for Study Participants

Baseline Characteristics

Anticipated baseline characteristics of both groups are presented in Table 4. It is anticipated that there will be no significant differences in baseline characteristics.

Table 4

Baseline Characteristics of the Study Population

Characteristics	Total N=382	Group 1 n=191	Group 2 n=191	P-Value
Gender				
Female, %	88	89	87	0.76
Male, %	12	11	13	0.63
Non-binary, %	0	0	0	1.0
Age				

18-25, %	20	19	21	0.74
26-40, %	68	70	66	0.82
40-65, %	12	11	13	0.59
Ethnicity				
Caucasian, %	60	59	61	0.44
African American, %	10	12	8	0.75
Latino or Hispanic, %	4	4	4	1.0
Asian, %	19	20	21	0.87
Native American, %	3	1	2	0.63
Native Hawaiian or Pacific Islander, %	2	2	2	1.0
Other/Unknown	2	2	2	1.0
Highest Education Level Completed				
Some High School	6	5	7	0.66
High School Degree	32	30	34	0.32
Bachelor's Degree, %	50	51	49	0.47
Master's Degree, %	10	12	8	0.38
Ph.D. or higher, %	2	2	2	1.0
Annual Household Income				
<\$25,000, %	19	20	18	0.73
\$25,000-\$50,000, %	23	22	24	0.81
\$50,000-\$100,000, %	31	29	33	0.35
\$100,000-\$200,000, %	22	24	20	0.42
>\$200,000, %	5	5	5	1.0

Marital Status

Single, %	40	39	41	0.69
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Married, %	60	61	59	0.54
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Children

None, %	35	36	34	0.22
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1-3, %	59	58	60	0.73
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4 or more, %	6	6	6	1.0
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General health status

Excellent of very good, %	69.5	71	68	0.37
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Good, %	25.5	25	26	0.92
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Fair or Poor, %	5.5	5	6	0.85
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* $p < 0.05$ indicates statistical significance

Healthfulness of Grocery Outcomes

The healthfulness of grocery purchases using both in-person and online shopping methods will be measured using the Food Assortment Scoring Tool (FAST). Grocery purchases from each participant will be linked to their loyalty card that will be used at check out. Grocery purchases will be compiled and evaluated for their healthfulness. To determine the healthfulness, the total weight of foods in each of the thirteen FAST category is calculated and entered into the spreadsheet within that category. The tool then divides the weight of each category by the total weight of all foods purchased to calculate the percent of food in each category. The tool then automatically multiplies each category by its healthfulness parameter and the resulting totals are summed together to produce the FAST score. The overall FAST score ranges from 0–100, with

100 being the healthiest. Healthfulness of groceries between in-person and online shopping methods will be compared using a paired t-test with anticipated results presented in Table 5.

Table 5

Healthfulness Outcomes

Outcome	Variable	Period 1				Period 2			
		Mean	SD	95% CI	P-Value	Mean	SD	95% CI	P-Value
FAST Score	In-person	61.5	8.2	[59.8., 63.7]	0.02	63.2	6.2	[60.4, 63.9]	0.02
	Online	67.2	7.9	[66.4, 69.9]		68.9	6.8	[65.8, 69.4]	

*p<0.05 indicates statistical significance

Exit Survey Outcomes

An exit survey will be sent out via email at completion of the study to all participant. Participants will be required to submit the survey to receive their \$50 gift card for completing the study. Participants will have the option to not respond to questions and their responses will be anonymous. Anticipated results of the survey can be found in Table 6. Details and discussion about responses can be found in Chapter 5.

Table 6

Exit Survey Responses

Question	In person	Online	
What method of grocery shopping did you prefer and why?	45%	55%	
	Yes	No	Maybe
Do you feel changing the method of your usual grocery shopping influenced you to purchase different/new items? If yes, what types of items and why?	71%	27%	2%

Do you feel the health of your grocery purchases were better using one method over the other? If yes, which one and why?	62%	42%	4%
Did you obtain groceries from other sources (farmers market, garden, supermarket, etc.) during either period?	10%	90%	0%
	In person	Online	Mix of both
Following the study, what method will you use most frequently to purchase groceries?	24%	26%	50%

Chapter 5: Discussion

Online grocery shopping has grown exponentially in the past few years and has quickly become a staple at many big name supermarkets. A gap in the literature exists as to how online grocery shopping has changed consumer's purchases and perspectives, as well as how this change could be impacting the health of the nation. According to a review by Jilcott Pitts et al. (2018) there are both positive and negative health impacts associated with online shopping. One drawback is that many consumers are less likely to purchase perishable foods online, such as fruits and vegetables, due to concerns about freshness, quality, and food safety (Jilcott Pitts et al., 2018). Positives of online shopping that were noted by participants included convenience, healthy meal planning through list functions on some retailer websites and apps and fewer

impulse purchases of unhealthy foods (Jilcott Pitts et al., 2018). This chapter will discuss the anticipated results of the proposed study and compare those results to previous studies in the field. Along with this, the strengths and limitations of the proposed study will be discussed, as well as suggestions for future research.

Interpretation of Results

This 10-week crossover trial will evaluate the effects of grocery shopping in person versus online in regard to healthfulness of food purchased. It is anticipated that the null hypothesis will be rejected and the alternative hypothesis will be accepted. It is predicted that online grocery shopping will produce healthier food purchases compared to in person grocery shopping. The Food Assortment Scoring Tool (FAST) will be used to calculate the healthfulness of purchases using their categorical criteria and the data will be compared between both shopping methods. The higher the FAST score, the healthier the rating of the food is.

Anticipated results show that foods purchased while shopping for groceries online will produce a higher FAST score compared to shopping in person. FAST scores from the two shopping methods will be significantly different from each other, allowing the rejection of the null hypothesis.

The increase in FAST score when purchasing groceries online could be for a number of reasons. Some reasons participants noted in the exit survey as to why they felt their purchases were healthier when shopping online were less impulse purchases of unhealthy foods, less influence from in-store marketing, and increased awareness of spending amount prior to purchase. Responses to the exit survey also noted that convenience and time saving were the top reasons for choosing online grocery shopping over in-person. On the other hand, those that preferred in person shopping over online, noted they preferred to pick out their own produce and

visually compare products. When asked if changing the method of their grocery shopping caused them to buy different items, majority of participants said yes. Common responses as to why this was, were finding new products when searching online and the different marketing tactics used online versus in-person. When asked which shopping method participants will use most often going forward, majority responded with a mix of both in person and online shopping.

Comparison to Other Studies

The anticipated results of the proposed study are somewhat consistent with previous research in different areas of online grocery shopping. Due to limited research in the area there are few studies that directly compare to the proposed study. The following studies will compare healthfulness of in-person purchases to online purchases and reasonings as to why the anticipated results are likely to occur.

For example, participants in both Gorin et al. (2007) and Jilcott Pitts et al. (2018) noted that online grocery shopping did help decrease impulse purchases and led to healthier choices when compared to their usual in-store shopping experience. Unfortunately, the direct purchase of fruits and vegetables was not recorded in either study to determine if concern with quality and freshness kept consumers from purchasing these foods. However, Gorin et al. (2007) specifically found a reduction in the total number of food categories within the home, as well as a decrease in the number of high-fat foods with online shopping. Findings are also in line with Zatz et al. (2021) who found that when comparing online shopping purchases to instore purchases, online shopping was associated with lower spending on unhealthy foods. In this study, foods were divided into 10 categories by researchers and transactions were linked to participants using loyalty cards. Within those categories researchers will be able to see increased spending on fruits, vegetables, beans, nuts and main proteins from online orders compared to in person shopping

(Zatz et al., 2021). On the other hand, in person shopping resulted in increased spending on desserts, candy, snacks and prepared foods when compared to online purchases in those categories (Zatz et al., 2021). The researchers did not examine why this was, but hypothesized that it may be due to online shoppers having reduced exposure to the physical product and in-store marketing, which aligns with the anticipated responses to the exit survey (Zatz et al., 2021).

What foods are ultimately purchased during a shopping visit may also have to do with the amount of planning that comes prior to it. While the proposed study does not limit when or how often participants can purchase groceries, research by Hollis-Hansen et al. (2019) and Milkman (2020) provide some insight and reasoning as to why the healthfulness of grocery purchases may differ. Both studies investigated how thinking into the future/purchasing groceries in advance impacted what food was purchased. Hollis-Hansen et al. (2019) saw study participants purchased fewer overall calories per person in the household when thinking into the future about how their choices would affect them. Milkman (2020) had similar results when participants ordered groceries multiple days in advance. In their study, participants purchased more items that they needed and less items that they wanted when groceries were ordered multiple days out. However, it is not anticipated that participants will purchase multiple days in advance when ordering groceries online in the proposed study. The proposed study is also unable to gauge if and how participants plan for their grocery shopping trip or order. These studies provide possible reasons for differences in healthfulness of grocery purchases, but cannot be directly applied to the proposed study as this is ultimately a confounding variable within its design.

Strengths and Limitations

There are a number of strengths to this study, with the first being the crossover design. Each participant will serve as their own control, and therefore their grocery purchases can be

directly compared from each method. Participants will also be shopping in their usual grocery store throughout the experiment since recruitment will occur among current customers. The study design also allows less participants to be required since each will participate in both treatments. Along with this, a washout period will occur between periods to avoid any carryover from one period to the next.

There are also limitations to the study. Although participants are told not to purchase groceries from outside sources during the study, this cannot be completely controlled for and could impact the results. Along with this, the study is unable to determine if the food that is purchased is consumed, and therefore cannot directly assume the health of the participant based on their grocery purchases. Additionally, the study will be conducted at one Midwest grocery store chain, so results will not be generalizable to other supermarkets and geographical locations due to variance in product availability, sales/promotions and different online ordering systems. The last limitation is the small study size and convenience population, which will also limit the ability for results to be applied to other populations.

Confounding variables within the study must also be addressed as they can impact results in a number of ways. Confounding variables include income/socioeconomic status of participants, education level of participants, weather/season, and time to shop. Participants' income may determine what and how much they buy based on current sales, SNAP approved foods, and their overall budget. Education level can create a barrier to how much participants know about healthy versus unhealthy foods, and therefore also influence their purchases. The weather/season will impact what produce is available to purchase. Lastly, the amount of time participants have to grocery shopping or create their grocery order will impact how thought out and planned their purchases are. All of these factors ultimately can play a big role in the results

of the study, but cannot be avoided. In order to determine if these variables play a role, similar research studies need to be done during different seasons, at different supermarkets, and segregating results based on participants income/socioeconomic status and education.

Future Research

The exponential increase in online grocery shopping in recent years has led to a gap in the literature. The change in shopping method may be affecting the food consumers purchase, and therefore what they are eating, which ultimately can impact their health. First, research must be conducted to understand the retail food environment and consumer behavior. This area includes understanding the influence of marketing tactics and consumer shopping behavior. Once it is established how shoppers can be influenced and what drives their behavior, there are multiple directions in which research could go. One focus could be testing the effectiveness of implementation of different strategies, interventions and policies to support healthier grocery purchases and addressing social determinants of health. In the area of online shopping specifically, research is needed to understand what features and tools can be added to online ordering apps and websites to assist or influence customers to purchase healthier options. There is also a need for future studies to focus on the aspects needed to apply findings to larger populations and geographical areas by improving study designs to include different ethnicities, genders, ages, a variety of supermarkets and longer study duration with follow up.

Conclusion

As the food market continues to change and the health of our country continues to decline, an advancement in strategies to improve the health of Americans is greatly needed. In our busy world today, the need for convenience seems to be an overarching factor in what people purchase and eat. Knowing that online grocery shopping provides this convenience and plays a

role in consumer health it is a perfect opportunity to find interventions to show that healthy can also be convenient. The proposed study will help to provide a foundation of information on online grocery shopping to expand from into more specific topics within the realm of retail dietetics and online grocery shopping. It is the hope that future research will ultimately produce the necessary tools and interventions to help consumers make healthier food purchases in an effort to improve the health of the nation.

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Appendix A
Screening Form

Participate in our grocery shopping study and earn a **\$50 Hy-Vee gift card and 5% off groceries!**

Who:

- Adults aged 18-65 years
- Main shopper of household
- Do not live in ISU campus dorms

What:

- 10 week study using in-person and online shopping methods
- Shop for groceries whenever you'd like and scan your loyalty card to earn discount

When:

-June 6, 2022-August 15, 2022

Where:

Lincoln Center Hy-Vee

For more information or to sign up contact Payton Leonard at
leonardp@mtmary.edu

Appendix B
Consent Form



Research Participant Information and Consent Form
Mount Mary University

Title of Study: A Crossover Trial to Determine the Healthfulness of Grocery Purchases when Shopping Online versus In-Person

Invitation to Participate and Purpose of the Research: You are invited to participate in a research study that seeks to assess differences between in-person and online grocery shopping on the healthfulness of purchases. The goal of this research is to determine if the method of grocery shopping impacts what customers buy. Participants will be asked to shop for groceries using both methods at the Lincoln Center

Hy-Vee. They will be split into two groups, one starting with online shopping and the other, in person shopping for 4 weeks. Participants will then switch to the opposite method for the final 4 weeks after a 2 taking 2 weeks off. The study will last a total of 10 weeks. They will also be asked to complete a sociodemographic and health survey at the start of the study and a short questionnaire about their experience at the end of the study. Participants may choose not an answer any question they do not feel comfortable with. Data will be de-identified and analyzed by researchers. Participants must be 18 years of age or older.

Benefits and Risks: This research is designed to benefit the dietetics profession, by providing data on how new ways of shopping for groceries could be impacting people's health. Ultimately this information could be used in part to create tools within grocery shopping that aid customers in making healthier food purchases. Although participants may not benefit personally from being in this research study, findings generated by this research may add new knowledge to the retail dietetics field in general. There will be no monetary compensation, but participants will receive a discount on groceries throughout the study period. There are no known potential risks associated with participating in this study. Please address any questions or issues of concern to the researchers using the contact information provided below.

Confidentiality: All information obtained will be kept confidential by the researchers who will be the only people with access to the data. Information obtained will be stored electronically and will be password protected. Per the U.S. Office of Human Research Protections (code §46.115), all data will be destroyed 3 years after the end of data collection. Paper files will be shredded, and electronic files will be deleted. Individual participants will not be identified in any report or publication about this study.

Contact Information: If you have questions about this research study, your rights as a research subject, or would like to know the outcome of the research, please contact Dana Scheunemann, 414-930-3658, scheuned@mtmary.edu and Payton Leonard, 319-540-5421, leonardp@mtmary.edu If you have any questions regarding your rights or privacy as a participant in this study, please contact Dr. Tammy Scheidegger, Mount Mary University Institutional Review Board Chair, 2900 North Menomonee River Parkway, Milwaukee, Wisconsin, 53222-4597, telephone (414) 930-3434 or email scheidet@mtmary.edu.

Consent: By signing below, you are indicating that you have read this consent form, have been given the opportunity to ask questions, and have agreed to voluntarily participate. You may withdraw from participation at any time, or refuse to answer any question herein, without penalty or loss of benefits to which other participants are entitled.

You may request a copy of this page for your records. Thank you for your participation.

Signature of participant _____ Date _____

Appendix C
Exit Survey

Q1 What method of grocery shopping did you prefer and why?

In-person _____

Online/grocery pickup _____

Other _____

Q2 Do you feel changing the method of your usual grocery shopping influenced you to purchase different/new items? If yes, what types of items and why?

- Yes _____
 - Maybe
 - No
-

Q3 Do you feel the health of your grocery purchases were better using one method over the other? If yes, which one and why?

- Yes _____
 - Maybe
 - No
-

Q4 Did you obtain groceries from other sources (farmers market, garden, supermarket, etc.) during either period?

- Yes
 - No
-

Q5 Following the study, what method will you use most frequently to purchase groceries?

- In-person
- Online/grocery pickup
- Mix of both

Appendix D
FAST Calculator

Appendix E

Sociodemographic and Health Survey

Q1 What is your age?

- 18-25
 - 26-40
 - 40-65
 - Prefer not to answer
-

Q2 What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

Q3 Please specify your ethnicity

- Caucasian
 - African American
 - Latino or Hispanic
 - Asian
 - Native American
 - Native Hawaiian or Pacific Islander
 - Other/Unknown
 - Prefer not to answer
-

Q4 What is the highest level of education you have completed?

- Some high school
 - High school
 - Bachelor's Degree
 - Master's Degree
 - Ph.D. or higher
 - Prefer not to answer
-

Q5 What is your household income?

- Less than \$25,000
 - \$25,000-\$50,000
 - \$50,000-\$100,000
 - \$100,000-\$200,000
 - Over \$200,000
 - Prefer not to answer
-

Q6 What is your marital status?

- Single
 - Married
 - Prefer not to answer
-

Q7 How many children do you have?

- None
 - 1-3
 - 4+
 - Prefer not to answer
-

Q8 What would you rate your general health status?

- Poor
- Fair
- Good
- Very Good
- Excellent

Appendix F
IRB Application

Office use only: IRB Approval #: _____

**Mount Mary University
Institutional Review Board (IRB)
for the Protection of Human Subjects**

Application for IRB Review

**DATA COLLECTION CANNOT BEGIN
UNTIL THE IRB HAS APPROVED THIS PROJECT**

I. Required Documentation - No action will be taken without these attachments.

Are the following attached to the IRB application?

- | | | |
|---|---|---|
| Informed Consent Document | <input checked="" type="checkbox"/> Yes | Informed Consent Documents should include an explanation of procedures, risk, safeguards, freedom to withdraw, confidentiality, offer to answer inquiries, third party referral for concerns, signature and date. See Appendix B and use the MMU Informed Consent Template to avoid delays in the process. |
| Questionnaire/Survey Instrument(s) | <input checked="" type="checkbox"/> Yes | If a survey is being administered in any written format (e.g., survey monkey, qualtrics), a copy of that survey must accompany this application. If a survey is being conducted verbally, a copy of the introductory comments and survey questions being asked must be attached to this application. If survey includes focus group questions, a complete list of the question must be attached. For research using a published/purchased instrument, a photocopy of the instrument will suffice. |
| Verification of Human Subjects Training | <input type="checkbox"/> Yes | Copy of transcript, certificate or other evidence that ALL members of the research team have completed the required training. |

Copy of cooperating institution's IRB approval. N/A Not required if there is no cooperating institution.

II. Investigator(s):

Name: Payton Leonard Phone: 319-540-5421
 Affiliation with Mount Mary University (e.g. faculty, student, etc.): Student
 Email: leonardp@mtmary.edu

Signature: Payton Leonard

Date: 9/5/2021

If student, list Research Advisor and complete the application. Research Advisor must provide requested information and verify.

Research Advisor's Name: Dr. Dana Scheunemann
 Email: scheuned@mtmary.edu

Department:

Phone:

Research Advisor: Have you completed Human Subject's Training? Yes No

Research advisor's signature indicates responsibility for student compliance with all IRB requirements.

Signature:

Date:

 Research Advisor

III. Project Description – Required by all applicants

Instructions: Briefly describe the proposed project including the sample and methodology (e.g. human subjects, data collection, data analysis and instruments).

1) Objectives (purpose of project):

The purpose of the project is to determine if grocery shopping in person versus online affects the healthfulness of food that is purchased.

2) Relevance to practice/body of knowledge:

Online grocery shopping has grown exponentially in recent years and fewer people are stepping foot in-store. Instead many are picking out their groceries from the convenience of their phone or computer. To determine practical nutritional interventions in the grocery store setting, research must first be conducted on the habits of shoppers and how grocery shopping online has impacted the purchases they make compared to shopping in-store. Nutritional grocery store interventions have been researched in the past, but with the spike in online grocery shopping more research is needed to provide insight into the healthfulness of consumer purchases. This project will help to

provide a foundation of information to develop grocery store based nutritional interventions from. There is currently little research in the area and more is granted to determine how online shopping may impact the food consumer's purchase, which ultimately impacts their health.

3) Describe the research design (e.g. subject/participant selection and assignment, design, intervention, data analysis):

The study will be a 10-week randomized crossover trial with recruitment from the Lincoln Center Hy-Vee in Ames, IA. The study will consist of two, 4-week study periods, with a 2 week washout in between the two shopping methods. Participants will be required to get 100% of their groceries from the Lincoln Center Hy-Vee using their designated shopping method.

Randomization of participants will reduce bias among the two groups. A sample size of 382 participants will be obtained to maintain a margin of error of 5 and a 95% confidence interval (Raosoft, 2004). The sample will consist of adults age 18-65 years who do not live in college dorms and are the main shopper of their household. Participants must agree to shop at the Lincoln Center Hy-Vee for all groceries and have the ability to use the Hy-Vee Aisles Online ordering platform through the web or a mobile device in order to be participate in the study.

Participants will be randomly assigned two groups; one will start shopping in-person and the other, online with a switch to the opposite method for period 2 of the study. The two groups will be compared to determine if a significant difference exists between them using a sociodemographic health survey that will be completed prior to the first study period. A t-test will be used to compare the results and determine if any significant differences exist. IBM SPSS statistics software will be used to analyze data. The mean and standard deviation will be presented in a table. a paired t-test to compare the FAST score of grocery purchases from the same individual during each method of grocery shopping.

4) What measurement/data collection tools are being used?

Food Assortment Screening Tool (FAST) will be used to calculate the healthfulness of grocery purchases. FAST is a valid tool as it includes a large number of categories and those categories align with other nutritional standards. FAST also correlates with HEI-2010 (healthy eating index), but is not validated in the current population of this study (Caspi et al., 2018). Qualtrics will also be used to conduct a survey.

IV. Additional Project Information – Required by all applicants

1) What human subjects training has the researcher completed (e.g. course work, online certification)?

2) What process is used for obtaining informed consent (attach the informed consent application)? See Appendix for consent application.

3) Does the research include special populations?

Minors under 18 years of age?

Yes No

- | | | |
|--|------------------------------|--|
| Persons legally incompetent? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Prisoners? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Pregnant women, if affected by research? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Persons institutionalized? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Persons mentally incapacitated? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

4) If **YES**, describe additional precautions included in the research procedures.

5) Does the research involve any of the following procedures?

- | | | |
|---|------------------------------|--|
| False or misleading information to subjects? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Withholds information such that their informed consent might be questioned? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Uses procedures designed to modify the thinking, attitudes, feelings, or other aspects of the behavior of the subjects? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

6) If **YES**, describe the rationale for using procedures, how the human subjects will be protected and what debriefing procedures are used.

7) Does the research involve measurement in any of the following areas?

- | | | |
|-------------------|------------------------------|--|
| Sexual behaviors? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Drug use? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Illegal conduct? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| Use of alcohol? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

8) If **YES**, describe additional precautions included in the research procedures.

9) Are any portions of the research being conducted online?

- | | | | |
|---|------------------------------|--|---|
| Survey posted on a website? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | If yes, assure anonymity |
| URL for survey includes information that could identify participants? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | If yes, assure anonymity |
| Invitation to participate sent by email? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | If yes, assure anonymity |
| Items use drop-down box? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | If yes, assure that items allow choice of "no response" |

10) If **YES**, describe additional procedures.

11) Describe the methods used to ensure confidentiality of data obtained.

Each participant and their orders will be compartmentalized using their loyalty card number. This is the number that will also be used as the “name” for the participants to protect privacy. This electronic data, along with others, such as Excel spreadsheets containing qualitative data, will be saved, and stored on a flash drive that will be kept in a locked filing cabinet in an office at the Lincoln Center Hy-Vee, along with the informed consent forms. Any laptop or computer utilized for study purposes will be password protected and will be programmed to time out after 10 minutes of inactivity. Online grocery orders will be stored in Retail Product Management (RPM), an application Hy-Vee uses to view, shop and tender orders. This application requires a login that only certain employees have access to, and each employee’s login is different.

Risks and Benefits

1) Describe risks to the subjects and the precautions that will be taken to minimize them. (Risk includes any potential or actual physical risk of discomfort, harassment, invasion of privacy, risk of physical activity, risk to dignity and self-respect, and psychological, emotional or behavioral risk.)

Study subjects will not be put at any risk of harm throughout the duration of the study.

2) Describe the benefits to subjects and/or society. (These will be balanced against risk.)

The proposed study will help to determine if grocery shopping online has an impact on the healthfulness of food purchased when compared to shopping in-person. This information can benefit society providing a foundation of information to create incentives and tools from to make healthy eating easier in an effort to improve the health of the nation. The study subjects may benefit from trying a new form of grocery shopping that will save them time and provide convenience. Participants will also benefit from a 5% discount on their groceries during the study period.

V. Is the proposed project “research” as defined by Institutional Review Board requirements? - Required by all applicants

- Research is defined as a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.
- A human subject is defined as a living individual about whom an investigator obtains either 1) data through intervention or interaction with the individual; or 2) identifiable private information.

Does the research involve human subjects or official records about human subjects?

- Yes
 No

If NO STOP here, and SUBMIT application.

If the results will be available in the library, presented at a professional conference (includes any presentation to group(s) outside of the classroom), or published, please check the Yes box:

- Yes
 No

If the YES box is CHECKED, proceed to SECTION VI.

If the NO box is CHECKED, STOP here, and SUBMIT application.