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Cost of Eating Well

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Introduction:

There seems to be a general idea in our country that fiber intake is only associated with good poops, however, that's not the reality recent research has uncovered. Adequate intake of dietary fiber is associated with digestive health and reduced risk for heart disease, stroke, hypertension, certain gastrointestinal disorders, obesity, type 2 diabetes, and certain cancers.[1] Most of the United States population believes they consume enough fiber, however, national consumption surveys have shown only about 5% of the population actually meets the recommendations of adequate fiber intake.[2] There are a number of reasons for this, including the misunderstandings of fiber's importance I alluded to above, but another reason a la social determinants of health is having a barrier to accessing quality, fiber-rich foods.

When looking at the community level – specifically within Vermont – a 2019 survey of Chittenden County found that 35.8% of the population had low access to healthy food.[3] Further breakdown of the data demonstrated only 38.9% of adults reported having consumed fruits at the recommended level of 2 or more times per day; and only 30.3% of adults reported having consumed vegetables at the recommended level of 3 or more times per day.

For many, this barrier to access is a financial one, and for others the barrier is geographical, given the paucity of true urban centers in the state. Consequently, this has proven a major financial burden for the state: in Vermont, data from 2010 estimated 23.2% of adults were obese.[4] Kim et al estimated the annual medical spending attributable to an individual with obesity was $1901[5] – this places the estimated cost of obesity in Vermont in 2010 to be *$275 million*. Additionally, approximately 46,377 people in Vermont, or 8.8% of the adult population, have diagnosed diabetes[6] – this costs an estimated *$520* million in Vermont each year. Increasing the intake of fiber-rich products, such as fruits, vegetables, nuts, and seeds, has proven beneficial in improving the outcomes of these two morbidities.[6,7]

In an attempt to address the financial barrier and encourage increased fiber intake through a whole-food, plant-based diet, this research sought to provide patients with insight into the actual costs of relevant foods supplied within their community, doing so through recipes and meal plans that take a restricted budget into consideration.

Methods:

Patients were surveyed at the South Burlington Family Practice to determine the most common places in the community they obtain food. This was done with an open ended question: "Where do you typically go grocery shopping?" Nominal responses were recorded and compiled.

Leanne Brown's frugally-minded cookbook, *Good and Cheap*, was downloaded via her freely sourced PDF to utilize the recipes she compiled in 2014 based on ingredient prices in New York. Recipes were selected from the book based on which ones contained a higher proportion of whole-food, plant-based ingredients, omitting the

recipes with higher amounts of simple carbohydrates (e.g. peanut butter and jelly granola bars).

Local grocers' website search functions were used to find the most cost-effective version of a given ingredient. This data was compiled in Excel, using the cost average of a given ingredient between grocers to build the total cost of the recipe (Table 1). The locally relevant costs were then used to supplant the original prices listed in *Good and Cheap* (Figure 1). Ingredients on sale were entered as their original price. Further edits to the cookbook were made to elaborate which ingredients were used when factoring the costs (Figure 2).

A meal plan was created for a single person to provide day-to-day variety, while also splitting multiple-serving meals across multiple days to conserve weekly costs (Table 2).

Results:

Through surveys, it was discovered the primary grocers visited by patients at South Burlington Family Practice were Hannaford, Market 32, and Trader Joe's. Early on, it was recognized that Trader Joe's didn't have many of the key ingredients needed for many recipes, so only Hannaford and Market 32 were factored into average ingredient costs.

As of now, no patients have completed the surveys, so there is no data to analyze or report.

Discussion, Limitations, and Future Plans:

Given the lack of survey data to analyze, this section will be dedicated to limitations and future plans for the project moving forward. The biggest limitation was the process of data acquisition for ingredient costs. This was due to differences in how the ingredients were reported on different grocer websites, including differences in weights requiring manual conversion to a unified unit of measure (ounces). This research will be further limited by the same reason it was created: inflation. While the edited cookbook will be relevant for local prices *now*, another 10 years will surely change the utility of this tool like it did for Leanne Brown's *Good and Cheap*. Perhaps it can still be used as a general guideline tool for ingredient purchasing, but it would lack the motivating factor to use it when one compares the differences in cookbook price versus real price of the time.

Looking forward, perhaps another tool could be created which could track ingredient prices of local grocers to build recipe costs in real time, factoring in ingredient sales which this project excluded. The issue with automating this lies in the coded nature of most grocer websites: permission is needed for coding scripts to run through a website, or else they'd be blocked as a means to maintain server integrity.

More firm future plans as of now include: meal plan evaluation by a Registered Dietician for their approval; edited cookbook and meal plan distribution to patients for survey analysis; based on results, the project could be expanded to include more recipes, a more extensive meal plan with a monthly shopping list optimizing recipes with shared ingredients, and further education on the nutritional breakdown of each meal. Also under consideration is using this project as a launching point for advocacy on the governmental level.

Table 1. Cost breakdown of each ingredient for a given recipe

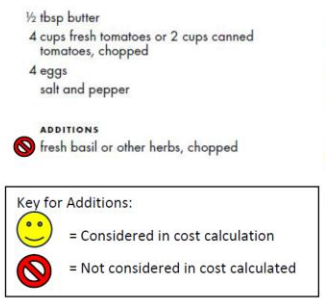
	Ingredients	Product Cost	oz/product	price/oz	Serving Needed (oz)	Serving Cost	Average serving cost	Meal	Total Meal Cost
215	Beets (canned)	1.39	15	0.09266667	15	1.39	1.49	Beet and Chickpea Salad	4.17
216		1.59	15	0.106	15	1.59			
217	Chickpeas	1.29	15.5	0.08322581	16	1.331612903	1.383225806		
218		1.39	15.5	0.08967742	16	1.43483871			
219	Peanuts	1.79	16	0.111875	1.5	0.1678125	0.2240625		
220		2.99	16	0.186875	1.5	0.2803125			
221	Lime	0.79	1	0.79	0.5	0.395	0.42		
222		0.89	1	0.89	0.5	0.445			
223	Chili Sauce	2.25	12	0.1875	0.167	0.0313125	0.044115833		
224		4.09	12	0.34083333	0.167	0.056919167			
225	Salt and Pepper	1.75	4.75	0.36842105	0.0208	0.007663158	0.007762779		
226		1.89	5	0.378	0.0208	0.0078624			
227	Olive Oil	6.89	17	0.40529412	1	0.405294118	0.602058824		
228		6.79	8.5	0.79882353	1	0.798823529			

(Purple) Spices, labeled due to generally prohibitive upfront cost. (Blue) Hannaford cost. (Green) Market 32 cost. (Yellow) Recipe from Good and Cheap*.*

Figure 1. Sample recipe in edited cookbook

The box in the lower right corner lists recipe total and cost per serving. This is where the original prices (from New York 2014) were previously listed.

Figure 2. Notes in edited cookbook



The author originally provided recipe additions, but didn't factor these into her cost analysis. I used some additions in certain recipes if they increased fiber intake, notating as above.

Table 2. Sample meal plan

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast	Oatmeal and Berries ($1.28)	Omelette ($3.47)	Broiled Grapefruit ($1.27)	Oatmeal and Berries ($1.28)	Yogurt Smash ($4.51 – varies on fruit)	Egg sandwich mushroom hash + tomatoes ($3.24)	Tomato Scrambled Eggs ($4.42)
Lunch	Veggie Dumplings x8 ($1.60)	Potato Salad ($1.29)	Veggie Dumpling X8 ($1.60)	Potato Salad ($1.29)	Veggie Dumpling x8 ($1.60)	Corn Soup ($1.96) Rainbow Rice – Orange ($1.42)	Potato Salad ($1.29)
Dinner	Taco Salad ($5.51)	Corn Soup ($1.96) Rainbow Rice – Orange ($1.42)	Taco Salad ($5.51)	Spicy Broiled Tilapia w/ Lime ($3.20)	Potato Salad ($1.29) Half Veggie Burger ($1.59)	Vegetable Jambalaya ($2.27)	Tofu Hot Pot ($2.54) Dumplings (Varies)
Snacks (Optional)	Clementines Sunflower seeds Almonds	Apples Pumpkin seeds Walnuts	Bananas Almonds Carrots	Sunflower seeds Clementines Walnuts	Almonds Carrots Pumpkin seeds	Clementines Celery Almonds	Apples Sunflower seeds Walnuts
Total (without snacks)	$8.39	$8.14	$8.38	$5.77	$8.99	$8.89	$8.25

Snacks were listed as optional and were not included in cost analysis, but ideas were provided in case the current plan isn't satiating enough.

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