Assignment 1: Linear Programming Example - The Diet Problem Revisited

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Introduction

The analysis being performed in this study is a revisit of the diet problem. The diet problem has been studied many times and used as a great linear programming exercise. The concept of this study will be to understand the individual's current nutritional metrics, the constraints required to meet standard nutritional weekly requirements, and the optimal diet based on current food intake. I'll be diving into the results of these constraints and decision variables, as well as several alternatives after the initial results are provided.

I. Description of Methods

The methods used in this study follow the standard linear programming method of solving a problem. The constraints in this method are the weekly nutritional requirements outlined by the FDA. The decision variables that will be under consideration are the five food items listed by me found around my home. I eat these five food items consistently, making them core sources of nutrition in my weekly diet. My optimal output will be focused on the minimal amount spent per week on these five food items to meet the minimum and maximum nutritional constraints.

II. Results

The results of the initial attempt were only focused on finding the minimal amount spent per week on these five food items while meeting the nutritional requirements set by the FDA and provided in the problem's description. Out of my five food items, only the Oikos Triple Zero Nonfat Greek Yogurt had Vitamin D. Being one of the key nutrients listed, this skewed my optimal daily servings towards this food item to require ten total servings per day. Another interesting optimization with my first attempt was the fact that my program determined that I should eat a little over ten total servings (10.29) of whole-grain pasta per day. This is due to the low cost per serving that the pasta provided ($0.25 per serving) which would help offset the higher cost of the Oikos Nonfat Greek Yogurt ($1.49 per serving). This imbalance in specific nutrients, coupled with low costs for specific nutrient-rich foods led to a weekly grocery cost of $122.31.

During my second attempt, I followed the instructions and added a constraint that required the daily serving for each food item to be greater than or equal to one serving. This altered my daily food items intake but did not balance my food items' daily servings very much. Now, foods that have zero daily servings like white rice, ground turkey, and traditional pasta sauce have one serving per day each. The Oikos Triple Zero Nonfat Greek Yogurt went unchanged, largely due to being the sole Vitamin D source, and the whole grain pasta dropped to 7.92 servings per day. Despite this providing more variety in my daily meals, it negatively impacted my minimum weekly cost. With the additional constraint, my costs increased to $136.15 which is almost fourteen dollars more than the initial optimization.

Conclusion

The linear programming problem was solved and I was able to generate two variations in my minimal weekly cost while meeting FDA nutritional requirements. However, the cost per week for these five food items would be expensive to consistently pay, and the lack of variety in daily servings per food item would become tiresome. Additionally, the lack of variety means that I would have to eat a large quantity of one food per day. I would become concerned with the body’s ability to eat this large amount of food each day. The calorie count surpasses the 2,000-calorie minimum each day, meaning my exercise levels would have to drastically increase to maintain my current weight and body composition. Overall, I would not personally follow any of the solutions to the linear programming problems I solved, and I would like to add more complexities to the food items, such as fruits and vegetables that do not come pre-packaged like the outline of the assignment required.