

NourishU: Universal Meals for College Students

April 3, 2023

“It is an eternal obligation toward the human being not to let him suffer from hunger when one has a chance of coming to his assistance.”

~ Simone Weil

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Problem Research

When you consider food insecurity, who comes to mind? Is it possible that you envision a man without a home residing under a bridge, a mother working single-handedly to provide for her children, or a household residing in a low-income area? These individuals all confront significant challenges. Yet, there is a demographic with elevated rates of food insecurity that may not have entered your mind: college students.

Within the previous 30 days, “48% of college students surveyed reported experiencing food insecurity,” and a significant percentage of food-insecure college students report that hunger has had a detrimental effect on their academic performance, with some even dropping out. One explanation is that many college students struggle financially due to college’s high tuition fees, leaving them with less money for food (San Diego Food Bank, 2023).

While food banks are attempting to solve this issue, they are limited in the amount of people they can reach because they depend on donations and volunteers. These organizations are helpful; however, a more effective approach to aid students would be to establish a nationwide program that benefits from government funding. For the purposes of this paper, our model will be applied to San Diego, but it can be implemented as a national model.

Undoubtedly, college is a defining chapter where students are expected to learn, grow, and equip themselves for the future. It would be a mistake to neglect the needs of low-income students breaking family cycles by attending college while struggling to make ends meet.

Existing Programs

Before proposing a new program, it’s imperative to understand the existing resources available so that we can improve upon them.

National School Lunch Program

Although the National School Lunch Program (NSLP) does not offer food assistance to college students, it is worth noting its success in providing meals to K-12 students. According to the United States Department of Agriculture (USDA), the group that directs the NSLP, the program began in 1946 when President Harry Truman signed the National School Lunch Act. Its aim is to provide children with healthy, free or reduced meals at school (USDA, 2017). The program reaches roughly 30 million children daily (USDA, 2022).

SNAP/CalFresh

The Supplemental Nutrition Assistance Program (SNAP), known as CalFresh in California, is also run by the USDA whose goal is to provide monetary assistance for food to those who need it (California Department of Social Services, n.d.). Eligibility is determined based on the income and number of people per household. This program aims to combat food insecurity for all people rather than only focusing on students (USDA, n.d.-b).

San Diego Food Bank

The San Diego Food Bank (SDFB) aims to alleviate food insecurity within San Diego, helping around 400,000 people per month (SDFB, 2022). There are a variety of programs within SDFB including one which specifically aims to provide food assistance to colleges within San Diego County so that students can access free food on campus (SDFB, 2023).

Feeding San Diego

Feeding San Diego provides programs to support a variety of groups, including students, seniors, and veterans among others (Feeding San Diego, 2022). Through its programs, it attempts to solve another issue: food waste. Feeding San Diego sources 70% of its food by “rescuing” food from places like grocery stores, where excess food might otherwise go to waste (Feeding San Diego, 2022a). As a result, it solves two problems with one solution. This strategy sets them apart from similar programs.

Problem Analysis

Our team was asked to use mathematical modeling to design a program addressing food insecurity among students in low-income communities. After reviewing existing literature, we chose to focus this paper on college students experiencing food insecurity. Burrows et al. (2017), who wrote a literature review of multiple studies linking food consumption and academic performance (GPA) for university students, found that the majority of studies reported statistically significant (p -value < 0.05) positive associations between diet and academic achievement. Five out of seven studies revealed that individuals who had a daily breakfast exhibited greater academic success. Based on this data, our team formulated approaches to increase the consistency of food intake, thereby promoting better health and academic performance among college students. Subsequently, we were tasked with designing a program proposal for our city council, assessing the feasibility, efficacy, accessibility, and scalability of our plan. We measure these through data from similar programs, greater economic impact, and qualitative logic.

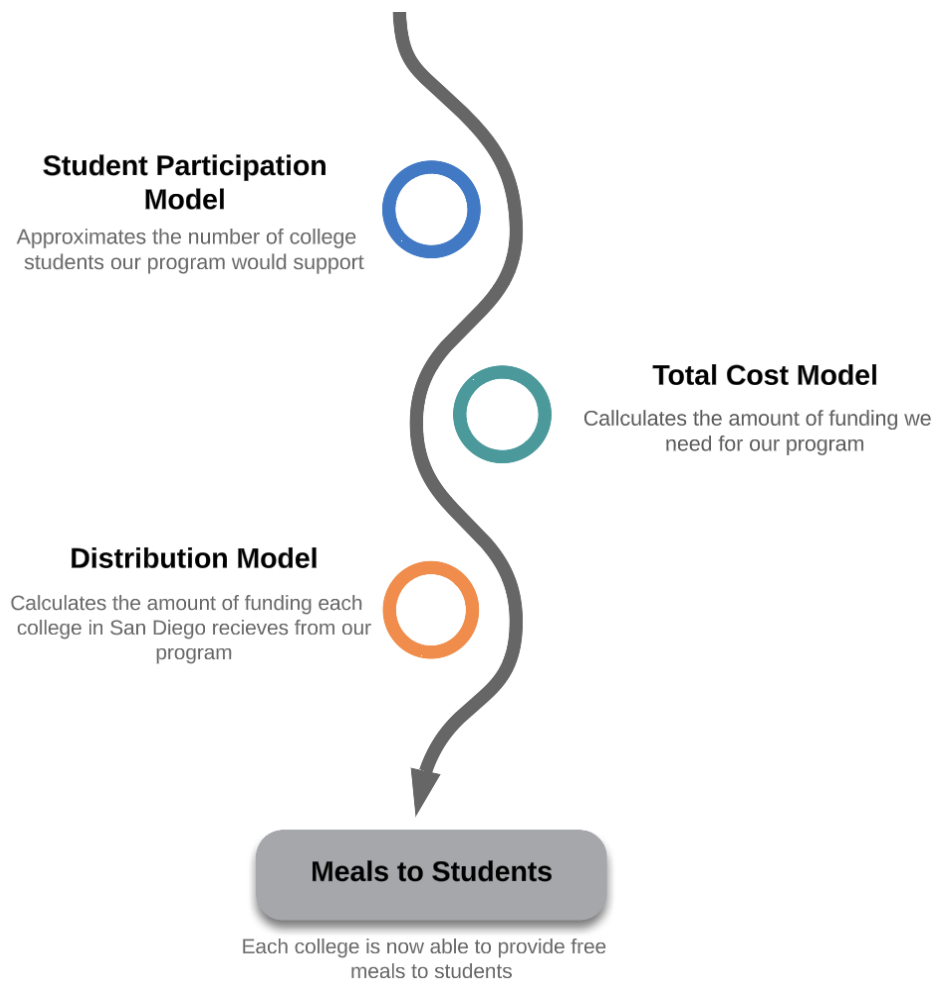
Our Proposal

Our proposal is to create a countywide program, Nourish Universal (NourishU), operated by San Diego that will provide free breakfast and lunch meals during all in-session school days to college students in need. Our team compiled a comprehensive list of eighteen colleges (public, private, and community institutions) in San Diego County that our program intends to serve using data from the U.S. News & World Report and sandiego.org. In contrast to other programs, we serve full-time and part-time students, especially because the latter are often struggling financially. The program's operational framework consists of three models: assessing the number of students involved, determining the overall program expenses, and allocating funds to each college. Our first model estimates how high participation would be for such a program. This result is fed into our total cost model to project the required funds for a specific number of

distributed meals. Next, the budget is distributed among the eighteen colleges and universities our program serves based on the number of students and tuition cost. After funding is distributed to each college, eligible students can register to receive their meals, thus improving their food security.

The advantage of a government-funded project as opposed to a private organization is that many private organizations depend at least partly on donations. As a result, a government-funded program would be more reliable.

Mathematical Modeling Pipeline



Global Assumptions

1. Our models assume that the cost of each meal remains constant throughout the year and is not subject to any variations based on seasonal factors.
2. Our program is intended to serve as a replacement for existing programs, such as CalFresh’s programs targeted at assisting college students, that are currently offered on

college campuses across San Diego. By combining all food assistance programs on college campuses into one, we ensure that eligibility criteria and accessibility to the program remains constant across all campuses. This also causes food assistance programs to become more unified so students will not have to deal with applying to various programs since it may be a barrier if they do not know which program is right for them. Replacing all current programs with NourishU resolves that issue.

3. The yearly budget estimation for NourishU assumes that all colleges and universities in San Diego are in-session for 180 days per year. In reality, each college has its own schedule for in-session classes. Some institutions use a quarter system, semester system, or operate in a series of short bootcamps. Additionally, some colleges offer summer and winter sessions while others do not. All of these factors result in varying in-session schedules for each institution.
4. Our Distribution Model takes into account tuition but not scholarships and other financial aid programs that may change the percentage of food insecure students.

Colleges Data

College	Zip Code	Undergraduate Total Enrollment	Type	In State Tuition
California State University - San Marcos	92096	13,865	Public	\$8,454
San Diego Christian College	92071	464	Private	\$34,310
National University	92037	7,648	Private	\$13,320
Point Loma Nazarene University	92106	3,174	Private	\$41,100
San Diego State University	92182	30,865	Public	\$8,198
University of California San Diego	92093	33,343	Public	\$15,348
University of Phoenix (San Diego)	92123	5,842	Private	\$11,482
University of San Diego	92110	5,702	Private	\$54,554
Alliant International University	92131	178	Private	\$17,130
Azusa Pacific University	91702	3,940	Private	\$41,510
John Paul the Great Catholic University	92025	292	Private	\$28,000
Grossmont College	92020	17,835	Community	\$1,386
MiraCosta College	92056	13,720	Community	\$1,336
Palomar Community College	92069	23,917	Community	\$1,338
San Diego City College	92101	15,066	Community	\$1,144
San Diego Mesa College	92111	22,284	Community	\$1,144

San Diego Miramar College	92126	15,893	Community	\$1,144
Southwestern College	91910	18,569	Community	\$1,338
Total Students	232,597			

Figure 1: List of San Diego Colleges

Student Participation Model

Access to affordable and nutritious food is essential for the health and academic success of college students. Unfortunately, many students face significant barriers to obtaining regular meals, which can lead to negative consequences such as poor academic performance and compromised physical and mental health. In San Diego, the number of college students experiencing food insecurity is a growing concern, with many struggling to make ends meet while pursuing their education. In recent months, SNAP eligibility has tightened causing fewer college students to obtain free meals, thus increasing the number of food insecure college students (Lopez, 2023).

Due to the fluctuating number of food insecure college students, it is helpful to have a model that generalizes the number of students who will be eligible for a free meal program. Any changes in the number of college students needing food assistance, program eligibility, or program participation can be substituted into this model for accurate results.

$$T_s = n \times f \times e \times p$$

Equation 1

In *Equation 1*, T_s represents the total number of eligible food insecure college students who would participate as a product of n , the total number of college students in San Diego multiplied by f , the percentage of total college students in San Diego who are food insecure multiplied by e , the percentage of food insecure college students who are eligible for the program multiplied by p , the percentage of eligible college students who participate in the program.

Based on the estimate in *Figure 1*, there are 232,597 college students in San Diego. About 48% of college students experienced food insecurity in the past 30 days (Hope Center for College, Community, and Justice, 2021). However, this percentage may vary depending on the demographic and socioeconomic factors of the student population in San Diego. Another survey showed that 41% of college students in San Diego experienced food insecurity in 2019 (San Diego Hunger Coalition & Feeding San Diego, 2019). Due to economic recessions resulting from the COVID-19 pandemic in 2020, this survey’s data may not be an accurate representation of food insecurity among college students in 2023. Economic hardship and food insecurity rates are still not back to pre-covid levels (City News Source, 2022). In order to have an accurate f percentage, the mean of the data from the sources above will be used, which is 44.5%.

The eligibility percentage e will ideally be as close to 100% as possible. The eligibility criteria includes both traditional and nontraditional students, since nontraditional students are left out of many other food assistance programs for college students while they generally have more students who need food assistance compared to traditional students. (Feeding America, n.d.) Both full time and part time students will be eligible for this program. Students with financial and food insecurity are more likely to take fewer classes in order to work, leaving them ineligible for some food assistance programs (Enrich, 2019). The income bracket for eligibility is based on 80% of the Average Median Income in San Diego adjusted for family size in order to allow more students to have access to this program (SanDiegoCounty.gov, n.d.) regardless of whether they are a dependent or independent student. In addition to these eligibility criteria, all students formerly under foster care and undocumented students under DACA will be eligible for this meal assistance program. Although the eligibility criteria for the NourishU Program is very open ended, there will still be students it leaves out such as international students and students whose families do not meet the income requirement. Based on these limitations, we can estimate that NourishU will meet nearly 90% of the need for free meals characterized by f .

Another factor to consider is the estimated participation of students in the meal assistance program. Even though a certain number of students are eligible for the program, they may decide not to participate in the program for various reasons. They simply might not be informed about the program's existence or unsure of how to apply for the program. There are other factors such as stigma or lack of accessibility that keep students from participating in the program. One study found that only about 56% of eligible college students participate in SNAP (U.S. Government Accountability Office, 2019). However, another study found that in the 2019–20 academic year, 10.2% of California community college students, 11.8% of UC undergraduate students, and 4.0% of UC graduate students were enrolled in CalFresh (Coffey, 2022). About 50% of California Community College students experience food insecurity (California Community Colleges, n.d.), $0.102/0.5 = 0.204$ so 20.4% of eligible community college students participate in CalFresh. Approximately 44% of UC Undergraduates are food insecure, $0.118/0.44 = 0.268$ so 26.8% of eligible UC Undergraduates participate in CalFresh. Nearly 26% of UC Graduate students are food insecure (Petek, G., & Constantouros, J., 2019), $0.04/0.26 = 0.153$ so 15.3% of eligible UC Graduates receive meal assistance. Averaging these findings, about 29.6% of eligible students participate in meal assistance programs. This percentage can represent p , student participation in our model. However, to provide more accurate participation results, conducting a randomly assigned survey to a group of 1,000 or more eligible college students and asking whether or not they would participate in such a program would be ideal.

Based on these estimations, we can approximate the number of college students our program would help using *Equation 1*.

$$232,597 \times 0.445 \times 0.9 \times 0.296 = 27,573 \text{ students}$$

Total Cost Model

Estimating the number of food insecure college students is only the first step to determining the contribution needed by lawmakers in order to create a food assistance program. In order to calculate the cost of our program, we will compare it to the NSLP which is very similar to our proposed program.

Under the NSLP, states and school authorities are paid a set amount of money per meal that the school provides, regardless of whether the lunches were fully paid, reduced price, or free for students, although these categories have different reimbursement rates. By assuming that the cost of our NourishU Program would be similar to the cost of the NSLP, the reimbursement rates from NSLP can be used to estimate how much money would be needed to fund our NourishU Program given the number of students who will be offered free or reduced price meals. We can generalize how much the program would cost using the following formula:

$$C = P_P M_P + P_R M_R + P_F M_F$$

Equation 2

In the formula above, P_P , P_R , and P_F are variables indicating the reimbursement rates in the current year for paid, reduced, and free meals, respectively. For each meal provided in the respective category, the government will pay state and school authorities a standard rate. M_P , M_R , and M_F are variables indicating the number of paid, reduced, and free meals, respectively. Multiplying each amount with the reimbursement rate of the respective category determines the total cost needed for each category. Adding these three values together will yield C , which represents the total cost.

For the reimbursement rates, we will use the most recent data available for base rates during the 2022-2023 school year. The base rates were \$0.38 for paid lunches, \$3.54 for reduced lunches, and \$3.94 for free lunches. These rates are used in the 48 contiguous states and in the District of Columbia (USDA, 2022). During the 2022-2023 school year, states and school authorities are given an additional 40¢ per meal served (USDA, n.d.-a). However, this bonus was *only* provided for the 2022-2023 school year, and was thus *not* included in the base rates listed above.

We will also account for additional labor costs needed to prepare the meals. For our model, we will assume that each college and university will need one chef and three line cooks. According to data gathered in May 2021 by the Bureau of Labor Statistics, the mean salary of a chef in San Diego County is \$56,000. Line cooks, on the other hand, earn only \$26,000 on average (Intuit Mint, n.d.). In total, this will equal \$134,000 at a single school, and \$2,412,000 for all 18. This does not take into account benefits, payroll taxes, etc.

Inflation

Due to inflation, we cannot assume that the reimbursement rates remain the same year after year. Similar to how total cost may fluctuate due to an increase or decrease of the number of students in need of free or reduced meals, the cost will also vary due to inflation. The rates are changed every school year by the USDA. Fortunately, past rates are also available on USDA’s website, so this data can be used to determine how these rates have changed.

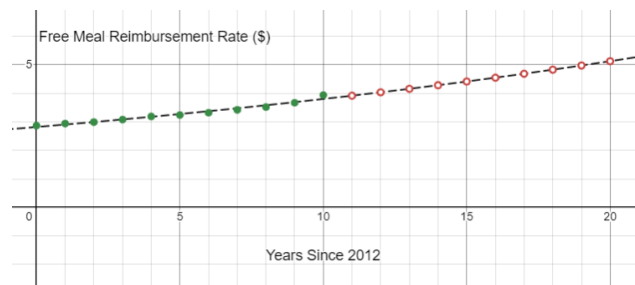


Figure 2: Free Meal Reimbursement Rate vs Time. Graph made with Desmos Graphing Calculator.

Figure 2 shows the relationship between the reimbursement rate for a free meal and the year. The free meal rate was chosen of the three rates to represent the overall change due to inflation. The year is shown along the x-axis as a value for the number of years since 2012. Note that the value indicates the year in which the school year begins, so the data point for 2012 represents the 2012-2013 school year. The y-axis indicates the reimbursement rates of a free meal in the contiguous states. The green dots represent data retrieved from the USDA, while the red dots indicate predicted values using the black trendline. The trendline is an approximate formula created from the data available. It predicts inflation of about 3% annually. This indicates that the cost of operating the program would grow exponentially by 3% per year, assuming a constant number of students.

In order to factor inflation into our equation, we can rewrite it as follows:

$$C = k(0.38M_P + 3.54M_R + 3.94M_F)$$

Equation 3

This formula replaces the three variables P_P , P_R , and P_F with a coefficient representing the base reimbursement rates in the 2022-2023 school year. Instead, *Equation 2* is now scaled by a factor of k implemented in *Equation 3*, representing an inflation factor assuming 2022 as the base year. Overall inflation is *not* represented by k , but rather the inflation calculated from past reimbursement rates. During the 2022-2023 school year, this factor would be equal to 1 since that is the base year. In following years, if k is a value between 0 and 1 then this would indicate that reimbursement rates are lower than the base year, and the total cost would be lower for the same number of meals served. This formula could be used to calculate the expected cost of the program in future years. If k is greater than 1, this indicates that the reimbursement rates would be higher than in the base year, increasing the total cost and assuming an equal number of meals served.

Budget for the 2023-2024 School Year

For the NourishU program budget, we will use *Equation 2* as well as the 2022-2023 reimbursement rates, as these are actual values rather than predicted values. Since NourishU offers all meals for free, M_P and M_R will be zero. Each participating student receives two free meals per day, so M_F will be twice the number of participating students calculated in the Student Participation Model. That's equal to $27,573 \times 2 = 55,146$ meals per in-session school day in San Diego County. This value multiplied by the \$3.94 per meal reimbursement rate yields a daily operating cost of roughly \$217,000 per in-session school day. To find the yearly cost, the daily operating cost would need to be multiplied by the number of school days per year. We will assume 180 school days per year, which would result in a cost of \$39,060,000 in the 2023-2024 school year. Finally, adding in the \$2,412,000 for labor equates to \$41,472,000 dollars in yearly operating costs.

Distribution Model

The findings from the Student Participation Model and Total Cost Model determine the number of students across San Diego who will receive meal assistance and the budget needed for the NourishU Program. After the budget has been allocated, our program needs to distribute the funds to all colleges in San Diego. Various factors including the student population and tuition rates of each college will be used to determine how much money each institution receives for the NourishU Program. According to the Student Participation Model, approximately 44.5% of college students in San Diego are facing food insecurity. Once we have our budget B_T , the next step is to distribute it proportionally based on total enrollment for each college using the expression below:

$$B_T \times (S_i / S_T)$$

S_i represents the student population for a particular college i , and S_T represents the total number of college students across the eighteen colleges in San Diego which our program serves.

But recent data suggests that although more financially struggling students are attending universities, they tend to choose less selective schools due to the high correlation between selectivity and tuition. To address this factor, we introduce a tuition dampening multiplier to our model as shown below:

$$(0.9 + ((T_M - T_i) / T_M) \times 0.1)$$

This component considers the data which indicates that the percentage of food insecure students has an inverse relationship with the tuition fees. It is worth noting that while the average percentage of food insecure students is 44.5% according to the Student Participation Model, this figure can drop by up to 10% at some colleges due to heterogeneity in the student population and income. The range of the tuition component is $[0.9, 1]$, which takes into account the 10% variability in the percentage of food insecure students. T_M represents the highest tuition fee among all the colleges that our program serves, while T_i represents the tuition fee of a particular

college, i . This component ensures that the higher the tuition fee of a college, the lower the resulting value. For example, if the tuition rate for the most expensive college is used as T_i , the expression simply becomes 0.9.

Combining these two components together, we get our distribution model:

$$F_i = B_T \times (S_i / S_T) \times (0.9 + ((T_M - T_i) / T_M) \times 0.1)$$

Equation 4

Equation 4 dynamically takes in various factors and outputs F_i , which represents the funding received by a specific college i .

After the funding for all the colleges in our program has been calculated, we need to ensure that the sum of the funding, $\sum_{n=0}^{18} F_i$, matches our total budget, B_T . To achieve this, we balance our budget using the following cases. We call the balanced funds for each college F_n .

Case 1:

$$\text{If } \sum_{i=0}^{18} F_i < B_T, \text{ then } F_n = F_i + (B_T - \sum_{i=0}^{18} F_i) \times (S_i / S_T)$$

If the total funding for all colleges falls short of the allocated budget, we need to add the proportionate difference from each particular college to balance the budget.

Case 2:

$$\text{If } \sum_{i=0}^{18} F_i = B_T, \text{ then our budget is already balanced and } F_n = F_i.$$

Note: $\sum_{i=0}^{18} F_i$ will never exceed B_T since our tuition multiplier shown in *Expression 2* is always ≤ 1 .

Combining these two components enables us to develop a model that considers both total enrollment and tuition, allowing us to distribute funds as precisely as possible, ultimately reducing food insecurity across the colleges in our program.

Based on the output from our custom source code (Appendix A - Program 1) that uses our Distribution Model and the budget from the Total Cost model, the funding for each college is shown below:

College	Annual Funding
California State University - San Marcos	\$2,469,741.92
San Diego Christian College	\$78,730.24
National University	\$1,350,158.3
Point Loma Nazarene University	\$531,511.84
San Diego State University	\$5,500,496.93
University of California San Diego	\$5,864,187.45

University of Phoenix (San Diego)	\$1,034,841.08
University of San Diego	\$929,772.98
Alliant International University	\$31,202.01
Azusa Pacific University	\$659,256.75
John Paul the Great Catholic University	\$50,147.95
Grossmont College	\$3,218,108.97
MiraCosta College	\$2,475,831.44
Palomar Community College	\$4,315,907.15
San Diego City College	\$2,719,668.19
San Diego Mesa College	\$4,022,639.45
San Diego Miramar College	\$2,868,955.7
Southwestern College	\$3,350,841.65

Figure 3: NourishU Funding per College

Job and Career Research

Virginia A. Stallings, MD

Virginia A. Stallings, MD is a pediatrician at the Children’s Hospital of Philadelphia and the director of the nutrition center. Dr. Stallings is an expert on a variety of medical topics, including nutrition and child health. She received several degrees: a Bachelor of Science at Auburn University in 1972, a Master of Science at Cornell University in 1975, and a Doctor of Medicine at Alabama-Birmingham in 1979 (Children’s Hospital of Philadelphia, n.d.).

Dr. Stallings has been a member of the National Academy of Medicine since 1997. At the National Academy of Medicine, she worked as the Chair of the Committee on Nutritional Standards for NSLP to create recommendations to the USDA for implementing a healthier meal plan for the NSLP (Children’s Hospital of Philadelphia). The research done by this committee resulted in the publication, *School Meals: Building Blocks for Healthy Children* which details the recommendations made to improve the NSLP. Throughout *School Meals*, Dr. Stallings and the committee utilized mathematical modeling in a variety of topics, such as estimating nutritional intake of students or determining how many nutrients are necessary, depending on the students’ age and gender (National Academy of Medicine, 2010).

According to the Bureau of Labor Statistics (BLS), a pediatrician earns a yearly salary of \$198,420. The BLS predicts that by 2031, the career will only grow by 1%. There are a variety of similar medical careers that assess and tend to the physical health of a person, such as cardiologists, surgeons, and dermatologists (2022).

Thomas Malthus

Thomas Malthus is an English economist best known for his work *An Essay on the Principle of Population*, published in 1798. In the essay, Malthus used mathematical models to graph population growth and the growth of food. He described that while population grows exponentially, the growth of production only grows linearly. This indicates that the growth of the population would eventually outgrow that of production (MacRae, 2023).

Malthus was homeschooled until the age of 18, at which point he studied at Jesus College, Cambridge, where he “studied a wide range of subjects and took prizes in Latin and Greek, graduating in 1788,” four years later (MacRae, 2023). Later, “he became a professor of history and political economy at the East India Company’s college at Haileybury” in 1805 (MacRae, 2023).

While Malthus’s model may be outdated, it is important to analyze the food supply and population. The main problem right now is distribution: too much food ends up in the hands of people of higher socioeconomic status, and too much food goes to waste. With proper distribution, we can feed everyone, which is what our program attempts to accomplish.

Thesis Defense**Strengths**

Our NourishU Program answers the prompt, taking inspiration from similar successful programs such as the NSLP for K-12 students. We enhance the reach of meal assistance programs through having open-ended eligibility, offering multiple meals per day, and being versatile to the changing economy. Accounting for inflation rates, participation rates, and a variety of other factors creates a realistic outcome for our model that can be implemented in San Diego county. Funds are distributed to schools based on the tuition rates and student population.

Limitations

1. Factors such as the Covid-19 pandemic’s lasting impact and the changing economy since the data used in our model was collected may have caused inaccurate estimations. To combat this limitation, we created a versatile model in which new data about the cost of each meal, number of students, or other data-dependent factors can be substituted in their respective variables creating accurate results that properly represent college student population needs at any given time.
2. While the eligibility criteria for the program is fairly open-ended, there still may be students who do not meet the criteria to qualify. For example, international students and students whose families make slightly above the 80% of the Average Median Income in San Diego may not be eligible. To overcome this constraint, our program is open to students who do not qualify based on the criteria but wish to receive meal assistance. These students can submit an application to the NourishU Program at their school and upon review by officials the student may receive program benefits. Although our program includes this application option for students who do not qualify, there are still

barriers such as students who do not know how to apply, stigma against receiving meal assistance, and a variety of other factors.

3. Our NourishU Program may encounter logistical limitations such as finding adequate facilities, staff, and food suppliers to provide nutritious and affordable meals. The program would also need to comply with health and safety regulations and address issues such as food allergies and dietary restrictions.

Economic Impact

The impact of the NourishU Program on the economy depends on various factors including the funding sources for the program, the amount of money injected into the economy, and the potential economic benefits of reducing food insecurity and improving the academic performance of college students.

On one hand, the implementation of the NourishU Program may require funding from various sources such as the federal government, state government, private donations, or a combination of these. The increased spending on the program may lead to a short-term increase in aggregate demand, especially for local businesses that provide food and services to the program.

Alternatively, the reduction in food insecurity and improvement in academic performance may lead to long-term increase in human capital, ultimately benefiting the economy by shifting the production-possibilities curve. For example, college students who are not struggling with hunger and malnutrition are more likely to succeed academically, graduate on time, and obtain higher-paying jobs, which can contribute to the overall economic growth of the region. Moreover, reducing food insecurity among college students may also reduce the burden on emergency food assistance programs, such as food banks, which can redirect their resources to other areas of need in the community.

The significant amount of tax revenue that would go into the NourishU Program would not be as huge of a burden as the budget, \$41.47 million, may seem since NourishU is intended to replace other food assistance programs that operate on college campuses. This means that money that is already set aside to go towards CalFresh and other programs on college campuses will go towards NourishU instead, dampening the effect of the large economic investment into NourishU.

NourishU would also create 72 jobs for chefs and cooks across San Diego even though the program itself is a large investment. Although creating 72 jobs seems like a small number, there will be a greater economic impact once the program expands to other cities and states creating even more jobs. The creation of such jobs helps the economy flourish in the long run by making unemployment rates drop.

The economic impact of the NourishU Program comes in complex layers. While the short-term costs of implementing the program may be significant, the long-term benefits of reducing food insecurity, improving academic outcomes for college students, and creating jobs may lead to positive economic outcomes for San Diego as a whole.

Recommendations for Implementation

1. Clearly defined measurable objectives for the NourishU Program will ensure that everyone in charge of implementing the program is on the same page about how to handle various situations that may arise and have a clear understanding of the program's goals.
2. The NourishU Program should be designed to make the best use of available resources. This may involve using cost-effective approaches, leveraging existing infrastructure, and minimizing unnecessary administrative costs.
3. Ongoing monitoring and evaluation of the program will ensure that it is delivering the desired outcomes. This will enable any necessary adjustments to be made in a timely manner and ensure that taxpayers are getting the best possible value for their money.
4. The NourishU Program should be transparent in its operations, with clear reporting and disclosure requirements. This will help to build trust and confidence among taxpayers and ensure that the program is accountable for its performance. Having transparency regarding NourishU's distribution of funds and estimation of quotas met can also enable community feedback. This helps to create a more robust program since those who NourishU affects can suggest recommendations with firsthand experience of the program.

San Diego County Council Proposal

Dear Council Member Campbell,

We are writing to you with a proposed solution to one of our city's most pressing concerns: food insecurity among college students. Recent data has shown that an alarming 44.5% of all college students have experienced food insecurity in the past 30 days. If almost half of all college students feel food insecure, what can we do to help?

Our team would like to propose the Nourish Universal Program (NourishU) to provide meal assistance across college campuses:

- Coverage: Full-time, part-time, traditional, nontraditional, documented, undocumented, dorming, and commuting college students who are enrolled across eighteen of San Diego's public, private, and community institutions would be eligible for NourishU.
- Support: Free breakfast and lunch meals during each in-session school day for all eligible students.
- Fiscal Impact: Our proposed annual budget is \$41,472,000, representing only 2.1% of San Diego's 2023 annual adopted budget for general fund expenditures (sandiego.gov).
- Dynamic: Our program is distributed proportionally based on the needs of students at each institution.
- Funding: NourishU would replace other existing programs, and thus the funding allocated to those programs would be redirected towards NourishU. To supplement expenses, other sources of revenue may be needed from local taxes, grants, and investments or from federal and state grants. Our program also accepts individual donations which may cover a fractional part of the cost.

We believe that the benefits of this program greatly extend beyond food insecurity. By ensuring that students have access to nutritious meals, we can holistically improve their academic performance, mental health, financial situation, and overall well-being. In addition to addressing food insecurity, our program has the potential to generate positive long-term economic impact, such as by increasing human capital, generating aggregate demand, and supporting local food businesses.

Our program's economic impact will increase tax revenue for San Diego in the long run. The program will create 72 jobs for chefs and cooks to work on college campuses across San Diego. In addition, students who are fed throughout college due to our program will have higher rates of academic success making them more likely to pursue high-paying jobs after graduating.

We would be happy to provide you with our data that outlines how the budget is calculated and distributed among eighteen colleges in San Diego. Investing in the food security of our community means investing in the future of our city. Let's bridge the gap and reduce food insecurity hardships among low-income students to drop the staggering 44.5% to zero.

Sincerely,

***, ***, and ***

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Appendix A

Our team used the Python programming language to perform large scale calculations observed in our models. Our source code is below:

Program 1 - Distribution Model

```
# Variables
tuition = [8454, 34310, 13320, 41100, 8198, 15348, 11482, 54554,
           17130, 41510, 28000, 1386, 1336, 1338, 1144, 1144, 1144, 1338]
tuition_max = max(tuition)

students = [13865, 464, 7648, 3174, 30865, 33343, 5842, 5702, 178,
           3940, 292, 17835, 13720, 23917, 15066, 22284, 15893, 18569]
total_students = 232597

budget = 41472000
funding = []

# Code
for i, t in enumerate(tuition):
    funding.append(round(budget * (students[i] / total_students) *
                      (0.9 + ((tuition_max - t) / tuition_max) * 0.1), 2))

print("Funding: ")
print(funding)
print("Unbalanced Budget: ")
print(sum(funding))

# Balancing Budget
unbalanced_budget = sum(funding)
```

```
if unbalanced_budget < budget:
    for i, f in enumerate(funding):
        funding[i] = round(f + ((budget - unbalanced_budget) *
                               (students[i] / total_students)), 2)

print("Balanced Funding: ")
print(funding)
print("Balanced Budget: ")
print(sum(funding))

# Program 1 End
```

Output:

Funding:

```
[2433817.32, 77528.0, 1330342.12, 523287.92, 5420524.86, 5777794.81,
 1019704.3, 914998.94, 30740.81, 649048.1, 49391.37, 3171897.99,
 2440282.54, 4253937.54, 2680631.77, 3964900.99, 2827776.5,
 3302728.86]
```

Unbalanced Budget:

```
40869334.74
```

Balanced Funding:

```
[2469741.92, 78730.24, 1350158.3, 531511.84, 5500496.93, 5864187.45,
 1034841.08, 929772.98, 31202.01, 659256.75, 50147.95, 3218108.97,
 2475831.44, 4315907.15, 2719668.19, 4022639.45, 2868955.7,
 3350841.65]
```

Balanced Budget:

```
41472000.0
```