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Article

Examining USDA Reimbursements, School Nutrition Programs, and Food Procurement in U.S. Public Schools: A Comparative Analysis of California and Texas

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Abstract: This paper investigates the financial, nutritional, and operational dynamics of school nutrition programs across California and Texas, focusing on USDA reimbursements, food procurement strategies, and their impacts on student well-being. Specifically, we analyze the National School Lunch Program (NSLP) and School Breakfast Program (SBP) to understand how reimbursement rates and commodity entitlements support these programs and sustain school nutrition budgets. We explore additional revenue streams like competitive foods and the Universal Meal Program in California, juxtaposed with Texas' nutrition policies. Drawing on cost of living data and individual district procurement practices, the study provides an empirical basis for understanding how schools navigate food costs and compliance with federal and state nutrition guidelines. By leveraging data from the California Department of Education (CDE), Texas Education Agency (TEA), and public procurement records, the research also highlights the fiscal and logistical challenges that influence school food programs and assesses trends in student health outcomes over time. This analysis offers insights into optimizing food program funding, procurement, and policy adjustments to better support equitable and nutritious school meal programs nationwide.

Keywords: School Nutrition Programs, USDA Reimbursements, Food Procurement Strategies, Student Well-Being, California and Texas Education Policy.

INTRODUCTION

1. Significance

Obesity rates among children in the United States have quadrupled since the 1980s from 5% to almost 20%, affecting approximately 15 million children today.1 This alarming trend not only poses significant health consequences but also con- tributes to an annual healthcare spending of $1.32 billion for children eventually amassing to $173 billion for adults.2 The issue of childhood obesity also highlights a concerning equity gap, with low-income, Hispanic, and Black families dispropor- tionately affected.3

A vital strategy to counteract this growing trend is through early education. Extensive research indicates a strong correla- tion between education and the adoption of healthier lifestyles, which in turn, are linked to reduced obesity rates. Centers for Disease Control and Prevention (CDC) (2021) Establishing healthy habits from a young age suggests that early educational initiatives are crucial for teaching children health-promoting skills and behaviors.Ward et al. (2021) Educational institutions are pivotal in creating a supportive environment that endorses healthy habits, including consistent physical activity and bal-

anced nutrition. Schools also offer a structured setting that, as per the 'structured days hypothesis', is believed to diminish be- haviors conducive to obesity. Finally, and most importantly, school-based nutrition programs are particularly beneficial for children from less advantaged backgrounds, providing a critical source of healthy food.

Yet, there remain important knowledge gaps on how school food procurement programs affect student's academic and health outcomes. This research proposal seeks to close these gaps.

2. Study Goals

What is the impact of food revenues on food procurement?
What is the impact of food procurement on student out- comes

3. Institutions

- School Districts
- Schools
- Food Service Providers
- Students

4. Data Sources

- California
- California Department of Education
- test scores
- physical fitness
- demographics
- Food procurement... details
- Los Angeles School Districts

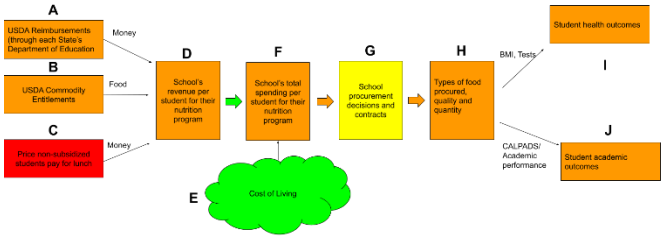
Data Description

See below for the flow chart of the data I made. The letters are a standard way of referring to the data. The colors for the boxes are defined as follows: Green: We have sufficient data (or a way of obtaining it) for the time period we are interested in. Yellow: I think we have enough data (or a way of obtaining it) in the time period we are interested in, but we will need to make assumptions. Orange: We do not have data for one or more of the following reasons:

We need to request the data from an organization
We need to find more years of the data

Red: This is not directly obtainable and we will need to find another method determine these values.Kitchin (2014) for the time period (or a way of obtaining it) for the time period we are interested in.Batini and Scannapieco (2016) The colored arrows

Figure 1: Figure title reflect the status of connecting the datasets to each other



Federal Data

USDA Reimbursements (A)

The USDA helps schools sustain their nutrition programs by reimbursing the schools on a per-meal-served basis. Different meals qualify for different reimbursements many programs schools can offer to students and faculty. Exam- ples of these programs include the National School Lunch Program (NSLP), School Breakfast Program (SBP), Sum- mer Food Service Program (SFSP), Special Milk Program, Meal Supplements, and other programs. In this paper, we will focus mainly on the USDA reimbursements from meals served through the NSLP and SBP.Little and Rubin (2019)

- See federal reimbursement rates per meal served through the NSLP and SBP over time from School Year 1998-1999 to present. Link here.
- Based on the link, "adjustments for the National School Lunch and the School Breakfast Programs reflect changes in the Food Away From Home series of the Consumer Price Index for All Urban Consumers."
- Competitive Foods (A)
- Schools can also choose to offer competitive foods, which are foods that the schools choose to sell a la carte. These foods typically have less nutrients and are unhealthier than the foods served through the NSLP and SBP. Competitive foods are more popular in affluent areas which leads to more revenue obtained through competitive foods in these schools. The references section is really interesting, a lot of good reading. Schafer and Graham (2002)Link here.

USDA Commodity Entitlements (B)

Schools get commodity entitlements from the USDA based on the number of NSLP lunches served in the prior school year.

Here are the entitlements per meal going back to SY 2008-2009. Link here.

Using this entitlement, schools can order food from the USDA. The price, quantities, and types of food that can be ordered is found in the Link here.

Schools can also use this entitlement to order from the De- partment of Defense Fresh Fruits and Vegetables Program. Foods ordered from this program are fruits and vegetables. I tried making an account on their portal called FFAVORS to view the available food, but it is password protected and I would need an authorized account. We have some data that the CDE provides on the produce available from SY 2022-2023, but I wasn't able to find a link that went further back.
If a school does not use all of its entitlement in the previous school year before they get their new entitlement, they lose the prior year's entitlement.

Link here.
Nutritional Guidelines (G) (H) (I)
School Food Authorities must adhere to national nutri- tional guidelines based on the Healthy Hunger Free Kids Act (2010) and its updates. Link here.

Cost of Living (E)
Using MAIRPD data, we can calculate the cost of living in different metropolitan areas around the US. To calculate the cost of living for individual schools, I found the mini- mum distance from the center of each county to the center of the first listed city in the metropolitan area. I then as- signed the cost of living in that metropolitan as the cost of living for the schools in that county. Zhang et al. (2021).

California Data
Reimbursement Rates (A)
California uses a program called Child Nutrition Informa- tion & Payment System (CNIPS) to distribute reimburse- ments. Due to the Universal Meal Program (UMP) implemented by California for SY 2022-2023, California provides ad- ditional reimbursement for each meal served. California mandated schools to serve one free lunch and one free breakfast to students per day.

California committed itself to making up the respective difference between each meal that would have been en- tirely paid for or sold at a reduced price.

Ex. If the student does not qualify for a free or reduced- price lunch and he is served a free lunch, the school will record that they served the student a paid meal. California will make up the difference between the federal reimburse- ment for a paid meal and the federal reimbursement for a free meal. Individual District Food Procurement (G) (H) (I)

It is up to individual districts to competitively procure their own food. Each district must send out RFPs and create contracts with companies to procure the food they serve. Schools can contract with a Food Service Management Company (FSMC). This company can procure the foods of the school and/or provide personnel and equipment to run the school's nutrition program. Schools can also create cooperatives with each other when purchasing food. This allows schools to contract with companies together, which may result in lower per-unit prices for the food purchased. Schools can also utilize a method called 'piggybacking' where a school district uses a contract that another district has to procure the food at the same price as that district.

California Department of Education (abbrev. CDE) (A) (B) (D) (F) (G) (H) (I) (J) (K)

The CDE has a lot of important data that we want to use. We will request data through the CDE Data Request portal. Link here.

The data we hope to use are as follows:
California Longitudinal Pupil Achievement Data System (CALPADS) (K)

Based on the CDE website linked below, "CAL- PADS is the foundation of California's K–12 ed- ucation data system, comprising student demo- graphic, program participation, grade level, enroll- ment, course enrollment and completion, and disci- pline data. The student-level, longitudinal data in CALPADS enables the facilitation of program eval- uation, the assessment of student achievement over time, the calculation of more accurate dropout and graduation rates, the efficient creation of reports to meet state and federal reporting requirements, and the ability to create ad hoc reports and responses to relevant questions." Link here.

Physical Fitness Test (abbrev. PFT) (J)
The PFT tests students on a variety of exercises such as the pacer test, trunk lift, and pushups. We are able to access to freely access data going back to SY 1998-1999 to SY 2018-2019 through the CDE DataQuest. Link here. I don't believe student BMI, height, or weight data is collected through this pro- gram anymore so we may need a new data source for this.

Vendor Paid List (G) (H)
The CDE conducts a state-wide procurement review of schools that participate in the NSLP and SBP. One of the things that every SFA submits to the CDE is a Vendor Paid List which contains the vendor(s) re- ceiving payment as well as the payment amount.

CDE Distribution Centers (B)
The CDE manages two warehouses that distribute the USDA Foods and DOD Fresh produce. These warehouses are located in Pomona and Sacramento.

Through these these datasets provided by the California, we hope to see the physical health and academic perfor- mance of students over time.

Southern California Data
Individual School Data (G) (H) (I)
We used the California Public Records Act to request food procurement data from school districts around Los Ange- les. The data includes the price, quantity, and description of the food purchased from the SY 2018-2019 to SY 2022- 2023. The largest cooperative (and the entity we have the most data for) is the San Gabriel Valley Purchasing Coop- erative.
Some of the obtained data was in pdf form and/or hand- written. We used the Adobe Acrobat pdf to Excel con- verter to obtain some files.

Texas Data
Reimbursement Rates (A)
Before SY 2023-2024, Texas did not give schools addi- tional funding per NSLP or SBP meal served. As a result, Texas schools receive the federal reimbursement for the meals served. Link here.

Texas passed a law that allows students that qualify for a reduced-price meal to receive their breakfast for free. The state pays for the difference in the paid-reimbursement and the free reimbursement.

Individual District Procurement (G) (H) (I)
Although there may be different laws for school food pro- curement, I think that the general process of competitively procuring food is the same.

Texas Education Agency (A) (B) (D) (F) (G) (H)
A lot of the data we have comes from the Texas Open Data Portal and the Texas Education Agency.
We will need to request student outcome data as well as anything else they can provide that is in this list: Link here.

Meal Reimbursement Data (A)
Texas has publicly available data on the number of meals served for the NSLP and SBP as well as the re- imbursement each school gets for participating. This data goes back to SY 2015-2016. Link here.

USDA Entitlement Data (B)
Using the same link as the above, we can see the USDA entitlement each school is given for the year from SY 2021-2022 to present. I believe we can sub- mit something Texas calls a 'Public Information Re- quest' to ask for the entitlement data. Link here.

School Expenditures on Nutrition Programs (D) (F) We can view Texas' school budgets with the link be- low. It includes an itemized category for spending on food. Link here.

We also can view the spending of schools on food with the following link. I checked a few schools with the data from the above item and it lined up. Link here.

	MIN	MEAN	MAX	SD
FoodServiceDirectorAddressZipCode	75002.0	105067509.531	799011917.0	2.650304e+08
TotalBeginningEntitlement	0.0	194337.954	9170504.0	5.813238e+05
ProcessingReservedUsed	0.0	101746.304	5518711.2	3.419828e+05
ProcessingReservedRemaining	-47123.5	1885.812	146488.2	9.020097e+03
DODFreshDeduction	0.0	28137.783	1331534.0	8.732312e+04
EntitlementAllocations	0.0	36507.361	1438560.1	8.537129e+04
EntitlementUsed	0.0	168680.484	5764324.7	4.542100e+05
UnfilledRequests	-2891550.1	-12408.017	0.0	1.587789e+05
EntitlementRemaining	-280319.1	13249.453	640593.1	4.743262e+04
CombinedValueTrueEntitlementRemaining	-245384.9	15538.488	787081.4	5.137115e+04
BonusAllocations	0.0	19864.893	641027.3	5.252093e+04
AdminAdjustments	0.0	0.000	0.0	0.000000e+00

Empirical Evidence and Actual Datasets

In this section I will give a summary of all the datasets we currently have as of 15 April 2024.

USDA Reimbursements

USDA reimbursements depend a) the reimbursement rate set by the USDA and b) the number of meals served by the school. The reimbursement rate is set according to the USDA. We can get the data from this based on the USDA page with the listed rates.

The number of meals and composition of free, reduced- priced, and full-price meals served by the school varies by school. We currently have this data for Texas, but not Cal- ifornia. We will need to request CNIPS data for through the CDE.

For Texas, here is the data description for the data linked above here!

The datasets, titled ”School Nutrition Programs Meal Reimbursement Information Program Year 2015-2016 20240314.csv” where 2015-2016 is replaced with the rel- evant year, have the following summary statistics for the columns containing numeric variables:

The names of the non-numeric columns are as fol- lows: ”ProgramYear”, ”ReportType”, ”CEID”, ”CE- Name”, ”CECounty”, ”TypeOfAgency”, ”TypeOfS- NPOrg”, ”SiteID”,”SiteName”, ”SiteCounty”, ”Claim- Date”

USDA Commodity Entitlements

The data we have for Commodity Entitlements comes from Texas through their data portal. We have the data from SY 2021-2022 to SY 2022-2023, but we will need to request data for other years. This data is grouped by 'Contracting Entity' which is basically school district for our purposes.

	MIN	MEAN	MAX	SD
ESC	1	9.778906e+00	20.00	5.681303
TDARegion	1	2.760028e+00	5.00	1.166252
EnrollmentQty	0	6.272803e+02	18741.00	512.677794
FreeEligibleQty	0	3.508706e+02	10497.00	321.979011
ReducedEligibleQty	0	3.679021e+01	611.00	44.040625
PaidEligibleQty	0	2.396174e+02	18028.00	335.365236
BreakfastDays	0	1.651063e+01	31.00	6.323185
BreakfastTotal	0	3.598404e+03	51107.00	3856.783785
BreakfastADP	0	2.126439e+02	2679.50	204.635101
BreakfastServedFree	0	2.863287e+03	46325.00	3375.956514
BreakfastServedReduced	0	1.917286e+02	3913.00	275.585246
BreakfastServedPaid	0	5.433879e+02	18399.00	811.556200
LunchDays	0	1.651043e+01	31.00	6.256674
LunchTotal	0	6.245601e+03	69816.00	5376.123244
LunchADP	0	3.712954e+02	3324.57	280.126249
LunchServedFree	0	4.400594e+03	55592.00	4369.427786
LunchServedReduced	0	3.972949e+02	7138.00	502.182783
LunchServedPaid	0	1.447711e+03	25918.00	1857.661798
SnackDays	0	3.708534e+00	31.00	7.317773
SnackTotal	0	2.628417e+02	14064.00	824.330544
SnackADP	0	1.741065e+01	900.00	50.437229
SnackServedFree	-1	2.576276e+02	14064.00	821.339230
SnackServedReduced	0	3.783925e-01	420.00	6.529587
SnackServedPaid	0	4.835636e+00	4281.00	73.226025
MilkDays	0	1.361452e-02	28.00	0.526458
Milktotal	0	1.073033e+00	3970.00	49.110439
MilkADP	0	5.444307e-02	194.53	2.488213
MilkServedFree	0	0.000000e+00	0.00	0.000000
MilkServedReduced	0	0.000000e+00	0.00	0.000000
MilkServedPaid	0	1.073033e+00	3970.00	49.110439
BreakfastReimbursement	0	6.157001e+03	94215.14	6975.738255
LunchReimbursement	0	1.547374e+04	180853.58	14595.421804
SnackReimbursement	0	2.169046e+02	11813.76	689.926975
MilkReimbursement	0	2.086741e-01	794.00	9.730704
TotalReimbursement	0	2.184785e+04	228223.44	20901.607903
TotalMeals_Snacks	0	1.010685e+04	103069.00	8844.849203

Other School Food Revenues
This data seems hard to directly calculate, so we may need to figure out the school's revenue from the school's budget (See (D)).

Each district has the authority to price their meals. I'm unaware if there is a legal upper limit to the price. The districts are supposed to operate on a not-for-profit basis, so the lower limit is probably the break-even price.

Total School Food Revenues
One way we calculate this is by adding (A), (B), and (C). This would give us an estimate of the total revenue the school has. Another way we have this is through Texas. They publish a budget and the actual spending of each district with food as an item. I checked different files against a web scraping script for SY 2018-2019 and it works. They also publish spending per student which I think is relevant.

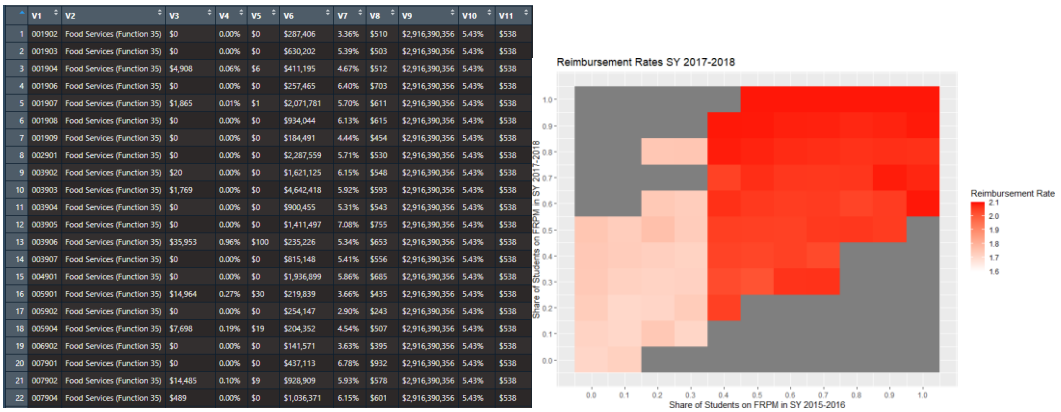
The columns of the large dataset for the expendi- ture of every district in the school year is: "DIS- TRICT", "FUND", "FUNDYEAR", "FUNCTION", "OB- JECT", "FIN UNIT", "PROGRAM INTENT", "AC- TAMT", "DTUPDATE".

Cost of Living
Using MAIRPD data, we are able to find the cost of living for different metropolitan areas in the US. The data con- tains the location and the index for every year from 2008 to 2022.

Total School Food Spending
We would need financial statements from school on their food program if we want to see their total food spending. This is very similar to item (D), but this is exactly what we are trying to create based on items (A), (B), and (C).
I chec

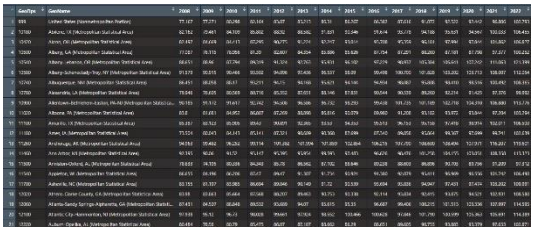
* We also have data for the budgeted amount they project

School Procurement Decisions



	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
1	001902	Food Services (Function 35)	$0	0.00%	$0	$287,406	3.36%	$510	$2,916,390,356	5.43%	$538
2	001903	Food Services (Function 35)	$0	0.00%	$0	$630,202	5.39%	$503	$2,916,390,356	5.43%	$538
3	001904	Food Services (Function 35)	$4,908	0.06%	$6	$411,195	4.67%	$512	$2,916,390,356	5.43%	$538
4	001906	Food Services (Function 35)	$0	0.00%	$0	$257,465	6.40%	$703	$2,916,390,356	5.43%	$538
5	001907	Food Services (Function 35)	$1,865	0.01%	$1	$2,071,781	5.70%	$611	$2,916,390,356	5.43%	$538
6	001908	Food Services (Function 35)	$0	0.00%	$0	$934,044	6.13%	$615	$2,916,390,356	5.43%	$538
7	001909	Food Services (Function 35)	$0	0.00%	$0	$184,491	4.44%	$454	$2,916,390,356	5.43%	$538
8	002901	Food Services (Function 35)	$0	0.00%	$0	$2,287,559	5.71%	$530	$2,916,390,356	5.43%	$538
9	003902	Food Services (Function 35)	$20	0.00%	$0	$1,621,125	6.15%	$548	$2,916,390,356	5.43%	$538
10	003903	Food Services (Function 35)	$1,769	0.00%	$0	$4,642,418	5.92%	$593	$2,916,390,356	5.43%	$538
11	003904	Food Services (Function 35)	$0	0.00%	$0	$900,455	5.31%	$543	$2,916,390,356	5.43%	$538
12	003905	Food Services (Function 35)	$0	0.00%	$0	$1,411,497	7.08%	$755	$2,916,390,356	5.43%	$538
13	003906	Food Services (Function 35)	$35,953	0.96%	$100	$235,226	5.34%	$653	$2,916,390,356	5.43%	$538
14	003907	Food Services (Function 35)	$0	0.00%	$0	$815,148	5.41%	$556	$2,916,390,356	5.43%	$538
15	004901	Food Services (Function 35)	$0	0.00%	$0	$1,936,899	5.86%	$685	$2,916,390,356	5.43%	$538
16	005901	Food Services (Function 35)	$14,964	0.27%	$30	$219,839	3.66%	$435	$2,916,390,356	5.43%	$538
17	005902	Food Services (Function 35)	$0	0.00%	$0	$254,147	2.90%	$243	$2,916,390,356	5.43%	$538
18	005904	Food Services (Function 35)	$7,698	0.19%	$19	$204,352	4.54%	$507	$2,916,390,356	5.43%	$538
19	006902	Food Services (Function 35)	$0	0.00%	$0	$141,571	3.63%	$395	$2,916,390,356	5.43%	$538
20	007901	Food Services (Function 35)	$0	0.00%	$0	$437,113	6.78%	$932	$2,916,390,356	5.43%	$538
21	007902	Food Services (Function 35)	$14,485	0.10%	$9	$928,909	5.93%	$578	$2,916,390,356	5.43%	$538
22	007904	Food Services (Function 35)	$489	0.00%	$0	$1,036,371	6.15%	$601	$2,916,390,356	5.43%	$538

Figure 2: V1 is the code for each School District. V6 is the total spending on each district's respective nutrition program. V8 is the total spending on the district's respective nutrition program per student in the school district



We have the data for this for some schools in Southern California from SY 2018-2019 to SY 2022-2023. We have the companies they contract with and the RFPs they send. We will need the Vendor Paid List from the CDE and the TEA if we want to have the data for all California and Texas school districts.

Food Procurement

- We have the data for this for some schools in Southern California from SY 2018-2019 to SY 2022-2023.
- Student Health Outcomes
- We can request data from California's Physical Fitness Test. See 'Physical Fitness Test' under Section 4.2.
- Student Academic Outcomes
- We can request CALPADS data from the CDE. See 'Cal- ifornia Longitudinal Pupil Achievement Data System' un- der Section 4.2.
- We will need to request the following from the CDE:
- The number of meals served, by school/district (A)
- The amount of USDA commodities received, by school/district (B)
- Total nutrition revenue or expenditure (D) (F)
- Vendor Paid List via CDE Procurement Review (H)
- Student Health Outcomes via Physical Fitness Test (I)
- Student Academic Outcomes via CALPADS (J)
- We will need to request the following from the TEA: I'll need to look into the specifics a little more
- The amount of USDA commodities received, by school/district (B)
- Vendor Paid List via TEA Procurement Review (H)

Student Health Outcomes via surveys? Link here. (I)
Student Academic Outcomes via Texas Academic Perfor- mance Reports Link here. (J)
Will we need to request individual school district data in Texas to replicate what we did in Southern California?

Figures

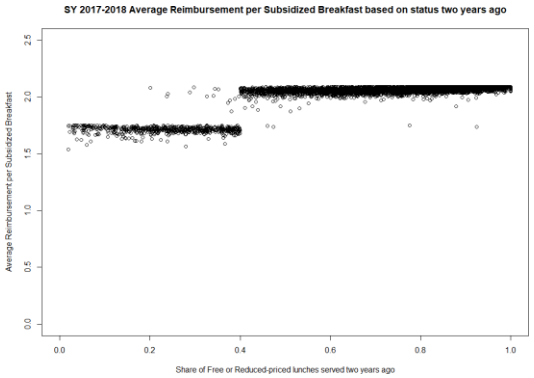


Figure 3: Average Reimbursement per Subsidized Breakfast

LITERATURE REVIEW

School nutrition programs have been extensively studied, with a focus on their role in combating childhood obesity and improving student academic performance. Research by Ward et al. (2021) highlights the critical role of educational institu- tions in promoting healthier eating habits and physical activity among children, aligning with the structured days hypothesis that links consistent schedules with reduced obesity rates.

The National School Lunch Program (NSLP) and School Breakfast Program (SBP) have been central to these efforts. Little and Rubin (2019) emphasize the importance of USDA reimbursements in sustaining these programs, while studies by Schafer and Graham (2002) examine the challenges posed by competitive foods, which often detract from the nutritional goals of these initiatives.

Comparative analyses, such as those by Zhang et al. (2021), have shed light on how cost-of-living disparities influence food procurement strategies across states. However, there is limited research exploring the combined impact of federal reimburse- ments, state-level policies, and individual district procurement practices on student outcomes. This study aims to fill this gap by comparing the school nutrition programs in California and Texas.

The findings of this study underscore the complexities of managing school nutrition programs in diverse states like Cali- fornia and Texas. California's Universal Meal Program demon- strates a progressive approach, providing additional reimburse- ments and mandating free meals for all students. This policy mitigates financial barriers for low-income families but imposes significant fiscal and logistical demands on school districts.

In contrast, Texas relies more heavily on federal reimburse- ments, with limited state-level support. While this approach reduces the financial burden on state budgets, it may exacer- bate inequities in access to nutritious meals, particularly in low- income and rural districts.

Procurement practices also vary significantly between the two states. California's cooperative purchasing and piggyback- ing strategies offer cost advantages, whereas Texas's decentral- ized approach may lead to inconsistencies in food quality and cost-efficiency.

These disparities have implications for student health and academic outcomes. The data suggest that California's more ro- bust funding and procurement systems are associated with bet- ter student health metrics, as evidenced by Physical Fitness Test scores. However, the long-term sustainability of such programs requires further investigation.

Policy recommendations include increasing federal reim- bursements to align with rising food costs, encouraging state- level support for universal meal programs, and promoting best practices in food procurement.

Further Research

- This study opens several avenues for further research:
- A longitudinal analysis of the impact of Universal Meal Programs on student health and academic performance across multiple states.
- Investigation into the role of public-private partnerships in enhancing the efficiency of school food procurement.
- Comparative studies of rural versus urban districts within California and Texas to identify specific challenges and opportunities in food procurement and nutrition program implementation.
- Exploration of the potential of technology, such as blockchain, to improve transparency and accountability in food procurement.
- An assessment of the environmental impact of school food procurement practices, focusing on sustainable and locally sourced options.

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