What are the effects of Farm to School Programs on student well-being? A systematic review protocol

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1. Abstract

1.1. Study background

Millions of American students access one or more meals everyday through their school meal program; this means schools support a major food system with a vital opportunity to procure food that supports local food producers. 42% of American schools receive Farm to School grants from the U.S. Department of Agriculture (USDA). Farm to School programs connect students to locally produced foods mainly through procurement for school meals and utilization for education. Farm to School programs claim to have positive benefits on a range of student outcomes, such as physical health, academic performance, mental health, and behavior. Peer-reviewed studies investigate various combinations of these outcomes. The objective of this systematic review will be to address the research question: What are the effects of Farm to School programs on student well-being? A systematic review of Farm to School studies helps to compare the known positive, negative, and neutral effects of Farm to School programs on student outcomes and their significance.

1.2. Summary of Study Methods

This study developed search terms for components describing the population, intervention, comparator, and outcomes for the question posed and peer-reviewed studies relevant to the question, “What are the effects of Farm to School programs on student well-being?” These are students, Farm to School programs, conventional Nutrition Services programs, and student outcomes, respectively. Synonyms for the search term components described were transformed into search characters. The resulting characters were strung together using Boolean operators to generate relevant studies in Web of Science databases searched. A screening protocol for selecting studies that meet screening eligibility requirements was defined using definitions of the population, intervention, comparator, and outcome components. For studies that are eligible, the mean and standard deviations will be extracted (or calculated where needed) to weigh the studies and visualize their respective effect size, confidence intervals, and Cohen’s d in a resulting forest plot.

2. Keywords

“Farm to school,” “School food,” “USDA,” “FTS”

3. Background

Every day more than 30 million American children eat school lunch at a free or reduced cost through the National School Lunch Program (Prescott et al. 2020). The USDA offers grants under the “Farm to School (FTS) Program” which help 42% of American schools and districts establish relationships with local food producers, especially through school lunch food procurement (Prescott et al. 2020). School Food and Nutrition Services departments spend $12 billion every year to feed American students; this is a market that can support locally and regionally operating farmers, ranchers, fishers, and other food producers (“Cultivating Opportunity: An Overview of Usda’s Fiscal Year 2015 and 2016 Farm to School Grantees’ Growing Achievements” 2015).

FTS programs claim to positively impact student physical health, mental health, behavior, and academic performance through increased access to fruits and vegetables and improved student knowledge about agriculture, nutrition, and the environment (Lehnerd et al. 2020). This review surveys investigations of the effects of FTS programs on “student well-being,” which is defined broadly as the physical, mental, and behavioral health outcomes of students, in addition to academic performance. A systematic review of the effects of FTS on students is useful because studies tend to examine specific districts, regions, or

effects. A comprehensive assessment of observed effects can help to guide evidence-based program implementation and adjustment to better support the needs of students and communities.

Previous systematic reviews of the effects of Farm to School programs on student well-being include a most recent review published in March 2020, with another prior published previously in 2008. Results included in the prior reviews do not include studies surveying mental and behavioral health outcomes for students, so I included terms in my search string which should return such results. The National Farm to School Network, for example, claims FTS supports emotional growth, sense of self, and school readiness ("Benefits of Farm to School" 2020).

Figure 1: A schematic illustrating how Farm to School Programs impact student well-being

4. Objective of the review

4.1:Primary research question

The primary research question that this systematic review protocol focuses on is:

"What are the effects of Farm to School (FTS) Programs on student well-being?"

Farm to School Programs integrate foods produced locally or regionally into school cafeterias and school systems (i.e. supporting curriculum). FTS programs claim to positively impact student physical health, academic performance, and behavior and mental wellbeing, which are categorized as "student wellbeing" for this study.

4.2. Components of primary research question (PICO)

The primary research question components are:

Population: American public-school students

Intervention/Exposure: implementation of FTS programs

Comparator: conventional Food and Nutrition Services programs

Outcome: Student well-being

5. Methods

5.1. Search string

(a)

Table 1. Literature search structure to evaluate the question: What are the effects of Farm to School Programs on student wellbeing?

Component*	Term (whole word)	Characters in search (w/ wildcards)	Justification for search term; Justification for wildcard use
P	students	Student$	Variations on single and plural student(s)
P	Children, child, childhood	Child*	Variations on the term child, including just the word "child"
P	adolescents	Adolescent$	
P	Elementary school/ers/school students	"Elementary school*"	Variations describing students and schools in various ways, such as, "elementary school," "elementary schoolers," "elementary school teachers," "elementary school students" I think this may not work for the third word, depending on if the search is examining study key terms, which I predict might be grouped, versus searching the actual text ("elementary school students" would be a result in the paper being selected in this case, simply because "elementary school" would be a hit in the text. If "elementary school students," is a key term, I think the paper might not be selected in the search.

P	Middle school/ers/school students	“Middle school*”	Same as above, but for middle schools
P	High school/ers/school students	“High school*”	Same as above, but for high schools
I/E	Farm to school	“farmtoschool”	Variations on “Farm to school,” with and without dashes
I/E	FTS(P/Ps)	FTS*	Search results for FTS, FTSPs
I/E	F2S(P/Ps)	F2S*	Search results for F2S, F2SPs
I/E	Locally produced	“locally$produced”	Variations on search terms describing sourcing that defines FTS programs (locally and regionally produced and procured)
I/E	Locally procured	“locally$procured”	
I/E	Regionally procured	“regionally$procured”	
I/E	Regionally produced	“regionally produced”	
O	Health, healthy	Health$	Variations on health, which I would like in search results as a way of indicating changed to student well-being
O	Academic performance	Academic* “academic$performance” “academic$achievement” “academic$standing”	Variations on the observed effects in student’s academic performance, including just “academic and academics”
O	Mental health	“mental$health” mental*	Variations on mental health including just mental or mental-wellbeing
O	Physical health	“physical$health” Physical*	Variations on describing physical health including
O	Well-being	“well$being” wellness	
O	Behavior	Behavior*	Variations describing behavioral outcomes for students, hopefully would return things like “behavior,”

			"behavioral outcomes," "behavioral interventions," etc.
O	Emotion	Emotion*	Variations describing emotional outcomes (as a way of determining mental/behavioral outcomes for students), hopefully would return things like "emotional," "emotional (well-being, capacity, stability)," "emotionally," "emotional," etc.

* "P" = population; "I/E" = Intervention/Exposure; "O" = Outcome

Full search string:

(Student$ OR Child* OR Adolescent$ OR "Elementary school*" OR "Middle school*" OR "High school*") AND ("farm to school" OR Farm-to-school OR "farm to school program" OR FTS* OR "locally produced" OR Locally-produced OR Locally-produced OR "locally produced" OR Locally-procured OR "Locally procured" OR "regionally procured" OR Regionally-procured OR "regionally produced" OR Regionally-produced) AND (Health$ OR Academic* OR "academic performance" OR "academic achievement" OR "academic standing" OR "mental health" OR mental* OR "physical health" OR Physical* OR Well-being OR "well being" OR wellness OR Behavior* OR Emotion*)

5.2. Bibliographic databases

For this study, I used the UCSB Web of Science Core Collection, which includes the databases Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index, Book Citation Index, and Current Chemical Reactions and Index Chemicus.

Table 2. Web of Science search to evaluate the question: **What are the effects of Farm to School Programs on student wellbeing?**

Search string	Restrictions	Returns
(Student$ OR Child* OR Adolescent$ OR "Elementary school*" OR "Middle school*" OR "High school*") AND ("farm to school" OR Farm-to-school OR "farm to school program" OR FTS* OR "locally produced" OR Locally-produced OR Locally-produced OR "locally produced" OR Locally-procured OR "Locally procured" OR "regionally procured" OR Regionally-procured OR "regionally produced" OR Regionally-produced) AND (Health$ OR Academic* OR "academic performance" OR "academic achievement" OR "academic standing" OR "mental health"	Web of Science Core Collection: Science Citation Index Expanded Social Sciences Citation Index Arts & Humanities Citation Index Conference Proceedings Citation Index Book Citation Index Current Chemical Reactions Index Chemicus	631 results Returned 09-08-2021
	Years: 1900-2016	
	Languages: All languages	

OR mental* OR “physical health” OR Physical* OR Well-being OR “well being” OR wellness OR Behavior* OR Emotion*)		

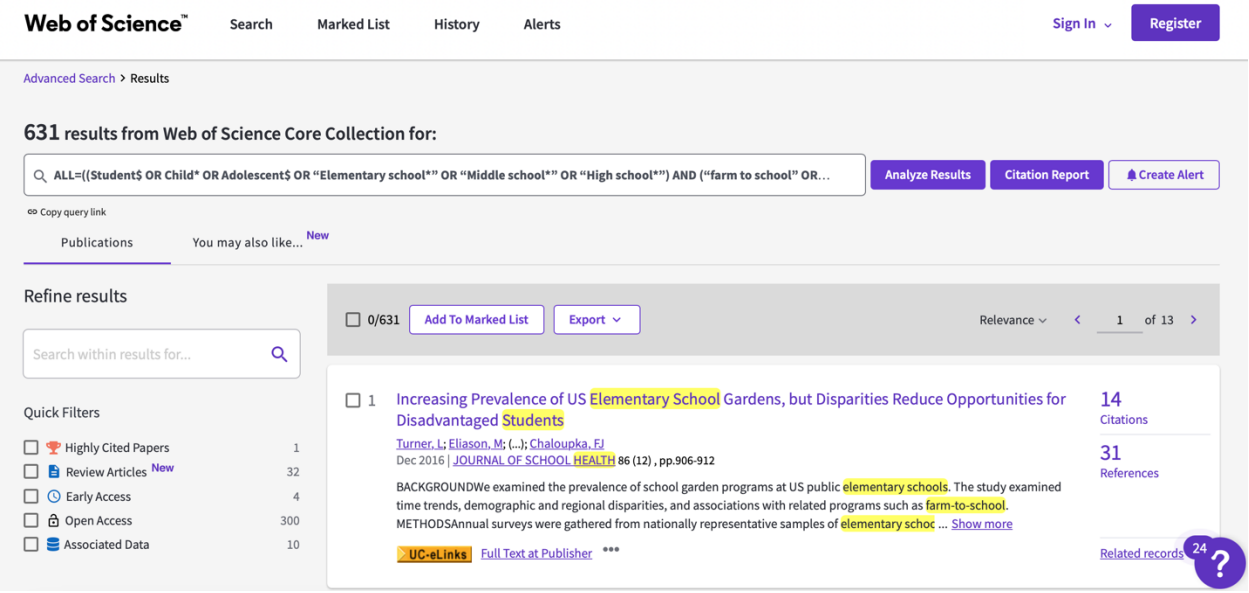

Figure 2: My Web of Science search, which successfully returned relevant studies and a total of 631 returns.

5.3. Search language(s)

All my search terms are in English, meaning the results given are disproportionately English. Because USDA Food and Nutrition Services programs support American students, I think that many reports and studies about Farm to School Programs will be in English as it is the primary language of the U.S. Because Spanish is the next most common language spoken in the U.S., we might reduce bias by expanding our search terms to include Spanish translations of key words. This could be executed by including a Spanish-speaking scientist on a team conducting this review. Otherwise, I acknowledge the fact that conducting this search in only English may limit possible results.

5.4. Websites of relevant organizations and supplementary internet searches

Table 3. Websites to be searched to evaluate the question: **What are the effects of Farm to School Programs on student wellbeing?**

Organization	**URL**	**Language of search terms**
USDA’s FTS	https://www.fns.usda.gov/cfs/farm-school-grant-program (home page)	English

Organization	URL	Language of search terms
	https://www.fns.usda.gov/resources?f%5B0%5D=program%3A9087&f%5B1%5D=resource_type%3A2 (research and report data about Farm to School grant recipients)	
CDC	https://www.cdc.gov/healthyschools/nutrition/school_nutrition_education.htm	English

5.5. Benchmark studies to estimate search comprehensiveness

(a) The following is a benchmark publication for this review's query.

Prescott, M. P. *et al.* Farm to School Activities and Student Outcomes: A Systematic Review. *Advances in Nutrition* **11**, 357–374 (2020).

(b) My benchmark study *was* included in the Web of Science search. I used the following search string to check:

(Student$ OR Child* OR Adolescent$ OR "Elementary school*" OR "Middle school*" OR "High school*") AND ("farm to school" OR Farm-to-school OR "farm to school program" OR FTS* OR "locally produced" OR Locally-produced OR Locally-produced OR "locally procured" OR Locally-procured OR Locally-procured OR "regionally procured" OR Regionally-procured OR "regionally produced" OR Regionally-produced) AND (Health$ OR Academic* OR "academic performance" OR "academic achievement" OR "academic standing" OR "mental health" OR mental* OR "physical health" OR Physical* OR Well-being OR "well being" OR wellness OR Behavior*) AND Prescott

6. Article screening and study eligibility criteria

6.1. Screening process

i.) The title of articles is examined for every article returned to assess for relevance.
ii.) SysRev software is used to categorize relevance of returned studies using the following protocol:
iii.) Articles will initially be categorized using the title. They will be categorized into 3 groups: 1.) include, 2.) exclude, and 3.) maybe include. Once categorized, reviewers will read the abstracts of the studies categorized "include" and "maybe include" to finally determine them as studies to "include" or "exclude."
iv.) To test for consistency among reviewers, give multiple reviewers 20 of the same studies. If they categorize the studies the same, the test demonstrates consistency among reviewers. If they do not return the same categories, the population, intervention, comparator, and outcome definitions will be reviewed and revised for more specificity to better guide reviewers.

6.2. Eligibility criteria applied in screening process

6.2.1. Population (P) criteria

Population criteria requires that the population of the study is represented by U.S. public school students, as they are representatives of traditional Food and Nutrition Services programs and Food and Nutrition

Services programs utilizing FTS grants. Population criteria excludes private school and non-U.S. school food programs to optimize comparative controls.

6.2.2. Intervention (I) criteria

Intervention criteria requires that the intervention of the study is some program funded by and meeting the requirements of USDA FTS grants.

6.2.3. Comparator (C) criteria

Comparator criteria requires that the comparator be a public-school Food and Nutrition Services program that does not or has not received a FTS grant. This includes public school programs before they implanted FTS programming and schools that have never had FTS programming. This excludes private schools and schools outside the U.S. because their Food and Nutrition Services programs are funded differently and have different nutrition requirements from U.S. public schools.

6.2.4. Outcome (O) criteria

Outcome criteria requires that the outcomes represent metrics of student well-being. This is a difficult outcome to define, but metrics that represent academic performance, physical health, behavior, and mental health can all be representative of student well-being.

6.2.5. Study design criteria

The study design criteria requires that the study compare U.S. public school programs with and without FTS programs. This design can be represented with temporal comparison studies (Food and Nutrition Services programs and student well-being before and after implementing FTS programs) and population comparison (schools with FTS programs and schools with conventional Food and Nutrition Services offerings).

6.2.6. Language criteria

Because FTS program grants are allocated to U.S. public schools, only studies in English are included in the systematic review. Because Spanish is the second-most spoken language in the U.S., it may also be included if there is a Spanish-speaking team member(s) to screen for relevant studies with language proficiency. Otherwise, it is excluded.

6.2.7. Tabulated screening criteria

Table 4. Screening criteria to evaluate the question: What are the effects of Farm to School Programs on student wellbeing?

Question elements	**Eligibility criteria**
Population	*Included* Students (in U.S. public school systems) *Excluded*

Question elements	Eligibility criteria
	Non-students, students outside the U.S., private school students (different Food and Nutrition Services funding, procurement, and plate requirements)
Intervention	*Included* FTS-funded programs (including locally/regionally sourced food procured by Food and Nutrition Services departments in cafeterias, experiential nutrition education programs, school garden programs) *Excluded* Private schools, schools outside the U.S., schools without FTS programs
Comparator	*Included* Conventional Food and Nutrition Service program procurement for public school cafeterias; U.S. public schools without FTS programs *Excluded* Private schools, schools outside the U.S.
Outcome	*Included* Student well-being Student health Student mental health Student behavior *Excluded* Outcomes not associated with student well-being
Study design	*Included* Control-intervention studies of schools with/without FTS programs Control-intervention studies of schools before/after implementing FTS programs *Excluded* Non-comparative studies between schools with and without FTS programs
Language	*Included* English

6.3. Documentation of eligibility

I will include a full list of excluded articles (full citations) in this systematic review.

6.4. PRISMA

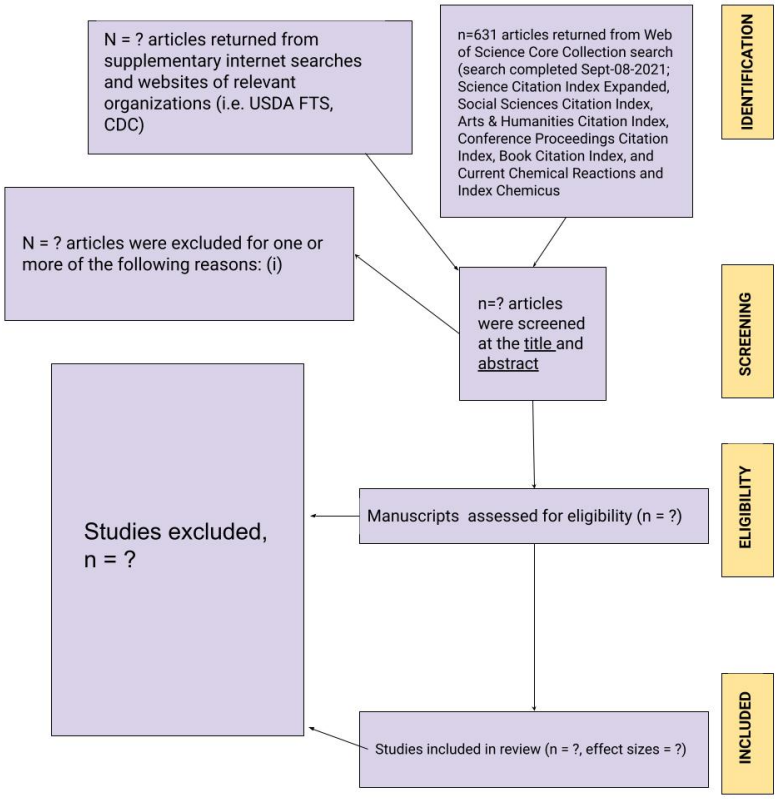

Figure 3: A PRISMA diagram visualizing the screening process where eligibility criteria are applied to returned studies.

7. Data coding and extraction strategy

7.1. Data extraction

i.) In an ideal case, we will read through all the selected the manuscripts and extract the mean and standard deviation provided.

ii.) In cases where the mean and standard deviation have not been calculated for use, we will extract the underlying primary data and find the mean and standard deviations ourselves. I think as more research about FTS programs becomes available, studies without these calculations could be discarded, but for now, more information is valuable, and the effort required to calculate these values will increase the number of eligible studies.

7.2. Potential explanatory variables for heterogeneity among studies

A potential explanatory variable is the cost of living across U.S. states. Because schools across the U.S. receive the same federal reimbursements for school lunches, the amount of locally/regionally produced

food accessible to Food and Nutrition Services programs utilizing FTS grants differs based on cost of living in that region. This is a quantitative variable.

7.3. Data presentation

This review will utilize a forest plot. A forest plot will be helpful for understanding the results of this meta-analysis because it is a neat way to display and compare the Cohen's d, effect size, confidence intervals and weights of each of the studies. By visualizing these, we can better understand and compare the results of the included studies.

8. Competing interests

The author declares no competing interests with the proposed research project.

9. Bibliography Imported from Zotero

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