

Redlined Lunch Rooms

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I. Introduction

Most children in Michigan spend a significant amount of their childhood in the state's public schools system, often this constitutes around thirteen to fourteen years of their lives, even more if they participated in pre-kindergarten programs. So, Michigan public school systems and the schools they manage become an incredibly important point of analysis for understanding the impact of public education on the conditions of Michigan children and their outcomes after high school graduation.¹ Furthermore, the inequality in these differences in conditions and outcomes is highly studied at a national level, especially on the topic of inequitable distributions of power and resources in society, usually along class and racial lines. Beyond just looking at schools themselves, several studies have tried to understand how the wealth of a community that a school serves—and is partly, resourced by—correlates with negative educational outcomes and school conditions.²

This study focuses on an important intersection between Michigan education policy, racial differences in community resources through redlining, and school food environments. School food is potentially one of the many school services that is affected by a common phenomenon: the inadequacies of the resources that a school provides its students tend to be reflected by the wealth inequalities facing the community in which the school is situated. This is supported by strong correlations between neighborhood poverty and student achievement³ as well as historical institutional inequalities in public school funding such as Michigan's public school funding system before 1995 which tied property value to local school funding via property taxes.⁴ Underlying wealth and racial inequalities in these schools and often exacerbating their negative correlations is the historical racist practice of redlining.

A historical indicator of wealth disparities in a community is redlining, a practice where in the 1930s, the U.S. Home Owners Loan Corporation (HOLC) orchestrated a systematic denial of home loans to Black families through racist neighborhood categorization.⁵ So that begs essential questions: where in Michigan has redlining occurred; do wealth disparities still exist in those places; if so, do these disparities measurably affect the school food environment? All of these precursor questions have led up to answering a much more specific question about Michigan schools: are there disparities in school food environments between Michigan public

¹ Roslin Growe and Paula S. Montgomery, "Educational Equity in America: Is Education the Great Equalizer?" *The Professional Educator* 25, no. 2 (2003): 23-29, <http://files.eric.ed.gov/fulltext/EJ842412.pdf>.

² Raj Chetty, Nathaniel Hendren, and Lawrence F. Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review* 106, no. 4 (2016): 855–902, <https://doi.org/10.1257/aer.20150572>

³ Jaap Nieuwenhuis, Tom Kleinepier, Maarten van Ham, "The Role of Exposure to Neighborhood and School Poverty in Understanding Educational Attainment." *Journal of Youth and Adolescence* 50, no. 5: 872–892, <https://doi.org/10.1007/s10964-021-01427-x>; Andy Hegedus, "Evaluating the Relationships Between Poverty and School Performance," *NWEA Research*, October 2018. ERIC Document ED593828, <https://eric.ed.gov/?id=ED593828>.

⁴ Michigan Department of Treasury, *School Finance Reform in Michigan: Proposal A Retrospective*, (Lansing, Michigan: Office of Revenue and Tax Analysis, 2002), 109.

⁵ Anthony Nardone, Joey Chiang, and Jason Corburn, "Historic Redlining and Urban Health Today in U.S. Cities" *Environmental Justice* 13, no. 4 (2020): 109–110, <https://doi.org/10.1089/env.2020.0011>.

schools that serve economically disadvantaged and historically redlined neighborhoods vs. schools that serve non-disadvantaged neighborhoods without a history of redlining?

II. Background and Related Literature

A. Current understandings of the school food environment

First, distinctions need to be made between terms such as “food security,” “school nutrition,” and “school food environments.” The USDA defines food security as “access by all people at all times to enough food for an active, healthy life”⁶ and implies that for a student to be food secure, that student needs to have everyday access to healthy food, even at school. School nutrition refers to the quality of school food, specifically when measured against USDA standards for nutritional density or the level of certain nutrients like sodium, fats, and protein.⁷ A school food environment is more than just a standardized evaluation of food items or just food access, a school food environment “includes both the availability of food items and the school food policies that regulate their accessibility and aim to promote healthy food choices.”⁸ The components contained within this environment include the nutritional standards of school lunch, district policy surrounding school food (i.e. wellness plans), competitive food sources, socio-cultural norms around food healthiness,⁹ “seat time,”¹⁰ and nutrition promotion activities.¹¹ All of these components combined, make up a holistic view of the whole food system or the “healthfulness” of a school food environment and recognize that there is more to quality, healthy eating than just the nutritional density of food items served.

Existing studies have investigated disparities specifically in school nutrition and healthfulness on a national level. For example, a 2020 study looked at 2015 survey data from 1,207 traditional public schools to explore public school lunches after the passage of the Healthy, Hungry-Free Kids Act (HHFKA).¹² Their findings suggested “that there are no disparities in the overall nutritional quality of [National School Lunch Program] lunches by school poverty level or race/ethnicity”¹³ which means that the school food across the U.S. is largely nutritious

⁶ Mark Gibson, "Food Security—A Commentary: What Is It and Why Is It So Complicated?" *Foods* 1, no. 1 (2012): 21, <https://doi.org/10.3390/foods1010018>.

⁷ Bardin, Sarah, Liana Washburn, and Elizabeth Gearan, "Disparities in the Healthfulness of School Food Environments and the Nutritional Quality of School Lunches" *Nutrients* 12, no. 8, 2375 (2020): 1. <https://doi.org/10.3390/nu12082375>

⁸ Bardin et. al., 1

⁹ Siobhan O'Halloran, Gabriel Eksteen, Mekdes Gebremariam, Laura Alston, "Measurement Methods Used to Assess the School Food Environment: A Systematic Review," *International Journal of Environmental Research and Public Health* 17, no. 5, 1623 (2020): 14. <https://doi.org/10.3390/ijerph17051623>.

¹⁰ United States Centers for Disease Control and Prevention, *Making Time for School Lunch*, July 29, 2019, https://www.cdc.gov/healthyschools/nutrition/school_lunch.htm.

¹¹ O'Halloran et. al, "Measurement Methods Used to Assess the School Food Environment: A Systematic Review," 6-15.

¹² Bardin et. al., "Disparities in the Healthfulness of School Food Environments and the Nutritional Quality of School Lunches," 2.

¹³ Bardin et. al., 10.

according to USDA standards. However, the authors also pointed out that food nutrition is different from the “healthfulness” of the school food environment and pointed out some racial differences: majority-Black and majority-Hispanic schools had more “healthful” environments and were more likely to have posted wellness policies.¹⁴ This trend seems counter to expectations regarding the legacy of redlining and will be investigated in this study.

A 2016 study from the CDC’s Preventing Chronic Disease (PCD) journal found contrasting results. Contrary to the aforementioned finding on healthfulness, the authors noted that majority-Black and majority-Latino elementary schools were less likely to offer fresh fruits and that low-SES schools were less likely to offer salad bars.¹⁵ This study reinforced that schools irrespective of racial makeup had similar nutritional quality in their food but reiterated that school lunches are not “equal” in healthfulness across the board. The SES difference in this example is weak due to its use of free and reduced-price lunch students as a proxy for SES determinations,¹⁶ but the statistics still indicate racial differences in school food environments outside of lunch nutrition. These findings in disparity raise questions about the implications of an “unhealthy” school food environment on not only students but also their larger community.

Historically, schools have always been a centerpiece of the community they’re situated in, resourced substantially by and serving that community concurrently. Schools play a role in equipping and empowering youth to make choices that proactively shape their communities. School environments are a change vector for its community through youth development and promoted societal cohesion.¹⁷ When tied in with school food environments, improved food policy choices focused on healthy eating may have more significant positive implications for the community food environment. This can be incredibly important when the neighborhood itself has been historically disinvested.

B. “Redlining” and under-resourced neighborhoods

At the center of neighborhood disinvestment is a 1930’s government agency called the Home Owners Loan Corporation (HOLC). The HOLC engineered residential maps that categorized residential areas on a scale of “best” to “high risk” across several cities in the United States. Historic redlining refers to how these HOLC maps would mark certain residential areas in red as “high risk” or “still hazardous” which would then be used by financial institutions to systematically deny mortgages to residents in those areas.¹⁸ A 2021 American Economic Journal study confirmed that these historically redlined neighborhoods were found to have “significant

¹⁴ Bardin et. al., 9-10.

¹⁵ Lindsey Turner, Punam Ohri-Vachaspati, Lisa Powell, Frank J. Chaloupka, "Improvements and Disparities in Types of Foods and Milk Beverages Offered in Elementary School Lunches, 2006–2007 to 2013–2014," *Preventing Chronic Disease* 13, 150395 (2016): 6, <https://doi.org/10.5888/pcd13.150395>.

¹⁶ Tom Snyder and Lauren Musu-Gillett, *Free or Reduced Price Lunch: A Proxy for Poverty?* National Center for Education Statistics Blog (blog), April 16, 2015. <https://nces.ed.gov/blogs/nces/post/free-or-reduced-price-lunch-a-proxy-for-poverty>.

¹⁷ Charleen Chiong and Loic Menzies, “Can Schools Make Our Society More Cohesive?” *LKMCo* (2016): 3-9. <https://doi.org/10.13140/RG.2.2.33382.88641>.

¹⁸ Nardone et. al., "Historic Redlining and Urban Health Today in U.S. Cities," 110.

and persistent housing disinvestment in the wake of restricted credit access.”¹⁹ Not only were these neighborhoods systematically under-resourced but this grading also had an overt and intentional racial element to it which would place systematic racial barriers to African Americans and immigrant groups purchasing homes.

This study attempts to add to the discourse around pre-existing relationships between these systemic racial barriers and the quality of public school food environments by analyzing existing Michigan schools in areas zoned by HOLC maps. Before the “Proposal A” ballot initiative was passed by Michigan voters in 1995, roughly two-thirds of public school funding was derived from local property taxes which led to severe disparities in per-pupil funding between districts.²⁰ After 1995, Michigan school funding became more equitable but a post-implementation study in 2002 on the Michigan School Aid System found that “the current school finance program [did] nothing to equalize capital” and meant that schools with poor facilities, such as missing or dated kitchens, could sparsely raise funds to improve or replace those facilities.²¹ Since redlined neighborhood residents were denied mortgages and their neighborhoods subsequently divested in by financial institutions, the property taxes used to fund their public schools would be significantly lower and facilities under-resourced along racial lines.

¹⁹ Daniel Aaronson, Daniel Hartley, Bhashkar Mazumder, "The Effects of the 1930s HOLC 'Redlining' Maps." *American Economic Journal: Economic Policy* 13, no. 4 (2021): 357

²⁰ Michigan Department of Treasury, *School Finance Reform in Michigan: Proposal A Retrospective*, 31-36.

²¹ Susanna Loeb and Julie Berry Cullen, “ School Finance Reform in Michigan: Evaluating Proposal A. In *Helping Children Left Behind: State Aid and the Pursuit of Educational Equity*” ed. John Yinger, *Cambridge, MA: MIT Press* (2004): 15-16.

C. The Urgency of this study and the lack of current research on redlining and education

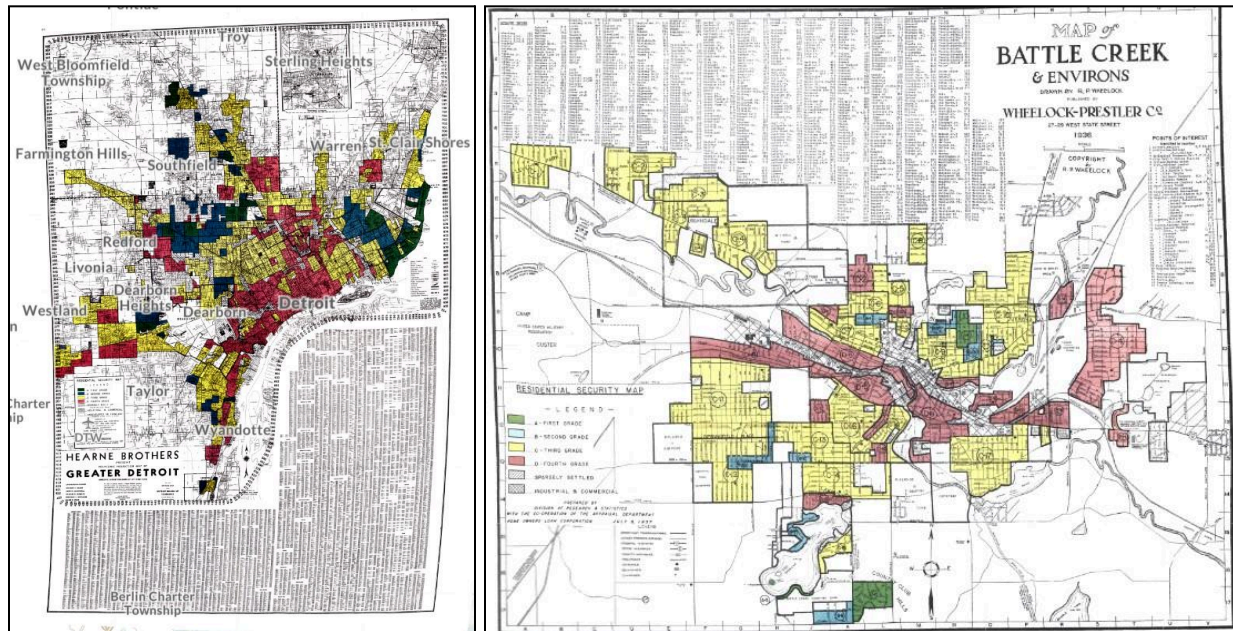


Figure 1.1 HOLC maps from the Richmond Mapping Inequality database.²² [Left] HOLC Map of the City of Detroit and [Right] HOLC Map of the City of Battle Creek.

Eleven different cities across Michigan were redlined by the HOLC in the 1930s. Included in this redlining was not only the act of surveying the cities themselves but also adjacent municipalities and suburbs around the city.²³ In **Figure 1.1**, maps of two of Michigan's cities—Detroit and Battle Creek—indicate how each city was broken up by residential zones and given A-D grades. In Battle Creek, there are two notable zones I want to highlight: D8 and A2. Zone D8 is grade D and notes in the inhabitants section that there is an “infiltration of foreign and negro families.” Zone A2 on the other hand, is marked as a “professional & business” zone with no foreign or Black families and explicitly describes the area as containing the “best people of the city.”²⁴ The racist nature of this mapping in Michigan is flagrantly apparent not only in how the zones were graded but also in the language used by the canvassers.

²² Edward L. Ayers et. al., "Mapping Inequality."

²³ Craig Wesley Carpenter, "Redlining in Michigan: The History and Legacy of Racist Housing Policies," *Michigan State University Extension*, Accessed December 8, 2024, <https://www.canr.msu.edu/redlining/>.

²⁴ Edward L. Ayers et. al., "Mapping Inequality," *American Panorama*, Accessed November 27, 2024, <https://dsl.richmond.edu/panorama/redlining>

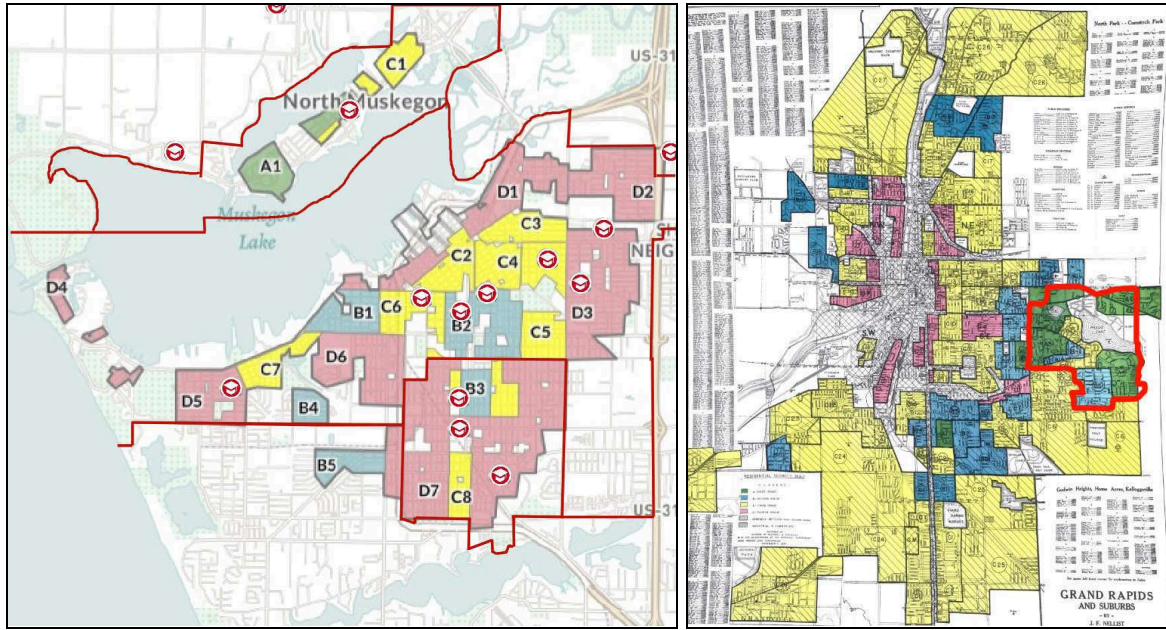


Figure 1.2 HOLC maps from the Richmond Mapping Inequality database.²⁵ [Left] HOLC Map of the City of Muskegon and [Right] HOLC Map of the City of Battle Creek; Both maps have school district boundaries outlined in red; the red icons represent individual schools in the district.

What is not so flagrant about these maps is their close connection to existing public school district boundaries in Michigan. In **Figure 1.2**, HOLC maps of Muskegon and the City of Grand Rapids are annotated with existing school district boundaries. The right map indicates where the East Grand Rapids Public School District is and suggests that most of the greenlined sections of Grand Rapids are within that district. The left map is the City of Muskegon with three districts showing a variable level of grading from very redlined (Muskegon Heights), mixed grading (City of Muskegon Schools District), and greenlined (North Muskegon Public Schools). This study investigates whether these grading differences in districts have a significant effect on schools in these areas.

While there is little existing literature on the connections between redlining and school food environments specifically, there is a growing body of literature that is looking into the connection between redlining and public schooling. *Lukes & Cleveland* (2021) for example draws on a wealth of spatial mapping studies to understand how HOLC mapping correlates with differences in public school financing and student outcomes. Perhaps surprising to what one may expect, *Lukes & Cleveland* found that existing government programs “systematically target and allocate more money to schools in historic HOLC D neighborhoods” to cover up funding shortfalls and that there was no significant difference in learning outcomes by HOLC grade. More alarming, the authors also found that redlined schools tended to be more segregated, have higher rates of Black students, and have higher rates of economically disadvantaged students. I aim to identify these same trends in Michigan schools and use them to explain how

²⁵ Edward L. Ayers et. al., "Mapping Inequality."

disinvestment such as redlining has a direct connection to the school food environment and by extension, youth health.

III. Methodology

A. Systemic Racism as a Fundamental Cause of Food Insecurity

Fundamental Cause Theory (FCT) will be used to first understand why neighborhood resources may affect the quality of a public school. A fundamental cause “embodies a set of flexible resources, and a superior set of resources generates superior results on some outcome”²⁶ such that those who possess the superior set of resources generally obtain the most advantaged outcome. This materializes through “intervening mechanisms” that link low socio-economic status (SES) to negative health outcomes.²⁷ FCT enriches this linkage to be more than just a correlation between state and outcome by arguing that the lack of resources associated with low SES exposes individuals to risk factors that cause negative health outcomes to be reproduced over time even as individual outcomes are addressed.²⁸ In this study, the consumption of unhealthy food or lack consumption of healthy foods is viewed as an intervening mechanism to better understand how economic disadvantage plays a fundamental role in causing food insecurity in underprivileged school children.

To take this framework another step, Jo Phelan and Bruce Link developed an additional article on “Racism as a Fundamental Cause of Health Inequality.” FCT finds its theoretical foundations in the apportionment of societal resources so it is essential to look at this inequality systematically. Namely, Phelan and Link identify that “the broad range and flexibility of the resources that racism provides Whites” systematically reproduces “SES inequalities by race.”²⁹ In comparison to White people, Black people tend to lack access to beneficial social connections that provide links to “job procurement, admission to college, or access to political power holders.”³⁰ Black people also tend to lack freedom over their economic conditions and prestige in society.³¹ This chasm of flexible resources makes it difficult for Black people to identify, prevent, and treat risk factors that lead to health inequalities.³² One such health inequality is food insecurity, which may be reproduced through poor school food environments. Children who do not receive nutritious, fresh food or learn about healthy eating lifestyles are more susceptible to malnutrition. Therefore, one can analyze the question of unequal school food environments under the frame of fundamental cause theory: racism is the fundamental cause that apportions poor education infrastructure and community resources to Black children; school food

²⁶ Jo Phelan and Bruce Link, “Is Racism a Fundamental Cause of Inequalities in Health?” *Annual Review of Sociology* 41 (2015): 314, <https://doi.org/10.1146/annurev-soc-073014-112305>.

²⁷ Phelan and Link, 81.

²⁸ Phelan and Link, 81.

²⁹ Phelan and Link, 315.

³⁰ Phelan and Link, 318.

³¹ Phelan and Link, 318.

³² Phelan and Link, 319–323.

environments are the intervening mechanism that links racism to chronic food insecurity for Black children.

B. HOLC Map Grades and School Categorizations

This study utilized district-level data from several online sources. Eleven Michigan cities were chosen to study, including Muskegon, Grand Rapids, Kalamazoo, Battle Creek, Lansing, Jackson, Bay City, Saginaw, Flint, Pontiac, and Detroit. I chose these cities specifically because these are all the cities in Michigan that have digitized redlining maps through the Richmond Mapping Inequality database.³³ Due to resource and time constraints, the specific Richmond shapefiles in this database were not used, instead, the maps were visually compared against Michigan District Boundary maps and MI School Data coordinates of public schools in Michigan. Only traditional public elementary schools were considered for this study since elementary schools tended to serve smaller geographic areas and were easier to map and maintain consistency in school type over a small sample size.

To identify these schools, I used the historic Home Owners Loan Corporation (HOLC) residential maps. The HOLC shaded each residential zone according to the “ratings” they were given such that grade A (best) areas were green, grade B (still desirable) areas were blue, grade C (definitely declining) areas were yellow, and grade D (hazardous) areas were red.³⁴ Every school district in Michigan where this shading occurred was observed and noted down. Within each of these districts, schools were marked either as “redlined”—the school is in or surrounded by a majority of grade D zones with no grade B or grade A zones nearby—or they were marked as “greenlined”—the school is in or surrounded by a majority of grade A zones with no grade C or grade D zones nearby. For this study, the term “greenlined” was coined to refer to areas that had positive ratings on HOLC maps to recognize schools located in areas where neighborhoods were not beholden to the negative consequences of loan denial and home ownership issues specifically due to HOLC maps.

Schools selected for further analysis were determined by the aforementioned “redlining” and “greenlining” labels and the economic disadvantage of the school. The economic disadvantage of a public school was determined by the MI School Data system which includes information on the number of economically disadvantaged students. This statistic is calculated by aggregating all of the students on free or reduced-price lunch programs in the school that year.³⁵ To further categorize differences in advantage, I subdivide the schools as “low poverty” if the number of economically disadvantaged students is less than 25% and “high poverty” if the number of economically disadvantaged students is more than 75%. If the percentage was between 25-75% the school was labeled as mid-poverty. These thresholds and definitions are

³³ Edward L. Ayers et. al., "Mapping Inequality."

³⁴ Nardone et. al, "Historic Redlining and Urban Health Today in U.S. Cities," 109–119.

³⁵ Michigan Department of Education, *Student Subgroups* (Lansing, MI: MI School Data), Last modified 2020, <https://www.mischooldata.org/Student-Subgroups>.

relatively common in education research and is what the National Center for Education Statistics (NCES) uses.³⁶

Finally, schools that were identified as “greenlined” or “redlined” were further sorted into several categories by their poverty level. For example, schools that were “mid-poverty” where the number of economically disadvantaged students was between 25% and 75% were noted down as redlined mid-poverty or greenlined mid-poverty. While the high-poverty redlined and low-poverty greenlined subgroups are the priority interest of this study, all subgroups have been included as a control to ensure trends hold up not only against HOLC rating but also at the interaction of poverty level.

C. School Categorizations based on HOLC Categories

After comparing the HOLC maps against MI School Data and District line maps, a large number of schools (n=65) were identified. These schools were then categorized based on their poverty level and HOLC status and sorted into low-poverty greenlined (n=7), mid-poverty greenlined (n=11), high-poverty greenlined (n=10), low-poverty redlined (n=0), mid-poverty redlined (n=3), and high-poverty redlined (n=34). No low-poverty redlined schools were identified as most redlined schools had very high rates of economically disadvantaged students. Due to time constraints, a random sample of only ten high-poverty redlined schools was taken out of the initial sample for further analysis.

School food environment data was gathered from several different online sources. The first and most common source of data was each school's website for their district wellness policy, current lunch and breakfast menus, and availability of nutrition resources. Information about fresh food initiatives and program participation were gathered from the US Department of Agriculture Farm to School Census which surveyed School Food Authority (SFA) directors on their school food environment practice at the district level.³⁷ Information regarding districts participation in the “10 cents a day” fresh food program was determined by a grantee report by the Michigan Association of Superintendents & Administrators.³⁸ The remaining data on NSLP, NBP, race statistics, pupil counts, and economic disadvantage rates was sourced from the MI School Data system.

³⁶ Bardin et. al., “Disparities in the Healthfulness of School Food Environments and the Nutritional Quality of School Lunches,” 4-5; U.S. Department of Education, *Concentration of Public School Students Eligible for Free or Reduced-Price Lunch*, Condition of Education, (Washington D.C: National Center for Education Statistics, Institute of Education Sciences) accessed November 26, 2024, <https://nces.ed.gov/programs/coe/indicator/clb>.

³⁷ U.S. Department of Agriculture, *Farm to School Census* (Washington D.C: Food and Nutrition Service, 2023).

³⁸ Megan McManus and Colleen Matts, “10 Cents a Meal 2021-2022 Grantees and Their Counties by MASA Regions” *Michigan Association of Superintendents and Administrators*, November 15, 2023.

IV. Results

A. School Demographics, Disadvantages, and HOLC Categories

The data collected on redlined and greenlined schools revealed some meaningful demographic patterns outlined in **Table 4.1**. Without taking into account economic disadvantage, some generalizations can be made about greenlined and redlined schools: there is not a substantial difference in pupil count between greenlined (average 349 pupils) and redlined (average 355 pupils) schools; greenlined schools have a lower percentage of economically disadvantaged students (average 52.1%) compared to redlined schools (average 84.26%); greenlined schools tend to have less Black students (average 33.51%, median 21.60%) relative to redlined schools (average 52.13%, median 55.60%). Generally, there is no difference in pupil count but there is a substantial difference in economic disadvantage and proportion of Black students.

Table 4.1 School Demographics and Economic Disadvantage by type

Category	Count	Economically Disadvantaged		Pupil Count		% Pupils That Identify as Black	
		Average	Median	Average	Median	Average	Median
All Schools in the Study	42						
All Greenlined Schools	29	52.1%	47.4%	349	346	33.51%	21.60%
All Redlined Schools	13	84.26%	92.00%	355	339	52.13%	55.60%
Greenlined Low-Poverty	7	11.80%	10.7%	294	295	6.68%	6.25%
Greenlined Mid-Poverty	11	43.5%	42.7%	405	388	26.72%	20.80%
Greenlined High-Poverty	10	89.95%	91.40%	326.2	350.5	52.23%	41.90%
Redlined Low-Poverty	0	NA	NA	NA	NA	NA	NA
Redlined Mid-Poverty	3	54.40%	61.00%	370	339	39.20%	48.30%
Redlined High-Poverty	10	93.4%	92.8%	351	348	56.43%	62.90%

While the poverty category is multicollinear with economic disadvantage and cannot yield any statistically valid information, the number of redlined or greenlined schools in each category yields notable differences. First, as previously noted, twenty-four redlined high-poverty schools from the initial sample were excluded from the study due to time constraints. Regardless, of the schools in historically redlined areas, only three were mid-poverty and zero were low-poverty. This skew towards high poverty is not present in greenlined schools of which there is a roughly even distribution between low-poverty (7), mid-poverty (11), and high-poverty (10). Furthermore, the previously identified difference in Black student representation by HOLC

rating is exacerbated by interacting poverty: there is much more Black representation in high-poverty greenlined schools (average 52.23%) vs. low-poverty greenlined schools (average 6.68%). Whatever food environment advantages are offered by going to a greenlined, non-economically-disadvantaged public school are not available to most Black students in Michigan.

B. School Nutrition & Fresh Food Initiatives

Data collected on each school's participation in the 10 Cents a Meal program, participation in the Fresh Fruit and Vegetable Program (FFVP), and whether they had an on-campus garden is displayed in **Table 4.2**. 10 Cents a Meal and FFVP participation was determined at the district level whereas the presence of a school garden was determined on a school-to-school basis. For the FFVP program, none of the low-poverty schools are eligible³⁹ so they have been marked NA in their respective cells.

Table 4.2 School Nutrition & Fresh Food Initiatives by type

Category	10 Cents a Meal Participation	Fresh Fruit and Vegetable Program (FFVP)	School Garden Present
All Greenlined Schools	64.28%	42.86%	17.86%
All Redlined Schools	53.85%	23.08%	30.77%
All Low-Poverty Schools	50.00%	NA	28.57%
All Mid-Poverty Schools	78.57%	50.00%	7.14%
All High-Poverty Schools	50.00%	40.00%	30.00%
Greenlined Low-Poverty	57.14%	NA	14.29%
Greenlined Mid-Poverty	81.82%	36.36%	9.09%
Greenlined High-Poverty	50.00%	60.00%	20.00%
Redlined Low-Poverty	NA	NA	NA
Redlined Mid-Poverty	66.67%	33.34%	0%
Redlined High-Poverty	50.00%	20.00%	40.00%

Certain trends appear when program participation is analyzed at the intersection of poverty level and HOLC rating. There is not a strong linear relationship between poverty level and 10 Cents a Meal and FFVP participation. On the other hand, it appears that greenlined schools are more likely to participate in either program in general (10 cents, 64.28%; FFVP,

³⁹ Michigan Department of Education, *School Nutrition Program: Fresh Fruit and Vegetable Program (FFVP) Important Information*, (Lansing, MI: Office of Nutrition Services, April 8, 2024), <https://www.michigan.gov/mde/Services/food/sntp/fruit-veg/511371>.

42.86%) compared to redlined schools (10 cents, 53.85%; FFPV, 23.08%). When broken down by poverty level and HOLC rating, a more nuanced story is told. Greenlined and redlined high-poverty schools have roughly the same participation in 10 cents a meal (50.00% and 50.00% respectively) and greenlined mid-poverty schools have marginally higher participation in 10 cents a meal (81.82%) compared to mid-poverty redlined schools (66.67%). There is a divergence in FFPV participation, while participation is roughly the same at the mid-poverty level, high-poverty redlined schools have a lower participation rate in FFPV (20.00%) compared to greenlined schools (60.00%). While the significance of this divergence can't be ascertained by this study, it appears that greenlined schools either have the same participation in these programs or higher participation.

C. Food Policies & Nutrition Education

Sampled schools were investigated for their online posted food policies, dietary accommodations, and nutrition information. The findings of this investigation are in **Table 4.3**. All variables in this section are binary and were marked either “yes” if the school had the information available on their website or “no” if the school did not. This means that variables like nutrition labels and the district’s wellness policy were not evaluated for their accuracy or effectiveness respectfully. Furthermore, the “Posted Dietary Accommodations (Health)” variable only considered health accommodations that are required by law. Of the forty-two schools surveyed, not a single school explicitly offered accommodations for lifestyle dietary preferences like vegan or vegetarian diets. Only one school, Charles A. Lindbergh Elementary School, made any religious accommodations which ensured all meat in the lunchroom was halal.

The extreme lack of accommodation for dietary preferences can be well understood through existing Michigan Department of Education (MDE) guidance on dietary accommodations. Specifically, the “Special Diet Statement” form is provided to families that have children with special dietary needs and notes that schools “are not required to accommodate special dietary requests that are not a disability.”⁴⁰ The “Understanding Special Diet Accommodations for Child Nutrition Programs” manual for school food authority (SFA) directors further divides out “dietary preferences” from disabilities, stating that not only do accommodations not have to be made, but if they are made, schools do not have to serve different accommodation items day-to-day and the accommodation does not have to match the food being substituted. The example given is that if lasagna is on the menu then schools could “provide beans and rice instead.”⁴¹ Michigan law suggests that the burden for matching a child’s special preferences, religious or lifestyle, is only on families and not the school.

⁴⁰ Michigan Department of Education, *Special Diet Statement*, (Lansing, MI, July 2022).

⁴¹ Michigan Department of Education, *Understanding Special Diet Accommodations for Child Nutrition Programs: Helping Schools, Sponsors, and Providers Understand Accommodations for Participants Who Request a Special Diet* (Lansing, MI, 2021).

Table 4.3 Food Policies and Nutrition Information

Category	Posted Dietary Accommodations (Health)	Posted Dietary Accommodations (Religious)	Online Menu	Nutrition Labels Posted	Wellness Policy Posted
All Greenlined Schools	67.86%	3.57%	96.43%	78.57%	57.14%
All Redlined Schools	76.92%	0.00%	100.00%	69.23%	92.31%
All Low-Poverty Schools	42.86%	0.00%	100.00%	100.00%	14.29%
All Mid-Poverty Schools	64.29%	7.14%	95.83%	64.29%	57.14%
All High-Poverty Schools	85.00%	0.00%	100.00%	75.00%	95.00%
Greenlined Low-Poverty	42.86%	0.00%	100.00%	100.00%	14.29%
Greenlined Mid-Poverty	63.64%	9.09%	90.91%	72.73%	54.55%
Greenlined High-Poverty	90.00%	0.00%	100.00%	70.00%	90.00%
Redlined Low-Poverty	NA	NA	NA	NA	NA
Redlined Mid-Poverty	66.67%	0.00%	100.00%	33.34%	66.67%
Redlined High-Poverty	80.00%	0.00%	80.00%	80.00%	100.00%

A relatively consistent trend across all schools is that there is a stronger food environment presence on the school's website for increasing poverty levels. First, there seems to be a trend where increasing poverty levels in a school positively correlate with an increasing likelihood that resources for dietary health accommodations are readily available on the school website. This trend, although hard to establish with redlined schools given the lack of data, seems to hold when this analysis is further segmented among HOLC ratings. Cases, where there was no posted guidance, were generally because of a poorly made school website, underdeveloped sections on food & nutrition services, or simply non-existent guidance on dietary accommodations. While slightly unrelated, school wellness policies followed a similar trend where in low-poverty schools the wellness policy was either buried under several web pages or completely inaccessible.

There was not much variation in school menu postings or associated nutrition labels for school lunch meals. Only a single school did not have a posted weekly meal menu online but this is likely due to a website error. Schools for the online menu and nutrition label variables generally fell into two groups: they either used Nutrislice digital menu display software or manually constructed their menus. All schools that used Nutrislice had full nutrition labels for all available food items including sides, beverages, fruits, and vegetables. Schools that self-constructed their menus with images, PDFs, or alternative software tended to have very limited nutrition labels or no nutrition labels at all. This may indicate that advances in school

menu technology (such as Nutrislice) are making this level of nutrition communication more easily accessible to districts.

D. The Eating Environment

Since all but one or two schools had posted lunch menus, the total number of entrees and fruits & vegetables served during lunch was able to be ascertained. This information is expressed in **Table 4.4** which notes down the percentage of schools that had X number (or more) of each lunch item available every day. Generally, there are not differences in variety across HOLC rating as redlined and greenlined schools had similar trends in the 2 entree variety (69.23% and 72.41% respectively), 3 or more entrees (38.46% and 24.14% respectively), and 2 vegetables or fruits (76.92% and 79.31% respectively). Redlined schools had slightly fewer schools that had three or more vegetable and fruit options (45.15%) compared to greenlined schools (62.07%). More consistently, variety dropped with increased levels of poverty in each school. The was inconsistent with the 3 or more entrees variable but held strongly for 2 entrees, 2 vegetables and fruits, and 3 or more vegetables and fruit. When interacting with HOLC rating and poverty level, both of these identified trends hold with greenlined schools but not redlined schools. There may be confounding variables or the generally small sample size that plays a part in the inconsistent results in the redlined cross-sections.

Table 4.4 Lunch item variety

Category	Entree Variety		Fruit and Vegetable Variety	
	2 Entrees	3 or more Entrees	2 Vegetables or Fruits	3 or more Vegetables or Fruits
All Greenlined Schools	72.41%	24.14%	79.31%	62.07%
All Redlined Schools	69.23%	38.46%	76.92%	46.15%
All Low-Poverty Schools	100.00%	14.29%	100.00%	85.71%
All Mid-Poverty Schools	78.57%	0.00%	85.71%	57.14%
All High-Poverty Schools	60.00%	50.00%	70.00%	50.00%
Greenlined Low-Poverty	100.00%	14.29%	100.00%	85.71%
Greenlined Mid-Poverty	80.00%	0.00%	90.00%	70.00%
Greenlined High-Poverty	60.00%	50.00%	60.00%	50.00%
Redlined Low-Poverty	NA	NA	NA	NA
Redlined Mid-Poverty	100.00%	0.00%	66.67%	33.34%
Redlined High-Poverty	60.00%	50.00%	80.00%	50.00%

Statistics from the MI School Data system were gathered to determine how many economically disadvantaged students that were eligible for the National School Lunch Program (NSLP) and by extension, the National School Breakfast Program (NSBP), actually utilized

those resources in school. These findings are expressed in **Table 4.5** and highlight strong patterns between all cross-sections. Redlined schools in this study consistently had higher participation in both NSLP and NSBP (average 87.42% and average 82.48% respectively) compared to greenlined school participation rates (average 74.31% and average 59.55% respectively). Furthermore, there were very strong trends in poverty level where increasing poverty level was matched with an increase in both program participation. When this interacts with HOLC categories, this trend holds for greenlined schools but does not hold for redlined schools. Participation appears the same for redlined mid-poverty (average 86.47%) and redlined high-poverty (average 87.71%) schools. Redlined mid-poverty schools seemed to have the highest NSBP participation (average 90.90%) among all categories. Again, not many conclusions can be made off of the redlined mid-poverty statistic simply due to the lack of a large sample size.

Table 4.5 NSLP / NSBP participation rates

Category	NSLP Participation		NSBP Participation	
	Average	Median	Average	Median
All Greenlined Schools	74.31%	81.00%	59.55%	71.80%
All Redlined Schools	87.42%	85.80%	82.48%	87.10%
All Low-Poverty Schools	41.83%	40.90%	29.70%	15.40%
All Mid-Poverty Schools	80.28%	81.65%	62.02%	73.45%
All High-Poverty Schools	88.41%	89.25%	80.19%	87.45%
Greenlined Low-Poverty	41.83%	40.90%	29.70%	15.40%
Greenlined Mid-Poverty	78.59%	81.00%	54.15%	47.20%
Greenlined High-Poverty	89.10%	91.10%	80.42%	88.75%
Redlined Low-Poverty	NA	NA	NA	NA
Redlined Mid-Poverty	86.47%	82.30%	90.90%	95.10%
Redlined High-Poverty	87.71%	87.40%	79.96%	84.10%

V. Discussion

This research aimed to investigate racial inequalities within Michigan's public school food programs influenced by racist disinvestment and lending practices throughout the 1930s and beyond. While thorough literature exists on racial inequality within the United States public school system, most of this literature does not focus specifically on Michigan's public schools and even less of the current literature is specifically on Michigan's school lunch programs. There is a small amount of existing redlining literature that makes a direct connection between public

education resources and HOLC redlining, for example, *Lukes & Cleveland* (2021) draws connections between HOLC zones and adverse student academic performance. Other parallel research also underscores the importance of neighborhood influence on public schools such as *Nieuwenhuis et. al.* (2021) which found that the wealth of the neighborhood that a student lived in had a significant impact on student achievement and graduation rates. While only indirectly related to redlining practices, a wealth of other studies have drawn lines between the racial makeup of a school and disparities in school food environments.⁴² I aim to align my findings with the intersection of all of these research avenues—education, racial inequalities, school food environments, redlining, and neighborhood wealth—and contribute to a deeper understanding of how public initiatives like the 2010 HHFKA or universal school lunches may have potentially closed some racial disparities in school nutrition but have also neglected to address inequalities in many other aspects of the school food environment across Michigan.

In particular, I found that the food environment disadvantages found in high-poverty schools and disadvantages found in redlined schools often mirrored each other. Redlined schools participated in fresh food programs at a lower rate than greenlined schools and tended to have less variety in fresh fruits and vegetables even when controlling for poverty level. While no association could be made between HOLC rating and entree variety, high-poverty schools had consistently lower entree variety day-to-day. What was most concerning about these disadvantages is the stark and racist fact that the Black population of these schools increased with the poverty level and when the school was historically redlined. Given that of the 37 initially identified redlined schools, only three were mid-poverty and none were low-poverty, there seems to be a very clear-cut resource disparity between redlined and greenlined schools. However, this is not to say that current nutrition and school food programs are necessarily failing impoverished students across Michigan.

Government school lunch programs generally do well at fighting food insecurity in disadvantaged schools and enabling the use of fresh foods. The National School Lunch Program (NSLP) is the main automatic stabilizer for disadvantaged schools. The clear positive trends between NSLP participation rates and the rising poverty level are an indication of this. Additionally, participation in FFPV and 10 Cents a day seems to indicate a level of freshness being injected into Michigan school lunches in disadvantaged schools. However, food being nutritious and fresh does not always mean that it is culturally and preferentially suitable for all children across the state. Baked into the statistics and Michigan law is a clear and undeniable message: food alternatives will only be provided if medically necessary. Children who are vegan, vegetarian, or adhere to a strict religious diet are generally provided only an alternative pre-packaged food item when the main entree(s) of the day are inconsistent with their strict diet needs. Sometimes there is no variation in alternative food items across school days or no alternative at all. This is the unfortunate reality of school children who are not lucky enough to

⁴² Sarah Martinelli et. al., “Improvements in School Food Offerings over Time: Variation by School Characteristics,” *Nutrients*, 15(8), 1868 (2023); Lindsey Turner et. al., “Improvements and Disparities in Types of Foods and Milk Beverages....”; Bardin et. al., “Disparities in the Healthfulness of School Food Environments....”

attend schools in a district like Dearborn where the community has specifically made arrangements for a need like a religious diet.

VI. Study Limitations

This study is limited, not only in scope but also in depth of data gathering of school food environment variables. Time and resource constraints made gathering certain data points difficult or impossible. “Seat time,” an important variable of interest for this study, was hard to determine due to the lack of posted bell schedules; future studies should call schools directly for this information. Additionally, school gardens are hard to reliably identify without calling or visiting the school, and limited news publications and school website articles had to be used for this study. Finally, while schools have posted menus that are often quite detailed, there is not a guarantee that this is what is actually served during the school day or that everything served is on the online menu. Other food environment studies similar to my study tend to use surveys and in-person visits to the school to validate this type of information.

The number of sampled schools in this study is limited and the sampling methods are imperfect. Due to time and technology restraints, proper programmatic identification using the Richmond HOLC shapefiles was not possible and left some variation in my data due to human error. This adds additional variation and error to the data and decreases the precision of the results. Many other studies that use HOLC maps to perform spatial research make more detailed determinations between A-D categories and take into account proximity to polygon borders (i.e. subjects that are on the boundary of a grade A and grade B area). Future studies should use Richmond’s HOLC shapefiles and go into more significant detail when categorizing schools.

Finally, this study has statistical limitations. While the simplicity of the results allows straightforward and surface-level conclusions, it stifles the depth at which schools can be analyzed. Other studies of this type use linear models with fixed effects to integrate the important temporal aspects of public education, housing, neighborhood pricing, and other state-level metrics. For example, this study aims to understand the interactions between HOLC rating and poverty level but would benefit from a more strictly defined empirical model that uses ordinary least squares (OLS) estimates and proper interaction terms.

VII. Conclusion

Discovering inequities in Michigan’s public education system is a critical avenue for unearthing and combatting historical disinvestment like redlining. If left alone, these inequities will continue to persist and widen student food health gaps along racial and poverty lines. It is clear that redlining is a fundamental cause of poor nutrition and food insecurity in black youth, this materializes through under-resourced schools with poor food environments. My study uses a light survey of public schools in Michigan to identify these links and find connections between poverty and poor school food environments. Redlining was found to have some noticeable effect on program participation and food variety as well. However, this study has limitations and is

exploratory into a body of research that is still quite small. Given the ostensible findings and limitations of this study, further research is needed into redlining and school food environments. The insidious legacy of redlining is clear and understood in Michigan schools, what there still is to be understood is how this racist practice continues to affect Michigan youth and cleave disparities in student outcomes across the state.

Work Cited

- Aaronson, Daniel, Daniel Hartley, and Bhash Mazumder. "The Effects of the 1930s HOLC 'Redlining' Maps." *American Economic Journal: Economic Policy* 13, no. 4 (2021): 355-392.
- Bardin, S., Washburn, L., & Gearan, E. "Disparities in the Healthfulness of School Food Environments and the Nutritional Quality of School Lunches." *Nutrients*, 12(8), 2375 (2020). <https://doi.org/10.3390/nu12082375>
- Carpenter, Craig W. "Redlining in Michigan: The History and Legacy of Racist Housing Policies," *Michigan State University Extension*. Accessed December 8, 2024, <https://www.canr.msu.edu/redlining/>.
- Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz. "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment." *American Economic Review* 106, no. 4 (2016): 855–902.
- Chiong, Charleen and Menzies, Loic. "Can Schools Make Our Society More Cohesive?" *LKMCo* (2016): 3-9. <https://doi.org/10.13140/RG.2.2.33382.88641>.
- Gibson, Mark. "Food Security—A Commentary: What Is It and Why Is It So Complicated?" *Foods* 1, no. 1 (2012): 18–27. <https://doi.org/10.3390/foods1010018>.
- Growe, R., and P. Montgomery. "Educational Equity in America: Is Education the Great Equalizer?" *The Professional Educator* 25, no. 2 (2003): 23-29.
- Hegedus, Andy. "Evaluating the Relationships Between Poverty and School Performance." Portland, OR: NWEA, October 2018. ERIC Document ED593828. <https://eric.ed.gov/?id=ED593828>.
- Link, B. G., and J. Phelan. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior*, Spec No (1995): 80-94.
- Loeb, S., & Cullen, J.B. "School finance reform in Michigan: Evaluating Proposal A." eds. J. Yinger & W. Duncombe, *Helping Children Left Behind: State Aid and the Pursuit of Educational Equity*, Cambridge, MA: MIT Press (2004): 215-250.
- Lukes, D., and C. Cleveland. "The Lingering Legacy of Redlining on School Funding, Diversity, and Performance." *Annenberg Institute at Brown University* (EdWorkingPaper, 2021). <https://doi.org/10.26300/qeer-8c25>

McManus, Megan, and Colleen Matts. *10 Cents a Meal 2021-2022 Grantees and Their Counties by MASA Regions*, Michigan Association of Superintendents and Administrators, November 15, 2023.

Michigan Department of Education, *Special Diet Statement*, (Lansing, MI, July 2022).
https://www.michigan.gov/-/media/Project/Websites/mde/Year/2021/05/17/SNP_Special_Dietary_Accommodations_Form__92018.pdf?rev=df23417fd9954baaaa167284fb1fabe.

Michigan Department of Education. *Student Subgroups* (Lansing, MI: MI School Data, 2020)
<https://www.mischooldata.org/Student-Subgroups>.

Michigan Department of Education, *Understanding Special Diet Accommodations for Child Nutrition Programs: Helping Schools, Sponsors, and Providers Understand Accommodations for Participants Who Request a Special Diet* (Lansing, MI, 2021).
https://www.michigan.gov/-/media/Project/Websites/mde/Year/2021/06/22/Special_Diet_Guide_2-2021.pdf?rev=02b0d9a926044908b4fdd0417a9a4837.

Michigan Department of Treasury. *School Finance Reform in Michigan: Proposal A Retrospective*, (Lansing, MI: Office of Revenue and Tax Analysis, 2002): 109.

Nardone, Anthony, Joey Chiang, and Jason Corburn. "Historic Redlining and Urban Health Today in U.S. Cities." *Environmental Justice* 13, no. 4 (2020): 109–119.
<https://doi.org/10.1089/env.2020.0011>.

Nelson, R.K., L. Winling, R. Marciano, N. Connolly, and E.L. Ayers. "Mapping Inequality." *American Panorama*. Accessed November 27, 2024.
<https://dsl.richmond.edu/panorama/redlining>.

Nieuwenhuis, J., Kleinepier, T., and van Ham, M. 2021. "The Role of Exposure to Neighborhood and School Poverty in Understanding Educational Attainment." *Journal of Youth and Adolescence* 50, no. 5: 872–892. <https://doi.org/10.1007/s10964-021-01427-x>.

O'Halloran, S., G. Eksteen, M. Gebremariam, and L. Alston. "Measurement Methods Used to Assess the School Food Environment: A Systematic Review." *International Journal of Environmental Research and Public Health* 17, no. 5 (2020): 1623.
<https://doi.org/10.3390/ijerph17051623>.

- Phelan, J. C., and B. G. Link. "Is Racism a Fundamental Cause of Inequalities in Health?" *Annual Review of Sociology* 41 (2015): 311-330.
<https://doi.org/10.1146/annurev-soc-073014-112305>.
- Snyder, Tom, and Musu-Gillette, Lauren. "Free or Reduced Price Lunch: A Proxy for Poverty?" National Center for Education Statistics Blog (blog), April 16, 2015.
<https://nces.ed.gov/blogs/nces/post/free-or-reduced-price-lunch-a-proxy-for-poverty>.
- Turner, Lindsey, and Ohri-Vachaspati, Punam, and Powell, Lisa, and Chaloupka, Frank J.. "Improvements and Disparities in Types of Foods and Milk Beverages Offered in Elementary School Lunches, 2006–2007 to 2013–2014." *Preventing Chronic Disease* 13 (2016): 150395. <https://doi.org/10.5888/pcd13.150395>.
- U.S. Department of Education. *Concentration of Public School Students Eligible for Free or Reduced-Price Lunch*. Condition of Education. (Washington D.C.: National Center for Education Statistics, Institute of Education Sciences, 2024). Retrieved November 26, 2024, from <https://nces.ed.gov/programs/coe/indicator/clb>.
- U.S. Department of Agriculture, *Farm to School Census* (Washington D.C.: Food and Nutrition Service, 2023).
- United States Centers for Disease Control and Prevention, *Making Time for School Lunch*, July 29, 2019, https://www.cdc.gov/healthyschools/nutrition/school_lunch.htm.