Exploring New York City Summer Meals Before and During the COVID-19 Pandemic: A Natural Experiment with Policy Implications and Recommendations

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Abstract

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Objective. The purpose of this study is to examine the relationship between the COVID-19-related waivers and the number of Summer Food Service Program (SFSP) meals served, accessibility of SFSP sites, and implementation of the SFSP sponsored by the Office of Food and Nutrition Service (OFNS) of the New York City Department of Education (NYC DOE).

Methods. This study is a convergent parallel mixed methods study. In the quantitative component, there are two research questions ("research question 1" and "research question 2"); the design is a non-experimental, one-group, completely within-subjects design; and the unit of analysis is NYC DOE geographic districts (n = 32). Research question 1 is "Among NYC DOE geographic districts, was there a significant difference in the number of SFSP meals served during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?" Research question 2 is "Among NYC DOE geographic districts, was there a significant difference in the accessibility of SFSP sites during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?" Both research questions 1 and 2 compare the first summer of the waivers (2020) to the six summers prior to the waivers (2014-2019) and the second summer of the waivers (2021) to the six summers prior to the waivers (2014-2019). In the qualitative component, there is one research question ("research question 3"); the methods consist of a document analysis of the policy memos for the waivers (n = 8) using the READ approach for document analysis of health policies. Research question 3 is

“What were the intended relationships between the COVID-19-related waivers and SFSP participation, site accessibility, and implementation according to the policy memos for the waivers?”

Data Analysis. For research question 1, the statistical tests are the repeated-measures analysis of variance (ANOVA) omnibus test and post-hoc analysis with Bonferroni adjustment. The primary outcome is the total number of SFSP meals served per student. For research question 2, the statistical tests are the repeated-measures ANOVA omnibus test and post-hoc analysis with the Bonferroni adjustment when the full sample is analyzed ($n = 32$), and the Friedman test and sign test with the Bonferroni adjustment when high poverty districts ($n = 16$), high non-White districts ($n = 16$), and high enrollment districts ($n = 16$) are analyzed. The primary outcome is the number of SFSP sites per 1,000 students. For research question 3, the analysis consists of deductive coding, inductive coding, and identification of themes.

Results. For research question 1, the results show a significant increase in the number of SFSP meals served per student during the first summer of the waivers compared to summers 2016-2019 ($p \leq 0.01$). However, there were no significant differences in the number of SFSP meals served per student during the second summer of the waivers compared to summers 2014-2019. Among the secondary outcomes, there was a significant increase in the number of breakfast meals served in August per student during both the first and second summer of the waivers compared to summers 2014-2019 ($p < 0.05$). For research question 2, the results show a significant decrease in the number of SFSP sites per 1,000 students during the first summer of the waivers compared to summers 2014-2019 ($p < 0.01$). Similarly, there was a significant decrease during the second summer of the waivers compared to summers 2015-2019 ($p < 0.01$). For research question 3, the results show that the Meal Service Time Flexibility Waiver may

address pre-pandemic barriers in the SFSP, but the Parent/Guardian Meal Pickup Waiver may cause implementation issues.

Conclusions. Among NYC DOE geographic districts, the waivers may increase the reach of breakfast meals served in August while decreasing the number of SFSP sites and making SFSP implementation easier. There is a need for a pilot study or more controlled study to establish causal relationships. Policymakers should consider making the Meal Service Time Flexibility Waiver and the Non-Congregate Feeding Waiver permanent flexibilities for summer meal programs.

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Dedication

To my father, my mother, and my brother.

Thank you for everything.

I am blessed to have you.

Chapter 1: Introduction

1.1 Background and Rationale

According to a September 2021 report from the Economic Research Service (ERS) of the United States Department of Agriculture (USDA), the national prevalence rate of household food insecurity was 10.5% in 2020. Although this national prevalence rate was the same as the rate in 2019, the USDA report showed that the COVID-19 pandemic exacerbated pre-pandemic disparities in household food insecurity. From 2019 to 2020, there were statistically significant increases in the prevalence of food insecurity for households with children and households with Black, non-Hispanic householders. Among households with children, the household food insecurity rate increased from 13.6% in 2019 to 14.8% in 2020. Among households with Black, non-Hispanic householders, the household food insecurity rate increased from 19.1% in 2019 to 21.7% in 2020. The report also found that, compared to the 2020 national prevalence rate of 10.5%, the prevalence of household food insecurity in 2020 was significantly greater for households with children (14.8%), households with children younger than six years old (15.3%), households with a single female (27.7%) or male (16.3%) householder, households with a Black, non-Hispanic (21.7%) or Hispanic (17.2%) householder, and households with incomes less than 185% of the federal poverty level (28.6%) (Coleman-Jensen et al., 2021).

To prevent food insecurity, the Food and Nutrition Service (FNS) of the United States Department of Agriculture (USDA) administers child nutrition programs, which provide funding to serve meals to children. These programs include the National School Lunch Program (NSLP), the School Breakfast Program (SBP), the Summer Food Service Program (SFSP), and the Seamless Summer Option (SSO), which serve K-12 students in the United States. Cross-sectional and longitudinal research has shown that participation in these programs is associated with improved food security (Huang & Barnidge, 2016; Huang et al., 2015; Huang et al., 2016; Miller, 2016; Nord & Romig, 2006). Research has also shown other benefits to participation in school meal programs. These include improvements in diet quality (Briefel et al., 2009; Crepinsek et al., 2006; Gearan et al., 2021; Gearan et al., 2020; Harrington et al., 2020; Mansfield & Savaiano, 2017), food purchasing behaviors (Caspi et al., 2017), and academic performance (Kleinman et al., 2002; Murphy et al., 1998). Furthermore, research has shown that school meal programs can improve the effectiveness of food and nutrition education (Harrington et al., 2020; Schaub & Marian, 2011).

However, school closures are a barrier to participation in school meals. Schools are regularly closed during the summer vacation. They have also been closed due to emergencies, including the COVID-19 pandemic. During the summer months, participation in school meals decreases (FNS, 2022a) and food insecurity increases (Huang & Barnidge, 2016; Huang et al., 2015; Huang et al., 2016). This is often referred to as "summer hunger" (Feeding America, n.d.; FRAC, 2019b; No Kid Hungry, 2016). Likewise, during the COVID-19 pandemic, participation in school meals decreased (Connolly et al., 2021; FNS, 2022a; McLoughlin, McCarthy, et al., 2020; Toossi, 2021) and food insecurity increased for households with children (Coleman-Jensen et al., 2021). The literature suggests several barriers to participation in school meals when schools are closed. Many of these barriers are requirements of the programs that operate during the summer and emergencies, i.e., the SFSP and SSO. The barriers include the congregate feeding requirement, which requires meals to be served and consumed in a group setting; the meal time requirement, which requires that certain meal types (breakfast, lunch, supper) are served only at certain times; the parent/guardian pickup requirement, which requires that parents/guardians accompany their children to the meal sites to pick up meals, but the parents/guardians usually cannot obtain a meal at the site to eat with their children; and the area eligibility requirement, which requires that school meal sites are placed in areas where "where 50 percent or more of the children qualify for free or reduced price school meals" (Chiappone et al., 2018; Chrisman & Alnaim, 2021; Connolly et al., 2021; Cullen et al., 2019; FNS, 2013b; Harper et al., 2022; Jabbari et al., 2021; Jowell et al., 2021; Kinsey et al., 2020; Patten et al., 2021; Sather et al., 2021). Furthermore, the treatment of summer meals (i.e., the SFSP and SSO) as poverty programs leads to stigma, which has been identified as a barrier to participation (Litt et al., 2020).

During the COVID-19 pandemic, many requirements of the SFSP and SSO were waived. According to policy memos, the purpose of the waivers was "to support access to nutritious meals while minimizing potential exposure to the novel coronavirus (COVID–19)"(FNS, 2021d, 2021e, 2021f, 2021g). Quantitative analyses showed that participation in school meals decreased during the first spring of the pandemic (Connolly et al., 2021; FRAC, 2021; Kenney et al., 2021; McLoughlin, McCarthy, et al., 2020); however, quantitative analyses have suggested that the decrease in school meal participation during the pandemic would have been larger if not for the waivers (Kinsey et al., 2020; Toossi, 2021). Qualitative analyses have shown that the waivers were appreciated by food service directors/staff and parents (Connolly et al., 2021; Jowell et al., 2021; Patten et al., 2021). A geospatial analysis suggests that physical access to school meals increased during the summer months under the waivers (Jabbari et al., 2021).

Although the waivers were designed for school closures secondary to the pandemic, many of the waivers could be applied to school closures secondary to the summer vacation. However, there are gaps in the literature on the relationship between the COVID-19-related waivers and summer meal participation. These waivers represent factors that may be associated with participation in summer meals and accessibility of summer meals. To the author's knowledge, there is no peer-reviewed quantitative analysis focused on the number of school meals served during the summer under the COVID-19-related waivers. There is one qualitative study conducted from June 2020 to August 2020 in San Joaquin Valley, California with school district stakeholders and parents on participation in school meals during the pandemic (Jowell et al., 2021); however, this study was not focused on the relationship between the waivers and summer meals. There is only one geospatial analysis of meal sites in summer 2019 and summer 2020, and this analysis was conducted in St. Louis, Missouri (Jabbari et al., 2021).

To help fill the gaps in the literature, this study is a convergent parallel mixed methods study on the relationship between the COVID-19-related waivers and the number of SFSP meals served, accessibility of SFSP sites, and implementation of the SFSP sponsored by the Office of Food and Nutrition Services (OFNS) of the New York City Department of Education (NYC DOE). The OFNS is a school food authority (SFA) that serves the public school system in New York City (NYC). The quantitative methods include a quantitative analysis of the number of SFSP meals served and the accessibility of SFSP sites, and the qualitative method follows the case study qualitative approach (Creswell & Poth, 2016).

1.2 Purpose of the Study

The purpose of this study is to examine the relationship between the COVID-19-related waivers and the number of SFSP meals served, accessibility of SFSP sites, and implementation of the SFSP sponsored by the OFNS. A convergent parallel mixed methods study will be conducted to compare the findings from quantitative and qualitative methods. In the quantitative component, quantitative data will be used to test if there was a difference in the number of SFSP meals served and the accessibility of SFSP sites during the summers under the COVID-19-related waivers compared to the summers without the waivers. In the qualitative component, qualitative data will be used to explore the intended relationships between the COVID-19-related waivers and SFSP participation, site accessibility, and implementation. These components will be included to allow comparison and triangulation of the findings from the quantitative and qualitative analyses, and thereby, obtain a more comprehensive understanding of the relationship between the COVID-19-related waivers and the number of SFSP meals served, SFSP site accessibility, and SFSP implementation. Furthermore, triangulation of the findings will be used to generate hypotheses about the impact of the COVID-19-related waivers on SFSP participation, site accessibility, and implementation.

1.3 Research Questions

1. Among NYC DOE geographic districts, was there a significant difference in the number of SFSP meals served during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

2. Among NYC DOE geographic districts, was there a significant difference in the accessibility of SFSP sites during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

3. What were the intended relationships between the COVID-19-related waivers and SFSP participation, site accessibility, and implementation according to the policy memos for the waivers?

1.4 Significance and Implications

The findings from this mixed methods study can help us obtain an understanding of the impact of the COVID-19-related waivers on summer meal programs. This can help inform policy decisions about summer meal programs aimed to increase participation and decrease summer hunger, summer weight gain, and summer learning loss. These terms describe different but related outcomes observed among students during the summer break in the United States: summer hunger refers to decreased participation in school meals and increased food insecurity (Feeding America, n.d.; FRAC, 2019b; No Kid Hungry, 2016), summer weight gain refers to excess weight gain (FRAC, 2019c; Tanskey et al., 2018; Weaver et al., 2019), and summer learning loss refers to the loss of knowledge and skills acquired during the school year (Alexander et al., 2016; FRAC, 2019c). Summer hunger may be related to summer weight gain and summer learning loss since food insecurity has been associated with increased risk of excess weight (Pourmotabbed et al., 2020) and lower academic performance among students (Shankar et al., 2017). Furthermore, these outcomes disproportionately impact Black children, Hispanic children, and children from low-income households (Cooper et al., 1996; Tanskey et al., 2018). Summer meal programs have been described as a strategy that can decrease summer hunger, weight gain, and learning loss (Orovecz et al., 2015). However, participation in these programs is low (FRAC, 2019a, 2020); therefore, it is important to determine policies that can increase participation.

1.5 Scope and Delimitations

The focus of this study is one sponsor of the SFSP: the OFNS, which serves the NYC DOE. This study includes sites operated by the OFNS under eight summers: summer 2014, summer 2015, summer 2016, summer 2017, summer 2018, summer 2019, summer 2020, and summer 2021. The COVID-19-related waivers were implemented in summers 2020 and 2021. The findings from this study may not be generalizable to other sponsors, including sponsors that are not SFAs and sponsors that serve non-CEP districts, non-public schools, non-urban school districts, and school districts in areas characterized by demographics different from NYC. Also, the findings from this study may not be generalizable to summers other than summers 2014-2021. Furthermore, since different sponsors of the SFSP may have implemented different waivers, the findings of this study are limited to the specific combination of waivers adopted by the OFNS.

1.6 Definition of Terms

USDA: United States Department of Agriculture.

FNS: Food and Nutrition Service.

SFSP: Summer Food Service Program.

SFA: School Food Authority.

OFNS: Office of Food and Nutrition Services.

NYC DOE: New York City Department of Education.

Chapter 2: Literature Review

2.1 Background on School Meals in the United States

This section provides a background on school meal programs in the United States. It includes subsections on the importance of school meals, the different school meal programs, and the changes that occurred to school meals during the COVID-19 pandemic.

2.1.1 Importance of School Meals

In the United States, children and adolescents are required to attend school, where they spend approximately six hours each day for 180 days out of the year (CDC, 2021; NCES, 2017, 2020). These hours contain two meal opportunities: breakfast and lunch. Research has shown that school breakfast and school lunch can account for approximately half of a student's total daily energy intake (Cullen & Chen, 2017). Because school meals can reach many students and account for a substantial proportion of their dietary intake, they represent an opportunity to promote food security, provide food and nutrition education, and influence the health and academic performance of tens of millions of US children and adolescents.

School meal programs in the United States were developed to address food insecurity and malnutrition. In 1932, as part of President Roosevelt's New Deal Programs, the federal government began providing funding for school meal programs to address malnutrition in the United States, which had experienced increased rates of malnutrition secondary to the Great Depression. This was framed as a national security issue since malnourished Americans would not be fit to serve in the army (Schaub & Marian, 2011). In 1946, the federal government passed the National School Lunch Act, which created the National School Lunch Program (NSLP) (FNS, 2019b). The purpose of the program was stated in the Act as follows:

> It is hereby declared to be the policy of Congress, as a measure of national security, to safeguard the health and well-being of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities and other food, by assisting the States, through grants-in-aid and other means, in providing an adequate supply of foods and other facilities for the establishment, maintenance, operation, and expansion of nonprofit school lunch programs (FNS, 2019d).

Similarly, to improve access to breakfast, the School Breakfast Program (SBP) was piloted in 1966 and became a permanent program in 1975 (Basch, 2011; FNS, 2017; Kennedy & Davis, 1998). To address the increased food insecurity during the summer months when school is out, the Summer Food Service Program (SFSP) was also established in 1975 (Hopkins & Gunther, 2015; Turner & Calvert, 2019). Collectively, these programs are referred to by the US government as "federally assisted meal programs" (FNS, 2017, 2019b, 2019f) and "child nutrition programs"(ERS, 2020). Cross-sectional and longitudinal studies have shown that these programs are associated with improved food security (Huang & Barnidge, 2016; Huang et al., 2015; Huang et al., 2016; Miller, 2016; Nord & Romig, 2006).

School meals can be incorporated into a food and nutrition education curriculum. According to Contento & Koch (2020), the definition of nutrition education is as follows:

> [A]ny combination of educational strategies, accompanied by environmental supports, designed to motivate and facilitate voluntary adoption of food choices and other food- and nutrition-related behaviors conducive to health and well-being; it is delivered through multiple venues, involving activities at the individual, institutional, community, and policy and social system levels through collaborations, that support healthful choices (Contento & Koch, 2020).

School meals are an “environmental support,” which is a necessary component of successful nutrition education (Contento & Koch, 2020). To provide this support, it is recommended that nutrition educators and schools work together to align school meals with the food choices and food- and nutrition-related behaviors promoted by the food and nutrition education curriculum (Contento & Koch, 2020). Research has shown that nutrition education is more effective in decreasing the incidence of obesity when it is combined with healthy school meals and changes to the school food environment (Schaub & Marian, 2011). A study on the SFSP found increased intention to consume fruits and vegetables and increased self-reported fruit and vegetable consumption when the SFSP meals were combined with nutrition education (Harrington et al., 2020). Interestingly, the 1932 New Deal Programs provided federal funding for both school meals and nutrition education. However, the 1946 National School Lunch Act dropped federal funding for nutrition education, passing the responsibility of nutrition education funding to state governments (Schaub & Marian, 2011).

School meals can improve the health and academic performance of students. Research has shown positive associations between school meal participation and diet quality (Briefel et al., 2009; Crepinsek et al., 2006; Gearan et al., 2021; Gearan et al., 2020; Harrington et al., 2020; Mansfield & Savaiano, 2017). The findings on the association between school meal participation and BMI have been mixed (Bardin & Gola, 2020; Baxter et al., 2010; Gleason & Dodd, 2009; Hernandez et al., 2011; Kohn et al., 2014; Paxton et al., 2012; Peterson, 2014); however, most of these studies were cross-sectional and examined school meals prior to the implementation of the improved nutrition standards in the Healthy, Hunger-Free Kids Act (HHFKA) of 2010. Recently, school meal programs have added obesity prevention to their founding goal of improving food security (Kennedy & Guthrie, 2016). Other research has shown associations between school meal participation and healthier food purchasing behaviors (Caspi et al., 2017). Longitudinal studies have shown positive associations between school meal participation and various academic or academic-related outcomes, including attendance, math grades, and behavior (Kleinman et al., 2002; Murphy et al., 1998).

In summary, school meal programs are associated with improvements in food security, nutrition education effectiveness, health, and academic performance. Therefore, it is important to promote participation in these programs and understand the factors associated with participation.

2.1.2 School Meal Programs in the United States

There are four school meal programs for breakfast and/or lunch for K-12 students in the United States. These programs are the NSLP, SBP, SFSP, and the Seamless Summer Option (SSO). All four programs are administered by the Food and Nutrition Service (FNS) of the United States Department of Agriculture (USDA) and by state agencies, and all four programs are congregate feeding programs, i.e., they are required to serve meals in a congregate or group setting, and participants are required to consume the meals "on-site" in that setting (FNS, 2013b, 2022d). This subsection will provide a description of these programs.

2.1.2.1 The National School Lunch Program. The NSLP provides funding for the service of school lunch and afterschool snacks during the school year, including summer school. The program can be sponsored by school food authorities (SFAs), who operate the program in public schools, non-profit private schools, and residential child care institutions (RCCIs). Meals must be served on-site at these schools and RCCIs. Students enrolled at the schools and individuals younger than 21 years at RCCIs can participate in the program (ERS, 2022; FNS, 2013b, 2019b).

The cost of a NSLP meal to the participants is based on their household income: (1) free for participants from households with incomes less than or equal to 130% of the federal poverty level, (2) reduced price for participants from households with incomes between 130-185% of the federal poverty level, and (3) full price for participants from households with incomes greater than 185% of the federal poverty level. “Free and reduced-price lunch” (FRPL) refers to school lunches received for free or at a reduced price, while “paid lunch” refers to school lunches received at full price. FRPL-eligible refers to students who qualify for FRPL based on their household income. SFAs receive reimbursement from the NSLP for every NSLP meal they served, and the reimbursement rate differs depending on whether the meal was a lunch or snack and whether the meal was a paid, free, or reduced-price meal. Free meals are reimbursed at the highest rate, followed by reduced-price meals, then paid meals (ERS, 2022; FNS, 2013b, 2019b). This process requires the collection of household applications. In 2010, the HHFKA established the Community Eligibility Provision (CEP), which “allows high-poverty schools to offer free meals to all students” (ERS, 2022) and eliminates the need to collect household applications (FNS, 2019a). High-poverty schools refers to schools or school districts where at least 40% of the students are “identified students.” Identified students refers to students who are homeless, migrants, foster children, or Head Start participants, or who come from households that participate in other assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), the Food Distribution Program on Indian Reservations (FDPIR), and Medicaid (Hunger Solutions New York, n.d.).

To receive reimbursement, SFAs must provide meals that meet federal nutrition standards, referred to as “meal pattern requirements”(FNS, 2013b). These requirements were last updated by the HHFKA of 2010 (ERS, 2022). The requirements include minimum weekly and daily amounts (in cups or ounce equivalents) of food from each of the following five food components: fruits, vegetables, grains, meats/meat alternates, and fluid milk. The requirements also include a minimum and maximum amount of calories for meals, a weekly requirement for whole grains, and maximum daily amounts for saturated fat, sodium, and trans-fat. These requirements vary based on the grade level of students, except for saturated and trans-fat that have the same maximum for all grade levels (FNS, 2022b). For a reimbursable meal, participants must select an item from each of the five food components. A food component refers to a food group in the meal pattern requirements, such as fruits; a food item refers to a food within a food component, such as apples and bananas, which are two items within the fruit component. If an SFA opts for Offer Versus Serve (OVS), then the SFA must offer items from each of the five food components, but for reimbursement, individual students only need to select, or be served, items from three of the five components, and one of the items must be from the fruit or vegetable component. SFAs must use OVS for lunches served at senior high schools (FNS, 2015b, 2019c). According to findings from the School Nutrition Dietary Assessment Study-IV (SNDA-IV), OVS is also used for lunches served at most elementary schools (69%) and middle schools (77%) (Fox & Condon, 2012).

Participation in the NSLP is usually highest compared to the other school meal programs described in this section. In 2019, the average number of participants per day was 29.6 million, and the total number of lunches served was 4.9 billion (FNS, 2022a). In 2020, participation decreased due to the COVID-19 pandemic (ERS, 2022): the average number of participants per day was 22.4 million, and the total number of lunches served was 3.2 billion (FNS, 2022a).

2.1.2.2 The School Breakfast Program. The SBP provides funding for the service of school breakfast during the school year, including summer school. Like the NSLP, the program can be sponsored by SFAs, and the participants can be students at schools and individuals younger than 21 years at RCCIs. Also, like the NSLP, the cost of a SBP meal to the participants is based on their household income unless the school or district participates in the CEP, and SFAs must provide meals that meet the meal pattern requirements updated by the HHFKA of 2010 (ERS, 2021a; FNS, 2013b, 2017).

Unlike the NSLP, the SBP allows “alternative breakfast service models” in addition to the “traditional, cafeteria-based model.” The alternative models are as follows: (1) “Breakfast in the Classroom” (BIC), which serves breakfast to students in the classroom, and (2) “Grab & Go Breakfast,” which serves to-go breakfasts to students at school for consumption before class or during breaks (FNS, 2017). In both models, breakfast is served and consumed on-site. For a reimbursable meal, participants must select an item from each of the following three components: fruit, grains, and fluid milk. If an SFA opts into OVS, then the SFA must offer at least four items and at least one item from each of the three components, but for reimbursement, participants only need to select three items, and one of the items must be from the fruit component or, if offered, the vegetable component (FNS, 2015b).

Participation in the SBP is usually second highest compared to the other school meal programs described in this section. In 2019, the average number of participants per day was 14.8 million, and the total number of breakfasts served was 2.5 billion (FNS, 2022a). In 2020, participation decreased due to the COVID-19 pandemic (ERS, 2021a): the average number of participants per day was 12.3 million, and the total number of breakfasts served was 1.8 billion (FNS, 2022a).

2.1.2.3 The Summer Food Service Program. The SFSP provides funding for the service of breakfast, lunch, supper, and snacks during the summer vacation, emergency-related school closures, and, for year-round schools, vacations longer than 14 days. Unlike the NSLP and SBP, the SFSP can be sponsored by not only SFAs but also “Local government agencies, Private non-profit organizations, Universities or Colleges, [and] Community & faith-based organizations” (FNS, 2013b). Meals must be served on-site at any of the following locations: “Schools, Camps, Churches, Community Centers, Housing Projects, Libraries, Migrant Centers, Parks, Playgrounds, Pools, and Other public sites where children gather” (FNS, 2013b). For example, when an SFA participates in the SFSP, they can serve meals at sites other schools and RCCIs, such as parks. The participants can be anyone aged 18 years or younger and anyone with physical or mental disabilities aged 19 years or older (ERS, 2021b; FNS, 2013b, 2019f); these participants will be referred to as “eligible participants.”

Unlike the NSLP and SBP, the cost of a SFSP meal to participants is always free. The SFSP was developed to fund meals served at sites in “low-income areas” (FNS, 2019f). There are four types of sites in the SFSP: open sites, closed enrolled sites, migrant sites, and camps (FNS, 2013b; GAO, 2018). Open sites serve all eligible participants, i.e., they are open to all. To operate an open site, sponsors must establish area eligibility, i.e., they must operate “in the attendance area of a school or in a geographic area defined by census data where 50 percent or more of the children qualify for free or reduced price school meals” (FNS, 2013b). Closed enrolled sites serve eligible participants who are enrolled at the site, i.e., they are closed to anyone not enrolled at the site. To operate a closed enrolled site, sponsors must show either area eligibility or that at least 50% of the enrolled participants are eligible for FRPL (FNS, 2013b; GAO, 2018). Migrant sites serve “children of migrant farm workers” (FNS, 2013b). To operate a migrant site, sponsors must show that they are certified by a “migrant organization.” Camps serve children enrolled at the camps. At camps, sponsors are only reimbursed for meals served to children who qualify for FRPL. At the other sites, sponsors receive reimbursement at the free rate for all participants. The reimbursement rate of the SFSP is higher than that of the NSLP and SBP. Sponsors may serve up to two reimbursable meals at open sites and closed enrolled sites and up to three reimbursable meals at migrant sites and camps (FNS, 2013b; GAO, 2018).

Like the NSLP and SBP, sponsors must provide meals that meet meal pattern requirements. However, unlike the NSLP and SBP, the SFSP meal pattern requirements were not updated by the HHFKA of 2010. The SFSP meal pattern requirements were last updated in 2000 (Hopkins & Gunther, 2015). In the SFSP, there are four food components: fruits/vegetables, grains, meats/meat alternates, and milk. To receive reimbursement for breakfast, participants must select an item from each of the following three food components: fruit/vegetable, grains, and milk. If a sponsor opts into OVS, then the sponsor must offer at least four items and at least one item from each of the three components, but for reimbursement, participants only need to select three items and do not need to select an item from each of the three components. To receive reimbursement for lunch, participants must select an item from each of the four food components in the SFSP. If a sponsor opts into OVS, then the sponsor must offer at least five items and at least one item from each of the four components, but for reimbursement, participants only need to select items from three out of the four components. Notably, SFA sponsors of the SFSP may decide to adhere to the NSLP/SBP meal pattern requirements. This is allowed; however, in this case, if the SFAs opt into OVS, they are required to adhere to the OVS requirements for the NSLP/SBP (FNS, 2015a, 2019e).

Participation in the SFSP is considerably lower than participation in the NSLP and SBP. In 2019, the total number of all meal types (breakfast, lunch, supper, snack) served through the SFSP was 142 million (FNS, 2022a). In 2020, the number of SFSP meals served increased substantially due to the COVID-19 pandemic, during which schools were allowed to operate the SFSP throughout the year (ERS, 2021b): the total number of meals served increased to 1.3 billion (FNS, 2022a).

To compare participation in the SFSP relative to participation in the NSLP, "summer uptake rate" is used, which is calculated as follows: the average daily participation (ADP) in lunch in July divided by the ADP in FRPL from May to September, which is then multiplied by 100 to obtain a percentage. ADP is calculated as the total number of lunches served divided by the total number of days of service (FRAC, 2019a, 2020; Turner & Calvert, 2019). In 2017, the summer uptake rate was 15.1% (FRAC, 2019a). In 2018, the summer uptake rate decreased to 14.1% (FRAC, 2020).

Reports have been released on the low participation in the SFSP. The reports include recommendations to improve (1) the tracking of participation and (2) participation rates.

In 2018, the Government Accountability Office (GAO) released a report titled "SUMMER MEALS: Actions Needed to Improve Participation Estimates and Address Program Challenges." The report made a recommendation to FNS to improve the methods used to estimate participation. FNS requires that (1) ADP should be calculated for July only, (2) ADP should be calculated at the site level, then all site ADPs for each sponsor should be added together to obtain the sponsor ADP, and all sponsor ADPs should be added together to obtain the state ADP, and (3) ADP should be calculated for the "primary" meal served at the site, where "primary" refers to the meal type served most often, such as lunch. The GAO report stated that this method is "unreliable" because the site-to-site variations in days of service are not accounted for when adding the ADPs to obtain sponsor ADP and state ADP. The report also stated that this method may “underestimate” participation because some states have higher participation numbers in summer months other than July (GAO, 2018).

The 2018 GAO report also made a recommendation to FNS to address challenges in implementation and participation in the SFSP. These challenges were identified through interviews with states and SFSP sponsors and site operators. The challenges identified by the report were as follows: (1) there is a limited availability of meal sites and transportation options in rural areas, (2) there is limited access to sites for eligible participants in areas that do not meet the area eligibility requirement, (3) the number of days of service at many sites is low, (4) there is limited awareness of the SFSP among families, (5) participants are not attracted to meal sites for several reasons, including the menu, the meal times, lack of other activities at the site, and stigma, (6) there are limited funds and staff for the SFSP, (7) there are challenges with finding safe meal sites, and (8) there is duplicative paperwork for sponsors who provide meals through multiple child nutrition programs (GAO, 2018).

In 2019, the Food Research and Action Center (FRAC) released its “Hunger Doesn’t Take a Vacation: Summer Nutrition Status Report.” The report made several federal recommendations to increase participation, including expanding the area eligibility to include areas where at least 40% of children qualify for FRPL, increasing the number of types of meals that can be served by sites from two meals to three meals, and providing funding for transportation of children to SFSP sites (FRAC, 2019a).

2.1.2.4 The Seamless Summer Option. The SSO allows SFAs to continue to operate the NSLP and SBP during the summer. The program was established in 2001. The purpose of the program is to decrease the paperwork for SFAs in the NSLP and SBP and thereby, encourage these SFAs to provide summer meals, including breakfast, lunch, supper, and snacks. The only differences between the SSO and SFSP are (1) the eligible participants, (2) the reimbursement rate, and (3) the meal pattern requirements. The eligible participants and the meal pattern requirements are the same between the SSO and the NSLP/SBP. The reimbursement rate is the same as the free rate for the NSLP/SBP (FNS, 2013a, 2013b, 2013d).

2.1.3 School Meals during COVID-19

In March 2020, schools in the United States closed due to the COVID-19 pandemic; this presented several barriers to school meal service and participation. In the same month, the Families First Coronavirus Response Act gave permission to the USDA to issue waivers for child nutrition programs to help overcome COVID-19-related barriers to school meal service and participation. These barriers included the school closures, social distancing requirements, and supply chain issues. The FNS of the USDA responded by issuing several waivers and flexibilities, which waived some of the requirements of the child nutrition programs to facilitate school meal service and participation. If a state agency wanted to use a waiver, they were required to notify their USDA Regional Office (FNS, 2021b, 2021c; Kinsey et al., 2020; No Kid Hungry, 2021b). Table 1 contains a list and description of the waivers issued up to October 25, 2021 that involve the SFSP or SSO (extensions not included); this table was adapted from No Kid Hungry, a campaign from Share Our Strength (No Kid Hungry, 2021b). Each waiver/flexibility was issued as a “COVID-19 Child Nutrition Response” and was given a number. All the waivers are set to expire on June 30, 2022 (FNS, 2021b, 2021c; Kinsey et al., 2020; No Kid Hungry, 2021b).

Table 1: COVID-19 Child Nutrition Responses Involving the SFSP/SSO

Waiver Number	Waiver Name	Description	Date First Issued
COVID-19: Child Nutrition Response #1	Nationwide Waiver to Allow Meal Service Time Flexibility in the Child Nutrition Programs	Waived the requirement to serve certain meal types at certain times. Allowed service of multiple meal types at once.	3/20/2020
COVID-19: Child Nutrition Response #2	Nationwide Waiver to Allow Non-congregate Feeding in the Child Nutrition Programs	Waived the congregate feeding requirement. Allowed grab-and-go meals.	3/20/2020
COVID-19: Child Nutrition Response #4	Nationwide Waiver to Allow Meal Pattern Flexibility in the Child Nutrition Programs	Waived the meal pattern requirements for reimbursement.	3/25/2020
COVID-19: Child Nutrition Response #5	Nationwide Waiver to Allow Parents and Guardians to Pick Up Meals for Children	Waived the requirement for parents and guardians to bring their children to pick up meals.	3/25/2020
COVID-19: Child Nutrition Response #9	Nationwide Waiver of Onsite Monitoring Requirements in the School Meals Programs	Waived the requirement for state agencies and SFAs to conduct on-site monitoring visits for the SSO.	3/27/2020
COVID-19: Child Nutrition Response #10	Nationwide Waiver of Onsite Monitoring Requirements for SFSP Sponsoring Organizations	Waived the requirement for sponsors to conduct on-site monitoring visits during the first four weeks of site operation.	3/27/2020
COVID-19: Child Nutrition Response #11	Nationwide Waiver of Onsite Monitoring Requirements for SFSP State Agencies	Waived the requirement for state agencies to conduct on-site monitoring visits.	3/27/2020
COVID-19: Child Nutrition Response #12	Nationwide Waiver of 60 Day Reporting Requirements for January and February 2020	Extended the deadline for meal claims.	4/1/2020

Waiver Number	Waiver Name	Description	Date First Issued
COVID-19: Child Nutrition Response #14	Nationwide Waiver to Allow Area Eligibility for Closed Enrolled Sites in the SFSP and SSO	Waived the requirement for closed enrolled sites to collect income applications to show eligibility.	4/21/2020
COVID-19: Child Nutrition Response #15	Nationwide Waiver of First Week Site Visits in the SFSP	Waived the requirement for sponsors in good standing to conduct on-site visits of sites that operated the SFSP successfully in the past year.	4/21/2020
COVID-19: Child Nutrition Response #16	Nationwide Waiver to Allow Offer Versus Serve Flexibilities in the SFSP	Waived the requirement for SFAs to adhere to the OVS requirements for the NSLP/SBP.	4/21/2020
COVID-19: Child Nutrition Response #17	Nationwide Waiver of Meal Service Time Restrictions in the SFSP and SSO	Waived requirements for meal service start and end times and meal service duration.	4/21/2020
COVID-19: Child Nutrition Response #19	Nationwide Waiver of Food Service Management Contract Duration in the NSLP and SFSP	Extended the contract duration limits.	4/24/2020
COVID-19: Child Nutrition Response #21	Nationwide Waiver to Extend Unanticipated School Closure Operations through June 30, 2020	Extended current operations of school meals.	4/27/2020
COVID-19: Child Nutrition Response #32	Nationwide Waiver to Extend Area Eligibility Waivers	Waived the area eligibility requirement for open sites.	6/10/2020
COVID-19: Child Nutrition Response #56	Nationwide Waiver to Allow SFSP and SSO Operations through December 2020	Allowed SFSP/SSO operations whether schools were closed, hybrid, or open.	8/31/2020

Waiver Number	Waiver Name	Description	Date First Issued
COVID-19: Child Nutrition Response #57	Nationwide Waiver to Allow Reimbursement for Meals Served Prior to Notification of Approval and Provide Flexibility for Pre-Approval Visits in the SFSP	Allowed reimbursement for SFSP meals served before state agency approval of waiver use by the sponsor. Waived the requirement for state-agency on-site pre-approval visits of SFSP sites.	9/11/2020
COVID-19: Child Nutrition Response #71	Nationwide Waiver of Food Service Management Contract Duration in the NSLP and SFSP	Extended the contract duration limits.	1/6/2021
COVID-19: Child Nutrition Response #83	Nationwide Waiver to Allow Sponsors that Successfully Participated in the SFSP in FY 2019 to Operate as Experienced Sponsors in FY 2021	As described by the name; streamlined the application process.	4/1/2021
COVID-19: Child Nutrition Response #85	Nationwide Waiver to Allow the Seamless Summer Option through School Year 2021-2022	Allowed service of school meals through the SSO during the school year.	4/20/2021
COVID-19: Child Nutrition Response #86	Nationwide Waiver to Allow Summer Food Service Program Reimbursement Rates in School Year 2021-2022	Allowed reimbursement of SSO meals at SFSP reimbursement rates.	4/20/2021
COVID-19: Child Nutrition Response #87	Nationwide Waiver to Allow Non-Congregate Meal Service for School Year 2021-2022	Waived the congregate feeding requirement.	4/20/2021

Waiver Number	Waiver Name	Description	Date First Issued
COVID-19: Child Nutrition Response #88	Nationwide Waiver of Meal Times Requirements for School Year 2021-2022	Waived the requirement to serve certain meal types at certain times. Allowed service of multiple meal types at once.	4/20/2021
COVID-19: Child Nutrition Response #89	Nationwide Waiver to Allow Parents and Guardians to Pick Up Meals for Children for School Year 2021-2022	Waived the requirement for parents and guardians to bring their children to pick up meals.	4/20/2021
COVID-19: Child Nutrition Response #90	Nationwide Waiver to Allow Specific School Meal Pattern Flexibility for School Year 2021-2022	Encouraged adherence to meal pattern requirements, but allowed flexibility on the requirements for sodium, whole-grains, vegetables, milk, and grade-level specific menus.	4/20/2021
COVID-19: Child Nutrition Response #92	Nationwide Waiver to Allow Offer Versus Serve Flexibility for Senior High Schools in School Year 2021-2022	Waived the requirement for SFAs to use OVS at senior high schools.	4/20/2021
COVID-19: Child Nutrition Response #97	Nationwide Waiver to Provide Flexibility for School Meal Programs Administrative Reviews of SFAs Operating Only the SSO in SY 2021-22	Waived some requirements for state agencies conducting administrative reviews.	5/24/2021
COVID-19: Child Nutrition Response #99	Nationwide Waiver of the Annual Half Aggregate Monitoring Requirement in the Summer Food Service Program	As described by the name.	9/15/2021

Waiver Number	Waiver Name	Description	Date First Issued
COVID-19: Child Nutrition Response #100	Waiver to Allow Fiscal Action Flexibility for Meal Pattern Violations Related to COVID-19 Supply Chain Disruptions Impacting School Meals in SY 2021-22	Waived the requirement for the state agencies to take fiscal action when meal pattern requirements were violated secondary to supply chain issues.	9/15/2021
COVID-19: Child Nutrition Response #101	Nationwide Waiver to Allow Non-Congregate Meal Service for Service Institutions Operating the SFSP during Unanticipated School Closures in SY 2021-22	Waived the congregate feeding requirement. Allowed grab-and-go meals.	11/22/2021
COVID-19: Child Nutrition Response #102	Nationwide Waiver of Meal Times Requirements for Service Institutions Operating the SFSP during Unanticipated School Closures in SY 2021-22	Waived requirements for meal service start and end times and meal service duration.	11/22/2021
COVID-19: Child Nutrition Response #103	Nationwide Waiver to Allow Parents and Guardians to Pick Up Meals Served by Service Institutions through the SFSP during Unanticipated School Closures in SY 2021-22	Waived the requirement for parents and guardians to bring their children to pick up meals.	11/22/2021
COVID-19: Child Nutrition Response #104	Nationwide Waiver of Area Eligibility Requirements for Service Institutions Operating the SFSP during Unanticipated School Closures in SY 2021-22	Waived the area eligibility requirement for open sites.	11/22/2021

In October 2021, the ERS of the USDA published a report titled "COVID-19 Working Paper: Filling the Pandemic Meal Gap: Disruptions to Child Nutrition Programs and Expansion of Free Meal Sites in the Early Months of the Pandemic." The report examined trends in participation in school meals during the pandemic to determine if the waivers helped to offset the anticipated decrease in school meal participation. The report found that the number of school meals served through the NSLP and SBP decreased during the pandemic, but the number served through the SFSP increased, helping to fill some but not all of the gap in participation. Also, the number of SFSP sites increased during the pandemic. The report concluded that "the pandemic meal gap for children might have been even larger had child nutrition programs not rapidly adapted at the onset of the pandemic" (Toossi, 2021).

In March 2022, the FNS of the USDA published a report titled "Results of the U.S. Department of Agriculture, Food and Nutrition Service-Administered School Food Authority Survey on Supply Chain Disruptions." The report examined experiences with supply chain disruptions from the perspective of SFAs. The methods involved an online questionnaire and weighting of the responses for national representativeness. The report found that 90% of SFAs used the COVID-19 Child Nutrition Response #85, i.e., the "Nationwide Waiver to Allow the Seamless Summer Option through School Year 2021-2022" (FNS, 2022c).

2.2 Research on Factors Associated with Participation in the National School Lunch Program and School Breakfast Program

This section provides a review of the results from the peer-reviewed literature on factors associated with participation in the NSLP and SBP. Although the focus of this dissertation is the SFSP, this section was included since some of the findings from the studies on the NSLP/SBP may be transferrable to the SFSP. However, the methods may differ due to differences between the programs. For example, there is more data available on NSLP/SBP participants, who must be enrolled in a school or RCCI, compared to the SFSP, which is open to participants aged 18 years or younger and participants with physical or mental disabilities who are aged 19 years or older (FNS, 2013b). As a result, the focus of this section is on the results of the studies on the NSLP/SBP.

In January 2022, a search was conducted on the PubMed and ERIC databases to find articles containing the following search terms: "school meal participation" OR "school lunch participation" OR "school breakfast participation" OR "NSLP participation" OR "SBP participation." This search returned 90 results on PubMed and 71 results on ERIC. Articles were included if (1) they were published in English, (2) they were conducted in the United States, (3) the exposure or intervention was related to the NSLP or SBP, (4) the outcome measures included school meal participation, assessed quantitively only, and (5) the full text was available online or through Columbia University libraries. Articles were excluded if (1) the statistical analysis was descriptive only, (2) the study used data collected before 2012, and (3) the article was not peer-reviewed. Reference lists were searched. Overall, 15 articles met the criteria and were included in this review.

The articles are presented in this section by design: cross-sectional study design (n = 6) and intervention study design (n = 9).

2.2.1 Cross-Sectional Study Design

Cross-sectional studies (n = 6) have been published that identified factors associated with participation in the NSLP/SBP. Most were on the SBP only (n = 4). The studies are presented here in chronological order by publication date.

In 2016, Askelson et al. published a cross-sectional study that sought to determine the associations between parental perceptions of the SBP and SBP participation. The sample consisted of parents in Iowa (n = 7,209). The data were collected via a survey administered in 2014-2015. Using generalized estimating equations, the researchers found positive associations between each of the following parental perceptions and SBP participation: the SBP is beneficial ($p < 0.001$), breakfast is the most important meal of the day ($p < 0.001$), SBP breakfasts are healthy ($p < 0.001$), and SBP was designed for student athletes ($p < 0.001$). The researchers found negative associations between each of the following parental perceptions and SBP participation: SBP breakfasts were designed for "parents who have no time" ($p < 0.001$), "parents who have no money" ($p < 0.001$), and "parents who do not care enough to serve breakfast at home" ($p < 0.001$). Limitations of the study included the use of self-report from parents to determine SBP participation (Askelson et al., 2017).

In 2018, Spruance et al. published a cross-sectional study that sought to determine the associations between parental perceptions of the SBP and SBP participation. The sample consisted of parents of public-school students in Utah (n = 488). The data were collected via a survey administered in 2016. Using generalized estimating equations, the researchers found several associations between parental perceptions and SBP participation. Children of parents who perceived that breakfast from the SBP is healthier than breakfast from home were 1.53 times more likely to participate than children of parents who perceived that breakfast from home is healthier (OR = 1.53; 95% CI = 1.26, 3.64). Children of parents who reported a perceived benefit of the SBP were 9.99 times more likely to participate than children of parents who perceived no benefits of the SBP (OR = 9.99; 95% CI = 3.56, 27.90). Children of parents who "would support" their child's desire to participate in the SBP were 8.87 times more likely to participate than children of parents who would not support their child's desire to participate in the SBP (OR = 8.87; 95% CI = 2.65, 29.65). There was no association between parental perception of the importance of breakfast compared to other meals and SBP participation. The study also found that, compared to students in elementary school, students in middle school (OR = 0.32; 95% CI = 0.15, 0.68) and high school (OR = 0.37; 95% CI = 0.17, 0.84) were less likely to participate compared to students in elementary school. Additionally, FRPL participants were 5 times more likely to participate in the SBP compared to non-FRPL participants (OR = 5.00; 95% CI = 2.61, 9.57). Limitations of the study included the use of self-report from parents to determine SBP participation (Spruance et al., 2018).

In 2019, Tsai et al. published a cross-sectional study that sought to determine the associations between actual and student perceptions of NSLP "healthfulness" and NSLP participation. For the student perceptions, the sample consisted of students across the US (n = 4,982). For the actual healthfulness, the researchers scored NSLP meals from schools across the US, and the sample consisted of students from these schools with scores (n = 4,453). The data were collected from 2013 to 2015 as part of the Healthy Communities Study. Using multilevel mixed model regression, the researchers found a positive association between student perceptions of NSLP healthfulness and NSLP participation: students who perceived NSLP meals as at least "sometimes" healthy participated in the NSLP 0.71 additional days per week compared to students who perceived NSLP meals as less healthy ($\beta = 0.71$; 95% CI = 0.60, 0.82; $p < 0.001$). However, there was no association between actual healthfulness of NSLP meals and NSLP participation. Limitations of the study included the use of self-report from students to determine NSLP participation (Tsai et al., 2019).

In 2019, Soldavini and Ammerman published a cross-sectional study that sought to determine the associations between various alternative SBP service models and SBP participation. The alternative models included universal free breakfast, BIC, grab-and-go breakfast, and second chance breakfast. The sample consisted of public-school students in North Carolina. The data were collected in October 2017. Using multiple logistic regression with the traditional SBP service model as the reference group, the researchers found several positive associations between alternative models and SBP participation. Universal free breakfast was positively associated with SBP participation in elementary schools (OR = 1.54; 95% CI = 1.33, 1.78; $p < 0.001$), middle schools (OR = 1.33; 95% CI = 1.12, 1.57; $p < 0.01$), and high schools (OR = 1.32; 95% CI = 1.04, 1.68; $p < 0.05$). However, BIC was positively associated with SBP participation in only elementary schools (OR = 1.49; 95% CI = 1.14, 1.93; $p < 0.01$) and high schools (OR = 2.12; 95% CI = 1.20, 3.75; $p < 0.01$). Similarly, grab-and-go was positively associated with SBP participation in only middle schools (OR = 1.52; 95% CI = 1.01, 2.28; $p < 0.05$) and high schools (OR = 1.35; 95% CI = 1.05, 1.72; $p < 0.05$), and second chance breakfast was positively associated with SBP participation in only middle schools (OR = 2.61; 95% CI = 1.68, 4.06; $p < 0.001$) and high schools (OR = 2.27; 95% CI = 1.66, 3.09; $p < 0.001$). Limitations of the study included that the service model may not be accurate since it was reported in the 2016-2017 school year as the model intended for the 2017-2018 school year (Soldavini & Ammerman, 2019).

In 2020, Tan et al. published a cross-sectional study that sought to determine the associations between the CEP and SBP/NSLP participation among students “near” eligible or ineligible for FRPL. The sample consisted of students across the US (n = 2,305). The data were collected from 2013 to 2015 as part of the Healthy Communities Study. Using difference-in-difference estimation and FRPL-eligible students as the reference group, the researchers found several positive associations between CEP and SBP/NSLP participation. Among students almost eligible for FRPL, CEP was associated with greater participation in the NSLP ($p < 0.05$) but not the SBP. Among students ineligible for FRPL, CEP was associated with greater participation in the NSLP ($p < 0.001$) and SBP ($p < 0.05$) and a significant increase in the number of days per week of participation by 0.8 days in the NSLP ($p < 0.05$) and 0.7 days in the SBP ($p < 0.05$). Limitations of the study included the size of the sample of near eligible students (n = 137), which was much smaller than the sample of ineligible students (n = 434) and eligible students (n = 1,734) (Tan et al., 2020).

In 2020, Leider et al. published a cross-sectional study that sought to determine the association between school wellness policies and SBP participation in a nationally representative sample of US public-school students (n = 1,575). The data were collected during the 2014-2015 school year as part of the School Nutrition and Meal Cost Study and the National Wellness Policy Study. Using multivariable logistic regression, the researchers found that students from schools with strong, “definitive” policies on the SBP were 1.86 times more likely to participate in the SBP than students from schools with no policies on the SBP (OR = 1.86; 95% CI = 1.09, 3.16; $p = 0.022$). However, there was no association between weak, “encouragement” policies on the SBP and SBP participation. There was a positive association between universal free breakfast and SBP participation (OR = 3.52; 95% CI = 2.18, 5.69; $p < 0.001$). The researchers also found associations between sociodemographic variables and SBP participation. Compared to students from schools with at least 66% white students, students from schools with at least 50% black students (OR = 0.39; 95% CI = 0.17, 0.91) or at least 50% Hispanic students (OR = 0.43; 95% CI = 0.21, 0.90) were less likely to participate in the SBP. However, compared to white students, black students (OR = 2.29; 95% CI = 1.21, 4.33) and Hispanic students (OR = 1.80; 95% CI = 1.06, 3.07) were more likely to participate in the SBP. Also, compared to students from households with incomes greater than 185% of the federal poverty level, students from households with incomes between 130-185% of the federal poverty level (OR = 2.87; 95% CI = 1.94, 4.25) and students from households with incomes less than or equal to 130% of the federal poverty level (OR = 1.95; 95% CI = 1.33, 2.86) were more likely to participate. Limitations of the study included that universal free breakfast was not considered in the definition of strong vs. weak policies on the SBP (Leider et al., 2020).

Overall, the cross-sectional studies on the SBP/NSLP identified several factors associated with participation in these programs. Notably, these studies identified factors at various levels of the socio-ecological framework: individual level (Tsai et al., 2019), interpersonal level (Askelson et al., 2017; Spruance et al., 2018), organizational level (Soldavini & Ammerman, 2019), and policy level (Leider et al., 2020; Tan et al., 2020). Factors at the individual level included student perceptions of the healthfulness of NSLP meals (Tsai et al., 2019). Factors at the interpersonal level included parental perceptions of the SBP (Askelson et al., 2017; Spruance et al., 2018). Factors at the organizational level included SBP service model (Soldavini & Ammerman, 2019). Factors at the policy level included CEP (Tan et al., 2020) and school wellness policies on the SBP (Leider et al., 2020). However, since these factors were identified from studies with a cross-sectional study design, they were limited by this design and the generalizability of their findings.

2.2.2 Intervention Study Design

Intervention studies (n = 9) have been published that identified factors that affect participation in the NSLP/SBP. Most were on the NSLP only (n = 5). The studies are presented here in chronological order by publication date.

In 2014, Just et al. published a pre/post pilot study that sought to determine the effect of including pizzas prepared by a professional chef in the NSLP menu on NSLP participation. The sample consisted of high school students in a school district in New York (n = 3,330). The data were collected in 2012, and the duration of the intervention was one day. Using a between-subject logistic estimation, the researchers found that NSLP participation increased by 19.3% on the day in which the pizzas were served (p = 0.022). Limitations of the study included lack of randomization, lack of a control group, and duration of the intervention (Just et al., 2014).

In 2015, Anzman-Frasca et al. published a quasi-experimental study that sought to determine the effect of BIC on SBP participation. The sample consisted of public elementary schools in a single urban school district in the US (n = 446). The data were collected in 2012-2013. The researchers found that the mean SBP participation for BIC was 73.7%, while the mean SBP participation for non-BIC was 42.9%. Using generalized linear mixed models, they found that BIC significantly increased SBP participation over time ($F_{10,414} = 136.90$, $p < 0.001$). Limitations of the study included lack of randomization (Anzman-Frasca et al., 2015).

In 2018, Larson et al. published an intervention study that sought to determine the effect of grab-and-go breakfasts on SBP participation at the school and individual levels. At the school level, the sample consisted of rural high schools in Minnesota randomized to a grab-and-go breakfast intervention as a part of the larger Project BreakFAST trial (n = 8). At the individual level, the sample consisted of students at these schools who reported skipping breakfast (n = 364). The data were collected from 2013 to 2016, and the duration of the intervention was one year. Using linear mixed models, the researchers found that the grab-and-go breakfasts increased school-level SBP participation from 13.0% at baseline to 22.6% during implementation of the grab-and-go breakfasts (p = 0.025). They also found that the grab-and-go breakfasts increased mean individual level-participation from 7.6% at baseline to 21.9% during implementation of grab-and-go breakfasts ($p < 0.001$). Limitations of the study included lack of a control group and duration of the intervention (Larson et al., 2018).

In 2018, Pope et al. published an intervention study that sought to determine the effect of introducing vegetable-based entrees, previously sampled by students, on NSLP participation. The sample consisted of 4^{th} through 8^{th} grade students at a rural school in Vermont ($n = 290$). The data were collected in 2015, and the duration of the intervention was four days. Using a one-tailed t-test, the researchers found that the NSLP participation increased from 82% to 92% among students eligible for FRPL ($p < 0.001$). However, there was no change in NSLP participation among students ineligible for FRPL. Limitations of the study included lack of randomization, lack of a control group, and short length of the intervention (Pope et al., 2018).

In 2019, Nanney et al. published an intervention study that sought to determine the effect of grab-and-go breakfasts and SBP marketing on SBP participation. The sample consisted of high schools in the group-randomized Project BreakFAST trial ($n = 16$). The data were collected from 2012 to 2015, and the duration of the intervention was one year. Using the Wilcoxon test, the researchers found a significant difference in the change in SBP participation between the intervention schools (+3%) and the control schools (+0.5%) ($p = 0.03$). Limitations of the study included duration of the intervention (Nanney et al., 2019).

In 2019, Pokorney et al. published a quasi-experimental study that sought to determine the effect of CEP on NSLP participation. The sample consisted of CEP schools ($n = 654$) and non-CEP schools ($n = 1,221$) in Pennsylvania. The data were collected during the 2013-2014 school year. Using a negative binomial regression model, the researchers found that CEP schools served significantly more NSLP meals than non-CEP schools (RR = 1.08; 95% CI = 1.03, 1.12).

However, compared to non-CEP schools, CEP schools served significantly less FRPL (RR = 0.91; 95% CI = 0.86, 0.96) and significantly more paid lunches (RR = 1.69; 95% CI = 1.11, 2.56). Limitations of the study included lack of randomization (Pokorney et al., 2019).

In 2020, Boehm et al. published an intervention study that sought to determine the effect of removing competitive foods or marketing/nudging NSLP meals to try to increase NSLP participation. The sample consisted of three high schools in the Northeast: one high school served as the control, one as the "Healthy Choices School" that removed competitive foods, and one as the "Healthy Nudging School" that promoted the NSLP through marketing and nudging. The data were collected from 2013 to 2014, and the duration of the intervention was four weeks. Using a difference-in-difference models, the researchers found that, compared to the control school, there were significantly more entrees served in the "Healthy Choices School" ($p < 0.05$) and the "Healthy Nudges School" ($p < 0.001$). Limitations of the study included the sample size (only one school in each intervention condition) and short duration of the intervention (Boehm et al., 2020).

In 2020, Thompson et al. published an intervention study that sought to determine the effect of a three-component intervention (cafeteria redesign + mobile carts/vending machines + teacher outreach) on NSLP participation. The sample consisted of 24 middle or high schools in an urban school district in California: 12 were control schools, 12 were intervention schools. The data were collected from 2015 to 2018, and the duration of the intervention was one year. Using linear mixed effects models, the researchers found that the proportion of students who participated in the NSLP decreased by 4.1% in intervention schools and by 5.1% in control school, but the decrease was significantly smaller in the intervention schools compared to the control schools ($p < 0.001$). Limitations of the study included duration of the intervention (Thompson et al., 2020).

In 2021, Schneider et al. published a quasi-experimental study that sought to determine the effect of CEP on SBP and NSLP participation. The sample consisted of CEP-eligible public and charter schools in Texas ($n = 2,797$). The data were collected from 2013 to 2019, with 2013-2014 serving as the baseline, non-CEP year. Using a difference-in-difference model, the researchers found that SBP monthly participation increased by 4.59% ($p < 0.001$) when all months were included and increased by 4.64% ($p < 0.001$) when the summer months were excluded. NSLP monthly participation increased by 4.32% ($p < 0.001$) when all months were included and increased by 4.61% ($p < 0.001$) when the summer months were excluded. Limitations of the study included lack of randomization and lack of a control group (Schneider et al., 2021).

Overall, the intervention studies on the SBP/NSLP identified several factors that increased participation in these programs. Some of these factors were at the organizational level: BIC (Anzman-Frasca et al., 2015), removal of competitive foods (Boehm et al., 2020), nudging (Boehm et al., 2020), service of chef-prepared pizzas (Just et al., 2014), grab-and-go breakfasts (Larson et al., 2018; Nanney et al., 2019), service of previously-sample, vegetable-based entrees (Pope et al., 2018), and cafeteria redesign combined with mobile carts/vending machines plus teacher outreach (Thompson et al., 2020). Other factors were at the policy level: CEP (Pokorney et al., 2019; Schneider et al., 2021). All the studies were limited by the generalizability of their findings to other schools/populations.

2.3 Research on Factors Associated with Participation in School Meals During Emergencies

This section provides a review of the methods and results from the peer-reviewed literature on factors associated with participation in school meals during emergencies, including the COVID-19 pandemic. This section was included because (1) the data used in this dissertation was partly collected during a specific emergency, the COVID-19 pandemic, and (2) there is a similarity between school meals served during emergencies and school meals served during the summer, and that similarity is that schools are usually closed, and students are not at school. As a result, the focus of this section is on the methods and results of the studies on participation in school meals during emergencies.

In January 2022, a search was conducted on the PubMed and ERIC databases to find articles containing the following search terms: ("COVID-19" OR "COVID 19" OR "COVID" OR "coronavirus" OR "pandemic" OR "school closures" OR "emergencies" OR "hurricane" OR "tornado" OR "flood" OR "snow day" OR "natural disaster") AND ("school meal" OR "school lunch" OR "school breakfast" OR "school meal participation" OR "Summer Food Service Program" OR "Seamless Summer Option"). This search returned 20 results on PubMed and 44 results on ERIC. Articles were included if (1) they were published in English, (2) they were conducted in the United States, (3) the exposure was related to school meals during emergencies, (4) the outcome measures included school meal participation, assessed either quantitively or qualitatively, and (5) the full text was available online or through Columbia University libraries. Articles were excluded if (1) the exposure was pandemic electronic benefit transfer (P-EBT), not school meals and (2) the article was not peer-reviewed. Reference lists were searched, and a search was conducted on the COVID-19 food security and obesity prevention resources, which are collected by the COVID-19 Food and Nutrition Work Group of the Health Eating Research (HER) program and the Nutrition & Obesity Policy Research & Evaluation Network (NOPREN). Overall, 12 articles met the criteria and were included in this review.

The articles are presented in this section by study design: brief case study design (n = 2), qualitative study design (n = 3), geospatial study design (n = 1), mixed method study design (n = 5), and intervention study design (n = 1).

2.3.1 Brief Case Study Design

Brief case studies (n = 2) have been published that reveal potential factors associated with participation in school meals during social and environmental emergencies (Kinsey et al., 2019) and the COVID-19 pandemic (Kinsey et al., 2020). Both studies assessed school meal participation quantitively by determining the number of “missed meals,” i.e., the number of school meals that would have been served at school had they been open. Kinsey et al. (2020) also assessed participation qualitatively. The studies are presented here in chronological order by publication date.

In 2019, Kinsey et al. published a case study that sought to project the number of missed school meals during one to three days of school closures of the Philadelphia School District in Philadelphia, Pennsylvania. The exposure in this study was school closures due to social or environmental emergencies. The outcome was the number of missed meals. The researchers found that one to three days of school closures may result in 135,000-405,600 missed meals (Kinsey et al., 2019). For the present study, the findings from Kinsey et al. (2019) suggest that school closures due to social or environmental emergencies is a factor associated with decreased participation in school meals.

In 2020, Kinsey et al. published a case study that had the following four objectives: (1) to project the number of school meals missed from March 2, 2020 to May 1, 2020 in the US, (2) to describe strategies used by states and school districts to overcome barriers to accessing school meals during the COVID-19 pandemic, (3) to describe school meal service in Maryland during the pandemic, and (4) to describe "lessons learned" that could be applied to school meal programs when schools are closed, such as during the summer. The exposure in this study was the COVID-19 pandemic. The outcomes included the number of missed meals and strategies to overcome barriers to participation (Kinsey et al., 2020).

The researchers found that approximately 1.15 billion FRP meals were missed from March 9, 2020 to May 1, 2020. They found that the following strategies were used to overcome barriers to accessing school meals: locating sites in "central locations" such as schools, libraries, churches and outdoor locations such as parking lots; locating sites based on school bus routes; home delivery (although delivery expenses are not reimbursed by the USDA); serving meals every day; serving one-week meal boxes; serving meals to adults as well; and serving grab-and-go meals. In Maryland, the researchers found that the number of actual missed meals was lower than the number of projected missed meals, and they attributed this to "rapid innovation and implementation of USDA waivers." Finally, the researchers explained that while the waivers were designed to address pandemic-related barriers to school meal participation, some of the barriers are related to school closures in general. For example, the congregate feeding requirement is a barrier to school meal participation during school closures in general (Kinsey et al., 2020). For the present study, the findings from Kinsey et al. (2020) suggest that school closures and congregate feeding during school closures may be factors associated with decreased participation in school meals during emergencies, while home delivery, grab-and-go meals, and meal boxes may be factors associated with increased participation.

Overall, both case studies showed that school closures due to emergencies is a factor associated with decreased participation in school meals (Kinsey et al., 2019; Kinsey et al., 2020). One study was conducted at the level of a single school district (Kinsey et al., 2019), while the other was conducted at the national level and at the level of a single state (Kinsey et al., 2020). Factors that may increase participation include non-congregate feeding strategies such as home delivery, grab-and-go meals, and meal boxes (Kinsey et al., 2020). These are hypotheses generated by the studies. However, the studies are limited by their descriptive design, which does not allow them to test any of these hypotheses for potential causal relationships. For example, since many other variables besides schools being closed changed during March to May 2020, this would make it hard to know if there were other factors besides non-congregate feeding strategies that could have contributed to the changes in school meal participation, such as increased job loss and fear of shopping at grocery stores. Furthermore, these studies are limited by their brevity relative to qualitative case studies, their generalizability, and their use of projections instead of actual meal counts to estimate the number of missed meals.

2.3.2 Qualitative Study Design

Qualitative studies (n = 3) have been published that reveal potential factors that may be associated with participation in school meals during the COVID-19 pandemic (Jowell et al., 2021; McLoughlin, Fleischhacker, et al., 2020; Patten et al., 2021). None of the qualitative studies were on emergencies other than the pandemic. All three studies assessed participation qualitatively. The studies are presented here in chronological order by publication date.

In 2020, McLoughlin et al. published a descriptive study that sought to assess state agency communication on school meal service during the initial months of the COVID-19 pandemic. This assessment was conducted for all 57 US jurisdictions. The exposure in this study was the COVID-19 pandemic. The main outcome was a score on the comprehensiveness of each state agencies communication on school meal service (McLoughlin, Fleischhacker, et al., 2020).

Data were collected from government websites from February to March 2020. All jurisdictions were scored 0-2 points for each of the following seven criteria: (1) mention of school meals in the emergency declaration, (2) mention of school meals in the school closure declaration, (3) school meal information on the website's landing page for COVID, (4) meal site information or maps, (5) information for families, (6) information for implementation of school meals, (7) partnerships with anti-hunger advocacy groups like Share Our Strength. A higher score indicated higher comprehensiveness in communication on school meal service. The criteria were based on four sources: two studies on summer meals, best practices for providing summer meals by No Kid Hungry, and nutrition program-related results from the 2016 School Health Policies and Practices Study (SHPPS) (McLoughlin, Fleischhacker, et al., 2020).

The results showed that most jurisdictions scored at least some points for the following criteria: (2) mention of school meals in the school closure declaration, (3) school meal information on the website's landing page for COVID, and (4) meal site information or maps. However, less than half of the jurisdictions scored on the following criteria: (1) mention of school meals in the emergency declaration, (5) information for families, (6) information for implementation of school meals, and (7) partnerships with anti-hunger advocacy groups (McLoughlin, Fleischhacker, et al., 2020). For the present study, these findings suggest that communication with families, guidance for sponsors, and partnerships with anti-hunger advocacy groups are factors that may increase participation in school meals during emergencies.

In 2021, Patten et al. published a phenomenological qualitative study that sought to describe the experiences of school nutrition employees providing school meals in the US during the COVID-19 pandemic. The sample consisted of 34 school nutrition employees, 19 of which were school district food directors or assistant food directors. These employees spanned all 7 USDA regions. The exposure in this study was the COVID-19 pandemic. The outcome was experiences in providing school meals from the perspective of school nutrition employees (Patten et al., 2021).

Data were collected from semi-structured interviews from April to May 2020. The interviews consisted of 14 questions. The analysis generated themes and while the coding method for the analysis was not stated, the description strongly suggested that inductive coding was used (Patten et al., 2021).

The results showed four themes that described the experiences of school nutrition employees in providing school meals during the pandemic. Theme 1 was “Shock, flexibility, and routine.” Under this theme, the participants reported that they experienced shock, followed by flexibility or creativity in meal service, followed by a meal service routine. They expressed a need for training and plans for school meal service during emergencies. Theme 2 was “Keeping people safe.” The participants reported concerns with respect to COVID-19 safety and food safety. For example, they had concerns over safe preparation of foods that were to be prepared at home. Theme 3 was “Out of the Shadows: The value of school nutrition.” The participants reported increased public appreciation of school meals. Finally, theme 4 was “Communication and accountability.” The participants expressed a need for training on social media marketing to parents. Although there was good communication with other school nutrition employees and governmental offices, the participants expressed a need for guidance on best practices (Patten et al., 2021).

In the discussion, the researchers made a link between their findings on flexibility and creativity in meal service during the pandemic to the "reimagination" of the summer meal programs. They explained that "typical summer feeding programs may be reimagined based on new distribution modalities used during this response, including state or federal policy requirements for site locations that participate in the program" (Patten et al., 2021). For the present study, the findings by Patten et al. (2021) suggest that the waivers (also known as the "key flexibilities"), social media marketing, and implementation plans may be factors associated with increased participation in school meals during emergencies.

In 2021, Jowell et al. published a qualitative study that sought to describe barriers and best practices for participation in school meals during COVID-19 from the perspectives of school district stakeholders and parents in San Joaquin Valley, California. The sample consisted of "school district stakeholders" (n = 11) and parents (n = 26) from six school districts in San Joaquin Valley, described as an urban-rural area and a "low-income, Latino immigrant community." The school district stakeholders were food service directors (n = 5), school superintendents (n = 2), and community partners (n = 4), while the parents included only those whose children participated in school meals. All parents were Latino, and 79% were Spanish-speaking. The exposure in this study was the COVID-19 pandemic. The outcomes were barriers and best practices for school meal participation during COVID-19 from the perspectives of the school district stakeholders and parents (Jowell et al., 2021).

Data were collected from June to August 2020. For the school district stakeholders, semi-structured interviews were used. The researchers stated that "[s]chool meal participation was assessed qualitatively based on interviews with food service directors." For the parents, focus groups were used. The socio-ecological framework was used, and while the coding method for the analysis was not stated, the description strongly suggested that both deductive and inductive coding were used to analyze the qualitative data (Jowell et al., 2021).

The results showed several themes. Eight themes were identified from the data. These themes were categorized under three themes derived from the socio-ecological framework. The three themes from the socio-ecological framework were as follows: (1) "School- and family-level factors impacting meal service" from the perspectives of school district stakeholders and parents, (2) "Community-level factors impacting meal service" from the perspective of school district stakeholders, and (3) "Policy-level factors impacting meal service" from the perspectives of school district stakeholders and parents (Jowell et al., 2021).

Under school- and family-level factors, the barriers and best practices were described under the following three themes: (1) "Programme outreach to improve meal participation," (2) "Meal programme logistics and appeal," and (3) "COVID-19 safety concerns." According to school district stakeholders, best practices for school meal service included English and Spanish communication, grab-and-go meals, and bulk meals. Barriers for school meal service included low participation rates, hot weather for outdoor pickup, and funding for PPE and other materials. According to parents, best practices included grab-and-go meals, bulk meals, and multiple sites. Barriers included English-only communication, internet-based-only communication, frequent changes in site location and times, morning pickup times (due to parental work, virtual learning, agricultural jobs), no car, far sites, meal quality, and concern over catching COVID at the sites.

According to the researchers, “efforts to make meals accessible were not enough to overcome factors such as meal appeal, ultimately reducing participation in many districts” (Jowell et al., 2021).

Under community-level factors, the barriers and best practices were described under the following three themes: (1) “Inter-district collaboration,” (2) “Inter-organisational partnerships,” and (3) “Diverse funding sources.” According to school district stakeholders, best practices for school meal service included collaborating with other districts and organizations. For example, a best practice for increasing school meal participation was distribution of other essentials with meals such as masks and diapers (Jowell et al., 2021).

Under policy-level factors, the barriers and best practices were described under the following two themes: (1) “Child nutrition programme waiver flexibilities” and (2) “Pandemic electronic benefits transfer.” According to school district stakeholders, the following waivers were beneficial for school meal service: the Non-Congregate Meal Service Waiver, Area Eligibility for Closed Enrolled Sites, the Meal Times Requirements Waiver, and the Parent/Guardian Meal Pickup Waiver. However, P-EBT was identified as a barrier to school meal participation. The parents agreed with school district stakeholders that the Non-Congregate Meal Service Waiver was beneficial. On the Parent/Guardian Meal Pickup Waiver, feedback from the parents was mixed: on the one hand, the waiver overcomes the barrier of virtual learning schedules interfering with meal pickup times, but on the other hand, the waiver leads to another barrier, which is arranging childcare while the parent picks up the meals. The parents appreciated having P-EBT. In the discussion, the researchers argued that there are “complementary benefits of P-EBT and school meals.” While P-EBT offers more flexibility for those who have access to affordable healthy food and the resources and ability to prepare healthy meals, school meals offer prepared, healthy meals for those who do not have access to affordable healthy food (like in food deserts or food swamps) or do not have the resources or ability to prepare healthy meals (like homeless youth) (Jowell et al., 2021).

In the conclusion, the researchers made the following suggestions for increasing participation in school meals: increase meal appeal and make use of the waivers, make partnerships, and incorporate parent feedback. For the present study, the findings by Jowell et al. (2021) suggest that multiple factors may be associated with participation in school meals during emergencies: communication in multiple languages, communication in print vs. web, frequent logistical changes, weather, congregate feeding, number of meals served at once, number of sites, pickup time during school and working hours, transportation, distance from sites, meal quality, partnerships, funding, the waivers, and P-EBT (Jowell et al., 2021).

Overall, all three qualitative studies showed that poor communication with families may be a factor associated with decreased participation in school meals during emergency-related school closures. Two studies were conducted at the national level (McLoughlin, Fleischhacker, et al., 2020; Patten et al., 2021), while one was conducted at the level of six school districts in the same area in California (Jowell et al., 2021). The studies differed in their methods: document analysis (McLoughlin, Fleischhacker, et al., 2020) and semi-structured interviews with school district employees (Jowell et al., 2021; Patten et al., 2021) and parents (Jowell et al., 2021). When semi-structured interviews were used, one study appeared to use inductive coding alone (Patten et al., 2021), while the other study appeared to use deductive coding and inductive coding (Jowell et al., 2021). A limitation of these studies is that none combined document analysis and semi-structured interviews or used multiple qualitative methods to obtain a more in-depth analysis. Also, none of the studies interviewed students, including participants and non-participants in school meals. Like the brief case studies, these qualitative studies are limited by their hypothesis-generating design and generalizability.

2.3.3 Geospatial Study Design

A geospatial analysis (n = 1) has been published that reveals potential factors associated with participation in school meals during the COVID-19 pandemic (Jabbari et al., 2021). This study did not assess participation directly but assessed accessibility of school meals. Since accessibility may be related to participation in school meals, the study was included in this review.

In 2021, Jabbari et al. published a geospatial analysis that sought to compare the accessibility of school meal sites in St. Louis, Missouri during the first spring and summer of the COVID-19 pandemic to the accessibility of school meal sites during the spring and summer of the previous school year. The sample consisted of school meal sites sponsored by schools in spring 2019, spring 2020, summer 2019, and summer 2020 (Jabbari et al., 2021). Notably, this suggests that only school sponsors or SFAs were included in the summer analysis even though summer meal sites can be sponsored by other organizations (FNS, 2013b). The exposure in this study was the COVID-19 pandemic. The outcomes included (1) the mean number of sites per census tract, (2) the mean number of sites per school district, (3) the mean distance (in miles) from school to site, and (4) the mean gravity-based site accessibility per census block group (Jabbari et al., 2021).

Data were obtained from several sources. The addresses of sites in 2020 were obtained from Missouri's Coronavirus GIS Hub. The addresses of sites in 2019 were obtained from the Missouri Department of Elementary and Secondary Education (DESE) and the Missouri Department of Health and Human Services. Shapefiles for school districts, schools, census tracts, and census block groups were obtained from the Missouri Spatial Data Information Service. To allow comparison of sites by "low-income vs. non-low-income tracts" and "low-income, low-access 'LILA' tracts vs. non-LILA tracts," the following data were used to define the tracts: (1) poverty and race data from the 2018 American Community Survey and (2) food access data from the Food Access Research Atlas. To allow comparison of sites by FRPL eligibility rate, data were used from DESE and the Prime Center. Altogether, these data sources allowed the measurement and comparison of the outcomes of the study. Of note, the gravity-based accessibility measure was obtained using a two-step floating catchment area analysis, which allowed the accessibility measure to consider both proximity of sites to people and density of sites per geographic area or population. For the statistical analysis, the study used t-tests to compare outcomes by census tract and FRPL eligibility rate, but no statistical analysis was used to compare spring 2020 to spring 2019 and summer 2020 to summer 2019 (Jabbari et al., 2021).

The results showed statistically significant differences in accessibility by census tract and FRPL eligibility rate. Some of the key descriptive characteristics of the census tracts in St. Louis were as follows: 46.6% of the census tracts were low income, and 10.2% of census tracts were LILA. A key descriptive characteristic of the schools was that 53.1% of the public schools were eligible for CEP based on the percentage of students who qualify for FRPL. The researchers found that the mean number of sites per census tract was significantly lower in non-low-income tracts compared to low-income tracts during summer 2019 (0.13 vs. 0.35, $p < 0.01$), spring 2020 (0.45 vs. 0.94, $p < 0.001$), and summer 2020 (0.63 vs. 1.76, $p < 0.001$). They also found that the mean number of sites per census tract was significantly lower in non-LILA tracts compared to LILA tracts during spring 2020 (0.62 vs. 1.19, $p < 0.05$) and summer 2020 (1.04 vs. 2.06, $p < 0.05$). The mean number of sites per school district was significantly higher for school districts with a FRPL eligibility rate between 62.5%-100% compared to school districts with a FRPL eligibility rate between 0%-39% during spring 2019 (21.0 vs. 12.5, $p < 0.01$), summer 2019 (6.8 vs. 0.10, $p < 0.001$), spring 2020 (19.4 vs. 0.69, $p < 0.001$), and summer 2020 (32.5 vs. 1.60, $p < 0.001$). The mean distance (in miles) from school to site was significantly lower for school districts with a FRPL eligibility rate between 62.5%-100% compared to school districts with a FRPL eligibility rate between 0%-39% during summer 2019 (0.71 vs. 4.64, $p < 0.001$), spring 2020 (0.38 vs. 3.28, $p < 0.001$), and summer 2020 (0.26 vs. 2.24, $p < 0.001$). Altogether, these results showed that there were more sites in low-income census tracts, LILA census tracts, and school districts with a high FRPL eligibility rate. These school districts also had shorter distances between schools and sites (Jabbari et al., 2021).

The results also showed differences in accessibility between the time periods. Comparing spring 2020 to spring 2019, the mean number of sites per census tract decreased for low-income census tracts, non-low-income census tracts, and non-LILA census tracts but increased for LILA census tracts. Additionally, the mean number of sites per school district decreased, the mean distance (in miles) from school to site increased, and the mean gravity-based site accessibility per census block group decreased by two-thirds. Comparing summer 2020 to summer 2019, the mean number of sites per census tract increased for low-income census tracts, non-low-income census tracts, LILA census tracts, and non-LILA census tracts. Additionally, the mean number of sites per school district increased, the mean distance (in miles) from school to site decreased, and the mean gravity-based site accessibility per census block group increased by four times. Altogether, these results showed that accessibility largely decreased in spring 2020 compared to spring 2019 but increased in summer 2020 compared to summer 2019 (Jabbari et al., 2021).

In the discussion, the researchers made the following statement:

> [O]ur findings suggest that extending several of the newly implemented policies, such as the SFSP/SSO Area Eligibility Waiver, the Meal Time Waiver, the Non-congregate Feeding Waiver, and the Nationwide Parent/Guardian Meal Pickup Waiver beyond COVID-19 could increase meal access and alleviate child food insecurity during weekends, holidays, and other academic breaks (Jabbari et al., 2021).

For the present study, this suggests that the waivers may be a factor associated with increased accessibility of school meals during the summer, which may lead to increased participation in summer meals.

Overall, the geospatial analysis showed school meal accessibility increased during the summer but decreased during the spring in the COVID-19 pandemic (Jabbari et al., 2021). The study was conducted at the level of a single city. However, a statistical analysis was not conducted to determine if the summer increase and spring decrease were significant. Also, accessibility was not linked to participation data. Furthermore, it appears that only SFAs were included in the analysis. Other limitations of the geospatial analysis include the generalizability of its findings.

2.3.4 Mixed Methods Study Design

Mixed methods studies (n = 5) have been published that reveal potential factors that may be associated with participation in school meals during the COVID-19 pandemic (Beckstead et al., 2022; Chrisman & Alnaim, 2021; Connolly et al., 2021; Kenney et al., 2021; McLoughlin, McCarthy, et al., 2020). None of the studies were on emergencies other than the pandemic. All five studies assessed participation qualitatively, while two studies also assessed participation quantitatively (Connolly et al., 2021; McLoughlin, McCarthy, et al., 2020), and one study assessed participation based on financial data (Kenney et al., 2021). The studies are presented here in chronological order by publication date.

In 2020, McLoughlin et al. published a mixed methods study that sought to (1) describe the implementation of school meals during the pandemic in four large, urban school districts in the US and (2) evaluate the equity impact of school meal implementation using guidelines developed from the Getting to Equity (GTE) in Obesity Prevention theoretical framework. The sample consisted of the following school districts:

- Chicago Public Schools (CPS): 642 public schools, 35.9% African American, 46.6% Hispanic.
- Houston Independent School District (HISD): 280 public schools, 24% African American, 61.8% Hispanic.
- Los Angeles Unified School District (LAUSD): 1,386 public schools, 8.2% African American, 73.4% Hispanic.
- New York City Department of Education (NYC DOE): 1,866 public schools, 25.5% African American, 40.6% Hispanic.

The exposure in this study was the COVID-19 pandemic. The outcomes were number of meals served, number of sites, meal service model, days and times of meal service, and the equity impact described through the domains of the GTE framework (McLoughlin, McCarthy, et al., 2020).

Data were collected from March to May 2020. The two methods of the study were (1) a document analysis of school district websites and social media and (2) a geospatial analysis of school meal site placement using the USDA Food Desert Locator dataset and the American

Community Survey dataset. For the document analysis, the GTE framework and inductive coding were used to identify themes. For the geospatial analysis, the researchers determined the count and percentage of sites in (1) census tracts that are food deserts and (2) census tracts that are above the median for percentage of the population in poverty, percentage of the population of racial/ethnic minorities, and percentage of the population aged 5-19 years (McLoughlin, McCarthy, et al., 2020).

The results first described the implementation of school meals in the four districts. For number of sites, there were approximately 276 CPS sites, 5 HISD sites, 63 LAUSD sites, and 439 NYC DOE sites. For meal service model, CPS used grab-and-go breakfast and lunch and three days of meals at time; HISD used 30-lb boxes of groceries; LAUSD used grab-and-go breakfast and lunch; and NYC DOE used grab-and-go breakfast, lunch, and dinner. For days and times of meal service, CPS served on Monday-Friday from 9am-1pm, HISD served from Monday-Saturday at different times for different sites, LAUSD served Monday-Friday from 8am-11am, and NYC DOE served Monday-Friday from 7:30am-11:30am. For the number of meals served, it decreased to 59-82% of "typical service" for CPS, 61-83% of typical service for LAUSD, and 19-32% of typical service for NYC DOE (McLoughlin, McCarthy, et al., 2020).

The results then evaluated the equity impact of school meal implementation using the domains of the GTE framework, starting with Domain 1. This domain was "Increase Healthy Options: Distribute School Meals." Under this domain, the researchers compared the districts on the number of meal types (breakfast, lunch, dinner) provided: CPS provided two meal types, HISD provided one grocery box, LAUSD provided two meal types, and NYC DOE provided three meal types. They also compared the districts on provision of nutrition information: CPS and LAUSD did not provide nutrition information, while HISD and NYC DOE did (McLoughlin, McCarthy, et al., 2020).

Domain 2 was “Reduce Deterrents: Address Barriers to Accessing Meals.” Under this domain, the researchers found the following: (1) all districts except HISD provided special or restricted diet options such as Halal, Kosher, and vegetarian meals; (2) all districts except CPS provided information in multiple languages; (3) all districts placed more than 50% of their sites in census tracts where the poverty percentage was above the median for the district; (4) NYC DOE had the most sites in these census tracts but many census tracts without sites; and (5) all districts except CPS placed more than 50% of their sites in census tracts where the minority percentage was above the median for the district (McLoughlin, McCarthy, et al., 2020).

Domain 3 was “Build on Community Capacity: Facilitate Maximum Benefit.” Under this domain, the researchers found that all districts placed more than 50% of their sites in census tracts where the percentage of 5-19 year olds was above the median. They also found that all districts used community resources and/or partnered with other community organizations such as food banks (McLoughlin, McCarthy, et al., 2020).

Domain 4 was “Increase Social and Economic Resources: Assist with Child and Family Needs.” Under this domain, the researchers found that districts provided assistance on how to access other assistance programs and wellness programs. They also found that only HISD placed more than 50% of their sites in food deserts, while NYC DOE placed 1.1% of their sites in food deserts (McLoughlin, McCarthy, et al., 2020).

In the conclusion, the researchers explained that their findings are relevant to not only school meal service during the pandemic but also to school meal service through the SFSP and

SSO. They also made suggestions for future research, stating there is a need for research on trends in the availability of school meal sites and on the relationship between school meal sites and food swamps (McLoughlin, McCarthy, et al., 2020). For the present study, the findings by McLoughlin et al. (2020) suggest that special or restricted diet options, communication in multiple languages and of nutrition information, and meal site placement may be factors associated with participation in school meals during emergencies.

In 2021, Connolly et al. published a mixed methods study that sought to (1) compare participation in school lunch during spring 2020 to participation during spring 2019 in Connecticut and (2) describe the barriers and best practices for school meal service from the perspective of food service directors in Connecticut. For the quantitative component, the sample consisted of public-school districts that participate in the NSLP and have monthly meal counts up to May 2020 (n = 120). For the qualitative component, the sample consisted of food service directors and one super-intendent (n = 9). The exposure in this study was the COVID-19 pandemic. The main outcome of the quantitative component was percentage participation in school lunch, while the main outcome of the qualitative component was food service director perceptions of barriers and best practices for school meal service during the pandemic (Connolly et al., 2021).

Data for the quantitative component included data from January to May 2019 and January to May 2020, while data for the qualitative component was collected from semi-structured interviews conducted in spring 2020. For the quantitative component, the data were obtained from the Connecticut State Department of Education. These data were used to calculate percentage participation in school lunch. Including all students, percentage participation in school lunch was calculated as follows: number of school lunches served per day divided by the total enrollment. Including only students who qualify for FRPL, percentage participation in school lunch was calculated as follows: number of school lunches served per day divided by the number of students eligible for FRPL. Using repeated-measures ANOVA for repeated measures within each school district, two comparisons were made for all students and for students eligible for FRPL: (1) percentage participation in January-March 2020 vs. January-March 2019 ("pre-COVID") and (2) percentage participation in March-May 2020 compared to March-May 2019 ("post-COVID"). For the qualitative component, inductive coding was used to identify themes that describe "factors for success" for school meal service during the pandemic (Connolly et al., 2021).

The qualitative component identified four themes or "factors for success." Theme 1 was "Tailor Programs to Community Needs and Available Resources." The best practices reported under this theme included using maps with income information to place sites in low-income areas, using staff and family feedback to adjust mealtimes, and providing bulk meals. The barriers included holding cold foods and refrigeration capacity. Theme 2 was "Identify Strategies to Facilitate Family Participation." The best practices included communication about the program and menus through multiple forms of media (one food service director noted increased participation following phone calls to families who qualify for FRPL) and building staff-family relationships. The barriers included "physical access" to the sites (one food service director noted increased participation following placement of sites in low-income areas) and concerns about showing identification and permission to use multiple forms of assistance including P-EBT. Theme 3 was "Develop Partnerships to Coordinate School, Municipal, and Community Efforts." The best practices included adding school-based pantries so that families did not have to go to multiple sites to access food, and distributing masks and school materials on site, which led to increased participation on those days. Finally, theme 4 was "Establish Programs that Encourage Flexibility and Resiliency" (Connolly et al., 2021).

The quantitative results were analyzed separately but were presented under theme 2. The researchers found that pre-COVID, for both all students and students eligible for FRPL, there were no significant differences between percentage participation in January-March 2020 compared to January-March 2019. However, post-COVID, for all students, there was a significant 28.9% decrease in percentage participation in March-May 2020 compared to March-May 2019 ($p < 0.0001$). There were also significant decreases when comparing individual months during this period, i.e., when comparing March 2020 to March 2019, April 2020 to April 2019, and May 2020 to May 2019. For students eligible for FRPL, the decrease was smaller: there was a significant 9.9% decrease in percentage participation in March-May 2020 compared to March-May 2019 ($p = 0.002$). However, there were no significant differences when comparing April 2020 to April 2019 and May 2020 to May 2019, suggesting that the overall decrease during March-May 2020 was driven by the decrease in March 2020 compared to March 2019. Notably, a limitation of this analysis is that the researchers could not confirm that the meals served in 2020 went to students who are FRPL-eligible (Connolly et al., 2021).

In the conclusion, the researchers stated that the best practices identified during the 2020 school closures provide insights into best practices for future school years (Connolly et al., 2021). For the present study, the findings from the study by Connolly et al. (2021) suggest that the bulk waiver, site placement in low-income areas, mealtimes, communication about the program and menu, and provision of other services at meal sites may be factors associated with participation in school meals during emergencies.

In 2021, Chrisman and Alnaim published a mixed methods study that sought to determine the resources needed during the COVID-19 pandemic for operations of schools and school meal programs. The researchers surveyed teachers and staff in Kansas City, Kansas Public Schools (n = 99). The exposure was the COVID-19 pandemic, while the outcome was needed resources (Chrisman & Alnaim, 2021).

Data were collected via a survey administered in October 2020. The two methods of the study were (1) a cross-sectional survey and (2) a qualitative study. The survey consisted of 27 questions. The section of the survey on school meal programs consisted of close-ended questions and one open-ended question. For the close-ended questions, frequencies were used to analyze the responses. For the open-ended question, content analysis was used to identify themes (Chrisman & Alnaim, 2021).

The results showed a need for several resources for continued operation of the school meal programs. From the close-ended questions, the researchers found that survey respondents most frequently selected the following resources: (1) higher reimbursements, (2) transportation for students to access meal sites, and (3) additional staff. From the open-ended question, the researchers identified several themes, including a need to address variety and quantity of food on the menu, transportation barriers, the limited number of sites, mealtimes, and the limited communication of the program. More specifically, the respondents cited a need for hot meals, options for children with diet restrictions, transportation for children whose parents are working during the day or an extension of the mealtimes to after working hours, and an expansion of meal sites to all schools in the district (Chrisman & Alnaim, 2021). For the present study, these findings suggest that variety and quantity of food on the menu, transportation barriers, the number of sites (including the number of school districts that serve as sites), mealtimes, and communication of the program may factors associated with participation in school meals during emergencies.

In 2021, Kenney et al. published a mixed methods study that sought to (1) compare revenue and cost per school meal during the COVID-19 pandemic to revenue and cost per meal before the pandemic and (2) describe the implementation of school meals during the COVID-19-related school closures from the perspective of food service directors for large, urban school districts in the US. For the quantitative component, the sample consisted of ten out of the 12 school districts in the Urban School Food Alliance (USFA). For the qualitative component, the sample consisted of 20 food service directors and staff, representing all 12 districts in the USFA. The exposure in this study was the COVID-19 pandemic. For the quantitative component, the main outcomes included revenue per week, revenue per meal, total expense per week, and total expense per meal. For the qualitative component, the outcome was food service director and staff perspectives of implementation of school meals during the COVID-19 pandemic (Kenney et al., 2021).

Data for the quantitative component were collected from financial data for the 2018-2019 school year, spring 2020, and fall 2020; data for the qualitative component were collected from semi-structured interviews conducted from October to November 2020. Medians and ranges were used to analyze the quantitative data. The Consolidated Framework for Implementation Research (CFIR), deductive coding, and inductive coding were used to analyze the qualitative data (Kenney et al., 2021).

The key descriptive characteristics of the school districts in the USFA were presented first. Under demographic characteristics, 72.3% of the schools provided meals through CEP, 79.8% of students were FRPL-eligible, 36.0% of the students were Black, and 39.3% of the students were Hispanic. Under the number of meals served, schools served a median of 1,005,888 meals per week in 2018-2019, a median of 318,190 meals per week in Spring 2020, and a median of 318,424 meals per week in Fall 2020 (Kenney et al., 2021).

The quantitative results showed differences in revenue and expenses across the three time periods in the study: the 2018-2019 school year, spring 2020, and fall 2020. Total expense per week exceeded revenue per week for two time periods: spring 2020 and fall 2020. Expense per meal was highest for spring 2020 (median = 6.61 USD), followed by fall 2020 (median = 3.54 USD), followed by the 2018-2019 school year (median = 3.21 USD). Revenue per meal was also highest for spring 2020 (median = 3.48 USD), followed by the 2018-2019 school year (median = 3.11 USD), followed by fall 2020 (median = 2.98 USD). Per week, total expense exceeded revenue during the two time periods coinciding with the COVID-19 pandemic: spring 2020 and fall 2020. Based on other financial data, the researchers explained that this finding was due to increased costs during the pandemic for (1) PPE, (2) food, (3) serving other members of the population, and (4) staff pay whether they worked or not. They explained that this finding was also largely due to decreased participation in school meals during the pandemic (Kenney et al., 2021).

The qualitative results showed four themes that described implementation of school meals during the pandemic. Theme 1 was "Serving Meals during COVID-19 Was a Highly Complicated Process." Theme 2 was "The Usual Financial Model of School Food Service Is Untenable during School Closures." This is because it is based on reimbursement per meal, which is more financially appropriate for restaurant operations versus charitable food organizations. Theme 3 was "The Existing Culture of School Food Authorities Sustained Morale throughout the Pandemic." Finally, theme 4 was "External Policies and Factors That Influenced

Implementation." Under this theme, the participants explained that the waivers were helpful for implementation but not reach or participation. They also explained that there was missing or insufficient guidance on where to place sites. Additionally, they explained that other community organizations like food pantries have a competitive advantage over school meals since they have less restrictions on who can participate and what foods can be served (Kenney et al., 2021).

In the conclusion, the researchers stated that "the current operations structure [of school meals] is not responsive to disaster" (Kenney et al., 2021). For the present study, the findings by Kenney et al., 2020 suggest that guidance on placement of sites and "competition" with other food assistance programs may be factors associated with participation in school meals during emergencies.

In 2022, Beckstead et al. published a cross-sectional and qualitative study that sought to describe the experiences of school nutrition professionals with respect to managing food safety and dietary restrictions when providing school meals in the US during the COVID-19 pandemic. The sample consisted of 504 school nutrition professionals for K-12 schools (42.2% were school district nutrition program directors, 21.0% were school nutrition program managers, 15.8% were frontline staff). The exposure in this study was the COVID-19 pandemic and alternative models for school meal service (i.e., grab-and-go and home delivery). The outcome was experiences with school meal food safety and dietary restrictions from the perspective of school nutrition professionals (Beckstead et al., 2022).

Data were collected from a survey administered from March to April 2020. The survey consisted of close-ended questions and one open-ended question. To analyze the responses from the close-ended questions, descriptive statistics were used. To analyze the responses from the open-ended question, inductive coding was used (Beckstead et al., 2022).

The results from the close-ended questions were presented before the results from the open-ended question. The survey found that 60.9% of participants reported equipment-related barriers to holding hot foods, 53.0% reported equipment-related barriers to holding cold foods, and 60.2% reported not accommodating dietary restrictions. From the responses to the open-ended question, the researchers identified four themes related to accommodating dietary restrictions such as food allergies, intolerances, vegetarian, etc. Theme 1 was “Logistical processes of managing special meals.” Under this theme, the participants reported contacting families or asking families to contact the school for dietary restrictions. They also reported challenges obtaining food items for dietary restrictions. Theme 2 was “Feelings toward special meals during pandemic.” While the participants reported that special meals were challenging, they felt appreciated by the families. Theme 3 was “Demand for special meals.” The participants reported that the demand decreased. Finally, theme 4 was “Special dietary needs accommodated.” While the participants accommodated special dietary needs, they reported limiting the number of dietary restrictions that could be accommodated (Beckstead et al., 2022). For the present study, these findings suggest that the meal service model impacts the ability to hold hot and cold foods and provide for dietary restrictions, which are factors that could be associated with participation.

Overall, more than one mixed methods study showed that the following factors may be associated with decreased participation in school meals during emergency-related school closures: lack of options for dietary restrictions (Beckstead et al., 2022; McLoughlin, McCarthy, et al., 2020), poor communication with families (Chrisman & Alnaim, 2021; Connolly et al., 2021; McLoughlin, McCarthy, et al., 2020), and poor meal site placement (Connolly et al., 2021; Kenney et al., 2021; McLoughlin, McCarthy, et al., 2020). One study was conducted at the national level (Beckstead et al., 2022), one study was conducted at the state level (Connolly et al., 2021), two studies were conducted at the level of a number of urban school districts (Kenney et al., 2021; McLoughlin, McCarthy, et al., 2020), and one study was conducted at the level of a single school district (Chrisman & Alnaim, 2021). There was variability in the methods: only McLoughlin et al. (2020) included a geospatial analysis and did not use interviews, only Connolly et al. (2021) statistically compared participation in school meals during COVID-19 to participation before COVID-19, only Chrisman et al. (2021) interviewed teachers, and only Kenney et al. (2021) included a financial analysis. All studies included a qualitative component, but some used inductive coding only (Beckstead et al., 2022; Chrisman & Alnaim, 2021; Connolly et al., 2021) while others used both deductive and inductive coding (Kenney et al., 2021; McLoughlin, McCarthy, et al., 2020). When deductive coding was used, they were based on different frameworks. None of the qualitative components involved interviewing parents or students. All the studies were largely descriptive; only one study used inferential statistics (Connolly et al., 2021). All the studies were also limited by their generalizability.

2.3.5 Intervention Study Design

A quasi-experimental study (n = 1) has been published that reveals potential factors associated with participation in school meals during the COVID-19 pandemic (Dombrowski et al., 2021). This study was designed to test the effect of an intervention unrelated to the COVID-19 pandemic and emergencies; however, a part of the intervention happened to occur during the COVID-19 pandemic. Since the researchers generated hypotheses about the effect of the pandemic, the study was included in this review.

In 2021, Dombrowski et al. published a quasi-experimental time series study that sought to evaluate the effect of the Best Food Forward (BFF) intervention on participation in school meal programs, among other outcomes, by children in two school districts in Michigan. A part of the intervention occurred during the COVID-19 pandemic. The sample consisted of parents/caregivers ($n = 122$) of children ($n = 162$) in the two school districts in the intervention. The aim of the BFF intervention was to increase the food security rate through several activities including increasing school district utilization of child nutrition programs and mobile food pantries, coordinating nutrition education programs provided by schools and other community organizations, and promoting awareness and utilization of school meals and other community services. A main outcome was frequency of participation in school breakfast and school lunch per week, among other outcomes unrelated to school meals (Dombrowski et al., 2021).

Data were collected in three time periods: (1) before August 2019 was pre-intervention (T0); (2) August 2019-March 2020 was post-intervention, pre-COVID (T1); and (3) March 2020-“present” was post-intervention, “post-COVID” (T2). The outcomes of the study were measured using a parent/caregiver survey. Repeated-measures ANOVA and Mauchly’s test of sphericity were used to analyze the results for the outcome related to school meals (Dombrowski et al., 2021).

The key descriptive characteristics of the parent/caregiver participants were reported before the results for the outcomes. The key descriptive characteristics were as follows: 48.8% of the participants made less than $35,000/year, 36.9% lost jobs during COVID-19, 51.1% utilized SNAP or WIC pre-COVID-19, 50.0% utilized SNAP or WIC during COVID-19, greater than 30% were African American or Black, and about 80% were female. From pre-intervention (T0) to post-intervention and post-COVID (T2), the researchers found a significant decrease in utilization of school breakfast ($\chi2(2) = 9.82$, $p < 0.001$; $F(1.78, 74) = 19.64$, $p < 0.001$) and a significant decrease in utilization of school lunch ($\chi2(2) = 29.52$, $p < 0.001$; $F(1.51, 74) = 23.30$,

$p < 0.001$). The researchers hypothesized that the decrease was due to the pandemic-related school closures and pandemic-related increase in other assistance programs. However, the study also found statistically significant decreases from pre-intervention (T0) to post-intervention, pre-COVID (T1) and from post-intervention, pre-COVID (T1) to post-intervention, post-COVID (T2) for both utilization of school breakfast and utilization of school lunch (Dombrowski et al., 2021).

In the conclusion, the researchers noted that one of the school districts in the intervention pivoted to using bus routes to deliver school meals during the pandemic. The researchers hypothesized that this model may have facilitated participation in school meals in that school district (Dombrowski et al., 2021). For the present study, the findings by Dombrowski et al. (2021) suggest that the school closures, other assistance programs, and use of bus routes may be factors associated with participation in school meals during emergencies.

Overall, the quasi-experimental time series study showed that school meal participation decreased during the COVID-19 pandemic (Dombrowski et al., 2021). The study was conducted at the level of two school districts in the same area. The researchers hypothesized factors that may be responsible for the decreased participation. These are the findings of interest in this review. However, this makes the study hypothesis-generating as opposed to hypothesis-testing for the purpose of this review. Furthermore, this study is limited by its generalizability to other school districts/populations.

2.3.6 Discussion of the Gaps in the Research on Factors Associated with Participation in School Meals During Emergencies

The research included in this section is largely descriptive and hypothesis-generating; only three out of the 12 studies used inferential statistics (Connolly et al., 2021; Dombrowski et al., 2021; Jabbari et al., 2021). Two of these studies compared school meal participation during COVID to pre-COVID (Connolly et al., 2021; Dombrowski et al., 2021), while one study compared school meal accessibility by census tract characteristics and FRPL eligibility rate (Jabbari et al., 2021). The focus on descriptive methods is perhaps appropriate considering that emergencies are usually either new or infrequent, lending itself to descriptive research, which usually precedes analytical research. Unlike the literature on participation in the NSLP and SBP, there is a paucity of research on factors associated with participation in school meals during emergencies. As a result, the hypothesis-generating studies were included in this review even though they could not provide associations or causal inferences of factors that are associated with participation. There is a need for analytical studies to determine factors associated with participation in school meals during all kinds of emergencies, and especially long and changing emergencies such as the COVID-19 pandemic. Also, there is a need for descriptive and analytical studies on summer meals during COVID-19. None of the studies assessed participation in summer meals, although one study did assess accessibility of summer meals (Jabbari et al., 2021).

2.4 Research on Factors Associated with Participation in the Summer Food Service Program and Seamless Summer Option

This section provides a review of the methods and results from the peer-reviewed literature on factors associated with participation in school meals provided through the SFSP or

SSO. This section was included because (1) the data used in this dissertation was on school meals provided through the SFSP and (2) the larger purpose of this dissertation is to contribute to the literature on factors associated with participation in the SFSP. As a result, the focus of this section is on the methods and results of the studies on participation in the SFSP/SSO.

In January 2022, a search was conducted on the PubMed and ERIC databases to find articles containing the following search terms: "summer food service program" OR "seamless summer option" OR "summer meals." This search returned 25 results on PubMed and 67 results on ERIC. Articles were included if (1) they were published in English, (2) they were conducted in the United States, (3) the exposure or intervention was related to the SFSP or SSO, (4) the outcome measures included school meal participation, assessed either quantitatively or qualitatively, and (5) the full text was available online or through Columbia University libraries. Articles were excluded if (1) the exposure was summer EBT, not school meals and (2) the article was not peer-reviewed. Reference lists were searched. Overall, nine articles met the criteria and were included in this review.

The articles are presented in this section by design: qualitative study design (n = 1), cross-sectional study design (n = 2), geospatial study design (n = 1), mixed method study design (n = 3), and intervention study design (n = 2).

2.4.1 Qualitative Study Design

A qualitative study (n = 1) has been published that reveals potential factors associated with participation in the SFSP (Cullen et al., 2019; Kannam et al., 2019). The study assessed participation qualitatively.

In 2019, Kannam et al. published a qualitative study that sought to describe parent perceptions of the benefits and barriers of participation in summer meals in New York City. The sample consisted of English-speaking parents of elementary students who participate in the NSLP and included parents of summer meal participants and non-participants (n = 20). The exposure in this study was the SFSP. The main outcome was perceived benefits and barriers (Kannam et al., 2019).

Data were collected from semi-structured interviews conducted from December 2017 to February 2018. Deductive coding and inductive coding were used to identify themes. The key descriptive characteristics of the interview participants were as follows: 85% were Hispanic/Latino, African American, or Asian; 80% were mothers; 55% had a household income less than $30,000; more than 50% had a college degree; 55% were parents of SFSP participants; and 45% were parents of SFSP non-participants (Kannam et al., 2019).

The results showed five themes, three related to benefits and two related to barriers. The benefits were as follows: (1) “Reducing Stress for Parents,” including psychological and financial stress from increased spending on food in the summer to feed children, (2) “Fostering Social Support and Connection” including the opportunity to socialize with others in the community, and (3) the “Opportunity to Develop Healthier Eating Habits,” which was a theme for non-participants vs. participants. The barriers were as follows: (1) “Lack of Cultural Inclusivity” with respect to cultural and religious dietary restrictions and ethnic foods and (2) “Lack of Widespread Knowledge About Summer Meals” (Kannam et al., 2019).

In the conclusion, the researchers stated that in addition to decreasing food insecurity rates, the SFSP “provide[s] social and psychological benefits valued by lower-income families in New York, although participation barriers persist” (Kannam et al., 2019). For the present study, the findings by Kannam et al. (2019) suggest that stress, socializing, and school meal quality may be factors associated with increased participation, while limited cultural responsiveness and awareness may be factors associated with decreased participation.

Overall, the qualitative study showed modifiable barriers to participation in the program: cultural responsiveness of summer meals and awareness of summer meals (Cullen et al., 2019). The study was conducted at the level of a single city. The study sampled parents of participants and non-participants in the SFSP. However, they did not obtain the perspectives of other stakeholders, including sponsors and students. The study used semi-structured interviews, but it did not combine multiple qualitative methods to obtain a more in-depth analysis. Furthermore, the study is limited by its descriptive design and generalizability to other geographic areas/populations.

2.4.2 Cross-Sectional Study Design

Cross-sectional studies (n = 2) have been published that have identified factors or revealed potential factors associated with participation in the SFSP (Litt et al., 2020; Molaison & Carr, 2006). None of the studies included school meals provided through the SSO. One study assessed participation qualitatively (Molaison & Carr, 2006), while the other assessed participation quantitatively (Litt et al., 2020). The studies are presented here in chronological order by publication date.

In 2006, Molaison & Carr published a cross-sectional study that sought to describe sponsor perceptions of the benefits, barriers, and best practices of SFSP operation and participation. The sample consisted of SFSP sponsors in the southwestern region of the US (n = 316). The exposure in this study was the SFSP and the “Simplified Summer Food Program” (Molaison & Carr, 2006), which was a “variation of the SFSP” that gave the maximum reimbursement per meal served and did not require reporting of costs. The purpose of the program was to increase reimbursement and decrease paperwork in order to increase the number of SFSP sponsors and ultimately, the number of SFSP participants (FNS, 2005). The outcome of the study was sponsor perceptions of benefits, barriers, and best practices of SFSP operation and participation (Molaison & Carr, 2006).

Data were collected from a survey administered in summer 2005. To develop the survey, the researchers conducted interviews with state agency directors and SFSP sponsors ($n = 9$). The survey consisted of six 5-point Likert scale questions on benefits, barriers, and best practices for SFSP operation and participation. The response rate of the survey was 39%. The key descriptive characteristics of the survey respondents were as follows: mean weeks of SFSP operation = 7.4, mean number of SFSP meals per day = 905, mean years of operation = 9.9, mean number of sites = 14.5, 53.9% served upper elementary students, and 34.3% utilized the Simplified Summer Food Program (Molaison & Carr, 2006).

The results showed several barriers for sponsors. For the question on barriers for sponsor participation, the following barriers received a mean rating of at least 3 (listed in descending order by rating): “there is too much paperwork involved in starting a SFSP,” “did not understand what was involved in starting a program,” “did not understand the financial component of SFSP,” “it takes too much time to manage a SFSP,” and “transportation of children to the sites was difficult.” For the question on reasons for sponsor exit from the SFSP, the following reasons received a mean rating of at least 3 (listed in descending order by rating): “too much paper is involved in operating a program,” “the overhead costs of running a program are too high,” “transportation of the children to the sites was inadequate,” and “there was an inadequate number of children to support the site” (Molaison & Carr, 2006).

The results showed several benefits and barriers for children. For the question on benefits to participation for children, all the benefits listed received a mean rating of at least 3 (listed in descending order by rating): “advertising the program in areas frequented by families,” “having an activity associated with the program,” “utilizing media to advertise the program,” “utilizing community groups to provide activities for the children,” and “having hot meals available for the children.” For the question on barriers to participation for children, the following barriers received a mean rating of at least 3 (listed in descending order by rating): “eligible children do not have transportation to the feeding sites,” “children would prefer to have hot food on a daily basis,” and “community members/families do not know about the program” (Molaison & Carr, 2006).

The results showed various best practices. For the question on helpful resources for SFSP operation, all the resources listed received a mean rating of at least 3 (listed in descending order by rating): “having adequate/appropriate staff to help with meal production,” “having an adequate facility for preparation of meals,” “having training manuals/workshops related to program operation,” “having pre-established partnerships in the community,” “having funding prior to the start of the program,” “having a central kitchen for food production,” and “utilizing volunteers to run the program.” For the question on best practices to increase participation, the following best practices received a mean rating of at least 3 (listed in descending order by rating): “partnering with community groups to sponsor activities,” “utilizing volunteers to teach enrichment classes,” “getting local merchants to give prizes as incentives for attendance,” and “having a feeding site near a homeless shelter” (Molaison & Carr, 2006).

Based on their findings, the researchers recommended education and training for SFSP sponsors, including assistance with obtaining funding from other sources in order to increase the number of sites. They also recommended community partnerships and development of site activities for SFSP participants (Molaison & Carr, 2006). For the present study, the findings by Molaison & Carr (2006), suggest that SFSP sponsor training, funding, site activities, transportation, awareness, hot meal options, and paperwork are factors associated with participation.

In 2020, Litt et al. published a cross-sectional study that sought to determine the association between school/site characteristics and reach of sites in LunchStop, a program utilizing the SFSP in Chicago, Illinois. The LunchStop Summer Meals Program is sponsored by the Chicago Public School (CPS) District. The sample consisted of all LunchStop sites (n = 100), which are all open sites and are all located at schools. The exposures in this study were "site characteristics" and "school characteristics" of sites/schools in the SFSP. The site characteristics were the number of years of continuous operation, staff continuity from 2017 to 2018, the number of miles to nearest site, and the presence of a public bus route next to the site. The school characteristics were the school level, the CPS geographic network in which the site is located, total number of students, percentage of students by race/ethnicity and FRPL eligibility, attendance percentage, and school performance score. The outcome was site reach (Litt et al., 2020).

Data were collected from CPS data and Google Maps for summer 2018. The outcome, "site reach," was operationalized as the mean number of lunches served per day of service for each site. The exposure variables included continuous and categorical variables. For the site characteristics, the continuous variables were the number of years of continuous operation and the number of miles to nearest site, while the categorical variables were staff continuity from 2017 to 2018 and the presence of a public bus route next to the site. For the school characteristics, the continuous variables were the total number of students, percentage of students by race/ethnicity and FRPL eligibility, and attendance percentage, while the categorical variables were the school level, the CPS geographic network in which the site is located, and the school performance score. For the categorical exposure variables, Mann-Whitney tests were used to test their association with site reach. For the continuous exposure variables, simple linear regression was used to test their association with site reach. For exposure variables significantly associated with site reach, multivariate linear regression was used to further test their association with site reach (Litt et al., 2020).

The results for the key descriptive characteristics of the sites were presented first. In summer 2018, 153,252 meals were served, the mean number of days of service was 41.8, the mean site reach was 36.6 lunches per day, site reach ranged from 5.2 to 108.8 lunches per day, 51.5% of students were African American, 44.8% of students were Hispanic/Latino, and 87.3% were eligible for FRPL (Litt et al., 2020).

The results showed several positive and negative associations between site/school characteristics and site reach. There were significant positive associations between site reach and number of students ($p < 0.01$), percentage of Hispanic/Latino students ($p < 0.01$), attendance percentage ($p = 0.01$), site location in network 8 (southwest Chicago) ($p < 0.01$), years of continuous operation ($p < 0.01$), and staff continuity ($p < 0.01$). There were significant negative associations between site reach and percentage of African American students ($p < 0.01$) and site location in network 5 (west Chicago) ($p = 0.04$). There were no associations between site reach and percentage of students eligible for FRPL, school level, school performance, location in geographic networks other than 5 and 8, presence of a public bus route next to the site, and miles to the nearest site. In the multivariate analysis, there were significant positive associations between site reach and number of students ($p = 0.01$), site location in network 8 ($p = 0.02$), years of continuous operation ($p < 0.001$), and staff continuity ($p = 0.05$) (Litt et al., 2020).

Based on their findings, the researchers highlighted the number of years of continuous site operation and staff continuity as characteristics associated with site reach. For the number of years of continuous operation, they explained that “as a site remains open from summer to summer, more community members learn about its presence, allowing more children to access it.” For the number of years of continuous site operation and staff continuity, they explained that it “may reduce discomfort or shame that is associated with use of public benefit programs and, as a result, increase access to summer meals among community members” (Litt et al., 2020). For the present study, the findings by Litt et al. (2020) suggest that site and staff continuity, larger schools, and geographic location may be factors associated with participation.

Overall, both studies found sponsor-related factors that were associated with participation in the SFSP (Litt et al., 2020) or may be associated with participation in the SFSP (Molaison & Carr, 2006). One study was conducted at the regional level (Molaison & Carr, 2006), while the other was conducted at the level of a single sponsor (Litt et al., 2020). The studies differed in their samples: one study sampled sites (not individuals) sponsored by one SFA sponsor (Litt et al., 2020), while the other sampled multiple sponsors (individuals) (Molaison & Carr, 2006). They also differed in their analytical methods: while one study used descriptive statistics only (Molaison & Carr, 2006), the other also used inferential statistics that allowed the researchers to identify associations (Litt et al., 2020). Both studies are limited by their generalizability to other geographic areas/populations.

2.4.3 Geospatial Study Design

A geospatial analysis (n = 1) has been published that identified factors associated with participation in SFSP and SSO programs (Turner et al., 2019). This study assessed participation quantitively. It also included a quantitative assessment of the availability of SFSP and SSO programs, which may be related to participation in the programs.

In 2019, Turner et al. published a geospatial analysis that sought to examine (1) the association between county characteristics and summer meal uptake rate, and (2) the association between school characteristics and availability of SFSP and SSO programs in California. The initial sample consisted of public schools in California (n = 8,442). The final sample consisted of public schools in California with a County-District-School identifier, demographic data, and site addresses (n = 7,752; 92% retention). The exposures in this study were county and school characteristics of counties and schools participating in either the SFSP or SSO. The outcomes were summer lunch uptake rate and availability of SFSP and SSO programs (Turner et al., 2019).

Data were collected for the 2015-2016 school year including summer 2016. For the initial sample, the key descriptive characteristics of the schools were as follows: 47% of sites served meals through SSO, 88.4% of sites were open sites, 90.8% were urban, and 64.9% were elementary schools. The researchers conducted their analyses at two levels: the county level and the "micro-level" (Turner et al., 2019).

For the county-level analysis, the researchers were interested in the association between county characteristics and summer meal uptake rate. To obtain the summer meal uptake rate for each county, they used summer meal claims data, which were at the site level. At the county level, the summer lunch uptake rate was calculated as follows: the mean number of lunches served per day in July 2016 divided by the mean number of FRPL served per day in October

2015, then multiplied by 100 to obtain a percentage. The mean number of lunches served per day was calculated as follows: the total number of lunches served in July divided by the number of days of service in July. Notably, the total number of lunches included SFSP claims and SSO claims for schools with summer breaks and NSLP FRPL claims for year-round schools. For the statistical analysis, summer meal uptake rate was categorized as (1) greater than 10% or (2) greater than 18%. The 18% cut-off represented the state average for California. Chi-squared tests were used to compare the summer meal uptake rate by rural/township vs. urban/suburban, education rate, employment rate, and persistent child poverty (Turner et al., 2019).

For the "micro-level geographic analysis," the researchers were interested in the association between school characteristics and availability of SFSP and SSO programs. To obtain the availability of SFSP and SSO programs, they used the service area function (1 mile for urban schools, 10 miles for rural schools) in ArcGIS ver. 10.4.1 to determine the number or availability of SFSP and SSO programs around each school. For the statistical analysis, logistic regression and calculation of odds ratios were used to compare the availability of SFSP and SSO programs by school levels (elementary, middle, high, multiple), school size (categories of number of students), FRPL eligibility (categories of percentage of students), race/ethnicity, SBP participation rate in October 2015, and NSLP participation rate in October 2015. Notably, urban and rural schools were analyzed separately. These schools differed significantly on school level, school size, FRPL eligibility, race/ethnicity, SBP and NSLP participation (higher in rural schools), and the number of summer sites within 1 mile and 10 miles ($p < 0.001$) (Turner et al., 2019).

The results for the county-level analysis largely showed no associations between county characteristics and summer meal uptake rate. There were significantly less counties with an uptake rate > 18% among counties that have low education rates compared to counties that do not have low education rates ($p = 0.022$). However, there were no significant differences in the number of counties with an uptake rate > 18% when comparing counties by rural/township vs. urban/suburban, employment rate, and child poverty rate. Notably, the county-level analysis had low statistical power (Turner et al., 2019).

The results for the micro-level analysis showed several associations between urban school characteristics and availability of SFSP and SSO programs. High schools were 2.07 times more likely to have an SFSP or SSO site within 1 mile (i.e., a nearby site) compared to elementary schools (OR = 2.07, 95% CI 1.65-2.61, $p < 0.001$). Schools with ≥75% of students eligible for FRPL were 7.83 times more likely to have a nearby site compared to schools with <50% of students eligible for FRPL (OR = 7.83, 95% CI 6.13-10.00, $p < 0.001$). Schools with >50% White, non-Latino students were 52% less likely to have a nearby site compared to schools with less White, non-Latino students (OR = 0.48, 95% CI 0.39-0.59, $p < 0.001$). Schools with a SBP participation rate > 90% were 80% more likely to have a nearby site compared to schools with participation rates from 0 to 10% (OR = 1.80, 95% CI 1.08-3.00, $p = 0.025$). There was no association between NSLP participation rate and availability of SFSP and SSO sites (Turner et al., 2019).

The results for the micro-level analysis showed several associations between rural school characteristics and availability of SFSP and SSO programs. Schools with ≥ 1,000 students were 5.46 times more likely to have a SFSP program or SSO site within 10 miles (i.e., a nearby site) compared to schools with ≤ 399 students (OR = 5.46, 95% CI 1.10-27.09, $p = 0.038$). Schools with ≥75% of students eligible for FRPL were 2.64 times more likely to have a nearby site compared to schools with <50% of students eligible for FRPL (OR = 2.64, 95% CI 1.21-5.75, p

= 0.015). Schools with >50% White, non-Latino students were 61% less likely to have a nearby site compared to schools with less White, non-Latino students (OR = 0.39, 95% CI 0.25-0.61, p < 0.001). NSLP participation rate, SBP participation rate, and school level were not associated with availability of SFSP and SSO sites (Turner et al., 2019).

In the conclusion, the researchers emphasized the low availability of SFSP and SSO programs (Turner et al., 2019). For the present study, the findings by Turner et al. (2019), suggests that education rate, school grade level, school size, FRPL eligibility rate, race/ethnicity makeup, and SBP participation may be factors associated with participation in the SFSP/SSO.

Overall, the geospatial analysis identified a number of school-related factors significantly associated with availability of SFSP and SSO programs, and availability may be related to participation in these programs. However, the study did not determine the association between availability and participation. The study was conducted at the state level. It did not include sponsors other than public school SFAs. The study is limited by the generalizability of its findings.

2.4.4 Mixed Methods Study Design

Mixed methods studies (n = 3) have been published that identified factors and/or revealed potential factors associated with participation in the SFSP (Chiappone et al., 2018; Harper et al., 2022) and SSO (Bruce et al., 2019). Two studies assessed participation quantitatively (Chiappone et al., 2018; Harper et al., 2022), while one study assessed participation qualitatively (Bruce et al., 2019). The studies are presented here in chronological order by publication date.

In 2018, Chiappone et al. published a convergent parallel mixed methods study that sought to determine the factors associated with participation in the SFSP in Oregon. For the quantitative component, the sample consisted of all SFSP sponsors in Oregon from 2010 to 2015 (n = 164 unique sponsors). For the qualitative component, the sample consisted of a purposeful, representative sample of sponsors (n = 10). The exposure in this study was the SFSP. The main outcome of the quantitative component was average daily participation (ADP) per year at the sponsor level. The outcome of the qualitative component was sponsor perceptions of barriers and facilitators to participation (Chiappone et al., 2018).

Data for the quantitative component included data from 2010 to 2015, while data for the qualitative component were collected from semi-structured interviews conducted in 2016. For the quantitative component, the data were obtained from the Oregon Department of Education. These data were used to calculate sponsor ADP per year, calculated as follows: sum of the number of meals served (all meal types) at all sponsor sites divided by the sum of the number of days of service at all sponsor sites. These data were also used to create covariates at the state, sponsor, and site levels:

- State-level covariates: number of sponsors, number of sites, types of meals served.
- Sponsor-level covariates: school district vs. non-school district, average number of days of service, number of sites, average number of types of meals served, year, proportion of rural sites, proportion of sites with activities.
- Site-level covariates: rural vs. urban, open vs. closed sites, activities vs. no activities.

Longitudinal linear mixed models were used to analyze the quantitative data. Four models were created, and all models were adjusted for the covariates in the base model:

- Base model: the covariates were year, number of sites at the sponsor level, average number of days of service, average number of types of meals served.

- Model 1: proportion of rural sites was added as a covariate to the base model.
- Model 2: school district vs. non-school district was added as a covariate to the base model.
- Model 3: activities vs. no activities was added as a covariate to the base model.

For the qualitative component, a Grounded Theory approach and inductive coding were used to identify themes (Chiappone et al., 2018).

The quantitative results identified several factors associated with sponsor ADP. In the base model, year was associated with a 3.81% decrease in sponsor ADP ($p < 0.001$), adding a site was associated with a 2.48% decrease in sponsor ADP ($p < 0.001$), and adding a day of service was associated with a 0.82% decrease in sponsor ADP ($p < 0.001$). Adding a meal type was associated with a 50.59% increase in sponsor ADP ($p < 0.001$). In model 1, proportion of rural sites at the sponsor level was not associated with sponsor ADP. In model 2, sponsor ADP was 28.30% higher for school districts compared to non-school districts ($p = 0.02$). Finally, in model 3, sponsor ADP was 20.46% higher for sponsors who had activities at all sites compared to sponsors who had no activities at any site ($p = 0.01$). Altogether, these results showed that year, additional site, and additional day of service were negatively associated with sponsor ADP, while number of meal service types, sponsor type (school district), and sponsor activities were positively associated with sponsor ADP (Chiappone et al., 2018).

The qualitative results showed three themes, which categorized factors associated with participation. These themes were as follows: “Organizational Characteristics,” “Site Characteristics,” and “Meal Logistics.” Under “Organizational Characteristics,” the participants reported that staffing and funding were barriers to SFSP implementation. However, they reported that increasing the number of sites was a facilitator to participation because it led to increased reach and accessibility and decreased transportation barriers. Under “Site Characteristics,” the participants reported that site activities were a motivator, but activities for adolescents were needed. Also, involving parents as volunteers and providing free meals to parent volunteers were motivators. The participants reported that the relationships between staff and participants were important for participation, and readiness to change site location can increase participation. However, it was unclear if indoor or outdoor sites were better for promoting participation; there were trade-offs in each case, e.g., weather became a barrier in outdoor sites, while lack of outdoor activities became a barrier for indoor sites. Under “Meal Logistics,” the participants reported that menu appeal was important for participation, and mealtime was important- perhaps explaining lower participation in breakfast. Also, for on-site vs. centralized kitchens, the participants reported that on-site was better for menu flexibility, while centralized was better for reaching many sites (Chiappone et al., 2018).

Based on their findings, the researchers stated that

> Strengthening existing sites by ensuring sites are geographically accessible, food and beverages served as well as activities are culturally sensitive for local communities, offering quality meals, hosting activities geared toward various age groups, and hiring staff and volunteers familiar to the population of interest, such as teenagers, parents, and gatekeepers, may increase SFSP participation.

They explained that while increasing the number of sites may increase reach, it also requires more resources (Chiappone et al., 2018). For the present study, the findings by Chiappone et al. (2018) suggest that number of sites, number of days of service, number of meal types, school district sponsors, site activities, staffing, funding, staff-participant relationships, meals for parents, mealtimes, and menu appeal are factors that may be associated with participation.

In 2019, Bruce et al. published a mixed methods study that sought to describe participant perceptions of a community-based mobile summer meal program in California. The study also sought to determine the association between participant demographic characteristics and household food security status; however, this objective is not relevant to the current review so its methods and results will not be presented here. For each part of the study, the sample consisted of parents/caregivers (English or Spanish-speaking) who utilized the program. The two methods of the study were (1) a survey and (2) interviews. The sample size for the surveys was 284 parents/caregivers, while the sample size for the interviews was 36 parents/caregivers. The exposure in this study was a community-based mobile summer meal program, a program utilizing the SSO at three parks, which were all open sites. The sponsor of the program was a Silicon Valley school district. The outcomes of the study were participant perceptions of the motivators and barriers for participation in the program. Data were collected from June to August 2017 (Bruce et al., 2019).

The results showed several motivators and barriers to participation in the community-based mobile summer meal program. The following are the key descriptive characteristics of the survey participants: 32% were Asian, 29% were Latino/Hispanic, 27% were White, 66% had an educational attainment of "some college," and 77% utilized the program 1-2 days a week. According to the survey results, 83% of the participants reported no barriers to participation. From the interviews, the researchers identified themes related to the program model and themes related to motivators and barriers. Under the themes related to the program model, participants expressed their appreciation for the site locations in public parks as a "convenient" and "inclusive" location. They also expressed their appreciation for activities near the park, opportunities for social interaction, and the welcoming treatment by the staff. Under the themes related to motivators and barriers, the participants reported the following motivators: household food insecurity and increased spending on food in the summer for children. They also reported the following barriers: work schedules and no access to affordable summer enrichment programs that include summer meals. Immigrant participants expressed concerns related to deportation and sharing of data with the government (Bruce et al., 2019).

In the discussion, the researchers noted that "expanded geographic eligibility for federal sponsors running mobile meal programs is a possible step toward ensuring access to the hardest-to-reach children." They explained that because California has large income disparities, sites may not meet the area eligibility requirement of the SFSP and SSO, which blocks the implementation of these programs (Bruce et al., 2019). For the present study, the findings by Bruce et al. 2019 suggest that stigma, parent work schedules, no summer programming, and immigrant concerns may be factors associated with decreased participation, while public and open sites, activities, social interaction, friendly staff, food insecurity, increased spending on food in the summer may be factors associated with increased participation. The discussion also suggests that the COVID-19 Child Nutrition Area Eligibility Waiver may be a factor associated with increased participation.

In 2022, Harper et al. published a mixed methods study that sought to evaluate the impact of the 2019 recission of six USDA summer meal waivers on SFSP sponsor experience and SFSP participation in Maryland and (2) compare the percentage change in the number of meals served from summer 2018 to summer 2019 across different sponsor characteristics. The methods of the study were (1) a survey (which was "linked" by the researchers to participation data) and (2) interviews. For the survey (n = 29) and the interviews (n = 11), the sample consisted of SFSP sponsors who operated sites in summer 2018 and summer 2019. The exposure in this study was the removal of six, pre-COVID, USDA waivers for the SFSP. States had the opportunity to apply to keep the waivers statewide; however, Maryland did not apply to keep them, leaving individual sponsors to apply on their own for their own operations (Harper et al., 2022). Briefly, the six waivers were as follows:

1. "Waiver of Site Monitoring Requirements in the Summer Food Service Program:" SFSP sponsors do not need to visit sites in the first week of operations if the site had no operation issues in the previous summer.
2. "REVISED, Summer Feeding Options for School Food Authorities": SFA sponsors do not need to visit sites during the first week of operations if the sponsor is in "good standing" in the SFSP.
3. "Available Flexibilities for CACFP At-risk Sponsors and Centers Transitioning to Summer Food Service Program (SFSP)": SFSP sponsors do not need to visit sites during the first week of operations if the sponsor is in "good standing" in the CACFP, and SSO sponsors do not need to visit sites during the first week of operations if the sponsor is in "good standing" in the NSLP.
4. "Meal Service Requirements in the Summer Meal Programs, with Questions and Answers – Revised": Sponsors can apply the offer versus serve (OVS) option, which means that sponsors must offer all five of the required meal components for a reimbursable meal, but they only need to serve at least 3 components including a fruit or vegetable component in order to receive reimbursement.
5. "Meal Service Requirements in the Summer Meal Programs, with Questions and Answers – Revised": Sponsors do not need to wait a certain number of hours before serving another meal or snack.

6. “Summer Food Service Program (SFSP) Waiver for Closed Enrolled Sites”: Sponsors can operate a closed enrolled site by establishing area eligibility instead of providing income eligibility applications from participants (FNS, 2018).

The outcome of the study was SFSP sponsor experience with the waivers and SFSP participation (Harper et al., 2022).

Data were collected in summer 2019. The survey was a 25-question survey about SFSP sponsor experience. There were some questions on sponsor operation characteristics, sponsor knowledge of the waivers, and sponsor decisions with respect to independently applying for continued waivers. There were also 7-point Likert scale questions on the “perceived impact of the waiver recission” with respect to six outcomes- increased workload, increased expenses, increased staff needs, decreased number of types of meals served, decreased number of meals served, decreased number of sites. The results were analyzed using descriptive statistics and frequency distributions. The results were also “linked” with data on the number of meals served per month for each sponsor; these data were obtained from the Maryland State Department of Education (MSDE). Using these data, the researchers calculated the percentage change in the number of meals served from summer 2018 to summer 2019 and categorized the percentage change into three categories: (1) at least +10%, (2) at least -10%, and (3) “no change,” i.e., between +10% and -10%. They then compared the percentage change across different sponsor characteristics using the Fischer’s Exact test. Finally, for the interviews, the researchers used a framework for applied policy research by Srivastava & Thompson (2009), inductive coding, and deductive coding to identify key themes (Harper et al., 2022).

The results from the survey were presented first. The key descriptive characteristics of the survey participants were as follows: 58% were public SFA sponsors, 44.8% had less than 10 sites, and 82.7% had open sites or open and closed sites. For sponsor knowledge of the waivers, 89.7% were aware of waiver 1, 75.9% were aware of waiver 2, 69% were aware of waiver 3, and 79.3% were aware of waivers 4-6. For perceived impact of the waiver recission, the mean (SD) was 4.6 (1.8). The perceived impact was higher for increased workload (5.3 (1.9)), increased expenses (5.0 (1.8)), and increased staff needs (4.3 (2.1)) vs. decreased number of types of meals served (3.9 (2.2)), decreased number of meals served (3.8 (2.2)), and decreased number of sites (3.3 (2.1)). In other words, on average, sponsors more strongly agreed that the recission of the waivers led to increased workload, increased expenses, and increased staff needs vs. decreased number of type of meals served, decreased number of meals served, and decreased number of sites. When linked with the participation data, the survey results showed that there were significant associations between the percentage change in the number of meals served and different sponsor types ("public school food authority," "government agency," and "nonprofit and other organizations") ($p = 0.003$) and different site types ("closed only," "open only," and "both") ($p = 0.03$). However, there were no significant associations between the percentage change and number of sites, years as a sponsor, use of OVS, use of waivers, and perceived impact of waiver recission (Harper et al., 2022).

The results from the interviews were presented after the survey results. The key descriptive characteristics of the interview participants were as follows: 55% were public SFA sponsors, 55% operated urban-suburban sites, and 36% had less than 20 sites. From the interviews, the researchers identified three themes on the impact of the waivers. Theme 1 was "Impact of the waiver rescission on Summer 2019 SFSP operations and sponsor experience." Under this theme, some participants reported no impact, while other participants reported an increase in staff workload and a decrease in the number of meals served due to loss of the waiver on mealtimes. Theme 2 was "Impact of the waiver rescission on future SFSP operations and anticipated sponsor experience." Under this theme, the participants reported an increase in staff needs, a decrease in the number of meals served due to movement from open to closed sites, and a burdensome waiver application. Theme 3 was "Site resiliency demonstrated by SFSP sponsors in Summer 2019 to overcome challenges due to the waiver rescission." Under this theme, the participants reported staff resiliency and community support. In addition to the recission of the waivers, other barriers to participation were revealed in the interviews. Those barriers were meal quality, awareness, transportation, weather, and crime (Harper et al., 2022).

In the conclusion, the researchers stated that the "federal rescission of USDA summer meals waivers created substantial barriers for sponsors" (Harper et al., 2022). For the present study, the findings by Harper et al. (2022) suggest that administrative burdens, mealtime restrictions, closed sites, and sponsor types other than public SFA sponsors are factors associated with decreased participation.

Overall, all the mixed methods studies either identified sponsor-related factors (Chiappone et al., 2018; Harper et al., 2022) or revealed potential sponsor-related factors associated with participation in the SFSP/SSO (Bruce et al., 2019). However, one study also revealed potential individual-related factors associated with participation in the SSO (Bruce et al., 2019). Two studies were conducted at the state level (Chiappone et al., 2018; Harper et al., 2022), while one study was conducted at the level of a single sponsor (Bruce et al., 2019). For the studies that assessed participation quantitively, both included all SFSP sponsors in the quantitative component and included only SFSP sponsors in the qualitative component (Chiappone et al., 2018; Harper et al., 2022). However, they differed in their outcome measures: one measured sponsor ADP per year (Chiappone et al., 2018), while the other measured percentage change in the number of meals served from one year to another (Harper et al., 2022). Both analyzed their findings using inferential statistics. The study that assessed participation qualitatively did not use inferential statistics (Bruce et al., 2019). It also did not sample SFSP sponsors; instead, it sampled parents/caregivers participating in a SSO program sponsored by one SFA. All studies were limited by the generalizability of their findings.

2.4.5 Intervention Study Design

Intervention studies (n = 2) have been published that reveal potential factors associated with participation in the SFSP (Cullen et al., 2019; Sather et al., 2021). In both studies, the intervention was a program that utilized the SFSP and was sponsored by one sponsor. One study assessed participation qualitatively as intention to participate in the future (Cullen et al., 2019), while the other assessed participation quantitatively (Sather et al., 2021). The studies are presented here in chronological order by publication date.

In 2019, Cullen et al. published a case study that sought to describe and evaluate the implementation of Complete Eats, a program utilizing the SFSP at the pediatric emergency department (ED) of the Children's Hospital of Philadelphia (CHOP). The sample consisted of parents/caregivers (n = 86) of children who participated in Complete Eats. These children included patients at CHOP's pediatric ED and any other children present with the patients. Children could participate if they were aged 2 to 18 years and not on NPO status. This site was a closed site sponsored by the Archdiocese of Philadelphia. The intervention in this study was the Complete Eats program, which provided boxed meals with information on how to find other SFSP sites. Since an intervention was given, this study has been placed under "Intervention study design" in this review. The main outcomes were acceptability of Complete Eats, prior knowledge of the SFSP, intention to participate in the SFSP, and self-efficacy in locating a SFSP site (Cullen et al., 2019).

Data were collected during summer 2017. The main outcomes were measured by a parent/caregiver survey. A five-point Likert scale was used to measure acceptability: strongly disagree, disagree, neutral, agree, and strongly agree. Binary coding was used to code the responses as follows: strongly disagree/disagree/neutral vs. agree/strongly agree. Descriptive statistics were used to analyze the data (Cullen et al., 2019).

The results were presented using percentages. 86% reported that the site, i.e., the pediatric ED, was acceptable. 91% reported that the program was easy to use. 37% reported that they had prior knowledge of the SFSP, and most of these respondents (84%) reported that they utilized the SFSP prior to utilizing it at the pediatric ED. 63% reported that they had no prior knowledge of the SFSP, and most of these respondents (79%) reported that they intend to utilize the program in the future and most (73%) reported self-efficacy with respect to locating a SFSP site (Cullen et al., 2019).

In the conclusion, the researchers stated that "situating the SFSP in the acute-care clinical setting is acceptable and has strong potential to improve the historically poor connection between families and critical community resources" (Cullen et al., 2019). For the present study, the findings by Cullen et al. (2019) suggest that knowledge and community-clinical partnerships may be factors associated with participation in the SFSP.

In 2021, Sather et al. published an intervention study that sought to evaluate the effect of a mobile summer meal program on participation in the SFSP in a school district in Illinois. The intervention was a mobile summer meal program utilizing the SFSP to serve grab-and-go meals at three low-income apartment complexes. The sample consisted of children who participated in the mobile summer meal program. The outcomes were number of meals served, number of new participants, past SFSP participation, feedback on the mobile summer meal program, and frequency of SFSP participation (Sather et al., 2021).

Data were collected in summer 2018. The number of meals served was obtained from the school district. All other outcomes were obtained from surveys of the children who participated in the mobile summer meal program. The researchers administered two surveys on separate groups of children: survey 1 was administered on June 29th (n = 62), and survey 2 was administered on August 3rd (n = 47). Survey 1 measured past SFSP participation, while survey 2 measured feedback on the mobile summer meal program. Both surveys measured the number of new participants. Descriptive statistics were used to analyze the results from both surveys. Using the responses from survey 1, a one-way between-subjects ANOVA was used to determine the effect of the mobile summer meal program on frequency of SFSP participation. Also, bivariate correlation statistics were used to determine the correlation between participation in the mobile summer meal program and past SFSP participation (Sather et al., 2021).

The results showed a 21.6% increase in the number of meals served in summer 2018 compared to summer 2017. In survey 1, 64.5% of the participants were in grades K-5, and 22.5% were in grades 6-8. Results from survey 1 showed that 61% of the sample were new participants, and 57% of the new participants did not participate before because they were unaware of the SFSP program, while 22% of the new participants did not participate before because the meal sites were too far. Among the total sample for survey 1, 29% learned about the site by seeing it at their apartment complex, while 21% learned about the site through a hand-out from school. Among past participants in survey 1, 71% of walked to SFSP sites in previous summers, while

17% were driven to SFSP sites in previous summers. Results from survey 2 showed that 81% of the sample were new participants. Among the total sample for survey 2, 43% reported that they liked the food at the mobile summer meal sites, 39% reported that they liked the convenient location of the mobile summer meal sites, and 23% reported that they did not like the food and limited variety. The one-way between subjects ANOVA showed a significant effect of the mobile summer meal program on frequency of SFSP participation ($F(4,58) = 5.853$, $p = 0.001$). Bivariate correlation statistics showed a small, significant, positive correlation between participation in the mobile summer meal program and past SFSP participation ($r(62) = 0.285$, $p < 0.05$) (Sather et al., 2021).

In the conclusion, the researchers stated that

> SFSP mobile feeding units can be a viable and effective way to increase participation and provide children with the nutrition they need during summer months or on remote learning days (Sather et al., 2021).

For the present study, the findings by Sather et al. (2021) suggest that grade level, knowledge/awareness of the program, location of the sites, and walkability may be factors associated with participation.

Overall, the interventions resulted in either an intention to participate in the SFSP in the future, which may lead to increased actual participation (Cullen et al., 2019), or an increase in actual participation in the SFSP (Sather et al., 2021). However, only one study used a statistical test to determine if the intervention had an effect on the outcome (Sather et al., 2021). Both studies were conducted at the level of a single sponsor. Notably, both interventions seemed to circumvent the congregate feeding requirement of the SFSP: one provided meals to inpatients whether there were other children with them or not (Cullen et al., 2019), and the other provided grab-and-go meals (Sather et al., 2021). The studies differed in their samples: one study sampled parents/caregivers (Cullen et al., 2019), while the other sampled children (Sather et al., 2021). Both studies are limited by lack of randomization, lack of a control group, and generalizability of the findings.

2.4.6 Discussion of the Gaps in the Research on Factors Associated with Participation in the Summer Food Service Program and Seamless Summer Option

Many of the studies included in this section used inferential statistics to identify factors associated with participation in the SFSP (Chiappone et al., 2018; Harper et al., 2022; Litt et al., 2020; Turner et al., 2019). Each of these studies measured participation differently: sponsor ADP per year (Chiappone et al., 2018), percentage change in the number of meals served (Harper et al., 2022), site reach (Litt et al., 2020), and summer meal uptake rate (Turner et al., 2019). One study used inferential statistics to determine the effect of an intervention (Sather et al., 2021). The remaining four out of the nine studies used descriptive statistics and/or deductive/inductive coding to analyze their data, but each study had a different design (Bruce et al., 2019; Cullen et al., 2019; Kannam et al., 2019; Molaison & Carr, 2006). Overall, there is a small number of studies on factors associated with participation in the SFSP/SSO and high variability in the methods of those studies. As a result, there is a need for more research on factors associated with participation in summer meal programs in the US.

Chapter 3: Methods

3.1 Study Design

This study is a convergent parallel mixed methods study. According to Creswell & Clark (2017),

> [A convergent parallel mixed methods study design] is used when the researcher wants to compare quantitative statistical results with qualitative findings for a complete understanding of the research problem (Creswell & Clark, 2017).

By including mixed methods, this design allows the researcher to combine quantitative and qualitative methods, each of which have different but complementary strengths and limitations. For example, while quantitative analyses allow for large sample sizes and hypothesis testing, qualitative analyses allow for a more in-depth analysis of small sample sizes and hypothesis generation. In a convergent parallel mixed methods study design, data for the quantitative and qualitative components are collected and analyzed at the same time but separately; in other words, these data are collected and analyzed in "parallel." This is followed by merging of the results by synthesis and comparison in the discussion; in other words, the results of the analyses are merged or "converged" in the discussion of the findings. Altogether, this design allows for a more comprehensive study compared to quantitative or qualitative methods alone. Furthermore, by collecting quantitative and qualitative data in parallel, this design gives equal importance to both types of data.

3.2 Setting

The OFNS is a SFA for the NYC DOE, which is the public school system in NYC. During the summer, the OFNS sponsors sites to provide SFSP meals to children aged 18 years or younger and anyone with physical or mental disabilities aged 19 years or older. The SFSP meals include breakfast and lunch. Since these meals are provided through the SFSP, they are provided free of charge. Table 2 shows the total number of sites, total number of open sites, total number of meals served, total number of breakfast meals served, total number of lunch meals served, total number of meals served in July, and total number of meals served in August by OFNS along with the total enrollment in the NYC DOE during each summer from summer 2014 through summer 2021. Appendix A contains tables showing the total sites and meals for each of the 32 NYC DOE geographic districts.

Table 2: Total Sites and Meals Served by OFNS, Summers 2014-2021

Summer	Sites[a]	Open[b]	Meals[c]	BF[d]	Lunch[e]	Jul[f]	Aug[g]	Enroll[h]
2014	1,187	665	8,038,298	2,728,036	5,310,262	5,311,861	2,726,437	948,048
2015	1,291	729	7,919,253	2,761,190	5,158,063	5,158,035	2,761,218	953,553
2016	1,255	570	7,342,439	2,601,248	4,741,191	4,251,783	3,090,656	955,279
2017	1,282	549	7,371,217	2,601,924	4,769,293	4,466,065	2,905,152	955,364
2018	1,294	574	7,247,852	2,524,584	4,723,268	4,548,461	2,699,391	991,850
2019	1,301	427	7,081,458	2,451,893	4,629,565	4,824,193	2,257,265	976,371
2020	501	405	11,119,495	4,549,031	6,570,464	5,878,853	5,240,642	967,001
2021	985	392	7,064,010	3,073,347	3,990,663	3,916,463	3,147,547	921,732

[a]Sites = total number of sites.
[b]Open = total number of open sites, which serve all eligible participants, i.e., they are open to all.
[c]Meals = total number of meals served.
[d]BF = total number of breakfast meals served.
[e]Lunch = total number of lunch meals served.
[f]Jul = total number of meals served in July.
[g]Aug = total number of meals served in August.
[h]Enroll = total enrollment.

In summers 2020 and 2021, the OFNS implemented the following COVID-19-related waivers issued by the FNS of the USDA:

- **Area Eligibility Waiver**: waived the area eligibility requirement for open sites, i.e., the requirement to place sites in areas where at least 50% of the children qualify for FRPL (effective 7/1/2020-8/31/2020 and 7/1/2021-9/30/2021) (Kline, 2020d, 2021d).
- **Meal Service Time Flexibility Waiver**: waived the meal service time requirement, i.e., the requirement to serve certain meal types (such as breakfast and lunch) at certain times only and for certain durations (effective 7/1/2020-9/30/2020 and 7/1/2021-9/30/2021) (Kline, 2020a, 2021a).
- **Non-Congregate Meal Service Waiver**: waived the congregate feeding requirement, i.e., the requirement to serve meals on site and in a group setting; allowed grab-and-go meals (effective 7/1/2020-8/31/2020 and 7/1/2021-9/30/2021) (Kline, 2020b, 2021b).
- **On-Site Monitoring Requirements Waiver**: waived the requirement for state agencies and/or sponsors to conduct on-site monitoring visits (effective 7/1/2020-8/31/2020 and 9/1/2020-9/30/2021) (Smith-Holmes, 2020a, 2020b, 2021a, 2021b).
- **Parent/Guardian Meal Pickup Waiver**: waived the requirement for parents and guardians to bring their children to the site to pick up meals (effective 7/1/2020-8/31/2020 and 7/1/2021-9/30/2021) (Kline, 2020c, 2021c).

3.3 Quantitative Component

The quantitative component consists of two research questions: research question 1 (on the number of SFSP meals served) and research question 2 (on the accessibility of SFSP sites), stated in Chapter 1. This section describes the design, sample, independent variables, dependent variables, covariates, and statistical analysis for both research questions, which are re-stated here:

1. Among NYC DOE geographic districts, was there a significant difference in the number of SFSP meals served during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

2. Among NYC DOE geographic districts, was there a significant difference in the accessibility of SFSP sites during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

3.3.1 Design

This component is a secondary data analysis with a non-experimental, one-group, completely within-subjects design. The data were provided by the New York State Education Department (NYSED), who submitted these data to the USDA to obtain reimbursements for the number of SFSP meals served.

3.3.2 Sample

The sample consists of all NYC DOE geographic districts (n = 32). These districts contain OFNS-sponsored sites that served breakfast and/or lunch through the SFSP during any of the following summers: summer 2014, summer 2015, summer 2016, summer 2017, summer 2018, summer 2019, summer 2020, and summer 2021. Summer 2014 is the first summer after the implementation of the HHFKA 2010 nutrition standards for the NSLP and SBP (FNS, 2013c). Sites were included if (1) they were sponsored by the OFNS, (2) they served meals through the SFSP, and (3) they could be geocoded. Only one site was excluded because it could not be geocoded. This site served 2,800 meals in summer 2019 only (0.04% of meals served in summer 2019). The unit of observation is site; the unit of analysis is NYC DOE geographic district.

The site-level data were used to create a wide-format dataset with the following variables: site name, site county, site address, site city, site zip code, site year, site type, number of breakfast meals served, and number of lunch meals served. For summers 2014-2018 and summer 2021, data were provided by the NYSED for all variables in the dataset. For summer 2019, data were not provided by the NYSED for the following variable: site zip code. For summer 2020, data were not provided by the NYSED for the following variables: site county, site address, site city, site zip code, and site type. For summer 2020, the missing data were obtained from Hunger Solutions (Hunger Solutions NY, 2020).

The site-level data were aggregated to the NYC DOE geographic district level using the spatial join tool in ArcMap 10.6.1, which matched each site address to the geographic district in which it is located. The shapefile for the NYC DOE geographic district boundaries was obtained from NYC OpenData (NYC OpenData, n.d.). The aggregated dataset is a wide-format dataset with the following variables, all at the NYC DOE geographic district level and available for each summer from 2014-2021: district number, number of sites, number of open sites, number of breakfast meals served in July, number of lunch meals served in July, number of breakfast meals served in August, and number of lunch meals served in August. There are no blanks or missing data in the aggregated dataset.

3.3.3 Independent Variables

For both research questions, the independent (exposure) variables are time periods, i.e., summer 2014, summer 2015, summer 2016, summer 2017, summer 2018, summer 2019, summer 2020, and summer 2021. Summers 2020 and 2021 represent exposure to the COVID-19-related waivers, while summers 2014-2019 represent non-exposure to the COVID-19 related waivers. Since none of the independent variables were “manipulated by the researcher,” they are quasi-independent variables (Gravetter et al., 2018). They are also categorical variables.

3.3.4 Dependent Variables

For research question 1 (on the number of SFSP meals served), the primary dependent (outcome) variable is the number of total meals (breakfast + lunch and July + August) served. The secondary outcomes are (1) the number of breakfast meals served, (2) the number of lunch meals served, (3) the number of meals served in July, (4) the number of meals served in August, (5) the number of breakfast meals served in July, (6) the number of lunch meals served in July, (7) the number of breakfast meals served in August, and (8) the number of lunch meals served in August. Notably, because the unit of analysis is not at the participant level, the dependent variables measure “reach” of the meals vs. “participation” in the meals.

For research question 2 (on the accessibility of SFSP sites), the primary dependent (outcome) variable is the number of sites per 1,000 students. The secondary outcomes are (1) the number of open sites per 1,000 students, (2) the number of sites per 1,000 students in high poverty districts, (3) the number of sites per 1,000 students in high non-White districts, (4) the number of sites per 1,000 students in high enrollment districts, (5) the number of open sites per 1,000 students in high poverty districts, (6) the number of open sites per 1,000 students in high non-White districts, and (7) the number of open sites per 1,000 students in high enrollment districts. “High poverty districts” are NYC DOE geographic districts where the percentage of students in poverty is above the median for all districts. “High non-White districts” are NYC DOE geographic districts where the percentage of non-White students is above the median for all districts. “High enrollment districts” are NYC DOE geographic districts where the number of enrolled students is above the median for all the districts. The secondary outcomes are similar to those in the geospatial analysis by McLoughlin et al. (2020), which assessed site accessibility for April 2020 and operationalized accessibility as the number of sites in census tracts that are above the median for percentage of the population in poverty, percentage of the population of racial/ethnic minorities, and percentage of the population aged 5-19 years (McLoughlin, McCarthy, et al., 2020).

3.3.5 Covariates

Potential covariates were added to the aggregated dataset. According to the literature, there are potential covariates for research question 1 (on the number of SFSP meals served). These covariates include (1) the number of sites, (2) the number of open sites, (3) total enrollment, (4) elementary school enrollment, (5) middle school enrollment, (6) high school enrollment, (7) non-White enrollment, and (8) poverty level of the student body, all of which may correlate with the number of SFSP meals served, according to previous literature (Bruce et al., 2019; Chiappone et al., 2018; Harper et al., 2022; Litt et al., 2020; Turner et al., 2019). The data on the number of sites and the number of open sites were already in the aggregated dataset. The remaining covariates were obtained from the NYC DOE InfoHub (NYC DOE, 2022) for each school year included in this study and added to the aggregated dataset. They are at the NYC DOE geographic district level. Since all the covariates are available for each school year or summer in the study, all the covariates are time-varying covariates.

3.3.6 Statistical Analysis

The descriptive statistics for each summer include means, standard deviations, minimum values, maximum values, medians, ranges, and interquartile ranges.

For both research questions, the inferential statistical test is repeated-measures analysis of variance (repeated-measures ANOVA) or the Friedman test. A repeated-measures ANOVA was used by Connolly et al. (2021) to compare participation in school lunch during spring 2020 to participation during spring 2019 in Connecticut (Connolly et al., 2021). A repeated-measures ANOVA is the inferential statistical test recommended when there are more than two categorical independent variables and one continuous dependent variable (Flynn, 2021). The Friedman test is the non-parametric version of the repeated-measures ANOVA and is used when the normality assumption of the repeated-measures ANOVA is violated. While the repeated-measures ANOVA compares mean values of the dependent variables, the Friedman test compares median values of the dependent variables.

Research question 1 includes time-varying covariates. First, the covariates will be tested for collinearity. If the correlation between two covariates is 0.5 or greater, the covariates will be considered redundant (Vatcheva et al., 2016). Second, the covariates will be tested for correlation with the dependent variables. If a covariate is not significantly correlated with a dependent variable, the covariate will be excluded from the analysis. Third, since the covariates are time-varying, they will be used to transform the dependent variable for each summer in order to control for the covariates. For example, to control for total enrollment, the number of total meals served in 2014 will be divided by the total enrollment in 2014, the number of total meals served in 2015 will be divided by the total enrollment in 2015, etc. The results chapter reports the statistical test results for the transformed dependent variables; the results for the untransformed dependent variables are in the appendix, where they are referred to as an "alternate analysis." Both analyses are included because there is heterogeneity and lack of consensus in the operationalization of school meal “reach” in the literature. Differences in the results between the analyses are stated in the results chapter.

Research question 2 could be analyzed using (1) different definitions for high poverty districts and high non-White districts and (2) number of sites instead of number of sites per 1,000 students. High poverty districts could be defined as districts where the number (instead of the percentage) of students in poverty is above the median for all districts. Similarly, high non-White districts could be defined as districts where the number (instead of the percentage) of non-White students is above the median for all districts. The results for this analysis are included in the appendix, where they are referred to as an “alternate analysis.” Both analyses are included because there are different definitions of “high poverty” and “high non-White” and different measures of food availability. Differences in the results between the analyses are stated in the results chapter.

The repeated-measures ANOVA procedure involves testing assumptions of the repeated-measures ANOVA to establish statistical conclusion validity, running the omnibus test, and performing post-hoc analyses. To establish statistical conclusion validity, the following assumptions will be assessed or tested: independence, normality, and sphericity. When normality is violated, the Friedman test will be used instead of the repeated-measures ANOVA. When sphericity is violated, the Greenhouse-Geisser correction will be applied to the repeated-measures ANOVA omnibus test. For significant omnibus tests in the repeated-measures ANOVA and Friedman tests, the post-hoc analyses will use the Bonferroni adjustment. To determine effect size, the percentage of variance explained (η^2) will be calculated. The level of significance is set at $p < 0.05$. The software program that will be used is SPSS version 28.

3.4 Qualitative Component

The qualitative component consists of a document analysis of the policy memos for the waivers. This section describes the sample, methods, framework, analysis, and researcher positionality for the qualitative component of the study, which seeks to answer the following research question: What were the intended relationships between the COVID-19-related waivers and SFSP participation, site accessibility, and implementation according to the policy memos for the waivers?

3.4.1 Sample

The sample consists of four pairs (one for each school year or summer) of the policy memos for the waivers implemented by the OFNS and relevant to SFSP participation and site accessibility:

- Meal Service Time Flexibility Waiver: COVID-19 Child Nutrition Response #17 and #78.
- Non-Congregate Feeding Waiver: COVID-19 Child Nutrition Response #22 and #75.
- Parent/Guardian Meal Pickup Waiver: COVID-19 Child Nutrition Response #25 and #76.
- Area Eligibility Waiver: COVID-19 Child Nutrition Response #32 and #77.

These policy memos are publicly available on the USDA website (Kline, 2020a, 2020b, 2020c, 2020d, 2021a, 2021b, 2021c, 2021d).

3.4.2 Methods

The methods consist of a thematic, document analysis using the READ approach. This approach is “a systematic approach for document analysis in health policy research” (Dalglish et al., 2021). The READ approach consists of four steps: “(1) ready your materials, (2) extract data, (3) analyse data and (4) distil your findings” (Dalglish et al., 2021). In step 1, the READ approach requires the researcher to determine the selection criteria for the documents to “ready [the] materials.” In the present study, the selection criteria were as follows: (1) the documents must be policy memos to allow for policy content analysis, (2) the policy memos must be for waivers implemented by the OFNS, (3) the policy memos must be for waivers that may be related to SFSP participation and site accessibility, and (4) the policy memos must have been effective or active during July and August of summers 2020 and 2021. In step 2, the READ approach requires the researcher to “extract data” or wording/quotes from the documents based on the research question and possibly, an analytical framework. In the present study, an analytical framework will be used (presented below, in section 3.4.3), and wording or quotes will be extracted and coded. In step 3, the READ approach requires the researcher to “analyse the data” using an analytical method. In the present study, the analytical method will be a thematic analysis, which requires the identification of themes. Finally, in step 4, the READ approach requires the researcher to “state [their] findings relative to [their] research questions and to draw policy-relevant conclusions” (Dalglish et al., 2021).

3.4.3 Framework

The extraction and analysis is guided by a framework developed by the National Collaborating Center for Healthy Public Policy (NCCHPP). This framework can be used to evaluate public health-related policies, like the USDA waivers. The framework includes six dimensions, three related to the “effects” or impact of the policies and three related to the “implementation” of the policies. Figure 1 illustrates the relationships between the dimensions in the framework (Morestin, 2013). In this study, each dimension is a deductive code, and each code is defined in the results chapter.

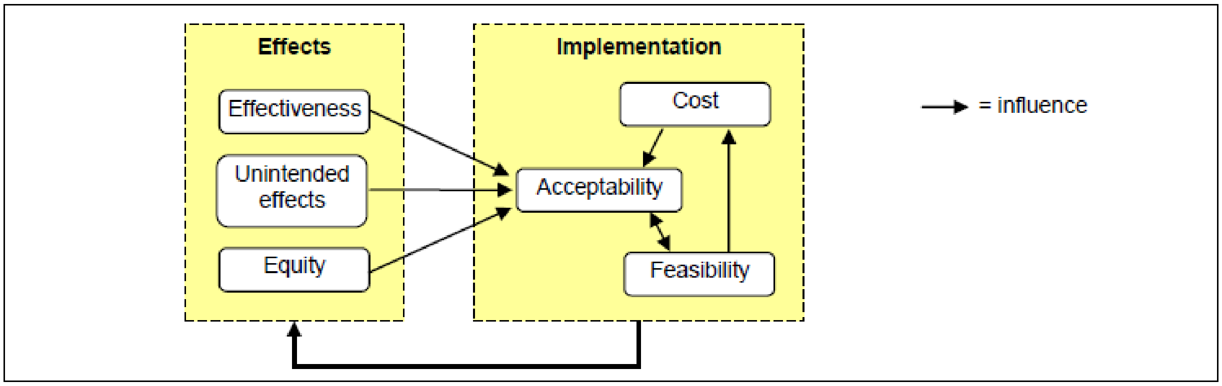

Figure 1: The NCCHPP Framework.

Note. Copied from "A framework for analyzing public policies: Practical guide," by Morestin, F., 2013, (http://www.ncchpp.ca/docs/Guide_framework_analyzing_policies_En.pdf). The guide states that "[r]eproductions for private study or research purposes are authorized by virtue of Article 29 of the Copyright Act."

The framework has been modified for the qualitative component to measure the intended effects and implementation vs. the actual effects and implementation of the waivers because the sample consists of only the policy memos for the waivers. As a result, the qualitative component is not evaluating the actual effects and implementation of the waivers; it is evaluating the intended effects and implementation instead.

3.4.4 Analysis

The NCCHPP framework, deductive coding, and inductive coding will be used to analyze the qualitative data from the policy memos. The outcome of the analysis is key themes that answer research question 3. These themes emerge from combining deductive and inductive codes into categories and them combining categories into themes as recommended by Saldaña in *The Coding Manual for Qualitative Researchers* (Saldaña, 2016). Because there is a small number of policy memos (n = 8), a software program will not be used to code the data. The researcher will be the only coder. The researcher's positionality is presented below, in section 3.4.5.

3.4.5 Researcher Positionality

The following is a researcher positionality statement. This statement is recommended for qualitative research because the position of a researcher influences the interpretation and write up of qualitative research findings (Creswell & Poth, 2016). This statement describes the researcher's education and experiences that are relevant to the present study. This helps the readers to understand the researcher's role in the study.

The researcher is a nutritionist with a Bachelor of Science in Nutrition and Dietetics from the American University of Beirut, a license in dietetics from the Ministry of Public Health in Lebanon, and a Master of Science in Nutritional Science from Arizona State University. As of writing this statement, the researcher is a doctoral candidate in Behavioral Nutrition at Teachers College, Columbia University. She is also the Tisch Scholar at the Laurie M. Tisch Center for Food, Education and Policy (also known as the "Tisch Food Center"). The mission of the Center is as follows:

> The mission of the Laurie M. Tisch Center for Food, Education & Policy, in the Program in Nutrition, is to conduct research on food and nutrition education practice and policy. We translate our research into resources for educators, policy makers, and advocates to give people the power to demand healthy, just, and sustainable food (Tisch Food Center, n.d.).

The vision of the Center is to “[transform] the status quo through food and nutrition education” (Tisch Food Center, n.d.).

The researcher attended elementary school and middle school in the US, where she participated in the NSLP as a non-FRPL-eligible elementary school student. She never participated in the SFSP and did not know about the program until she joined the Tisch Food Center in 2020. At the Tisch Food Center, she attended meetings for “Lunch 4 Learning NYC,” which is

> a broad, diverse coalition-based campaign [from Community Food Advocates] that is working toward making free and healthy school meals available to all New York City public school students, regardless of income (Lunch 4 Learning, n.d.).

In these meetings, she learned about the changes that occurred to school meals during the pandemic and the COVID-19-related waivers. She was also a researcher for a statewide study on school meals during the pandemic and the COVID-19-related waivers. This study was funded by “Share Our Strength” (SOS), whose mission is “to end poverty and hunger in the U.S. and abroad” (Share Our Strength, n.d.). The objectives of the study included a comparison of the number of school meals served during the first summer of the pandemic compared to the previous summer (Harb et al., 2022). The study found that the number of meals served increased, and as a result, the research team hypothesized that “[the] waivers may provide flexibility to increase participation in school meals, especially during the summer” (Harb et al., 2022).

Chapter 4: Results

4.1 Quantitative Component

This section reports the results of the quantitative component, which consists of two research questions:

1. Among NYC DOE geographic districts, was there a significant difference in the number of SFSP meals served during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

2. Among NYC DOE geographic districts, was there a significant difference in the accessibility of SFSP sites during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?

The results for research question 1 are reported under “Quantitative Analysis of the Number of SFSP Meals Served.” The results for research question 2 are reported under “Quantitative Analysis of the Accessibility of SFSP Sites.”

4.1.1 Quantitative Analysis of the Number of SFSP Meals Served

In this analysis, there are nine dependent variables: (1) number of total meals served (primary outcome), (2) number of breakfast meals served, (3) number of lunch meals served, (4) number of total meals served in July, (5) number of total meals served in August, (6) number of breakfast meals served in July, (7) number of lunch meals served in July, (8) number of breakfast meals served in August, and (9) number of lunch meals served in August. The descriptive statistics and results are presented by dependent variable, starting with the primary outcome.

There are also eight potential covariates: (1) the number of sites, (2) the number of open sites, (3) total enrollment, (4) elementary school enrollment, (5) middle school enrollment, (6) high school enrollment, (7) non-White enrollment, and (8) poverty level of the student body. The descriptive statistics for the covariates are presented in Table 3. Notably, total enrollment is the number of students enrolled at a specific NYC DOE geographic district. For example, total enrollment in 2014 for a NYC DOE geographic district is the number of students enrolled at schools in that district in the 2013-2014 school year. This number is determined at the beginning of the school year.

Table 3: Means and Standard Deviations for the Covariates, Summers 2014-2021 (n = 32)

Summer	Sites[a]	Open sites[b]	Total[c]	ES[d]	MS[e]	HS[f]	Non-White[g]	Poverty[h]
2014	37.09	20.78	29,627	13,652	6,265	8,996	25,058	21,854
	(15.07)	(9.04)	(14,780)	(7,047)	(3,125)	(6,386)	(11,226)	(10,063)
2015	40.34	22.78	29,799	13,686	6,213	9,096	25,173	21,643
	(15.03)	(9.42)	(15,093)	(7,200)	(3,187)	(6,446)	(11,511)	(10,182)
2016	39.22	17.81	29,853	13,681	6,192	9,081	25,161	21,279
	(14.79)	(6.10)	(15,444)	(7,315)	(3,247)	(6,467)	(11,810)	(10,260)
2017	40.06	17.16	29,855	13,533	6,266	9,135	25,109	21,119
	(14.49)	(5.84)	(15,696)	(7,360)	(3,333)	(6,520)	(11,993)	(10,234)
2018	40.44	17.94	30,995	13,256	6,309	9,222	25,809	23,086
	(13.15)	(5.79)	(16,318)	(7,279)	(3,406)	(6,471)	(12,406)	(11,504)
2019	40.66	13.34	30,512	12,801	6,350	9,080	25,351	22,240
	(15.01)	(4.22)	(16,223)	(7,097)	(3,457)	(6,427)	(12,296)	(11,155)
2020	15.66	12.66	30,219	12,368	6,299	8,849	24,948	21,898
	(6.18)	(5.80)	(16,245)	(6,959)	(3,497)	(6,344)	(12,221)	(11,109)
2021	30.78	12.25	28,804	11,534	6,122	8,806	23,855	20,921
	(10.34)	(3.15)	(15,774)	(6,614)	(3,428)	(6,338)	(11,840)	(10,750)

Note. Standard deviations are in parenthesis.
[a]Sites = number of sites.
[b]Open = number of open sites, which serve all eligible participants, i.e., they are open to all.
[c]Total = total enrollment.
[d]ES = elementary school enrollment.
[e]MS = middle school enrollment.
[f]HS = high school enrollment.
[g]Non-White = non-White enrollment.
[h]Poverty = poverty enrollment.

Based on Pearson correlations, total enrollment has significant correlations greater than 0.5 with each of the remaining seven covariates in each summer (2014-2021) ($p < 0.01$) (see

Appendix B). Total enrollment is also significantly correlated with each of the nine dependent variables in each summer (2014-2021) ($p < 0.01$) (see Appendix C). As a result, to control for these variables, each dependent variable is divided by total enrollment for each NYC DOE geographic district. For example, the number of total meals served in 2014 is divided by the total enrollment in 2014, the number of total meals served in 2015 is divided by the total enrollment in 2015, etc. Because the dependent variables or number of meals served are divided by total enrollment, the dependent variables are transformed from the number of meals served to the number of meals served per enrolled student. Hypothetically, each student could receive approximately 42 breakfast meals and 42 lunch meals during a two-month summer vacation.

For each dependent variable, the assumptions of the repeated-measures ANOVA are tenable. The independence assumption is tenable because each district's data is independent from the data of the other districts. The normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) show violations of the assumption of normality for several dependent variables (see Appendix D); however, the normality assumption is still tenable based on sample size, which is greater than 30 ($n = 32$), making the repeated-measures ANOVA robust to violations of the assumption of normality. Mauchly's test of sphericity shows violations of the sphericity assumption for every dependent variable (see Appendix E), presumably due to autoregression; as a result, the Greenhouse-Geisser correction is needed with the repeated-measures ANOVA test.

The analysis is repeated using the untransformed dependent variables, which are number of meals vs. number of meals served per student. The repeated analysis is referred to as the "alternate analysis for research question 1." Appendix F presents the normality test results, sphericity test results, and repeated-measures ANOVA results including post-hoc analyses. The results chapter states any differences between the analyses.

4.1.1.1 Results for Number of Total Meals Served Per Enrollment.

The mean number of total meals served per enrollment was highest in the first summer of the waivers (summer 2020) (M = 12.20, SD = 4.54). The mean was lowest in summer 2018 (M = 8.24, SD = 2.66) (Table 4). However, in the alternate analysis, the mean was lowest in the second summer of the waivers (see Appendix F).

Table 4: Descriptive Statistics for Number of Total Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	5.13	15.96	9.34	3.01
2015	5.16	17.95	9.32	3.01
2016	5.07	18.36	8.71	3.03
2017	5.58	15.73	8.69	2.77
2018	4.68	15.56	8.24	2.66
2019	4.86	15.94	8.27	2.84
2020	4.52	24.55	12.20	4.54
2021	3.34	16.30	8.47	3.43

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021) (Figure 2).

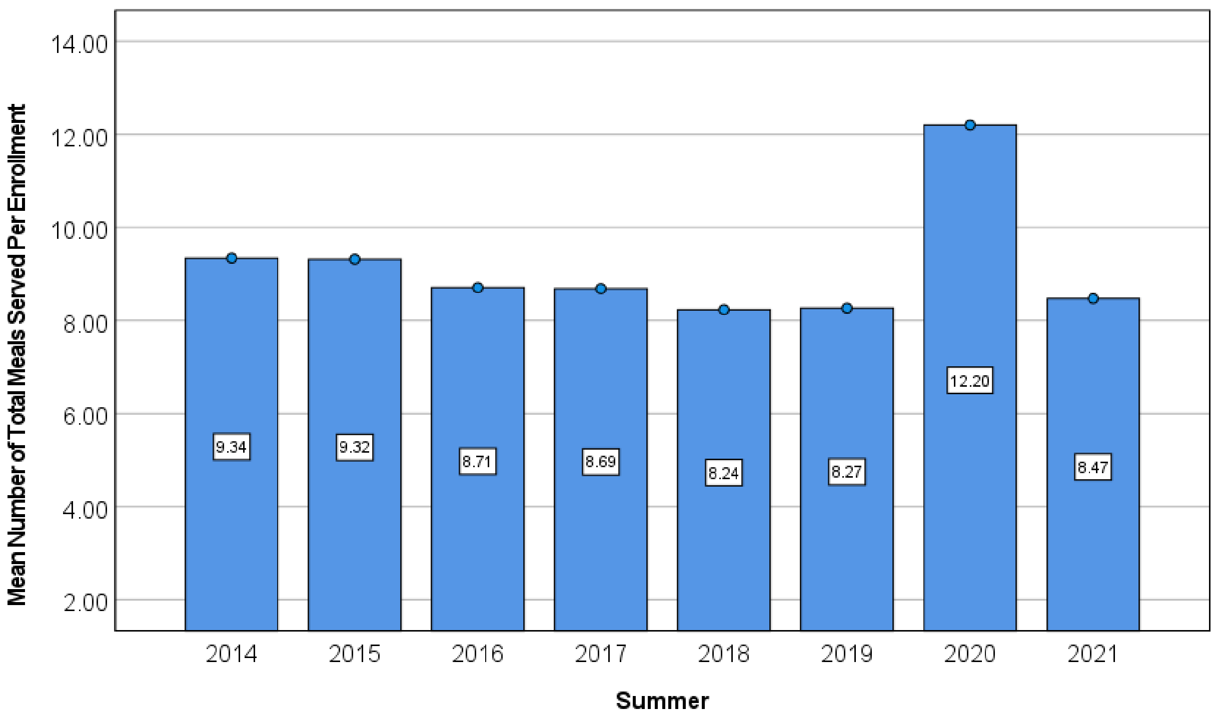

Figure 2: Bar Chart of the Mean Number of Total Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served per enrollment differed significantly across the summers ($F(1.91, 59.12) = 14.08$, $p < 0.001$, $\eta^2 = 0.31$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers, except summers 2014 and 2015 (Table 5). However, in the alternate analysis, only summer 2014 did not differ significantly from the first summer of the waivers (see Appendix F).

Table 5: Mean Differences in Total Meals Served Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	2.86	0.89	0.09	[-0.19, 5.91]
2015	2.88	0.85	0.05	[-0.01, 5.78]
2016	3.49	0.82	0.01	[0.68, 6.30]
2017	3.51	0.81	<0.01	[0.73, 6.30]
2018	3.96	0.80	<0.01	[1.22, 6.71]
2019	3.93	0.83	<0.01	[1.10, 6.76]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the second summer of the waivers and any of the summers without the waivers (Table 6).

Table 6: Mean Differences in Total Meals Served Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.87	0.51	1.00	[-2.62, 0.89]
2015	-0.84	0.50	1.00	[-2.57, 0.88]
2016	-0.23	0.45	1.00	[-1.76, 1.29]
2017	-0.21	0.40	1.00	[-1.57, 1.15]
2018	0.24	0.39	1.00	[-1.08, 1.56]
2019	0.21	0.41	1.00	[-1.20, 1.61]
2020	-3.73	0.80	<0.01	[-6.46, -1.00]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.2 Results for Number of Breakfast Meals Served Per Enrollment. The mean number of breakfast meals served per enrollment was highest in the first summer of the waivers (summer 2020) (M = 5.06, SD = 2.02). The mean was lowest in summer 2018 (M =

2.87, SD = 0.90) (Table 7). However, in the alternate analysis, the mean was lowest in the summer before the waivers (summer 2019) (see Appendix F).

Table 7: Descriptive Statistics for Number of Breakfast Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	1.67	5.80	3.21	1.07
2015	1.84	6.54	3.27	1.10
2016	1.89	6.63	3.09	1.11
2017	1.85	5.41	3.06	0.96
2018	1.57	5.06	2.87	0.90
2019	1.51	5.56	2.88	1.01
2020	1.97	10.56	5.06	2.02
2021	1.41	7.23	3.70	1.52

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of breakfast meals served per enrollment in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure 3).

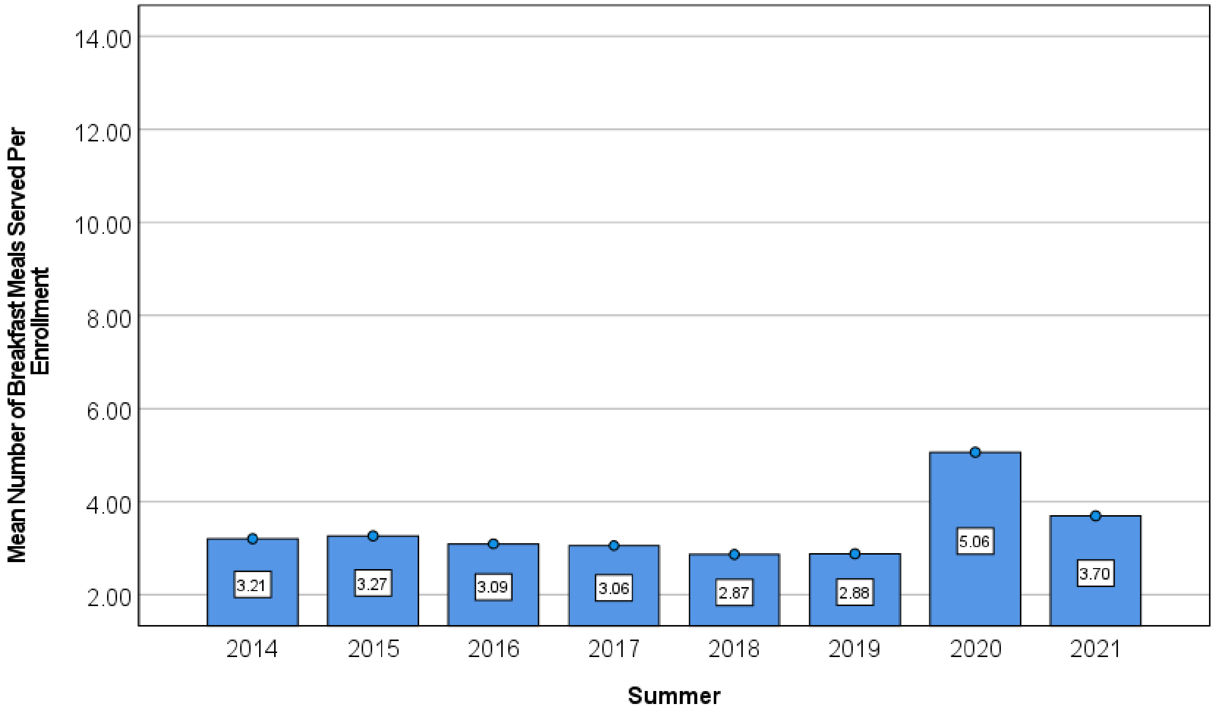

Figure 3: Bar Chart of the Mean Number of Breakfast Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served per enrollment differed significantly across the summers ($F(1.87, 58.07) = 23.65$, $p < 0.001$, $\eta^2 = 0.43$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table 8).

Table 8: Mean Differences in Breakfast Meals Served Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	1.86	0.37	<0.01	[0.60, 3.12]
2015	1.80	0.37	<0.01	[0.55, 3.05]
2016	1.97	0.35	<0.01	[0.76, 3.18]
2017	2.01	0.35	<0.01	[0.80, 3.21]
2018	2.20	0.35	<0.01	[1.00, 3.40]
2019	2.18	0.36	<0.01	[0.96, 3.41]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. However, the mean number of breakfast meals served increased significantly during the second summer of the waivers compared to the two most recent summers without the waivers (summer 2018 and summer 2019) (Table 9). In the alternate analysis, there were no significant differences between the second summer of the waivers compared to any of the summers without the waivers (see Appendix F).

Table 9: Mean Differences in Breakfast Meals Served Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	0.49	0.21	0.80	[-0.24, 1.22]
2015	0.43	0.23	1.00	[-0.34, 1.21]
2016	0.60	0.20	0.13	[-0.07, 1.28]
2017	0.64	0.19	0.06	[-0.01, 1.29]
2018	.83	0.18	<0.01	[0.21, 1.45]
2019	.82	0.19	<0.01	[0.18, 1.46]
2020	-1.37	0.37	0.02	[-2.63, -0.11]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.3 Results for Number of Lunch Meals Served Per Enrollment. The mean number of lunch meals served per enrollment was highest in the first summer of the waivers (M = 7.14, SD = 2.63) and lowest in the second summer of the waivers (M = 4.78, SD = 1.93) (Table 10).

Table 10: Descriptive Statistics for Number of Lunch Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	3.23	12.06	6.14	2.08
2015	3.32	11.41	6.05	1.97
2016	3.18	11.73	5.61	1.97
2017	3.60	10.32	5.63	1.86
2018	3.11	10.50	5.37	1.81
2019	3.14	11.11	5.39	1.90
2020	2.55	13.99	7.14	2.63
2021	1.93	9.07	4.78	1.93

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). After the sharp decrease, the mean number of lunch meals served per enrollment in the second summer of the waivers was lower than the mean numbers served before the waivers (Figure 4).

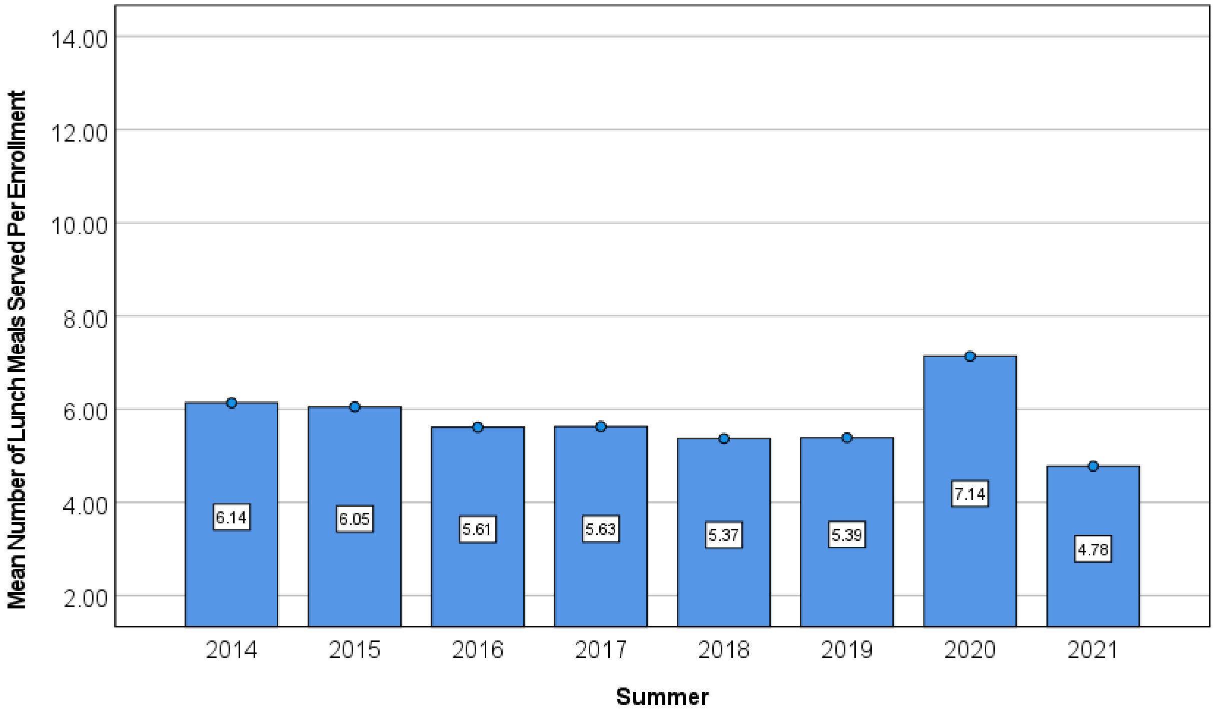

Figure 4: Bar Chart of the Mean Number of Lunch Meals Served Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served per enrollment differed significantly across the summers ($F(2.00, 62.00) = 10.60$, $p < 0.001$, $\eta^2 = 0.26$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to the two most recent summers before the waivers (summers 2018 and 2019) (Table 11).

Table 11: Mean Differences in Lunch Meals Served Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	1.00	0.56	1.00	[-0.92, 2.92]
2015	1.08	0.51	1.00	[-0.67, 2.84]
2016	1.52	0.50	0.13	[-0.19, 3.23]
2017	1.51	0.49	0.13	[-0.18, 3.20]
2018	1.77	0.49	0.03	[0.11, 3.43]
2019	1.75	0.50	0.04	[0.03, 3.47]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Also, the mean number of lunch meals served per enrollment decreased significantly during the second summer of the waivers compared to three of the six summers without the waivers (summer 2014, summer 2015, and summer 2017) (Table 12). In the alternate analysis, the mean increased compared to five of the six summers without the waivers (see Appendix F).

Table 12: Mean Differences in Lunch Meals Served Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-1.36	0.33	0.01	[-2.50, -0.22]
2015	-1.28	0.30	<0.01	[-2.30, -0.25]
2016	-0.84	0.27	0.11	[-1.76, 0.08]
2017	-0.85	0.23	0.03	[-1.65, -0.06]
2018	-0.59	0.23	0.42	[-1.38, 0.19]
2019	-0.61	0.25	0.62	[-1.48, 0.26]
2020	-2.36	0.45	<0.01	[-3.89, -0.82]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.4 Results for Number of Total Meals Served in July Per Enrollment. The mean number of total meals served in July per enrollment was highest in the first summer of the waivers (summer 2020) (M = 6.52, SD = 2.40) and lowest in the second summer of the waivers (summer 2021) (M = 4.65, SD = 1.81) (Table 13).

Table 13: Descriptive Statistics for Number of Total Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	3.47	9.79	6.11	1.78
2015	3.39	10.44	5.98	1.71
2016	2.96	9.51	4.97	1.54
2017	3.40	8.48	5.17	1.42
2018	2.89	8.54	5.08	1.43
2019	3.20	10.17	5.56	1.73
2020	2.40	12.61	6.52	2.40
2021	2.03	9.68	4.65	1.81

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summers 2014 to 2016. The mean reached a peak in the first summer of the waivers (summer 2020) but then sharply decreased in the second summer of the waivers (summer 2021). After the sharp decrease, the mean number of total meals served in July per enrollment during the second summer of the waivers was lower than the mean numbers served before the waivers (Figure 5).

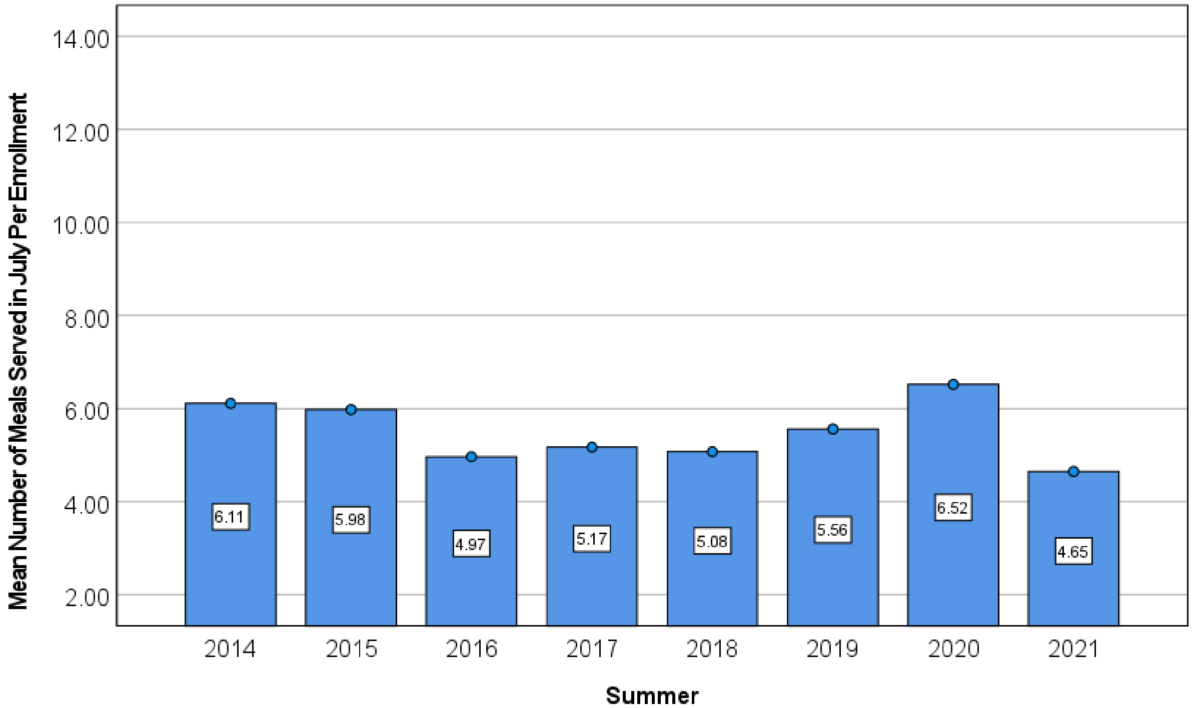

Figure 5: Bar Chart of the Mean Number of Total Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served in July per enrollment differed significantly across the summers ($F(2.03, 62.93) = 12.45$, $p < 0.001$, $\eta^2 = 0.29$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to only two summers without the waivers (summers 2016 and 2018) (Table 14). In the alternate analysis, there was no significant difference when comparing the first summer of the waivers to summer 2018 (see Appendix F).

Table 14: Mean Differences in Total Meals Served in July Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	0.41	0.47	1.00	[-1.20, 2.02]
2015	0.54	0.45	1.00	[-0.99, 2.07]
2016	1.55	0.42	0.02	[0.12, 2.98]
2017	1.35	0.42	0.08	[-0.07, 2.77]
2018	1.44	0.42	0.04	[0.02, 2.87]
2019	0.96	0.44	1.00	[-0.55, 2.47]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Also, the mean number of total meals served in July per enrollment decreased significantly during the second summer of the waivers compared to three out of the six summers without the waivers (summers 2014, 2015, and 2019) (Table 15). In the alternate analysis, the mean decreased compared to four out of the six summers without the waivers (see Appendix F).

Table 15: Mean Differences in Total Meals Served in July Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-1.46	0.27	<0.01	[-2.39, -0.53]
2015	-1.33	0.27	<0.01	[-2.26, -0.40]
2016	-0.32	0.23	1.00	[-1.09, 0.45]
2017	-0.52	0.20	0.42	[-1.21, 0.17]
2018	-0.43	0.20	1.00	[-1.11, 0.26]
2019	-0.91	0.23	0.01	[-1.71, -0.11]
2020	-1.87	0.41	<0.01	[-3.28, -0.46]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.5 Results for Number of Total Meals Served in August Per Enrollment.

The mean number of total meals served in August per enrollment was highest in the first summer of the waivers (summer 2020) (M = 5.68, SD = 2.20) and lowest in the summer before the waivers (summer 2019) (M = 2.71, SD = 1.16) (Table 16).

Table 16: Descriptive Statistics for Number of Total Meals Served in August Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	1.59	6.25	3.23	1.29
2015	1.77	7.51	3.34	1.38
2016	2.11	8.85	3.74	1.53
2017	2.02	7.86	3.51	1.43
2018	1.77	7.03	3.16	1.32
2019	1.55	6.45	2.71	1.16
2020	2.12	11.94	5.68	2.20
2021	1.31	8.04	3.82	1.73

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of total meals served in August per enrollment in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure 6).

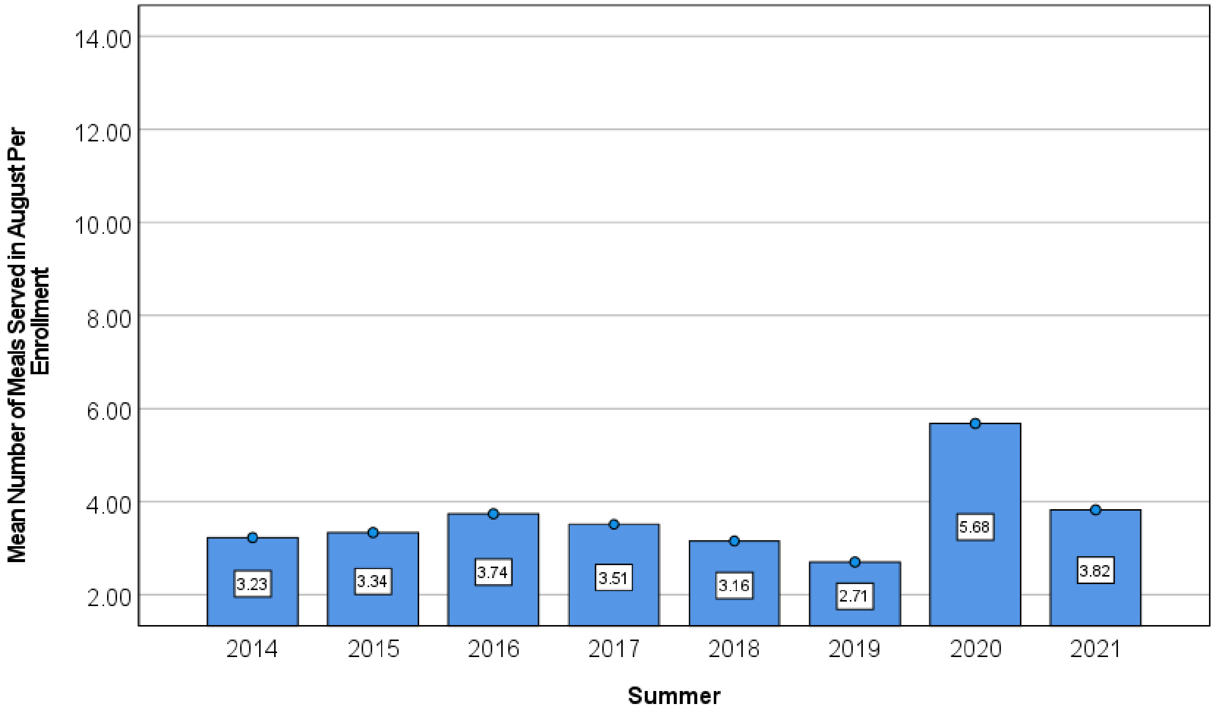

Figure 6: Bar Chart of the Mean Number of Total Meals Served in August Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served in August per enrollment differed significantly across the summers ($F(1.97, 61.09) = 26.08$, $p < 0.001$, $\eta^2 = 0.46$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table 17).

Table 17: Mean Differences in Total Meals Served in August Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	2.45	0.44	<0.01	[0.96, 3.94]
2015	2.34	0.42	<0.01	[0.91, 3.78]
2016	1.94	0.42	<0.01	[0.51, 3.37]
2017	2.16	0.41	<0.01	[0.75, 3.58]
2018	2.52	0.41	<0.01	[1.13, 3.91]
2019	2.97	0.40	<0.01	[1.60, 4.35]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean during the second summer of the waivers compared to the means during any of the summers without the waivers, except summer 2019 (Table 18).

Table 18: Mean Differences in Total Meals Served in August Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	0.59	0.26	0.84	[-0.30, 1.48]
2015	0.49	0.25	1.00	[-0.37, 1.35]
2016	0.08	0.24	1.00	[-0.73, 0.90]
2017	0.31	0.22	1.00	[-0.45, 1.07]
2018	0.66	0.22	0.12	[-0.07, 1.40]
2019	1.12	0.21	<0.01	[0.41, 1.83]
2020	-1.86	0.41	<0.01	[-3.26, -0.45]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.6 Results for Number of Breakfast Meals Served in July Per Enrollment.

The mean number of breakfast meals served in July per enrollment was highest in the first summer of the waivers (summer 2020) (M = 2.71, SD = 1.08) and lowest in summer 2016 (M = 1.79, SD = 0.57) (Table 19).

Table 19: Descriptive Statistics for Number of Breakfast Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	1.20	3.55	2.14	0.65
2015	1.25	3.90	2.14	0.65
2016	1.10	3.37	1.79	0.57
2017	1.15	2.89	1.85	0.51
2018	1.00	2.96	1.80	0.52
2019	1.04	3.61	1.98	0.65
2020	1.06	5.41	2.71	1.08
2021	0.85	4.20	2.01	0.78

[a]M = mean.
[b]SD = standard deviation.

The mean increased from 2016 to 2017, then decreased from 2017 to 2018, and then increased in 2018 and 2019. The mean reached a peak in the first summer of the waivers followed by a sharp decrease in the second summer of the waivers (Figure 7).

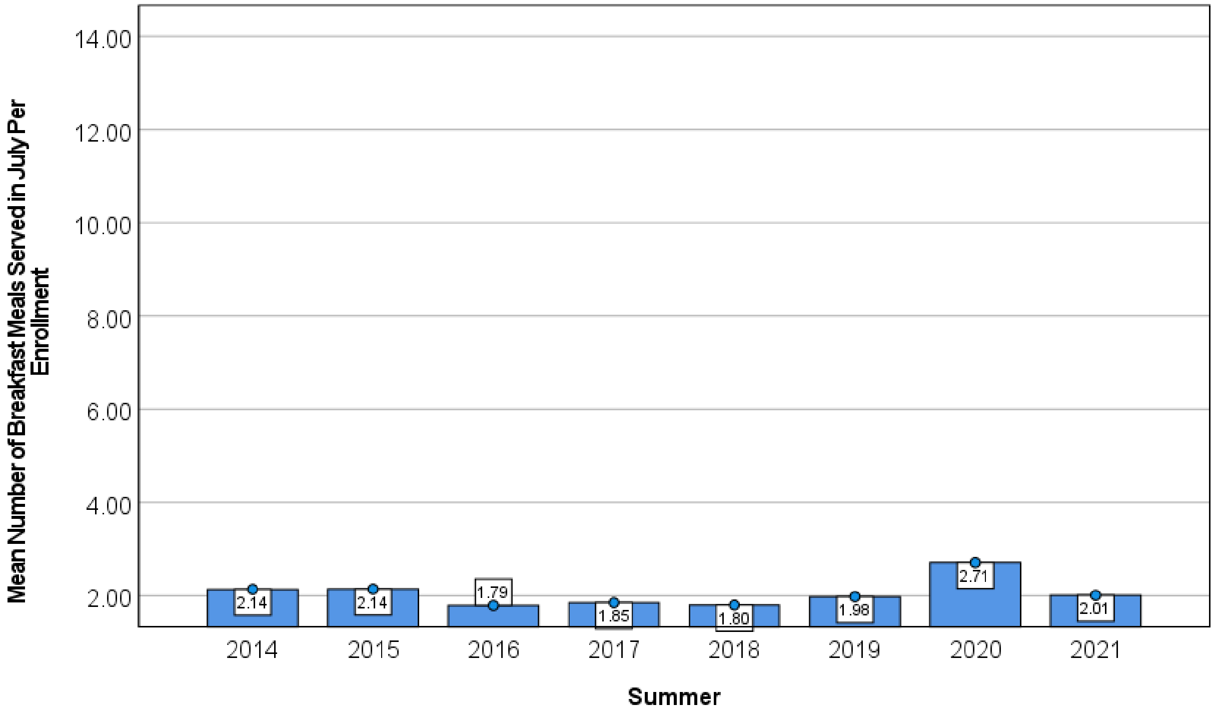

Figure 7: Bar Chart of the Mean Number of Breakfast Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served in July per enrollment differed significantly across the summers ($F(1.95, 60.38) = 14.41$, $p < 0.001$, $\eta^2 = 0.32$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to the four most recent summers without the waivers (summers 2016, 2017, 2018, and 2019) (Table 20).

Table 20: Mean Differences in Breakfast Meals Served in July Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	0.58	0.20	0.17	[-0.09, 1.24]
2015	0.57	0.19	0.17	[-0.09, 1.24]
2016	0.92	0.18	<0.01	[0.30, 1.54]
2017	0.86	0.18	<0.01	[0.23, 1.49]
2018	0.91	0.19	<0.01	[0.28, 1.55]
2019	0.73	0.19	0.02	[0.08, 1.39]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the second summer of the waivers and any of the summers without the waivers (Table 21).

Table 21: Mean Differences in Breakfast Meals Served in July Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.13	0.11	1.00	[-0.49, 0.24]
2015	-0.13	0.12	1.00	[-0.55, 0.28]
2016	0.22	0.10	0.87	[-0.11, 0.54]
2017	0.16	0.10	1.00	[-0.17, 0.49]
2018	0.21	0.09	0.88	[-0.11, 0.52]
2019	0.03	0.10	1.00	[-0.30, 0.36]
2020	-0.70	0.19	0.02	[-1.35, -0.06]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.7 Results for Number of Lunch Meals Served in July Per Enrollment.

The mean number of lunch meals served in July per enrollment was highest in summer 2014 (M = 3.97, SD = 1.21) (Table 44). However, in the alternate analysis, the mean was highest in the first summer of the waivers (summer 2020) (see Appendix F). In the present analysis, the mean was lowest in the second summer of the waivers (summer 2021) (M = 2.64, SD = 1.04) (Table 22).

Table 22: Descriptive Statistics for Number of Lunch Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	2.19	7.40	3.97	1.21
2015	2.14	6.54	3.84	1.10
2016	1.81	6.14	3.18	1.00
2017	2.18	5.71	3.32	0.95
2018	1.89	5.58	3.28	0.94
2019	2.11	6.57	3.58	1.13
2020	1.34	7.20	3.81	1.38
2021	1.14	5.48	2.64	1.04

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2014 to 2016. The mean increased from 2018 to the first summer of the waivers. The mean then sharply decreased in the second summer of the waivers (summer 2021) (Figure 8).

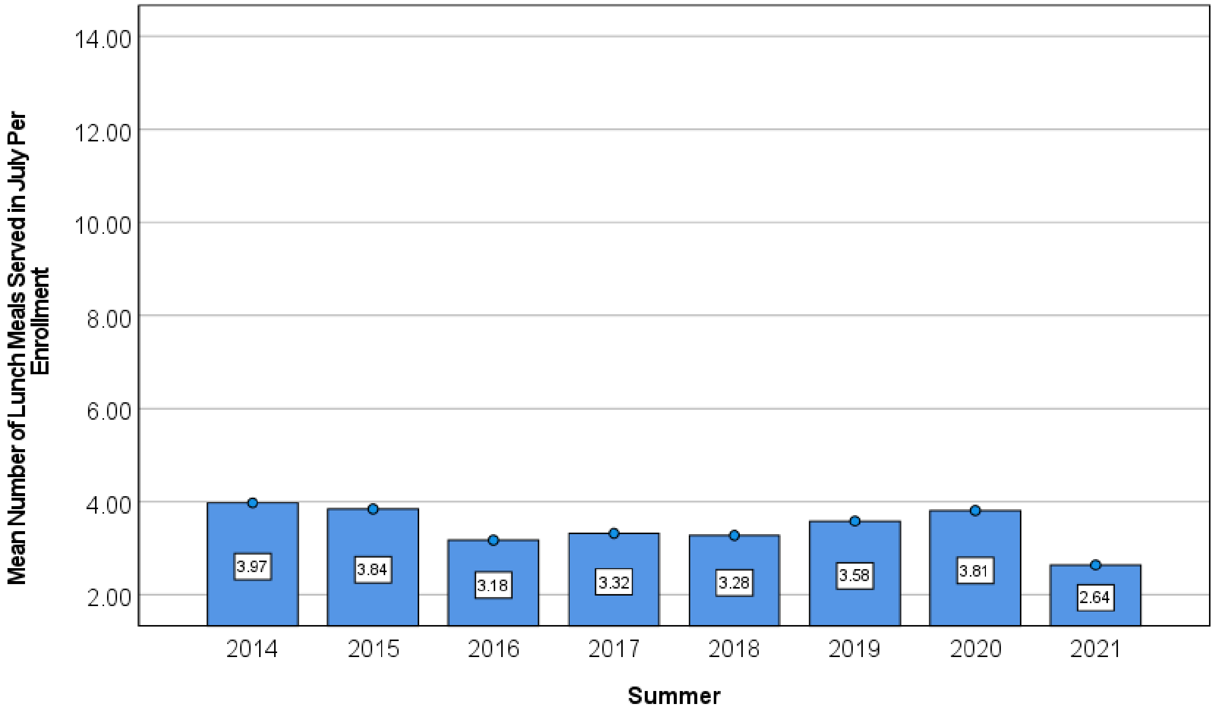

Figure 8: Bar Chart of the Mean Number of Lunch Meals Served in July Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served in July per enrollment differed significantly across the summers ($F(2.16, 67.09) = 14.89$, $p < 0.001$, $\eta^2 = 0.32$). In the post hoc analysis with the Bonferroni adjustment, there were no significant differences between the mean during the first summer of the waivers compared to any of the summers without the waivers (Table 23).

Table 23: Mean Differences in Lunch Meals Served in July Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.17	0.30	1.00	[-1.18, 0.85]
2015	-0.03	0.27	1.00	[-0.95, 0.89]
2016	0.63	0.25	0.49	[-0.23, 1.50]
2017	0.49	0.25	1.00	[-0.36, 1.34]
2018	0.53	0.25	1.00	[-0.31, 1.37]
2019	0.22	0.27	1.00	[-0.69, 1.14]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Furthermore, the mean number of lunch meals served in July per enrollment decreased significantly during the second summer of the waivers compared to each summer without the waivers (Table 24).

Table 24: Mean Differences in Lunch Meals Served in July Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-1.33	0.18	<0.01	[-1.96, -0.71]
2015	-1.20	0.16	<0.01	[-1.75, -0.65]
2016	-0.53	0.14	0.01	[-1.00, -0.06]
2017	-0.68	0.12	<0.01	[-1.07, -0.28]
2018	-0.63	0.12	<0.01	[-1.03, -0.23]
2019	-0.94	0.15	<0.01	[-1.45, -0.43]
2020	-1.17	0.23	<0.01	[-1.97, -0.37]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.8 Results for Number of Breakfast Meals Served in August Per Enrollment.

Enrollment. The mean number of breakfast meals served in August per enrollment was highest in the first summer of the waivers (summer 2020) (M = 2.35, SD = 0.97) and lowest in the summer before the waivers (summer 2019) (M = 0.90, SD = 0.38) (Table 25).

Table 25: Descriptive Statistics for Number of Breakfast Meals Served in August Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	0.47	2.31	1.07	0.45
2015	0.54	2.64	1.12	0.48
2016	0.74	3.27	1.30	0.56
2017	0.69	2.72	1.21	0.49
2018	0.57	2.10	1.07	0.41
2019	0.47	1.95	0.90	0.38
2020	0.91	5.15	2.35	0.97
2021	0.56	3.96	1.69	0.79

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020). This was followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of breakfast meals served in August per enrollment in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure 9).

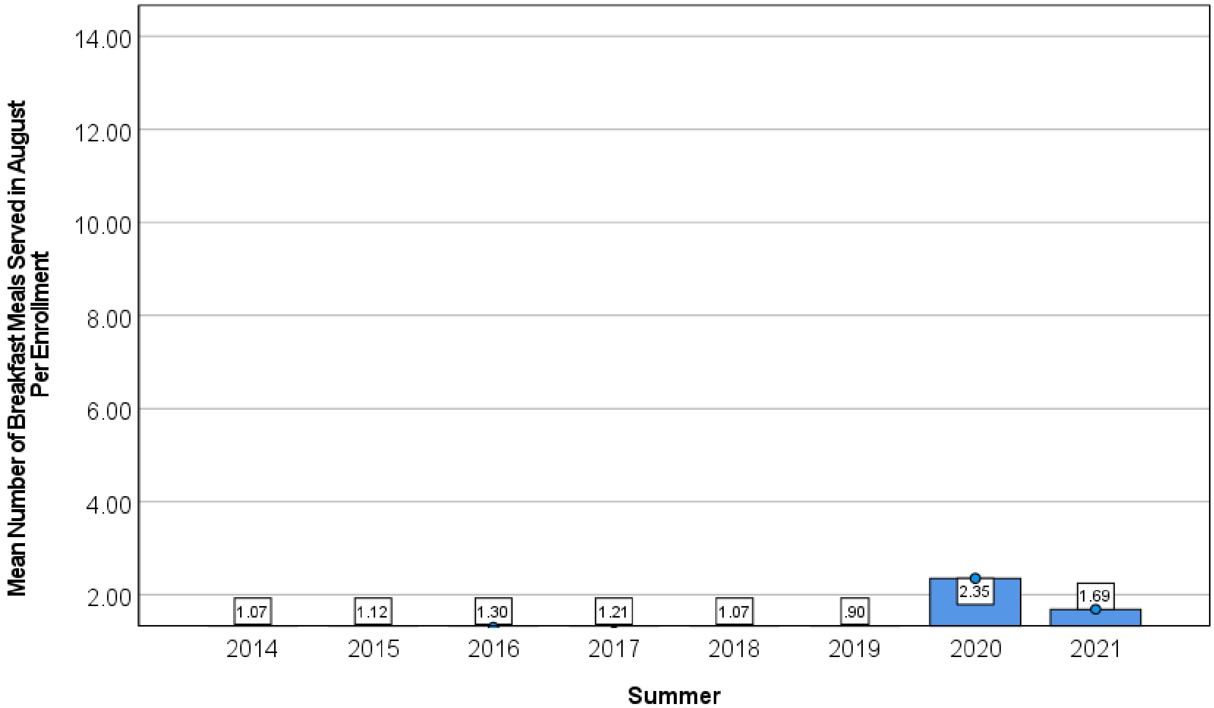

Figure 9: Bar Chart of the Mean Number of Breakfast Served in August Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served in August per enrollment differed significantly across the summers ($F(1.20, 61.72) = 38.56$, $p < 0.001$, $\eta 2 = 0.55$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table 26).

Table 26: Mean Differences in Breakfast Meals Served in August Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	1.28	0.18	<0.01	[0.66, 1.90]
2015	1.23	0.18	<0.01	[0.61, 1.84]
2016	1.05	0.18	<0.01	[0.44, 1.66]
2017	1.15	0.18	<0.01	[0.54, 1.75]
2018	1.29	0.17	<0.01	[0.69, 1.88]
2019	1.45	0.17	<0.01	[0.86, 2.04]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. The mean number of breakfast meals served in August increased significantly during the second summer of the waivers compared to each summer without the waivers (Table 27). In the alternate analysis, the comparison with summer 2016 did not reach statistical significance (see Appendix F).

Table 27: Mean Differences in Breakfast Meals Served in August Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	0.62	0.12	<0.01	[0.22, 1.01]
2015	0.56	0.12	<0.01	[0.17, 0.96]
2016	0.39	0.11	0.05	[0.00, 0.77]
2017	0.48	0.11	<0.01	[0.12, 0.85]
2018	0.62	0.11	<0.01	[0.26, 0.98]
2019	0.79	0.11	<0.01	[0.42, 1.15]
2020	-0.66	0.19	0.05	[-1.32, -0.01]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.9 Results for Number of Lunch Meals Served in August Per Enrollment.

The mean number of lunch meals served in August per enrollment was highest in the first summer of the waivers (summer 2020) (M = 3.33, SD = 1.29) and lowest in the summer before the waivers (summer 2019) (M = 1.80, SD = 0.81) (Table 28).

Table 28: Descriptive Statistics for Number of Lunch Meals Served in August Per Enrollment, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	1.00	4.66	2.16	0.90
2015	1.16	4.87	2.21	0.92
2016	1.37	5.58	2.44	1.00
2017	1.33	5.14	2.31	0.95
2018	1.14	4.93	2.09	0.92
2019	1.01	4.64	1.80	0.81
2020	1.21	6.79	3.33	1.29
2021	0.75	4.14	2.13	0.95

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021) (Figure 10).

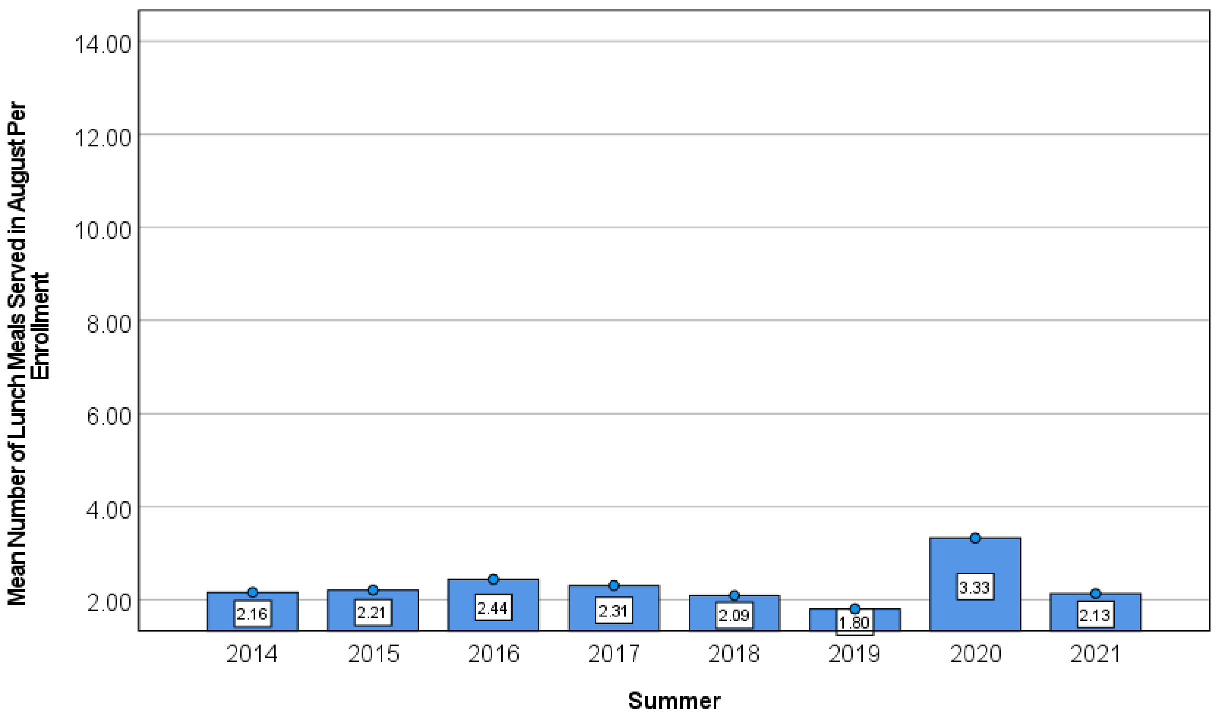

Figure 10: Bar Chart of the Mean Number of Lunch Meals Served in August Per Enrollment, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served in August per enrollment differed significantly across the summers ($F(2.02, 62.50) = 17.50$, $p < 0.001$, $\eta 2 = 0.36$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table 29).

Table 29: Mean Differences in Lunch Meals Served in August Per Enrollment, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	1.17	0.27	0.01	[0.23, 2.10]
2015	1.12	0.26	<0.01	[0.24, 1.99]
2016	0.86	0.26	0.04	[0.01, 1.76]
2017	1.02	0.25	0.01	[0.15, 1.88]
2018	1.23	0.25	<0.01	[0.38, 2.09]
2019	1.52	0.24	<0.01	[0.69, 2.36]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean number of lunch meals served in August per enrollment during the second summer of the waivers compared to any of the summers without the waivers (Table 30).

Table 30: Mean Differences in Lunch Meals Served in August Per Enrollment, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.03	0.16	1.00	[-0.58, 0.53]
2015	-0.08	0.15	1.00	[-0.58, 0.43]
2016	-0.30	0.14	1.00	[-0.78, 0.17]
2017	-0.17	0.13	1.00	[-0.61, 0.26]
2018	0.04	0.13	1.00	[-0.39, 0.47]
2019	0.33	0.12	0.24	[-0.07, 0.73]
2020	-1.19	0.23	<0.01	[-1.97, -0.41]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.1.10 Summary of the Results. Figure 11 presents a summary of the descriptives in bar chart format, while Table 31 presents a summary of the significant findings for research question 1, which is "among NYC DOE geographic districts, was there a significant difference in the number of SFSP meals served during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?"

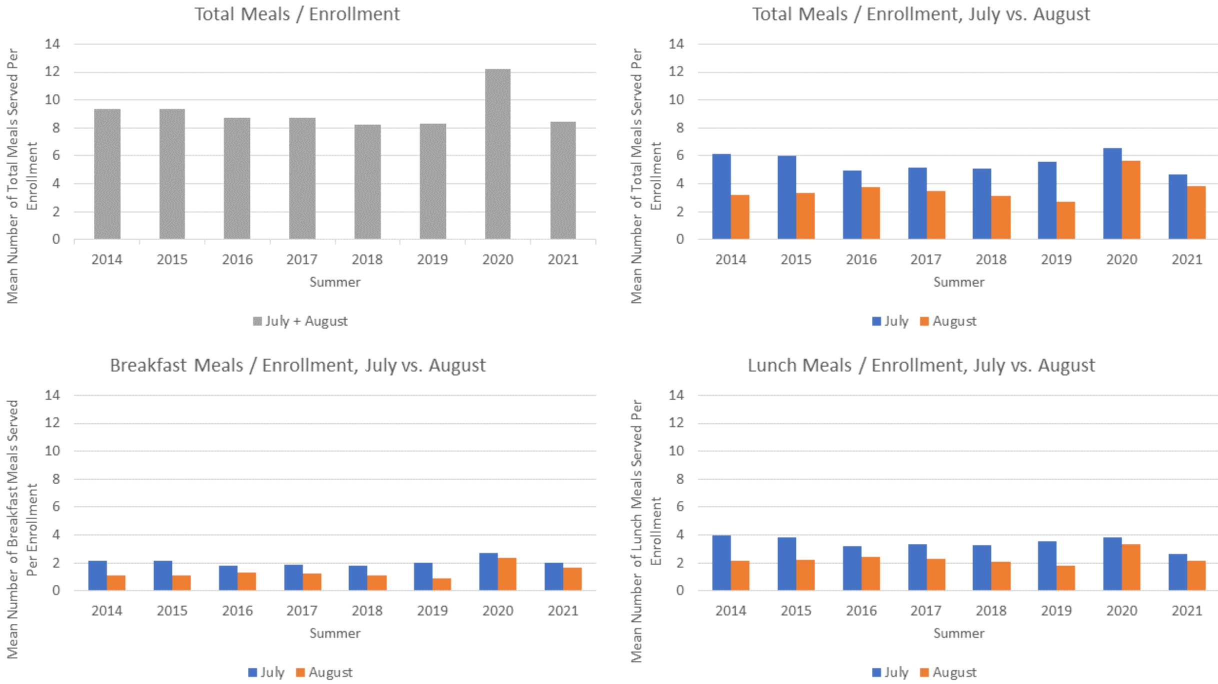

Figure 11: Summary of the Descriptives for Research Question 1

Table 31: Summary of the Significant Findings for Research Question 1

Dependent Variable	2020 vs. 2014-2019	2021 vs. 2014-2019	2021 vs. 2020[a]
Total[b]	Increase vs. 2016-2019	No change	Decrease
BF[c]	Increase vs. 2014-2019	Increase vs. 2018-2019	Decrease
Lunch[d]	Increase vs. 2018-2019	Decrease vs. 2014, 15, 17	Decrease
Jul[e]	Increase vs. 2016, 18	Decrease vs. 2014, 15, 19	Decrease
Aug[f]	Increase vs. 2014-2019	Increase vs. 2019	Decrease
Jul BF[g]	Increase vs. 2016-2019	No change	Decrease
Jul Lunch[h]	No change	Decrease vs. 2014-2019	Decrease
Aug BF[i]	Increase vs. 2014-2019	Increase vs. 2014-2019	Decrease
Aug Lunch[j]	Increase vs. 2014-2019	No change	Decrease

[a]This comparison does not answer research question 1.
[b]Total = total meals served per student.
[c]BF = breakfast meals served per student.
[d]Lunch = lunch meals served per student.
[e]Jul = meals served in July per student.
[f]Aug = meals served in August per student.
[g]Jul BF = breakfast meals served in July per student.
[h]Jul Lunch = lunch meals served in July per student.
[i]Aug BF = breakfast meals served in August per student.
[j]Aug Lunch = lunch meals served in August per student.

The bar charts in Figure 11 show increases in the number of meals served per enrolled student during the first summer of the waivers (summer 2020) compared to the summers without the waivers (summers 2014-2019). The bar charts also show marked increases in the number of total meals served in August, breakfast meals served in August, and lunch meals served in August (August is represented by orange lines). August numbers are consistently lower than July numbers throughout all the summers included in this study. However, during the first and second summers of the waivers, the gap between July and August comes close to closing for breakfast meals.

Column 1 of Table 31 compares the first summer of the waivers (summer 2020) to the summers without the waivers (summers 2014-2019). This comparison shows significant increases in the reach of summer meals. Per enrolled student, there were significant increases in total meals served, breakfast meals served, lunch meals served, total meals served in July, total meals served in August, breakfast meals served in July, breakfast meals served in August, and lunch meals served in August during the first summer of the waivers compared to at least two summers before the waivers. Compared to all summers before the waivers, there was a significant increase in breakfast meals served, total meals served in August, breakfast meals served in August, and lunch meals served in August. However, there was no change in the number of lunch meals served in July.

Column 2 of Table 31 compares the second summer of the waivers (summer 2021) to the summers without the waivers (summers 2014-2019). This comparison shows significant increases and decreases in the reach of summer meals. Per enrolled student, there were significant increases in breakfast meals served, total meals served in August, and breakfast meals served in August during the second summer of the waivers compared to at least one summer before the waivers. Compared to all summers before the waivers, there was a significant increase in breakfast meals served in August. However, there were no changes in total meals served, breakfast meals served in July, and lunch meals served in August. Furthermore, there were decreases in lunch meals served, total meals served in July, and lunch meals served in July when comparing the second summer of the waivers to at least three summers before the waivers.

The only consistent finding across both comparisons is the increase in the number of breakfast meals served in August during the summers when the waivers were used compared to all summers without the waivers included in this analysis. This finding did not differ substantially in the alternate analysis; the only difference is the increase in summer 2021 vs. 2016 did not reach statistical significance. Notably, the increase is clinically small: from an average of 1.11 breakfast meals served per student in August pre-waivers to an average of 2.02 breakfast meals served per student in August during the waivers. Hypothetically, 21 breakfast meals could be served per student in August if a student ate breakfast every Monday through Friday. For all dependent variables in both analyses, there was a decrease in the reach of summer meals in the second summer of the waivers (summer 2021) compared to the first summer of the waivers (summer 2020).

4.1.2 Quantitative Analysis of the Accessibility of SFSP Sites

In this analysis, there are eight dependent variables, all per 1,000 students: (1) number of sites (primary outcome), (2) number of open sites, (3) number of sites in high poverty districts, (4) number of sites in high non-White districts, (5) number of sites in high enrollment districts, (6) number of open sites in high poverty districts, (7) number of open sites in high non-White districts, and (8) number of open sites in high enrollment districts. The descriptive statistics and results are presented by dependent variable, starting with the primary outcome.

As described in Chapter 3, accessibility is operationalized into the eight dependent variables using a method similar to that used by McLoughlin et al. (2020) (McLoughlin, McCarthy, et al., 2020), which used census tracts as the geographic unit of analysis. The present study uses NYC DOE geographic districts as the unit of analysis. “High poverty districts” are NYC DOE geographic districts where the percentage of students in poverty is above the median for all districts on average over the years in the study (2014-2021). “High non-White districts” are NYC DOE geographic districts where the percentage of non-White students is above the median for all districts on average over the years in the study (2014-2021). “High enrollment districts” are NYC DOE geographic districts where the number of enrolled students (total enrollment) is above the median for all districts on average over the years in the study (2014-2021).

Table 32 shows the medians and ranges for the percentage of students in poverty, the percentage of non-White students, and the number of enrolled students. Figures 12, 13, and 14 show the percentage of students in poverty, the percentage of non-White students, and the number of enrolled students, respectively, for each district (n = 32) with median levels indicated by a horizontal line.

Table 32: Medians and Ranges for Percentage of Students in Poverty, Percentage of Non-White Students, and Total Enrollment, 2014-2021 (n = 32)

Students	Median	Range
Percentage Poverty	76.11%	49.17% - 92.32%
Percentage Non-White	90.44%	52.75% - 98.57%
Enrollment	26,926.88	6,777.25 - 62,063.00

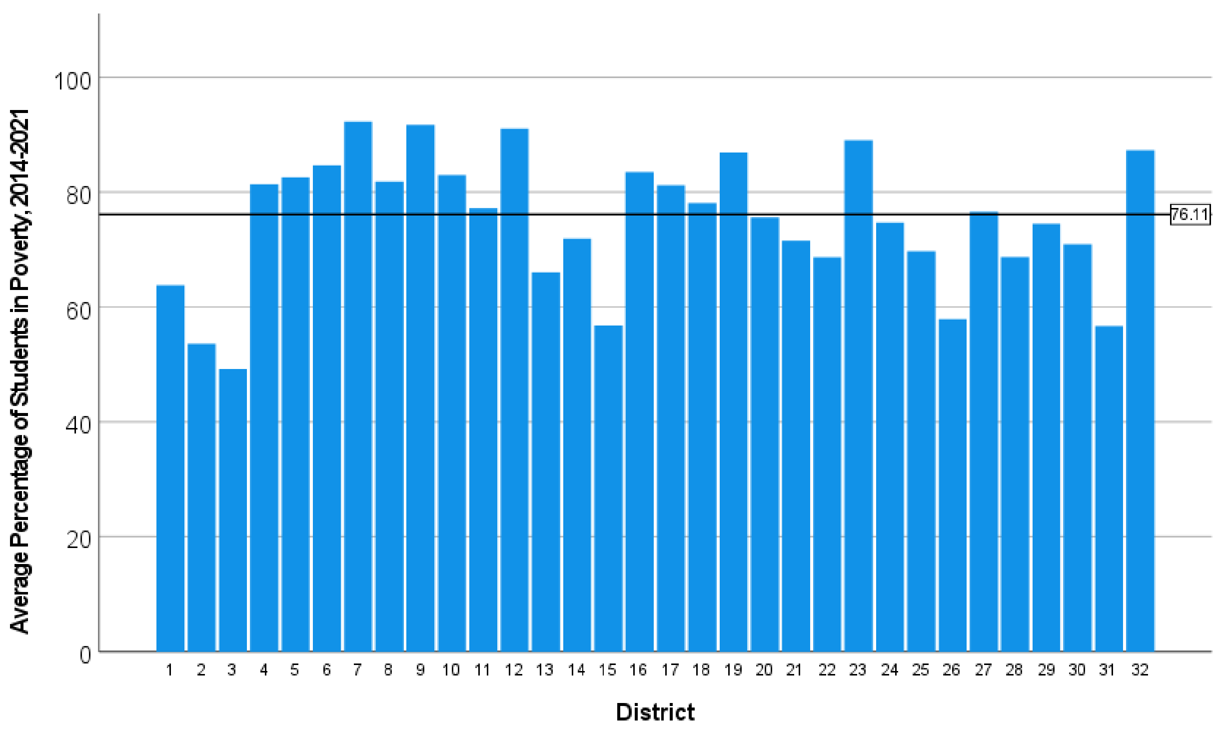

Figure 12: Bar Chart of Average Percentage of Students in Poverty (2014-2021) by District

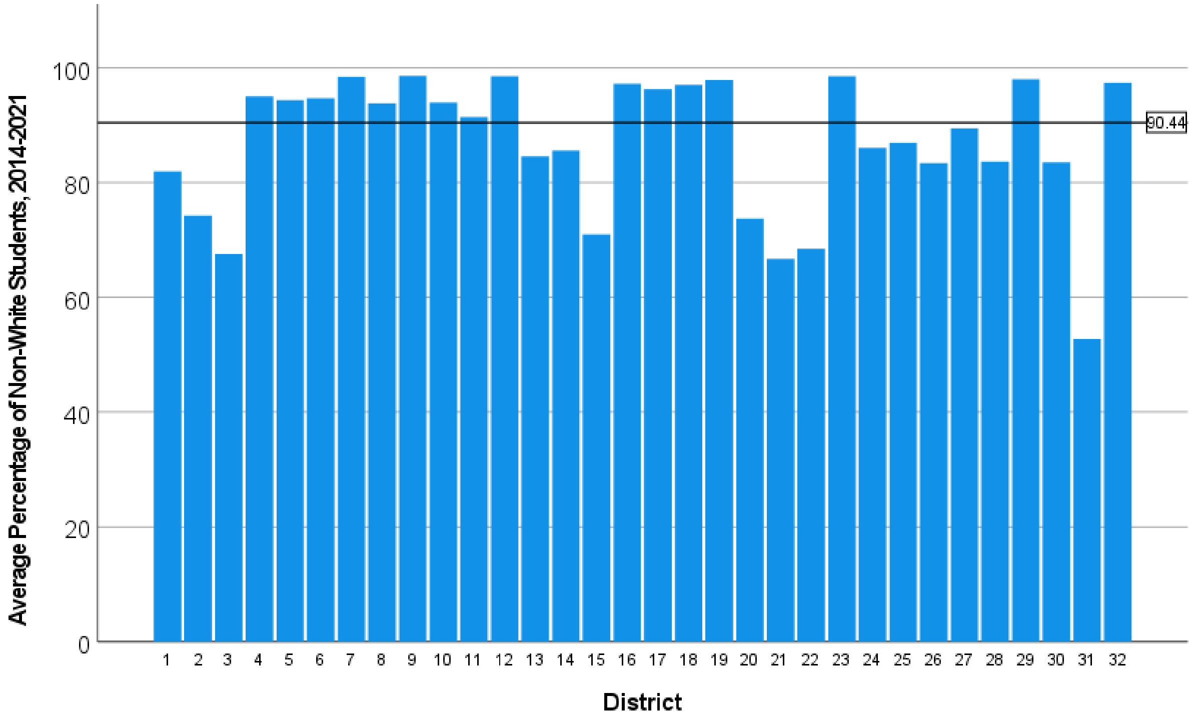

Figure 13: Bar Chart of Average Percentage of Non-White Students (2014-2021) by District

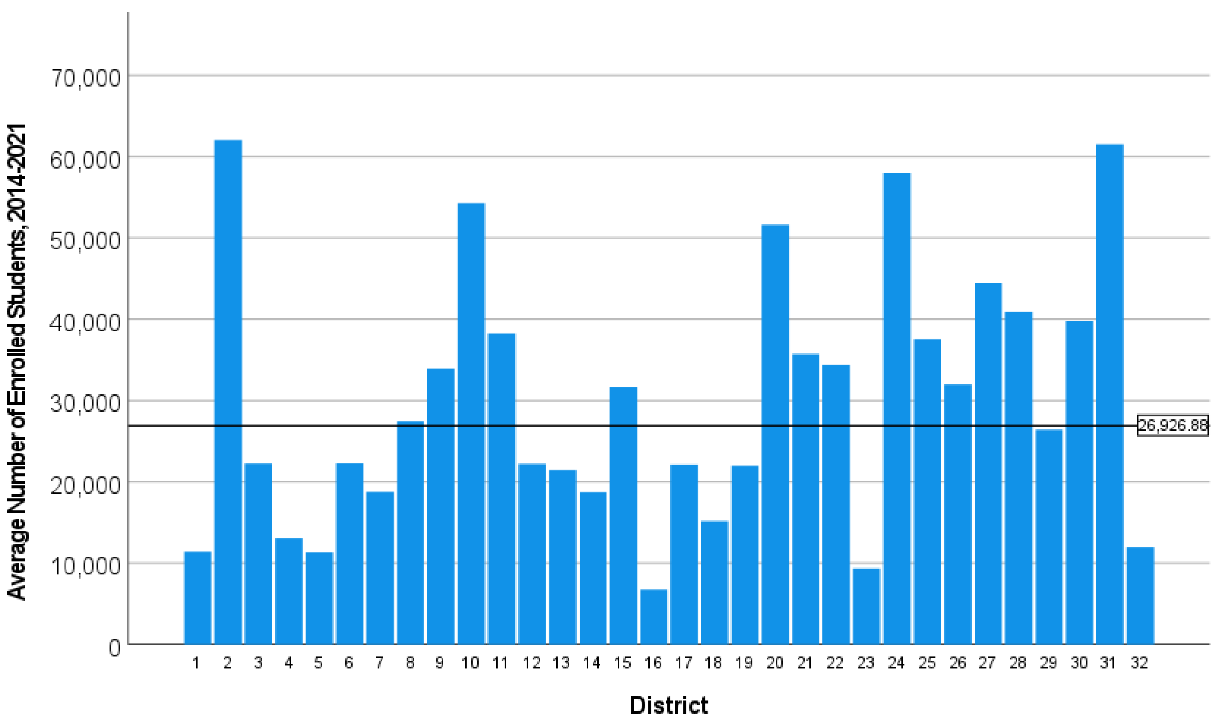

Figure 14: Bar Chart of Average Number of Enrolled Students (2014-2021) by District

For four dependent variables (number of sites per 1,000 students, number of open sites per 1,000 students, number of sites per 1,000 students in high enrollment districts, and number of open sites per 1,000 students in high enrollment districts), the assumptions of the repeated-measures ANOVA are tenable. The independence assumption is tenable because each district's data is independent from the data of the other districts. The normality tests show no violations of the assumption of normality for two of the dependent variables (number of sites per 1,000 students in high enrollment districts and number of open sites per 1,000 students in high enrollment districts) but violations for the other two dependent variables (number of sites per 1,000 students and number of open sites per 1,000 students) at several timepoints (see Appendix G); however, the normality assumption is still tenable based on sample size, which is greater than 30 (n = 32), making the repeated-measures ANOVA robust to violations of the assumption of normality. Mauchly's test of sphericity shows violations of the sphericity assumption for all four dependent variables (see Appendix H), presumably due to autoregression; as a result, the Greenhouse-Geisser correction is needed with the repeated-measures ANOVA test. The repeated-measures compares the mean values of the dependent variables, and the post-hoc analysis determines if there is a significant mean difference.

For the remaining four dependent variables, the normality assumption of the repeated-measures ANOVA is not tenable. The normality tests show violations of the assumption of normality (see Appendix G), and the sample size is less than 30 (n = 16). Because the repeated-measures ANOVA is not robust to violations of the assumption of normality when the sample size is less than 30, the Friedman test is used instead. This test compares the median values of the dependent variables. For this test, the independence assumption is tenable for all four dependent variables, and there is no need to test for sphericity. The post-hoc test may be the Wilcoxon-signed rank test or the sign test. The Wilcoxon-signed rank test has an additional assumption of symmetrical distribution, i.e., the differences between years are symmetrically distributed around the median difference. Box-plots comparing 2015 to 2020 show violations of this assumption (see Appendix I), so the Wilcoxon-signed rank test cannot be used, and there is no need to complete the remaining year-to-year comparisons. The sign test is used instead with the Bonferroni adjustment. The sign test determines if there is a significant median difference.

The analysis is repeated using (1) different definitions for high poverty districts and high non-White districts and (2) number of sites instead of number of sites per 1,000 students. High poverty districts are defined as districts where the number (instead of the percentage) of students in poverty is above the median for all districts. Similarly, high non-White districts are defined as districts where the number (instead of the percentage) of non-White students is above the median for all districts. The repeated analysis is referred to as the "alternate analysis for research question 2." Appendix J presents the normality test results, sphericity test results, distribution test results, and repeated-measures ANOVA or Friedman test results including post-hoc analyses. The results chapter states any differences between the analyses.

4.1.2.1 Results for Number of Sites Per 1,000 Students. The statistical test is the repeated-measures ANOVA.

The mean number of sites per 1,000 students was highest in summer 2017 (M = 1.60, SD = 0.67) and lowest in the first summer of the waivers (summer 2020) (M = 0.63, SD = 0.31) (Table 33).

Table 33: Descriptive Statistics for Number of Sites Per 1,000 Students, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	0.64	2.91	1.42	0.51
2015	0.70	3.11	1.57	0.61
2016	0.74	3.38	1.54	0.61
2017	0.70	3.53	1.60	0.67
2018	0.74	3.36	1.56	0.65
2019	0.72	3.34	1.57	0.64
2020	0.22	1.50	0.63	0.31
2021	0.63	2.86	1.29	0.54

[a]M = mean.
[b]SD = standard deviation.

The mean appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure 15).

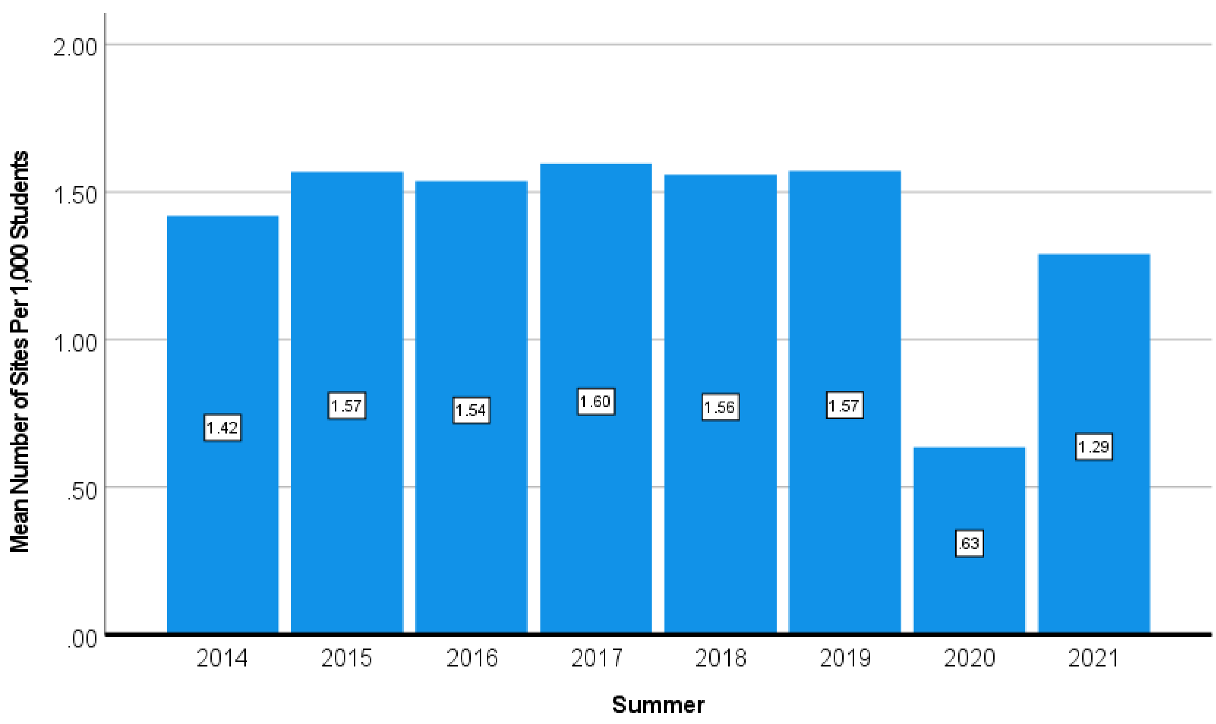

Figure 15: Bar Chart of the Mean Number of Sites Per 1,000 Students, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of sites per 1,000 students differed significantly across the summers ($F(3.02, 93.54) = 102.11$, $p < 0.001$, $\eta^2 = 0.77$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer before the waivers (Table 34).

Table 34: Mean Differences in the Number of Sites Per 1,000 Students, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.79	0.05	<0.01	[-0.95, -0.62]
2015	-0.93	0.07	<0.01	[-1.16, -0.71]
2016	-0.90	0.06	<0.01	[-1.11, -0.70]
2017	-0.96	0.07	<0.01	[-1.21, -0.72]
2018	-0.92	0.07	<0.01	[-1.16, -0.69]
2019	-0.94	0.07	<0.01	[-1.17, -0.70]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then increased significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of sites per 1,000 students between the second summer of the waivers and each summer without the waivers except summer 2014 (Table 35), though the magnitudes or mean differences were smaller in this comparison vs. the comparison between the first summer of the waivers and the summers without the waivers.

Table 35: Mean Differences in Number of Sites Per 1,000 Students, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.13	0.04	0.19	[-0.28, 0.02]
2015	-0.28	0.04	<0.01	[-0.43, -0.13]
2016	-0.25	0.04	<0.01	[-0.39, -0.10]
2017	-0.31	0.05	<0.01	[-0.46, -0.15]
2018	-0.27	0.04	<0.01	[-0.41, -0.12]
2019	-0.28	0.05	<0.01	[-0.44, -0.13]
2020	0.66	0.05	<0.01	[0.49, 0.82]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.2.2 Results for Number of Open Sites Per 1,000 Students. The statistical test is the repeated-measures ANOVA.

The mean number of open sites per 1,000 students was highest in summer 2015 (M = 0.90, SD = 0.43) and lowest in the first summer of the waivers (M = 0.51, SD = 0.25) (Table 36).

Table 36: Descriptive Statistics for Number of Open Sites[a] Per 1,000 Students, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[b]	SD[c]
2014	0.32	1.98	0.82	0.37
2015	0.35	2.03	0.90	0.43
2016	0.35	1.84	0.72	0.36
2017	0.34	1.53	0.69	0.32
2018	0.33	1.47	0.69	0.29
2019	0.20	1.42	0.55	0.29
2020	0.13	1.05	0.51	0.25
2021	0.22	1.59	0.56	0.34

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]M = mean.
[c]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers from summer 2015 to 2019 and continued to decrease during the first and second summers of the waivers (Figure 16).

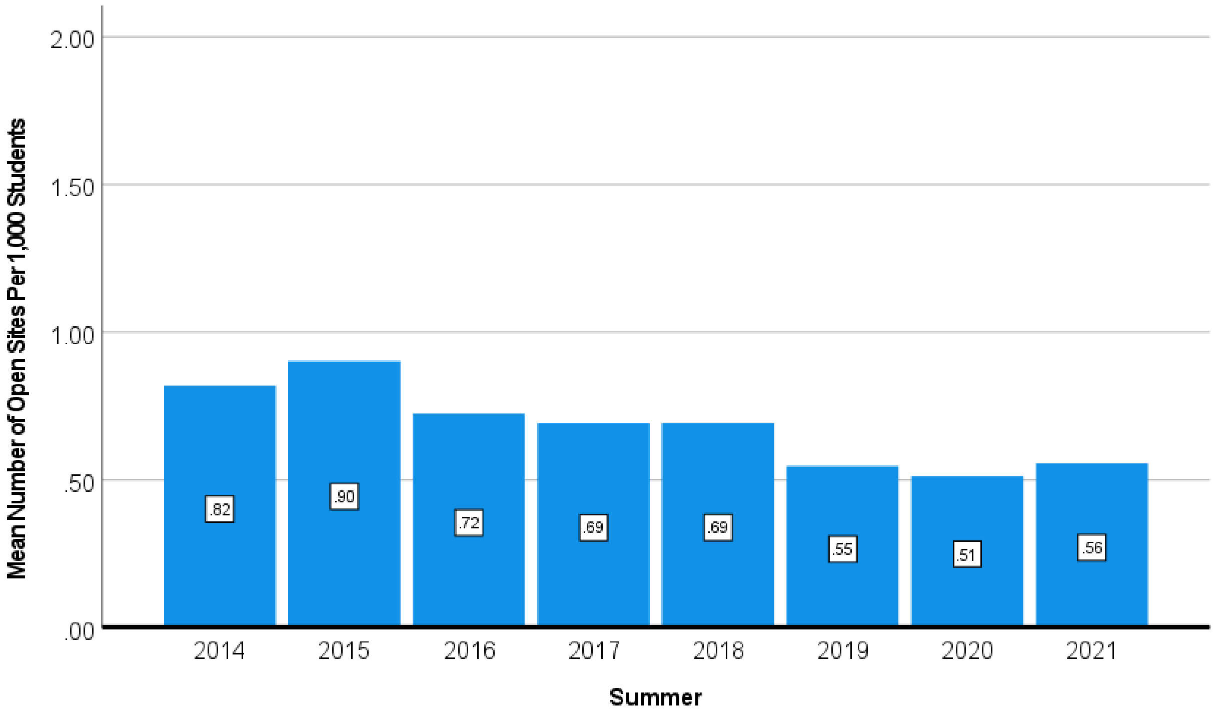

Figure 16: Bar Chart of the Mean Number of Open Sites Per 1,000 Students, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of open sites per 1,000 students differed significantly across the summers ($F(3.42, 106.14) = 28.35$, $p < 0.001$, $\eta^2 = 0.48$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer without the waivers, except the most recent summer, summer 2019 (Table 37).

Table 37: Mean Differences in Number of Open Sites[a] Per 1,000 Students, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[b]	SE[c]	p[d]	95% CI[e]
2014	-0.31	0.04	<0.01	[-0.44, -0.17]
2015	-0.39	0.04	<0.01	[-0.54, -0.24]
2016	-0.21	0.03	<0.01	[-0.33, -0.09]
2017	-0.18	0.03	<0.01	[-0.28, -0.07]
2018	-0.18	0.03	<0.01	[-0.29, -0.07]
2019	-0.03	0.03	1.00	[-0.15, 0.08]

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]MD = mean difference.
[c]SE = standard error.
[d]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[e]95% CI = 95% confidence interval.

The mean did not change significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of open sites per 1,000 students between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table 38).

Table 38: Mean Differences in Open Sites[a] Per 1,000 Students, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[b]	SE[c]	p[d]	95% CI[e]
2014	-0.26	0.04	<0.01	[-0.39, -0.13]
2015	-0.35	0.05	<0.01	[-0.50, -0.19]
2016	-0.17	0.03	<0.01	[-0.27, -0.07]
2017	-0.14	0.03	<0.01	[-0.23, -0.04]
2018	-0.14	0.03	0.01	[-0.25, -0.03]
2019	0.01	0.04	1.00	[-0.12, 0.15]
2020	0.04	0.04	1.00	[-0.08, 0.17]

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]MD = mean difference.
[c]SE = standard error.
[d]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[e]95% CI = 95% confidence interval.

4.1.2.3 Results for Number of Sites Per 1,000 Students in High Poverty Districts.

The statistical tests are the Friedman test and the sign test.

The median number of sites per 1,000 students in high poverty districts was highest in the summer 2017 (Mdn = 1.77, IQR = 1.40-2.30) and lowest in the first summer of the waivers (Mdn = 0.71, IQR = 0.60-0.99) (Table 39).

Table 39: Descriptive Statistics for Number of Sites Per 1,000 Students in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[a]	IQR[b]
2014	1.56	1.25-1.86
2015	1.75	1.39-2.11
2016	1.70	1.45-2.08
2017	1.77	1.40-2.30
2018	1.62	1.46-2.35
2019	1.67	1.47-2.26
2020	0.71	0.60-0.99
2021	1.40	1.25-1.86

[a]Mdn = median.
[b]IQR = interquartile range.

The median appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure 17).

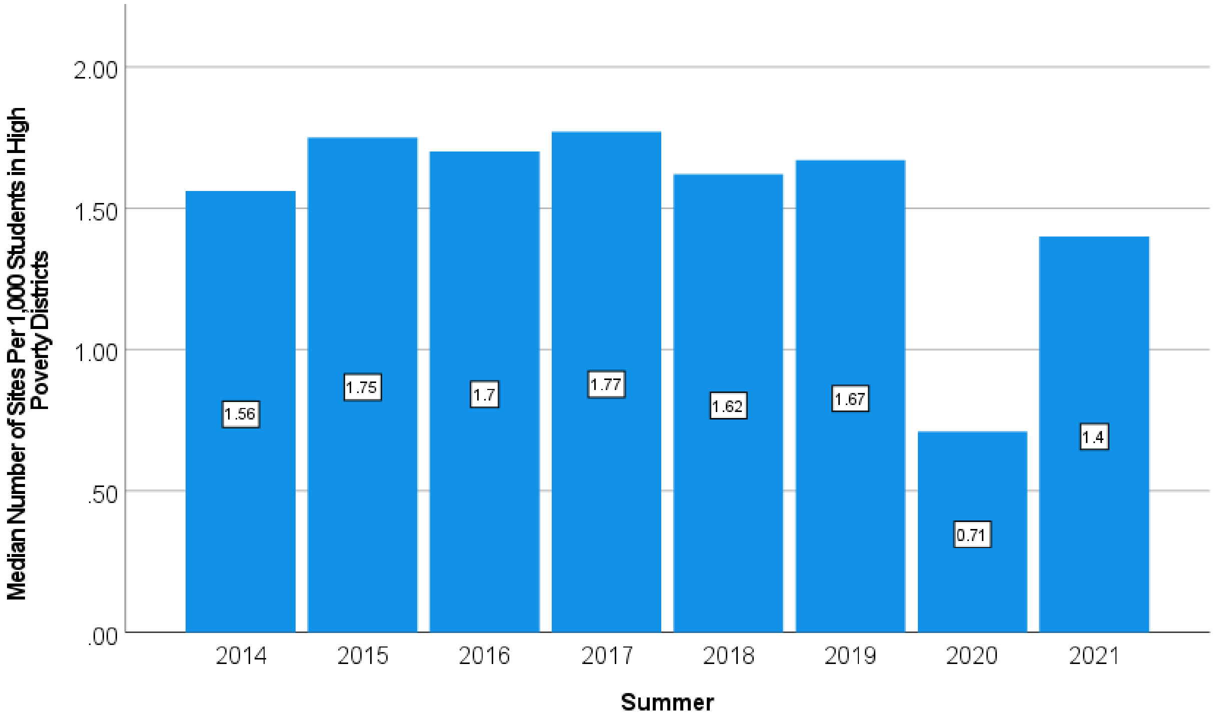

Figure 17: Bar Chart of the Median Number of Sites Per 1,000 Students in High Poverty Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of sites in high poverty districts per 1,000 students differed significantly across the summers ($\chi(7) = 66.54$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to each summer without the waivers (Table 40).

Table 40: Median Differences in Number of Sites Per 1,000 Students in High Poverty Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-0.83	<0.01
2015	-0.98	<0.01
2016	-1.07	<0.01
2017	-1.10	<0.01
2018	-0.88	<0.01
2019	-0.97	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Conversely, there was a significant median increase during the second summer of the waivers compared to the first summer of the waivers. There was a significant median decrease in the second summer of the waivers compared to the two most recent summers without the waivers (summers 2018 and 2019) (Table 41).

Table 41: Median Differences in Number of Sites Per 1,000 Students in High Poverty Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-0.05	1.00
2015	-0.23	1.00
2016	-0.18	1.00
2017	-0.31	1.00
2018	-0.21	0.01
2019	-0.26	0.01
2020	0.74	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

4.1.2.4 Results for Number of Sites Per 1,000 Students in High Non-White Districts.

The statistical tests are the Friedman test and the sign test.

The median number of sites per 1,000 students in high non-White districts was highest in summer 2017 (Mdn = 1.77, IQR = 1.54-2.30) and lowest in the first summer of the waivers (Mdn = 0.71, IQR = 0.60-0.99) (Table 42).

Table 42: Descriptive Statistics for Number of Sites Per 1,000 Students in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[a]	IQR[b]
2014	1.56	1.25-1.86
2015	1.75	1.39-2.11
2016	1.70	1.45-2.08
2017	1.77	1.54-2.30
2018	1.62	1.46-2.35
2019	1.67	1.51-2.26
2020	0.71	0.60-0.99
2021	1.40	1.25-1.86

[a]Mdn = median.
[b]IQR = interquartile range.

The median appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure 18).

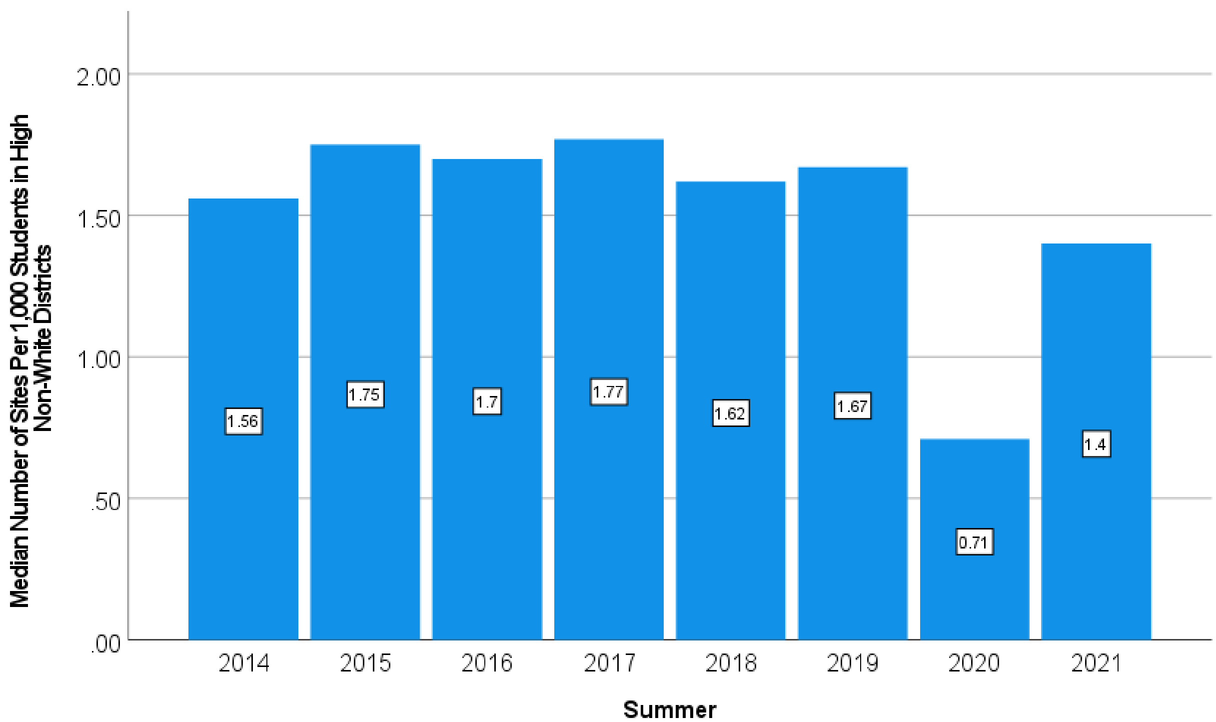

Figure 18: Bar Chart of the Median Number of Sites Per 1,000 Students in High Non-White Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of sites per 1,000 students in high non-White districts differed significantly across the summers ($\chi(7) = 67.27$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to each summer without the waivers (Table 43).

Table 43: Median Differences in Number of Sites Per 1,000 Students in High Non-White Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-0.83	<0.01
2015	-1.00	<0.01
2016	-1.07	<0.01
2017	-1.10	<0.01
2018	-0.90	<0.01
2019	-1.05	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Conversely, there was a significant median increase during the second summer of the waivers compared to the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and the two most recent summers (summers 2018 and 2019) (Table 44).

Table 44: Median Differences in Number of Sites Per 1,000 Students in High Non-White Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-0.05	1.00
2015	-0.28	1.00
2016	-0.20	1.00
2017	-0.34	1.00
2018	-0.26	0.01
2019	-0.31	0.01
2020	0.74	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

4.1.2.5 Results for Number of Sites Per 1,000 Students in High Enrollment Districts.

Districts. The statistical test is the repeated-measures ANOVA.

The mean number of sites per 1,000 students was highest in summer 2015 (M = 1.19, SD = 0.33) and lowest in the first summer of the waivers (summer 2020) (M = 0.43, SD = 0.16) (Table 45).

Table 45: Descriptive Statistics for Number of Sites Per 1,000 Students in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	0.64	1.89	1.12	0.31
2015	0.70	1.93	1.19	0.33
2016	0.74	1.70	1.14	0.29
2017	0.70	1.85	1.15	0.31
2018	0.74	1.68	1.12	0.25
2019	0.72	1.75	1.17	0.29
2020	0.22	0.75	0.43	0.16
2021	0.63	1.40	0.91	0.22

[a]M = mean.
[b]SD = standard deviation.

The mean appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure 19).

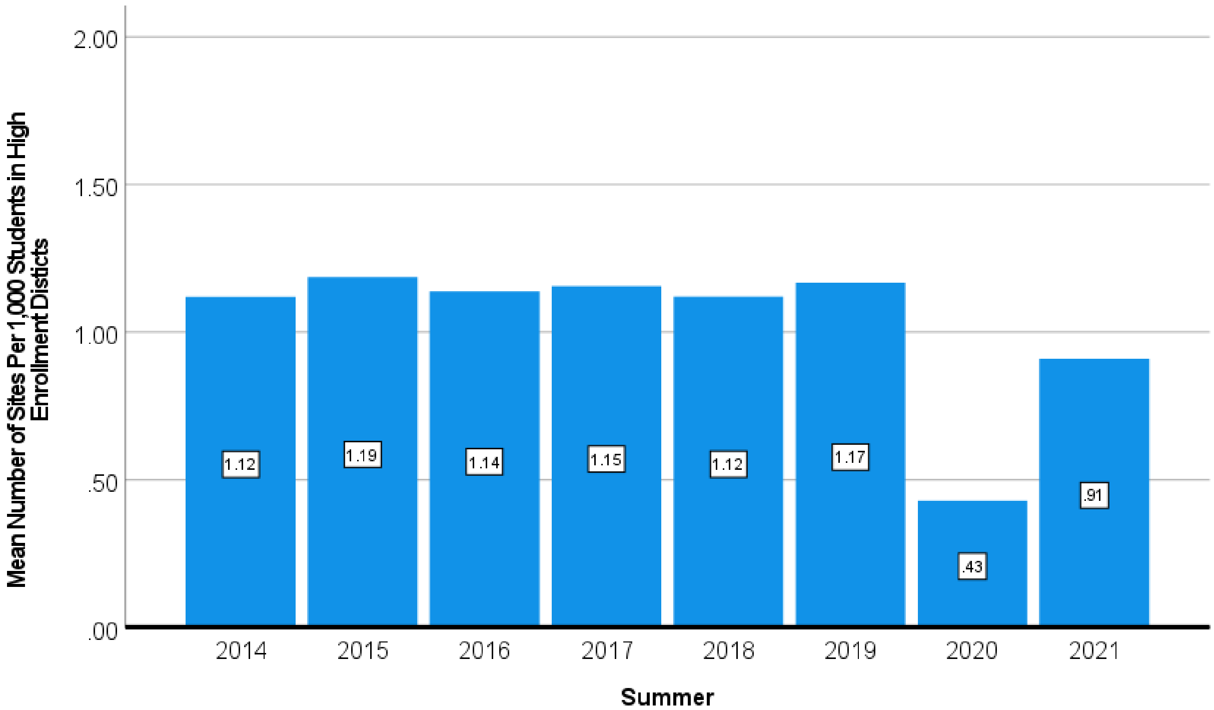

Figure 19: Bar Chart of the Mean Number of Sites Per 1,000 Students in High Enrollment Districts, Summers 2014-2021 (n = 16)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of sites per 1,000 students differed significantly across the summers ($F(2.54, 38.11) = 98.45$, $p < 0.001$, $\eta^2 = 0.87$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer before the waivers (Table 46).

Table 46: Mean Differences in Number of Sites Per 1,000 Students in High Enrollment Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.69	0.05	<0.01	[-0.88, -0.50]
2015	-0.76	0.05	<0.01	[-0.96, -0.56]
2016	-0.71	0.05	<0.01	[-0.89, -0.53]
2017	-0.73	0.05	<0.01	[-0.91, -0.54]
2018	-0.69	0.03	<0.01	[-0.81, -0.57]
2019	-0.74	0.04	<0.01	[-0.90, -0.58]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then increased significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of sites per 1,000 students between the second summer of the waivers and each summer without the waivers (Table 47).

Table 47: Mean Differences in Number of Sites Per 1,000 Students in High Enrollment Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.21	0.05	0.04	[-0.41, -0.01]
2015	-0.28	0.05	<0.01	[-0.48, -0.07]
2016	-0.23	0.04	<0.01	[-0.40, -0.06]
2017	-0.25	0.05	0.01	[-0.44, -0.05]
2018	-0.21	0.04	<0.01	[-0.37, -0.05]
2019	-0.26	0.04	<0.01	[-0.41, -0.11]
2020	0.48	0.04	<0.01	[0.34, 0.62]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.2.6 Results for Number of Open Sites Per 1,000 Students in High Poverty Districts. The statistical tests are the Friedman test and the sign test.

The median number of open sites per 1,000 students in high poverty districts was highest in summer 2015 (Mdn = 0.99, IQR = 0.77-1.22) and lowest in summer 2019 (Mdn = 0.60, IQR = 0.43-0.88) (Table 48).

Table 48: Descriptive Statistics for Number of Open Sites[a] Per 1,000 Students in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[b]	IQR[c]
2014	0.89	0.72-1.15
2015	0.99	0.77-1.22
2016	0.80	0.62-0.94
2017	0.74	0.54-1.07
2018	0.69	0.61-1.06
2019	0.60	0.43-0.88
2020	0.64	0.55-0.84
2021	0.65	0.44-0.92

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn = median.
[c]IQR = interquartile range.

The median was on a decreasing trajectory overall from summer 2015 to summer 2019, but then increased in summers 2020 and 2021 (Figure 20).

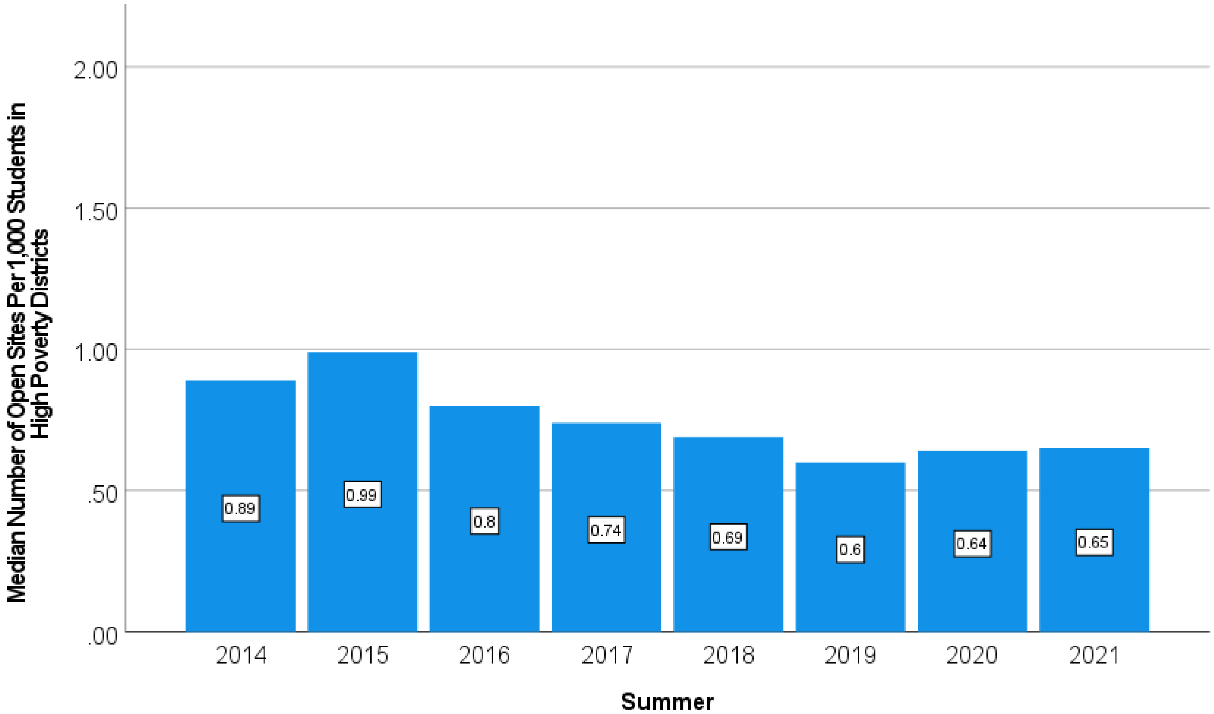

Figure 20: Bar Chart of the Median Number of Open Sites Per 1,000 Students in High Poverty Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of open sites per 1,000 students in high poverty districts differed significantly across the summers ($\chi(7) = 42.94$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to summer 2015 only (Table 49).

Table 49: Median Differences in Number of Open Sites[a] Per 1,000 Students in High Poverty Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-0.27	0.60
2015	-0.35	0.01
2016	-0.12	1.00
2017	-0.10	1.00
2018	-0.10	0.12
2019	0.02	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

There was no significant difference between the second summer of the waivers and the first summer of the waivers. There were also no significant differences between the second summer of the waivers and each summer without the waivers (Table 50).

Table 50: Median Differences in Open Sites[a] Per 1,000 Students in High Poverty Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-0.27	0.60
2015	-0.35	0.12
2016	-0.19	0.12
2017	-0.10	0.60
2018	-0.10	0.60
2019	0.03	1.00
2020	0.01	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

4.1.2.7 Results for Number of Open Sites Per 1,000 Students in High Non-White Districts. The statistical tests are the Friedman test and the sign test.

The median number of open sites per 1,000 students in high non-White districts was highest in summer 2015 (Mdn = 0.99, IQR = 0.77-1.22) and lowest in the summer 2019 (Mdn = 0.60, IQR = 0.50-0.88) (Table 51).

Table 51: Descriptive Statistics for Number of Open Sites[a] Per 1,000 Students in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[b]	IQR[c]
2014	0.89	0.72-1.15
2015	0.99	0.77-1.22
2016	0.80	0.62-0.94
2017	0.74	0.56-1.07
2018	0.69	0.61-1.06
2019	0.60	0.50-0.88
2020	0.64	0.55-0.84
2021	0.65	0.44-0.92

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn = median.
[c]IQR = interquartile range.

The median was on a decreasing trajectory overall from summer 2015 to summer 2019, but then increased in summers 2020 and 2021 (Figure 21).

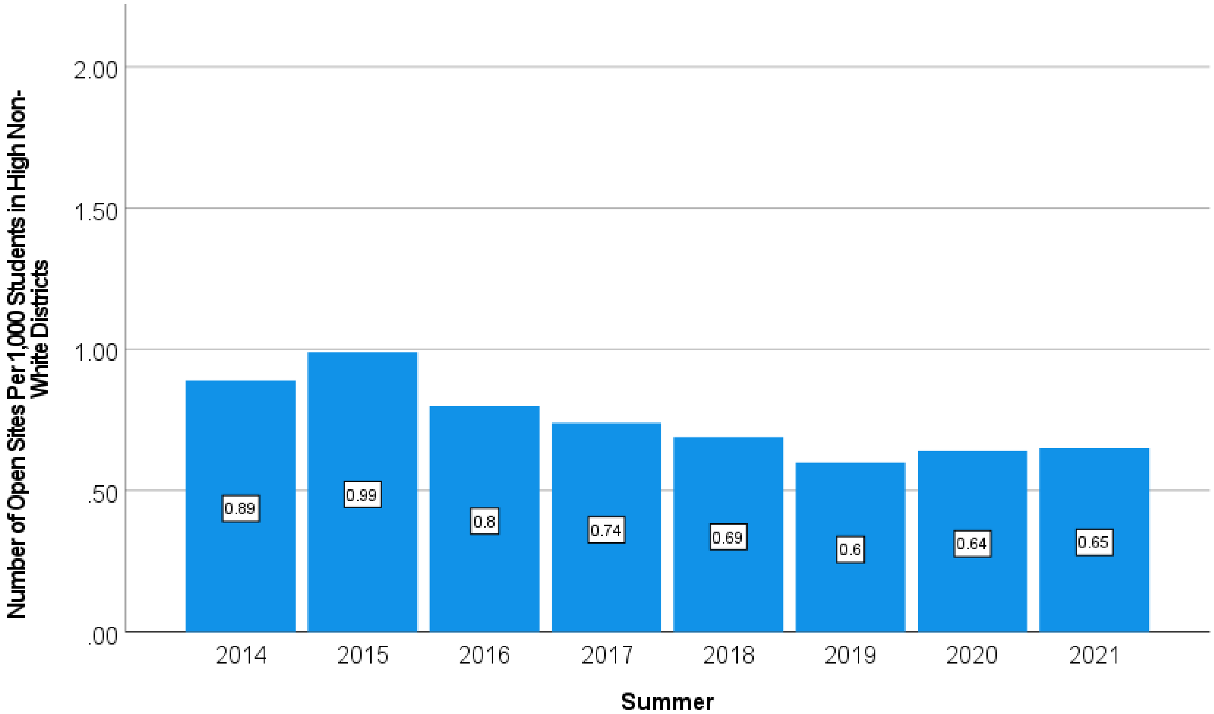

Figure 21: Bar Chart of the Median Number of Open Sites Per 1,000 Students in High Non-White Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of open sites per 1,000 students in high non-White districts differed significantly across the summers ($\chi(7) = 41.42$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to summer 2015 only (Table 52).

Table 52: Median Differences in Number of Open Sites[a] Per 1,000 Students in High Non-White Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-0.27	0.60
2015	-0.35	0.01
2016	-0.12	0.60
2017	-0.15	1.00
2018	-0.11	0.12
2019	-0.03	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

There was no significant difference between the second summer of the waivers and the first summer of the waivers. There were no significant differences between the second summer of the waivers and each summer without the waivers (Table 53).

Table 53: Median Differences in Open Sites[a] Per 1,000 Students in High Non-White Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-0.27	0.60
2015	-0.37	0.12
2016	-0.22	0.12
2017	-0.11	0.60
2018	-0.12	0.60
2019	0.03	1.00
2020	0.01	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

4.1.2.8 Results for Number of Open Sites Per 1,000 Students in High Enrollment Districts. The statistical test is the repeated-measures ANOVA.

The mean number of sites per 1,000 students was highest in summer 2015 (M = 0.65, SD = 0.23) and lowest in the first summer of the waivers (summer 2020) (M = 0.34, SD = 0.16) (Table 54).

Table 54: Descriptive Statistics for Number of Open Sites[a] Per 1,000 Students in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	0.32	1.16	0.61	0.22
2015	0.35	1.21	0.65	0.23
2016	0.35	0.69	0.50	0.12
2017	0.34	0.72	0.49	0.11
2018	0.33	0.70	0.50	0.11
2019	0.20	0.64	0.38	0.14
2020	0.13	0.65	0.34	0.16
2021	0.22	0.58	0.35	0.09

[a]M = mean.
[b]SD = standard deviation.

The mean appears to be on a decreasing trajectory from summer 2014 to summer 2021 (Figure 23).

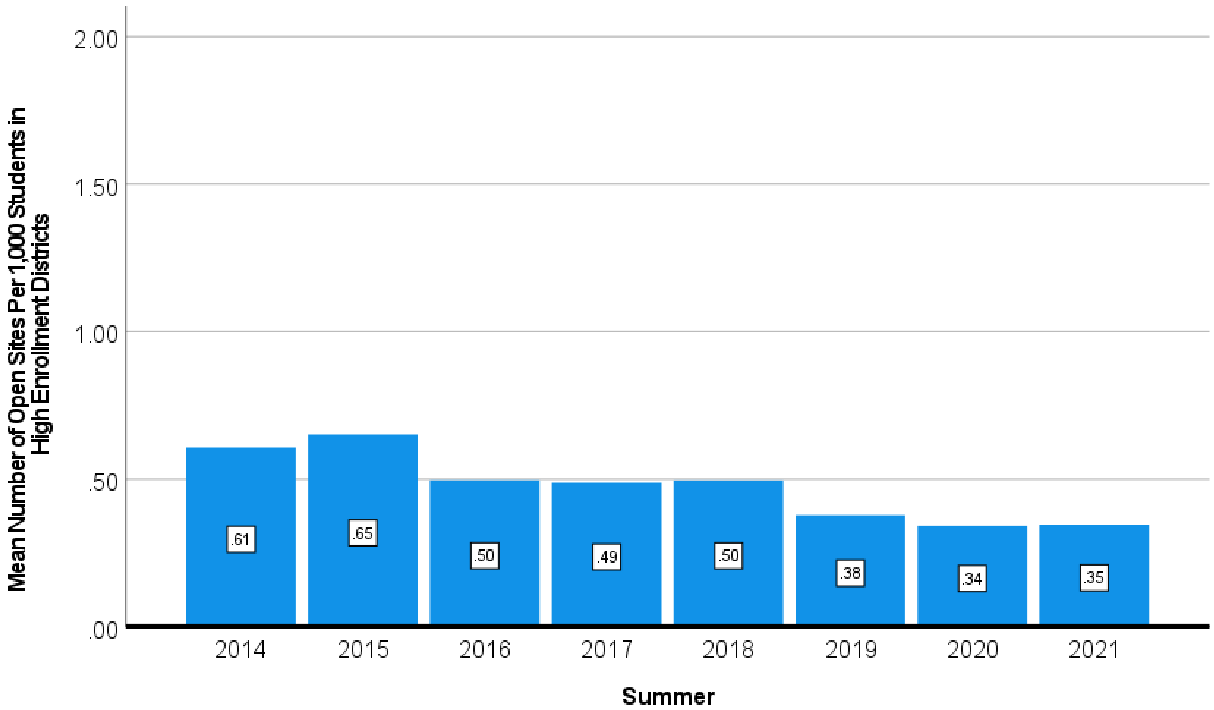

Figure 23: Bar Chart of the Mean Number of Open Sites Per 1,000 Students in High Enrollment Districts, Summers 2014-2021 (n = 16)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of sites per 1,000 students differed significantly across the summers ($F(2.11, 31.63) = 19.67$, $p < 0.001$, $\eta^2 = 0.57$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer before the waivers, except summer 2019 (Table 55).

Table 55: Mean Differences in Number of Open Sites[a] Per 1,000 Students in High Enrollment Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.27	0.03	<0.01	[-0.39, -0.14]
2015	-0.31	0.04	<0.01	[-0.46, -0.16]
2016	-0.16	0.03	0.01	[-0.28, -0.03]
2017	-0.15	0.04	0.04	[-0.29, 0.00]
2018	-0.15	0.04	0.02	[-0.29, -0.02]
2019	-0.04	0.04	1.00	[-0.17, 0.10]

[a]MD = mean difference.
[b]SE = standard error.

However, the mean then increased but not significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of sites per 1,000 students between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table 56).

Table 56: Mean Differences in Number of Open Sites[a] Per 1,000 Students in High Enrollment Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-0.26	0.05	<0.01	[-0.45, -0.07]
2015	-0.31	0.05	<0.01	[-0.50, -0.11]
2016	-0.15	0.03	<0.01	[-0.25, -0.05]
2017	-0.14	0.03	<0.01	[-0.24, -0.04]
2018	-0.15	0.02	<0.01	[-0.24, -0.06]
2019	-0.03	0.02	1.00	[-0.12, 0.05]
2020	0.00	0.03	1.00	[-0.11, 0.12]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

4.1.2.9 Summary of the Results. Figure 24 presents a summary of the descriptives in bar chart format, while Table 57 presents a summary of the significant findings for research question 2, which is “among NYC DOE geographic districts, was there a significant difference in the accessibility of SFSP sites during the summers when the COVID-19-related waivers were used compared to the summers without the waivers?”

Figure 24: Summary of the Descriptives for Research Question 2

Table 57: Summary of the Significant Findings for Research Question 2

Dependent Variable	2020 vs. 2014-2019	2021 vs. 2014-2019	2021 vs. 2020[a]
Sites[b]	Decrease vs. 2014-2019	Decrease vs. 2015-2019	Increase
Open[c]	Decrease vs. 2014-2018	Decrease vs. 2014-2018	No change
Sites-Poverty[d]	Decrease vs. 2014-2019	Decrease vs. 2018-2019	Increase
Sites-Non-White[e]	Decrease vs. 2014-2019	Decrease vs. 2018-2019	Increase
Sites-Enrollment[f]	Decrease vs. 2014-2019	Decrease vs. 2014-2019	Increase
Open-Poverty[g]	Decrease vs. 2015	No change	No change
Open-Non-White[h]	Decrease vs. 2015	No change	No change
Open-Enrollment[i]	Decrease vs. 2014-2018	Decrease vs. 2014-2018	No change

[a]This comparison does not answer research question 2.
[b]Sites = number of sites per 1,000 students.
[c]Open = number of open sites per 1,000 students, which serve all eligible participants, i.e., they are open to all.
[d]Sites-Poverty = number of sites per 1,000 students in high poverty districts.
[e]Sites-Non-White = number of sites per 1,000 students in high non-White districts.
[f]Sites-Enrollment = number of sites per 1,000 students in high enrollment districts.
[g]Open-Poverty = number of open sites per 1,000 students in high poverty districts.
[h]Open-Non-White = number of open sites per 1,000 students in high non-White districts.
[i]Open-Enrollment = number of open sites per 1,000 students in high enrollment districts.

The bar charts in Figure 24 show marked decreases in the number of sites per 1,000 students (blue bars) during the first summer of the waivers (summer 2020) followed by a marked increase in the second summer of the waivers (summer 2021); however, the marked increase does not bring the number of sites per 1,000 students back up to pre-waiver levels (summers 2014-2019). For open sites per 1,000 students (orange bars), the bar charts show a decreasing trajectory from summer 2014 to summer 2021. These patterns do not appear to differ based on poverty, non-White, or enrollment levels. For all sites and open sites, there appears to be less clustering, no large areas without sites, and more open sites relative to non-open sites in summer 2020 compared to the other summers (see maps in Appendix K).

Column 1 of Table 57 compares the first summer of the waivers (summer 2020) to the summers without the waivers (summers 2014-2019). This comparison shows significant decreases in the accessibility of summer meals. For number of sites per 1,000 students, there was a significant decrease during the first summer of the waivers compared to each summer before the waivers. This was true for the total sample (n = 32) and for the subsets of the total sample, i.e., high poverty districts (n = 16), high non-White districts (n = 16), and high enrollment districts (n = 16). Notably, 15 of the 16 districts were high poverty and high non-White. In other words, the same 15 districts were in the subset analyses for high poverty districts and high non-White districts.

For number of open sites per 1,000 students, the total sample analysis and subset analyses differed. For the total sample and high enrollment subset, there was a significant decrease during the first summer of the waivers compared to each summer before the waivers except summer 2019. However, in the alternate analysis, there were significant decreases during the first summer of the waivers compared to summers 2014, 2015, and 2018 only; notably, a less powerful, non-parametric test was used in the alternate analysis due to violation of the assumption of normality (see Appendix J). In the present analysis, for the high poverty and high non-White subsets, there was a significant decrease compared to summer 2015 only. However, in the alternate analysis, there were significant decreases compared to summers 2014 and 2018 in addition to summer 2015 (see Appendix J).

Column 2 of Table 57 compares the second summer of the waivers (summer 2021) to the summers without the waivers (summers 2014-2019). This comparison shows significant decreases in the accessibility of summer meals. For number of sites per 1,000 students, the total sample analysis and subset analyses differed. For the total sample, there was a significant decrease during the first summer of the waivers compared to each summer before the waivers, except summer 2014. In the alternate analysis, there was a significant decrease compared each summer, including summer 2014 (see Appendix J). In the present analysis, for the high enrollment subset, there was a significant decrease compared to each summer before the waivers. In the alternate analysis, there was a significant decrease compared each summer, except summer 2014 (see Appendix J). In the present analysis, for the high poverty and high non-White subsets, there was a significant decrease compared to summers 2018 and 2019, only. In the alternate analysis, there was a significant decrease compared each summer, except summer 2014 (see Appendix J).

For number of open sites per 1,000 students and number of open sites per 1,000 students in high enrollment districts, there was a significant decrease during the first summer of the waivers compared to each summer before the waivers, except summer 2019. However, for number of open sites per 1,000 students in high poverty and high non-White districts, there was no significant difference between the second summer of the waivers and the summers without the waivers. In the alternate analysis, there was a significant decrease compared each summer, except summer 2019 (see Appendix J).

There are three consistent findings across both comparisons: (1) the decrease in the number of open sites per 1,000 students during the summers with the waivers compared to summers 2014-2018, (2) the decrease in the number of sites per 1,000 students in high enrollment districts during the summers with the waivers compared to summers 2014-2019, and (3) the decrease in the number of open sites per 1,000 students in high enrollment districts during the summers with the waivers compared to summers 2014-2018. Also, for the total sample analysis and the subset analyses, the number of sites per 1,000 students increased in the second summer of the waivers (summer 2021) compared to the first summer of the waivers (summer 2020), while the number of open sites per 1,000 students did not change significantly.

4.2 Qualitative Component

This section reports the results of the qualitative component, which consists of one research question: What were the intended relationships between the COVID-19-related waivers and SFSP participation, site accessibility, and implementation according to the policy memos for the waivers? First, the codes are described. Then, the key themes are presented. These themes emerged from combining codes into categories and then combining categories into themes, as recommended by Saldaña in *The Coding Manual for Qualitative Researchers* (Saldaña, 2016). The key themes are the results of the qualitative component, and they answer the research question.

The sample consists of four pairs (one for summer 2020 and one for summer 2021) of the policy memos implemented by the OFNS and relevant to SFSP participation and site accessibility:

- Meal Service Time Flexibility Waiver: COVID-19 Child Nutrition Response #17 and #78.
- Non-Congregate Feeding Waiver: COVID-19 Child Nutrition Response #22 and #75.
- Parent/Guardian Meal Pickup Waiver: COVID-19 Child Nutrition Response #25 and #76.
- Area Eligibility Waiver: COVID-19 Child Nutrition Response #32 and #77.

All the policy memos are from the FNS of the USDA. They are all addressed to Regional and State Directors of Child Nutrition Programs. The stakeholders are as follows: (1) FNS, who administers the child nutrition programs and issued the waivers, (2) Regional Directors, who were required to know which states implemented the waivers, (3) State Directors, who were required to notify their Regional Office that they implemented the waivers and worked with

Program Operators to implement the waivers, (4) Program Operators/Sponsors, who implemented the waivers, and (5) Program Participants, who were the children eligible for participation in the child nutrition programs like the SFSP.

There are six deductive codes, one for each dimension of the NCCHPP framework: (1) Effectiveness, (2) Unintended Effects, (3) Equity Impact, (4) Cost, (5) Feasibility, and (6) Acceptability. The NCCHPP framework can be used to evaluate public health-related policies (Morestin, 2013). Dimensions 1-3 evaluate the effects of a policy, while dimensions 4-6 evaluate the implementation of a policy. Quotes were coded as "Effectiveness" if they showed that the waiver was intended to support participation or site accessibility. Quotes were coded as "Unintended Effects" if they showed an anticipated unintended effect of the waivers. Quotes were coded as "Equity Impact" if they showed that the waiver was intended to improve participation or site accessibility for certain groups, such as groups disproportionately impacted by food insecurity. Quotes were coded as "Cost" if they showed an anticipated increase or decrease in cost to any stakeholder. Quotes were coded as "Feasibility" if they showed the waiver was intended to make implementation of summer meals easier for the State Directors or Program Operators. Quotes were coded as "Acceptability" if they showed that the waiver was requested or adopted by State Directors or Program Operators. Quotes were also coded as "Acceptability" if they showed that FNS intended to assess the acceptability of the waiver to the other stakeholders.

Two inductive codes emerged from the policy memos. These codes were "Safety" and "Pre-COVID-19 Waiver." Quotes were coded as "Safety" if they showed that the waiver was intended to decrease or prevent exposure to COVID-19. Quotes were coded as "Pre-COVID-19 Waiver" if they showed that the waiver existed and/or was adopted by at least some State

Directors prior to the COVID-19 pandemic.

Five themes were identified from the policy memos for the waivers. These themes describe the intended relationship between the waivers and summer meal participation, site accessibility, and implementation. The key themes and quotes are presented in Table 58.

Table 58: Key Themes and Quotes from the Policy Memos (n = 8)

Key Theme	Quotes
1. All four waivers were designed to promote participation in the context of COVID-19.	"…(FNS) is establishing a nationwide waiver to support access to nutritious meals while minimizing potential exposure to the novel coronavirus (COVID-19)." "…FNS recognizes that in this public health emergency, waiving the congregate meal requirements is vital to ensure appropriate safety measures for the purpose of providing meals and meal supplements." "…FNS recognizes that in this public health emergency, continuing to require children to come to the meal site to pick up meals may not be practical and in keeping with the goal of providing meals while also taking appropriate safety measures."
2. The Area Eligibility Waiver was designed to improve site accessibility for 'children in need,' emphasizing children who became in need due to the COVID-19 pandemic.	"State agencies must continue their plan for ensuring that meal sites are targeting benefits to children in need, for example, children who may be eligible for benefits due to the economic impacts of COVID-19." "Area eligibility waivers already in place facilitate the provision of meals to children in need during the challenges faced by Americans as a result of hardships due to COVID–19." "These waivers facilitated the provision of meals to children in need during the challenges faced by Americans as a result of economic hardships due to COVID-19."
3. The Meal Service Time Flexibility Waiver appears to address pre-COVID-19 barriers to participation or implementation of the SFSP.	"FNS accepted requests from individual States to waive these requirements in 2019."
4. The Meal Service Time Flexibility Waiver and Area Eligibility Waiver were designed to make implementation easier in the context of COVID-19.	"…FNS recognizes that, in this public health emergency, continuing the waiver of meal service times in the SFSP would reduce administrative burden on State agencies and sponsors and support streamlined access to nutritious meals." "This extension [area eligibility] eases administrative burdens and provides for greater access to meals this summer."
5. The Parent/Guardian Meal Pickup Waiver may have unintended, undesirable effects and implementation issues, while the Area Eligibility Waiver may increase costs for the FNS.	"…State agencies must have a plan for ensuring that Program operators are able to maintain accountability and program integrity. This includes putting in place processes to ensure that meals are distributed only to parents or guardians of eligible children, and that duplicate meals are not distributed to any child." "… approve waivers [area eligibility] that may increase cost to the Federal Government."

Theme 1 is “All four waivers were designed to promote participation in the context of COVID-19.” The wording of each policy memo suggests that each waiver was intended to promote participation in summer meals by mitigating the effect of the COVID-19 pandemic on participation. For example, when the policy memo stated that the waiver’s purpose was to “support access to nutritious meals” or “[provide] meals,” the statement included qualifiers like “while minimizing exposure to the novel coronavirus (COVID-19)” or “in this public health emergency.” This wording suggests that the waivers were designed to promote safety and, thereby, participation.

Theme 2 is “The Area Eligibility Waiver was designed to improve site accessibility for ‘children in need,’ emphasizing children who became in need due to the COVID-19 pandemic.” Similar to theme 1, the wording of the policy memos for the area eligibility waiver suggests that this waiver was intended to improve site accessibility by allowing open sites in areas that do not qualify based on pre-COVID-19 poverty data. However, these areas may have had an immediate increase in low-income households due to the impact of the COVID-19 pandemic on jobs, and this recent increase would not be reflected in the data used to determine area eligibility. As a result, the Area Eligibility Waiver would allow Program Operators to set up open sites in these areas with recent increases in low-income households and reach the children from these households.

Theme 3 is “The Meal Service Time Flexibility Waiver appears to address pre-COVID-19 barriers to participation or implementation of the SFSP.” Unlike the other waivers, the policy memos for the Meal Service Time Flexibility Waiver indicate that these waivers existed in 2019 for the SFSP upon request from State Directors. The policy memos do not seem to indicate if the 2019 waivers were requested to improve participation or implementation of the SFSP.

Theme 4 is “The Meal Service Time Flexibility Waiver and Area Eligibility Waiver were designed to make implementation easier in the context of COVID-19.” The policy memos for both waivers state that these waivers decrease “administrative burdens.” However, these statements also include qualifiers, suggesting that these waivers are addressing the administrative burdens brought on by the pandemic, such as implementing school meal distribution while adhering to social distancing.

Theme 5 is “The Parent/Guardian Meal Pickup Waiver may have unintended effects and implementation issues, while the Area Eligibility Waiver may increase costs for the FNS.” The policy memos for the Parent/Guardian Meal Pickup Waiver show that the FNS anticipated two unintended effects of this waiver: (1) meals may go to adults claiming to be parents/guardians, and (2) parents/guardians may claim more meals than they have children, leading to “duplication of meals” or service of more than one meal type per child on one date, e.g., more than one breakfast per child for Monday. The policy memos request that State Directors and Program Operators develop plans to prevent these effects. This suggests that the Parent/Guardian Meal Pickup Waiver may lead to implementation issues for State Directors and Program Operators. Among all the waivers, the policy memo for the Area Eligibility Waiver is the only one that mentioned a potential increase in cost to the FNS brought on by implementation of the waiver.

Chapter 5: Discussion

5.1 Overall Findings

The purpose of this study was to examine the relationship between the COVID-19-related waivers and the number of SFSP meals served, accessibility of SFSP sites, and implementation of the SFSP sponsored by the OFNS of the NYC DOE. To achieve this purpose, this study compared two summers with the waivers (summers 2020 and 2021) to six summers prior to the waivers (summers 2014-2019). Overall, this study found a positive relationship between the waivers and the number of breakfast meals served in August but a negative relationship between the waivers and site accessibility when accessibility is operationalized as “availability” or number of sites per 1,000 students. Although the policy memos for the waivers were not worded to indicate that the waivers were addressing pre-pandemic barriers in the SFSP, the policy memos indicate that the Meal Service Time Flexibility Waiver existed before the pandemic, suggesting that waiving the meal service time requirement may address pre-pandemic barriers to either SFSP participation, site accessibility, or implementation. Altogether, the findings in this study suggest that the Meal Service Time Flexibility Waiver with the Non-Congregate Feeding Waiver may improve SFSP breakfast participation during out-of-school times, especially when there is no summer programming. This conclusion is supported by findings in the quantitative and qualitative components. However, more research is needed to establish causality.

5.2 Findings from the Quantitative Component

5.2.1 Number of SFSP Meals Served

Compared to the four most recent summers without the waivers (summers 2016-2019), this study found a significant increase in the number of SFSP meals served per student during the first summer of the waivers but no change in the number served during the second summer of the waivers. In the second summer of the waivers, the number of SFSP meals served per student significantly decreased compared to the first summer of the waivers. These findings suggest a positive relationship between the waivers and the reach of the SFSP during the first summer of the waivers only. However, for the number of breakfast meals served in August per student, there was a significant increase during both summers of the waivers when compared to each of the six summers without the waivers included in this study (summers 2014-2019). This finding suggests a positive relationship between the waivers and the reach of breakfast meals served in August. For the OFNS, breakfast meals have lower reach than lunch meals, and August meals have lower reach than July meals. Altogether, this suggests that the waiver may have been helpful for increasing the reach of the OFNS's lowest reach meal (breakfast) during their lowest reach month (August). Notably, breakfast school meals usually have lower reach and participation compared to lunch school meals (FNS, 2022a), and summer meals usually have lower reach when there is less summer programming or summer activities (Bruce et al., 2019; Chiappone et al., 2018; GAO, 2018; Molaison & Carr, 2006), like in August compared to July for the NYC DOE schools.

Several confounders may partly explain the significant increase in SFSP reach during the first summer of the waivers but not the second summer of the waivers. These confounders include a greater pandemic-related need for food assistance, less P-EBT assistance, and the novelty effect during the first summer of the waivers compared to the second summer of the waivers.

There may have been a greater need for food assistance during summer 2020 compared to summer 2021. "Need" is a latent trait; indicators of need may include unemployment and income but also the “perceived need” engendered by the empty grocery store shelves at the beginning of the pandemic. In summer 2020 vs. summer 2021, it could be argued that “perceived need” was greater, and the NYC unemployment rate was indeed higher (BLS, n.d.). Additionally, a report found that food bank use increased in 2020, then decreased in 2021, though use remained high in 2021 compared to pre-pandemic (Khalil, 2021). Nonetheless, based on this, the 2020 increase in SFSP reach may be partly explained by the 2020 pandemic-related increased need for food assistance.

There may have been less P-EBT assistance during summer 2020 compared to summer 2021. Although distribution of P-EBT benefit was scheduled to begin in June 2020, Community Food Advocates was receiving phone calls from families in July and August 2020 asking for more information about the benefits (A. Molnar, personal communication, February 10, 2023), suggesting that some NYC families did not receive their P-EBT benefits yet during summer 2020. It is possible that by summer 2021, the distribution of P-EBT was better at reaching all families compared to their first distribution in summer 2020. P-EBT assistance has been described as a competitor to school meals because P-EBT benefits offer families more choices about what to eat than school meals (Jowell et al., 2021; Katz et al., 2022; Kenney et al., 2021). School nutrition directors in one study reported decreased school meal participation “in the days following P-EBT distribution” (Katz et al., 2022). However, school meals have the advantage of being nutritionally balanced and do not require cooking equipment access and skills. Although it would be best to have both EBT benefits and summer meals, the presence of P-EBT benefits may have decreased SFSP reach in summer 2021 compared to summer 2020.

There may have been a novelty effect in summer 2020 compared to summer 2021. When the effect of an experiment or intervention occurs due to the newness of the intervention rather than the intervention itself, the effect is said to be a “novelty effect.” It manifests as short-term effects that are not sustained into the long-term. This effect has been reported in reviews of the diet-related school intervention literature (Calvert et al., 2019; Mingay et al., 2022; Racey et al., 2016). In the present study, because there was an increase in SFSP reach in summer 2020 that was not sustained into summer 2021, it is possible that there was a novelty effect in summer 2020. By summer 2021, a lot of time had passed for the novelty factor to wear off, esp. since the OFNS continued to distribute school meals using the waivers during the period between summer 2020 and summer 2021. In this case, the waivers represent an intervention that led to changes in the SFSP that were perceived as new or interesting. This may have led to increased participation to try out something new. After trying out the program, participants may have dropped out because it was no longer new to them or because they had negative experiences with the program. There is some evidence for negative experiences with the OFNS’s pandemic school meals: a qualitative study of NYC DOE parents found that many complained about “low meal variety,” “unappealing” meals, “questionable freshness,” and plastic waste from the meals (Cadenhead et al., 2022). The same study also found that, although OFNS released menus that described an entrée specific to date and daily offerings, parents reported that sites did not have all the offerings, which could be due to factors beyond OFNS’s control, such as supply chain issues. Notably, for the reach of breakfast meals in August in the present study, there does not appear to be a novelty effect as the relationship was sustained across both summers with the waivers. This sustained reach may be due to the ability to pick up breakfast with lunch when there is no summer programming. In other words, when there is no summer programming (like in August for NYC DOE students), bundling breakfast and lunch may increase the reach of breakfast meals.

The peer-reviewed quantitative research shows mixed findings on whether these types of school meal waivers are helpful for increasing the reach of summer meals. However, there are few peer-reviewed quantitative studies on this topic (Harb et al., 2022; Harper et al., 2022; Sather et al., 2021).

To the best of the author's knowledge, there is only one peer-reviewed quantitative study on the number of summer meals served under the COVID-19-related waivers. That study determined the percentage change in the number of school meals served in New York from summer 2019 (pre-waivers) to summer 2020 (the first summer of the waivers). For NYC, the study found a 22% increase in the number of meals served in July 2020 compared to July 2019 and a 146% increase in the number of meals served in August 2020 compared to August 2019 (Harb et al., 2022). The findings from this descriptive study suggest that the waivers may have been especially helpful for increasing the reach of summer meals in August, like the findings from the present analytical study.

There is also a peer-reviewed quantitative study on the number of summer meals served under waivers like the COVID-19-related waivers. That study evaluated the impact of the 2019 recission of six USDA summer meal waivers in Maryland. Among these six waivers, one waiver waived the meal service time requirement, like the Meal Service Time Flexibility Waiver issued during the pandemic. However, the study found no significant association between use of the waivers and the percentage change in the number of meals served from summer 2018 to summer 2019. The study also found no significant association between the sponsor-perceived impact of the waiver recission and percentage change in the number of meals served (Harper et al., 2022). These findings differ from the findings in the present study; however, the present study also has different methods and a different sample and examined a different exposure- the COVID-19-related waivers.

Although not involving waivers, there is an intervention study that evaluated the effects of a grab-and-go, mobile summer meal program in Illinois. That study found an increase in the number of SFSP meals served. It also found a significant effect of the grab-and-go, mobile summer meal program on frequency of SFSP participation (Sather et al., 2021). These findings support the findings from the present study, as the grab-and-go model resembles the grab-and-go meals permitted by the Non-Congregate Feeding Waiver.

In addition to peer-reviewed studies, there are a few reports on the reach of summer meals during the pandemic. Notably, these reports include descriptive statistics only, not inferential statistics like the present study (FRAC, 2023; No Kid Hungry, 2021a).

In 2023, FRAC released its "Hunger Doesn't Take a Vacation: Summer Nutrition Status Report." This report compared the number of school lunches served in July 2020 (the first summer of the waivers) and July 2021 (the second summer of the waivers) to the number served in July 2019 using USDA data. This comparison revealed a "dramatic increase in the number of meals served in July 2020 and July 2021, compared to July 2019" (FRAC, 2023). These findings differ from those in the present study. Comparing July 2020 to July 2019 in the alternate analysis, the present study also found an increase in the number of lunches served, but this increase did not reach statistical significance. Also, the present study found a sharp, significant decrease when comparing July 2021 to July 2019, while the FRAC report found an 89% increase. Comparing July 2021 and July 2020, the FRAC report and the present study found a decrease in the number of lunch meals served in July. According to the report, the decreased participation in 2021 may have been due to “the scaling back of philanthropic funding and the sense that the height of the crisis was over” (FRAC, 2023).

For August, the 2023 FRAC report and the present study had similar findings. Comparing 2020 to 2019 and 2021 to 2019, both the FRAC report and the present study’s alternate analysis found greater increases in the number of lunch meals served in August relative to July. For example, the FRAC report found a 511.2% increase in the number of lunch meals served in August 2020 compared to August 2019 and a smaller, 135% increase in July 2020 compared to July 2019 (FRAC, 2023). Similarly, the present study found a mean increase of 49,645 meals served in August 2020 compared to August 2019 and a smaller mean increase of 11,008 meals served in July 2020 compared to July 2019. Comparing 2021 to 2020, both the FRAC report and the present study found a greater decrease in the number of lunch meals served in August relative to July (FRAC, 2023).

The 2023 FRAC report also compared the average daily participation (ADP) in breakfast in July 2020 and July 2021 to ADP in July 2019. The FRAC report calculated ADP as the total number of breakfast meals served in July divided by the total number of days of service. The comparison revealed a 289.0% increase in breakfast participation in July 2020 compared to July 2019 and a 228.9% increase in July 2021 compared to July 2019. Comparing July 2021 to July 2020, there was -15.4% decrease in breakfast participation (FRAC, 2023). Although the present study did not calculate ADP, the present study’s alternate analysis also found a significant increase when comparing the number of breakfast meals served in July 2020 to the number served in July 2019. Like the FRAC report, the present study found a significant decrease when comparing the number of breakfast meals served in July 2021 to the number served in July 2020.

However, the present study found an insignificant decrease when comparing July 2021 to July 2019, while the FRAC report found a 228.9% increase.

In 2021, No Kid Hungry reported a 160% increase in the number of free and reduced-price meals (FRPM) served in July 2020 compared to July 2019 (No Kid Hungry, 2021a). It is not clear from the report whether this increase is for lunch only or the sum of breakfast and lunch meals. In either case, for the present study, the alternate analysis showed an increase in July 2020 compared to July 2019, but it was not statistically significant.

5.2.2 Accessibility of SFSP Sites

Compared to all summers without the waivers, this study found a significant decrease in the accessibility of SFSP sites during the first and second summers of the waivers. For this finding, accessibility is operationalized as “availability” or “density,” i.e., the number of total sites or open sites per 1,000 students. Open sites are SFSP sites that are open to all eligible participants, requiring no prior enrollment at the site. Compared to each summer without the waivers except summer 2019, there was a significant decrease in the number of open sites per 1,000 students during the first and second summers of the waivers. There were also significant decreases in the number of total sites per 1,000 students during both summers of the waivers compared to summers 2015-2019. Looking at accessibility in high enrollment districts, there were significant decreases during both summers of the waivers compared to summers 2014-2019 for number of total sites per 1,000 students and summers 2014-2018 for number of open sites per 1,000 students. Looking at accessibility in high poverty and high non-White districts, the findings were not consistent across both summers of the waivers, but there were less statistically significant differences detected for these districts. This may be due to no change in access in these districts, but it could also be due to the use of a less powerful statistical test for these districts, which was necessary due to violations of the assumption of normality. Altogether, these findings suggest a negative relationship between the waivers and the accessibility of SFSP sites, especially in high enrollment districts.

The findings in the present study differ from the findings in other studies on the accessibility of summer sites during the COVID-19-related waivers.

To the best of the author's knowledge, there is only one peer-reviewed quantitative study on the accessibility of summer sites under the COVID-19-related waivers. That study compared the accessibility of summer sites in St. Louis, Missouri in summer 2020 (the first summer of the waivers) to the accessibility in summer 2019. In summer 2020 vs. summer 2019, the study found that (1) the mean number of sites per census tract increased, (2) the mean number of sites per school district increased, (3) the mean distance (in miles) from school to site decreased, and (4) the mean gravity-based site accessibility per census block group increased by four times. Notably, this study did not use inferential statistics for these results. It also measured accessibility as availability (mean number of sites per census tract and mean number of sites per school district), proximity (mean distance from school to site), and the combination of availability and proximity (gravity-based site accessibility per census block group) (Jabbari et al., 2021). The present study only measured accessibility as availability of sites per 1,000 students and found that availability significantly decreased in summer 2020 compared to summer 2019.

To the best of the author's knowledge, there is only one report on the accessibility of SFSP sites during the pandemic. That report was the aforementioned 2023 FRAC report "Hunger Doesn't Take a Vacation: Summer Nutrition Status Report." This report compared the number of SFSP sites in July 2020 (the first summer of the waivers) and July 2021 (the second summer of the waivers) to the number in July 2019, describing this comparison as an "important indicator of access to the program for low-income children." This comparison revealed a 21.5% decrease in the number of SFSP sites in July 2020 compared to July 2019 and 0.9% increase in July 2021 compared to July 2019. Comparing July 2021 to July 2020, there was an increase in the number of SFSP sites. The present study's alternate analysis also found a significant decrease in the number of SFSP sites when comparing summer 2020 to summer 2019 and a significant increase when comparing summer 2021 to summer 2020, where "summer" includes July and August. However, the present study did not find an increase when comparing summer 2021 to summer 2019, like the FRAC report. Instead, the present study found a significant decrease.

5.3 Findings from the Qualitative Component

The waivers examined in this component were the Area Eligibility Waiver, the Meal Service Time Flexibility Waiver, the Non-Congregate Feeding Waiver, and the Parent/Guardian Meal Pickup Waiver. The policy memos suggest that most of these waivers were designed to address only pandemic-related barriers to summer meal participation, site accessibility, and implementation, limiting their effectiveness to school closures in similar emergencies vs. school closures in a regular summer. However, the policy memos show that there is one waiver that existed pre-pandemic, suggesting that it addresses pre-pandemic barriers in the summer meal programs: the Meal Service Time Flexibility Waiver. The policy memos also show that there is one waiver that has implementation issues and unintended, undesirable effects: the Parent/Guardian Meal Pickup Waiver.

To provide more context about the waivers, this section will include key takeaways from a semi-structured interview with one key informant on the waivers in NYC. At the beginning of the present study, there was a plan to conduct semi-structured interviews with several key informants on the waivers in NYC; however, after contacting several potential participants, only one consented to participate in the study. Appendix L contains details regarding recruitment and a table of key takeaways and quotes from the one key informant.

SFSP breakfast participation may benefit from the continuation of the Meal Service Time Flexibility Waiver along with the Non-Congregate Feeding Waiver. Prior to the pandemic, a peer-reviewed study found that morning meal pickup hours were a barrier to SFSP breakfast participation according to parents (Chiappone et al., 2018). Waiving the meal service time requirement and allowing meals to be consumed off-site allows parents/guardians to pick up breakfast meals later in the day for their children to consume the next morning. This next-morning-consumption benefit was reported by the key informant. However, the key informant reported that this waiver may not be necessary if the distance between residences and sites is small, as in NYC. In the policy memos, only the Meal Service Time Flexibility Waiver was presented as existing before the pandemic upon request from state directors, suggesting that it addresses pre-pandemic barriers, though it is not clear from the memos if these barriers are related to SFSP participation or implementation.

SFSP site accessibility may benefit from the continuation of the Area Eligibility Waiver. Prior to the pandemic, FRAC recommended expanding area eligibility to include areas where at least 40% of children qualify for FRPL (FRAC, 2019a); currently, the area eligibility requirement requires that school meal sites are placed in areas where at least 50% of children qualify for FRPL (FNS, 2013b). Also, prior to the pandemic, a peer-reviewed study noted that sponsors for areas with large income disparities may struggle to meet the area eligibility requirement, preventing sponsors from opening sites in areas where there is a need (Bruce et al., 2019). The key informant emphasized the importance of waiving the area eligibility requirement in CEP districts, where free meals are offered to all students during the school year. The Area

Eligibility Waiver would allow CEP districts to "continuously service the same population," according to the key informant.

SFSP implementation may benefit from the continuation of the Meal Service Time Flexibility Waiver, the Area Eligibility Waiver, and the Non-Congregate Feeding Waiver. The policy memos explained that the Meal Service Time Flexibility Waiver and the Area Eligibility Waiver decrease "administrative burdens," though it is not clear if these are burdens due to the pandemic only or include burdens that existed prior to the pandemic. According to the key informant, the Meal Service Time Flexibility Waiver made implementation easier since there was no need to monitor the time to separate the meals; the Area Eligibility Waiver made implementation easier since there was no need to go through the process or "exercises" of identifying eligible areas; and the Non-Congregate Feeding Waiver made implementation easier since there was no need to "rope off a specific area" for congregate feeding.

The Parent/Guardian Meal Pickup Waiver has implementation issues and unintended, undesirable effects. These effects include the following: (1) meals may have gone to adults claiming to be parents/guardians, and (2) parents/guardians may have claimed more meals than they have children, leading to "duplication of meals" or service of more than one meal type per child on one date, e.g., more than one breakfast per child for Monday. These effects were reported by the policy memos and the key informant. The memos asked state directors and sponsors to develop plans to prevent these effects. This made implementation of summer meals more difficult, according to the key informant.

A key takeaway from the key informant interview is that there were several potential confounders in the relationship between the waivers and SFSP participation. These confounders include community feeding, the pandemic, and the OFNS's operational decisions.

Community feeding is a potential confounder. It refers to the OFNS's participation in NYC's emergency feeding operation. In this operation, OFNS served meals to adults at the same sites where SFSP meals were served. These meals were counted separately from SFSP meals, but community feeding may have increased the number of SFSP meals served and SFSP participation because parents may have been encouraged to go to the site since they could obtain meals for both themselves and their children. Notably, a pre-pandemic study found that providing free meals to parents was a motivator for SFSP participation (Chiappone et al., 2018). Also, a case study on pandemic school meals reported that serving meals to adults was a strategy used by states or school districts to overcome barriers to accessing school meals (Kinsey et al., 2020). Overall, community feeding is a confounder that may have increased the reach of SFSP meals independent of the waivers.

In addition to community feeding, the pandemic is a notable confounder. The pandemic may have increased SFSP participation due to a pandemic-related increased need for food assistance (Coleman-Jensen et al., 2021). Also, the pandemic may have influenced SFSP participation due to a pandemic-related fear of contracting COVID-19 at school meal sites or grocery stores. On the one hand, the pandemic may have decreased SFSP participation due to a fear of contracting COVID-19 at school meal sites. On the other hand, the pandemic may have increased SFSP participation due to a fear of contracting COVID-19 at grocery stores, leading to a preference to access food from school meal sites. Additionally, the influence of the pandemic likely differed based on the summer. On the one hand, there may have been less fear in summer 2020 compared to summer 2021. In summer 2020, NYC began re-opening, and June 14, 2020 was the first day since the start of the pandemic with no COVID-19-related deaths in NYC. Conversely, in June 2021, the director of the Centers for Disease Control and Prevention reported the delta variant as a “variant of concern,” and COVID-19 cases doubled in NYC in July 2021 (Christensen, 2021; Syam et al., 2022). On the other hand, there may have been less fear in summer 2021 because it was the second summer of the pandemic and universal eligibility for the COVID-19 vaccine began in spring 2021 (Governor Cuomo Press Office, 2021). Overall, the pandemic is a confounder that may have increased and/or decreased the reach of SFSP meals independent of the waivers.

In addition to community feeding and the pandemic, operational decisions may have been a confounder. For example, grab-and-go meals served in NYC were primarily cold meals, and this may decrease participation compared to service of hot meals. It may also decrease menu variety and overall menu appeal. Several studies have reported limited hot menu items, limited menu variety, and low menu appeal for school meals served during the pandemic (Cadenhead et al., 2022; Chrisman & Alnaim, 2021; Jowell et al., 2021; Katz et al., 2022). One of these studies stated “efforts to make meals more accessible were not enough to overcome factors such as meal appeal, ultimately reducing participation in many districts” (Jowell et al., 2021). Another one of these studies found that “low meal variety” was a barrier to participation according to parents of NYC DOE students. This study also found that “[p]arents who had access to hot meals said their children liked them most,” and parents criticized the “freshness” of the meals (Cadenhead et al., 2022). Pre-pandemic research suggests that hot meals, menu variety, and meal quality may improve participation in the SFSP (Chiappone et al., 2018; Harper et al., 2022; Molaison & Carr, 2006; Sather et al., 2021). Overall, menu decisions are a confounder that may have decreased the reach of SFSP meals independent of the waivers.

Other qualitative research reveals more potential confounders between the waivers and school meal participation and accessibility throughout the pandemic. These confounders include staffing and supply chain issues, P-EBT assistance, and attention to school meals.

Staffing issues may have been a confounder in this study, but it is unclear if the supply chain was an issue for the OFNS. According to the key informant in the present study, the OFNS did not apply for any nutrition-related USDA school meal waivers during the pandemic because the OFNS "felt they had plenty of supply or alternate products" to meet the nutritional requirements like the whole grain requirement. However, according to another study, parents of NYC DOE students were told by school food service workers that there were supply chain issues (Cadenhead et al., 2022). In addition to the supply chain, staffing may have been an issue for the OFNS. According to news articles, school food service workers in NYC were concerned about contracting COVID-19, esp. early in the pandemic, with some workers choosing not to report to work (Chang, 2020; Elsen-Rooney, 2020). This may have decreased the number of sites and the reach of school meals during the pandemic, especially during 2020. Other studies reported staffing issues for school meals during the pandemic (Chrisman & Alnaim, 2021; Katz et al., 2022), while pre-pandemic studies reported staffing issues and an association between staff continuity and school meal reach for the SFSP specifically (Chiappone et al., 2018; Litt et al., 2020; Molaison & Carr, 2006).

P-EBT assistance may have been a confounder in this study. As described earlier, P-EBT benefits have the advantage of allowing families more options for what to feed their children compared to school meals, and this advantage may decrease the reach of SFSP meals (Jowell et al., 2021; Katz et al., 2022; Kenney et al., 2021). As a result, P-EBT assistance may have been a confounder that decreased the reach of summer meals, independent of the waivers.

Attention to school meals may have been a confounder in the present study. A qualitative study found that attention to school meals and appreciation for school meal programs increased during the pandemic according to school nutrition directors in North Carolina (Katz et al., 2022). A quantitative study found a significant increase in tweets on school meal programs by Ohio school districts during the pandemic and significant increases in likes and retweets on school breakfast and school lunch (Whitesell & Fitch, 2022). Also, school food service workers became known as essential workers during the pandemic (Chang, 2020). Altogether, the increased attention and appreciation for school meals and school food service workers may have been a confounder that increased the reach of school meals, including summer meals, independent of the waivers.

There is a paucity of qualitative research on the waivers and summer meals. To the best of the author's knowledge, there are only two other studies on this topic, one on summer 2020 (Lu et al., 2022) and the other on summer 2021 (Bennett et al., 2022). None examined the policy memos for the waivers.

For summer 2020, researchers interviewed a food service director and vendor (n = 2) for one sponsor and a food service director (n = 1) for another sponsor to "explore and compare the factors that enabled [these] SFSP sponsors in Maryland to dramatically increase meals distribution during the pandemic." They increased their distribution by greater than 3,000% from summer 2019 to summer 2020. One of the sponsors was an "urban, faith-based sponsor"; this sponsor cited the Non-Congregate Feeding Waiver, the Meal Service Time Flexibility Waiver, and the Parent/Guardian Meal Pickup Waiver as helpful for SFSP reach. The other sponsor was a "rural, public school sponsor"; this sponsor cited the Non-Congregate Feeding Waiver, the Meal Service Time Flexibility Waiver, and the Area Eligibility Waiver as helpful for SFSP reach.

Notably, both sponsors agreed that the Meal Service Time Flexibility Waiver was helpful, and the present study found that the policy memos suggest that this waiver addresses pre-pandemic barriers. Additionally, both sponsors attributed their increased reach to their communication strategies for school meals (Lu et al., 2022), another potential confounder.

For summer 2021, researchers interviewed food service directors (n = 16) in Connecticut to "identify practices designed to increase program participation during the summer of 2021," the second summer of the waivers. The food service directors reported increased participation due to practices allowed by the waivers, and some food service directors in higher-income areas reporting being "surprised by the need in their communities." The practices included grab-and-go meals, weekend packages of meals, holiday packages of meals, extended meal pickup times, parent/guardian meal pickup without bringing children to sites, placement of open sites near bus lines, and placement of sites in higher-income areas. However, while not described as "confounders" like in the present study, the researchers also found other non-waiver-related factors that may have influenced participation: other services or activities at summer meal sites such as homework help, promotion of summer meals including through social media and events like barbeques, SNAP benefits, staffing issues including burnout in summer 2021 and the requirement for overtime pay when meal times are extended to after-work hours for parents, fears of contracting COVID-19 through summer meals or summer meal sites, limited menu variety, availability of hot meals, meal appeal, and stigma. Based on the results of this study, summer meal participation may benefit from the continuation of all the waivers in the present study, including the Parent/Guardian Meal Pickup Waiver (Bennett et al., 2022).

5.4 Convergence of Quantitative and Qualitative Findings

In the present study, the quantitative and qualitative findings appear to agree on the relationship between the COVID-19-related waivers and the reach of SFSP breakfast meals. The quantitative findings show a significant increase in the number of breakfast meals served in August per student during both the first and second summer of the waivers compared to each of the six summers prior to the waivers (summers 2014-2019); based on this, the Meal Service Time Flexibility Waiver and Non-Congregate Feeding Waiver may have been helpful for promoting summer breakfast meals during August, which has less summer programming. When students are not in the building for summer programs, waiving the meal service time requirement and allowing meals to be consumed off-site allows parents/guardians to pick up breakfast meals later in the day for their children to consume the next morning. The qualitative findings show that the Meal Service Time Flexibility Waiver existed prior to the pandemic, suggesting that it addresses pre-pandemic barriers to either SFSP participation, site accessibility, or implementation.

However, the quantitative and qualitative findings disagree on the relationship between the COVID-19-related waivers and the accessibility of SFSP sites. The quantitative findings show a significant decrease in the accessibility of SFSP sites during both the first and second summer of the waivers compared to summers prior to the waivers. However, policy memos for the Area Eligibility Waiver show an intended effect of increased accessibility. The reason for this difference may be the operationalization of “accessibility” in the quantitative component as the number of sites per NYC DOE geographic district. In the qualitative component, the policy memos described increased accessibility as the placement of sites in non-area eligible communities. Area eligible communities are smaller units of analysis (attendance areas of school, census block groups, or census tracts) (FNS, 2021a) compared to NYC DOE geographic districts. As a result, the quantitative component would not be able to capture the increased accessibility as intended by the Area Eligibility Waiver. Notably, the key informant also perceived increased accessibility due to the ability to place sites in non-area eligible communities.

The qualitative findings suggest that there is a benefit to keeping some of the waivers regardless of the quantitative findings or the waivers' potential effects on SFSP participation and site accessibility. This benefit is the easing of SFSP implementation for SFSP operators and sponsors. According to the policy memos, the Meal Service Time Flexibility Waiver and the Area Eligibility were designed to decrease "administrative burdens," though it is not clear if these are burdens due to the pandemic only or include burdens that existed prior to the pandemic. According to the key informant, three waivers made SFSP implementation easier: the Non-Congregate Feeding Waiver, the Area Eligibility Waiver, and the Meal Service Time Flexibility Waiver.

Although the present study was not designed to investigate the relationship between the number of SFSP sites and SFSP reach, its quantitative findings taken together challenge a popular conception about the relationship between the availability of SFSP sites and the reach of SFSP meals. Previous qualitative studies show that there is a perception that more SFSP sites will lead to greater SFSP reach and participation (Chrisman & Alnaim, 2021; Jowell et al., 2021; Molaison & Carr, 2006). In other words, there is a positive relationship between SFSP sites and SFSP reach/participation. However, in the present study, the reach of the SFSP was highest when the number of sites was lowest, which was in summer 2020. This suggests a potential negative relationship between SFSP sites and SFSP reach. Also, the mapping of sites showed less clustering in summer 2020 and no large areas without sites, suggesting selective or efficient placement of sites to promote reach. Although less clustering of sites meant that families may have had to travel a bit further to access a SFSP site, there may have been too many redundant sites in the summers prior to the pandemic. The present study is not the first convergent parallel mixed methods study to report a potential negative relationship. A 2018 study on the SFSP found a negative association between adding an SFSP site and SFSP participation, although SFSP sponsors reported additional sites as a facilitator to SFSP participation (Chiappone et al., 2018).

5.5 Study Strengths

This study has several strengths. First, this study has a convergent parallel mixed methods design, which allowed for a more comprehensive study of the waivers and gave equal importance to the quantitative and qualitative findings. Second, the quantitative component used reimbursement data, which contains no missing data and must be as accurate as possible for legal purposes. Third, the reimbursement data are administrative data; as a result, the quantitative component includes data on all individuals who participated at each site for all sites whereas researcher-collected data or survey data would require sampling of participants/sites, which would incur selection bias. Fourth, the quantitative component includes data across several years: six years pre-waivers and two years during the waivers. Fifth, the quantitative component could detect a potential novelty effect because it included two years of data during the waivers. Sixth, the data in the quantitative component allowed analysis of several secondary outcomes. Seventh, the findings on SFSP reach were controlled for total enrollment, which is strongly correlated with several potential confounders. Eighth, the quantitative component included inferential statistics and established statistical conclusion validity. Ninth, the qualitative component used a framework recommended for public health-related policies, like the USDA waivers, for both the document analysis. Finally, the study is a natural experiment, which increases the external validity of the findings.

5.6 Study Limitations

This study has several limitations. First, this study may have benefited from a sequential explanatory mixed methods design in which the qualitative component is used to explain the quantitative findings. A sequential explanatory mixed methods design may have been more useful in this context to help understand the role of the contextual factors or confounders in the quantitative findings. Second, the quantitative component had quasi-independent variables and a non-experimental/natural experiment design, i.e., no randomization, no control group, many confounders; this decreases the internal validity of the findings and prevents the study from reaching a conclusion on the causal relationship between the waivers and SFSP reach and site accessibility. Future studies should consider a controlled trial design. Third, reimbursement data may have reliability issues; its quality is difficult to assess because it was not collected by the researchers; and misinterpretation of the data cannot be ruled out though efforts were made to obtain the definitions of the variables in the administrative data. Future studies should consider using primary data. Fourth, the quantitative component includes only two years of data during the waivers vs. six years of data pre-waivers. This prevented an interrupted time-series analysis, a quasi-experimental design, which is stronger than the non-experimental design used in the present study. Fifth, the quantitative component aggregated data to the NYC DOE geographic district level, which are larger units of analysis compared to area-eligible and area-ineligible communities; this prevented hypothesis generation on the impact of the Area Eligibility Waiver on site placement in these communities. Also, the large unit of analysis resulted in decreased specificity when defining high poverty and high non-White areas. For example, a district may not be "high poverty" on average, but it may have areas within it that are high poverty. Sixth, the analysis of high poverty and high non-White districts in the quantitative component necessitated the use of non-parametric statistical tests, which are less powerful than parametric tests. This may explain why there were few statistically significant differences in SFSP accessibility in these districts when comparing the summers with the waivers to the summers without the waivers. Seventh, the quantitative component used reach data vs. participation data, and it is unclear how reach relates to participation in the SFSP. Also, the use of reach data resulted in an ecological study design, preventing any hypothesis generation about the impact of the waivers on individuals or participation in the program. Eighth, the quantitative component operationalized accessibility using availability only, while there are other measures of food access, such as proximity (Bivoltsis et al., 2018). This decreased the construct validity of "accessibility." Ninth, the quantitative component used administrative areas (NYC DOE geographic districts) but did not account for boundary effects or edge effects (Lucan, 2015), i.e., the ability of an enrolled student to access sites across the boundary or edge between two districts. This could alter the denominators used to calculate the number of meals served per enrolled student and number of sites per 1,000 enrolled students. Tenth, the qualitative component only included a document analysis. A stronger qualitative design would be a qualitative case study, which analyzes data from various sources, usually including interviews. Eleventh, the qualitative component included only one coder. Furthermore, the coder was biased by the quantitative findings in another study to believe that the waivers may be beneficial for SFSP participation. Finally, the study is on one sponsor of the SFSP and the set of waivers they used, which limits the generalizability of the findings. Specifically, the findings may not be generalizable to sponsors that are not SFAs; sponsors that serve non-CEP districts, non-public schools, non-urban school districts, and school districts with less poverty and non-White students; summers other than summers 2014-2021; and combinations of waivers that differ from those adopted by the OFNS.

5.7 Future Research Needs

There is a need for a pilot study or long-term, controlled study on the waivers on SFSP participation and site accessibility. Findings from the present study suggest that the waivers may be an intervention that can increase the reach of the SFSP, a program that has the potential to reduce summer hunger, summer weight gain, and summer learning loss, which disproportionately impact Black children, Hispanic children, and children from low-income households in the US. The findings in this study provide support for investment in a pilot study or a more controlled study of the waivers, esp. since the present study contained many confounding variables. A notable confounder was the COVID-19 pandemic; as a result, the pilot study or long-term, controlled study should be conducted after the pandemic. A qualitative study on summer meals also suggested studying the waivers post-pandemic due to confounding by the pandemic (Bennett et al., 2022). Additionally, future research should consider smaller geographic units of analysis, such area-eligible and area-ineligible communities, to assess the impacts of the Area Eligibility Waiver.

Alternatively, an interrupted time series (ITS) analysis may be used to evaluate the effect of the waivers on SFSP reach and site accessibility. ITS analysis is a quasi-experimental design recommended for the evaluation of population-level interventions (Bernal et al., 2017), like the COVID-19-related waivers. However, this design requires continuation of the waivers for several years. According to one paper, an ITS analysis requires at least eight observations both before and after a population-level intervention to have enough power to detect any differences, and the observations are usually periods longer than one month (Penfold & Zhang, 2013). So, an

ITS analysis of the waivers may require continuation of the waivers for at least eight summers to have enough observations after waiver introduction.

There is a need for a larger qualitative study on the waivers and the SFSP. The present study only included a document analysis of the policy memos for the waivers implemented by the OFNS. However, there is a need for a qualitative case study that combines the document analysis with semi-structured interviews with the various stakeholders in summer meals, including the FNS, regional directors, state directors, SFSP sponsors, SFSP operators (i.e., school food service managers and workers), parents/guardians, and children or the participants. While there are several studies on sponsor, operator, vendor, teacher, and parent perspectives of pandemic school meals (Adams et al., 2022; Beckstead et al., 2022; Bennett et al., 2022; Chrisman & Alnaim, 2021; Jowell et al., 2021; Katz et al., 2022; Kenney et al., 2021; Lu et al., 2022; Patten et al., 2021), there are no studies focused on parent/guardian and participant perspectives of pandemic school meals during the summer. There would be considerable recall bias if these studies were conducted now that the waivers are no longer available, necessitating study subjects to recall their experiences with the waivers years ago. As a result, the waivers need to be reintroduced in a pilot study or randomized controlled trial with a qualitative component to study stakeholder perspectives of the waivers.

5.8 Policy Implications and Recommendations

The waivers are policy changes to the way the SFSP or summer meals operate. According to this natural experiment, these policy changes may increase the reach of breakfast meals in the SFSP, which has historically low participation despite its potential to address summer hunger, summer weight gain, and summer learning loss. Although the present study could not establish a causal relationship between the waivers and SFSP breakfast meal reach, the author recommends that policymakers consider making the Meal Service Time Flexibility Waiver and the Non-Congregate Feeding Waiver permanent flexibilities for the SFSP or consider a pilot study to test the effects of these two waivers. The author recommends testing the effects on SFSP programs that are not coupled with summer programming because the hypothesis generated by the present study is that the waivers may be helpful when there is no summer programming as the present study found increased SFSP breakfast meal reach during August only, which characterized by less summer programming for the sample in this study. Furthermore, the Meal Service Time Flexibility Waiver existed prior to the pandemic upon request from state directors, suggesting that there is a need for this flexibility regardless of the pandemic.

This study adds to a small but growing body of literature that suggests that the waivers should become permanent options for SFSP sponsors. Bennett et al. (2022) stated "[Our] findings underscore how the USDA waivers increased food service directors' ability to flexibly and creatively solve problems related to summer meal delivery" (Bennett et al., 2022). Similarly, Jabbari et al. (2021) stated "…our findings suggest that extending several of the newly implemented policies, such as the SFSP/SSO Area Eligibility Waiver, the Meal Time Waiver, the Non-congregate Feeding Waiver, and the Nationwide Parent/Guardian Meal Pickup Waiver beyond COVID-19 could increase meal access and alleviate child food insecurity during weekends, holidays, and other academic breaks" (Jabbari et al., 2021). Lu et al. (2022) concluded "…permanently integrating more flexibility into regulation of the SFSP may increase meals participation during future out-of-school times" (Lu et al., 2022). Also, Kinsey et al. (2020) commented that "Extending program flexibility beyond the pandemic, especially in regard to the congregate meal requirement, would enable schools and other organizations to better reach children in rural and underserved communities and to operate more effectively during out-of-school times" (Kinsey et al., 2020).

Policymakers should also consider making the Area Eligibility Waiver a permanent flexibility for the SFSP. Although this study did not show improvements to site accessibility after the introduction of the Area Eligibility Waiver due to limitations in the study design, the Area Eligibility Waiver is perhaps the only COVID-19-related waiver that addresses an oft-cited barrier to participation in summer meals: stigma (Bruce et al., 2019; GAO, 2018; Litt et al., 2020). The Area Eligibility Waiver waives the requirement that school meal sites are placed in areas where at least half of the children qualify for FRPL, a requirement that makes the SFSP as a "poverty program," which leads to stigmatization of SFSP participation. Children and their families should not be made to feel ashamed to access food, a universal human right (UN, n.d.). Furthermore, school meals can be combined with food and nutrition education to increase the effectiveness of food and nutrition education (Contento & Koch, 2020; Harrington et al., 2020; Schaub & Marian, 2011), a benefit for all children regardless of income, esp. in the US, where obesity levels are still high among those with higher incomes (Ogden et al., 2017). As a result, policymakers should consider changing the perception of school meals and summer meals from "poverty programs" to "educational programs." The Area Eligibility Waiver could help contribute to this change when coupled with nutrition education interventions.

5.9 Conclusion

In conclusion, among NYC DOE geographic districts, the COVID-19-related school meal waivers may increase the reach of breakfast meals served in August while decreasing the number of SFSP sites and making SFSP implementation easier. Although more research is needed to establish causal relationships between the waivers and SFSP reach, site accessibility, and implementation, the present study provides support for investing in this research. Specifically, there is a need for a pilot study or more controlled study to establish causal relationships. There is also a need for testing other strategies in addition to the waivers as the present study demonstrated only a small increase in the number of SFSP meals served per student for one meal type (breakfast meals) in one summer month (August). Nonetheless, this study found a change in the positive direction for a program with historically low reach compared to the NSLP, adding to a small but growing body of literature supporting continuation of the waivers. Based on the findings in the present study, policymakers should consider making the Meal Service Time Flexibility Waiver and Non-Congregate Feeding Waiver permanent for summer meal programs. These flexibilities remove the meal service time requirement and congregate feeding requirement. These requirements are pre-pandemic barriers to participation in the SFSP, a program that has the potential to prevent summer hunger, summer weight gain, and summer learning loss, which disproportionately impact Black children, Hispanic children, and children from low-income households in the US.

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Appendix A: Totals by NYC DOE Geographic District

Table A1: Total Sites by NYC DOE Geographic District, Summers 2014-2021

District	2014	2015	2016	2017	2018	2019	2020	2021
1	25	27	24	26	28	21	8	18
2	78	77	81	75	73	71	23	57
3	29	31	29	25	32	28	12	22
4	24	29	27	28	33	30	12	23
5	26	36	26	31	33	36	11	24
6	27	29	32	30	34	32	14	28
7	29	36	32	37	38	38	12	28
8	42	49	46	46	42	49	16	36
9	43	49	46	44	50	49	22	38
10	54	55	54	58	58	65	21	51
11	70	73	65	70	68	66	29	42
12	34	37	36	36	35	33	20	27
13	35	39	36	39	36	31	13	28
14	32	37	33	35	34	34	16	30
15	36	34	36	35	37	38	15	36
16	22	22	22	23	23	20	10	18
17	29	36	36	34	35	35	19	38
18	28	28	33	36	29	32	14	22
19	37	42	45	41	40	37	15	29
20	36	38	37	39	41	39	12	33
21	28	34	30	32	35	37	11	29
22	32	36	30	35	38	35	17	25
23	25	27	29	29	29	31	13	18
24	36	40	45	41	45	45	15	40
25	34	34	32	35	36	38	13	26
26	30	34	34	33	32	33	7	25
27	44	48	48	47	50	51	22	39
28	44	48	43	45	46	47	13	27
29	32	35	33	41	39	43	13	25
30	45	47	52	54	56	54	20	33
31	82	86	82	83	72	86	36	55
32	19	18	21	19	17	17	7	15
TOTAL	1,187	1,291	1,255	1,282	1,294	1,301	501	985

Table A2: Total Open Sites by NYC DOE Geographic District, Summers 2014-2021

District	2014	2015	2016	2017	2018	2019	2020	2021
1	15	14	9	9	11	7	7	12
2	42	43	28	29	29	15	21	19
3	21	18	16	14	21	12	8	11
4	10	13	12	14	14	12	10	10
5	17	24	15	16	16	16	11	10
6	12	15	15	12	15	12	12	14
7	20	23	14	15	21	8	9	9
8	23	25	17	15	17	17	15	15
9	24	27	19	18	24	22	19	13
10	32	30	24	24	24	17	18	14
11	43	46	24	22	21	12	25	14
12	21	27	17	17	16	12	16	13
13	22	21	13	10	10	7	11	9
14	19	25	22	17	16	13	15	8
15	19	18	18	14	16	16	11	11
16	15	14	12	10	8	5	7	10
17	20	24	21	20	19	13	15	15
18	13	14	14	16	14	14	12	12
19	22	22	19	16	15	11	14	13
20	15	22	18	19	18	11	7	14
21	16	21	15	17	16	12	8	8
22	14	15	16	19	21	17	10	13
23	15	18	16	14	14	13	8	12
24	18	20	24	21	23	13	12	16
25	18	19	13	16	18	17	6	12
26	23	27	22	23	23	10	6	11
27	23	25	17	16	19	16	18	15
28	16	18	14	14	14	11	9	12
29	13	17	13	16	14	14	10	6
30	22	21	21	22	24	21	17	17
31	49	53	41	37	35	23	31	18
32	13	10	11	7	8	8	7	6
TOTAL	665	729	570	549	574	427	405	392

Table A3: Total Meals Served by NYC DOE Geographic District, Summers 2014-2021

District	2014	2015	2016	2017	2018	2019	2020	2021
1	128,723	139,090	122,671	105,651	100,734	95,744	248,675	55,516
2	389,204	379,791	368,212	353,221	326,173	311,672	953,847	483,662
3	236,253	239,833	160,560	131,708	106,078	109,626	175,418	93,131
4	150,008	152,174	125,548	121,128	126,482	130,646	187,397	184,131
5	173,170	186,744	174,494	174,908	181,041	177,988	95,423	137,865
6	194,584	224,532	221,399	221,600	210,373	210,271	532,695	309,918
7	204,860	201,982	182,014	188,747	177,559	177,175	219,487	156,141
8	270,868	280,163	253,597	255,215	252,144	249,938	240,429	214,484
9	376,828	386,631	315,781	333,077	301,245	297,872	409,550	293,348
10	379,731	374,303	344,272	348,393	339,105	326,803	506,760	294,022
11	448,217	380,093	329,502	347,985	339,936	348,078	420,683	259,029
12	261,945	260,780	252,758	242,026	242,349	223,304	286,633	192,209
13	170,038	159,779	144,277	149,341	139,384	144,243	96,804	96,585
14	207,043	228,226	200,205	188,971	189,111	199,527	234,373	169,390
15	258,005	239,290	216,355	252,454	271,207	244,376	676,941	251,255
16	110,666	98,110	95,113	93,139	87,752	79,707	97,112	102,697
17	196,255	215,245	202,930	198,781	207,071	186,078	232,619	235,987
18	133,684	140,244	144,732	164,409	157,895	176,722	160,726	134,900
19	238,435	236,204	230,231	238,244	223,646	206,680	229,759	159,589
20	375,769	386,529	383,293	364,390	373,500	347,488	728,589	512,357
21	235,248	219,941	216,745	234,991	225,324	227,748	495,239	197,352
22	172,642	173,722	172,584	197,392	192,631	184,804	441,371	206,944
23	158,594	177,249	174,207	145,397	139,445	148,088	164,715	104,874
24	326,699	328,054	348,554	346,353	353,799	330,374	581,858	475,866
25	553,858	381,153	384,898	382,687	391,816	377,022	328,008	440,163
26	255,756	245,146	234,654	231,380	224,075	220,212	413,325	188,621
27	233,506	267,125	235,140	255,271	238,616	222,308	474,436	210,045
28	312,732	335,464	282,934	227,339	242,144	253,898	237,093	135,918
29	147,180	155,492	151,924	160,457	165,502	164,397	173,109	146,056
30	243,748	248,641	228,848	260,060	272,823	266,487	437,660	194,097
31	382,596	377,343	347,724	365,618	351,503	351,181	432,461	352,011
32	111,453	100,180	96,283	90,884	97,389	91,001	206,300	75,847
TOTAL	8,038,298	7,919,253	7,342,439	7,371,217	7,247,852	7,081,458	11,119,495	7,064,010

Appendix B: Pearson Correlations Between Covariates

Table B1: Pearson Correlations Between Covariates, Summer 2014 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.929**	1						
MS[b]	.913**	.959**	1					
HS[c]	.820**	.558**	.543**	1				
Non-White[d]	.923**	.885**	.867**	.723**	1			
Poverty[e]	.938**	.939**	.937**	.661**	.968**	1		
Site[f]	.778**	.665**	.625**	.740**	.671**	.668**	1	
Open Sites[g]	.633**	.504**	.476**	.659**	.521**	.516**	.930**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**$p < 0.01$.

Table B2: Pearson Correlations Between Covariates, Summer 2015 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.932**	1						
MS[b]	.914**	.960**	1					
HS[c]	.821**	.567**	.547**	1				
Non-White[d]	.927**	.892**	.870**	.727**	1			
Poverty[e]	.939**	.941**	.939**	.662**	.967**	1		
Site[f]	.755**	.641**	.623**	.718**	.657**	.664**	1	
Open Sites[g]	.623**	.498**	.504**	.632**	.509**	.528**	.925**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**$p < 0.01$.

Table B3: Pearson Correlations Between Covariates, Summer 2016 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.935**	1						
MS[b]	.919**	.962**	1					
HS[c]	.817**	.564**	.554**	1				
Non-White[d]	.933**	.900**	.877**	.723**	1			
Poverty[e]	.938**	.944**	.937**	.653**	.968**	1		
Site[f]	.787**	.674**	.657**	.749**	.708**	.690**	1	
Open Sites[g]	.709**	.635**	.633**	.620**	.560**	.593**	.848**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**p < 0.01.

Table B4: Pearson Correlations Between Covariates, Summer 2017 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.936**	1						
MS[b]	.922**	.963**	1					
HS[c]	.822**	.574**	.565**	1				
Non-White[d]	.937**	.905**	.888**	.730**	1			
Poverty[e]	.938**	.946**	.940**	.658**	.967**	1		
Site[f]	.761**	.673**	.652**	.700**	.689**	.688**	1	
Open Sites[g]	.762**	.665**	.680**	.697**	.633**	.659**	.829**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**p < 0.01.

Table B5: Pearson Correlations Between Covariates, Summer 2018 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.945**	1						
MS[b]	.932**	.967**	1					
HS[c]	.821**	.597**	.583**	1				
Non-White[d]	.936**	.909**	.902**	.723**	1			
Poverty[e]	.942**	.947**	.951**	.660**	.969**	1		
Site[f]	.809**	.730**	.715**	.731**	.763**	.743**	1	
Open Sites[g]	.761**	.682**	.684**	.692**	.658**	.663**	.801**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**$p < 0.01$.

Table B6: Pearson Correlations Between Covariates, Summer 2019 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.948**	1						
MS[b]	.933**	.967**	1					
HS[c]	.829**	.614**	.596**	1				
Non-White[d]	.939**	.913**	.907**	.731**	1			
Poverty[e]	.941**	.948**	.951**	.666**	.967**	1		
Site[f]	.803**	.745**	.742**	.689**	.750**	.745**	1	
Open Sites[g]	.515**	.558**	.562**	0.293	.472**	.500**	.667**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
**$p < 0.01$.

Table B7: Pearson Correlations Between Covariates, Summer 2020 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.951**	1						
MS[b]	.936**	.968**	1					
HS[c]	.831**	.629**	.607**	1				
Non-White[d]	.941**	.919**	.915**	.736**	1			
Poverty[e]	.937**	.948**	.953**	.661**	.968**	1		
Site[f]	.590**	.578**	.558**	.443*	.533**	.563**	1	
Open Sites[g]	.510**	.473**	.467**	.419*	.470**	.485**	.960**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
*$p < 0.05$.
**$p < 0.01$.

Table B8: Pearson Correlations Between Covariates, Summer 2021 (n = 32)

Covariate	Total Enrollment	ES[a]	MS[b]	HS[c]	Non-White[d]	Poverty[e]	Site[f]	Open Sites[g]
Total Enrollment	1							
ES[a]	.946**	1						
MS[b]	.935**	.967**	1					
HS[c]	.835**	.622**	.609**	1				
Non-White[d]	.945**	.918**	.914**	.752**	1			
Poverty[e]	.942**	.948**	.953**	.679**	.969**	1		
Site[f]	.814**	.728**	.712**	.749**	.790**	.779**	1	
Open Sites[g]	.643**	.587**	.555**	.581**	.618**	.610**	.710**	1

[a]ES = elementary school enrollment.
[b]MS = middle school enrollment.
[c]HS = high school enrollment.
[d]Non-White = non-White enrollment.
[e]Poverty = poverty enrollment.
[f]Site = number of sites.
[g]Open Sites = number of open sites.
*$p < 0.05$.
**$p < 0.01$.

Appendix C: Pearson Correlations Between Total Enrollment and Dependent Variables

Appendix C: Pearson Correlations Between Total Enrollment and Each Dependent Variable in the Corresponding Year, Summers 2014-2021 (n = 32)

Year	Total[a]	BF[b]	Lunch[c]	Jul[d]	Aug[e]	Jul BF[f]	Jul Lunch[g]	Aug BF[h]	Aug Lunch[i]
2014	.737**	.774**	.680**	.781**	.624**	.802**	.734**	.664**	.568**
2015	.826**	.794**	.812**	.849**	.732**	.813**	.842**	.695**	.715**
2016	.853**	.821**	.838**	.875**	.797**	.843**	.866**	.762**	.776**
2017	.864**	.849**	.847**	.885**	.795**	.861**	.877**	.791**	.768**
2018	.860**	.848**	.845**	.882**	.777**	.857**	.875**	.787**	.748**
2019	.847**	.809**	.835**	.858**	.787**	.813**	.854**	.768**	.758**
2020	.785**	.775**	.775**	.776**	.783**	.760**	.770**	.777**	.771**
2021	.782**	.778**	.781**	.816**	.721**	.811**	.815**	.716**	.720**

[a]Total = total meals served.
[b]BF = breakfast meals served.
[c]Lunch = lunch meals served.
[d]Jul = meals served in July.
[e]Aug = meals served in August.
[f]Jul BF = breakfast meals served in July.
[g]Jul Lunch = lunch meals served in July.
[h]Aug BF = breakfast meals served in August.
[i]Aug Lunch = lunch meals served in August.
**$p < 0.01$.

Appendix D: Normality Test Results for Research Question 1

Table D1: Normality Tests for Total Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.152	32	0.059	0.933	32	0.048
2015	0.116	32	0.200	0.927	32	0.032
2016	0.141	32	0.104	0.873	32	0.001
2017	0.132	32	0.168	0.876	32	0.002
2018	0.130	32	0.183	0.903	32	0.007
2019	0.142	32	0.098	0.893	32	0.004
2020	0.124	32	0.200	0.950	32	0.149
2021	0.122	32	0.200	0.938	32	0.068

[a]df = degrees of freedom.
[b]p = p-value.

Table D2: Normality Tests for Breakfast Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.146	32	0.082	0.940	32	0.076
2015	0.126	32	0.200	0.919	32	0.020
2016	0.139	32	0.117	0.871	32	0.001
2017	0.114	32	0.200	0.908	32	0.010
2018	0.101	32	0.200	0.945	32	0.106
2019	0.152	32	0.058	0.938	32	0.064
2020	0.189	32	0.005	0.918	32	0.019
2021	0.119	32	0.200	0.936	32	0.059

[a]df = degrees of freedom.
[b]p = p-value.

Table D3: Normality Tests for Lunch Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.122	32	0.200	0.936	32	0.059
2015	0.094	32	0.200	0.935	32	0.055
2016	0.139	32	0.117	0.889	32	0.003
2017	0.140	32	0.113	0.876	32	0.002
2018	0.126	32	0.200	0.885	32	0.003
2019	0.145	32	0.086	0.871	32	0.001
2020	0.097	32	0.200	0.969	32	0.460
2021	0.121	32	0.200	0.934	32	0.050

[a]df = degrees of freedom.
[b]p = p-value.

Table D4: Normality Tests for Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.156	32	0.045	0.947	32	0.115
2015	0.130	32	0.182	0.956	32	0.214
2016	0.124	32	0.200	0.913	32	0.013
2017	0.142	32	0.102	0.911	32	0.012
2018	0.116	32	0.200	0.952	32	0.161
2019	0.155	32	0.048	0.935	32	0.054
2020	0.121	32	0.200	0.961	32	0.291
2021	0.105	32	0.200	0.940	32	0.074

[a]df = degrees of freedom.
[b]p = p-value.

Table D5: Normality Tests for Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.145	32	0.085	0.907	32	0.009
2015	0.148	32	0.071	0.871	32	0.001
2016	0.144	32	0.091	0.834	32	0.000
2017	0.148	32	0.074	0.836	32	0.000
2018	0.146	32	0.081	0.846	32	0.000
2019	0.159	32	0.038	0.828	32	0.000
2020	0.119	32	0.200	0.930	32	0.040
2021	0.129	32	0.191	0.928	32	0.034

[a]df = degrees of freedom.
[b]p = p-value.

Table D6: Normality Tests for Breakfast Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.117	32	0.200	0.937	32	0.061
2015	0.132	32	0.167	0.942	32	0.087
2016	0.143	32	0.093	0.912	32	0.013
2017	0.121	32	0.200	0.934	32	0.050
2018	0.128	32	0.198	0.957	32	0.230
2019	0.156	32	0.047	0.938	32	0.068
2020	0.152	32	0.057	0.939	32	0.068
2021	0.116	32	0.200	0.945	32	0.101

[a]df = degrees of freedom.
[b]p = p-value.

Table D7: Normality Tests for Lunch Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.108	32	0.200	0.953	32	0.170
2015	0.103	32	0.200	0.963	32	0.336
2016	0.124	32	0.200	0.924	32	0.027
2017	0.129	32	0.190	0.912	32	0.013
2018	0.124	32	0.200	0.942	32	0.083
2019	0.149	32	0.070	0.911	32	0.012
2020	0.094	32	0.200	0.975	32	0.633
2021	0.137	32	0.130	0.930	32	0.040

[a]df = degrees of freedom.
[b]p = p-value.

Table D8: Normality Tests for Breakfast Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.145	32	0.085	0.897	32	0.005
2015	0.121	32	0.200	0.877	32	0.002
2016	0.160	32	0.036	0.825	32	0.000
2017	0.171	32	0.018	0.839	32	0.000
2018	0.141	32	0.105	0.892	32	0.004
2019	0.147	32	0.076	0.890	32	0.004
2020	0.149	32	0.069	0.891	32	0.004
2021	0.125	32	0.200	0.926	32	0.031

[a]df = degrees of freedom.
[b]p = p-value.

Table D9: Normality Tests for Lunch Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.128	32	0.200	0.914	32	0.014
2015	0.153	32	0.056	0.874	32	0.001
2016	0.153	32	0.054	0.849	32	0.000
2017	0.152	32	0.057	0.841	32	0.000
2018	0.151	32	0.063	0.818	32	0.000
2019	0.172	32	0.017	0.804	32	0.000
2020	0.129	32	0.193	0.950	32	0.145
2021	0.131	32	0.173	0.918	32	0.018

[a]df = degrees of freedom.
[b]p = p-value.

Appendix E: Sphericity Test Results for Research Question 1

Appendix E: Mauchly's Test of Sphericity for All Dependent Variables, Summers 2014-2021 (n = 32)

Dependent Variable	Mauchly's W	Approx. Chi-Square	df[a]	p[b]	Greenhouse-Geisser Epsilon
Total	0.000	294.469	27	<0.001	0.272
BF	0.000	309.297	27	<0.001	0.268
Lunch	0.000	268.064	27	<0.001	0.286
Jul	0.000	244.578	27	<0.001	0.290
Aug	0.000	281.221	27	<0.001	0.282
Jul BF	0.000	276.475	27	<0.001	0.278
Jul Lunch	0.000	217.189	27	<0.001	0.309
Aug BF	0.000	298.245	27	<0.001	0.284
Aug Lunch	0.000	262.224	27	<0.001	0.288

[a]df = degrees of freedom.
[b]p = p-value.
[c]Total = total meals served.
[d]BF = breakfast meals served.
[e]Lunch = lunch meals served.
[f]Jul = meals served in July.
[g]Aug = meals served in August.
[h]Jul BF = breakfast meals served in July.
[i]Jul Lunch = lunch meals served in July.
[j]Aug BF = breakfast meals served in August.
[k]Aug Lunch = lunch meals served in August.

Appendix F: Alternate Analysis for Research Question 1

Normality Test Results

The normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) show violations of the assumption of normality for several dependent variables (Tables F1 through F9); however, the normality assumption is still tenable based on sample size, which is greater than 30 ($n = 32$), making the repeated-measures ANOVA robust to violations of the assumption of normality.

Table F1: Normality Tests for Total Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.147	32	0.075	0.924	32	0.028
2015	0.139	32	0.120	0.925	32	0.029
2016	0.130	32	0.185	0.944	32	0.096
2017	0.130	32	0.181	0.941	32	0.077
2018	0.093	32	0.200	0.961	32	0.287
2019	0.094	32	0.200	0.964	32	0.345
2020	0.187	32	0.006	0.908	32	0.010
2021	0.177	32	0.012	0.893	32	0.004

[a]df = degrees of freedom.
[b]p = p-value.

Table F2: Normality Tests for Breakfast Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.120	32	0.200	0.925	32	0.028
2015	0.090	32	0.200	0.958	32	0.250
2016	0.118	32	0.200	0.954	32	0.184
2017	0.091	32	0.200	0.961	32	0.302
2018	0.109	32	0.200	0.963	32	0.323
2019	0.078	32	0.200	0.971	32	0.523
2020	0.146	32	0.081	0.931	32	0.042
2021	0.168	32	0.022	0.885	32	0.003

[a]df = degrees of freedom.
[b]p = p-value.

Table F3: Normality Tests for Lunch Meals Served, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.160	32	0.037	0.880	32	0.002
2015	0.147	32	0.078	0.932	32	0.045
2016	0.157	32	0.043	0.952	32	0.167
2017	0.121	32	0.200	0.960	32	0.268
2018	0.129	32	0.190	0.965	32	0.373
2019	0.105	32	0.200	0.967	32	0.431
2020	0.186	32	0.006	0.886	32	0.003
2021	0.183	32	0.008	0.897	32	0.005

[a]df = degrees of freedom.
[b]p = p-value.

Table F4: Normality Tests for Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.155	32	0.049	0.929	32	0.036
2015	0.128	32	0.196	0.929	32	0.036
2016	0.124	32	0.200	0.920	32	0.021
2017	0.148	32	0.074	0.934	32	0.050
2018	0.101	32	0.200	0.945	32	0.102
2019	0.098	32	0.200	0.953	32	0.178
2020	0.185	32	0.007	0.898	32	0.005
2021	0.182	32	0.009	0.904	32	0.008

[a]df = degrees of freedom.
[b]p = p-value.

Table F5: Normality Tests for Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.131	32	0.172	0.916	32	0.017
2015	0.091	32	0.200	0.964	32	0.344
2016	0.081	32	0.200	0.973	32	0.580
2017	0.088	32	0.200	0.969	32	0.477
2018	0.076	32	0.200	0.974	32	0.612
2019	0.094	32	0.200	0.977	32	0.706
2020	0.174	32	0.015	0.906	32	0.009
2021	0.177	32	0.012	0.881	32	0.002

[a]df = degrees of freedom.
[b]p = p-value.

Table F6: Normality Tests for Breakfast Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.110	32	0.200	0.922	32	0.024
2015	0.122	32	0.200	0.944	32	0.100
2016	0.133	32	0.157	0.933	32	0.046
2017	0.104	32	0.200	0.952	32	0.163
2018	0.111	32	0.200	0.958	32	0.248
2019	0.091	32	0.200	0.967	32	0.421
2020	0.156	32	0.047	0.920	32	0.020
2021	0.173	32	0.016	0.901	32	0.006

[a]df = degrees of freedom.
[b]p = p-value.

Table F7: Normality Tests for Lunch Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.185	32	0.007	0.900	32	0.006
2015	0.147	32	0.076	0.920	32	0.021
2016	0.141	32	0.103	0.930	32	0.040
2017	0.127	32	0.200	0.948	32	0.124
2018	0.097	32	0.200	0.957	32	0.227
2019	0.098	32	0.200	0.965	32	0.370
2020	0.171	32	0.018	0.876	32	0.002
2021	0.151	32	0.063	0.912	32	0.012

[a]df = degrees of freedom.
[b]p = p-value.

Table F8: Normality Tests for Breakfast Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.098	32	0.200	0.943	32	0.091
2015	0.084	32	0.200	0.968	32	0.450
2016	0.093	32	0.200	0.969	32	0.462
2017	0.067	32	0.200	0.968	32	0.433
2018	0.105	32	0.200	0.955	32	0.197
2019	0.083	32	0.200	0.976	32	0.676
2020	0.135	32	0.144	0.921	32	0.022
2021	0.180	32	0.010	0.882	32	0.002

[a]df = degrees of freedom.
[b]p = p-value.

Table F9: Normality Tests for Lunch Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.152	32	0.059	0.856	32	0.001
2015	0.094	32	0.200	0.971	32	0.516
2016	0.123	32	0.200	0.970	32	0.499
2017	0.118	32	0.200	0.966	32	0.387
2018	0.070	32	0.200	0.972	32	0.562
2019	0.091	32	0.200	0.974	32	0.605
2020	0.200	32	0.002	0.880	32	0.002
2021	0.164	32	0.029	0.882	32	0.002

[a]df = degrees of freedom.
[b]p = p-value.

Sphericity Test Results

Mauchly's test of sphericity shows violations of the sphericity assumption for every dependent variable (Table F10), presumably due to autoregression; as a result, the Greenhouse-Geisser correction will be used with the repeated-measures ANOVA test.

Table F10: Mauchly's Test of Sphericity for All Dependent Variables, Summers 2014-2021, Unadjusted Model (n = 32)

Dependent Variable	Mauchly's W	Approx. Chi-Square	df[a]	p[b]	Greenhouse-Geisser Epsilon
Total[c]	0.000	394.005	27	<0.001	0.207
BF[d]	0.000	413.832	27	<0.001	0.213
Lunch[e]	0.000	360.148	27	<0.001	0.216
Jul[f]	0.000	335.010	27	<0.001	0.225
Aug[g]	0.000	379.684	27	<0.001	0.198
Jul BF[h]	0.000	353.542	27	<0.001	0.227
Jul Lunch[i]	0.000	309.545	27	<0.001	0.240
Aug BF[j]	0.000	415.355	27	<0.001	0.207
Aug Lunch[k]	0.000	347.008	27	<0.001	0.204

[a]df = degrees of freedom.
[b]p = p-value.
[c]Total = total meals served.
[d]BF = breakfast meals served.
[e]Lunch = lunch meals served.
[f]Jul = meals served in July.
[g]Aug = meals served in August.
[h]Jul BF = breakfast meals served in July.
[i]Jul Lunch = lunch meals served in July.
[j]Aug BF = breakfast meals served in August.
[k]Aug Lunch = lunch meals served in August.

Results for Number of Total Meals Served

The mean number of total meals served was highest in the first summer of the waivers (summer 2020) (M = 347,484.22, SD = 202,274.54) and lowest in the second summer of the waivers (summer 2021) (M = 220,750.31, SD = 121,224.46) (Table F11).

Table F11: Descriptive Statistics for Number of Total Meals Served, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	110,666	553,858	251,197	106,636
2015	98,110	386,631	247,477	90,170
2016	95,113	384,898	229,451	85,503
2017	90,884	382,687	230,351	87,320
2018	87,752	391,816	226,495	87,026
2019	79,707	377,022	221,296	82,674
2020	95,423	953,847	347,484	202,275
2021	55,516	512,357	220,750	121,225

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021) (Figure F1).

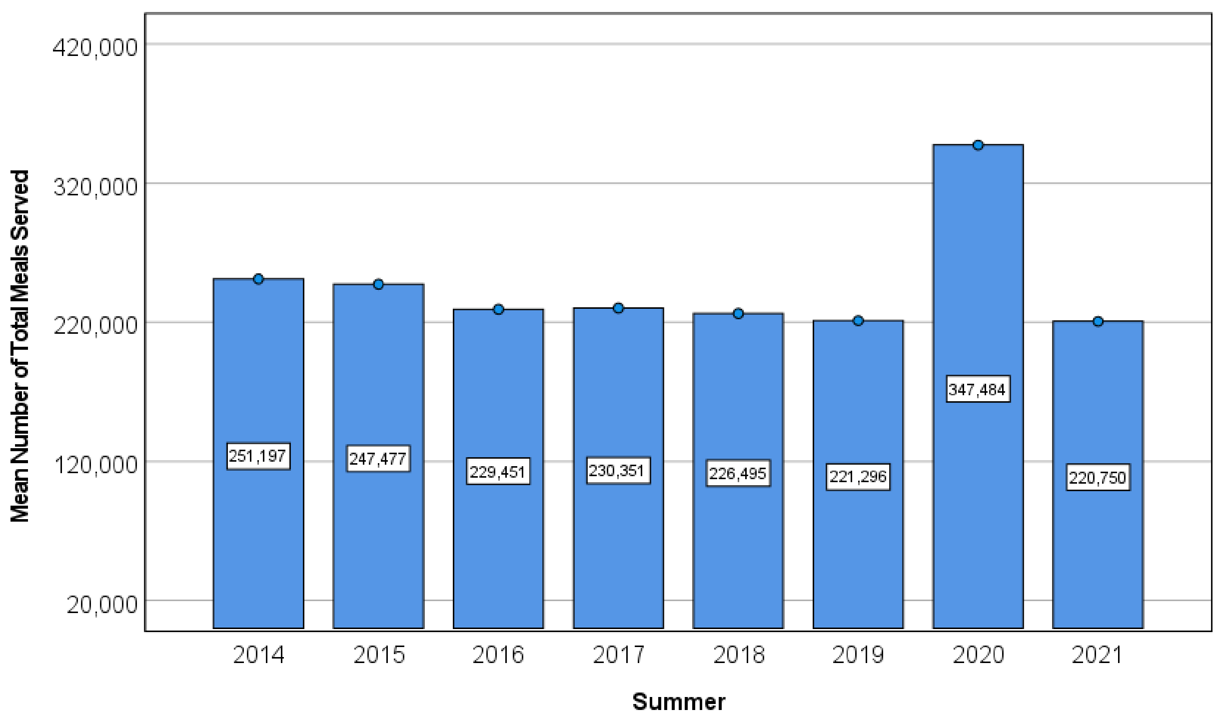

Figure F1: Bar Chart of the Mean Number of Total Meals Served, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served differed significantly across the summers ($F(1.45, 44.90) = 15.05$, $p < 0.001$, $\eta^2 = 0.33$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers, except summer 2014 (Table F12).

Table F12: Mean Differences in Total Meals Served, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	96,287	29,859	0.08	[-5,759, 198,334]
2015	100,008	28,608	0.04	[2,237, 197,779]
2016	118,033	27,762	0.01	[23,152, 212,914]
2017	117,134	27,065	<0.01	[24,638, 209,629]
2018	120,989	27,336	<0.01	[27,565, 214,413]
2019	126,189	28,280	<0.01	[29,539, 222,838]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences in the mean number of total meals served between the second summer of the waivers and any of the summers without the waivers (Table F13).

Table F13: Mean Differences in Total Meals Served, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-30,447	14,070	1.00	[-78,532, 17,639]
2015	-26,726	13,493	1.00	[-72,839, 19,386]
2016	-8,701	11,245	1.00	[-47,131, 29,730]
2017	-9,600	11,130	1.00	[-47,638, 28,437]
2018	-5,745	11,067	1.00	[-43,567, 32,077]
2019	-545	12,059	1.00	[-41,758, 40,668]
2020	-126,734	22,988	<0.01	[-205,297, -48,171]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Breakfast Meals Served

The mean number of breakfast meals served was highest in the first summer of the waivers (summer 2020) (M = 142,157.22, SD = 79,288.04) and lowest in the summer before the waivers (summer 2019) (M = 76,621.66, SD = 28,589.73) (Table F14).

Table F14: Descriptive Statistics for Number of Breakfast Meals Served, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	38,330	152,617	85,251	33,493
2015	33,909	146,534	86,287	31,430
2016	33,871	145,041	81,289	30,644
2017	30,971	139,112	81,310	31,274
2018	32,145	135,567	78,893	30,254
2019	29,291	135,435	76,622	28,590
2020	42,195	357,390	142,157	79,288
2021	22,319	218,495	96,042	53,025

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of breakfast meals served in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure F2).

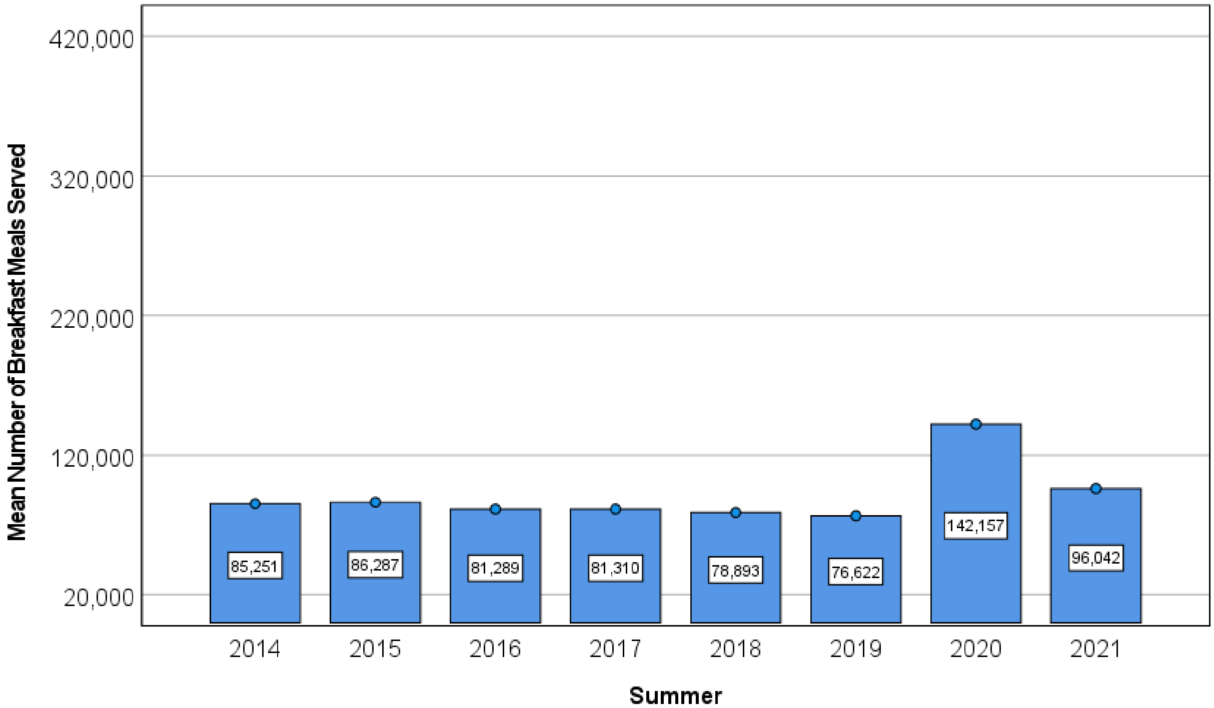

Figure F2: Bar Chart of the Mean Number of Breakfast Meals Served, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served differed significantly across the summers ($F(1.49, 46.26) = 21.97$, $p < 0.001$, $\eta^2 = 0.42$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table F15).

Table F15: Mean Differences in Breakfast Meals Served, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	56,906	11,722	<0.01	[16,847, 96,966]
2015	55,870	11,950	<0.01	[15,029, 96,711]
2016	60,868	11,598	<0.01	[21,231, 100,506]
2017	60,847	11,202	<0.01	[22,562, 99,132]
2018	63,264	11,346	<0.01	[24,487, 102,041]
2019	65,536	11,872	<0.01	[24,962, 106,109]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean number of breakfast meals served in the second summer of the waivers compared to any of the summers without the waivers (Table F16).

Table F16: Mean Differences in Breakfast Meals Served, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	10,791	6,403	1.00	[-11,093, 32,675]
2015	9,755	6,582	1.00	[-12,741, 32,251]
2016	14,753	5,825	0.46	[-5,155, 34,661]
2017	14,732	5,872	0.49	[-5,336, 34,800]
2018	17,149	5,933	0.20	[-3,128, 37,425]
2019	19,420	6,494	0.15	[-2,774, 41,615]
2020	-46,115	9,408	<0.01	[-78,267, -13,964]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Lunch Meals Served

The mean number of lunch meals served was highest in the first summer of the waivers (summer 2020) (M = 205,327.00, SD = 125,494.29) and lowest in the second summer of the waivers (summer 2021) (M = 124,708.22, SD = 68,627.48) (Table F17).

Table F17: Descriptive Statistics for Number of Lunch Meals Served, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	69,003	431,231	165,946	77,344
2015	61,392	275,975	161,190	60,971
2016	59,240	274,663	148,162	57,000
2017	57,497	279,693	149,040	57,730
2018	55,607	285,126	147,602	58,254
2019	50,416	282,124	144,674	56,246
2020	51,392	596,457	205,327	125,494
2021	33,197	293,862	124,708	68,628

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers (from summer 2014 to 2019) but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). After the sharp decrease, the mean number of lunch meals served in the second summer of the waivers was lower than the mean numbers served before the waivers (Figure F3).

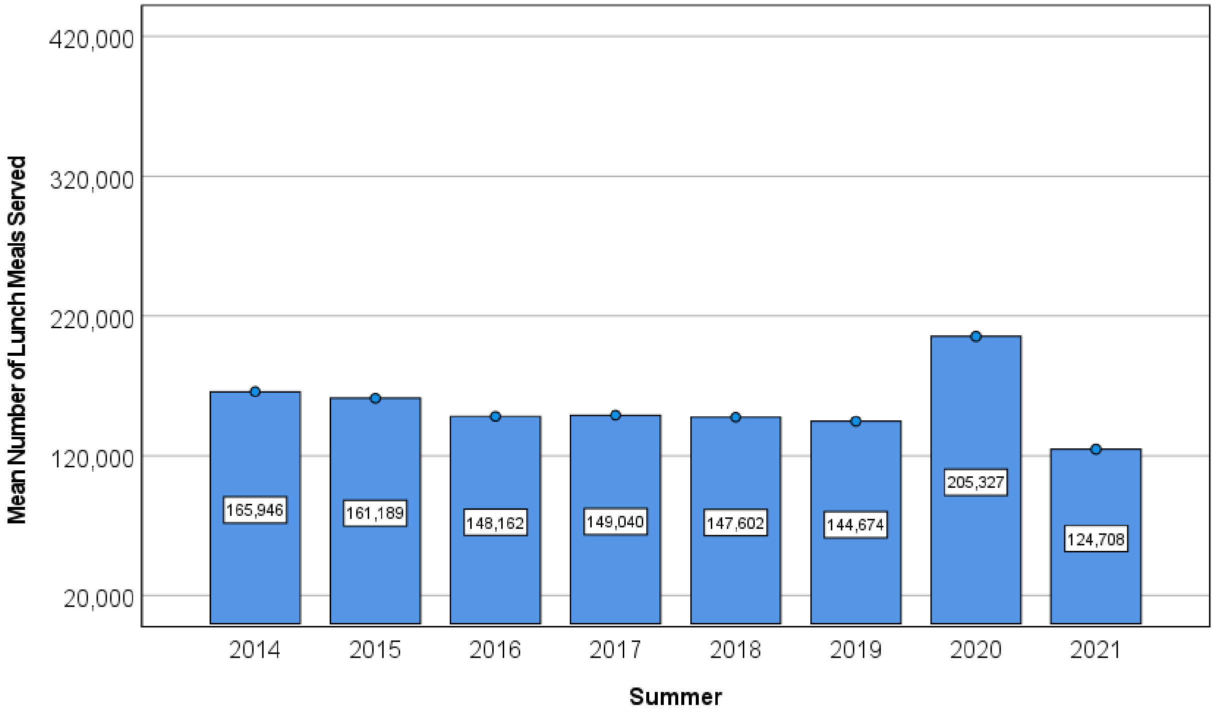

Figure F3: Bar Chart of the Mean Number of Lunch Meals Served, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served differed significantly across the summers ($F(1.51, 46.84) = 11.78$, $p < 0.001$, $\eta^2 = 0.28$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to the two most recent summers before the waivers (summers 2018 and 2019) (Table F18).

Table F18: Mean Differences in Lunch Meals Served, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	39,381	19,496	1.00	[-27,248, 106,010]
2015	44,138	17,602	0.49	[-16,020, 104,295]
2016	57,165	17,064	0.06	[-1,154, 115,483]
2017	56,287	16,711	0.06	[-823, 113,396]
2018	57,725	16,840	0.05	[171, 115,279]
2019	60,653	17,248	0.04	[1,706, 119,601]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Furthermore, the mean number of lunch meals served decreased significantly during the second summer of the waivers compared to all the summers without the waivers, except summer 2019 (Table F19).

Table F19: Mean Differences in Lunch Meals Served, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-41,238	9,454	<0.01	[-73,546, -8,929]
2015	-36,481	7,751	<0.01	[-62,971, -9,992]
2016	-23,454	6,160	0.02	[-44,505, -2,403]
2017	-24,332	5,854	0.01	[-44,337, -4,327]
2018	-22,894	5,706	0.01	[-42,394, -3,394]
2019	-19,966	6,169	0.08	[-41,050, 1,119]
2020	-80,619	14,427	<0.01	[-129,926, -31,312]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Total Meals Served in July

The mean number of total meals served in July was highest in the first summer of the waivers (summer 2020) (M = 183,714.16, SD = 104,605.19) and lowest in the second summer of the waivers (summer 2021) (M = 122,389.47, SD = 66,839.01) (Table F20).

Table F20: Descriptive Statistics for Number of Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	70,011	346,108	165,996	70,657
2015	59,842	261,010	161,189	61,481
2016	54,122	224,338	132,868	52,266
2017	53,952	239,168	139,565	55,870
2018	52,742	241,812	142,139	57,760
2019	52,529	250,799	150,756	58,477
2020	51,425	528,335	183,714	104,605
2021	29,115	275,084	122,390	66,839

[a]M = mean.
[b]SD = standard deviation.

Before the waivers, the mean was on a decreasing trajectory from summer 2014 to 2016 but then on an increasing trajectory from summer 2016 to 2019. The mean reached a peak in the first summer of the waivers (summer 2020) but then sharply decreased in the second summer of the waivers (summer 2021). After the sharp decrease, the mean number of total meals served in July during the second summer of the waivers was lower than the mean numbers served before the waivers (Figure F4).

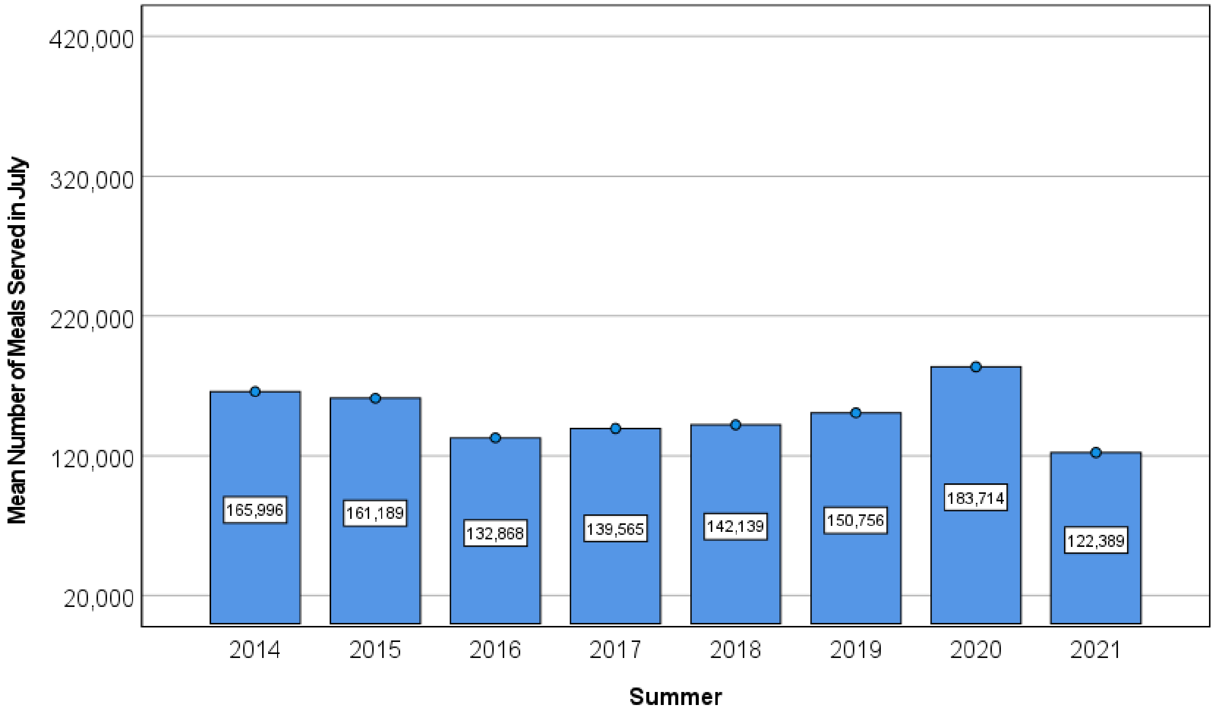

Figure F4: Bar Chart of the Mean Number of Total Meals Served in July, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served in July differed significantly across the summers ($F(1.57, 48.79) = 12.44$, $p < 0.001$, $\eta^2 = 0.29$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to only one summer without the waivers (summer 2016) (Table F21).

Table F21: Mean Differences in Total Meals Served in July, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	17,719	15,271	1.00	[-34,470, 69,907]
2015	22,526	14,538	1.00	[-27,160, 72,211]
2016	50,846	14,117	0.03	[2,601, 99,091]
2017	44,150	13,657	0.08	[-2,524, 90,823]
2018	41,575	13,778	0.14	[-5,513, 88,663]
2019	32,958	14,343	0.80	[-16,060, 81,976]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

The mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Furthermore, the mean number of total meals served in July decreased significantly during the second summer of the waivers compared to all the summers without the waivers, except summers 2016 and 2017 (Table F22).

Table F22: Mean Differences in Total Meals Served in July, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-43,606	7,457	<0.01	[-69,093, -18,120]
2015	-38,799	7,008	<0.01	[-62,750, -14,848]
2016	-10,479	5,569	1.00	[-29,512, 8,555]
2017	-17,175	5,525	0.11	[-36,056, 1,706]
2018	-19,750	5,254	0.02	[-37,707, -1,793]
2019	-28,367	5,885	<0.01	[-48,479, -8,255]
2020	-61,325	12,342	<0.01	[-103,504, -19,145]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Total Meals Served in August

The mean number of total meals served in August was highest in the first summer of the waivers (summer 2020) (M = 163,770.06, SD = 99,083.62) and lowest in the summer before the waivers (summer 2019) (M = 70,539.53, SD = 25,242.96) (Table F23).

Table F23: Descriptive Statistics for Number of Total Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	35,410	207,750	85,201	37,496
2015	33,850	140,169	86,288	30,440
2016	40,863	168,886	96,583	34,152
2017	36,932	158,035	90,786	32,728
2018	35,010	150,137	84,356	30,804
2019	27,178	126,223	70,540	25,243
2020	39,270	425,512	163,770	99,084
2021	26,401	237,273	98,361	55,872

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of total meals served in August in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure F5).

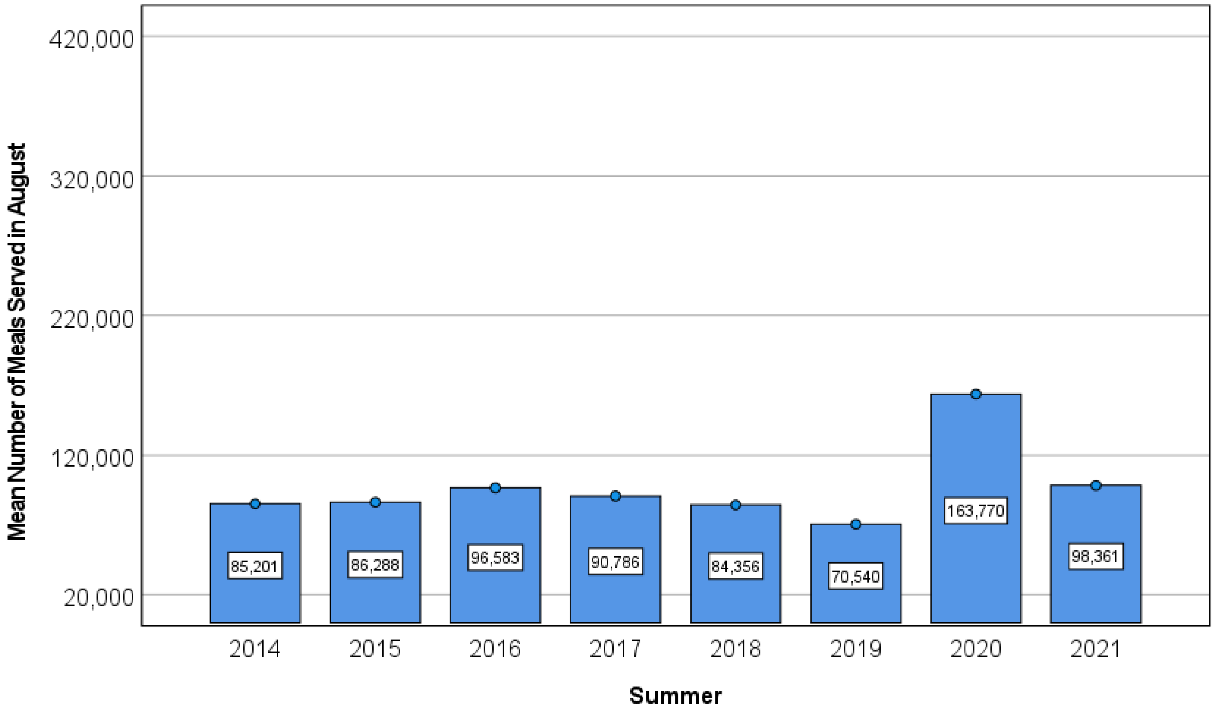

Figure F5: Bar Chart of the Mean Number of Total Meals Served in August, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of total meals served in August differed significantly across the summers ($F(1.39, 43.07) = 24.99$, $p < 0.001$, $\eta^2 = 0.45$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table F24).

Table F24: Mean Differences in Total Meals Served in August, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	78,569	15,533	<0.01	[25,482, 131,656]
2015	77,482	15,028	<0.01	[26,123, 128,842]
2016	67,187	14,225	<0.01	[18,572, 115,802]
2017	72,984	14,147	<0.01	[24,636, 121,333]
2018	79,414	14,434	<0.01	[30,085, 128,743]
2019	93,231	14,958	<0.01	[42,112, 144,349]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean number of total meals served in August during the second summer of the waivers compared to any of the summers without the waivers, except summer 2019 (Table F25).

Table F25: Mean Differences in Total Meals Served in August, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	13,160	7,311	1.00	[-11,826, 38,145]
2015	12,073	7,055	1.00	[-12,039, 36,184]
2016	1,778	5,978	1.00	[-18,653, 22,209]
2017	7,575	6,028	1.00	[-13,026, 28,176]
2018	14,005	6,318	0.95	[-7,586, 35,596]
2019	27,821	6,836	0.01	[4,458, 51,185]
2020	-65,409	11,458	<0.01	[-104,570, -26,249]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Breakfast Meals Served in July

The mean number of breakfast meals served in July was highest in the first summer of the waivers (summer 2020) (M = 75,196.69, SD = 41,105.37) and lowest in summer 2016 (M = 47,898.88, SD = 19,298.06) (Table F26).

Table F26: Descriptive Statistics for Number of Breakfast Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	26,245	106,060	57,702	23,778
2015	20,948	99,815	57,471	22,318
2016	19,517	85,840	47,899	19,298
2017	18,030	88,565	50,192	20,734
2018	19,246	88,857	50,309	20,455
2019	19,277	96,030	53,247	20,794
2020	22,656	198,516	75,197	41,105
2021	11,662	123,724	52,776	29,072

[a]M = mean.
[b]SD = standard deviation.

The mean was on a increasing trajectory before the waivers from summer 2016 to 2019, reaching a peak in the first summer of the waivers (summer 2020). However, this was followed by a sharp decrease in the second summer of the waivers (summer 2021) (Figure F6).

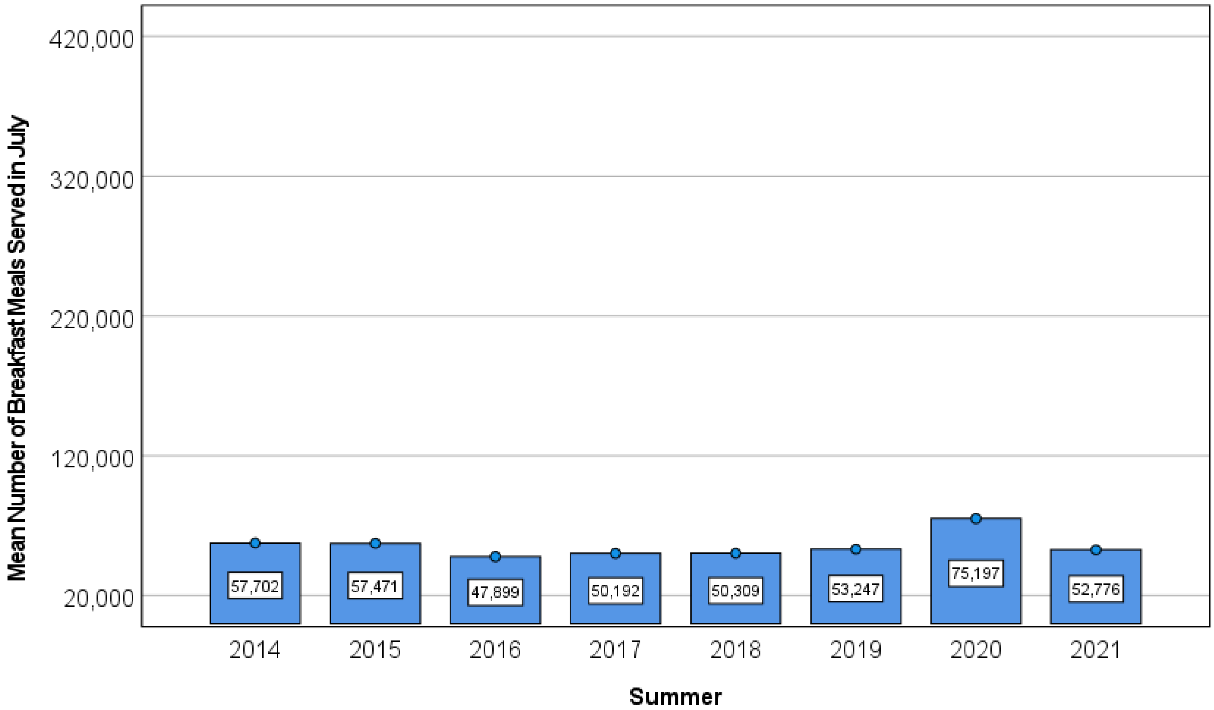

Figure F6: Bar Chart of the Mean Number of Breakfast Meals Served in July, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served in July differed significantly across the summers ($F(1.59, 49.25) = 13.33$, $p < 0.001$, $\eta^2 = 0.30$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to the four most recent summers without the waivers (summers 2016, 2017, 2018, and 2019) (Table F27).

Table F27: Mean Differences in Breakfast Meals Served in July, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	17,495	5,979	0.18	[-2,940, 37,929]
2015	17,726	6,150	0.20	[-3,292, 38,743]
2016	27,298	5,934	<0.01	[7,017, 47,578]
2017	25,005	5,750	<0.01	[5,353, 44,657]
2018	24,888	5,833	<0.01	[4,954, 44,823]
2019	21,950	6,097	0.03	[1,113, 42,788]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean number of breakfast meals served in July during the second summer of the waivers compared to any of the summers without the waivers (Table F28).

Table F28: Mean Differences in Breakfast Meals Served in July, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-4,926	3,163	1.00	[-15,736, 5,884]
2015	-4,695	3,306	1.00	[-15,993, 6,604]
2016	4,878	2,813	1.00	[-4,736, 14,491]
2017	2,585	2,846	1.00	[-7,141, 12,310]
2018	2,468	2,814	1.00	[-7,150, 12,086]
2019	-470	3,109	1.00	[-11,095, 10,155]
2020	-22,420	5,169	<0.01	[-40,085, -4,755]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Lunch Meals Served in July

The mean number of lunch meals served in July was highest in the first summer of the waivers (summer 2020) (M = 108,517.47, SD = 64,767.61) and lowest in the second summer of the waivers (summer 2021) (M = 69,613.09, SD = 37,991.09) (Table F29).

Table F29: Descriptive Statistics for Number of Lunch Meals Served in July, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	43,170	264,646	108,293	49,178
2015	38,894	172,614	103,718	40,429
2016	33,138	152,389	84,969	34,008
2017	33,355	161,015	89,373	35,994
2018	33,496	173,882	91,831	38,165
2019	33,252	185,986	97,510	38,980
2020	28,769	329,819	108,518	64,768
2021	17,453	158,785	69,613	37,991

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2014 to 2016, then on an increasing trajectory from summer 2016 to the first summer of the waivers (summer 2020), but then sharply decreased in the second summer of the waivers (summer 2021) (Figure F7).

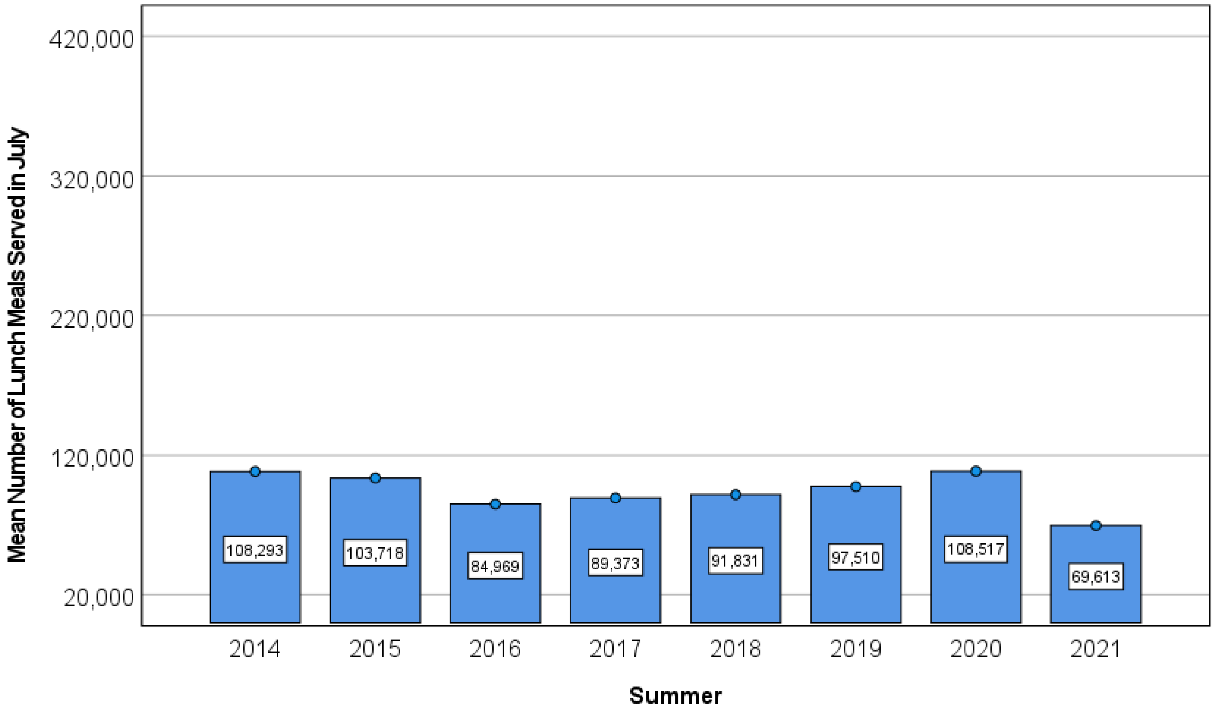

Figure F7: Bar Chart of the Mean Number of Lunch Meals Served in July, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served in July differed significantly across the summers ($F(1.68, 52.06) = 13.85$, $p < 0.001$, $\eta^2 = 0.31$). In the post hoc analysis with the Bonferroni adjustment, there were no significant differences between the mean number of lunch meals served in July during the first summer of the waivers compared to any of the summers without the waivers (Table F30).

Table F30: Mean Differences in Lunch Meals Served in July, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	224	10,043	1.00	[-34,097, 34,546]
2015	4,800	8,910	1.00	[-25,651, 35,250]
2016	23,548	8,618	0.29	[-5,903, 53,000]
2017	19,145	8,340	0.80	[-9,356, 47,646]
2018	16,687	8,394	1.00	[-12,000, 45,373]
2019	11,008	8,728	1.00	[-18,820, 40,836]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Furthermore, the mean number of lunch meals served in July decreased significantly during the second summer of the waivers compared to each summer without the waivers (Table F31).

Table F31: Mean Differences in Lunch Meals Served in July, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-38,680	5,326	<0.01	[-56,882, -20,479]
2015	-34,105	4,255	<0.01	[-48,647, -19,563]
2016	-15,356	3,183	<0.01	[-26,234, -4,478]
2017	-19,760	3,046	<0.01	[-30,169, -9,350]
2018	-22,218	2,917	<0.01	[-32,185, -12,251]
2019	-27,896	3,328	<0.01	[-39,270, -16,522]
2020	-38,904	7,596	<0.01	[-64,865, -12,943]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Breakfast Meals Served in August

The mean number of breakfast meals served in August was highest in the first summer of the waivers (summer 2020) (M = 66,960.53, SD = 38,857.98) and lowest in the summer before the waivers (summer 2019) (M = 23,375.13, SD = 8,081.93) (Table F32).

Table F32: Descriptive Statistics for Number of Breakfast Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	12,085	46,557	27,549	10,289
2015	12,705	48,894	28,816	9,801
2016	14,354	59,201	33,390	11,678
2017	12,790	50,763	31,118	10,995
2018	11,819	46,710	28,585	10,324
2019	9,234	39,405	23,375	8,082
2020	18,424	158,874	66,961	38,858
2021	10,657	103,462	43,266	24,665

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020). This was followed by a sharp decrease in the second summer of the waivers (summer 2021). However, even after the sharp decrease, the mean number of breakfast meals served in August in the second summer of the waivers was higher than the mean numbers served before the waivers (Figure F8).

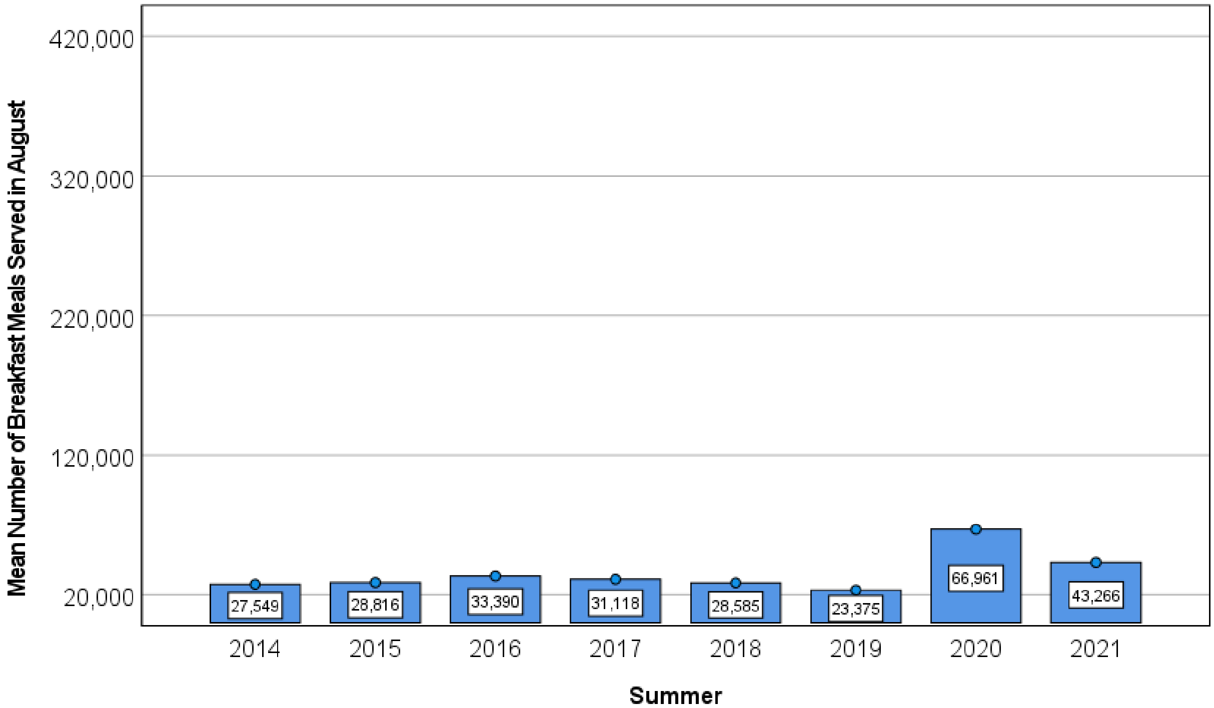

Figure F8: Bar Chart of the Mean Number of Breakfast Meals Served in August, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of breakfast meals served in August differed significantly across the summers ($F(1.45, 44.83) = 34.62$, $p < 0.001$, $\eta^2 = 0.53$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table F33).

Table F33: Mean Differences in Breakfast Meals Served in August, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	39,412	6,160	<0.01	[18,358, 60,465]
2015	38,144	6,206	<0.01	[16,934, 59,355]
2016	33,570	5,913	<0.01	[13,363, 53,778]
2017	35,842	5,774	<0.01	[16,111, 55,574]
2018	38,376	5,859	<0.01	[18,354, 58,398]
2019	43,585	6,168	<0.01	[22,505, 64,666]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. Still, the mean number of breakfast meals served in August increased significantly during the second summer of the waivers compared to each summer without the waivers, except summer 2016 (Table F34).

Table F34: Mean Differences in Breakfast Meals Served in August, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	15,717	3,466	<0.01	[3,870, 27,564]
2015	14,449	3,474	0.01	[2,578, 26,320]
2016	9,876	3,127	0.10	[-810, 20,561]
2017	12,147	3,184	0.02	[1,267, 23,028]
2018	14,681	3,269	<0.01	[3,511, 25,851]
2019	19,891	3,561	<0.01	[7,722, 32,059]
2020	-23,695	4,615	<0.01	[-39,467, -7,923]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Lunch Meals Served in August

The mean number of lunch meals served in August was highest in the first summer of the waivers (summer 2020) (M = 96,809.53, SD = 61,510.65) and lowest in the summer before the waivers (summer 2019) (M = 47,164.41, SD = 18,020.99) (Table F35).

Table F35: Descriptive Statistics for Number of Lunch Meals Served in August, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	23,325	166,585	57,652	29,107
2015	21,145	103,361	57,472	21,644
2016	26,102	122,274	63,193	23,597
2017	24,142	118,678	59,668	22,573
2018	22,111	111,244	55,771	21,133
2019	17,164	96,138	47,164	18,021
2020	20,716	266,638	96,810	61,511
2021	15,744	135,077	55,095	31,434

[a]M = mean.
[b]SD = standard deviation.

The mean was on a decreasing trajectory from summer 2016 to 2019 but then sharply increased in the first summer of the waivers (summer 2020), followed by a sharp decrease in the second summer of the waivers (summer 2021) (Figure F9).

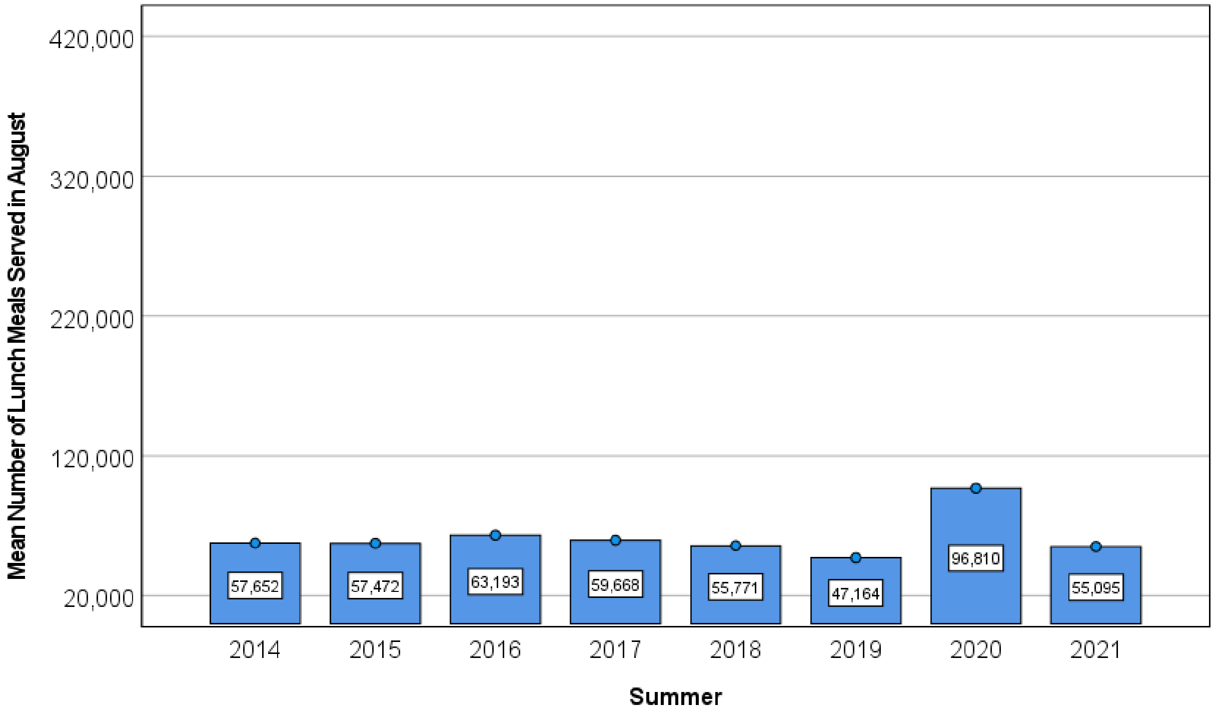

Figure F9: Bar Chart of the Mean Number of Lunch Meals Served in August, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of lunch meals served in August differed significantly across the summers ($F(1.43, 44.23) = 18.04$, $p < 0.001$, $\eta^2 = 0.39$). In the post hoc analysis with the Bonferroni adjustment, the mean increased significantly during the first summer of the waivers compared to each summer without the waivers (Table F36).

Table F36: Mean Differences in Lunch Meals Served in August, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	39,157	9,967	0.01	[5,094, 73,221]
2015	39,338	9,238	<0.01	[7,765, 70,910]
2016	33,617	8,771	0.02	[3,640, 63,593]
2017	37,142	8,784	0.01	[7,122, 67,162]
2018	41,038	8,967	<0.01	[10,393, 71,683]
2019	49,645	9,146	<0.01	[18,389, 80,901]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then decreased significantly during the second summer of the waivers compared to the first summer of the waivers. There were no significant differences between the mean number of lunch meals served in August during the second summer of the waivers compared to any of the summers without the waivers (Table F37).

Table F37: Mean Differences in Lunch Meals Served in August, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-2,557	4,533	1.00	[-18,050, 12,936]
2015	-2,377	3,888	1.00	[-15,663, 10,910]
2016	-8,098	3,173	0.44	[-18,942, 2,746]
2017	-4,573	3,086	1.00	[-15,121, 5,976]
2018	-676	3,227	1.00	[-11,706, 10,353]
2019	7,931	3,421	0.76	[-3,760, 19,621]
2020	-41,714	7,259	<0.01	[-66,523, -16,906]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Appendix G: Normality Test Results for Research Question 2

Table G1: Normality Tests for Number of Sites, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.135	32	0.145	0.929	32	0.036
2015	0.148	32	0.074	0.911	32	0.012
2016	0.142	32	0.101	0.900	32	0.006
2017	0.130	32	0.186	0.907	32	0.009
2018	0.163	32	0.031	0.879	32	0.002
2019	0.159	32	0.039	0.870	32	0.001
2020	0.142	32	0.100	0.918	32	0.018
2021	0.136	32	0.143	0.915	32	0.016

[a]df = degrees of freedom.
[b]p = p-value.

Table G2: Normality Tests for Number of Open Sites, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.121	32	0.200	0.921	32	0.022
2015	0.129	32	0.189	0.879	32	0.002
2016	0.171	32	0.018	0.834	32	0.000
2017	0.197	32	0.003	0.837	32	0.000
2018	0.179	32	0.011	0.904	32	0.008
2019	0.157	32	0.043	0.843	32	0.000
2020	0.090	32	0.200	0.965	32	0.365
2021	0.182	32	0.009	0.816	32	0.000

[a]df = degrees of freedom.
[b]p = p-value.

Table G3: Normality Tests for Number of Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.168	16	0.200	0.918	16	0.156
2015	0.203	16	0.077	0.909	16	0.112
2016	0.205	16	0.072	0.895	16	0.066
2017	0.161	16	0.200	0.917	16	0.152
2018	0.227	16	0.026	0.866	16	0.023
2019	0.227	16	0.027	0.857	16	0.017
2020	0.177	16	0.191	0.909	16	0.110
2021	0.211	16	0.056	0.925	16	0.202

[a]df = degrees of freedom.
[b]p = p-value.

Table G4: Normality Tests for Number of Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.178	16	0.185	0.908	16	0.106
2015	0.211	16	0.054	0.899	16	0.077
2016	0.212	16	0.053	0.887	16	0.050
2017	0.177	16	0.193	0.905	16	0.096
2018	0.238	16	0.016	0.843	16	0.011
2019	0.248	16	0.009	0.828	16	0.007
2020	0.179	16	0.180	0.907	16	0.103
2021	0.219	16	0.039	0.904	16	0.092

[a]df = degrees of freedom.
[b]p = p-value.

Table G5: Normality Tests for Number of Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.148	16	0.200	0.951	16	0.498
2015	0.173	16	0.200	0.925	16	0.200
2016	0.132	16	0.200	0.934	16	0.283
2017	0.185	16	0.147	0.935	16	0.294
2018	0.202	16	0.081	0.951	16	0.498
2019	0.166	16	0.200	0.948	16	0.457
2020	0.098	16	0.200	0.960	16	0.666
2021	0.156	16	0.200	0.931	16	0.251

[a]df = degrees of freedom.
[b]p = p-value.

Table G6: Normality Tests for Number of Open Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.170	16	0.200	0.903	16	0.088
2015	0.204	16	0.074	0.869	16	0.027
2016	0.249	16	0.009	0.862	16	0.020
2017	0.167	16	0.200	0.889	16	0.053
2018	0.222	16	0.034	0.919	16	0.165
2019	0.184	16	0.150	0.869	16	0.026
2020	0.110	16	0.200	0.974	16	0.896
2021	0.179	16	0.184	0.885	16	0.047

[a]df = degrees of freedom.
[b]p = p-value.

Table G7: Normality Tests for Number of Open Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.168	16	0.200	0.907	16	0.104
2015	0.207	16	0.066	0.863	16	0.021
2016	0.254	16	0.007	0.842	16	0.010
2017	0.186	16	0.141	0.858	16	0.018
2018	0.231	16	0.022	0.914	16	0.133
2019	0.195	16	0.107	0.863	16	0.021
2020	0.108	16	0.200	0.973	16	0.887
2021	0.172	16	0.200	0.899	16	0.079

[a]df = degrees of freedom.
[b]p = p-value.

Table G8: Normality Tests for Number of Open Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.097	16	0.200	0.939	16	0.342
2015	0.194	16	0.108	0.911	16	0.122
2016	0.150	16	0.200	0.923	16	0.192
2017	0.117	16	0.200	0.950	16	0.482
2018	0.134	16	0.200	0.954	16	0.555
2019	0.157	16	0.200	0.932	16	0.263
2020	0.161	16	0.200	0.941	16	0.364
2021	0.160	16	0.200	0.908	16	0.108

[a]df = degrees of freedom.
[b]p = p-value.

Appendix H: Sphericity Test Results for Research Question 2

Appendix H: Mauchly's Test of Sphericity for All Dependent Variables, Summers 2014-2021

Dependent Variable	Mauchly's W	Approx. Chi-Square	df[a]	p[b]	Greenhouse-Geisser Epsilon
Sites	0.010	129.708	27	<0.001	0.431
Open Sites	0.037	93.481	27	<0.001	0.489
Sites in High Enrollment Districts	0.005	65.120	27	<0.001	0.363
Open Sites in High Enrollment Districts	0.001	91.379	27	<0.001	0.301

[a]df = degrees of freedom.
[b]p = p-value.

Appendix I: Distribution Results for Research Question 2

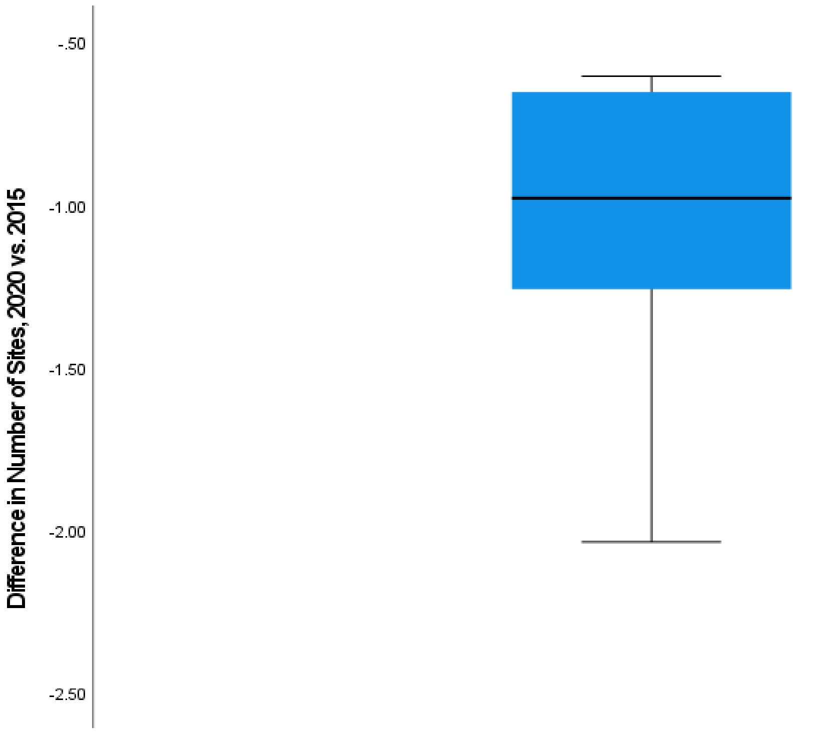

Figure I1: Box-Plot for the Difference in Number of Sites between Summer 2020 and 2015, High Poverty Districts (n = 16)

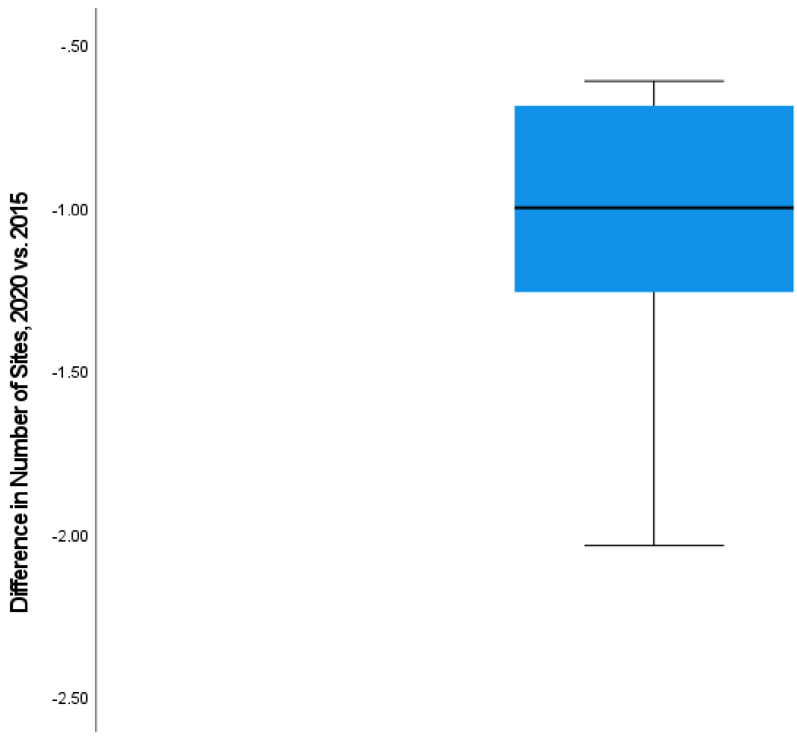

Figure I2: Box-Plot for the Difference in Number of Sites between Summer 2020 and 2015, High Non-White Districts (n = 16)

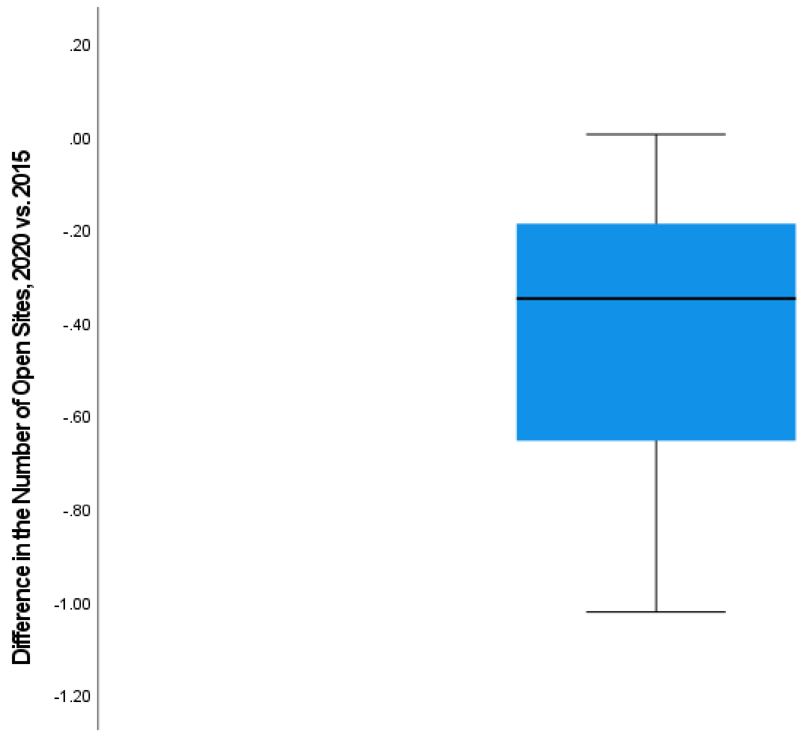

Figure I3: Box-Plot for the Difference in Number of Open Sites between Summer 2020 and 2015, High Poverty Districts (n = 16)

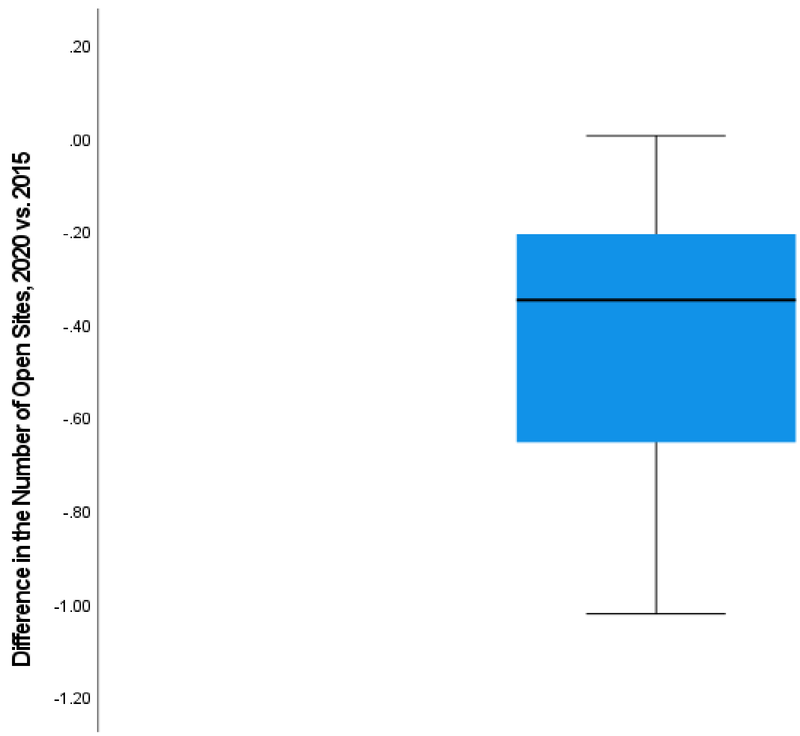

Figure I4: Box-Plot for the Difference in Number of Open Sites between Summer 2020 and 2015, High Non-White Districts (n = 16)

Appendix J: Alternate Analysis for Research Question 2

High Poverty, High Non-White, and High Enrollment Districts

Table I1 shows the medians and ranges for the percentage of students in poverty, the percentage of non-White students, and the number of enrolled students. Figures I1, I2, and I3 show the percentage of students in poverty, the percentage of non-White students, and the number of enrolled students, respectively, for each district (n = 32) with median levels indicated by a horizontal line.

Table J1: Medians and Ranges for Number of Students in Poverty, Number of Non-White Students, and Total Enrollment, 2014-2021 (n = 32)

Students	Median	Range
Poverty	19,671.00	5,658.13 - 45,061.75
Non-White	23,547.62	6,589.00 - 51,011.63
Enrollment	26,926.88	6,777.25 - 62,063.00

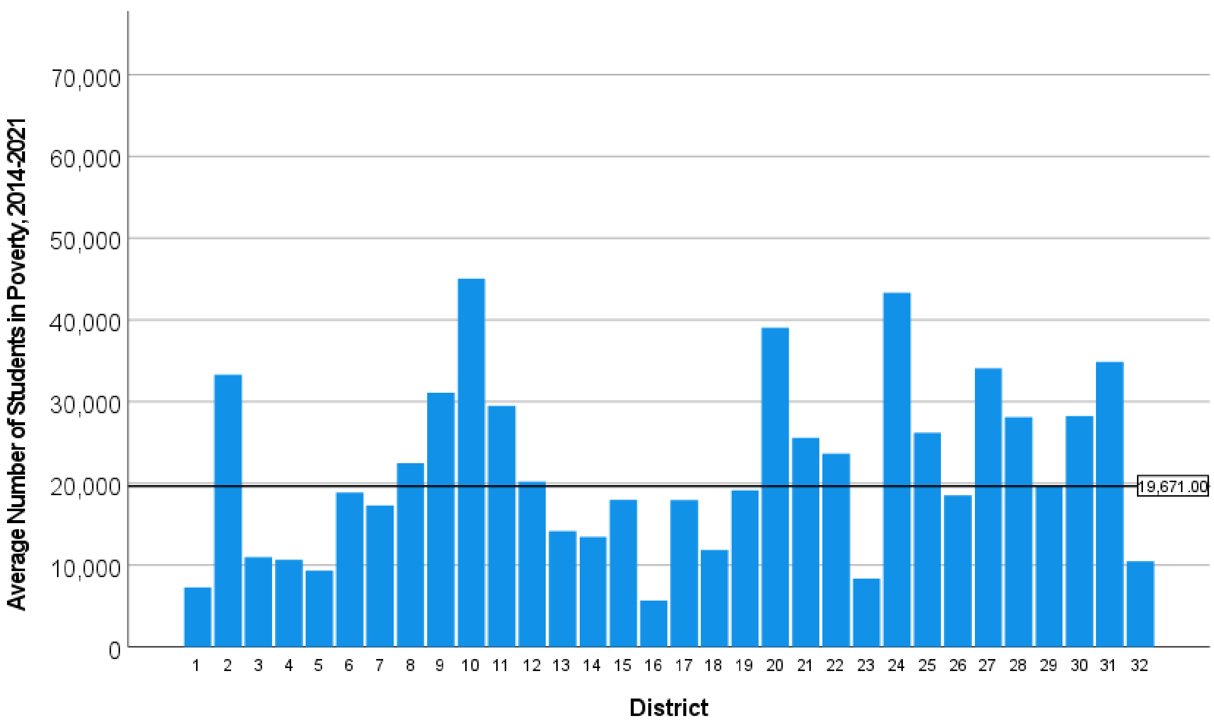

Figure J1: Bar Chart of Average Number of Students in Poverty (2014-2021) by District

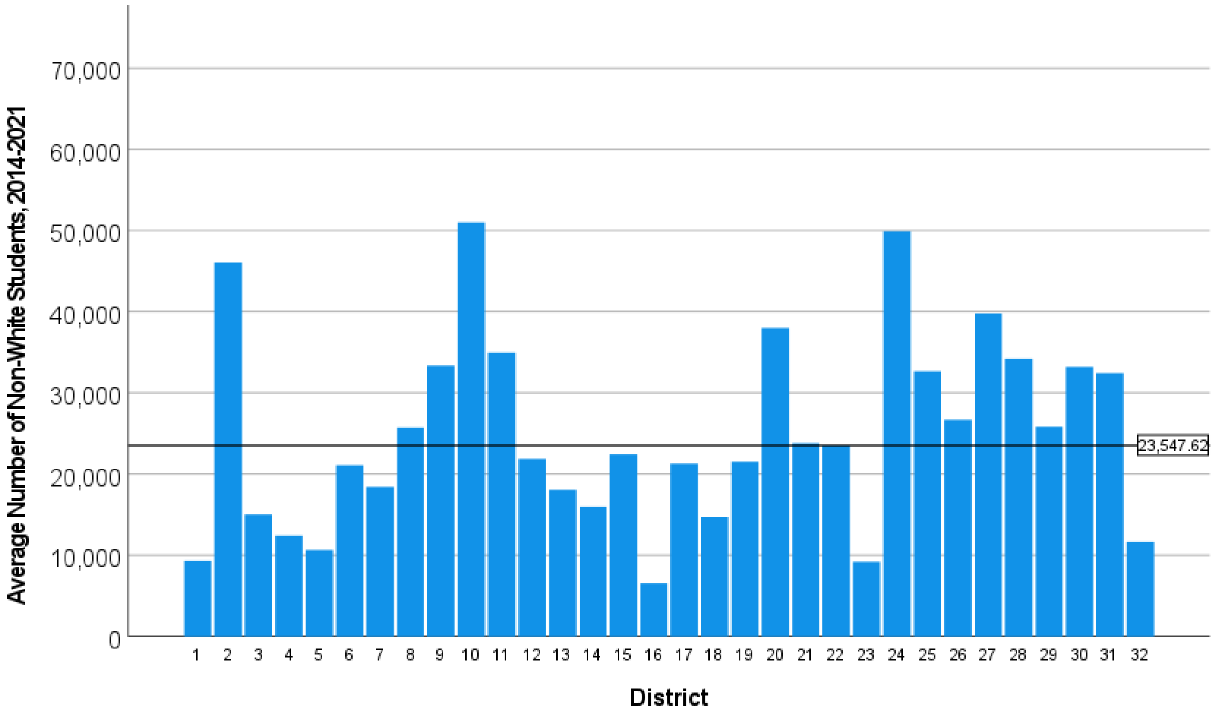

Figure J2: Bar Chart of Average Number of Non-White Students (2014-2021) by District

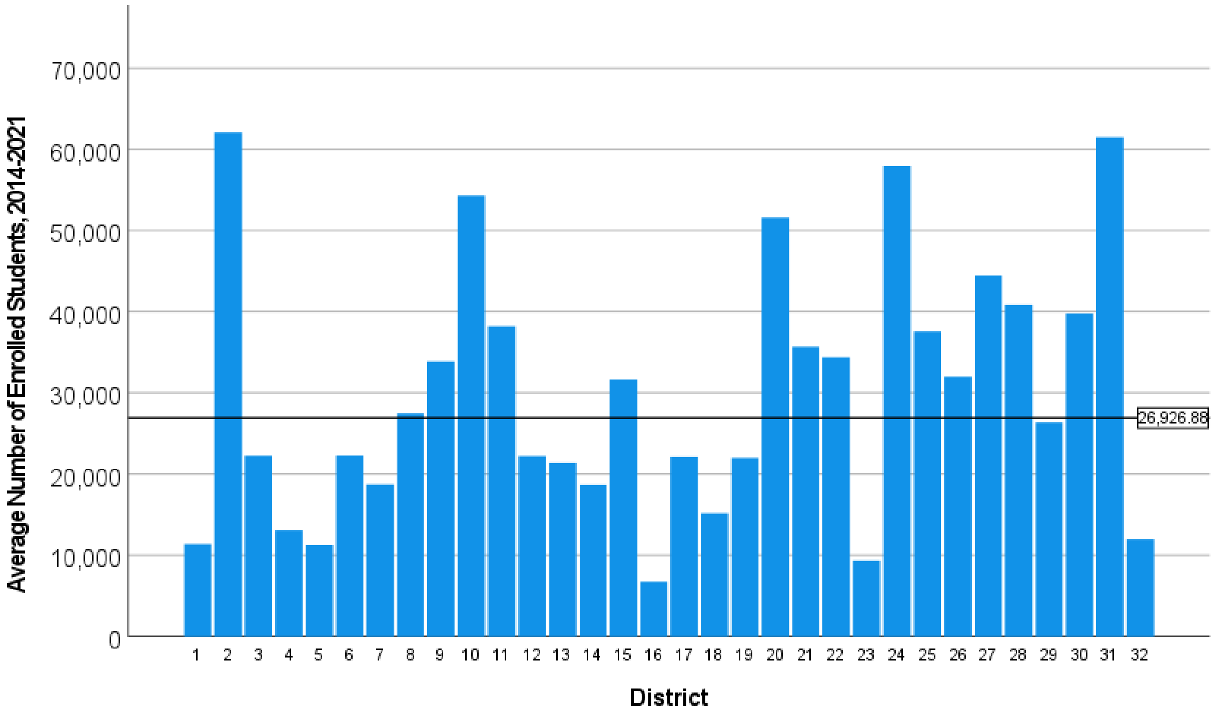

Figure J3: Bar Chart of Average Number of Enrolled Students (2014-2021) by District

Normality Test Results

For number of sites and number of open sites, the normality tests show violations of the assumption of normality at several timepoints (Tables I2 and I3); however, the normality assumption is still tenable based on sample size, which is greater than 30 (n = 32). For number of sites and number of open sites, the repeated-measures ANOVA will be used, and the sphericity assumption will be tested.

For the remaining six dependent variables, the normality assumption is not tenable. The normality tests show violations of the assumption of normality at several timepoints (Tables I4 through I9), and the sample size is less than 30 (n = 16). For the remaining six dependent variables, the Friedman test will be used, and the assumption of symmetrical distribution will be tested.

Table J2: Normality Tests for Number of Sites, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.221	32	<0.001	0.799	32	<0.001
2015	0.197	32	0.003	0.846	32	<0.001
2016	0.216	32	0.001	0.840	32	<0.001
2017	0.193	32	0.004	0.866	32	0.001
2018	0.171	32	0.018	0.896	32	0.005
2019	0.200	32	0.002	0.902	32	0.007
2020	0.167	32	0.023	0.892	32	0.004
2021	0.162	32	0.032	0.924	32	0.026

[a]df = degrees of freedom.
[b]p = p-value.

Table J3: Normality Tests for Number of Open Sites, Summers 2014-2021 (n = 32)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.247	32	<0.001	0.790	32	<0.001
2015	0.202	32	0.002	0.830	32	<0.001
2016	0.147	32	0.078	0.856	32	0.001
2017	0.167	32	0.024	0.906	32	0.009
2018	0.131	32	0.175	0.951	32	0.151
2019	0.126	32	0.200	0.965	32	0.363
2020	0.170	32	0.019	0.887	32	0.003
2021	0.093	32	0.200	0.984	32	0.893

[a]df = degrees of freedom.
[b]p = p-value.

Table J4: Normality Tests for Number of Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.271	16	0.003	0.823	16	0.006
2015	0.253	16	0.007	0.827	16	0.006
2016	0.175	16	0.200	0.869	16	0.026
2017	0.235	16	0.019	0.866	16	0.023
2018	0.157	16	0.200	0.884	16	0.045
2019	0.174	16	0.200	0.908	16	0.108
2020	0.148	16	0.200	0.899	16	0.077
2021	0.138	16	0.200	0.893	16	0.062

[a]df = degrees of freedom.
[b]p = p-value.

Table J5: Normality Tests for Number of Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.265	16	0.004	0.831	16	0.007
2015	0.248	16	0.009	0.828	16	0.006
2016	0.172	16	0.200	0.867	16	0.024
2017	0.229	16	0.024	0.871	16	0.029
2018	0.152	16	0.200	0.909	16	0.111
2019	0.174	16	0.200	0.908	16	0.108
2020	0.132	16	0.200	0.936	16	0.302
2021	0.144	16	0.200	0.892	16	0.059

[a]df = degrees of freedom.
[b]p = p-value.

Table J6: Normality Tests for Number of Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.271	16	0.003	0.830	16	0.007
2015	0.247	16	0.010	0.827	16	0.006
2016	0.177	16	0.195	0.869	16	0.026
2017	0.219	16	0.039	0.866	16	0.023
2018	0.148	16	0.200	0.907	16	0.102
2019	0.166	16	0.200	0.899	16	0.078
2020	0.132	16	0.200	0.942	16	0.371
2021	0.135	16	0.200	0.910	16	0.117

[a]df = degrees of freedom.
[b]p = p-value.

Table J7: Normality Tests for Number of Open Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.261	16	0.005	0.831	16	0.007
2015	0.243	16	0.012	0.829	16	0.007
2016	0.184	16	0.149	0.825	16	0.006
2017	0.200	16	0.086	0.822	16	0.005
2018	0.161	16	0.200	0.913	16	0.130
2019	0.173	16	0.200	0.907	16	0.105
2020	0.145	16	0.200	0.943	16	0.393
2021	0.181	16	0.171	0.937	16	0.314

[a]df = degrees of freedom.
[b]p = p-value.

Table J8: Normality Tests for Number of Open Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.266	16	0.004	0.835	16	0.008
2015	0.243	16	0.012	0.829	16	0.007
2016	0.180	16	0.178	0.848	16	0.013
2017	0.163	16	0.200	0.854	16	0.016
2018	0.184	16	0.151	0.927	16	0.219
2019	0.167	16	0.200	0.930	16	0.247
2020	0.169	16	0.200	0.925	16	0.204
2021	0.135	16	0.200	0.960	16	0.659

[a]df = degrees of freedom.
[b]p = p-value.

Table J9: Normality Tests for Number of Open Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df[a]	p[b]	Statistic	df[a]	p[b]
2014	0.280	16	0.002	0.821	16	0.005
2015	0.245	16	0.011	0.823	16	0.006
2016	0.189	16	0.129	0.839	16	0.010
2017	0.153	16	0.200	0.866	16	0.024
2018	0.187	16	0.138	0.920	16	0.166
2019	0.178	16	0.188	0.929	16	0.237
2020	0.138	16	0.200	0.930	16	0.248
2021	0.107	16	0.200	0.983	16	0.980

[a]df = degrees of freedom.
[b]p = p-value.

Sphericity Test Results

Mauchely's test of sphericity shows violations of the sphericity assumption for both dependent variables, presumably due to autoregression; as a result, the Greenhouse-Geisser correction will be used with the repeated-measures ANOVA test.

Table J10: Mauchly's Test of Sphericity for All Dependent Variables, Summers 2014-2021 (n = 32)

Dependent Variable	Mauchly's W	Approx. Chi-Square	df[a]	p[b]	Greenhouse-Geisser Epsilon
Sites	0.004	155.921	27	<0.001	0.313
Open Sites	0.004	158.211	27	<0.001	0.317

[a]df = degrees of freedom.
[b]p = p-value.

Distribution Test Results

For the Friedman test, the post-hoc test may be the Wilcoxon-signed rank test or the sign test. The Wilcoxon-signed rank test has an additional assumption of symmetrical distribution, i.e., the differences between years are symmetrically distributed around the median difference. Box-plots comparing 2014 to 2020 show violations of this assumption, so the Wilcoxon-signed rank test cannot be used, and there is no need to complete the remaining year-to-year comparisons. The sign test will be used instead.

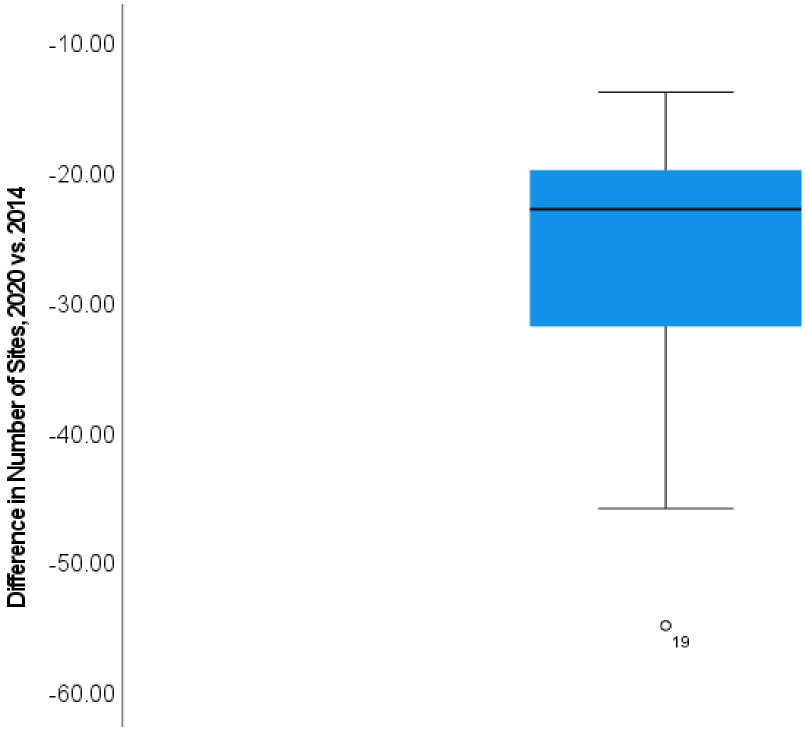

Figure J4: Box-Plot for the Difference in Number of Sites between Summer 2020 and 2014, High Poverty Districts (n = 16)

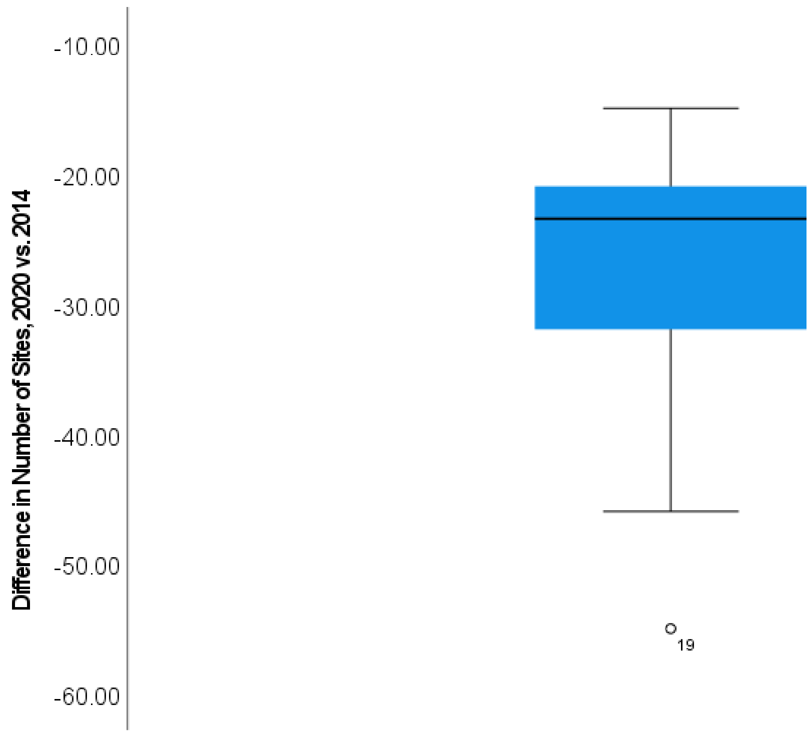

Figure J5: Box-Plot for the Difference in Number of Sites between Summer 2020 and 2014, High Non-White Districts (n = 16)

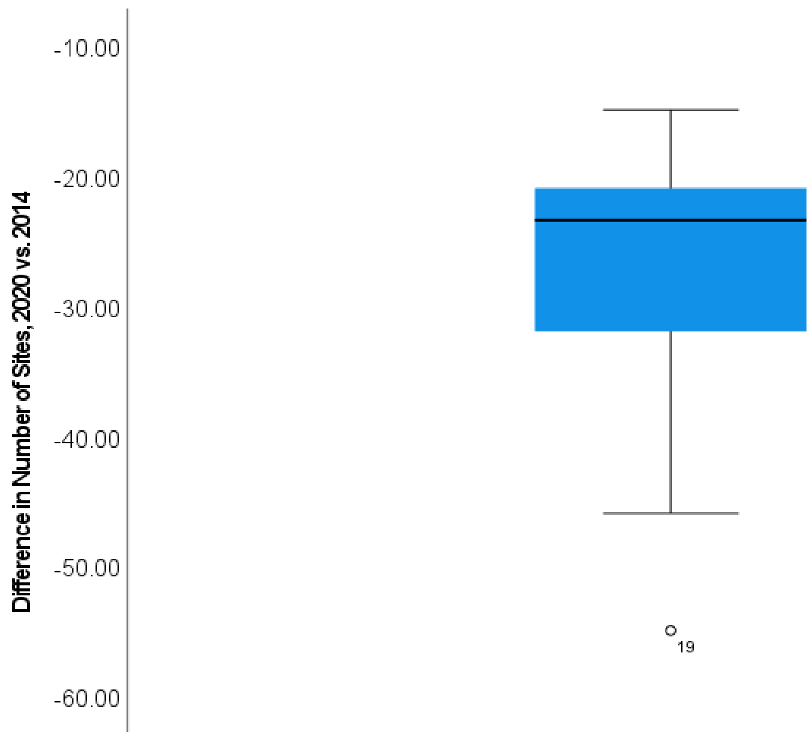

Figure J6: Box-Plot for the Difference in Number of Sites between Summer 2020 and 2014, High Enrollment Districts (n = 16)

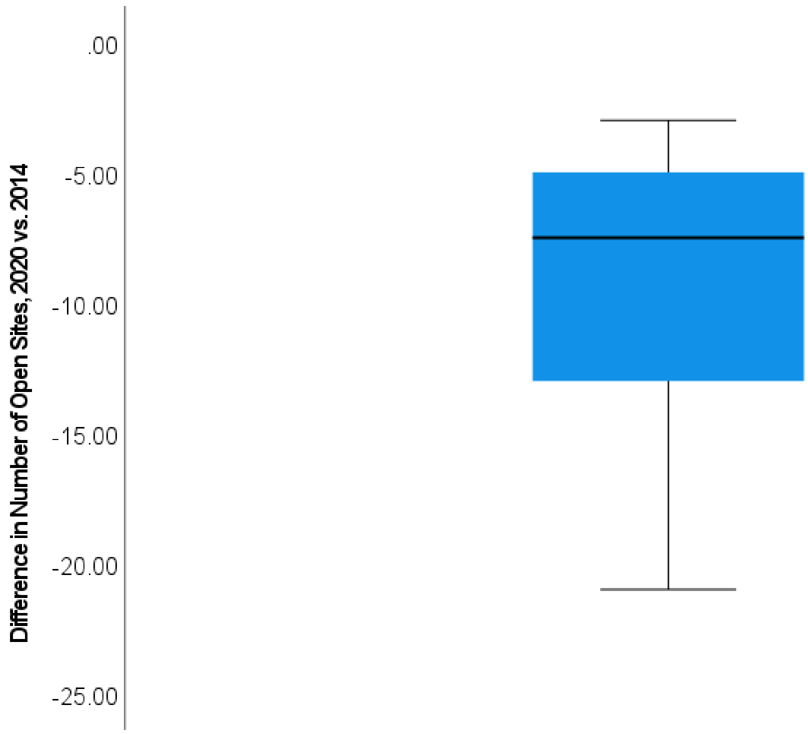

Figure J7: Box-Plot for the Difference in Number of Open Sites between Summer 2020 and 2014, High Poverty Districts (n = 16)

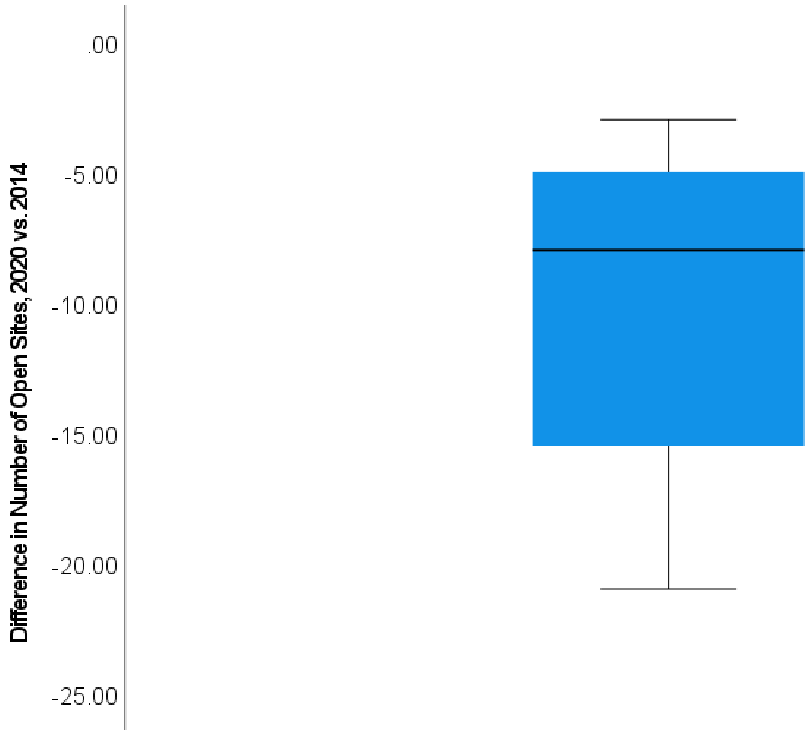

Figure J8: Box-Plot for the Difference in Number of Open Sites between Summer 2020 and 2014, High Non-White Districts (n = 16)

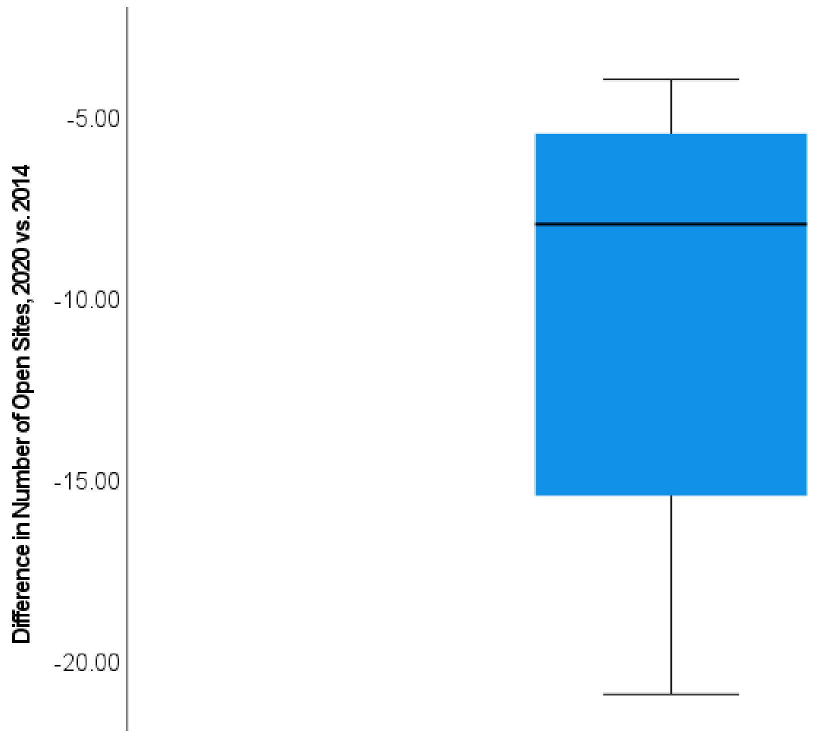

Figure J9: Box-Plot for the Difference in Number of Open Sites between Summer 2020 and 2014, High Enrollment Districts (n = 16)

Results for Number of Sites

The mean number of sites was highest in the summer before the waivers (summer 2019) (M = 40.66, SD = 15.01) and lowest in the first summer of the waivers (summer 2020) (M = 15.66, SD = 6.18) (Table J11).

Table J11: Descriptive Statistics for Number of Sites, Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[a]	SD[b]
2014	19	82	37.09	15.07
2015	18	86	40.34	15.03
2016	21	82	39.22	14.79
2017	19	83	40.06	14.49
2018	17	73	40.44	13.15
2019	17	86	40.66	15.01
2020	7	36	15.66	6.18
2021	15	57	30.78	10.34

[a]M = mean.
[b]SD = standard deviation.

The mean appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure J10).

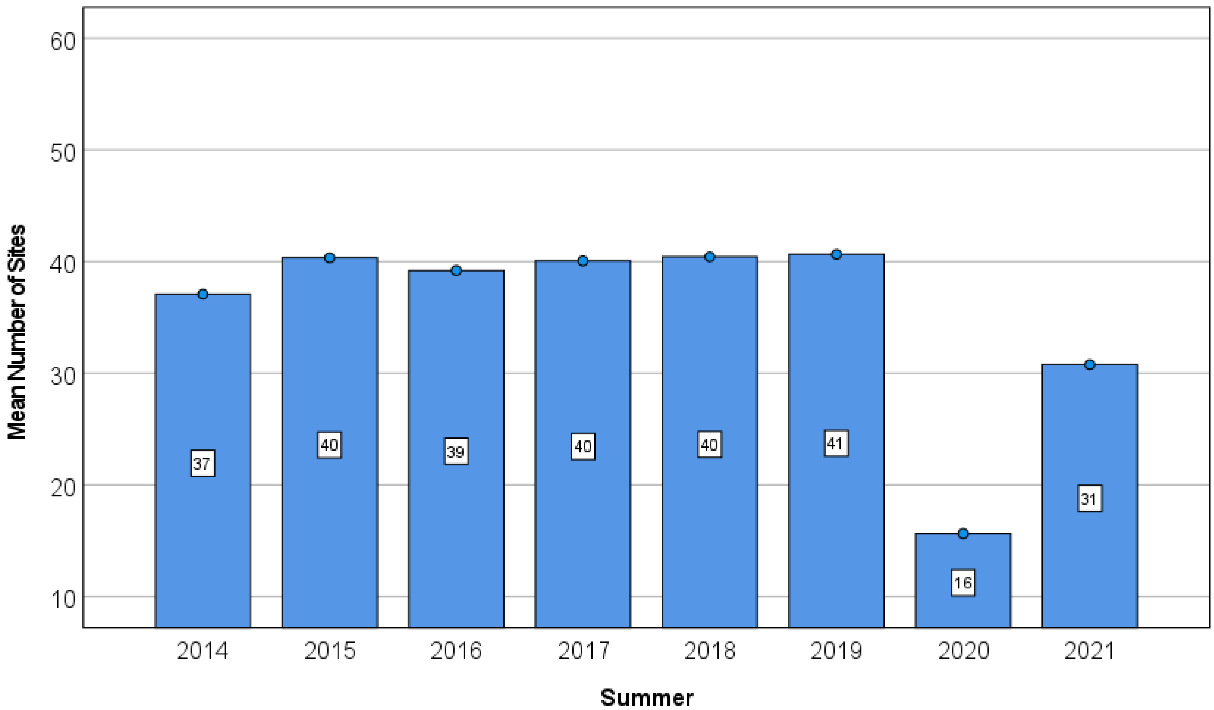

Figure J10: Bar Chart of the Mean Number of Sites, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of sites differed significantly across the summers ($F(2.19, 67.84) = 117.31$, $p < 0.001$, $\eta^2 = 0.79$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer before the waivers (Table J12).

Table J12: Mean Differences in the Number of Sites, Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-21.44	1.81	<0.01	[-27.62, -15.25]
2015	-24.69	1.79	<0.01	[-30.80, -18.57]
2016	-23.56	1.77	<0.01	[-29.60, -17.52]
2017	-24.41	1.70	<0.01	[-30.23, -18.58]
2018	-24.78	1.50	<0.01	[-29.92, -19.64]
2019	-25.00	1.80	<0.01	[-31.16, -18.84]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

However, the mean then increased significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of sites between the second summer of the waivers and each summer without the waivers (Table J13), though the magnitudes or mean differences were smaller in this comparison vs. the comparison between the first summer of the waivers and the summers without the waivers.

Table J13: Mean Differences in Number of Sites, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[a]	SE[b]	p[c]	95% CI[d]
2014	-6.31	1.38	<0.01	[-11.03, -1.60]
2015	-9.56	1.36	<0.01	[-14.21, -4.92]
2016	-8.44	1.24	<0.01	[-12.67, -4.21]
2017	-9.28	1.30	<0.01	[-13.72, -4.84]
2018	-9.66	1.06	<0.01	[-13.27, -6.05]
2019	-9.88	1.27	<0.01	[-14.23, -5.52]
2020	15.13	1.14	<0.01	[11.22, 19.03]

[a]MD = mean difference.
[b]SE = standard error.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[d]95% CI = 95% confidence interval.

Results for Number of Open Sites

The mean number of open sites was highest in summer 2015 (M = 22.78, SD = 9.42) and lowest in the second summer of the waivers (M = 12.25, SD = 3.15) (Table J14).

Table J14: Descriptive Statistics for Number of Open Sites[a], Summers 2014-2021 (n = 32)

Summer	Minimum	Maximum	M[b]	SD[c]
2014	10	49	20.78	9.04
2015	10	53	22.78	9.42
2016	9	41	17.81	6.10
2017	7	37	17.16	5.84
2018	8	35	17.94	5.79
2019	5	23	13.34	4.22
2020	6	31	12.66	5.80
2021	6	19	12.25	3.15

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]M = mean.
[c]SD = standard deviation.

The mean was on a decreasing trajectory before the waivers from summer 2018 to 2019 and continued to decrease during the first and second summers of the waivers (Figure J11).

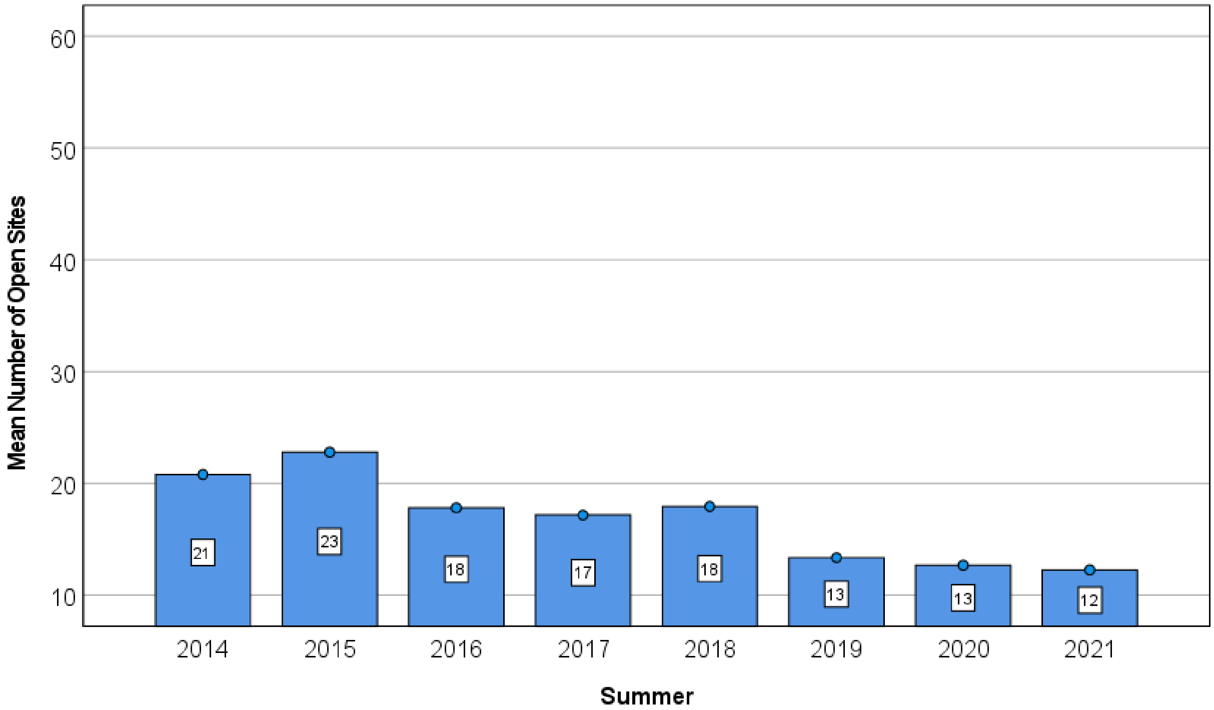

Figure J11: Bar Chart of the Mean Number of Open Sites, Summers 2014-2021 (n = 32)

In the omnibus test with the Greenhouse-Geisser correction, the mean number of open sites differed significantly across the summers ($F(2.22, 68.22) = 34.01$, $p < 0.001$, $\eta^2 = 0.52$). In the post hoc analysis with the Bonferroni adjustment, the mean decreased significantly during the first summer of the waivers compared to each summer without the waivers, except the most recent summer, summer 2019 (Table J15).

Table J15: Mean Differences in Number of Open Sites[a], Summer 2020 vs. Summers 2014-2019 (n = 32)

Summer	MD[b]	SE[c]	p[d]	95% CI[e]
2014	-8.13	0.92	<0.01	[-11.27, -4.98]
2015	-10.13	0.97	<0.01	[-13.44, -6.81]
2016	-5.16	0.67	<0.01	[-7.43, -2.88]
2017	-4.50	0.77	<0.01	[-7.13, -1.87]
2018	-5.28	0.83	<0.01	[-8.12, -2.44]
2019	-0.69	0.83	1.00	[-3.52, 2.14]

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]MD = mean difference.
[c]SE = standard error.
[d]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[e]95% CI = 95% confidence interval.

The mean did not change significantly during the second summer of the waivers compared to the first summer of the waivers. There were significant decreases in the mean number of open sites between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table J16), and the magnitudes or mean differences were similar between this comparison and the comparison between the first summer of the waivers and the summers without the waivers.

Table J16: Mean Differences in Open Sites[a], Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 32)

Summer	MD[b]	SE[c]	p[d]	95% CI[e]
2014	-8.53	1.35	<0.01	[-13.14, -3.92]
2015	-10.53	1.43	<0.01	[-15.42, -5.65]
2016	-5.56	0.83	<0.01	[-8.39, -2.73]
2017	-4.91	0.78	<0.01	[-7.58, -2.23]
2018	-5.69	0.76	<0.01	[-8.27, -3.10]
2019	-1.09	0.66	1.00	[-3.34, 1.15]
2020	-0.41	0.80	1.00	[-3.15, 2.33]

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]MD = mean difference.
[c]SE = standard error.
[d]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.
[e]95% CI = 95% confidence interval.

Results for Number of Sites in High Poverty Districts

The median number of sites in high poverty districts was highest in the summer before the waivers (summer 2019) (Mdn = 48.00, IQR = 38.25- 62.25) and lowest in the first summer of the waivers (Mdn = 18.50, IQR = 13.00- 22.00) (Table J17).

Table J17: Descriptive Statistics for Number of Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[a]	IQR[b]
2014	42.50	34.00-51.75
2015	47.50	36.25-53.50
2016	45.50	33.75-53.50
2017	44.50	36.75-57.00
2018	45.50	38.25-57.50
2019	48.00	38.25-62.25
2020	18.50	13.00-22.00
2021	34.50	27.00-41.50

[a]Mdn = median.
[b]IQR = interquartile range.

The median appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure J12).

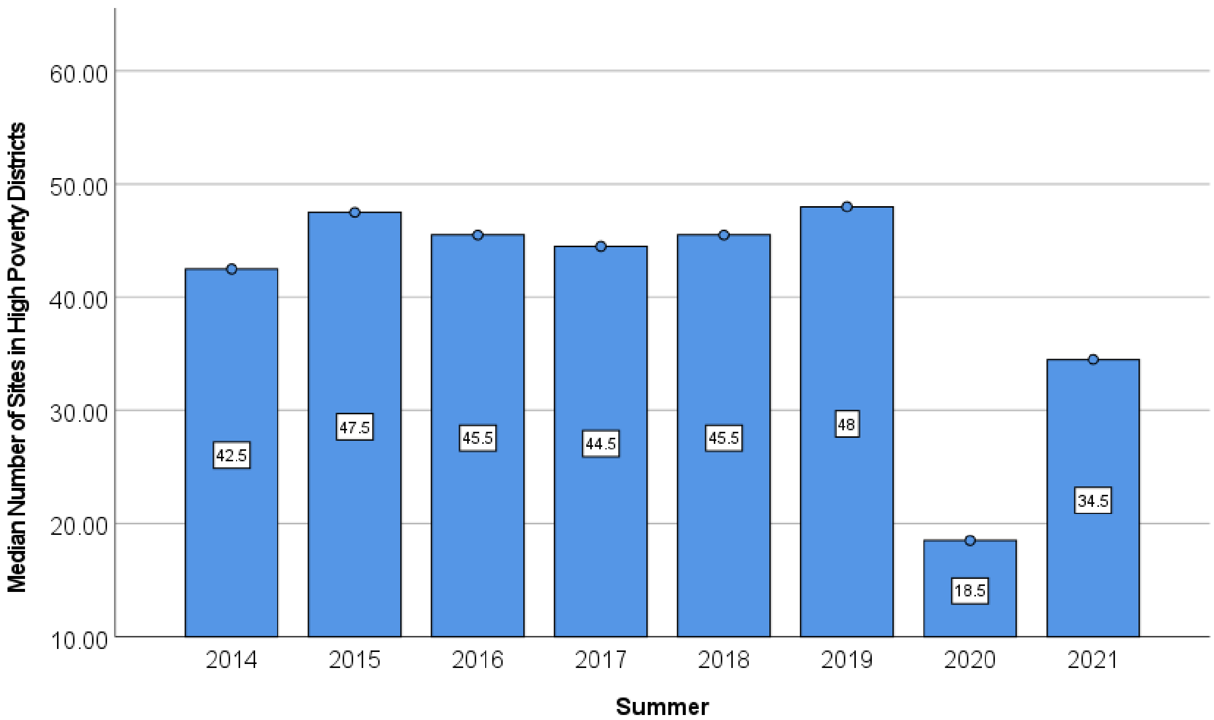

Figure J12: Bar Chart of the Median Number of Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of sites in high poverty districts differed significantly across the summers ($\chi(7) = 78.26$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to each summer without the waivers (Table J18).

Table J18: Median Differences in Number of Sites in High Poverty Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-23.00	<0.01
2015	-26.50	<0.01
2016	-28.00	<0.01
2017	-27.50	<0.01
2018	-28.50	<0.01
2019	-30.00	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Conversely, there was a significant median increase during the second summer of the waivers compared to the first summer of the waivers. There was a significant median decrease in the second summer of the waivers compared to each summer without the waivers, except summer 2014 (Table J19), though the median differences were smaller in this comparison vs. the comparison between the first summer of the waivers and the summers without the waivers.

Table J19: Median Differences in Number of Sites in High Poverty Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-7.00	0.12
2015	-10.50	<0.01
2016	-8.50	<0.01
2017	-9.50	<0.01
2018	-11.50	<0.01
2019	-12.50	<0.01
2020	16.50	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Results for Number of Sites in High Non-White Districts

The median number of sites in high non-White districts was highest in the summer before the waivers (Mdn = 48.00, IQR = 38.25-62.25) and lowest in the first summer of the waivers (Mdn = 16.50, IQR = 13.00-22.00) (Table J20).

Table J20: Descriptive Statistics for Number of Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[a]	IQR[b]
2014	42.50	32.50-51.75
2015	47.50	35.25-53.50
2016	45.50	33.25-53.50
2017	44.50	36.00-57.00
2018	45.50	38.25-57.50
2019	48.00	38.25-62.25
2020	16.50	13.00-22.00
2021	34.50	26.25-41.50

[a]Mdn = median.
[b]IQR = interquartile range.

The median appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure J13).

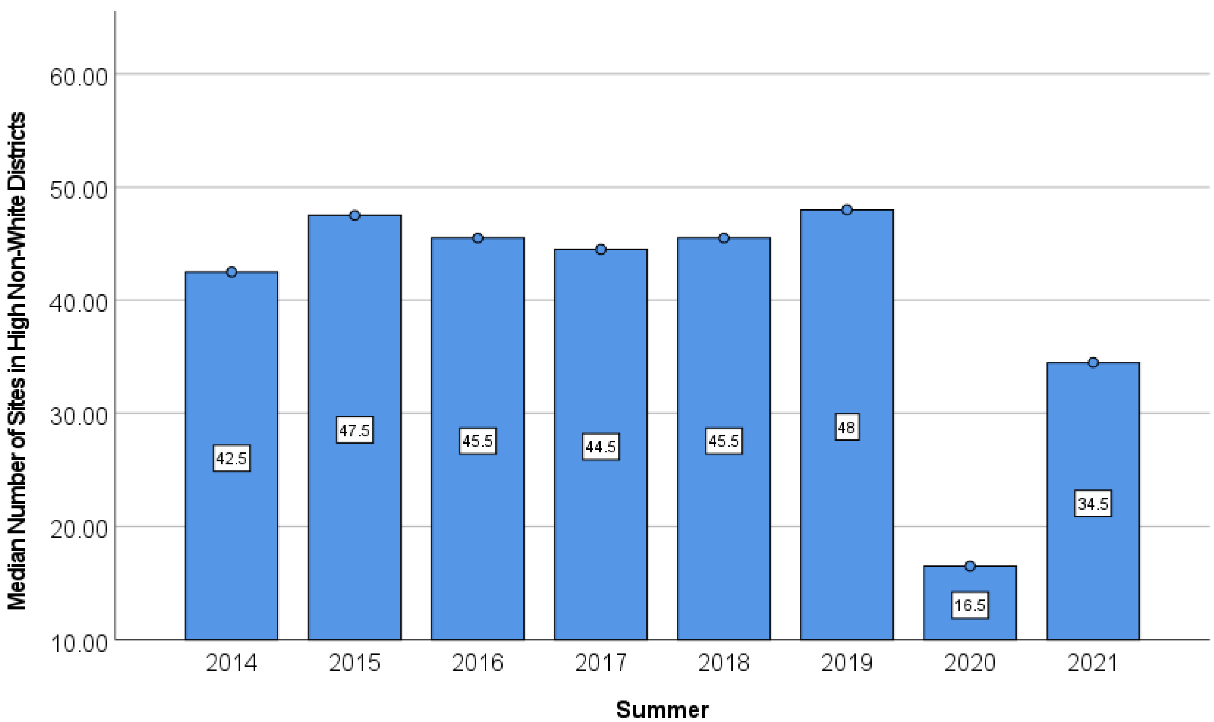

Figure J13: Bar Chart of the Median Number of Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of sites in high non-White districts differed significantly across the summers ($\chi(7) = 79.19$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to each summer without the waivers (Table J21).

Table J21: Median Differences in Number of Sites in High Non-White Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-23.50	<0.01
2015	-27.00	<0.01
2016	-28.50	<0.01
2017	-27.50	<0.01
2018	-28.50	<0.01
2019	-30.00	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Conversely, there was a significant median increase during the second summer of the waivers compared to the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and each summer without the waivers, except summer 2014 (Table J22), though the median differences were smaller in this comparison vs. the comparison between the first summer of the waivers and the summers without the waivers.

Table J22: Median Differences in Number of Sites in High Non-White Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-6.50	0.12
2015	-10.50	<0.01
2016	-8.50	<0.01
2017	-9.50	<0.01
2018	-11.50	<0.01
2019	-12.50	<0.01
2020	17.50	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Results for Number of Sites in High Enrollment Districts

The median number of sites in high enrollment districts was highest in the summer before the waivers (summer 2019) (Mdn = 48.00, IQR = 38.00-62.25) and lowest in the first summer of the waivers (Mdn = 16.50, IQR = 13.00-22.00) (Table J23).

Table J23: Descriptive Statistics for Number of Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[a]	IQR[b]
2014	42.50	34.50-51.75
2015	47.50	34.50-53.50
2016	45.50	34.50-53.50
2017	44.50	35.00-57.00
2018	45.50	37.25-57.50
2019	48.00	38.00-62.25
2020	16.50	13.00-22.00
2021	36.00	27.50-41.50

[a]Mdn = median.
[b]IQR = interquartile range.

The median was on appeared to be stable before the waivers (from summer 2014 to 2019) but then sharply decreased in the first summer of the waivers (summer 2020), followed by a sharp increase in the second summer of the waivers (summer 2021) (Figure J14).

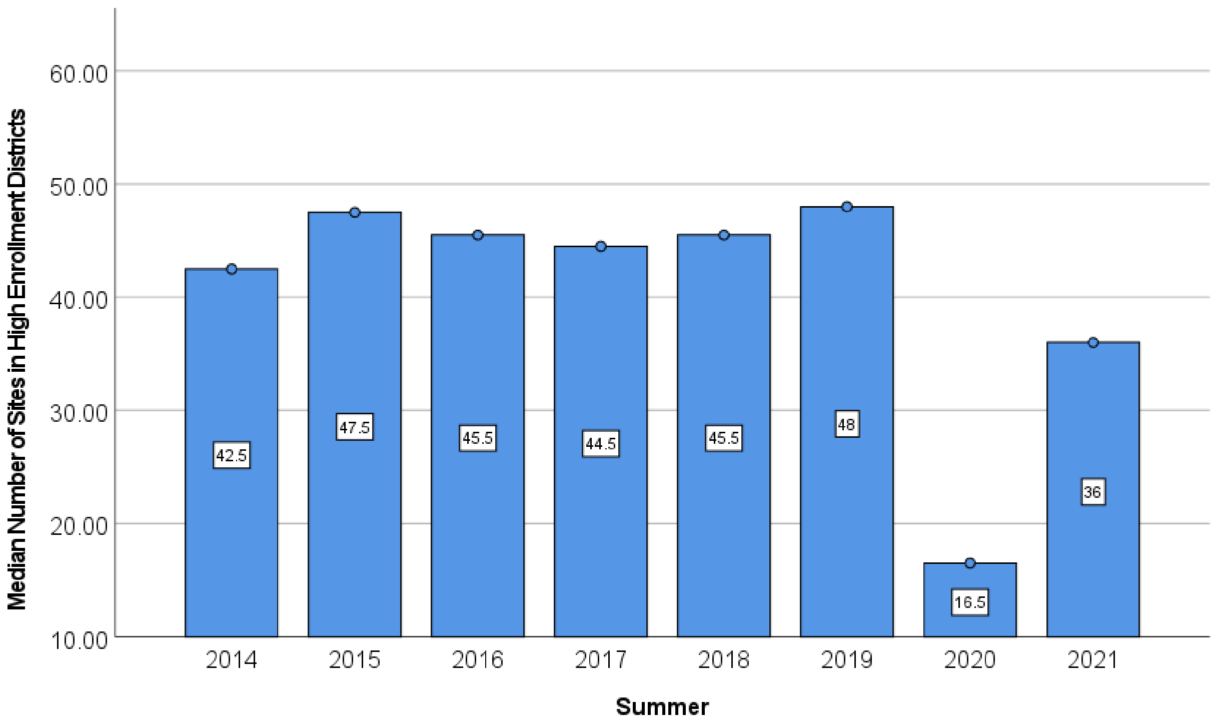

Figure J14: Bar Chart of the Median Number of Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of sites in high enrollment districts differed significantly across the summers ($\chi(7) = 74.52$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to each summer without the waivers (Table J24).

Table J24: Median Differences in Number of Sites in High Enrollment Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-23.50	<0.01
2015	-27.00	<0.01
2016	-28.50	<0.01
2017	-26.50	<0.01
2018	-28.50	<0.01
2019	-29.50	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Conversely, there was a significant median increase during the second summer of the waivers compared to the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and each summer without the waivers, except summer 2014 (Table J25), though the median differences were smaller in this comparison vs. the comparison between the first summer of the waivers and the summers without the waivers.

Table J25: Median Differences in Number of Sites in High Enrollment Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[a]	p[b]
2014	-5.50	0.21
2015	-10.00	0.03
2016	-8.50	<0.01
2017	-8.50	0.01
2018	-10.50	<0.01
2019	-12.00	<0.01
2020	18.00	<0.01

[a]Mdn D = median difference.
[b]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Results for Number of Open Sites in High Poverty Districts

The median number of open sites in high poverty districts was highest in summer 2015 (Mdn = 23.50, IQR = 19.25-29.25) and lowest in the second summer of the waivers (summer 2021) (Mdn = 14.00, IQR = 12.25-15.75) (Table J26).

Table J26: Descriptive Statistics for Number of Open Sites[a] in High Poverty Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[b]	IQR[c]
2014	21.50	16.00-30.00
2015	23.50	19.25-29.25
2016	17.50	15.25-24.00
2017	18.50	16.00-22.00
2018	20.00	16.25-24.00
2019	15.50	12.00-17.00
2020	15.50	9.25-18.75
2021	14.00	12.25-15.75

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn = median.
[c]IQR = interquartile range.

The median was on a decreasing trajectory overall from summer 2014 to summer 2019, but altered between increasing and decreasing trajectories during this time. The median number of open sites in high poverty districts then remained constant in the first summer of the waivers (summer 2020), followed by a decrease in the second summer of the waivers (summer 2021) (Figure J15).

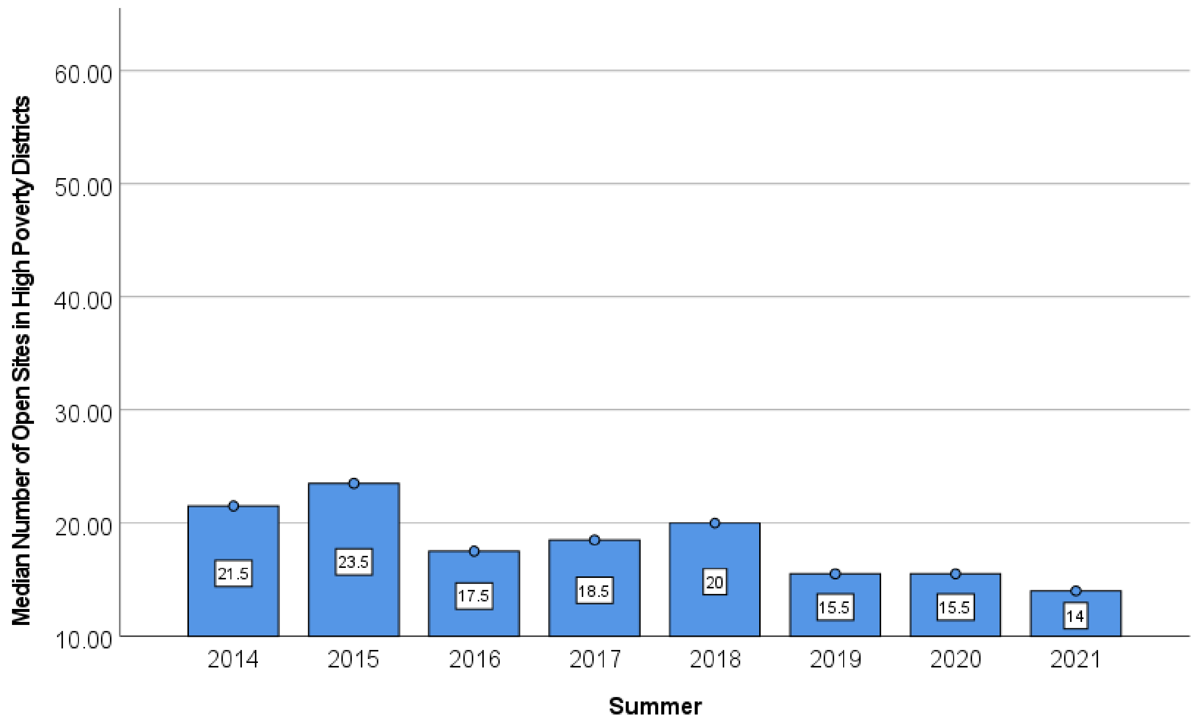

Figure J15: Bar Chart of the Median Number of Open Sites in High Poverty Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of open sites in high poverty districts differed significantly across the summers ($\chi(7) = 68.47$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to summers 2014, 2015, and 2018; however, there were no significant differences between the first summer of the waivers and summers 2016, 2017, and 2019 (Table J27).

Table J27: Median Differences in Number of Open Sites[a] in High Poverty Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-7.50	<0.01
2015	-10.50	<0.01
2016	-5.50	0.21
2017	-6.00	0.98
2018	-5.50	0.03
2019	-2.00	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

There was no significant difference between the second summer of the waivers and the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table J28).

Table J28: Median Differences in Open Sites[a] in High Poverty Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-8.00	<0.01
2015	-10.50	<0.01
2016	-5.00	<0.01
2017	-5.00	<0.01
2018	-7.00	<0.01
2019	-2.50	1.00
2020	-1.00	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Results for Number of Open Sites in High Non-White Districts

The median number of open sites in high non-White districts was highest in summer 2015 (Mdn = 23.50, IQR = 19.25-29.25) and lowest in the first summer of the waivers (summer 2020) (Mdn = 13.50, IQR = 8.25-18.75) (Table J29).

Table J29: Descriptive Statistics for Number of Open Sites[a] in High Non-White Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[b]	IQR[c]
2014	22.50	16.00-30.00
2015	23.50	19.25-29.25
2016	18.50	15.25-24.00
2017	19.00	16.00-22.75
2018	21.00	17.25-24.00
2019	15.50	12.00-17.00
2020	13.50	8.25-18.75
2021	14.00	12.00-15.75

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn = median.
[c]IQR = interquartile range.

The median was on a decreasing trajectory overall from summer 2014 to summer 2019, but altered between increasing and decreasing trajectories during this time. The median number of open sites in high non-White districts then continued to decrease in the first summer of the waivers (summer 2020), followed by an increase in the second summer of the waivers (summer 2021) (Figure J16).

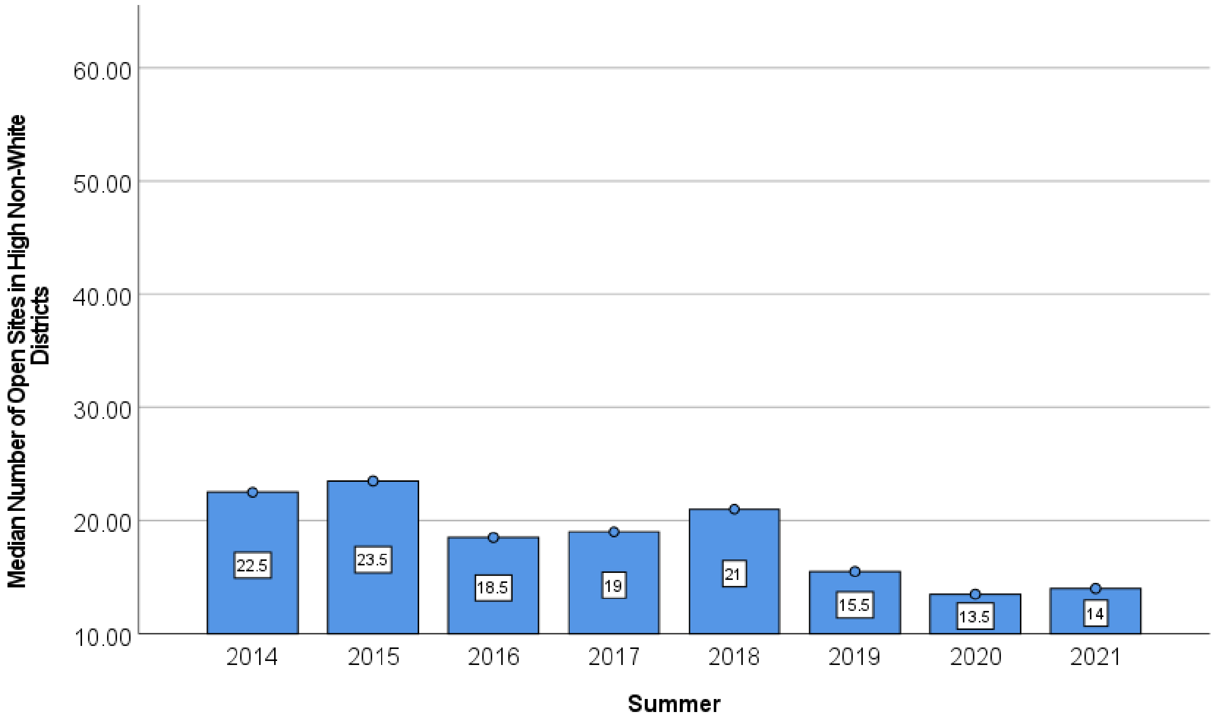

Figure J16: Bar Chart of the Median Number of Open Sites in High Non-White Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of open sites in high non-White districts differed significantly across the summers ($\chi(7) = 69.50$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to summers 2014, 2015, and 2018; however, there were no significant differences between the first summer of the waivers and summers 2016, 2017, and 2019 (Table J30).

Table J30: Median Differences in Number of Open Sites[a] in High Non-White Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-8.00	<0.01
2015	-11.00	<0.01
2016	-6.00	0.21
2017	-6.00	0.98
2018	-6.50	0.01
2019	-2.50	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

There was no significant difference between the second summer of the waivers and the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table J31).

Table J31: Median Differences in Open Sites[a] in High Non-White Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-8.00	<0.01
2015	-10.50	<0.01
2016	-6.50	<0.01
2017	-5.50	<0.01
2018	-7.50	<0.01
2019	-2.50	1.00
2020	0.00	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Results for Number of Open Sites in High Enrollment Districts

The median number of open sites in high enrollment districts was highest in summer 2015 (Mdn = 23.50, IQR = 19.25-29.25) and lowest in the first summer of the waivers (Mdn = 13.50, IQR = 8.25-18.75) (Table J32).

Table J32: Descriptive Statistics for Number of Open Sites[a] in High Enrollment Districts, Summers 2014-2021 (n = 16)

Summer	Mdn[b]	IQR[c]
2014	22.50	16.50-30.00
2015	23.50	19.25-29.25
2016	18.50	16.25-24.00
2017	19.00	16.00-22.75
2018	21.00	17.25-24.00
2019	16.00	12.00-17.00
2020	13.50	8.25-18.75
2021	14.00	12.00-15.75

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn = median.
[c]IQR = interquartile range.

The median was on a decreasing trajectory overall from summer 2014 to summer 2019, but altered between increasing and decreasing trajectories during this time. The median number of open sites in high enrollment districts then continued to decrease in the first summer of the waivers (summer 2020), followed by an increase in the second summer of the waivers (summer 2021) (Figure J17).

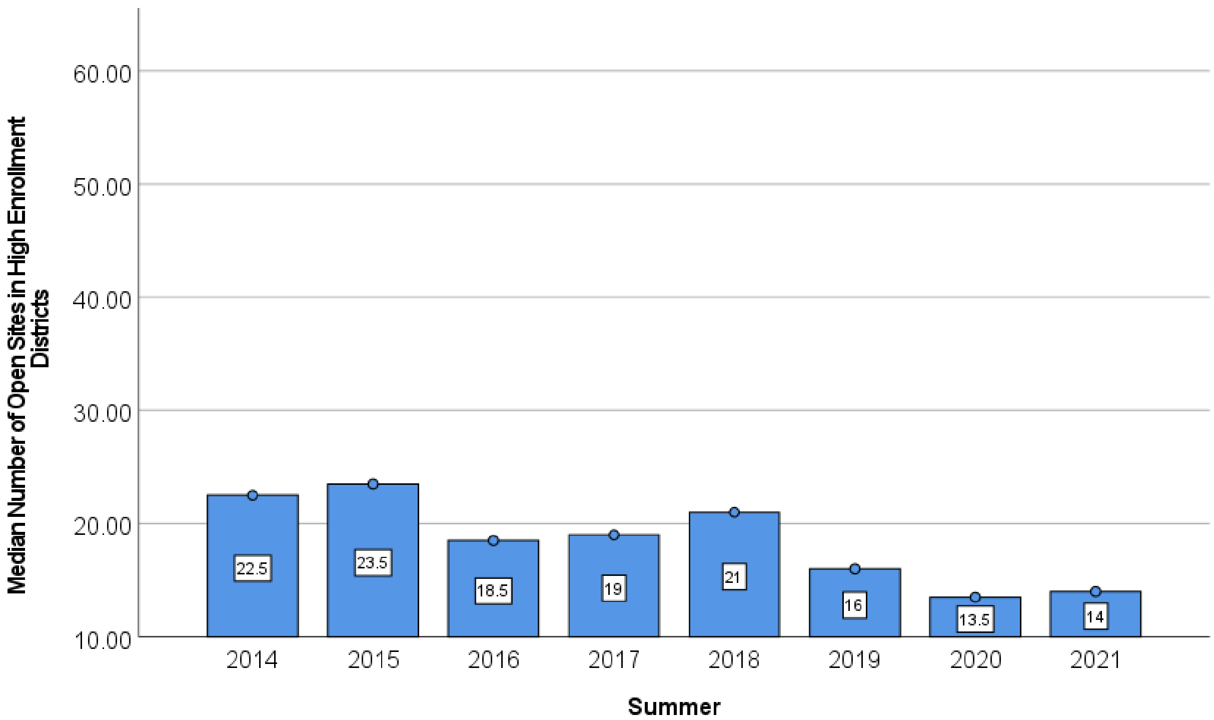

Figure J17: Bar Chart of the Median Number of Open Sites in High Enrollment Districts, Summers 2014-2021 (n = 16)

In the Friedman test, the median number of open sites in high enrollment districts differed significantly across the summers ($\chi(7) = 70.26$, $p < 0.001$). In the sign test with the Bonferroni adjustment, there was a significant median decrease in the first summer of the waivers compared to summers 2014, 2015, and 2018; however, there were no significant differences between the first summer of the waivers and summers 2016, 2017, and 2019 (Table J33).

Table J33: Median Differences in Number of Open Sites[a] in High Enrollment Districts, Summer 2020 vs. Summers 2014-2019 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-8.00	<0.01
2015	-11.00	<0.01
2016	-6.50	0.21
2017	-6.00	0.98
2018	-6.50	0.01
2019	-2.50	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

There was no significant difference between the second summer of the waivers and the first summer of the waivers. There was a significant median decrease between the second summer of the waivers and each summer without the waivers, except summer 2019 (Table J34).

Table J34: Median Differences in Number of Open Sites[a] in High Enrollment Districts, Summer 2021 vs. Summers 2014-2019 and Summer 2020 (n = 16)

Summer	Mdn D[b]	p[c]
2014	-8.00	<0.01
2015	-10.00	<0.01
2016	-6.50	<0.01
2017	-5.00	<0.01
2018	-7.00	<0.01
2019	-2.50	1.00
2020	0.00	1.00

[a]Open sites are sites that serve all eligible participants, i.e., they are open to all.
[b]Mdn D = median difference.
[c]p = p-value; due to the Bonferroni adjustment, SPSS caps the p-values at 1.00 when the p-value after adjustment exceeds 1.00.

Appendix K: Maps of Sites and Open Sites

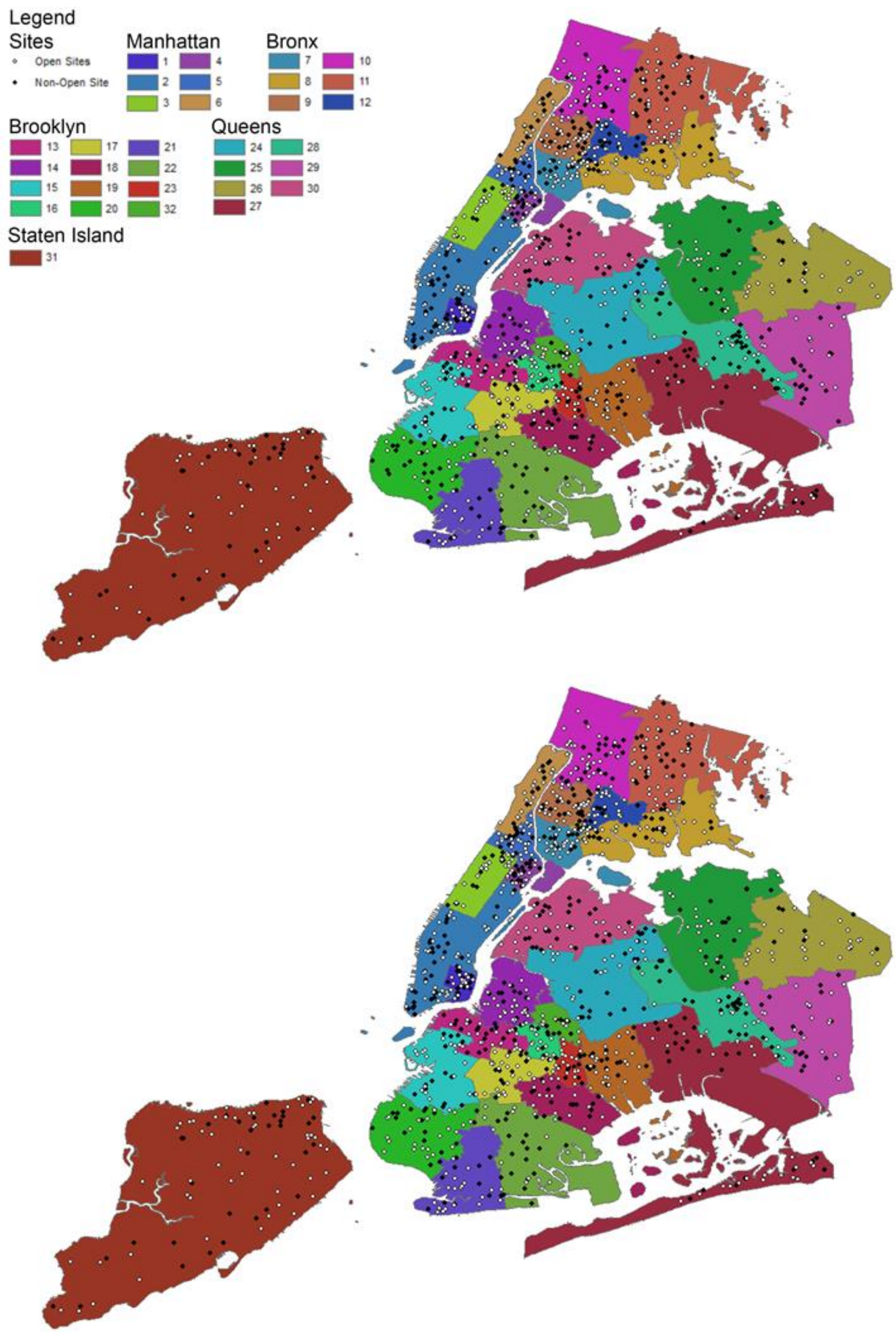

Figure K1: Map of Sites and Open Sites in NYC DOE Geographic Districts, Summers 2014 and 2015

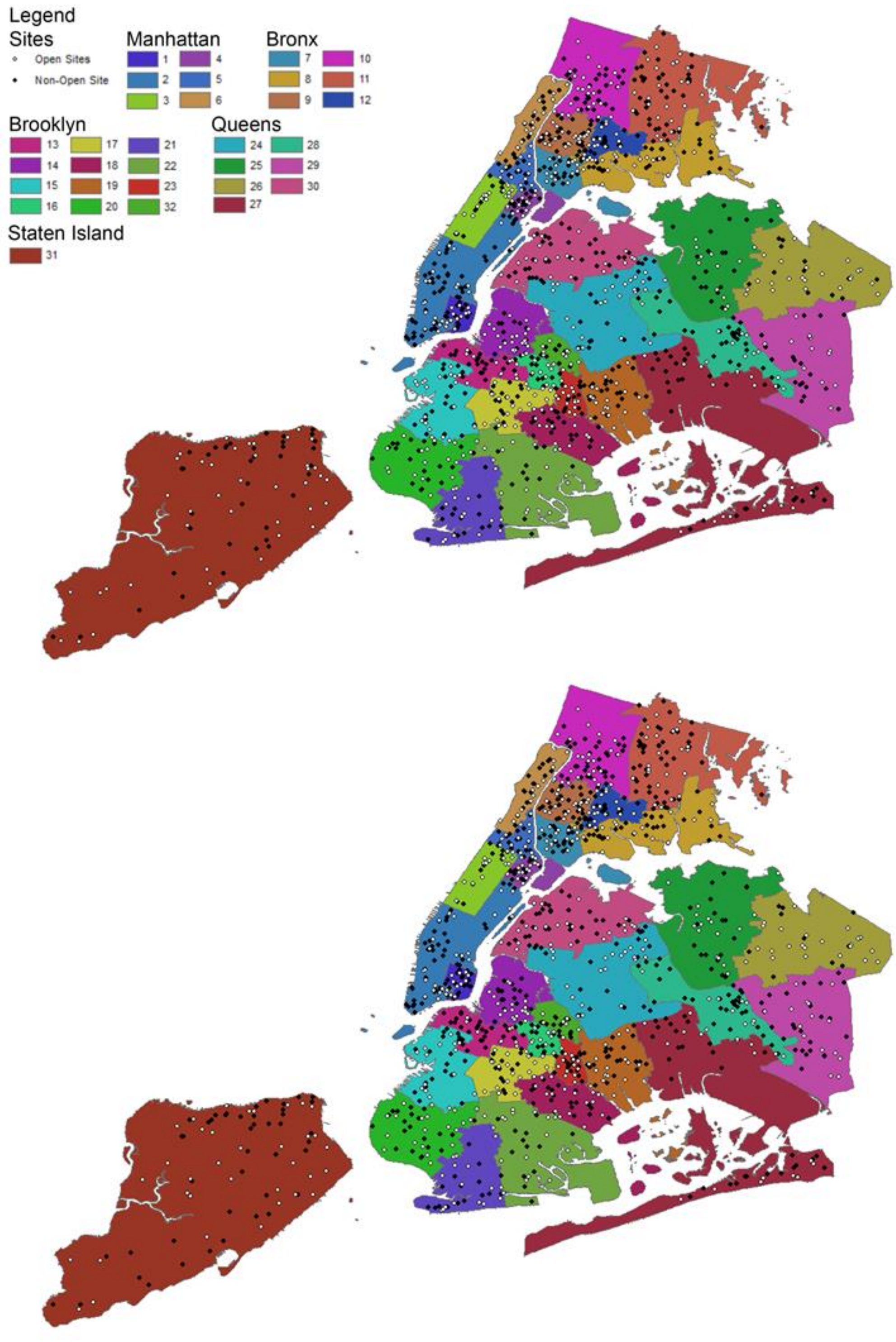

Figure K2: Map of Sites and Open Sites in NYC DOE Geographic Districts, Summer 2016 and 2017

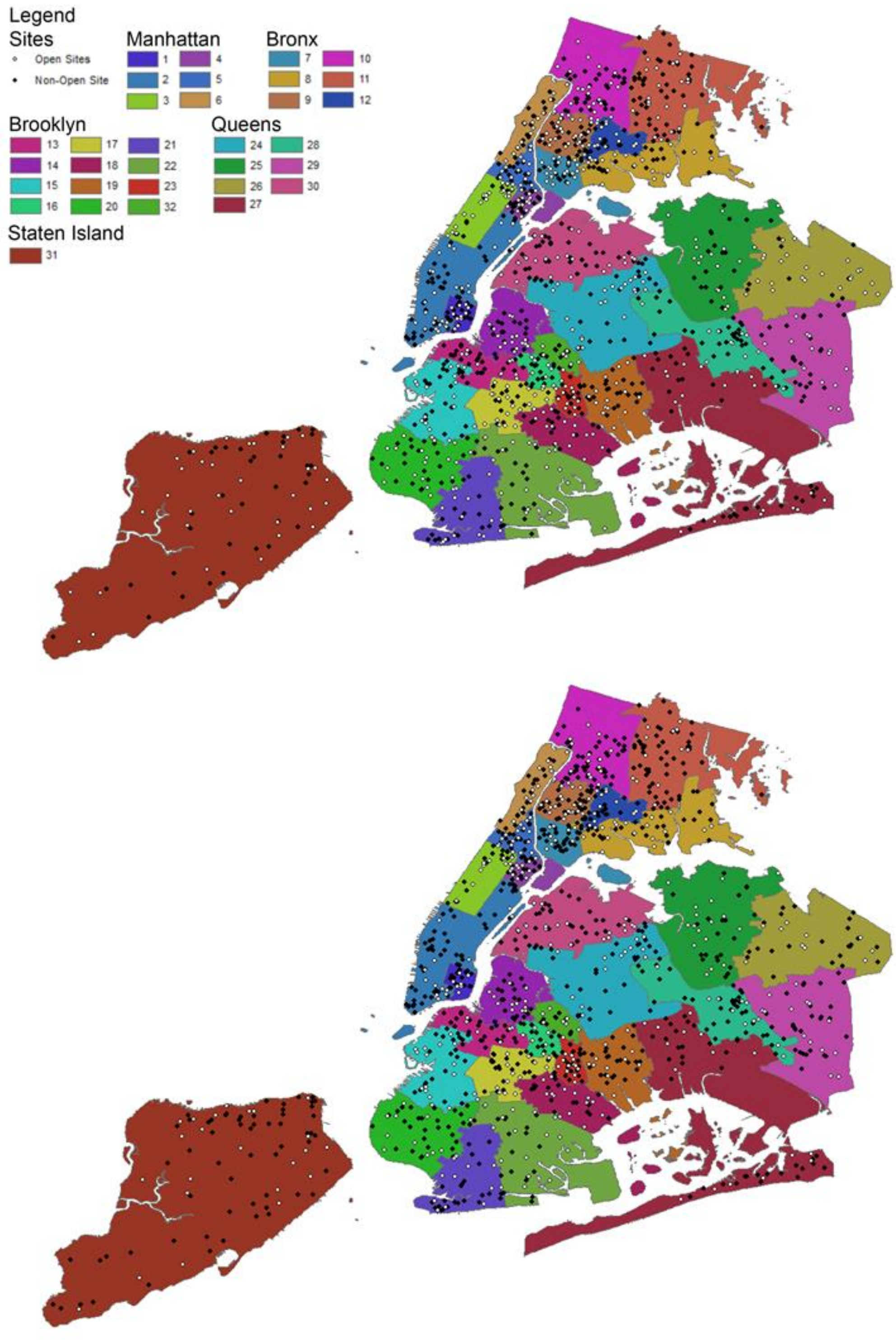

Figure K3: Map of Sites and Open Sites in NYC DOE Geographic Districts, Summer 2018 and 2019

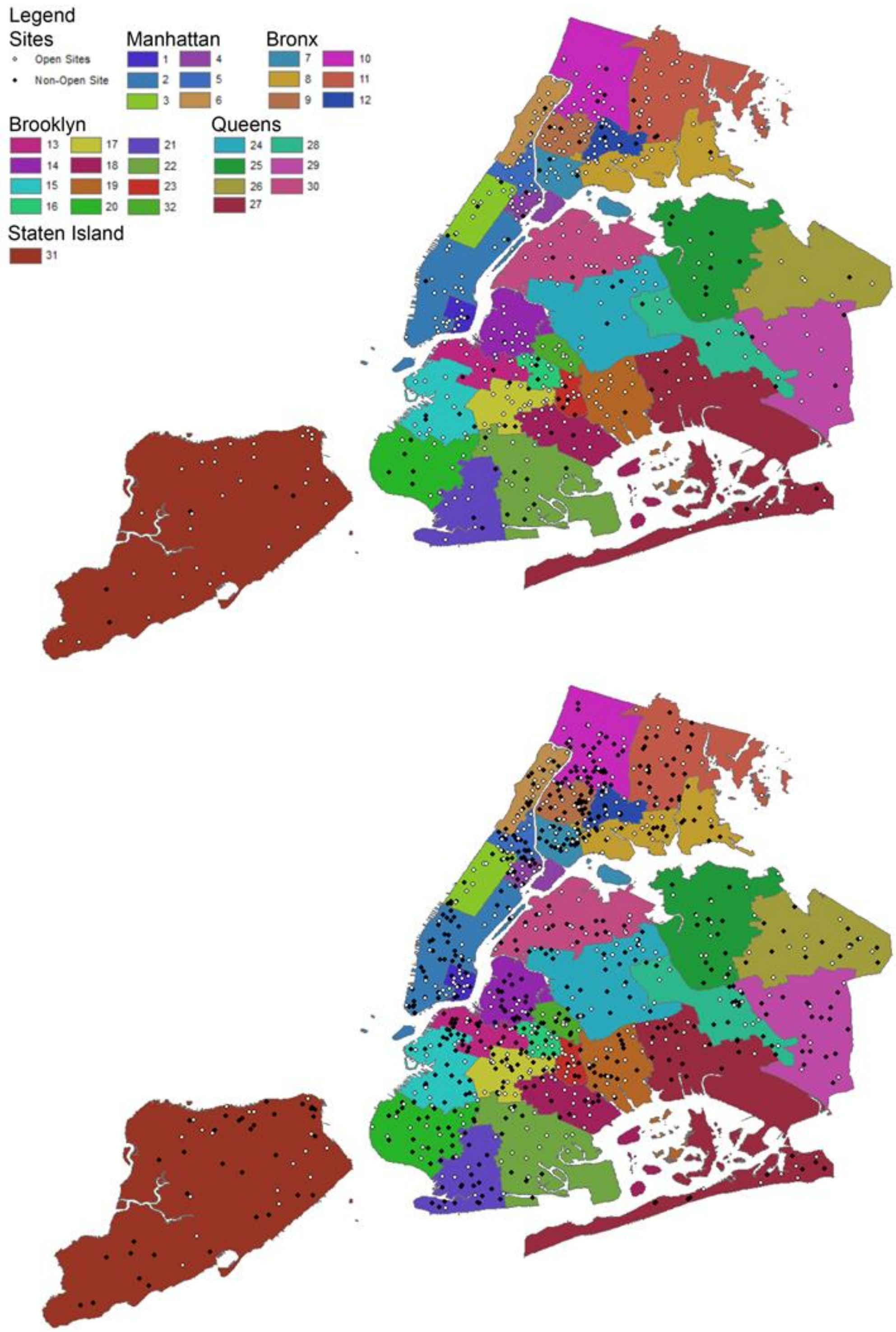

Figure K4: Map of Sites and Open Sites in NYC DOE Geographic Districts, Summer 2020 and 2021

Appendix L: Key Takeaways from Key Informant on the Waivers in NYC

At the beginning of the study, there was a plan to conduct semi-structured interviews with key informants on the waivers in NYC. However, only one key informant consented to participate in the study. Twenty-two people were sent a recruitment email; one individual agreed to participate; three people declined, stating that they did not work with the waivers/school meals; two people declined with no reason; and 16 people did not respond to the email and a follow-up email. The low recruitment prevented a thematic analysis. Instead, the table below presents key takeaways and quotes from the one key informant interview.

Appendix L: Key Takeaways and Quotes from the Key Informant Interview

Key Takeaway	Quotes
1. The waivers may have been helpful for SFSP participation and site accessibility.	"I think, just in general, participation was strong during the first year of the summer meals program during the pandemic." "I would say that obviously the waiver for area eligibility increased the access because of the fact that we didn't have to worry about being a community that would have qualified for 51% or more of the poverty." [On the Meal Service Time Flexibility Waiver] "And in New York [City], I think you have pretty good access. Usually less than half a mile away from anyone's given residence, there's usually a community feeder open. So, if that's the case, I think you can come to get, you know, the separate meals. I don't think you need to be picking up breakfast and lunch together. That's one argument. The other argument is that it's nice to be able to pick up breakfast and lunch because, you know, then you'd be able to eat the breakfast maybe the next day."
2. The Parent/Guardian Meal Pickup Waiver had unintended, undesirable effects, while the Area Eligibility Waiver may have unintended, desirable effects.	"…it might have been parents that were saying they were picking up for a student but didn't necessarily. So, we have no way of knowing that, but you know that might have been an unintended consequence that meals went to adults instead of children." [On the Area Eligibility Waiver] "Even though it might not be needed, based on the economics, I think that it's still a benefit, and it's an option to get [school meals] in front of communities that may or may not participate."

Key Takeaway	Quotes
3. The Parent/Guardian Meal Pickup Waiver made implementation more difficult, but the other waivers made implementation easier.	[On the Non-Congregate Feeding Waiver] "It just makes it easier… not having to rope off a specific area that people have to eat in, in a supervised fashion." [On the Meal Service Time Flexibility Waiver] "…not having to worry about the separation of time between breakfast ending and lunch starting might have made things a little easier for operations." "…the parent guardian pick up, it might have been the only other thing that might have been challenging was limiting the number of meals." [On the Area Eligibility Waiver] "…maybe it would reduce costs, you know, because the fact that you wouldn't have to go through those exercises [exercises referring to determining which areas are eligible because there are enough children living in poverty]..."
4. The impacts of the waivers were confounded by other factors.	"…[OFNS was] feeding the community as well…" "I think you might have had more of a new participation during the first couple years of the pandemic when we had adults being served with the students, so you might have had families that normally did not access the meals because of the nature of the pandemic, so especially in 2020… and they probably were the most, the most in need that showed up those early years." "Your research, you know, in my opinion has to take into account the pandemic and what version of the pandemic New York City schools was serving under… and the operations… versus just the waiver itself. You know, and that's going to be hard, I think, a little bit hard to distinguish between what was the benefit of the waiver versus what was the benefit of an operational decision?"
5. There is a desire to keep some of the waivers.	"…if the district's in CEP, there should be some accommodation for sort of saying that if you are a community eligibility district, and you're providing free meals for your students during the regular school year, the area eligibility should be waved during the summer as well, so that you can continuously service the same population." "[The Non-Congregate Feeding Waiver is] important to allow for maximum flexibility during the summer, for the meals to be taken by the students and consumed wherever they might be. Not so much for parent and guardian meal pick up. Again, because I think you know, the point of the program is to go to the students. And the last one with the meal service time, I think, there, you know, as a dietitian, you might be in agreement that, you know, there is a reason for sort of having a spread."