The Effect of Subsidized School Meals on Student Academic Outcomes: Evidence from the Medicaid Direct Certification Policy

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Take up of social programs is incomplete and varies widely across contexts. For instance, the U.S. cash welfare program, temporary assistance to needy families (TANF) has an estimated take-up rate of approximately 20% (Ko and Moffitt 2022), while the food stamps program (SNAP) has a take-up rate of nearly 80%. A growing body of literature illustrates how complex application procedures, recertification costs, and other administrative hurdles create substantial barriers to participating in social programs (e.g. Herd and Moynihan 2019; Homonoff and Somerville 2021; etc.) and that reducing such hurdles can lead to increases in take-up (e.g. Finkelstein and Notowidigdo 2019).

In this paper, we investigate the impact of reducing application hurdles on program take-up and downstream outcomes in the context of the National School Meals Program (NSMP), which is the second-largest food program in the U.S., serving lunches to more than 30 million children each year. Students can receive free meals in school if their family income is below 130% of the federal poverty line and reduced-price meals if their family income is below 185% of the federal poverty line.[2] Students typically certify their eligibility for subsidized meals either by filling out paperwork with the school each year verifying their family income, or through what is known as "direct certification". Direct certification allows students to automatically qualify for subsidized meals if they participate in means-tested programs such as food stamps or TANF and has become an important share of all students on subsidized meals in recent years.[3] Despite efforts over the last decade to streamline the application process for subsidized meals through direct certification, take-up of subsidized meals is incomplete and estimated to be approximately 80%.

In an effort to further increase take-up of subsidized meals, the USDA started demonstration projects to include Medicaid, the public health insurance program, as an additional direct certification program (Medicaid DC). [4] In our setting, the state of Michigan,

[2] We refer to students who were eligible for and certified for the subsidized (free or reduced-price) school meals program, either through direct certification or by manually filling out forms verifying their income, as those who "certify for" school meals. We refer to economically disadvantaged students who may be eligible, but do not participate in the program as "eligible non-participants". In our data, we do not have information on daily meal intake, so we avoid using the term "receive" to refer to students who participate in the subsidized meals program.
[3] Direct certification is a process by which administrative agencies automatically determine whether a student is eligible for subsidized meals. Students who directly certify can claim subsidized meals without having to fill out paperwork to verify their income.
[4] See for more information on the USDA demonstration project here: https://www.fns.usda.gov/cn/direct-certification-medicaid-demonstration-project

Medicaid became a direct certification program in the 2017-18 school year. Because of Medicaid DC, students who participate in Medicaid no longer need to fill out paperwork to certify their eligibility for subsidized meals, reducing their administrative barriers to certifying eligibility for subsidized meals. Instead, verification of income occurs at the state agency level, with the Michigan Department of Health and Human Services (MDHHS) sharing a list of eligible students with the state education agency each month. Schools then notify parents of their children's eligibility for subsidized meals.

Leveraging this policy change, we use student-level administrative education data matched to administrative health and human services data to investigate the causal impact of reducing hurdles to accessing subsidized school meals on student achievement.[5] We note that this policy change does not change the income criteria for subsidized meals—all of the children who gain access to subsidized meals because of Medicaid DC would have been income-eligible in the absence of the policy change—instead, Medicaid DC simplifies the process of applying for subsidized meals for students on Medicaid. In theory, if take-up of subsidized meals were 100%, Medicaid direct certification would have no impact on the number of students on subsidized meals. Instead, as we will show, including Medicaid as a direct certification program resulted in a large increase in the number of students who newly certified for subsidized meals in the year after the policy change was introduced, providing a unique opportunity to study the causal impact of gaining access to such meals on student achievement.

This policy change could potentially improve student achievement through two main channels, namely through changes in access to food and through changes in money. These changes potentially operate at the individual as well as the school/district level. At the individual level, Medicaid DC could have a positive effect on student achievement through improved nutrition – both in terms of the nutritional content of meals themselves, or potentially through additional caloric intake for students who may be undernourished. Through the income channel, Medicaid DC could also improve achievement by increasing family income through savings gained by not having to pay for or provide lunch (and breakfast). On the other hand, subsidized meals could also negatively impact students if the quality of the food provided is worse than the quality of food brought from home.

[5] School meals may include both free and reduced-price lunch as well as breakfast.

Medicaid DC also leads to important changes at the school and district level that could impact student achievement. Because Medicaid DC increases the share of students within a school who are eligible for subsidized meals, some schools and districts may become newly eligible for the federal Community Eligibility Provision (CEP), which allows schools to serve free meals to all students within a school (or district) if a sufficient share of their population is directly certified for free meals. This could lead to an increase in access to food as well. Finally, state funding formulas in Michigan rely on the number of economically disadvantaged students (which is based on the number of students on subsidized meals, among other criteria) within a school for allocating Section 31a funding, which is earmarked for helping at-risk students improve achievement. If schools experience an increase in the number of students considered "economically disadvantaged" due to Medicaid DC, this could lead to increases in school spending, which could impact student achievement.

This study fills several important gaps in the literature. First, ours is the first to evaluate the impact of Medicaid direct certification on student outcomes. In recent years, several states have begun including Medicaid as a direct certification program for subsidized meals (Hulsey et al. 2019), but to our knowledge, there is no evidence on how its inclusion has impacted student achievement. Second, we study the impact of a policy change designed to increase take-up of subsidized meals among students eligible for the program but who were not previously participating. Previous work studying the causal impact of the NSLP on student outcomes—and of social policy programs more broadly—focuses on the impact of expanding eligibility or introducing new programs. Finally, this study evaluates the direct impact of gaining individual access to subsidized meals. Nearly all the previous work studying the impact of subsidized meals on student achievement analyzes the impact of schoolwide policies such as CEP or other universal free meal policies that primarily affect students in high-poverty schools. Our work builds on prior research by analyzing the impact of a policy designed to increase *individual* access among those already eligible, compared to a *schoolwide* initiative to expand eligibility. This will allow us to consider which type of policy might be more effective in improving student outcomes and also allow us to investigate heterogeneous effects of gaining access to subsidized meals according to the school environment.

We show that including Medicaid as a direct certification program in the state of Michigan led to a substantial increase in the share of students transitioning onto the subsidized

meals program. The share transitioning on to subsidized meals nearly doubles in magnitude from about 3% of all students on average in prior years to 6% in the 2017-18 school year, when the program is introduced. This increase in the share of students certified eligible for subsidized meals leads to a modest increase in the total number of meals served at the school level, as well as a shift from paid to subsidized meals. This suggests that gaining access to subsidized meals might affect student outcomes both through an income effect—reducing families' out of pocket costs of providing meals—and through a nutrition effect, by changing the source of meals.

Our analyses on student achievement find positive effects of gaining access to subsidized meals on ELA scores by about 0.02 standard deviations, but no impact on math scores in the overall sample. Effects are primarily driven by Asian students and students with limited English proficiency (LEP), for whom we observe positive effects for both math and ELA scores that range from 0.05 to 0.10 standard deviations. These students are disproportionately impacted by the introduction of Medicaid direct certification, as they tend to be less connected to other safety net programs, such as food stamps, that would have directly certified them for subsidized meals prior to the policy change. We hypothesize that these groups are disproportionately impacted by Medicaid direct certification either because they are not eligible for other direct certification programs, either due to income or immigration-related restrictions on those programs, and they are less likely to fill out the forms verifying their income because of lack of information or language barriers in the application process.

In addition to finding larger effects for Asian and LEP students, we also find that effects are largest among students in higher-poverty settings: those who spent the majority of their childhoods on Medicaid, who live in high-poverty neighborhoods, and who attend high-poverty schools. We find null effects of gaining access to subsidized meals among students in the lowest-poverty neighborhoods and schools. In preliminary analyses, we believe that these positive effects in high poverty schools are driven by increases in state funding as a result of more students transitioning onto subsidized meals due to Medicaid direct certification, which led to a significant increase in per-pupil instructional spending.

Together, our results provide evidence that simplifying the process of applying for subsidized meals can lead to a large increase in access to subsidized meals and can improve student achievement, particularly for students who have less connection to social safety net programs such as food stamps and cash welfare. However, our results also indicate that positive

effects on student achievement are primarily concentrated in higher-poverty settings; improving outcomes for students in low-poverty settings will require other types of policy interventions.

Background

National School Lunch Program

The National School Lunch Program is the second-largest food assistance program in the U.S, serving lunches to 30 million students each year for a federal cost of about $14 billion (United States Department of Agriculture Food and Nutrition Service 2018). Students can receive a free (reduced-price) meal in school if their monthly family income is less than 130% (185%) of the federal poverty line for their family size (rules are the same for the National School Breakfast Program where available). For a family of four, 185% of the federal poverty line was approximately $57,000 in 2023. Students become eligible for subsidized meals either by filling out forms to verify their monthly family income, or by directly certifying their eligibility through participation in other means-tested public assistance programs. In 2023, over half (54%) of all students enrolled in public schools were certified eligible for free or reduced-price meals in Michigan public schools.[6]

Direct certification has grown into an important component of the subsidized meals program over the last 15 years, relying on communication between state administrative agencies to exchange relevant information on students' economic circumstances and reducing the burden on families to submit forms to prove their eligibility for the program. Historically, students could be directly certified for subsidized meals if they also received food stamps (SNAP), cash welfare (TANF), were homeless, a migrant, or a foster child. In the 2017-18 school year, Medicaid was added to the direct certification process in Michigan, such that any child receiving Medicaid could qualify for free or reduced-price meals in school without filling out paperwork to verify their income.

This change in policy affected students on Medicaid who did not previously fill out the paperwork to apply for subsidized meals and who were not participating in another direct

[6] Estimate from the Annie E Casey Foundation. https://datacenter.aecf.org/data/line/1672-students-who-are-economically-disadvantaged-previously-students-eligible-for-free-or-reduced-price-lunch?loc=24&loct=2#2/24/false/2048,574,1729,37,871,870,573,869,36,868/asc/any/13159

certification program (SNAP or TANF), which would have automatically enrolled them in free meals. Recent work suggests that about two-thirds of children who are enrolled in Medicaid also receive food stamps (Schmidt, Shore-Sheppard, Watson 2021). The population we study here thus represents the one-third of children on Medicaid who do *not* receive SNAP.[7] However, we cannot say for certain whether these students are eligible for other programs like SNAP. It may be the case that students who are certified through Medicaid are those who are less well-connected to social services; individuals are often signed up for Medicaid when they have a medical crisis.[8] In Michigan, estimates suggest that 95% of eligible children participate in a Medicaid/CHIP program and 90% of eligible individuals participate in SNAP.[9] It might also be the case that these students reside in households with incomes between 130% and 185% of poverty, which would qualify them for reduced-price meals but not SNAP or TANF. Thus, these students may be slightly different from other students who directly certify for free meals.

Under Medicaid direct certification, unlike SNAP or TANF, where all students whose families are on those programs are income-eligible for a free meal, the Michigan Department of Health and Human Services must verify that student's incomes are below 185% of poverty to be eligible for subsidized meals. This income verification must happen because children in Michigan can participate in a Medicaid program (Medicaid or Children's Health Insurance Program) if their families have incomes up to approximately 217% of the federal poverty line. But importantly, this change does not add any burden on the part of the student or student's family to verify income, as it is done by the administrative agencies.

The Medicaid direct certification policy change presents an opportunity to evaluate how exposure to subsidized meals affects students' achievement. In the absence of policy changes, it is extremely challenging to distinguish between the effect of exposure to the subsidized meal program from economic disadvantage itself, because students typically become eligible for subsidized meals when they experience a negative shock to their household income. In the case of Medicaid direct certification, many students became newly eligible for subsidized meals, not because of a shock to household income, but due to the change in direct certification policy. This

[7] Our sample also represents students who were not on cash welfare, but this is an extremely small share of students in a given year (~1%).
[8] For example, hospitals are allowed to presume eligibility for Medicaid when treating patients, a mechanism that can link people to Medicaid https://www.medicaid.gov/state-resource-center/faq-medicaid-and-chip-affordable-care-act-implementation/downloads/faqs-by-topic-hospital-pe-01-23-14.pdf
[9] See, https://www.fns.usda.gov/usamap/2019#

allows us to disentangle the economic disadvantage effect from the effect of gaining access to subsidized meals, allowing us to directly estimate the causal impact of the subsidized meals program on student achievement.

Conceptual framework

How might subsidized meals affect student achievement? On the one hand, subsidized meals may improve student achievement through both an income effect as well as a nutrition effect. For students who were already eating school meals, certifying eligible for free or reduced-price meals lowers their out-of-pocket costs. The average price of a school lunch in Michigan is about $2 per meal, so if students previously purchased all their lunches at school, this would save approximately $360 per year (about 1% of income for a family of four in 2020 earning $34,000, or 130% of poverty). For students who were not previously receiving lunch from school, cost savings could be higher if families were spending more than $2 per meal on food brought from home. In addition to saving time and money on preparing food for school lunches, access to subsidized meals may also improve nutrition if the quality of school food is better than the quality of food brought from home. Improved nutrition could also increase test scores.

On the other hand, we might find a null or negative effect of subsidized meals on student outcomes through a stigma effect, or if the quality of the food is worse than the quality of the food that students were previously eating (or if they were simply more likely to eat the food). Previous research highlights the negative stigma associated with receiving subsidized meals (e.g., Poppendieck 2010), suggesting that offering free meals to all students within a school can reduce stigma and school disciplinary outcomes (Domina et al. 2023; Gutierrez 2020). In schools that do not offer free meals to all students, gaining individual access to subsidized meals might call attention to a student's economic disadvantage and negatively impact their social well-being in school. Finally, even if a student certifies their eligibility for subsidized meals in school, it does not necessarily mean that they will consume school meals. This might lead to a null or even a negative effect of Medicaid direct certification on student achievement, if the policy change does not induce a change in school meals consumption, and if the certification leads to an increase in stigma and bullying.

Unfortunately, we lack individual-level information on school meals consumption, nor do we have information from point of service (POS) data that indicates whether an individual

student took a school meal. Instead, we will rely on aggregate, school-level data to indicate whether the change in Medicaid direct certification led to an overall increase in the number of meals, particularly the number of free meals, served within a school. Assessing how the number and type of meals served changed within schools over time will provide a sense of how the policy change affected participation in the school meals program (i.e., the total number of meals served) versus a change in the price of meals (i.e., a shift from paid to free or reduced-price meals) and will shed light on potential mechanisms through which the policy change may impact student outcomes. If the total number of meals served increases due to the policy change, we can infer that there may have been some change in nutrition quality associated with Medicaid direct certification (positive or negative), as students shift from bringing meals from home to eating meals provided by the school. If the total number of meals served does not change but there is a shift from paid to free meals, we can infer that the impact of the Medicaid direct certification policy might be driven by changes in the costs of meals that families face.

Beyond affecting access to and costs of food, gaining access to subsidized meals could also affect students through school finance channels. State funding formulas provide revenue to districts based on the number of economically disadvantaged students enrolled in the district. Including Medicaid as a direct certification program may increase the number of students flagged as "economically disadvantaged", which means that schools should receive extra funding to support these additional disadvantaged students. If schools use this additional revenue in ways that benefit students, such as through increased instructional expenditures, we may observe an increase in student achievement through this school finance effect.

Additionally, increasing the number of economically disadvantaged students within a school or district also has implications for the Community Eligibility Provision (CEP). CEP is a federal program that allows higher-poverty schools and districts to serve free meals to all students within a school or district.[10] During our analyses time-period, schools or districts with at least 40% of students directly certifying for subsidized meals were eligible to apply for the program. Districts can apply as an entire district, or a subset of schools can apply for CEP, so long as the average direct certification rate (also referred to as the individual student percentage

[10] Note, the Medicaid direct certification policy increases the number of students who are eligible for subsidized meals affecting the likelihood that schools will adopt CEP. We are also planning to examine the effects of the policy on CEP take-up and using that variation to study the impacts on student achievement in future work related to this grant.

or ISP) is at least 40%. Districts are reimbursed by the federal government for the costs of meals according to their ISP rate; they receive 1.6 multiplied by the ISP rate to determine the fraction of costs that are reimbursed by the federal government. For instance, a district with a 40% ISP would receive federal funding to reimburse 64% of the costs of providing free meals to all students within the district. For districts with an ISP of 62.5% or higher, the federal government will reimburse 100% of the costs of providing free meals to all students. Because of the way the federal reimbursement schedule is structured, schools that were already enrolled in CEP at the time of Medicaid direct certification could receive additional federal funding if Medicaid direct certification increases the ISP and the ISP is below 62.5% prior to Medicaid direct certification. Similar to the school finance effect described above, this could lead to an improvement in student achievement if schools use the additional revenue in ways that are beneficial for children. Importantly, these two channels also illustrate why we might observe improvements in student outcomes even in schools that were already providing free meals to all students within the school.

Finally, Medicaid direct certification could also affect schools' and districts' eligibility for CEP itself, which may affect student achievement more broadly within a school, not just those who are directly affected by Medicaid direct certification. Since Medicaid direct certification is likely to increase a school or district's ISP, it may increase the likelihood of districts becoming eligible for CEP or increases their ISP in such a way that makes it more financially feasible for schools to enroll in CEP. We explore this relationship between Medicaid direct certification and CEP eligibility directly in a separate paper. For this analysis, we limit our scope to evaluating the effects of Medicaid direct certification on the students whose subsidized meal eligibility is directly affected by the policy change. We discuss how we handle CEP schools in more detail in the data section.

Data

We use student-level administrative data from the Michigan Department of Education (MDE) and the Center for Educational Performance and Innovation (CEPI) matched to data from the Michigan Department of Health and Human Services (MDHHS). The student-level education data include information on students' demographics, enrollment history, eligibility for subsidized

meals, and achievement. We merge on school, district, and neighborhood characteristics based on U.S. Census data from the American Community Survey (ACS) as well as Common Core Data (CCD; data gathered by the Department of Education on things like teacher pay and school characteristics) to gain additional information about other students' educational and residential context, including the demographic makeup of peers, and the number of meals consumed in each school. The MDHHS data contain information on monthly Medicaid, SNAP, and TANF participation for individuals who have ever been on Medicaid.[11]

We use data from MDHHS on individuals born between 2000-2008. Academic assessments are administered in every year between 3rd and 11th grade. Because we use a student fixed effects approach, we need at least two observations on each child to conduct our analyses, so we limit our sample to individuals who were in 3rd through 10th grade as of 2016-17, the year before Medicaid became a direct certification program in Michigan, and who have at least two years of non-missing test score data.[12]

We make further restrictions for our causal impact analyses. Specifically, we identify children who were impacted by the Medicaid direct certification policy change (hereby the "Medicaid sample") as those who meet the following criteria (see Table 1 below): 1) were on Medicaid at some point in the academic year prior to the policy change (2016-17), 2) were also on Medicaid in the beginning of the the subsequent academic year (July 2017), 3) were not certified eligible for subsidized meals in the education data in the 2016-17 year, and 4) were certified eligible for subsidized meals in 2017-18.[13]

Children who meet these criteria likely would have been eligible for subsidized meals in 2016-17 if they had filled out the paperwork to certify their income eligibility, but for reasons that we cannot observe, were not identified as eligible for subsidized meals in that year. Conditioning the sample on individuals who were on Medicaid in the 2016-17 school year ensures that these children did not simultaneously experience a change in economic

[11] According to the American Community Survey, approximately two-in-five children in Michigan have health insurance through Medicaid (KFF, 2023). We have SNAP and TANF participation rates only among this population.
[12] We exclude students who took alternative assessments (typically reserved for students with severe disabilities) and students flagged as having "invalid" scores, which arise if a student was tested in an incorrect grade, exhibited prohibited behavior, or did not answer enough questions to calculate a score. For students who took the same test twice in a year, we take the highest score. This excludes almost 20% of students (mainly students with disabilities).
[13] We define the academic year as July-June, so academic year 2017-18 is defined as July 2017 to June 2018. Our results are qualitatively similar if we include students in our sample who were on Medicaid at any point in the 2017-18 academic year.

circumstances that led them to both gain access to Medicaid and subsidized meals at the same time as that might bias our estimates of the effects of the subsidized meals programs on academic outcomes. For these individuals that we identified, the only thing that should have changed for them between the 2016-17 and 2017-18 school years is that they gained access to subsidized meals, allowing us to isolate the impact of subsidized meals on subsequent outcomes. Appendix Table 1 provides more detail on the transitions and sample criteria.

Finally, we also restrict our sample to three academic years: 2016-17 through 2018-19. In 2020, testing was disrupted because of the COVID-19 pandemic so we do not have complete assessment data for that school year or the 2020-21 school year. The 2016-17 school year serves as a pre-treatment year, when Medicaid direct certification was not in place in Michigan; 2017-18 and 2018-19 both serve as post-treatment years. In total we have 32,600 children in our sample who met all of the criteria detailed above, which represents approximately 87,000 student-year-observations (specific numbers vary by outcome). Although most of our analyses focus on the Medicaid analytic sample, we provide descriptive statistics for all students in the academic year 2017-18 as a point of reference.

Outcomes

Our primary outcome of interest is standardized student math and English language assessment (ELA) test scores that come from the M-STEP (Michigan Student Test of Educational Progress), a test that is administered in Michigan in every grade between 3rd and 8th grade. In high school, students take the national PSAT in 9th and 10th grade and the SAT in 11th grade. Test scores are standardized at the grade-year-subject level (e.g., 3rd grade math test scores in 2016-17).[14]

Other variables

We include several other variables from the administrative education and MDHHS data to describe our sample and include in our regression analyses. From the education data, we have information on student gender, race/ethnicity, special education participation, limited English proficiency (LEP, or students whose first language is not English), participation in school of choice programs (where students can choose which school within their district they would like to

[14] In academic year 2018-19, the state stopped assessing 8th graders with the MSTEP, and instead they began assessing them with the PSAT. Therefore, in 2019, 8th grade scores represent standardized PSAT scores.

attend), and yearly attendance rates. Data on schools come from the Common Core of Data (CCD) and detail the school's enrollment, student-to-teacher ratio, provide aggregate data on race/ethnicity of students in the school, the share receiving subsidized (free or reduced-price) meals and average math and ELA test scores. Finally, characteristics of the neighborhood (Census tract) come from the American Community Survey (ACS) and include data on the share of families who live below the poverty threshold, median household income, share of residents with college degrees and share of households headed by single parents.

Method

To assess the impacts of gaining access to subsidized meals, we employ a student fixed effects regression analysis to analyze how transitioning onto subsidized meals affects student achievement. As described in Table 1 above, we restrict our sample to students who participated in the Medicaid program in 2016-17 and in 2017-18, but who were not certified for subsidized meals in 2016-17 and were certified for subsidized meals in 2017-18. This allows us to isolate the causal effect of the program on student achievement. Using this sample, we run models of the following form:

$$Y_{igt} = \beta_0 + \beta_1 NSLP_t + \beta_2 X_{it} + \gamma_i + \alpha_{gt} + \epsilon_i \quad (1)$$

Where Y_{it} is the outcome of interest, student test scores for individual *i* in grade *g* in year *t.* $NSLP_t$ is an indicator for whether the student is certified for subsidized meals, which "turn on" in the 2017-18 school year (and potentially beyond), the year of the policy change. γ_i is a set of individual fixed effects, X_{it} is a vector of individual-year level controls, α_{gt} is a grade-by-year fixed effect, and ϵ_i is an idiosyncratic error term. Our coefficient of interest is β_1, which indicates how a student's test scores change once they become certified for subsidized meals. We also test the robustness of our results to the inclusion of school or district fixed effects to control for sorting across schools and districts that might be correlated with the policy change.

Results

Does Medicaid direct certification increase the share of children who are certified for subsidized meals?

Before we examine the impacts of subsidized meals among the population of students who are certified under Medicaid direct certification, we first examine if Medicaid direct certification changes the share of children who are eligible for subsidized meals. In theory, if all students who were eligible for subsidized meals completed the paperwork to certify for subsidized meals, then the introduction of Medicaid as a direct certification program would have no effect on the number of students receiving subsidized meals and we would not expect to find any effects on downstream outcomes such as achievement. That is, if take-up of subsidized meals were 100%, then Medicaid direct certification should have had no impact on the share of students receiving subsidized meals since all of these students should have been eligible for subsidized meals in the absence of including Medicaid as a direct certification program.

Instead, we observe that the inclusion of Medicaid as a direct certification program did, in fact, increase in the share of students who newly certified eligible for subsidized meals in the first year that the policy was introduced, the 2017-18 school year. In Figure 1, we show the share of children who transition onto subsidized meals in the 2017-18 school year (e.g. those who were not on subsidized meals in 2016-17, but were on subsidized meals in 2017-18). As a reference for the typical transition rate onto subsidized meals, we also present the share of students who transitioned onto subsidized meals in the 2016-17 school year (e.g. those who were not on subsidized meals in 2015-16 but were on subsidized meals in 2016-17, the last year before Medicaid direct certification).

Figure 1 shows that the proportion of students transitioning onto the subsidized meals program grows significantly in the 2017-18 school year, after Medicaid direct certification. In fact, the share transitioning on nearly doubles in magnitude from about 3.5% of all students in 2016-17, to 6-7% of students in 2017-18, depending on the grade. Overall, approximately 6,000 students per grade from kindergarten through 12th grade newly transition onto subsidized meals, with a larger increase among those in middle and high school. This figure illustrates that including Medicaid as a direct certification program did increase access to the subsidized meals program among students who otherwise were not participating in the program. Based on the difference in the percent of students newly-transitioning onto subsidized meals in 2017-18 compared to 2016-17, it appears that about half of the students who transitioned onto subsidized meals in 2017-18 did so because of Medicaid direct certification.

Figure 1 shows the percent of all students who transition onto subsidized meals, regardless of whether they transition on because of Medicaid direct certification. To further distinguish between the students who transition onto subsidized meals because of Medicaid direct certification versus other reasons, in Figure 2, we use data on two school years (2016-17 and 2017-18) and categorize students based on their certification for subsidized meals in each year. We are particularly interested in identifying the students who transition onto subsidized meals because of Medicaid direct certification. Nearly equal shares of students are certified for subsidized meals both years (44%) as are not certified in either year (44.1%). As the estimates in Figure 1 imply, 3.1% of students gain access to subsidized meals in the 2017-18 school year as a result of Medicaid direct certification. These students specifically represent those who were on Medicaid both years, not certified for subsidized meals in 2016-17 but certified the next year (our analytic sample). In contrast, we see a slightly smaller share of students who transition onto subsidized meals (2.4%) for some other reason (like direct certification from a program like SNAP or because they submitted paperwork and were income eligible). A small share (2.8%) of students loses subsidized meal eligibility between 2016-17 and 2017-18 and 3.7% are new students who were only observed in the 2017-18 school year.

What are the characteristics of students who become eligible for subsidized meals due to Medicaid direct certification?

In Table 2 we present descriptive statistics on the students who gained access to subsidized meals through Medicaid direct certification to better understand how they compare to other students who also transition onto subsidized meals (but through other mechanisms) as well as the broader population of students in Michigan. In column 2, we present the overall descriptive statistics for our main Medicaid analytic sample. About 68% of those in the Medicaid sample (those who gained access to subsidized meals through Medicaid direct certification) are White, 16% are Black, 4% Asian and 4% Hispanic. About 8% of student in the Medicaid sample are limited English proficient (LEP). The average proportion of students on free or reduced-price meals within a school is 50%.

For the most part, the Medicaid direct certification students are similar to the overall sample of students along demographics and the characteristics of the schools they attend, though they do have lower average test scores. The main differences are their attachment to Medicaid:

on average 44% of all students across the state are on Medicaid, as compared to 100% of the Medicaid sample. The Medicaid sample, perhaps unsurprisingly, has spent more of their lives on Medicaid (162 lifetime months) as compared to the average student (83 lifetime months).

Comparing the Medicaid sample (Column 2) to students who transitioned onto subsidized meals for other reasons (Column 3) reveals generally similar characteristics with a few key differences. Students in the Medicaid sample are more likely to be White (68% versus 66%) and less likely to be Black (16% versus 19%), differences that are statistically significant (at $p<0.01$). Students in the Medicaid sample are also more likely to be limited English proficient (8%) as compared to other students who transition onto subsidized meals (5%). They are also much more likely to be in either middle school or high school, which is consistent with the pattern we observed in Figure 1. The students in the Medicaid sample also attend schools where the share of students receiving subsidized meals is about 3 percentage points lower than students who transition onto meals for other reasons, but school level average ELA and math tests are quite similar. Finally, the Medicaid sample attends schools in neighborhoods with slightly higher average household earnings (about $1,400 more per year).[15]

Table 2 also presents descriptive statistics for students who are on subsidized meals for both academic years ("always", column 4), those who are not on subsidized meals in either year (column 5), and those who were on subsidized meals in 2016-17 but not in 2017-18 "transition off" (column 6). Compared to students who were always on or transitioned off subsidized meals, students in the Medicaid sample are more likely to be White, have higher test scores, and attend schools in higher SES neighborhoods. The opposite is true when comparing the Medicaid sample to students that were not on subsidized meals in either year. Overall, these results suggest that the Medicaid sample is somewhat less advantaged in terms of test scores and school neighborhood characteristics relative to the overall population, but quite similar to students who transition onto subsidized meals for reasons other than through Medicaid direct certification.

Does Medicaid direct certification increase the share of children who are consuming meals?

[15] We also conduct a regression analysis where we regress an indicator for transitioning onto subsidized meals due to Medicaid on all of the characteristics listed in Table 2 to more formally test how these students compare to other students who transition onto subsidized meals for other reasons. The key takeaways from that analysis are similar to those discussed here: compared to students who transition onto subsidized meals for other reasons, students who were affected by Medicaid direct certification are more likely to be female, Asian, and LEP, and are less likely to be Black. They are also more likely to come from middle or high school, and to attend schools with lower shares of peers certifying eligible for subsidized meals.

As we noted in the conceptual framework, there are several mechanisms through which access to subsidized meals may affect student achievement. Students who gain access to subsidized meals may increase their food consumption, potentially improving (or worsening) caloric intake or nutritional value of food, or students may have already been consuming school meals and gaining access to subsidized meals helps students' families save money on food. Using data on school meal consumption over time, we next examine whether total meals served across the state increased as a result of students gaining access to subsidized meals.

At the state level, we find that total meals consumed between the 2017 (2016-17 school year) and later school years remains unchanged (the black line) after Medicaid became a direct certification program (see Figure 3). This suggests that gaining access to subsidized meals does little to increase the consumption (or purchase) of school meals, at least at the aggregate level. We do, however, find that the share of students who pay for meals declines between 2016-17 and 2017-18, the year of the Medicaid direct certification. In fact, the number of both paid and reduced-price meals go down and free meals increase between 2016-17 and 2017-18. This suggests that the policy change helps student gain access to free meals in particular, thus saving families money.

Given that only about 3% of the population of students enrolled in public schools in the state of Michigan were directly impacted by Medicaid direct certification, it is also possible that the share of students directly affected is too small to observe any changes in meals served at the state level. We next turn to a school-level analysis to further investigate this question of how the number of type of meals served in schools changed after students gained access to subsidized meals through Medicaid direct certification. To investigate this, we limit our sample to the students directly affected by Medicaid direct certification and run our student fixed effects model specification discussed above using school-level meals data as the outcome. In essence, this analysis investigates how gaining access to subsidized meals among students on Medicaid affects the total number of meals served at each school, as well as the number of paid versus subsidized meals served.

Results of this analysis (Figure 4) indicate that gaining access to subsidized meals does increase the number of meals served at the school level. While paid lunches decline slightly (0.4%), we observe an increase in the number of subsidized lunches by about 2%. While not

statistically significant, we also find an overall increase in the number of lunches served (paid and subsidized) by about 1%. This suggests that gaining access to subsidized meals not only shifts schools from serving more subsidized meals and fewer paid meals but also leads to an increase in the total number of meals served. This suggests that any effects of subsidized meals on student achievement may operate both through an income effect (i.e. reducing the costs of meals) and a nutrition effect (changing the number of meals served).

Effect of Medicaid Direct Certification on Student Achievement

Our main goal is to assess the impact of becoming eligible for subsidized meals via Medicaid direct certification on student test scores, which is presented in Table 3. For the rest of the analysis, we focus on the Medicaid direct certification sample as outlined in Table 1. Column 1 presents results from our preferred specification, where we include an indicator for certifying eligible for subsidized meals (our main parameter of interest), as well as student and grade-by-year fixed effects. We find that transitioning onto subsidized meals because of Medicaid direct certification is not statistically significantly associated with math scores but increases ELA scores by about 0.02 standard deviations, a modest effect.

Columns 2 through Columns 5 of Table 3 add additional controls to test the robustness of our main findings. Column 2 adds controls for time-varying student characteristics and Column 3 adds time-varying school level characteristics that might confound the effects of subsidized meal status. As is evident in Table 4, the addition of both student and school level characteristics does little to affect the size or direction of the point estimates. We continue to find positive effects of school meals on student ELA test scores and no significant effect on math scores. In Column 4, we add school fixed effects to account for cases where students may systematically sort into different schools. If sorting into schools is in any way affected by the Medicaid direct certification this model should account for those differences. In Column 5, we control for district fixed effects instead of school fixed effects, as many policy decisions that may affect student achievement occur at the district, rather than the school level. Overall, our point estimates are very stable across these different specifications and suggest that gaining access to subsidized meals leads to modest improvements in ELA scores, and no significant effect on math scores.

Subgroup analyses

We next examine how effects vary for a variety of different subgroups. As discussed above, we find some differences in the characteristics of students who gain access to subsidized meals through Medicaid direct certification relative to other routes. We might therefore expect to find different effects for subgroups that are disproportionately impacted by the policy change. For instance, our analysis in Table 2 indicated that female students, Hispanic students, and those with limited English proficiency were more likely to be impacted by the policy change, as were middle and high school students (relative to elementary school students). In this section, we explore heterogeneity along several of these dimensions: grade, race/ethnicity, gender, and different measures of individual, school, and neighborhood poverty levels. In all of the analyses that follow, we present results from our preferred specification, which includes student fixed effects as well as grade-by-year fixed effects.

Turning first to heterogeneity by grade, Table 4 shows results for math and ELA test scores when we separately examine elementary (3rd-5th grade), middle (6th- 8th grade), and high (9th-12th grade) schools.[16] Overall, we continue to find null effects of gaining access to subsidized meals through Medicaid direct certification on math test scores, and some evidence of positive effects on ELA scores that are concentrated among elementary school students. After gaining access to subsidized meals, elementary school students experience a 0.045 standard deviation increase in ELA scores. Effects for middle and high school are close to zero and not statistically significant.

Next, examining heterogeneity by gender and race in Table 5, we do not find any evidence of differential effects for male versus female students. For both math and ELA test scores, we do find variation by race and ethnicity. Asian and Hispanic students experience the largest gains, with math scores increasing by 0.039 standard deviations for Hispanic students and 0.108 standard deviations for Asian students. We find similar increases in ELA scores for Asian students, but no impact for Hispanic students. Some of these racial/ethnic patterns may be driven by students with LEP. Controlling for LEP status in our models (columns 4 and 8), we continue to find large, significant effects of gaining access to subsidized meals for Asian students (0.064 standard deviations for ELA and 0.094 standard deviations for math), but effects among Hispanic students are rendered insignificant, suggesting that the positive effect of gaining access

[16] Grade level is determined based on the grade the student was in during the first treated year, 2017-18. Elementary school includes those who were in 3rd through 5th grade, middle school includes those who were in 6th through 8th grade, and high school includes those who were in 9th through 12th grade.

to subsidized meals among Hispanic students is largely driven by LEP students. LEP students experience a 0.053 standard deviation increase in math and 0.099 standard deviation increase in ELA scores after gaining access to subsidized meals.

As a final set of heterogeneity analyses, we examine how effects vary across individual, school, and neighborhood measures of poverty. Our goal with this analysis is to understand whether the gains in test scores are driven by those living in more or less disadvantaged neighborhoods and schools. This subgroup analysis is particularly important given that the bulk of prior research on the effect of subsidized meals has focused on their impact in CEP schools, which are all higher-poverty schools. We lack rigorous evaluations of how access to subsidized meals affects student achievement among students in lower-poverty environments.

To investigate whether the effect of access to subsidized meals affects students differentially according to poverty level, we examine heterogeneity in effects by categorizing student, neighborhood, and school-level poverty rates into terciles. In particular, we categorize students into terciles of disadvantage based on the total childhood share of months spent on Medicaid, as a proxy for depth and duration of disadvantage. We categorize neighborhoods into terciles of disadvantage based on the census tract poverty rate and we categorize schools into terciles of disadvantage based on the share of economically-disadvantaged students in the school in the year prior to Medicaid direct certification.

Results from this analysis, shown in Figure 5, indicate some evidence that the gains in ELA scores that we observe in the main results are driven by students in more disadvantaged environments. Across all of our measures of disadvantage—individual-level terciles of duration on Medicaid, school-level share of economically-disadvantaged students, and the neighborhood poverty rate, we find larger increases in ELA scores among the highest poverty groups. Individuals in the top tercile in terms of percent of childhood months on Medicaid experience a 0.043 standard deviation increase in ELA scores; those living in the highest poverty neighborhoods experience a 0.061 standard deviation increase in ELA scores, and those attending the highest-poverty schools experience a 0.042 standard deviation increase in ELA scores. Effects are much more muted in lower-poverty environments. We find effects on ELA scores ranging from -0.011-0.002 in the bottom terciles of individual, neighborhood, and school-level poverty, and small, but positive coefficients in the middle tercile of disadvantage. We

continue to find null effects on math scores regardless of the economic disadvantage of the individual, school, or neighborhood context.

Heterogeneity by CEP status

Evidence from Figure 5 suggests that the positive effects of gaining access to subsidized meals that we find are driven by students in high-poverty settings, whether we consider poverty at the individual, school, or neighborhood level. Another way that we can examine heterogeneity by economic disadvantage is to compare the effects among students enrolled in schools that were already providing free meals to all students through CEP to those students enrolled in schools that were not part of the CEP program (either lower-poverty schools or eligible schools that chose not to participate in the program). To avoid confounding effects of schools *becoming* CEP because of Medicaid direct certification on student outcomes, we split the sample into three categories: schools that were not CEP in either 2016-17 or 2017-18; schools that were CEP in both 2016-17 and 2017-18; and schools that were not CEP in 2016-17 but became CEP in 2017-18.[17] The last set of schools represents a group of schools potentially induced to become CEP by Medicaid direct certification and should be interpreted with caution. Results of this analysis, shown in Table 6, corroborate the findings in Figure 5 that suggest that the effects are concentrated among students in high-poverty settings. Splitting the sample by CEP status, we find larger effects of gaining access to subsidized meals in schools that were already providing free meals through the federal CEP program. For schools that were not CEP in either year, we find null effects that are close to zero in magnitude and not statistically significant for either math or ELA scores. For schools that were CEP in both years, we find no effect on math scores, but a 0.076 standard deviation increase in ELA scores after students gain access to subsidized meals. For schools that become CEP in 2017-18, we do not find statistically significant effects on the students who gain access to subsidized meals through Medicaid direct certification, but point estimates are positive and modest (0.025 standard deviations).

To further unpack these results, we also conduct our race/ethnicity subgroup analyses separately for CEP and non-CEP schools. This analysis helps determine whether the racial differences we observed were driven by differences in the racial composition of CEP schools

[17] Very few schools transition from CEP in 2016-17 to not CEP in 2017-18 so we do not include them in this analyses, but they are included in the main set of analyses.

compared to non-CEP schools. Table 7 shows these results. While we did not find any overall effect of gaining access to subsidized meals on student achievement in non-CEP schools, when we further examine patterns by race/ethnicity, our results are consistent with the main heterogeneity analysis by race: In non-CEP schools, we continue to find large, significant increases in both math and ELA scores among Asian students and LEP students that are very similar in magnitude as the main findings by race depicted in Table 5. In CEP schools, the pattern is different. We do not find any evidence of positive effects of gaining access to subsidized meals on math test scores, except for LEP students. For ELA scores, we find an increase in test scores that seem to be driven by Black and LEP students. Finally, we also find some evidence of increases in math test scores among LEP students attending schools that become CEP after Medicaid direct certification.

Together, these results suggest a few takeaways. First, we do find some evidence of positive effects of gaining access to subsidized meals in non-CEP schools (e.g. lower poverty schools) that are driven by Asian students and students with LEP. These students are disproportionately impacted by Medicaid direct certification and might have weaker ties to the social safety net.[18] In some ways, it is not surprising to find larger effects for these groups since they were more likely to be directly impacted by the Medicaid direct certification policy change.

On the other hand, in higher-poverty schools that were already providing free meals to all students, we find positive effects of Medicaid direct certification on ELA scores, which are primarily driven by Black students and LEP students. The fact that we find evidence of *any* positive effects of Medicaid direct certification on student achievement in CEP schools is puzzling, since students in these schools should have already been receiving free meals. What is changing in these schools that might lead to gains in student test scores? As we discussed in the conceptual framework, schools may receive additional funding if they experience a large increase in the share of students flagged as economically disadvantaged through state funding formulas. Additionally, CEP-participating schools with ISPs below 62.5% would receive additional federal reimbursement if Medicaid direct certification led to an increase in their ISPs.

[18] We present some evidence of this in Appendix Table 2, which shows connection to various social safety net programs by race for our sample of students who were on Medicaid in 2016-17 and 2017-18 but only transitioned onto subsidized meals in 2017-18. Compared to their White, Black, and Hispanic peers, Asian students are much less likely to receive SNAP benefits, and have fewer lifetime months on Medicaid, SNAP, and TANF.

To answer these questions, we next turn to an analysis of how Medicaid direct certification affects school-level ISP and school finances.

Medicaid Direct Certification and School Finance

To examine how changes in school finance might explain why we find positive effects on achievement in CEP schools, we use school-year level data on per-pupil spending on operations, instruction, and administration. As discussed above, state funding formulas are tied to the number of economically-disadvantaged students in the school. Given that Medicaid direct certification increases the share of economically-disadvantaged students in schools, it is reasonable to expect that these schools would receive more state funding to support these students. This funding is supposed to be spent on instruction, and added needs instruction more specifically.

In Table 8, we run our main regression model specification (student fixed effects model with grade-by-year fixed effects) on our main sample of students who transitioned onto subsidized meals because of Medicaid direct certification, examining per-pupil expenditure outcomes. We conduct this analysis pooling all schools in Panel A, as well as separately for schools that were CEP in both 2016-17 and 2017-18 and schools that were not CEP in either year. While we find no effect on per-pupil expenditures in the full sample, we do see some evidence of increased spending in CEP schools in particular. When a given student transitions onto subsidized meals, on average, they attend schools that increase per-pupil operations spending by about 2.7%. This increase in spending is largely driven by instructional spending (2.5%) and added needs instructional spending (6.6%) in particular. We do not see any significant change in administration spending.

Why might expenditures increase more in CEP schools compared to non-CEP schools? It might be the case that CEP schools experience a larger increase in the number of economically-disadvantaged students as a result of Medicaid direct certification. We examine this in Appendix Figure A1, which presents histograms of the share of students within a school who are economically disadvantaged, separately for the 2016-17 and 2017-18 school years. We present separate histograms for CEP schools versus non-CEP schools. What Appendix Figure A1 illustrates is that while both CEP and non-CEP schools experienced an increase in the number of economically-disadvantaged students within the school as a result of Medicaid direct

certification, the increase is much larger in CEP schools, which implies that these schools may have experienced larger increases in state funding. In non-CEP schools, in the year before Medicaid direct certification, about 38% of students were economically-disadvantaged. After Medicaid direct certification, this increased to about 40%. In CEP schools, on the other hand, about 70% of students were economically disadvantaged in the year before Medicaid direct certification, increasing to about 80% in the following year.[19] Thus, CEP schools experienced a much larger increase in the share of students certifying eligible for subsidized meals as a result of Medicaid direct certification.

While preliminary, these results provide some suggestive evidence of why we observe improvements in student achievement for Medicaid direct certification students in CEP schools. These results indicate that while Medicaid direct certification may not have had a direct impact on access to meals for these students, it did lead to more state funding for instructional spending, which likely is why we find a subsequent improvement in student achievement. This analysis is ongoing.

Conclusion

Our findings suggest that Medicaid direct certification led to a substantial increase in the share of students certified for subsidized meals, nearly doubling the typical share of students who transition onto subsidized meals in a given year. Relative to their peers who gained access to subsidized meals in 2017-18 for other reasons, Medicaid direct certification students are more likely to be Asian, LEP, and are more likely to be in either middle or high school. However, they have very comparable test scores as their peers who transitioned onto subsidized meals for other reasons, and their school environments are similar, with the exception that they attend schools with fewer peers receiving subsidized meals.

After gaining access to subsidized meals, we find some evidence of increases in the number of meals served at the school-level, primarily driven by an increase in the number of free and reduced-price meals served. This provides some evidence that Medicaid direct certification may affect student outcomes both by increasing access to nutrition as well as reducing costs of

[19] We examine this a different way, by using our student fixed effects model to predict the average increase in the school-level percent of students on subsidized meals. Those results (not shown) indicate that when a student becomes certified eligible for subsidized meals because of Medicaid direct certification, on average, their school experiences a 1.5 percentage point increase in the total percent of students on subsidized meals.

food. We cannot observe, however, whether the quality of the food improves as a result of Medicaid direct certification, nor can we observe whether students actually consume the meals.

How does gaining access to subsidized meals affect student achievement? Our results suggest that gaining access to subsidized meals leads to a modest, positive effect on ELA scores. These effects appear to be driven by students in elementary school, Asian students, and students with LEP. Asian students and students with LEP were disproportionately impacted by Medicaid direct certification, so in some ways it is not surprising to see the largest positive effects for these groups. Additionally, these effects appear to be driven by students in non-CEP schools, suggesting that gaining access to subsidized meals does have a meaningful impact on students' access to affordable meals.

When we further examine how results differ across different contexts, we find evidence that effects are largest among students in the highest-poverty environments: those in the top tercile in terms of childhood duration on Medicaid, living in high-poverty neighborhoods, and attending high-poverty schools. When we explicitly examine differences among students attending schools that were already providing free meals to all students through the federal CEP program, we find evidence of larger effects in CEP schools. On its face, this finding is quite puzzling, since gaining access to subsidized meals should be inconsequential in CEP schools. However, upon further investigation, we find that CEP schools experienced a much larger increase in the share of students certified eligible for subsidized meals because of Medicaid direct certification than their non-CEP peers. This likely meant that CEP schools received a larger amount of additional state funding to support these economically disadvantaged students, a pattern we confirm when examining changes in per-pupil expenditures. Following Medicaid direct certification, CEP schools increase instructional spending by about 2.5%. We do not find any comparable effect on expenditures in non-CEP schools.

Overall, this analysis indicates that Medicaid direct certification led to a significant increase in access to subsidized meals, particularly among students with weaker ties to the social safety net. This increase in access translates into positive effects on test scores, which we hypothesize are explained both by increased access to food, reduced costs of meals, and through increases in school funding. In future drafts we intend to further explore the school finance channel to better understand the implications of Medicaid direct certification for school funding.

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Figure 1: Proportion transitioning onto subsidized meals by school year and grade

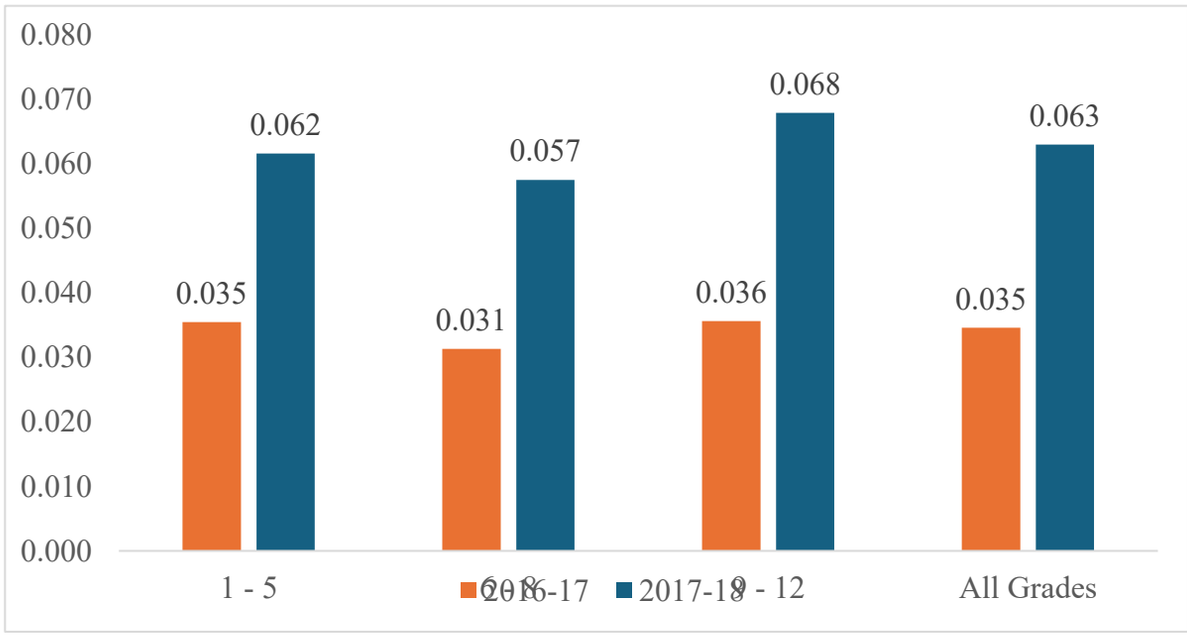
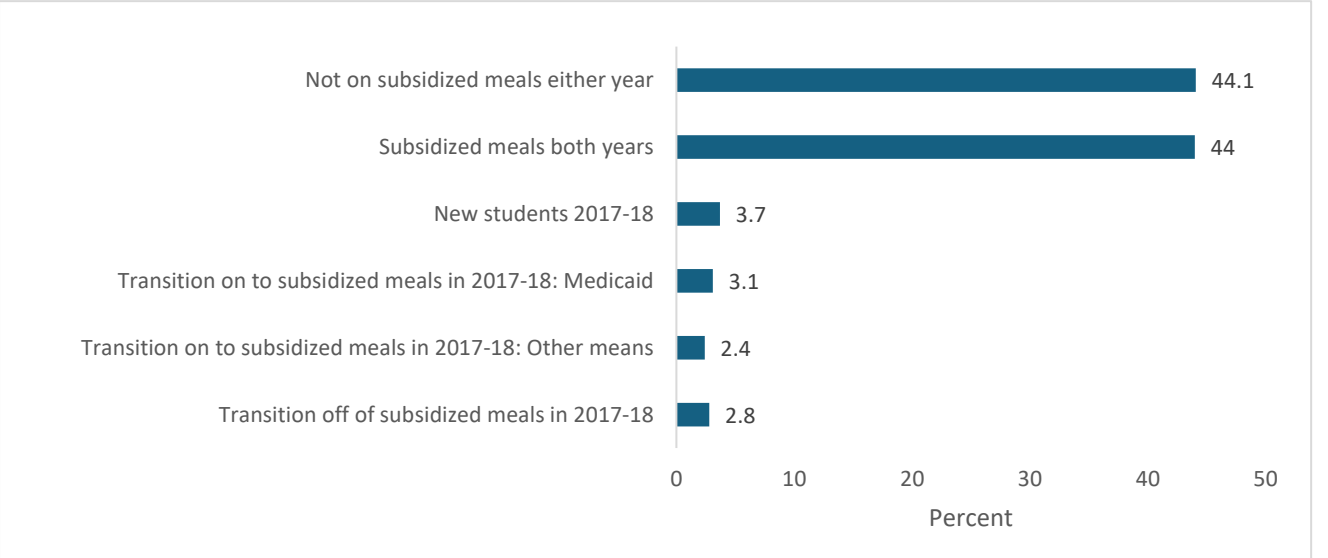


Figure 2. Subsidized meal eligibility over two school years (2016-17 & 2017-18).



Note: Data come from the the Michigan Department of Education (MDE) and consist of students public school students born between 2000 and 2005 who were in 6-8th grade during 2016-17 and 2017-18 school years.

Figure 3: Statewide total meals consumed

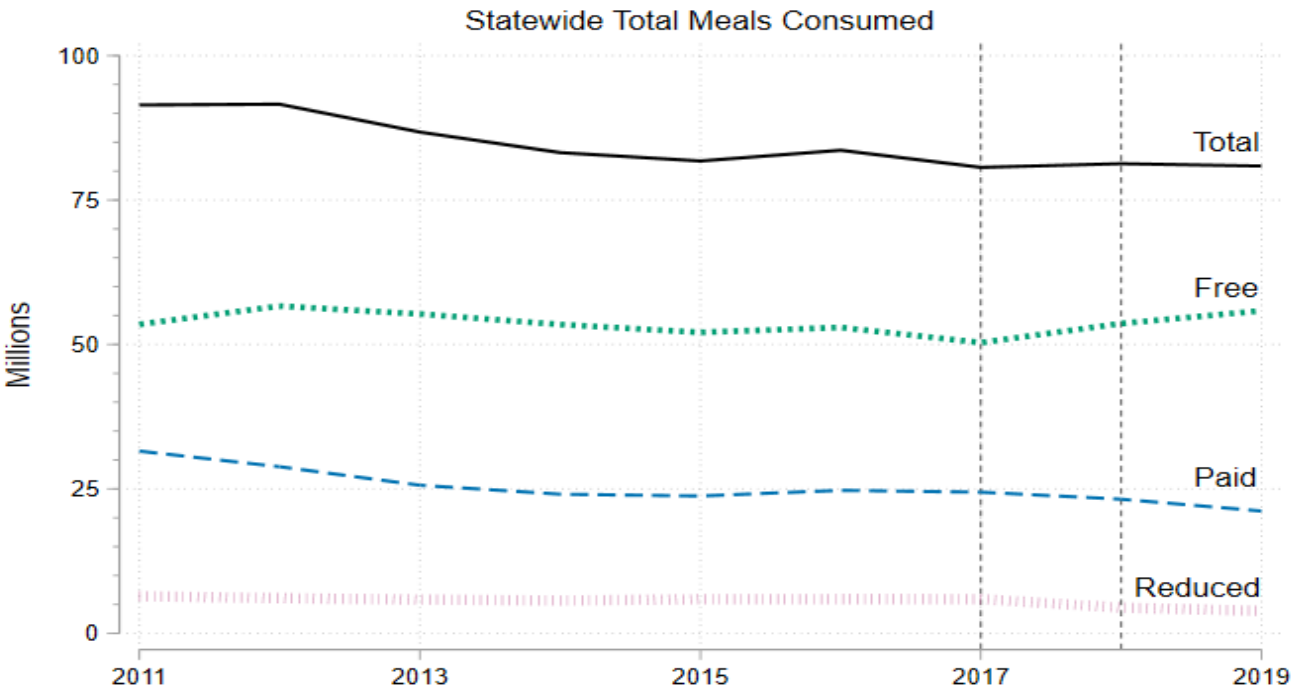
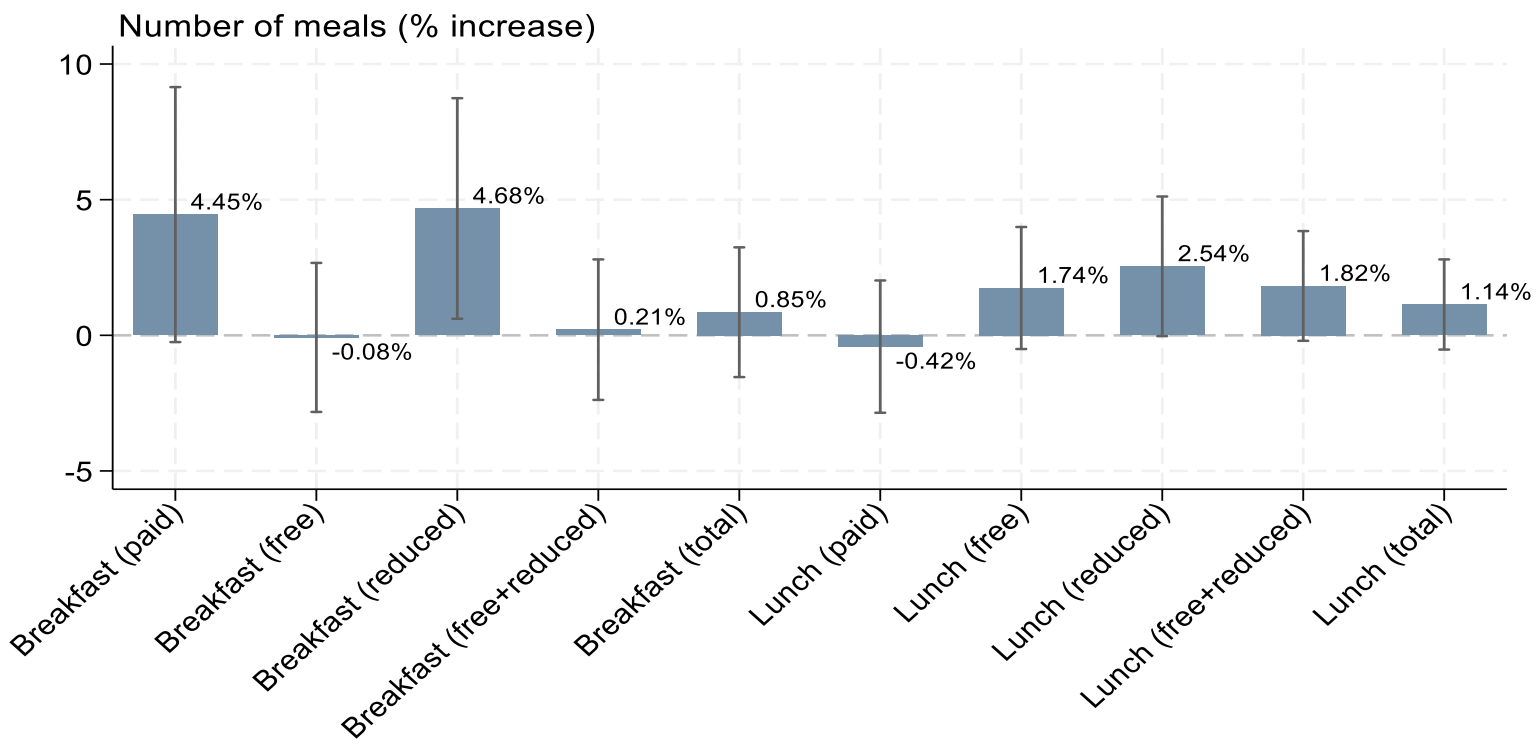
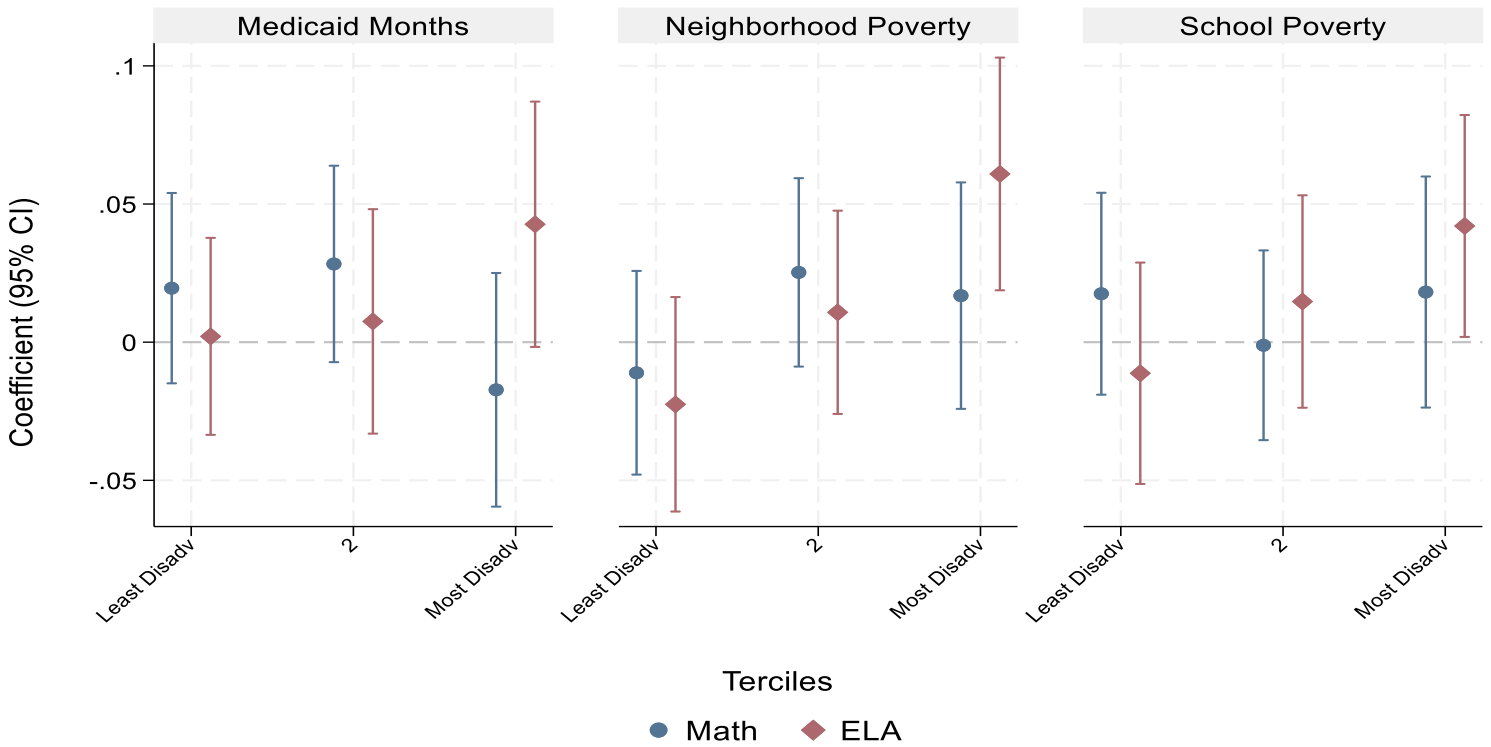


Figure 4. Impact of Medicaid Direct Certification on Meals Served



Notes: These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress a school-level measure of meals served on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. The percent is calculated relative to 2017 levels. The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Standard errors are in parentheses and clustered at the school level. Gray bars are 95 percentile confidence intervals.

Figure 5. Impact of Medicaid Certification on Standardized Test Scores by Poverty (2017-19)



Notes: These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress test scores on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. We run regressions seprately for student poverty terciles: percent of months on Medicaid up until 2017, percent of families below the poverty line in the school's neighborhood in 2017, and percent of students in a school who are flagged as economically disadvantaged in 2017. Tercile 1 = bottom tercile (least disadvantaged) and tercile 3 = top tercile (most disadvantaged). Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Standard errors are clustered by school.

Table 1: Sample criteria for impact analyses, N=32,600

	On Medicaid	Certified for subsidized meals
2016-2017	Yes	No
2017-2018	Yes	Yes

Table 2. Sample characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
		Transition onto subsidized meals in 2017-18				
	All students	Medicaid sample	Other transition	Always subsidized meals	Never subsidized meals	Transition off subsidized
Student Characteristics						
Female	0.487	0.495	0.485	0.486	0.487	0.475
Non-Hispanic White	0.662	0.676	0.657	0.517	0.823	0.616
Non-Hispanic Black	0.179	0.158	0.194	0.294	0.057	0.229
Hispanic	0.079	0.086	0.076	0.115	0.038	0.09
Non-Hispanic Asian	0.034	0.036	0.028	0.019	0.048	0.02
Other[a]	0.052	0.05	0.053	0.066	0.037	0.055
Special Education[b]	0.136	0.149	0.135	0.182	0.090	0.151
LEP[c]	0.068	0.077	0.051	0.106	0.022	0.054
School of Choice[d]	0.099	0.115	0.122	0.106	0.090	0.115
Attendance Rate	0.926	0.920	0.925	0.902	0.954	0.918
Grades 3-5	0.317	0.281	0.346	0.344	0.293	0.291
Grades 6-8	0.329	0.322	0.305	0.332	0.332	0.324
Grades 9-11	0.353	0.397	0.348	0.323	0.375	0.385
Standardized Test Scores (SD)						
Math	0.002	-0.102	-0.109	-0.419	0.435	-0.173
ELA	0.001	-0.073	-0.069	-0.400	0.409	-0.136
Math (2016-17)	0.001	-0.105	-0.112	-0.417	0.428	-0.179
ELA (2016-17)	0.001	-0.076	-0.075	-0.401	0.406	-0.147
Safety Net						
Medicaid	0.437	1.000	0.291	0.764	0.075	0.233
SNAP[e]		0.147				
TANF[f]		0.010				
Medicaid (2016-17)	0.446	1.000	0.112	0.767	0.091	0.343
SNAP (2016-17)		0.077				
TANF (2016-17)		0.008				
Medicaid total months (2016-2018)	10.069	22.347	2.850	17.917	1.743	5.852
SNAP total months (2016-2018)		1.949				
TANF total months (2016-2018)		0.127				
Medicaid lifetime months	82.940	161.605	34.610	151.867	12.463	42.187
SNAP lifetime months		49.702				
TANF lifetime months		6.693				
School Characteristics						
Average Total Enrollment	736.702	739.780	699.407	664.802	815.629	726.617
Student-Teacher Ratio	20.949	21.640	20.942	20.861	20.485	23.477
Prop White	0.665	0.669	0.659	0.568	0.770	0.635
Prop Black	0.178	0.180	0.189	0.266	0.083	0.214
Prop Hispanic	0.078	0.077	0.078	0.096	0.059	0.082
Prop Asian	0.034	0.029	0.028	0.024	0.046	0.023
Prop Free Lunch	0.448	0.453	0.472	0.582	0.302	0.488
Prop Free or Reduced Lunch	0.498	0.502	0.527	0.635	0.349	0.542
Math (SD)	-0.031	-0.073	-0.087	-0.263	0.231	-0.158
ELA (SD)	-0.028	-0.061	-0.068	-0.239	0.208	-0.130
School Neighborhood Characteristics						
% Families Below Poverty Level	12.223	11.920	11.651	17.974	6.163	12.811
Median HH income ($)	59779.070	57358.617	55964.375	45630.340	75167.148	52601.270
% College Degree	16.762	16.100	15.667	12.476	21.476	14.558
% Single Parent HH	11.403	11.295	11.504	14.888	7.711	12.293
N	1054051	36057	25570	474573	453473	31992

Notes: These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. A student is flagged as being in the Medicaid direct certification sample (column 2) if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) remained on Medicaid in the subsequent academic year (2017-18), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Column 3 contains all other students who transitioned onto subsidized meals but not through Medicaid direct certification. Column 4 contains students who were on subsidized meals in both the 2016-17 and 2017-18 academic years, column 5 contains students who were never on subsidized meals in 2016-17 and 2017-2018, and column 6 contains students who were on subsidized meals in 2016-17 but not in 2017-18.

[a] Other includes American Indians, Native Hawaiians, and mixed race.

[b] These are students receiving special education services.

[c] LEP = students classified as having limited English proficiency.

[d] Student is attending school through school of choice program, which allows students to choose which school to attend within their district.

[e] SNAP = Supplemental Nutrition Assistance Program.

[f] TANF = Temporary Assistance for Needy Families program.

Table 3. Impact of Medicaid Certification on Standardized Test Scores (2017-19)

	(1)	(2)	(3)	(4)	(5)
Panel A. Math					
Subsidized meals	0.011	0.010	0.010	0.014	0.010
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
N			86926		
R-squared	0.875	0.875	0.875	0.886	0.878
Panel B. ELA					
Subsidized meals	0.019+	0.019+	0.019+	0.021+	0.018
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)
N			86838		
R-squared	0.873	0.873	0.873	0.884	0.876
Student fixed effects	X	X	X	X	X
Grade fixed effects					
Year fixed effects					
Grade x year fixed effects	X	X	X	X	X
Student characteristics		X	X	X	X
School characteristics			X	X	X
School fixed effects				X	
District fixed effects					X

Notes: + p<0.1, * p<0.05, ** p<0.01. These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. W We regress test scores on a binary indicator of being eligible for subsidized meals. The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Column 1 is a bivariate regression of test scores on subsidized meals. Column 2 adds student and grade x year FE. Column 3 adds time-varying student characteristics, column 4 adds time-varying school characteristics, column 5 has school FE, and column 6 has district FE. Student characteristics include special education, limited English proficiency, and school of choice usage indicators. School characteristics include enrollment, student-teacher ratio, White, and Black, and the poverty rate in the neighborhood. Standard errors are in parentheses and clustered at the school level.

Table 4. Impact of Medicaid Certification on Standardized Test Scores by Grade Level (2017-19)

	Math	ELA
Panel A. Elementary schools (grades 3-5)		
Subsidized meals	0.010	0.045*
	(0.019)	(0.019)
N	25075	25037
R-squared	0.887	0.875
Panel B. Middle schools (grades 6-8)		
Subsidized meals	0.007	-0.002
	(0.016)	(0.018)
N	32167	32143
R-squared	0.875	0.860
Panel C. High schools (grades 9-11)		
Subsidized meals	0.015	0.021
	(0.022)	(0.023)
N	30516	30489
R-squared	0.865	0.885

Notes: + p<0.1, * p<0.05, ** p<0.01. These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress test scores on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. School-level is determined by the school the student was in during the 2017-18 school year (elementary school = grades 3-5; middle school = grades 6-8; high school = grades 9-11). The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Standard errors are in parentheses and clustered at the school level.

Table 5. Impact of Medicaid Certification on Standardized Test Scores by Gender, Race, and LEP (2017-19)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Math				ELA			
Subsidized meals	0.008	0.002	0.004	-0.000	0.024*	0.013	0.012	0.010
	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.012)
Subsidized meals * Female	0.004				-0.010			
	(0.007)				(0.007)			
Subsidized meals * Black		0.002		0.003		0.012		0.014
		(0.012)		(0.012)		(0.011)		(0.011)
Subsidized meals * Asian		0.110**		0.083**		0.090**		0.056**
		(0.020)		(0.021)		(0.019)		(0.020)
Subsidized meals * Hispanic		0.040**		0.014		0.025+		-0.013
		(0.015)		(0.015)		(0.015)		(0.015)
Subsidized meals * Other		0.018		0.021		-0.018		-0.014
		(0.017)		(0.017)		(0.018)		(0.018)
Subsidized meal * LEP			0.089**	0.072**			0.114**	0.112**
			(0.016)	(0.018)			(0.018)	(0.019)
N	87764	87764	87764	87764	87676	87676	87676	87676
R-squared	0.875	0.875	0.875	0.875	0.873	0.873	0.873	0.873
P-value of test Subsidized meals + Subsidized meals * Female = 0	0.281				0.231			
P-value of test Subsidized meals + Subsidized meals * Black = 0		0.818		0.830		0.091		0.100
P-value of test Subsidized meals + Subsidized meals * Asian = 0		0.000		0.000		0.000		0.002
P-value of test Subsidized meals + Subsidized meals * Hispanic = 0		0.017		0.430		0.033		0.872
P-value of test Subsidized meals + Subsidized meals * Other = 0		0.309		0.293		0.819		0.858
P-value of test Subsidized meals + Subsidized meals * LEP = 0			0.000	0.000			0.000	0.000

Notes: + p<0.1, * p<0.05, ** p<0.01. These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress test scores on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. The omitted category for race is White. Other includes American Indians, Native Hawaiians, and mixed race. LEP = limited english proficiency. The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Standard errors are in parentheses and clustered at the school level.

Table 6. Impact of Medicaid Certification on Standardized Test Scores by CEP (2017-19)

	(1)	(2)
	Math	ELA
Panel A. Not CEP in 2017 or 2018		
Subsidized meals	0.009	0.007
	(0.012)	(0.013)
N	61684	61665
R-squared	0.875	0.870
Panel B. CEP in 2017 and 2018		
Subsidized meals	0.005	0.076**
	(0.033)	(0.029)
N	15390	15328
R-squared	0.839	0.856
Panel C. Not CEP in 2017, CEP in 2018		
Subsidized meals	0.025	0.025
	(0.037)	(0.043)
N	7204	7194
R-squared	0.874	0.874

Notes: + p<0.1, * p<0.05, ** p<0.01. These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress test scores on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. CEP = Community Eligibility Provision. The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Standard errors are in parentheses and clustered at the school level.

Table 7. Impact of Medicaid Certification on Standardized Test Scores by CEP, Gender, Race, and LEP (2017-19)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Math				ELA			
Panel A. Not CEP in 2017 or 2018								
Subsidized meals	0.006	0.001	0.007	-0.000	0.015	0.004	0.005	0.003
	(0.013)	(0.013)	(0.012)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
Subsidized meals * Female	0.007				-0.016+			
	(0.008)				(0.009)			
Subsidized meals * Black		0.012		0.012		0.000		0.000
		(0.018)		(0.018)		(0.020)		(0.020)
Subsidized meals * Asian		0.122**		0.115**		0.091**		0.078**
		(0.019)		(0.020)		(0.021)		(0.021)
Subsidized meals * Hispanic		0.019		0.014		-0.007		-0.017
		(0.018)		(0.018)		(0.018)		(0.018)
Subsidized meals * Other		0.043*		0.044*		-0.002		-0.002
		(0.019)		(0.019)		(0.020)		(0.020)
Subsidized meal * LEP			0.055**	0.035+			0.078**	0.069**
			(0.019)	(0.020)			(0.019)	(0.020)
N	61684	61684	61684	61684	61665	61665	61665	61665
R-squared	0.875	0.875	0.875	0.876	0.870	0.870	0.870	0.871
Panel B. CEP in 2017 and 2018								
Subsidized meals	-0.000	-0.014	-0.003	-0.018	0.071*	0.043	0.060*	0.036
	(0.035)	(0.038)	(0.033)	(0.038)	(0.032)	(0.034)	(0.029)	(0.033)
Subsidized meals * Female	0.011				0.011			
	(0.018)				(0.019)			
Subsidized meals * Black		0.023		0.028		0.054+		0.064*
		(0.028)		(0.028)		(0.029)		(0.028)
Subsidized meals * Asian		0.014		-0.019		0.069		-0.021
		(0.082)		(0.084)		(0.073)		(0.070)
Subsidized meals * Hispanic		0.072*		0.037		0.067*		-0.036
		(0.033)		(0.037)		(0.034)		(0.040)
Subsidized meals * Other		-0.037		-0.031		-0.035		-0.022
		(0.043)		(0.043)		(0.045)		(0.044)
Subsidized meal * LEP			0.079*	0.072+			0.152**	0.203**
			(0.032)	(0.039)			(0.039)	(0.048)
N	15390	15390	15390	15390	15328	15328	15328	15328
R-squared	0.839	0.839	0.839	0.839	0.856	0.856	0.857	0.857
Panel C. Not CEP in 2017, CEP in 2018								
Subsidized meals	0.036	0.021	0.016	0.015	0.028	0.014	0.021	0.012
	(0.039)	(0.038)	(0.037)	(0.038)	(0.044)	(0.043)	(0.044)	(0.043)
Subsidized meals * Female	-0.022				-0.008			
	(0.024)				(0.026)			
Subsidized meals * Black		-0.009		-0.005		0.051		0.053
		(0.049)		(0.049)		(0.045)		(0.046)
Subsidized meals * Asian		0.176+		0.146		0.040		0.028
		(0.095)		(0.095)		(0.079)		(0.081)
Subsidized meals * Hispanic		0.030		-0.005		0.049		0.036
		(0.045)		(0.047)		(0.049)		(0.053)
Subsidized meals * Other		-0.049		-0.041		-0.004		-0.001
		(0.070)		(0.070)		(0.057)		(0.057)
Subsidized meal * LEP			0.140**	0.130**			0.058	0.050
			(0.044)	(0.048)			(0.047)	(0.053)
N	7204	7204	7204	7204	7194	7194	7194	7194
R-squared	0.874	0.874	0.874	0.874	0.874	0.874	0.874	0.874

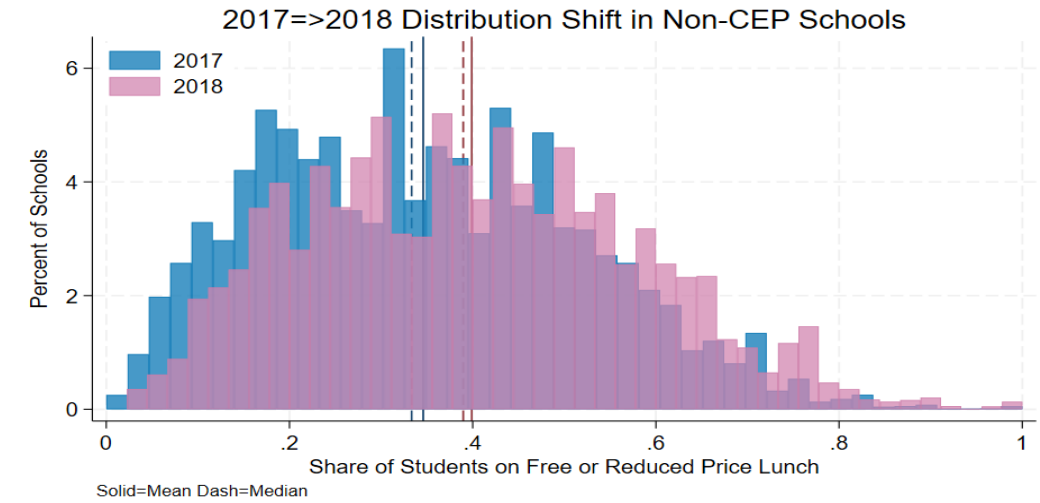
Notes: + p<0.1, * p<0.05, ** p<0.01. These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. We regress test scores on a binary indicator of being eligible for subsidized meals, using student and grade x year FE. CEP = Community Eligibility Provision. The omitted category for race is White. Other includes American Indians, Native Hawaiians, and mixed race. LEP = limited english proficiency. The sample is restricted to the Medicaid sample in years 2017, 2018, and 2019. A student is flagged as being in the Medicaid sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) were on Medicaid in the beginning of the subsequent academic year (July 2017), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. Test scores are standardized at the test x grade x year level. In 2019, 8th graders no longer took the M-STEP, so we use PSAT math and ELA scores. We use PSAT scores for grade 10 students and SAT scores for grade 11 students. Standard errors are in parentheses and clustered at the school level.

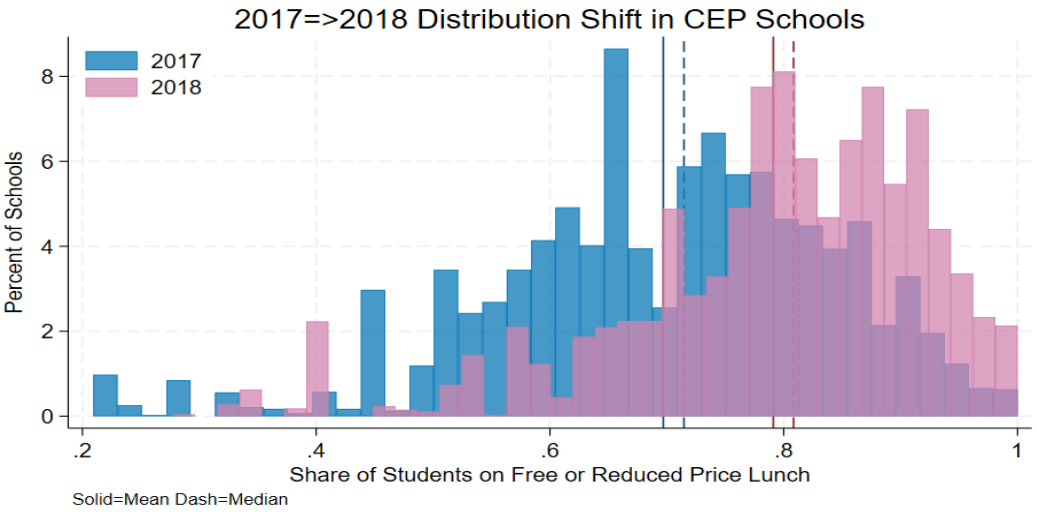
Table 8. The effect of Medicaid direct certification on per-pupil expenditures

	Operations	Basic instruction	Added Needs	Administration
	(1)	(2)	(3)	(4)
Panel A: All Schools				
Log(PP Expend)	0.000	-0.000	-0.001	0.001
	(0.004)	(0.004)	(0.011)	(0.007)
N	86146	86085	85327	85474
R-squared	0.766	0.766	0.739	0.688
Panel B: CEP Schools				
Log(PP Expend)	0.029**	0.029**	0.066**	0.021
	(0.013)	(0.013)	(0.033)	(0.018)
N	15223	15220	15127	15112
R-squared	0.745	0.765	0.753	0.766
Panel C: Non-CEP Schools				
Log(PP Expend)	-0.005	-0.003	-0.019	-0.009
	(0.004)	(0.004)	(0.013)	(0.008)
N	60632	60614	59963	60144
R-squared	0.822	0.796	0.752	0.722

Notes: All models include student fixed effects as well as grade-by-year fixed effects.

Appendix Figure 1. Distribution of share of students on subsidized meals between 2016-17 and 2017-18, by CEP status





Appendix Table 1. Subsidized Meal Transitions for Sample Definition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Medicaid	Subidized Meals, Not from Medicaid			Subsidized meals both school years				Not on subsidized meals either school year				On subsidized meals 2016-17, not on 2017-18			
Medicaid in 2016-17 (Ever)	Yes	No	No	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Medicaid in 2017-18 (July)	Yes	No	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
FRPL in 2016-17	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
FRPL in 2017-18	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
N	32,600	19,690	537	2572	94,974	977	17,375	307,365	373,045	195	10,527	27,758	18,980	19	3,857	6,165

Appendix Table 2. Safetynet Usage of Medicaid Direct Cert Sample, by Race

	(1)	(2)	(3)	(4)	(5)
	White	Black	Hisp	Asian	Other
Medicaid	1.000	1.000	1.000	1.000	1.000
SNAP	0.106	0.329	0.151	0.075	0.173
TANF	0.006	0.029	0.009	0.006	0.012
Medicaid (2016-17)	1.000	1.000	1.000	1.000	1.000
SNAP (2016-17)	0.047	0.207	0.100	0.040	0.077
TANF (2016-17)	0.004	0.026	0.009	0.007	0.007
Medicaid total months (2016-2018)	22.138	23.166	22.682	22.129	22.084
SNAP total months (2016-2018)	1.238	5.026	2.122	1.047	2.056
TANF total months (2016-2018)	0.064	0.412	0.119	0.117	0.114
Medicaid lifetime months	153.728	192.194	175.925	138.812	164.702
SNAP lifetime months	39.130	99.552	51.188	17.853	55.988
TANF lifetime months	3.562	21.313	6.251	1.641	7.094
N	24390	5700	3090	1300	1787

Notes: These data come from the the Michigan Department of Education (MDE) and consist of students public school students who were in 3rd-11th grade during 2017-18 the school year. A student is flagged as being in the Medicaid direct certification sample if they meet the following criteria: they 1) were on Medicaid at some point in the academic year prior to the policy change, (2016-17), 2) remained on Medicaid in the subsequent academic year (2017-18), 3) were not flagged as economically disadvantaged in the education data in the 2016-17 year, and 4) were flagged as economically disadvantaged in 2017-18. SNAP = Supplemental Nutrition Assistance Program. TANF = Temporary Assistance for Needy Families program.