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A school-based material needs intervention for chronic absenteeism: a state-wide staggered interrupted time series analysis

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Abstract

Background. Chronically absent students miss learning opportunities at school, and as a result, may suffer academically and socially. Student absenteeism is rising across the US, with 14–30% of K-12 students being chronically absent (missing ≥10% of school days) each year. In 2012, Michigan started Pathways to Potential (P2P)—placing caseworkers in public schools to address students' material needs that interfere with attendance. In this study, we evaluated the effect of P2P on chronic absenteeism in public schools across Michigan.

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Competing Interest Statement

Ms. Grinnell and Mr. Gernaat work for the Pathways to Potential Head Office implementing the evaluated intervention. They provided context and edited the manuscript but did not alter which analyses or results were reported.

Ethics Approval

The University of Michigan Human Subjects Behavioral Science Institutional Review Board (FWA00004969) approved this study (HUM00224140).

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Methods. Our quasi-experimental study included 160 Michigan K-12 public schools that began implementing P2P between 2012 and 2016. We evaluated P2P's effect on chronic absenteeism using administrative data for academic years 2008–09 through 2018–19. We used a staggered interrupted time series (ITS) analysis, first modeling a simple ITS for each school, and then pooling effect estimates using random effects meta-analysis. We estimated meta-regressions to investigate heterogeneous treatment effects.

Results. Results suggest P2P reduced chronic absenteeism rates by 7.82% (IRR=0.92 [95% CI=0.88–0.96]), preventing 21 students from being chronically absent per school per year (95% CI=17.52–24.95).There was significant heterogeneity, with greater effects for schools that received a higher P2P dose, were in the eastern region of the state, had wealthier student bodies, and were less racially diverse.

Conclusion. This school-based intervention represents a feasible and effective program for preventing chronic absenteeism. Further standardizing the program, while ensuring P2P can address diverse needs, may produce more consistent results across schools.

Introduction

Regular school attendance facilitates academic, social, and emotional learning. The consequences of chronic absenteeism are pervasive across the life course, and it has reverberating impacts for society. At the individual level, absenteeism predicts poor academic performance, social-behavioral problems, and can ultimately lead to school dropout.[1-4] These costs extend into adulthood, as adults without a high school diploma have worse labor market prospects,[5] earn less,[6] have more criminal justice involvement,[7] experience poorer health,[8,9] and ultimately live shorter lives[8] compared to those with a high school diploma. At the societal level, chronic absenteeism rates signal the degree to which an education system serves every student it is responsible for teaching. Learning loss because of school absences can reduce worker skill, stunt economic growth, and reproduce racial and socioeconomic wage inequalities.[4,10]

Routine student absences have worsened in the United States in recent years.[11-13] In the 2021–2022 academic year, one in three students attending kindergarten through 12th grade (K-12) in US public schools were chronically absent – missing at least 10% of school days.[13] While extended school closures during the COVID-19 pandemic exacerbated chronic absenteeism, and have since brought public attention to school attendance,[13] the issue predates the pandemic. For example, between the academic years of 2015 and 2018, around one in seven students were chronically absent.[13,14]

Students may miss school for a variety of reasons, including: obstacles originating from material needs, such as unreliable transportation and caretaking responsibilities at home; illness; because they are struggling socially, behaviorally, or academically; because they are disengaged from learning, their teachers, or peers; or, because parents hold misconceptions about attendance.[15-18] Prior research suggests there are effective strategies for addressing some of these causes, such as student disengagement from school and parental misconceptions about attendance. Specifically, researchers have found that effective teachers,[19] small classes,[20] and information-based nudges to parents,[21] can reduce

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absenteeism. Yet, a 2022 meta-analysis using data from 22 studies found that most practices to improve student attendance are either understudied, lead to small effects, or both.[22]

Overall, relatively few interventions have sought to reduce chronic absenteeism by addressing students' material needs.[22] Yet, chronic absenteeism is concentrated among socioeconomically disadvantaged students and underserved communities, exacerbating existing social and health disparities.[14] This concentration exists because some of the main barriers to school attendance—such as poor or unsafe transportation, housing and food insecurity, and responsibilities at home—disproportionately burden students who already experience educational disadvantages rooted in racism and classism.[15,23,24]

Pathways to Potential (P2P) is one such program that works to reduce chronic absenteeism by identifying and addressing students' material needs. MDHHS launched P2P in 2012, and it has served hundreds of Michigan public K-12 schools. Within schools, P2P is a universal intervention available to all students (although not all students interact with the program). Across the state, however, MDHHS prioritizes schools to receive P2P that fare worse on attendance and have higher proportions of economically disadvantaged students than state averages.

Borrowing from Geoffrey Rose's seminal work on high-risk and population strategies, this creates a situation where P2P can represent either strategy type to improve student attendance, depending on the unit of analysis.[25] At the school level, P2P is a population strategy that seeks to shift down a school's distribution of risk factors for chronic absenteeism. At the state level, however, P2P is a high-risk strategy that focuses on schools with the highest needs. To better understand the macro-level effects that P2P can have on school populations, here we adopt the school as the unit of analysis.

Even though MDHHS prioritizes the highest need schools to receive P2P, there remains socioeconomic differences between these schools. As a large scale program, concerns about inverse equity arise, or the idea that higher socioeconomic schools will benefit most, thereby increasing inequities at the state level.[26,27] Using schools as the unit of analysis provides the opportunity to study heterogenous effects between different populations (i.e., schools) and evaluate this inverse equity hypothesis.

In this study, we evaluate a state-wide school-based intervention, P2P, that focuses on identifying and addressing students' and their families' material needs. By leveraging the staggered timing and location of P2P, we use a quasi-experimental design to estimate the impacts of the intervention on chronic absenteeism and explore effect heterogeneity by possible school-level moderators.

Methods

Study design and setting

We conducted a quasi-experimental study at the school-academic year level to evaluate the effects of P2P on chronic absenteeism in Michigan public K-12 schools. Study years for the main analyses included academic years 2008–09 through 2018–19. The analyzed

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study period ends in 2018–19 due to substantial deviations in chronic absenteeism trends introduced by school closures and virtual learning during the COVID-19 pandemic in academic years 2019–20 and 2020–21 (Supplemental Figures 1 and 2).

We used a staggered interrupted time series (ITS) approach,[28,29] leveraging the staggered implementation of P2P across public K-12 schools in Michigan. Because schools selected to implement P2P differed from schools that never implemented P2P with respect to the proportion of chronically absent and economically disadvantaged students (see Supplemental Table 1), we did not incorporate a control group based on non-P2P schools within the staggered ITS design. Rather, we theorized that pre-intervention trends in P2P schools were the most appropriate information to estimate the counterfactual.[30,31] The full study protocol, including the statistical analysis plan, is publicly available online at ClinicalTrials.gov (https://clinicaltrials.gov/study/NCT05986188). Supplemental Methods 1 details how the present analyses deviate from this plan. Supplemental Methods 2 provides an additional justification for our methodological approach.

Pathways to Potential intervention

Starting in the 2012–13 academic year, the Michigan Department of Health and Human Services (MDHHS) began P2P in public K-12 schools. Schools selected to receive P2P have high proportions of chronically absent and economically disadvantaged students (Supplemental Table 1). P2P places MDHHS caseworkers (named “success coaches”), in schools to address students’ and families’ needs that interfere with attending school (e.g., unreliable transportation, limited clothing). Success coaches are employees of a local MDHHS county office with training in human services. Success coaches work to decrease chronic absenteeism through connecting students and families to school resources (e.g., afterschool activities, school-based job fairs) and community organizations (e.g., food banks, job training), and they can directly enroll individuals and families in MDHHS public benefits (e.g., Supplemental Nutrition Assistance Program [SNAP], Temporary Assistance for Needy Families [TANF]). Success coaches may also help develop and implement attendance incentive programs, send attendance letters to families, and work with other school efforts to promote attendance, though specific strategies vary by school.

Data sources

Data included P2P program data available from MDHHS and administratively collected student educational records available from the Michigan Education Research Institute-Michigan Education Data Center (MERI-MEDC). We obtained these restricted-use data sets via data use agreements with MDHHS and MERI-MEDC. Supplemental Table 2 provides the data dictionary for the analytic variables in this study.

P2P program data are longitudinal data that include the school buildings and districts for schools that participate in P2P, years the schools were/are active in P2P, and full-time equivalence of success coaches per school per year.

The administratively collected student educational records included student-level data for all public K-12 students in Michigan. We aggregated these data to the school-academic year

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level to obtain the number and characteristics of students enrolled in each school and in each academic year (e.g., student count, proportion of chronically absent students).

Exposure – P2P intervention: We operationalized the interruption as the first year a school began implementing P2P. With staggered implementation, this interruption occurred in different academic years for different schools, between 2012 and 2016 (Supplemental Table 1).

Outcome – Chronic absenteeism: Our primary outcome was chronic absenteeism, or the count of students in a school who were absent ≥10% of possible school days in an academic year. We included student count as an offset to analyze chronic absenteeism rates.

Moderators: To evaluate if P2P addresses socioeconomic and racial disparities in chronic absenteeism, we investigated potential heterogeneous treatment effects by student body racial diversity and the percentage of economically disadvantaged, White, Black, and Latinx students. We derived these measures from the student-level data for the first year of P2P implementation. School-level racial diversity was the probability (0 to 1) that two people chosen at random from the same school would be from different racial groups. Therefore, 0 represents no racial diversity (i.e., a racially homogenous student body) and 1 represents high racial diversity (i.e., a racially heterogenous student body).

Although P2P is a statewide initiative, local context may influence success. Specifically, program effectiveness may depend on the quality and capacity of community and school resources that success coaches can leverage. As such, we also used school-level data from MERI-MEDC to measure school urbanicity (rural, suburban, urban), school grade level (elementary school, combined elementary-middle school, middle school, combined middle-high school, high school, combined all grades), student count, the school's region within the state (Upper Peninsula, Northwest, Northeast, West, East Central, East, South, Southwest, Southeast, Detroit Metro), and P2P dose—the ratio of full-time equivalent success coaches to economically disadvantaged students within the school.

Statistical analysis

For the main analyses, we retained schools (1) continuously opened between 2008–09 and 2018–19; (2) with valid student attendance and enrollment data, and; (3) with at least three years of data available pre- and post-P2P implementation. Supplemental Methods 3 details the process and outcomes for detecting and addressing invalid student attendance and enrollment data. Analyses included 160 schools that initiated P2P during the study period, with 894 school-academic years pre-P2P and 866 school-academic years with P2P.

We first modeled changes in chronic absenteeism in each P2P school using segmented quasi-Poisson regressions with linear trends, where academic year (July 1st–June 30th) was modeled as the independent variable. We evaluated residuals for more complex models (i.e., polynomial trends), and the linear trend exhibited the best fit. We did not control for seasonal patterns, as yearly data is matched on seasonality by design. We modeled the chronic absenteeism as a count (i.e., the number of students in a school that were chronically absent in a given year) and included the number of students in each school

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as an offset variable to derive the incidence rate ratio (IRR) of chronic absenteeism during P2P implementation compared to what pre-implementation trends predicted. We pre-specified that the impact of P2P participation followed a step-change in chronic absenteeism (i.e., abrupt sustained change in level). Specifically, we theorized that any effect was likely immediate and sustained because a new student cohort received the intervention each year, thereby providing little opportunity for effects to lag or wane within students across years.[29] We therefore used a simple dummy variable to code the implementation of P2P (pre-intervention period: coded 0; intervention period: coded 1). Given the time sequencing of data, we generated robust standard errors using a sandwich estimator to produce conservative uncertainty estimates.[32]

We also calculated the number of investigations P2P prevented for each school-academic period, the attributable number (AN), as the difference between the number of chronically absent students and the number of chronically absent students we would have expected in the absence of P2P. We calculated the AN variance based on the delta method.[33]

Next, to estimate the average effect of P2P on all schools across Michigan, we pooled effect estimates for both the IRR and AN using random effects meta-analysis, as we anticipated heterogeneity across schools. We estimated meta-regressions to evaluate potential heterogeneous treatment effects by: percentage of economically disadvantaged, White, Black, and Latinx students; student body racial diversity; school urbanicity, level, and region; student count, and; P2P dose.[34] Specifically, we computed adjusted effects based on meta-regression models. For continuous moderators, we computed average effects at the mean, 25th percentile, and 75th percentile; for categorical moderators, we computed average effects for each value of the moderator.[35]

In line with recommendations from the American Statistical Association, we evaluated effects based on the magnitude of estimates and corresponding 95% confidence intervals[36] We completed all analyses using R version 4.4.

Robustness checks: We supplemented main analyses using generalized synthetic control (GSC) methodology[37] to estimate the average treatment effect of P2P from 2006–07 through 2018–19 (Supplemental Methods 4). GSC addresses possible threats to validity from abrupt time-varying confounding, while also partially overcoming the issue of selection bias, by only incorporating comparison schools (i.e., non-P2P schools) that have similar levels and trends in chronic absenteeism to derive a weighted average synthetic control group.[30] We further investigated the possible role of time-varying confounding (i.e., history bias) by conducting a systematic search of possible confounding events during our study period (Supplemental Figure 2). In addition, to check the robustness of main findings against our handling of outlying data (Supplemental Methods 1), we ran the main staggered ITS analysis on data from 2006–07 through 2018–19. Supplemental Table 3 describes these robustness checks and rationales.

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Results

Over the study period, 2008–09 through 2018–19, 160 schools included in the analyses implemented P2P. Across all Michigan public K-12 schools, chronic absenteeism increased over time (Supplemental Figure 1). P2P schools also observed this upward linear trend in chronic absenteeism, rising from an average percentage of chronically absent students at 32.52 (SD=21.73) pre-P2P to 37.16 (SD=23.39) during P2P (IRR for linear trend: 1.04 [95% CI=1.03–1.05]; Table 1).

P2P worked against this upward linear trend in chronic absenteeism. Based on the meta-analysis of simple ITS estimates at the school level from 2008–09 to 2018–19, P2P was associated with, on average, an immediate and sustained reduction in the chronic absenteeism rate of 7.88% across public schools that implemented P2P (IRR=0.92 [95% CI=0.88–0.96]; Table 1; Figure 1; Supplemental Figure 3). This equated to preventing 21.24 (95% CI=17.52–24.95) students from being chronically absent per school per year.

There was, however, significant heterogeneity between schools (Q=596.20, df=159, p<.0001; Figure 1; Supplemental Table 4). Meta-regressions indicated that the effects of P2P on chronic absenteeism were moderated by the location of the school (omnibus tests for moderation all p<.05). For example, schools in the eastern region of Michigan showed the largest reductions (IRR=0.88 [95% CI=0.84–0.91]). Intervention effects were also moderated by sociodemographic characteristics of the student body, with the largest reductions among less racially diverse (IRR=0.89 [95% CI=0.88–0.91]) and wealthier (IRR=0.90 [95% CI=0.88–0.91]) student bodies. Schools that received higher P2P doses also observed larger reductions in chronic absenteeism (IRR=0.91 [95% CI=0.89–0.92]). Meta-regressions did not find heterogeneity based on school size, school grade level, urbanicity, nor the proportion of students who identified as White, Black, or Latinx.

Results were robust to study period and modeling strategy (Supplemental Table 3). GSC analyses, comparing P2P to non-P2P schools, estimated a reduction of 12.74 percentage points in annual chronic absenteeism rates ([95% CI=−17.62– −7.87]; Supplemental Figures 4 and 5), indicating that P2P schools had a larger average reduction in chronically absent students than expected had the school not implemented P2P. We identified potential confounding events during the study period that plausibly increased or decreased chronic absenteeism. These events, however, largely occurred after most schools implemented P2P for at least three years (Supplemental Figure 2). A staggered ITS analysis spanning from 2006–07 through 2018–19 found a similar, yet slightly larger, reduction as compared to the main analyses (IRR=0.90 [95% CI: 0.86–0.95]; Supplemental Figure 6).

Discussion

School-based interventions that address socioeconomic barriers to school attendance are critical for tackling chronic absenteeism and eliminating educational disparities. A state-wide school-based material needs intervention, P2P, was associated with an overall 7.88% reduction in chronic absenteeism rates in public schools across Michigan, US. While P2P likely represents a feasible and effective strategy for reducing chronic absenteeism,

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effectiveness varied across schools based on school geography and sociodemographic characteristics.

In its current form, P2P was the most effective among schools in the eastern region of the state, schools that received a higher intervention dose, and, notably, among less diverse and wealthier student bodies. This provides some evidence for the inverse equity hypothesis that wealthier and more advantaged school populations may benefit most, although not along every dimension.[27] We did not find heterogenous effects based on school size, school grade level, urbanicity, nor the proportion of students who identified as White, Black, or Latinx. Exploring why this effect heterogeneity exists where it does is a next step towards ensuring effectiveness and equity across all public schools.

Considering what an intervention can feasibly address and which schools are likely to benefit can inform decisions to implement an equitable intervention for reducing chronic absenteeism. For example, reasons for missing school vary across race, ethnicity, and class. Black and Latinx children, and children in low-income households, are more likely to be chronically absent from school for illnesses complicated by socioeconomic determinants, such as uncontrolled asthma.[24,38] Because P2P focuses on addressing socioeconomic barriers to school attendance, it is plausible that P2P could have had greater effects in schools with more economically disadvantaged students. Yet, moderation analyses found the opposite: the effect of P2P on chronic absenteeism was higher in schools with a lower percentage of economically disadvantaged students.

The stronger effect for schools with a lower percentage of economically disadvantaged students may be due to schools with wealthier student bodies also having more school and community resources with which to connect families, and the existing resources were not at (or over) their serving capacity. It could also be that students in these schools experienced, on average, fewer stressors in their communities that became barriers to attending school, for example, community violence, unreliable transportation, or air pollution. Continually monitoring and adapting P2P to address school-specific barriers to attendance could help the program achieve more equitable results across schools in communities of differing wealth.

Although P2P was more effective among racially homogenous schools, we found no treatment differences according to student body race (i.e., proportion of students identifying as White, Black, or Latinx). Because barriers to attending school vary across race and ethnicity,[24,38] these barriers may be more uniform across racially homogenous as compared to racially diverse schools. As such, success coaches in racially homogenous schools might quickly learn how to navigate common barriers to school attendance, whereas success coaches in racially diverse schools need to learn how to address multiple different barriers.

Our meta-regression accounted for some of the observed differences in P2P effectiveness according to school region, racial diversity, the percentage of economically disadvantaged students, and P2P dose, but much of the heterogeneity remained unexplained. Starting in 2021–22, MDHHS undertook efforts to increase success coach training, update school eligibility criteria, clarify memoranda of understandings with participating schools, and standardize documenting interactions between success coaches, students, and families. A

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revised program version may produce more consistent results across schools and can be the subject of future evaluation efforts.

P2P's focus on identifying and addressing students' material needs provides a strong basis for generalizability, as the link between unmet basic needs and school absenteeism is well-documented across diverse contexts.[14] Michigan includes these diverse contexts, as the state contains dense urban centers, suburban neighborhoods, and rural farming communities, areas of extreme wealth and poverty,[39] and its political leanings are representative of the nation.[40] Even though effect sizes varied, P2P remained effective at preventing chronic absenteeism in nearly all types of schools across the state (with a few exceptions), including but not limited to schools of various sizes, with different student body demographics, and in rural, urban, and suburban settings. Given the state's heterogeneity, this suggests that findings may generalize to other states and some international contexts.

The extent to which the program can transfer to other communities likely depends on having a social service system to which caseworkers can connect students and their families. P2P is likely particularly helpful in settings where the social service system is complex and difficult to navigate.[41] Given that all US states participate in federal programs such as the Supplemental Nutrition Assistance Program (SNAP), and chronic absenteeism has been a growing issue across the nation, school communities in all 50 US states could likely implement P2P. This program may translate to international contexts, as well. For example, the UK parliament has issued concerns about students' increased absences from schools, and the Department for Education has developed an attendance hub program to address this[42]; P2P is a strategy that could be embedded within such hubs.

Limitations

Our study is subject to limitations. As an ITS design, our causal inferences are subject to the threat of history bias. We expect, however, that history is not unduly influencing results. Specifically, the staggered approach makes it so that an event at a given time point (e.g., new guidance to protect LGBT students in 2016) is unlikely to bias results, as the event co-occurred with the start of P2P for only some schools. A remaining confounder of the staggered ITS approach is the possibility that schools more strictly adhered to state guidelines for reporting attendance when they received P2P, i.e., when an outside party was observing them. Yet, the GSC analysis is not subject to this confounding, as it creates a comparison group that did not experience this observer phenomenon. As both the staggered ITS and GSC analyses found that P2P was associated with an overall reduction in chronic absenteeism, we expect the influence of history on results to be negligible.

Additionally, the study period ended at academic year 2018–2019, preventing us from estimating the effect of P2P in a pandemic and post-pandemic setting. The drastic changes in chronic absenteeism rates starting in 2019–2020, combined with the changes in the latent factors that caused chronic absenteeism during this time, violated model assumptions for using pre-implementation trends in chronic absenteeism to predict post-implementation trends.

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Finally, P2P program data were at the school level and did not indicate which students interfaced with success coaches. This precluded individual-level analyses. Accordingly, we cannot conclude that P2P was more effective for specific students, only specific schools.

Conclusions

Chronic absenteeism remains a fundamental issue for many schools, both across the United States and globally.[11,13] Even while implementing P2P, chronic absenteeism rates continued to increase over time. P2P worked against this increasing trend and likely prevented an even steeper increase in chronic absenteeism that would have occurred if the intervention had not taken place. Just as chronic absenteeism has no single cause,[15,16] it has no single solution. Rather, efforts to reduce and prevent chronic absenteeism likely require multiple, simultaneous strategies that make attending school possible and easy for students and their families. The present findings suggest that tackling socioeconomic barriers to attending school is likely a critical piece of this solution.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data Sharing Statement

The Michigan Education Research Institute (MERI) and Michigan Department of Health and Human Services (MDHHS) provided data analyzed in this study. These data were acquired through restricted-use agreements and cannot be shared outside of the study team.

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Key Messages

What is already known on this topic

- Chronically absent students are at higher risk for poor academic performance, social-behavioral problems, and school dropout.
- Interventions that address a wide range of students' material needs may reduce absenteeism, but these approaches are understudied.

What this study adds

- We found that addressing material needs can reduce chronic absenteeism, with Pathways to Potential leading to an approximate 8% reduction in chronic absenteeism rates.

How this study might affect research, practice or policy

- Interventions, such as Pathways to Potential, which address students' material needs, offer a programmatic opportunity to reduce absenteeism by removing barriers to school attendance.

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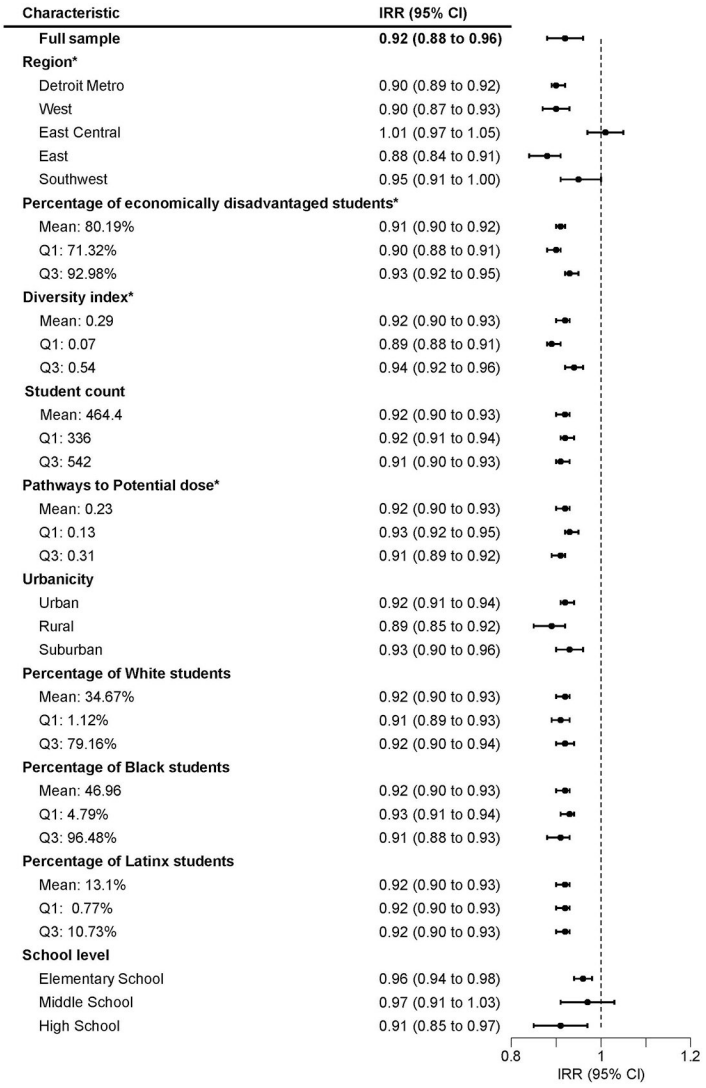


Figure 1.

Pooled and heterogeneous treatment effects of Pathways to Potential on chronic absenteeism in Michigan public K-12 schools (n=160).

Notes. * denotes moderation at α=0.05 based on omnibus tests for moderation. Presented school regions include those with ≥10 schools. Presented school grade levels exclude mixed grade levels. Abbreviations: Q1 (first quartile); Q3 (third quartile)

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Table 1.

Chronic absenteeism in Michigan public K-12 schools each year before and during Pathways to Potential implementation (n=160).

			Incidence rate ratio (95% CI)	
	Before P2P implementation	**During P2P implementation**	**Linear trend**	**Step change following P2P**
Percentage of chronically absent students	32.52 (21.73)	37.16 (23.39)	1.04 (1.03, 1.05)	0.92 (0.88–0.96)
Count of chronically absent students	163.94 (139.42)	167.79 (133.24)	--	--
Student count	480.04 (190.88)	442.79 (182.59)	--	--

Notes. We aggregated variables for each school by averaging these values across the years before P2P implementation and the years during P2P implementation. Linear trend and incidence rate ratio from random effects meta-regression of simple ITS quasi-Poisson regressions using data from 2008–09 through 2018–19. Abbreviations: CI (confidence interval); ITS (interrupted time series); P2P (Pathways to Potential); SD (standard deviation)