Advancing an Ecological Approach to Chronic Absenteeism: Evidence From Detroit

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Background/Context: *Chronic absenteeism has received increased attention from educational leaders and policy makers, in part because of the association between attendance and important student outcomes. Student attendance is influenced by a range of student-, school-, and community-level characteristics, suggesting that a comprehensive and multilayered approach to addressing chronic absenteeism is warranted, particularly in high-poverty urban districts. Given the complexity of factors associated with chronic absenteeism, we draw from ecological systems theory to study absenteeism in Detroit, which has the highest rate of chronic absence of major cities in the country.*

Purpose/Research Questions: *We use administrative and public data to advance the ecological approach to chronic absenteeism. In particular, we ask: (1) How are student, neighborhood, and school characteristics associated with individual absenteeism? (2) How are structural and environmental conditions associated with citywide rates of absenteeism? Our study helps to fill a gap in the research on absenteeism by moving beyond a siloed focus on student, family, or school factors, instead placing them in relationship to one another and in their broader socioeconomic context. It also illustrates how researchers, policy makers, and administrators can take a theoretically informed approach to chronic absenteeism and use administrative data to conceptualize the problem and the potential routes to improving it.*

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Research Design: *Using student-level administrative data on all students living and going to school in Detroit in the 2015–2016 school year, we estimate a series of multilevel logistic regressions that measure the association between student-, neighborhood-, and school-level factors and the likelihood of a Detroit student being chronically absent. We also use publicly available data to examine how macrosystemic conditions (e.g., health, crime, poverty, racial segregation, weather) are correlated with citywide rates of absenteeism in the 2015–2016 school year, and we compare Detroit with other large cities based on those conditions.*

Findings/Results: *Student-, neighborhood-, and school-level factors were significant predictors of chronic absenteeism in Detroit. Students were more likely to be chronically absent if they were economically disadvantaged, received special education services, moved schools or residences during the year, lived in neighborhoods with more crime and residential blight, and went to schools with more economically disadvantaged students and less stable student populations. Macro-level factors were also significantly correlated with citywide rates of absenteeism, highlighting Detroit's uniquely challenging context for attendance.*

Conclusions/Recommendations: *Our ecological understanding of absenteeism suggests that school-based efforts are necessary but not sufficient to substantially decrease rates of chronic absenteeism in Detroit and other high-absenteeism contexts. Policies that provide short term relief from economic hardship and aim to reduce inequalities in the long-run must be understood as part of, rather than separate from, a policy agenda for reducing chronic absenteeism.*

Chronic absenteeism, typically defined as missing 10% or more days of school per year, has received increased attention from educational lead ers and policy makers (Balfanz & Chang, 2016; Chang & Romero, 2008; Childs & Grooms, 2018), in part because of the association between atten dance and important student outcomes, such as academic achievement and graduation rates (Allensworth & Easton, 2007; Gottfried, 2014b). Student absenteeism is influenced by a range of student-, school-, and community-level characteristics (Balfanz & Byrnes, 2012; Childs & Lofton, 2021; Gottfried & Gee, 2017; Lenhoff & Pogodzinski, 2018), suggesting that a comprehensive and multilayered approach to improving student attendance is warranted (Childs & Grooms, 2018). This is particularly im portant in high-poverty urban districts, where chronic absenteeism rates "are typically two, to as much as four times, higher than the national aver age" (Balfanz & Chang, 2016, p. 10).

Given the complexity of factors associated with student attendance, we draw from ecological systems theory (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006) to study chronic absenteeism in Detroit.

Detroit has the highest rate of student absence of major cities in the country, and local stakeholders have set an ambitious goal of reducing chronic absenteeism rates to 15% by 2027 (Simmons & Bell, 2019). Using student-level administrative data on all students living and going to school in Detroit in the 2015–16 school year, we estimate a series of multilevel

logistic regressions that measure the association between student-, neigh borhood-, and school-level factors and the likelihood of a Detroit student being chronically absent. We also use publicly available data to examine how macrosystemic conditions (e.g., health, crime, poverty, racial seg regation, weather) are correlated with citywide rates of absenteeism in the 2015–16 school year, and we compare Detroit with other large cities (500,000 or more residents) based on those conditions.

Complementing previous studies that have applied the ecological frame work to illuminate the influence of proximal processes, personal charac teristics, and contextual factors on student attendance (Gottfried & Gee, 2017; E. P. Sugrue et al., 2016), we use these administrative and public data to advance the ecological approach to chronic absenteeism. In particular, we ask: (1) How are student, neighborhood, and school characteristics associated with individual absenteeism? (2) How are structural and envi ronmental conditions associated with citywide rates of absenteeism? Our study helps fill a gap in the research on absenteeism by moving beyond a siloed focus on student, family, or school factors, instead placing them in relationship to one another and in their broader socioeconomic context. It also illustrates how researchers, policy makers, and administrators can take a theoretically informed approach to chronic absenteeism and use administrative data to conceptualize the problem and the potential routes to improving it. Our findings emphasize the need for coordinated, ecosys temic policy interventions that address structural and environmental bar riers to attendance, along with school-based efforts that more immediately support students and their families.

Literature Review

Many states now track chronic absenteeism in their school accountability systems in compliance with the federal Every Student Succeeds Act (Jordan & Miller, 2017). Districts are increasingly interested in developing solu tions to encourage more regular attendance, motivated by research that shows the consequences of

missing 10% or more of the school year. For example, research has shown that chronic absenteeism is associated with lower student academic achievement and graduation rates (Allensworth & Easton, 2007; Gershenson et al., 2017; Gottfried, 2014b; London et al., 2016). Further, chronic absenteeism disrupts the learning environment of classrooms and schools, impacting the outcomes of students who are not chronically absent (Balfanz & Byrnes, 2013; Epstein & Sheldon, 2002; Foy, 2005; Gottfried, 2014b; Hartman, 2002). Yet the reasons for absentee ism are complex, varied, and embedded in multiple contexts, making any single strategy or intervention unlikely to reduce absenteeism at scale.

Therefore, the ecological systems perspective provides a useful framework through which policy makers and practitioners can think about absenteeism and potential reforms needed to reduce it. An evolution of his original ecological theory of human development (Bronfenbrenner, 1979), Bronfenbrenner's bioecological model ex plains human development as a product of *proximal processes*, charac teristics of a *person*, the person's *context*, and *time* (Bronfenbrenner & Morris, 2006). Context includes a student's immediate contexts, such as their home or school (microsystem); the relationships between their multiple immediate contexts, such as their school-family relationships (mesosystem); aspects of their context that indirectly affect them by affecting others in their immediate contexts, such as their parent's employment (exosystem); and the broader social and material struc tures in which these more immediate contexts are situated (macro system). Applied to student attendance, bioecological systems theory draws attention to the interconnected effects of processes that a stu dent experiences at home and school, the student's dispositions and biopsychosocial attributes, the structures and environmental factors in their immediate and broader contexts, and how these things interact, change, and affect students over time (Gottfried & Gee, 2017). Though research on student attendance has tended to examine factors of absenteeism "in isolation from one another" and in a "largely atheo retical" way (Gottfried & Gee, 2017, p. 2), researchers have illuminated causes of chronic absenteeism associated with each of these ecological di mensions. For *process*, relationships and developmental experiences with family members, peers, teachers, and mentors are important (Anderson et al., 2004; Balfanz & Byrnes, 2012, 2018; Gershenson, 2016; Gottfried & Gee, 2017; Sampson & Laub, 1994; Southworth, 1992; E. P. Sugrue et al., 2016; Wallace, 2017). Processes that occur regularly over time, such as positive or negative interactions with other

children at school or the extent to which students engage in learning activities at home, shape a students' development and thus can influence their school-going patterns (Gottfried & Gee, 2017).

At the individual level (*person*), a student's disposition toward school, ex ternalizing and internalizing behaviors, physical and mental health, and cognitive and social development can all shape attendance rates (Balfanz & Byrnes, 2012; Brundage et al., 2017; Gee, 2018; Gottfried & Gee, 2017; Jacob & Lovett, 2017). Although a student's biopsychosocial characteris tics are malleable and not independent from the environment in which they are expressed (Youdell & Lindley, 2019), operationalizing them at the individual level is useful for illuminating how they shape and are shaped by proximal processes in a student's context.

Context can include family factors such as socioeconomic status (SES) (Chang & Romero, 2008; Gottfried & Gee, 2017; Reid, 2012); socioeco nomic and sociodemographic characteristics of a student's neighborhood (Gottfried, 2014a); and school factors such as school climate (Ansari & Gottfried, 2020; Hamlin, 2020; Lenhoff & Pogodzinski, 2018), teacher at tributes (Gershenson, 2016; Whipple et al., 2010), and the presence of sup ports such as school nurses or school-based health systems (Allen, 2003; Tinkelman & Schwartz, 2004). It also includes structural factors, such as transit and housing infrastructure, and concentrated poverty, as well as de terminants of health, such as food security, access to healthcare, and air quality rates (Balfanz & Chang, 2016; Bell et al., 1994; Epstein & Sheldon, 2002; Gottfried, 2017; Gottfried & Gee, 2017; Jacob & Lovett, 2017; Lenhoff & Pogodzinski, 2018; Kearney, 2008; Metzger et al., 2015; Moonie et al., 2006; Sutphen et al., 2010; Wallace, 2017; Whipple et al., 2010).

Finally, *time* plays a role as well: Attendance patterns vary not only by time within a single day (Whitney & Liu, 2016), but also by grade level, and they can be impacted by grade-level transitions (Balfanz & Byrnes, 2012; Bealing, 1990). The timing of a student's absences during the school year may have different consequences (Gottfried & Kirksey, 2017), and absen
teeism itself may have compounding effects over time (Ansari & Gottfried, 2021; London et al., 2016; Simon et al., 2020). Finally, the effects of the process, person, and context factors described earlier can change over time as students develop and as their life circumstances change or re
main the same.

Only two prior studies of chronic absenteeism have explicitly used an ecological perspective to examine the multiple and interrelated causes

of absenteeism. In a qualitative study, E. P. Sugrue et al. (2016) collected data from caseworkers and supervisors at community-based agencies about stu
dents in grades K–5 to detail the ecological determinants of absenteeism. They emphasize the relationship between student attendance and a vari ety of resource-based and relationship-based household and school fac tors at the microsystems level; information-based and relationship-based issues between families and schools at the mesosystem level; issues of pa rental employment at the exosystem level; and poverty and cultural con flicts at the macrosystems level. Importantly, the authors note that case workers made little or no effort to address resource-based factors at the exosystem or macrosystem level and that resource-based interventions for microsystem-level issues (such as referrals for housing or transportation) were often less efficacious because of resource limitations and short-term caseworking periods for addressing long-term issues.

Gottfried and Gee (2017) use quantitative measures of proximal pro cesses, personal characteristics, and contextual factors from the Early

Childhood Longitudinal Study to predict the odds of chronic absentee ism for kindergarteners. Their findings show that home learning activi ties, internal problem behaviors, poor physical health, and low SES pre dict higher rates of absenteeism, whereas factors such as positive attitudes
toward school, external problem behaviors, a greater number of siblings, center-based pre-K, and high parent involvement predict lower rates of chronic absenteeism. They also show that the significance and effects of process, person, and context factors on student absenteeism vary between low-, medium-, and high-SES families. Both of these studies illustrate the ways in which an ecological perspective can help policy makers and prac titioners understand and more effectively target barriers to attendance across a student's ecosystem.

Most research-based attendance interventions, however, have focused on school-based efforts at the microsystem and mesosystem levels (E. P. Sugrue et al., 2016), likely because these are the ecological factors that are closest to a school's locus of control. For example, some interventions focus on improving teacher quality (Liu & Loeb, 2017), and others fo
cus on student relationships in schools with teachers or other mentors (Balfanz & Byrnes, 2013). Schools have also tested the impact of direct communication with families (Rogers & Feller, 2017; Smythe-Leistico &

Page, 2018), and the impact of financial incentives for parents and stu dents (Martorell et al., 2016). To formalize these school-based attendance practices, schools and districts have adopted multi-tiered systems of sup port (Freeman et al., 2016; Jordan, 2019) or have fostered community based interorganizational networks that work together to address the problem (Childs & Grooms, 2018). From an ecological perspective, these types of interventions represent just one part, albeit a necessary part, of a coordinated approach to systematically improving attendance. By con ceptualizing absenteeism ecologically and examining the student, school, neighborhood, and macro-structural factors associated with absenteeism together, we emphasize the need for policies that go beyond school-based interventions and address inequalities in families' immediate and broader social and economic contexts.

Methodology

The goal of this study was to examine chronic absenteeism in Detroit from an ecological perspective, which requires attention to process, per son, context, and time factors (Rosa & Tudge, 2013; Tudge et al., 2009, 2016). The measures that can be constructed from administrative data, however, present some limitations. In particular, compared with rich qual itative data or intentionally constructed surveys, administrative data do

not provide clear measures of the "processes of progressively more com plex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate external environment" (Bronfenbrenner & Morris, 1998, p. 996). Still, administrative data provide a unique opportunity to study student atten dance longitudinally and at large scales (Dynarski & Berends, 2015). The data do not allow us to directly measure or represent proximal processes, but they do allow us to examine variance in person, context, and time variables that are suggestive of processes that shape students' school-going patterns (Maxwell, 2004).

Thus, to advance a bioecological approach to student attendance, we proceeded with our study in three analytic phases. First, we described chronic absenteeism in Detroit by grade, school sector, and geography, and in comparison with other large cities in the United States (500,000 or more residents). Then, we examined the variance of student, residen tial tract, and school factors among Detroit students and their association with chronic absence to assess the determinants of chronic absenteeism in Detroit ecologically. Finally, we identified macro-level

factors associated with the variance in citywide rates of chronic absenteeism among large cities, and we compared Detroit with other large cities based on those measures. This allowed us to consider the macrosystems level, placing the variance we observed in Detroit students' ecological conditions within the broader context of the city's "resources, hazards, lifestyles, opportu nity structures, life course options, and patterns of social interchange" (Bronfenbrenner, 2005, pp. 149–150).

Data Sources and Variables

Data for Regression Analysis of Chronic Absenteeism in Detroit

To examine the ecological determinants of absenteeism for students in Detroit, we used state administrative data provided by Michigan's Center for Educational Performance and Information (CEPI). Our data set in cludes all students who lived in Detroit and attended a public or char ter school in Detroit since the 2010–11 school year. The data include a unique identifier for each student across all years and indicators for a stu dent's gender and race, special education status, and status as "economi cally disadvantaged."[1] The data also include students' math and English/ language arts (ELA) test scores from the Michigan Educational Assessment Program (MEAP; Grades 3–8) or Michigan Student Test of Educational Progress (M-STEP; Grade 11) in applicable grade levels. Each student has a single record for each school that they attend within a year, including

the school's building and district codes, and a geocode for the student's residential block at the beginning, middle, and end of each school year. Using publicly available data from CEPI, we matched schools with their physical locations to create a geocode for each student's school as well.

Drawing on public data sources, we linked individual students in the administrative data with measures of contextual variables that are theo retically related to student attendance. Using data from the Department of Education's Civil Rights Data Collection (CRDC), we linked students with school-level discipline data. Using Detroit Police Department data, we linked students to tract-level violent crime rates in their residential neighborhoods. Using data from the American Community Survey (ACS), we incorporated a tract-level measure of residential vacancy for their resi
dential neighborhoods.

From these data, we constructed a number of variables at the student,

neighborhood, and school levels that reflect person, context, and time factors and that are suggestive of processes that may impact student atten dance (Appendix A). At the student level, we created dummy variables for the following student demographics: gender (female = 1), race,[2] status as a special education student, and status as economically disadvantaged. We also included the "as-the-crow-flies" distance from a student's residential block to their school and a distance-squared variable to account for a po
tential nonlinear relationship between distance-to-school and attendance (Singer et al., 2019).[3] Finally, we included residential and school mobility variables. Both kinds of moves may occur as a result of negative experi ences or life circumstances that affect attendance, which are, in and of themselves, disruptive to the routines and relationships that students and families have (Welsh, 2018).

At the neighborhood (residential tract) level, we include two contextual measures that may also suggest the effects of proximal processes: violent crime and residential vacancy. Violent crime and residential vacancy are strongly associated with each other, and these measures may reflect per
ceptions of safety in one's residential neighborhood as well as actual po tential threats to student safety on the way to and from school (Branas et al., 2012; Spelman, 1993).[4]

At the school level, we include measures that capture a school's cli mate and culture and its socioeconomic context, with implications for proximal processes. We constructed a "school stability rate," which is the percentage of students attending the school who also attended the school the previous year (excluding students who naturally transitioned in or out based on grade-level promotion). Greater student turnover may mean a less stable school culture, and it represents disruptions to students' peer groups (Einhorn & Dawsey, 2018). In addition, we include

the school's discipline rate, which is the number of suspensions or expul sions at the school per 100 students. Higher discipline rates may capture a direct impact on attendance through out-of-school suspensions or the indirect effects of a more punitive school culture. We also include the percentage of students who are economically disadvantaged to capture the effects that a higher concentration of economically disadvantaged students may have on student attendance, such as concentrating great
er socioeconomic need or stretching a school's resources more thinly. Finally, we include a dummy variable to indicate whether the school is a charter school or public school.

Data for Correlational Analysis of Citywide Absenteeism

To compare Detroit with other large cities, we collected data on a num ber of macro-level conditions that might theoretically influence citywide absenteeism (Appendix B). Just as crime or blight may be higher in some areas of a city than others because of varying structural and environmen tal conditions, it may also systematically vary between cities. Asthma has also been documented as a significant barrier to attendance (Currie et al., 2009; Gottfried & Gee, 2017; Silverstein et al., 2001; Tinkelman & Schwartz, 2004), and overall asthma rates may indicate the extent to which
students are more or less prone to having asthma themselves.[5] The particular macro-social and economic conditions and political and economic histories of cities may be related to uniquely challenging conditions for attendance as well. Students in higher poverty cities may grow up in less advantageous conditions for their health and develop ment (Brooks-Gunn & Duncan, 1997), and addressing student challeng es associated with high levels of poverty and unemployment may over whelm the resources available to district- and school-based staff as they try to improve attendance (Blank, 2000; Childs & Grooms, 2018). Some cities have experienced greater population loss and deindustrialization over the past several decades, which has implications for the state of the physical infrastructure of a city as well as its financial and institutional health (Pallagst et al., 2014). In addition, some metropolitan areas are more racially segregated today than others, which may be connected to a history of disinvestment and racial discrimination at the root of pres ent contextual barriers to attendance (Massey, 1988; T. J. Sugrue, 2005). Higher levels of segregation may also be associated with the erosion of school–community relationships after decades of disruptive reforms (Scott & Holme, 2016). Finally, climate varies widely by geographic re gion, which means that colder weather may be a greater barrier to atten dance in some cities than others (Singer & Lenhoff, 2020).

We used publicly available data to compare these macro-level conditions among large cities in the United States.[6] The percentage of chronically absent students in each city comes from the CRDC. Total population for each city comes from the ACS, and population change rates since 1970 were calculated from the decennial census population counts. The city's overall poverty rate, unemployment rate, and rate of residential vacancy (as a proxy for blight) also came from the ACS.

Asthma rates for each city come from the CDC's "500 Cities" data set. Violent crime rates in each city come from the FBI's Uniform Crime Reporting Program. We also constructed a racial segregation index for each city's metropolitan area, which measures the degree to which Black, Hispanic, and Asian residents are segregated from White residents, using measures from the Population Studies Center at the Institute for Social Research.[7] Finally, we retrieved each city's average monthly temperature from the National Oceanic and Atmospheric Administration's Climate Divisional Database.

Methods of Analysis

We restricted our analysis to the 2015–16 school year because of data avail ability. For citywide comparisons, the most recent CRDC data available are from the 2015–16 school year, restricting the availability of citywide absen teeism rates to that year. School-level discipline data from the CRDC were also not available beyond 2015–16. In addition, while a small percentage of students attending school in Detroit in 2015–16 resided outside the city, we only include students living in and attending school in Detroit because crime data from the DPD are available only for census tracts in Detroit, not its suburbs.[8]

Descriptive Analysis

First, we conducted a descriptive analysis of chronic absenteeism in Detroit in 2015–16. We calculated a student's attendance rate by dividing their to tal days of possible attendance by their total days of actual attendance, and we created a dummy variable to identify students as "chronically absent" if they missed 10% or more school days. We summarized rates of absen teeism for students overall, by grade level, and by school sector. We then aggregated the rate of chronic absenteeism by students' residential census tract and mapped the data using the geographic information systems pro gram QGIS to examine whether absenteeism rates varied geographically. These first steps served as a foundation for examining variation in student, neighborhood, and school factors, as well as the macro-level context, to fully understand the ecological determinants of absenteeism in Detroit.

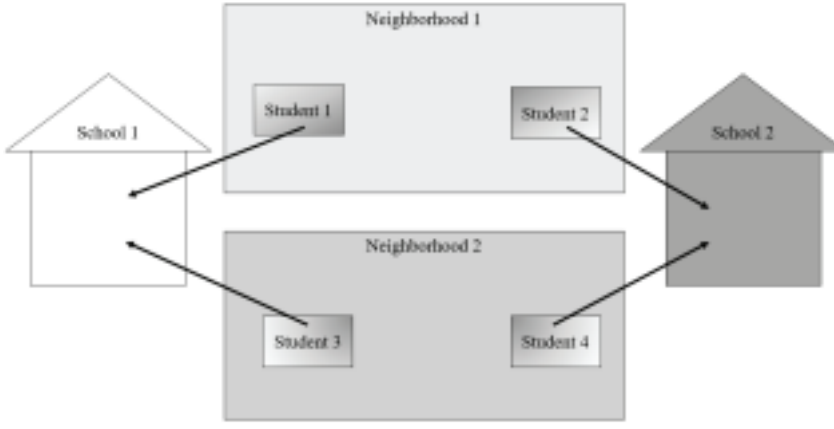

Figure 1. Conceptual framework for the multilevel logistic regression model

Multilevel Logistic Regressions

Second, we estimated a three-level model, accounting for variation in stu dent, neighborhood (residential tract), and school factors. Conceptually, this model captures the ways in which student-, neighborhood-, and school-level factors result in proximal and distal processes that vary be tween different students' educational ecosystems (Figure 1). We standard ized continuous variables to compare the magnitude of their associations with chronic absence. We began by estimating an unconditional model (Model 1) to predict the likelihood that student *i* living in residential tract *j* and attending school *k* was chronically absent:

$$\ln\{P[\textit{Chronically Absent}_{ijk} = 1] / 1 - P[\textit{Chronically Absent}_{ijk} = 1]\} = \theta_0 + v_k + u_{jk} + e_{ijk.} \quad (1)$$

We then estimated a series of conditional models, incorporating stu dent, residential tract, and school characteristics. In Model 2, we intro duced student-level variables:

$$\ln\{P[\textit{Chronically Absent}_{ijk} = 1] / 1 - P[\textit{Chronically Absent}_{ijk} = 1]\} = \theta_0 + \theta_1(\text{Student-Level Variables}) + v_k + u_{jk} + e_{ijk.} \quad (2)$$

In Model 3, we introduced residential tract-level variables:

$$\ln\{P[\textit{Chronically Absent}_{ijk} = 1] / 1 - P[\textit{Chronically Absent}_{ijk} = 1]\} = \theta_0 + \theta_1(\text{Student-Level Variables}) + \theta_2(\text{Residential Tract-Level Variables}) + v_k + u_{jk} + e_{ijk.} \quad (3)$$

In Model 4, we introduced school-level variables:

$$\ln\{P[\textit{Chronically Absent}_{ijk} = 1] / 1 - P[\textit{Chronically Absent}_{ijk} = 1]\} = \theta_0 + \theta_1(\text{Student-Level Variables}) + \theta_2(\text{Residential Tract-Level Variables}) + \theta_2(\text{School-Level Variables}) + v_k + u_{jk} + e_{ijk.} \quad (4, 5)$$

Model 5 builds on Model 4, including three additional student-level dummy variables: whether students were chronically absent in the prior year and whether they moved residences or switched schools between the start of the 2014–2015 and 2015–2016 school years. While this model nec
essarily excludes all students who were not observed in the 2014–2015 school year, it is useful to consider time-based factors and to see how the magnitude and significance of same-year variables are affected when con trolling for prior-year chronic absence.

Correlational Analysis of Citywide Absenteeism

Third, we compared Detroit's rate of chronic absenteeism with that of all other cities with more than 500,000 residents to consider the impact of macrosystemic conditions on absenteeism. We began by identifying the correlation between our eight macro-level variables and citywide chronic absenteeism. Then, we examined how Detroit ranked on each measure in comparison with the other large cities. Because these macro-contex tual factors are largely correlated with one another (Appendix C), we constructed a simple index of these eight macrosystems-level factors by standardizing each variable and summing them to get an index score for each city.[9] We used this index to consider the influence of macrosystem level factors on absenteeism in Detroit, both by examining the correlation between index scores and citywide absenteeism rates and by comparing Detroit's score on this index to the other cities.

Findings

As Figure 2 shows, Detroit's attendance patterns by grade-level reflect those observed in districts throughout the country: Chronic absence was highest in the early grades, declined during elementary and middle school, and rose again in high school (Balfanz & Byrnes, 2012).[10] Importantly, chroni
cally absent students were not evenly distributed between charter and public schools in the city. Of the approximately 40% of Detroit students attending charters in the city, only 29% were chronically absent,

whereas 53% of students in Detroit Public Schools were chronically absent. In ad
dition, rates of chronic absenteeism varied geographically (Figure 3), with lower absenteeism among students living in the southwest part of the city and higher rates of absenteeism concentrated among students living on

the east side and the west side. Taken together, these patterns of chronic absenteeism in Detroit emphasize the usefulness of approaching absen teeism from an ecological perspective.

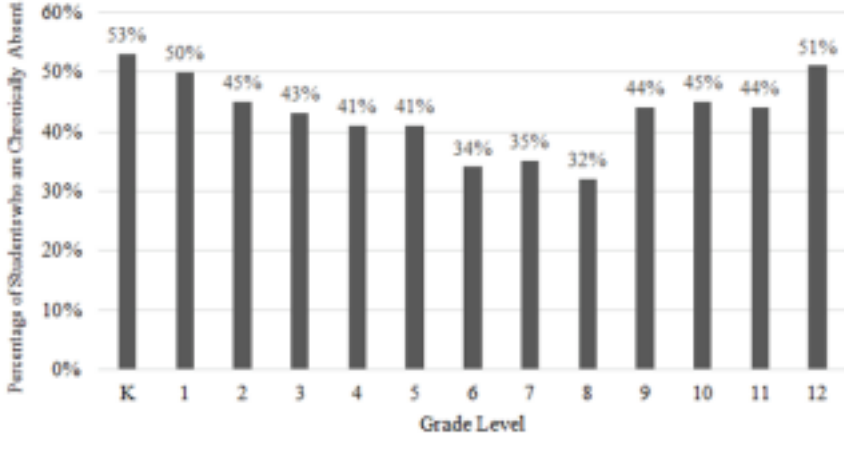

Figure 2. Chronic absenteeism rates in Detroit by grade level, 2015–2016

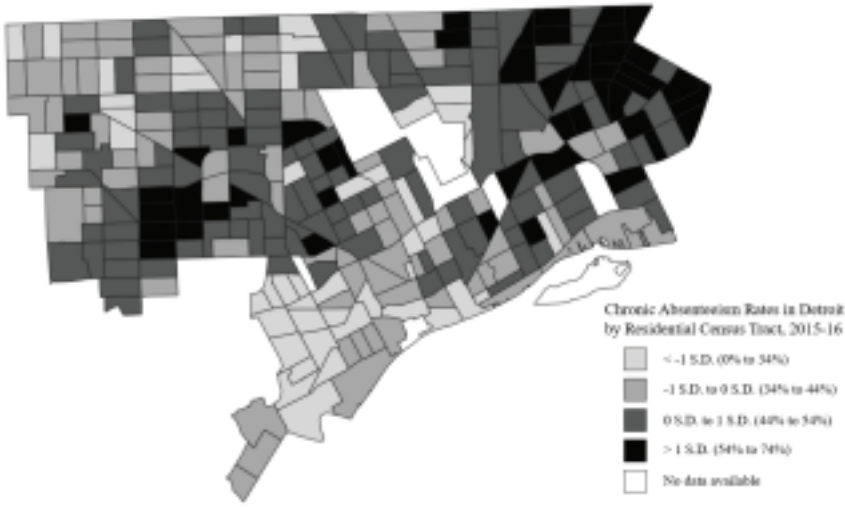

Figure 3. Chronic absenteeism rates in Detroit by residential census tract, 2015–2016

The Ecological Determinants of Absenteeism in Detroit

The results of our multilevel logistic regression analysis highlight the role of student, neighborhood, and school factors as they relate to student at tendance (Table 1).[11] We present all coefficients as odds ratios (OR). We first estimated an unconditional model (Model 1) to identify the extent to which variation in chronic absence was between neighborhoods and between schools, as opposed to among students themselves. The intraclass correlation indicates that approximately 5% of variance in chronic absence was between residential tracts, while approximately 30% of the variance was between schools, supporting an ecological framework and our multilevel approach.

Table 1. Multilevel Logistic Regressions Estimating Chronic Absenteeism in Detroit, 2015–2016

Variable Model 1 Model 2 Model 3 Model 4 Model 5 *Student Level*

Race (Black = reference)

Asian - 0.54*** 0.57*** 0.57*** 0.70** Hispanic - 0.52*** 0.53*** 0.53*** 0.67***

White or MENA - 0.87* 0.89 0.90 0.92

Other Race - 0.85 0.86 0.86 0.83 Female - 0.98 0.98 0.98 0.99 Special Education - 1.21*** 1.21*** 1.21*** 1.12*** Economically Disadvantaged - 1.62*** 1.62*** 1.62*** 1.35*** School Mover Within Year - 3.67*** 3.67*** 3.66*** 3.34*** Residential Mover Within Year - 1.40*** 1.40*** 1.40*** 1.31*** Distance to School[+] - 1.02 1.02 1.02 1.02 Distance to School Squared[+] - 0.95*** 0.95*** 0.95*** 0.96** Prior Year Chronically Absent - - - - 9.24*** School Mover Between Years - - - - 0.96 Residential Mover Between Years - - - - 1.22*** *Residential Tract Level*

Violent Crime Rate - - 1.08** 1.08** 1.06* Residential Vacancy Rate - - 1.04* 1.04* 1.01 *School Level*

Discipline Rate - - - 0.99 1.04 Economically Disadvantaged - - - 1.46*** 1.26** Stability Rate - - - 0.82* 0.87 Charter School - - - 0.20*** 0.27**

Variable Model 1 Model 2 Model 3 Model 4 Model 5 Intercept 0.76** 0.46*** 0.45*** 0.93 0.32*** Variance Component: Level 2 0.21 0.18 0.18 0.18 0.12 Variance Component: Level 3 1.53 1.41 1.38 0.81 0.61 *N* students 76,968 76,968 76,968 76,968 66,813 *N* tract-school combinations 14,558 14,558 14,558 14,558 13,621 *N* schools 196 196 196 196 196 Log likelihood -45030.48 -43805.04 -43784.60 -43740.76 -31401.29

Note. Continuous variables were standardized at the appropriate level (student, tract, and school) to compare the magnitude of odds ratios. MENA = Middle Eastern/North African.

[+]Natural-log transformed variables.

*$p < .05$. **$p < .01$. ***$p < .001$.

In Model 2, we introduced student-level measures. The results highlight the significant association between within-year student mobility and atten dance (Welsh, 2018). Students who changed schools during the year were nearly 4 times more likely to be chronically absent. Residential mobility was also associated with chronic absenteeism: Our model predicted that students who changed residences during the year were 40% more likely to be chronically absent. In addition, the model predicted that students re
ceiving special education services were 20% more likely to be chronically absent and that students identified as “economically disadvantaged” were more than 60% more likely to be chronically absent. Finally, the odds ra tios for the distance-to-school variables suggests that students living farther from school were less likely to be chronically absent, which may reflect ac cess to transit for students who choose schools farther from home (Singer et al., 2019). The predicted odds for these variables remained consistent

when neighborhood and school measures were added to the model. In Model 3, we added the neighborhood (residential tract) variables. Though smaller in magnitude than variables at the student level, both vio lent crime rates and residential vacancy rates were statistically significantly associated with higher odds of chronic absence. A one standard deviation increase in the crime rate in a student's residential tract was associated with 8% greater odds that the student would be chronically absent. A one standard deviation increase in the residential vacancy rate in a student's residential tract was associated with 4% greater odds that the student would be chronically absent. These coefficients remained consistent in Model 4, when school-level measures were introduced.

In Model 4, we added school-level measures. Attending a charter school was associated with 80% lower odds of being chronically absent. Student stability and the percentage of economically disadvantaged students at the school level were also associated with chronic absence. A one standard de
viation increase in the student stability rate at a student's school was asso ciated with 18% lower odds that the student would be chronically absent, and a one standard deviation increase in the percentage of students who are economically disadvantaged at a student's school was associated with 46% higher odds that the student would be chronically absent. Figure 4 illustrates the relative magnitude of student, neighborhood, and school factors, showing the odds that a student would be chronically absent as
sociated with these measures.

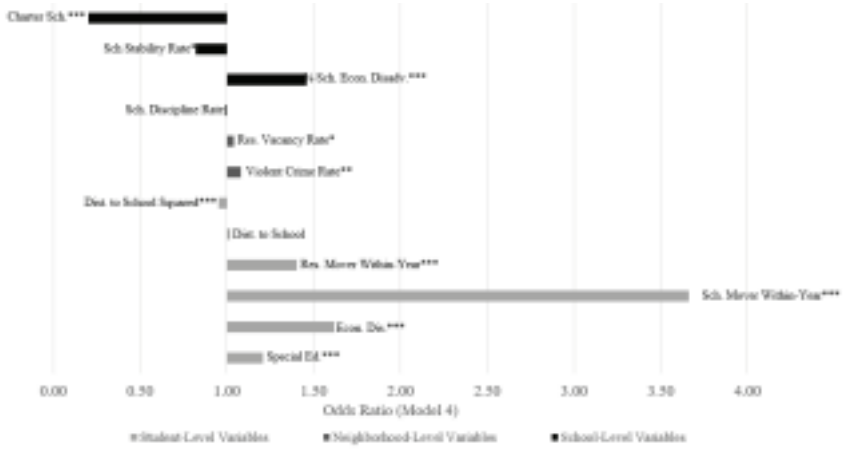

Figure 4. Odds ratios for student, neighborhood, and school variables predicting chronic absenteeism (Model 4)

*$p < .05$. **$p < .01$. ***$p < .001$.

Finally, in Model 5, we introduced time-dependent measures: previous year chronic absence, student mobility between years, and residential mo bility between years. Controlling for the other student, neighborhood, and school factors, the model predicts that students who were chronically absent in 2014–2015 were more than *9 times* more likely to be chronically absent in 2015–2016 than students who were not chronically absent in that prior year. The model also predicted that students who changed residences be tween the start of the 2014–2015 and 2015–2016 school years were more than 20% more likely to be chronically absent in 2015–2016. Students who switched schools between the start of the 2014–2015 and 2015–2016 school

years were not predicted to be more or less chronically absent than students who did not. In addition, the magnitude or significance of several variables that were associated with socioeconomic disadvantage changed when prior year measures were included in the model. The odds that economically dis advantaged students would be chronically absent fell from more than 60% to 35%, and the odds of chronic absence associated with the percentage of economically disadvantaged students at one's school also decreased, from 46% to 26%. Further, tract-level residential vacancy rates were not statisti cally

significantly associated with chronic absence in this model.

Detroit's Uniquely Challenging Context for Attendance

To complement the findings presented earlier, which provide insight into variation in chronic absenteeism among Detroit students, our correla tional analysis of citywide absenteeism rates examines the association of Detroit's macro-level context with its high overall rates of absenteeism. Among the largest cities in the United States, Detroit had the highest level of chronic absenteeism in 2015–2016 (Table 2). Table 3 shows the corre lation matrix for citywide rates of chronic absence from all 34 U.S. cities with 500,000 or more residents and the eight macro-contextual indicators we included in our study. All eight measures are moderately or strongly correlated with chronic absenteeism.

Table 2. Citywide Chronic Absence for Large U.S. Cities (500,000 Residents or More), 2015–2016

City	Citywide Chronic Absence (%)
Detroit	48
Milwaukee	38
Philadelphia	32
Washington	31
Baltimore	30
Columbus	29
Louisville	27
Tucson	26
Denver	26
Chicago	25
Portland	23
Albuquerque	22
Seattle	21
Jacksonville	21

Table 2. Citywide Chronic Absence for Large U.S. Cities (500,000 Residents or More), 2015–2016 (continued)

City	Citywide Chronic Absence (%)
Las Vegas	21
Nashville	19

New York 19

Phoenix 19

Boston 17

Oklahoma City 16

Fort Worth 16

Indianapolis 15

Los Angeles 14

San Antonio 13

San Diego 12

Houston 12

El Paso 11

San Jose 11

Austin 11

Dallas 11

Charlotte 10

Memphis 8

Fresno 8

San Francisco 6

Table 3. Correlation of Citywide Chronic Absenteeism and Macro-Level Factors, 2015–2016

	Chronic Absence
Asthma Rate	0.65***
Violent Crime Rate	0.52**
Residential Vacancy Rate	0.56***
Avg. Monthly Temperature	-0.53**
Poverty Rate	0.44**
Unemployment Rate	0.55***
Population Change	-0.43*
Segregation Index	0.42*

*$p < .05$. **$p < .01$. ***$p < .001$.

Based on these macro-contextual measures, Detroit ranks among cities with the most challenging conditions for student attendance. Detroit had the highest asthma rate (14%), unemployment rate (about

20%), poverty rate (about 38%), violent crime rate (about 20 per 1,000 people), and residential vacancy rate (27%), and the third lowest average monthly tem
perature (about 49°F). In addition, the city had the greatest population loss since 1970 (about 50% decline) and was the second most segregat ed metropolitan area based on the 2010 census data. The index of these macro-contextual factors further illustrates Detroit's uniquely challenging context for student attendance (Figure 5). The index is moderately cor related with citywide rates of chronic absence (r = .48, p < .01). Detroit is an extreme outlier among the cities, with an index score of 3.11; no other city scored above 2.00.

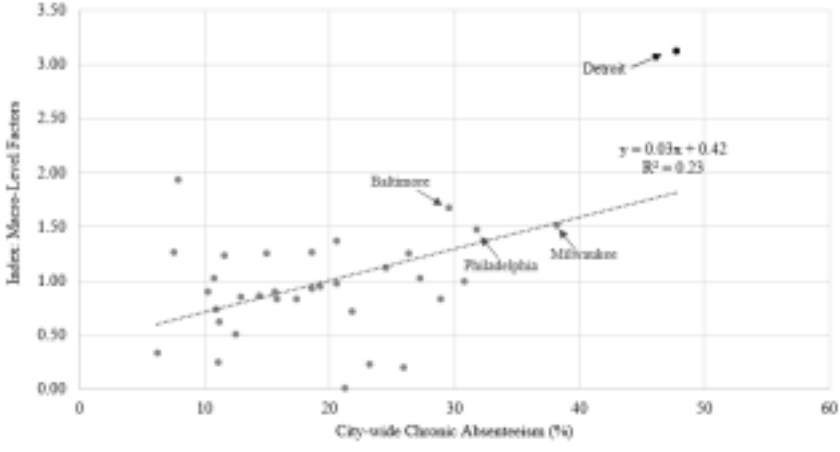

Figure 5. Correlation between citywide chronic absenteeism and index of macro-level factors, 2015–2016

Discussion and Conclusions

Our findings help advance the ecological approach to chronic absentee ism, showing that factors at the student, residential neighborhood, and school levels are associated with Detroit students' odds of chronic absence and that the city's high overall levels of chronic absenteeism are associ ated with the challenging macro-contextual conditions that schools and students face. Taken together, these findings reinforce an ecological un derstanding of the problem of chronic absenteeism and the need for co ordinated policy interventions that simultaneously build schools' capacity

to support student attendance, improve families' socioeconomic circum stances, and reduce structural inequalities that maintain substantial barri ers to attendance.

Although our public and administrative data do not contain precise measures of proximal processes, we can apply the ecological framework to our findings to infer the processes that affect students with particular characteristics and in particular sociomaterial contexts. Switching schools during the year, for example, was highly associated with chronic absentee
ism, even while controlling for switching residences. Students may switch schools during the year if they or their parents are having a negative expe rience stemming from a bad relationship with administrators, in class with a teacher, or with the student's peers. In addition, as Welsh (2018) notes, school-switching is often related to poverty and economic insecurity. Not only does moving schools disrupt existing relationships for a student and their family, but the negative experience that prompted the move may have a lasting impact on a student's or parent's willingness to trust or en
gage with staff at their new school (Mehana & Reynolds, 2004; Wang & Degol, 2016; Welsh, 2017).

The socioeconomic indicators that we found to be associated with ab senteeism, such as a student's status as economically disadvantaged, the concentration of economically disadvantaged students in one's school, and the crime rate in one's neighborhood, reflect this complex ecologi cal impact as well. Socioeconomic factors may reflect a direct influence on student attendance: Students may not feel safe traveling through an unsafe neighborhood to or from school (Burdick-Will et al., 2019), or they may be dealing with a host of social and material burdens associated with poverty (Zhang, 2003). However, these factors may also affect a student's attendance by structuring the proximal processes that shape students' de velopment and experiences. For example, students who attend schools with a higher concentration of economically disadvantaged students may experience a more negative school climate or more stressful interactions (Nauer et al., 2014; Paulle, 2013).

Another important finding is the extremely strong association between prior-year chronic absence and current-year chronic absence (Gee, 2019). When including the prior-year chronic absence and the other prior-year variables, most of the current-year variables associated with chronic ab
sence remained statistically significant. Yet many of them decreased mean ingfully in magnitude, and those that decreased the most or changed to statistically insignificant were socioeconomic indicators such as economic disadvantage and residential vacancy. Given these results, attendance pat terns may relate to and result in proximal

processes that have compound ing effects over time (Simon et al., 2020). Alternatively, or in addition,

students who are the most persistently chronically absent may also face greater socioeconomic barriers to attendance. In the future, longitudi nal studies that account for changes in students' attendance patterns over time can further explore the time dimension of the ecology of chronic absenteeism. A longitudinal quantitative study could examine the impact of changes in student, school, or neighborhood characteristics over time, and a longitudinal qualitative study could describe in detail how proximal processes and contextual factors affect students' attendance patterns.

The kinds of inferences we have drawn in this study are limited, espe cially given that our research examined associations and correlations with chronic absenteeism rather than causal effects on student attendance. Still, they are a reminder that researchers and policy makers can adopt an ecological perspective even with administrative and public data. Survey data, especially when it can be linked to public and administrative data related to a student's neighborhood and school, can provide more precise constructs that represent proximal processes and contextual factors. In addition, qualitative research is necessary to richly describe how process, person, context, and time factors actually operate in tandem to shape a student's attendance patterns. Still, by using an ecological framework to ground one's thinking about chronic absence, policy makers and adminis trators can use public and administrative data as a starting point to better understand chronic absenteeism in their districts and identify what other information is needed in order to make policy and practice decisions.

Our findings also raise the perpetual question about charter schools, school effectiveness, and student sorting (Hamlin, 2018; Scott & Villavicencio, 2009). Rates of chronic absenteeism were systematically lower in charter schools than in traditional public schools, and we found that attending a charter school in Detroit was strongly associated with lower odds of chronic absence while controlling for the student, neigh borhood, and other school variables included in our model. However, prior research with Detroit data did not find associations between organi zational effectiveness and absenteeism in Detroit charter schools (Lenhoff & Pogodzinski, 2018). Thus, differences in school attendance between public and charter schools in Detroit may be driven by student selection rather than organizational differences. Other recent research on Detroit, for example, strongly suggests that meaningful but hard-to-observe socio

economic differences distinguish students in charters and public schools and have implications for attendance, such as access to a personal automo bile or a stronger social network (Hamlin, 2018). Given that 84% of the students in our sample are classified as “economically disadvantaged,” this binary measure may function as a blunt proxy that masks hard-to-observe socioeconomic differences. Yet, these subtle socioeconomic differences

could have a meaningful effect on students’ attendance patterns, espe cially if they translate to slightly better or worse student and family health, more or less reliable access to transportation, more or less stable parent schedules and routines, and more or less reliable networks of friends and family who help students get to and from school (Hamlin, 2018). Future quantitative research can benefit from applying a more complex school typology that goes beyond “charter” and “public” (e.g., Hamlin, 2017; Singer, 2020), and more fine-grained data on students’ SES. In addi
tion, more qualitative research, such as comparative case studies, can help parse the relationship between chronic absenteeism, school organization, school type, and student sorting.

The model also highlighted some racial differences in absenteeism: Hispanic and Asian students had lower predicted odds of absenteeism compared with Black students. (White or Middle Eastern/North African students also had lower predicted odds of absenteeism in Model 1, but the association was not statistically significant after introducing Level 2 and Level 3 variables.) As with the other results in this study, these differ ences should be understood ecologically—as the result of a complex set of proximal processes and situated in particular contexts. They should *not* be interpreted as reflecting intrinsic attributes based on race (Gillborn, 2010). Though it is beyond the scope of this study, future research on ab
senteeism should examine the particular ecological structures and mecha nisms that shape patterns of attendance for students from different racial or ethnic groups.

Finally, by comparing Detroit’s rate of chronic absence and macro-level context to other large U.S. cities, we considered an even more holistic approach to the ecology of attendance and chronic absenteeism. Given the magnitude of chronic absenteeism in Detroit and the relative socio
economic homogeneity of the city, focusing solely on variation *within* the city would fail to consider the barriers that are created by its macro-level structural and environmental conditions. Future studies can greatly ex

pand on this line of research by comparing relevant dimensions of the policy context, such as differences in punitive or restorative responses to attendance or more or less regulated choice and enrollment systems; tran sit systems, including school-provided and public transportation, walkabil ity, and personal automobile access; school and community resources, in cluding socioeconomic and health services and socioemotional supports; and the broader sociopolitical dynamics that continue to shape school– community relationships.

Perhaps most important, this macro-level perspective is a reminder that in cities with high rates of chronic absenteeism such as Detroit, school based efforts must be pursued in coordination with a policy agenda that

addresses the structural circumstances in which students live and go to school. As more states have incorporated measures of chronic absentee ism into their school accountability frameworks (Jordan & Miller, 2017), schools are devoting new resources, designing new staff roles, and devel oping organizational infrastructure meant to improve student attendance (Childs & Grooms, 2018; Lenhoff, 2019). In Detroit, for example, the public school district has dedicated millions of dollars annually to staff ev ery school with attendance agents (Einhorn & Higgins, 2019). In addition, a coalition of community organizations and philanthropic supporters has marshalled resources to conduct a public awareness campaign about absenteeism, provide professional development for public and charter school staff, and introduce after-school programming to promote better attendance (Simmons & Bell, 2019). Although these efforts are promis ing, especially in that they have helped mobilize a coordinated effort to address chronic absenteeism, they remain largely focused on school-based interventions and parent behaviors rather than addressing the barriers to attendance that students face in their immediate and broader socioeco nomic contexts. They reflect a logic of school accountability that holds schools responsible for factors over which they only have partial influence (Schneider, 2017).

Our ecological understanding of absenteeism suggests that school-based efforts are necessary but not sufficient to substantially decrease rates of chronic absenteeism (Childs & Lofton, 2021). Policy makers must match these school-based efforts with coordinated strategies for addressing social and economic inequality, including safe and reliable school transporta

tion (Gottfried, 2017), stable and affordable housing (Erb-Downward & Watt, 2018; Evangelist & Shaefer, 2020), and more effective poverty reduc tion and economic assistance programs (National Academies of

Sciences, Engineering, and Medicine, 2019; Shaefer et al., 2018; Tach & Edin, 2017). Policies that provide short-term relief from economic hardship and aim to reduce structural and environmental inequalities in the long run must be understood as part of, rather than separate from, an educational policy agenda intended to reduce chronic absenteeism (Anyon, 2005). Such an ecological approach is necessary for improving attendance and educational opportunities and outcomes.

Acknowledgment

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(MDE) and/or Michigan's Center for Educational Performance and Information (CEPI). Results, information and opinions solely represent the analysis, information and opinions of the author(s) and are not en dorsed by, or reflect the views or positions of, grantors, MDE and CEPI or any employee thereof.

NOTES

1. CEPI indicates that a student is "economically disadvantaged" if they meet any of the following criteria: eligible for free or reduced-price meals via NSLP, live in households receiving food (SNAP) or cash (TANF) assistance, are homeless, are migrant, or are in foster care.
2. In the administrative data, the "White" racial category includes students who are Middle Eastern or North African (MENA). In addition, we exclude students' status as English language learners (ELLs) because of its strong association to race: More than 80% of students in the sample with ELL status are Hispanic.
3. We transformed the distance-to-school variable by taking the natural log to normalize its distribution of values. The distance-to-school squared values were calculated from the natural log-transformed variable.
4. We tested for collinearity before including both of these variables in our model. Even though they are moderately correlated for our observations ($r = .46$, $p < 0.001$), their variable inflation factor was only 1.26.
5. Only adult asthma rates (18 years and older) were available.
6. Measures of adult asthma, poverty, unemployment, residential vacancy, and average monthly temperature used for the citywide comparisons are

two-year averages based on 2015 and 2016 rates. Some measures were only available for a limited year. The metropolitan racial segregation indices from the ISR were only available based on the 2010 decennial census, and population change was calculated based on decennial census data from 1970 and 2010. Citywide crime statistics from the FBI were most recently available for 2014.

7. Separate index measures for Black–White, Hispanic–White, and Asian–White segregation were combined in a weighted average to account for varying demographics across the country.
8. For the multilevel logistic regressions, we included all students who lived and went to school in Detroit and had no missing values for the variables included in the full model (Model 4). Overall, this sample includes more than 90% of students in the population. See Appendix A for a summary of key variables for this sample.
9. After constructing the index scores, we increased each city's index score by the minimum index score to set the lowest score at zero.

10. One exception is that Detroit students in Grades 6–8 had the lowest lev els of absenteeism, whereas Balfanz and Byrnes (2012) reported that levels of chronic absence tend to start climbing upward near the end of mid dle school.
11. As robustness checks, we also ran a multilevel linear probability model with chronic absenteeism as the outcome, and a linear mixed-effects model us ing the continuous variable "percentage of days absent" as an outcome, for the model that included student, neighborhood, and school variables (Appendices D and E). We observed results comparable with those in the multilevel logistic regression to predict chronic absenteeism.

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Appendix A

Summary of Variables: Chronic Absenteeism in Detroit

Variable *N M SD* Min Max *Student Level*

Chronically Absent 76,968 0.42 - 0 1 Prior Year Chronically Absent 67,777 0.40 - 0 1 Black 76,968 0.83 - 0 1 Asian 76,968 0.01 - 0 1 Hispanic 76,968 0.12 - 0 1 White or MENA 76,968 0.03 - 0 1

Other Race 76,968 0.01 - 0 1 Female 76,968 0.50 - 0 1 Special Education 76,968 0.15 - 0 1 Economically Disadvantaged 76,968 0.84 - 0 1 School Mover Within Year 76,968 0.07 - 0 1 School Mover Between Years 68,463 0.26 - 0 1 Residential Mover Within Year 76,968 0.04 - 0 1 Residential Mover Between Years 69,524 0.14 - 0 1 Distance to School (mi) 76,968 2.32 2.54 0 21.65

Residential Tract Level

Violent Crime Rate (per 1,000 residents) 371 34.34 24.30 0.00 153.67 Residential Vacancy Rate (%) 371 27.41 14.20 00.44 67.71 *School Level*

Discipline Rate (per 100 students) 196 22.49 20.35 0 124.74 Economically Disadvantaged (%) 196 86.45 1.40 44.46 100.00 Stability Rate (%) 196 80.11 12.39 0.00 98.92 Charter School 196 0.46 - 0 1

Note. We included all students who lived and went to school in Detroit and had no missing values for the variables listed. Overall, this sample includes 92% of students in the population. MENA = Middle Eastern/North African.

Appendix B

Summary of Variables: Citywide Chronic

Variable *N M SD* Min Max Citywide Chronic Absence (%) 34 19.56 9.34 6.20 47.80 City Population 34 1,259,660 1,473,511 522,053 8,537,673 Adult Asthma Rate (%) 34 9.86 1.49 7.80 14.00 Violent Crime Rate (per 1,000 residents) 34 8.00 3.96 3.21 19.90

Residential Vacancy Rate (%) 34 10.45 4.65 3.34 29.90 Average Monthly Temperature (°F) 34 59.43 7.12 47.10 71.59 Poverty Rate (%) 34 16.13 5.49 6.95 35.10 Unemployment Rate (%) 34 9.13 3.33 5.39 23.51 Population Change (%) 34 64.13 85.59 -52.86 364.08 White–Non-White Segregation Index 34 51.78 8.73 35.80 69.42

Crime Rate Violent

sthma Rate A Adult

Seg. Index

op.

Change

P empl.

Rate Un

verty

Rate Po

thly Temp. Mon Avg.

cancy Rate Va Res.

6. Unemployment Rate	0.	0.64***	0.65***				
7. Population Change	-0.46**	-0.48**	-0.29	0.58***	-0.27	-0.20	
8. Segregation Index	0.56***	0.62***	0.50**	-0.41*	0.59***	0.50**	-0.65***

**p < .01. ***p < .001.

Appendix D

Multilevel Linear Probability Model Estimating Chronic Absenteeism in Detroit, 2015–2016

	Variable Model 4
Student Level	
Race (Black = reference)	
Asian	-0.11***
Hispanic	-0.13***
White or MENA	-0.25
Other Race	-0.28
Female	-0.00
Special Education	0.04***
Economically Disadvantaged	0.09***
School Mover Within Year	0.24***
Residential Mover Within Year	0.06***
Distance to School[+]	0.01**
Distance to School Squared[+]	-0.01***
Residential Tract Level	
Violent Crime Rate	0.01***
Residential Vacancy Rate	0.01**
School Level	
Discipline Rate	-0.00
Economically Disadvantaged	0.07***
Stability Rate	-0.03**
Charter School	-0.30***
Intercept	0.49***
Variance Component: Residual	0.19
Variance Component: Level 2	0.02
Variance Component: Level 3	0.01
N students	76,968
N tract-school combinations	14,558
N schools	196
Log likelihood	-46,113.26

Note. Continuous variables were standardized in order to compare the magnitude of coefficients.

[+]Natural-log transformed variables. MENA = Middle Eastern/North African.

*p < .05. **p < .01. ***p < .001.

Appendix E

Mixed-Effects Regression Estimating Percentage of Days Absent in Detroit, 2015–2016

Variable	Model 4
Student Level	
Race (Black = reference)	
Asian	-2.39***
Hispanic	-2.46***
White or MENA	-0.20*
Other Race	0.75
Female	-0.17*
Special Education	1.23***
Economically Disadvantaged	2.06***
School Mover Within Year	6.92***
Residential Mover Within Year	1.56***
Distance to School[+]	0.21***
Distance to School Squared[+]	-0.19***
Residential Tract Level	
Violent Crime Rate	0.25**
Residential Vacancy Rate	0.23***
School Level	
Discipline Rate	-0.12
Economically Disadvantaged	1.82***
Stability Rate	-1.30**
Charter School	-7.36***
Intercept	13.50***
Variance Component: Residual	87.30
Variance Component: Level 2	4.27
Variance Component: Level 3	26.55
N students	76,968
N tract-school combinations	14,558
N schools	196
Log likelihood	-282,903.45

Note. Continuous variables were standardized to compare the magnitude of coef ficients. MENA = Middle Eastern/North African.

[+]Natural-log transformed variables.

*$p < .05$. **$p < .01$. ***$p < .001$.

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