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School facility funding inequities: an assessment of California

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ABSTRACT

In this paper, we contribute to the literature on school facility funding by examining California's facility funding formula and assessing how the current state system facilitates meeting annual investment standards in facility stewardship and upkeep. To do this, we quantify the total school square footage of school facilities and then calculate the current replacement value (CRV). For our analysis, we adhere to industry standard benchmarks of 3 percent of CRV for maintenance & operation (M&O) and 4 percent of CRV for capital renewal. Overall, we find California school districts fail to adequately and equitably invest in school facilities upkeep leaving more than half of students attending subpar school facilities. Additionally, we show that nearly forty percent of school districts do not have enough taxable property wealth to raise capital funds. Looking ahead, educator leaders must prioritize equalizing school facility funding formulas to reduce educational funding inequities between school districts.

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Introduction

One in ten students in the United States is educated in California, the country's largest state K-12 education system. In California, there are an estimated 5.85 million students enrolled in about 10,000 public schools in 938 school districts. California's extensive array of schools makes it one of the nation's largest inventories of school facilities. However, California's education system faces an unprecedented challenge, it must modernise and renovate its aging school facilities. While many school buildings are relatively new, constructed in the last few decades, there are many more older buildings that require substantial modernisation and renovation (Brunner and Vincent 2018). One analysis of California's school facilities found that 30 percent of schools were built more than 50 years ago, and roughly 10 percent were built more than 70 years ago (Vincent 2012). As California's facilities age, the need for school facility modernisation and renovations continues to grow.

According to estimates from Vincent and Jaine (2015), school districts are projected to require an annual expenditure ranging from $3.1 to $4.1 billion for the modernisation

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and renovation of school facilities in the next decades. Despite this substantial financial need, local school districts have primarily borne the responsibility of generating the required capital investment for facility upkeep, receiving limited support from the federal government and minimal state aid intervention. Like many other states, California has designed and implemented a school facility capital funding formula that is tied to school district wealth, vis a vis the assessed property value within the district's geographic boundary (Brunner and Vincent 2018). The formula relies on school districts raising capital funds from voter-approved general obligation (GO) bonds, which are repaid through taxes on local property. This funding approach, which ties the raising of capital funds to property values, results in disparities in capital funds allocated for school facilities. For instance, school districts located in areas with higher property values can raise significantly more capital funds than school districts located in areas with lower property values (Brunner, Schwegman, and Vincent 2023; Vincent and Jaine, 2015)

To address financial inequities, the State of California created the School Facility Programme (SFP) in 1998, as a dedicated funding initiative. This programme offers grants for capital needs, including the acquisition of school sites, construction of new facilities, and modernisation of existing ones. The SFP is a funding programme that exists entirely separate from the state's main education operational funding to school districts, drawing its financial support from statewide voter-approved bonds. While originally intended to provide capital funding for all school districts, it quickly became apparent that local school district demand for state capital aid far surpassed the available SFP funding. Analysis by Lafortune and Gao (2022), revealed the SFP's competitive, first-come, first-served funding model approach tended to benefit affluent school districts over poor school districts. As such, the SFP has likely widened educational inequities across California.

In this paper, we conduct a comprehensive investigation of local school facility expenditures by California's public school districts. Most analyses on school facility funding focus on the relationship between school district wealth and the generated capital revenue to describe the inequities. We take a different approach to our analysis, by comparing an estimate of what should have been spent to upkeep buildings to what was actually spent by local school districts on their buildings in recent years. We intend to assess how the current state system facilitates meeting annual investment standards in facility stewardship and upkeep. To do this, we quantify the total school square footage of school facilities and then calculate the current replacement value (CRV). We adhere to industry standard benchmarks of 3 percent of CRV for maintenance & operation (M&O) and 4 percent of CRV for capital renewal. These baseline percentages are designed to ensure the proper maintenance and upkeep of buildings. Our analysis is driven by the goal of guaranteeing that all students have access to safe and operational school facilities, creating optimal learning environments.

Moreover, California provides an important case study of capital funding in public education for several reasons. First, California enrolls more than 5.8 million students across more than 900 school districts. Second, the public school system is composed of a vast inventory of publicly owned buildings and property that must be continuously maintained. Third, despite having a school facility modernisation funding programme, California relies primarily on local general bonds and state aid to fund school facility investment. This article is organised into seven parts (I) literature review, (II) California context, (III) theoretical framework, (IV) data, (V) methods, (VI) results, and (VII) discussion.

Literature review

In the field of education, there has been a contentious discourse on educational expenditures and their impact on student achievement (Hanushek 1994; Jackson and Mackevicius 2024). Eric Hanushek, a prominent economist, has been a key figure in this discourse and has consistently argued there is no clear relationship between the amount of money spent on education and the overall performance of schools (Hanushek 1989, 1994, and 1997). In his perspective, he suggests that the focus should be on how resources are allocated and used within the education system. In a refute to Hanushek's findings, Jackson and Mackevicius (2024) argue policies that increase school expenditures can improve student test scores and college-going rates. The latter research on school expenditures has challenged Hanushek's core argument suggesting adequate funding is essential for providing quality education and necessary resources for students (Jackson, Johnson, and Persico 2016; Johnson 2015; Lafortune, Rothstein, and Schanzenbach 2018). While this research has moved the debate on improving school expenditures in a positive direction, the importance and conditions of school facilities are often omitted from the discourse.

For many educational researchers, the discourse on addressing school funding inequities is linked to improving instruction, school curriculum, and teacher pay. But, rarely have researchers analysed school facilities, when the quality and conditions of school facilities are significant aspects of educational quality impacting students, teachers, and staff (Filardo, Vincent, and Sullivan 2019). A growing body of literature is raising concerns about the growing inequities in school facilities, signalling a need to broaden the discussion on school funding to include school facilities (Brunner, Schwegman, and Vincent 2023; Filardo, Jeffrey, and Sullivan 2018). However, a complex challenge remains in this research.

Because data on the physical conditions of school facilities often do not exist, researchers have used levels of spending on facilities as a proxy for facility conditions. There is a need to further advance methodologies in assessing and quantifying the actual state of school facilities, allowing for more precise evaluations, and informing decision-making in educational policy. In the context of this study, we review the literature on school facility investment with a focus on the Los Angeles Unified School District (LAUSD) facility expansion project. Additionally, we explore the literature that sheds light on the regressive element in school facility funding, further contributing to the understanding of the intricate relationship between neighbourhood value and facility conditions.

The impact of school facilities investment

The literature on student achievement has shown neighbourhood context is highly associated with school quality (Owens 2010). Using data from the National Longitudinal Study of Adolescent Health, Owens (2010) finds neighbourhoods of higher wealth provide greater education attainment than neighbourhoods of lower wealth. Her findings suggest that differences in neighbourhood wealth construct educational disparities by the unequal distribution of resources. While Owens (2010) highlights the role of neighbourhood wealth in driving education inequities, the analysis is focused on core educational programming. However, neighbourhood wealth is an element that also contributes to inequities in school facilities and impacts student achievement.

Many elements contribute to school quality and impact student achievement, and one crucial factor is the physical conditions of the facilities where students attend class. Through a comprehensive review of numerous scientific studies, Allen et al. (2021), contend there is compelling evidence that the physical school environment plays a significant role in influencing student health, thinking, and performance. Therefore, it becomes imperative to establish a healthy learning environment that is structurally sound, clean, and modernised to provide students with optimal learning environments. In her analysis of student perception, Maxwell (2016) found building conditions have a direct impact on academic achievement. In short, improved school building conditions were linked to a better school social climate resulting in lower student absenteeism, which in turn predicted higher test scores. As such, investing in and maintaining high-quality school facilities can have far-reaching positive effects on both student well-being and academic success.

One encouraging example of the positive impact of school facilities investment is from the LAUSD facility expansion project. Around the early 2000s, faced with a severe shortage of facilities and overcrowded classrooms, LAUSD addressed the issue by expanding its classroom capacity through the construction of new school facilities. Initially, the effects of this spatial expansion on student achievement were uncertain. However, Fuller et al. (2009) found modest gains in student achievement. This positive outcome was attributed to the construction of new school facilities, which led to reduced classroom sizes and improved access to schools in local neighbourhoods. Additionally, Welsh et al. (2012) observed significant academic improvements in elementary school students who transitioned from an old facility to a newly constructed one. These gains were equivalent to approximately 35 additional instructional days. Furthermore, Lafortune and Schönholzer (2022) found promising academic benefits for students who attended newly constructed schools. These students were found to have reduced the math achievement gap between LAUSD and the California average. Although these findings may not be generalisable to other school districts, the evidence suggests that improvement to school facilities does impact student outcomes.

In a different analysis, Lafortune and Gao (2022) found corroborating evidence that investment in school facilities not only affected student achievement but also had a positive effect on neighbourhood house prices. Building upon prior research on LAUSD facility investment programme, their analysis reveals that the construction of new schools led to a 6 percent increase in the value of houses in the surrounding areas near the school. The rise in home value can serve as a valuable tool to address educational disparities by enhancing neighbourhood and school quality. However, Lafortune and Gao (2022) raise a pertinent issue, pointing out that while the evidence demonstrates a positive impact on student achievement and house prices with the construction of new school facilities, it remains unclear which specific aspects of school facilities contribute to these benefits. By obtaining more accurate data on changes in school facilities, future research could potentially differentiate and identify which specific components of school facilities yield the most significant benefits.

The regressive element of school facility funding

The existing body of literature demonstrates a positive link between investment in school facilities and student outcomes but falls short in describing the challenges in accessing

equitable funding for school facilities. Historically, public education has been highly decentralised and funded largely by property and state taxes and federal grants. These financial streams are essential in supporting the general operating budget of schools (Yilmaz 2020). As part of the general operating budget, school districts allocate funds for facility M&O, which goes towards facility operations (e.g. custodial cleaning and utilities) and routine (i.e. small) maintenance and recurring inspections. However, for capital investment, spending funds for expensive work such as major repair of building systems, equipment, major alterations of existing buildings, and new construction, comes out of the district's capital budget. Capital revenue raising authority for school districts varies by state. In California, for example, local school district capital budgets are largely funded by revenue streams such as developer fees, special taxes, and/ or GO bonds. Local GO bonds are repaid by a voter-approved tax placed on private property within the district's geographic area.

The heavy reliance on local property tax to fund school capital needs has contributed to disparities in facility funding across school districts and states (Filardo 2016, 2021). For example, in California, state statutes establish each school district's maximum 'bonding capacity' as a small percentage of the taxable property within the districts, known as the total assessed property value (referred to as assessed value, or AV). While the formula is equally applied to all school districts, differences in property values have resulted in different bonding capacities for school districts leading to unequal abilities to raise capital funds through local GO bond measures.

Over fiscal years 1994 through 2013, Filardo (2016) found that spending and investments in K – 12 facilities spending averaged $99 billion per year. However, she estimates the nation needs to spend $145 billion per year to repair and bring facilities to modern standards Essentially, Filardo (2016) contends that the nation is underspending on school facilities by $46 billion. This substantial underspending on school facilities poses a critical challenge, endangering the ability of public-school districts to have high-quality facilities. In the 19 years analysed, states, on average covered just 19 percent of K – 12 public school facilities capital leaving the remaining 81 percent responsibility on local school districts. Given financial capital is tied to the wealth of the community, some school districts are unable to raise capital funds through bond measures. As a result, the disparities in funding perpetuate facility inequalities (Filardo, Vincent, and Sullivan 2019).

In a more comprehensive analysis of public-school facilities funding in California, Brunner and Reuben (2001) and Brunner, Schwegman, and Vincent (2023), observe disparities in facilities are driven primarily by interdistrict differences in property wealth. In both studies, they establish a positive relationship between property values and bond revenue. They find as local AV increase; local bond revenues also increase accordingly. Thus, neighbourhoods of higher property values can provide more school facilities funding than neighbourhoods of lower property values. In addition, Brunner, Schwegman, and Vincent (2023) find a negative relationship between AV and student demographics. In neighbourhoods with more disadvantaged students and students of colour, the AV tends to be lower. This leads to significantly less funding for school facilities in districts with higher disadvantaged students and students of colour. Therefore, the approach to financing school facilities is relatively regressive.

California context

California's school funding formula

The school finance system in California has been significantly reformed over the last fifty years, but funding for facilities remains unchanged. Like many other states, California funded schools from local property taxes, but this mechanism was replaced by a funding scheme that relied more heavily on state revenue. Picus (1991) identifies three main events that catalysed the state takeover of California's school funding, the legal challenge to California's finance system in Serrano v. Priest, the passage of Proposition 13's property tax limitation, and voter approval of Proposition 98 (1988) and shortly after Proposition 111 (1990).

These events began in the 1970s, with the *Serra*no lawsuits alleging that California's education financing scheme, which relied on property tax to fund schools, violated the equal protection clause of both the United States Constitution and the California Constitution. Given unequal property values across the state, some school districts were able to generate more funds than other school districts. The courts agreed and ruled in favour of the plaintiff. The state legislature was instructed to adjust the funding scheme and reduce disparities between districts to less than $100 by 1980. However, this legislation drew criticism among voters, leading to the passage of Proposition 13 in 1978 which reduced property tax revenues and imposed a 2/3-majority vote requirement for statewide tax increases. The initial property-tax-based solution was replaced by a funding scheme that relied more heavily on state (as opposed to district) revenue. Constrained by a shortage of school funding due to Proposition 13, voters approved Proposition 98 (1988) and Proposition 111 (1990), establishing a mandated minimum funding level derived from both state and local property taxes for K-14 public schools (Kaplan 2012).

The state takeover of school funding limited local control and instilled a formula that revolved around block grants and categorical programmes that advanced the state's education goals. This funding formula was changed in 2014, with the passage of the local control funding formula (LCFF) which replaced the previous formula with uniform base grants for each school district on the grade span of pupils multiplied by units of average daily attendance (ADA) (Department of Education, n.d.). The new formula aimed to address disparities in educational outcomes by directing more resources to schools with higher proportions of low-income students, English learners, and foster youth, while providing greater autonomy to school districts over how they choose to spend state funding (Lafortune 2023). While the formula has provided greater local spending flexibility, it has mostly been for a school district's operational budget, but largely absent is the state's capital funding framework for school facilities.

California's school facility program

The State of California began assisting local school districts in school construction and modernisation when the state legislature created the State Allocation Board (SAB) in 1947 (Brunner and Vincent 2018). The SAB was charged with allocating state funds for new school construction and modernisation projects, albeit in limited capacity. As

the state's school facilities capital needs evolved, the state legislature created the School Facility Program (SFP) in 1998, which established a more robust programme of state investment that remains in effect today (California Office of Public School Construction 2019). To fund the SFP, California voters have approved 6 statewide GO bonds totalling more than $42 billion since 1998. However, stringent eligibility criteria are in place, and local school districts are responsible for demonstrating their eligibility. The SFP processes applications in the order they are received (Lopez and Ugo 2017). This practice often favours smaller, wealthier districts characterised by higher property values. These districts have the capacity to generate more revenue for bonds and expenditures and typically maintain dedicated staff specifically handling state funding applications.

To apply for new construction funds, school districts must demonstrate existing seating capacity is insufficient to house student enrollment growth. To apply for modernisation funds, permanent buildings within a school district must be a minimum of 25 years old or have portable buildings with a minimum age of 20 years. If school districts meet the criteria and successfully apply, the SFP provides grants to assist local school districts in financing new construction, on a 50/50 state and local match basis, and modernisation projects, on a 60/40 state and local match basis (California Office of Public School Construction 2019).

Yet, state funding through the SFP is dwarfed by local capital funding sources. Over this same time period, California's local school districts have raised about three times more local capital funding ($125 billion) for school construction and modernisation compared to statewide GO bonds. In Filardo (2021), she found that state funds only amounted to 16% of all capital spending by California school districts in the years 2009-2019. By contributing only 16% of total capital spending by local school districts, California's finance system for public school capital facilities is most heavily dependent on local funding sources (Brunner and Vincent 2018). Local school districts have generated capital funds mostly from local GO bonds which are tied to property values. While local funding sources, particularly local GO bonds, have had to be the primary avenue for school districts to generate capital funds, this funding source is very unequal. School districts located in lower-assessed neighbourhoods face greater constraints in raising funds compared to those in higher-assessed neighbourhoods. This funding formula is identified by researchers as the regressive element in school facilities funding, reflecting a system that disproportionately favours school districts in affluent areas over poor areas.

California's school facilities conditions

As an element of the school district's planning process, the state's guidance for local educational facility master plans advises school districts to collect and analyse data regarding current and future needs for students, the conditions of existing facilities, and facilities modernisation and remodelling to support the district's educational and programmatic goals (California Office of Public School Construction 2019). Across the state, school facilities require major upgrades and upkeeping (California Office of Public School Construction 2019). Three examples of geographically disbursed school districts in California highlight the widespread nature of facility challenges California districts are facing, as shown in Table 1. Across three different school districts, all would benefit from comprehensive modernisation of facilities to promote a healthy learning environment.

Table 1. Facility challenges identified in three example educational facility master plans by California school districts.

	Enrollment[a]	Number of Schools	Region	Key Challenge Identified in District Educational Facility Master Plan
District 1 (unified school district)	20,000	26	Bay Area	Assessing conditions at each school, the 2018 educational facility master plan concluded that '… most sites need modernization with a few buildings requiring reconstruction.' The plan estimates total districtwide facility needs at $1.3 billion to meet local priorities of safety/curb appeal, maintain building integrity, and provide for future needs.
District 2 (elementary school district)	1,800	5	Sierra Foothills	The 2017 master plan estimated $12 million in facility needs and identified 75% of the district's schools scored a 'fair' on the Facility Inspection Tool (FIT). 'Fair' is defined as: 'The school is not in good repair. Some deficiencies noted are critical and/or widespread. Repairs and/or additional maintenance are necessary in several areas of the school site.' The plan states, 'The older permanent buildings in the District would benefit from a comprehensive modernization of the facilities to include the upgrade of the site's infrastructure.' Forty-one percent of the district's classrooms are in portables. The plan notes that, 'Optimally, these portables should be replaced.'
District 3 (unified school district)	53,000	58	Southern California	The 2018 district facility master plan identified an estimated $2.3 billion in facility needs, noting that while the district undertakes continual effort to maintain its schools, 'many facilities require substantial modernization and upgrades beyond the scope of normal maintenance.'

[a]Enrollment rounded to the nearest 100.

District 1 located in the Bay Area region with 26 schools and an estimated 20 thousand enrolled students assesses their districtwide facility needs at a staggering $1.3 billion to modernise and upkeep facility integrity. District 2 located in the Sierra Foothills region with 5 schools and an estimated 1,800 enrolled students assesses their districtwide facility needs at $12 million. District 3 located in Southern California with 58 schools and an estimated 53 thousand enrolled students assesses their districtwide facility needs at $2.3 billion. The data reflect the larger the school district the higher the facility needs.

Theoretical framework

In this study, we utilise the bioecological model of human development as the foundation of our theoretical framework. The bioecological systems theory states that human development is significantly shaped by the physical environment of an individual (Bronfenbrenner 1977). For instance, Bronfenbrenner (1974) examined the complex system of relationships that interact with a developing child from immediate family and school settings to broad cultural values, laws, and customs. These relationships are the principal context within which a child's development unfolds and can impact their emotional and intellectual development. As we consider the implications of the bioecological systems theory, it becomes evident that an understanding of these relationships is crucial for designing effective educational interventions and creating physical environments that induce positive development in children.

The bioecological model can be divided into five different systems: the microsystem, the mesosystem, the exosystem, the macrosystem, and the chronosystem (Bronfenbrenner 1977). In our analysis, we focus on the microsystem, the first and most important level in a child's development. The microsystem includes the elements that have direct contact with the student in their immediate environment, such as parents, siblings, and teachers to school facilities and health services. The interactions within microsystems are often very personal and are crucial for fostering and supporting the child's development. For example, if a child has a strong nurturing relationship with their parents, this is said to have a positive effect on the child, whereas distant and unaffectionate parents may harm the child. This concept can also be applied to school facilities; if a child attends schools with new and modernized facilities, there is said to be a positive effect on the child's learning, whereas old and decaying facilities may negatively impact the child's learning (Allen et al. 2021).

However, school facilities are often overlooked as a critical component for effective and equitable education environments. As Filardo, Vincent, and Sullivan (2019) note, student learning is undermined in poorly designed and maintained buildings, and further investment is needed to address these educational environments. For our analysis, we focus on assessing California's school facilities to determine if the state education system is adequately and equitably investing in facility stewardship and upkeep.

Data

In this study, we make use of available data on K-12 public school facility expenditures in California and draw on the facility expenditure standards in the building management field. Our approach offers a simple and replicable way to assess patterns of K-12 school facility spending statewide, to provide a better basis for policy decision-making. This approach is especially useful when detailed statewide data on school facility conditions are unavailable, as is the case in California.

Key to our analysis is school district-level data on facility M&O expenditures and capital outlay, as reported by the National Center for Education Statistics (NCES) Common Core of Data based on the U.S. Census Bureau's Census of Governments and the Annual Surveys of State and Local Government Finances. The Annual Survey of School System Finances, similar to previous annual surveys and censuses of governments, covers the entire range of government finance activities – revenue, expenditure, debt, and assets (cash and security holdings). These data are combined with additional district-level data from the California Department of Education. We assembled complete data on 896 of California's 938 public K-12 school districts (elementary school districts (ESD), high school districts (HSD), and unified school districts (USD)). These districts enroll 98% of California's public-school students. County Offices of Education and other, smaller types of education providers (e.g. State Special Schools, Statewide Benefit Charters, Non-school Locations, or Regional Occupation Centers) were excluded.

Central to our analysis is quantifying the total school square feet of buildings at each school within each school district. To do so, we first created a geospatial inventory of all land owned by California public school districts by assembling parcel ownership data obtained from all 58 county offices of education. We then used the statewide building

footprint spatial layer created by Microsoft and isolated the building footprints on school district-owned properties that have operation schools on them. Using a Geographic Information System (GIS), we quantified the total building square footage for each school district. Next, we calculated the CRV of all school facilities for each school district in California, which is a function of total building inventory size (measured in square feet) and estimated cost per square foot to replace the facilities. Our data analysis indicates that as of 2020, California has at least 730,072,793 square feet of public K-12 school facilities. We then estimate the CRV of these facilities using an average square foot replacement cost of $517.76,[1] California's statewide CRV for the state's 730 million square feet of public K-12 facilities is estimated to be $378 billion (2020$).

Method

How school districts budget and spend on their facilities

School districts typically plan for and spend money on their facilities from two separate budgets: the general district operating budget (used for most basic M&O needs) and the capital budget (used for larger capital projects). Each budget has different funding streams. General operating funds largely come from local property tax and state transfers. General operating budgets also pay teachers and other staff salaries. Capital budgets are largely funded by a combination of local GO bonds, locally imposed development fees (if available), and state grants through the SFP. Bond funds accrue interest, which must be paid in addition to the principal borrowed amount.

There are five facilities spending categories, as shown in Table 2. Facility Operations and Routine Maintenance (together commonly known as M&O) typically come from a district's general operating budget (which also funds teachers, educational materials, and district staff). The remaining four categories, Capital Renewal, Major Modernisation, Obsolete Building Replacement, and New Construction are typically funded by a capital budget.

School district capital and operating budgets are separate, but they affect each other. Well-deployed capital funds can finance improvements that help reduce facility operating expenses. Additionally, a school with well-maintained facilities, for example, may be able to extend the life of their assets and spend less money on capital renewals. The converse is also true: some districts must use operating funds on facility repairs to compensate for capital shortfalls. For example, a district may keep making frequent, inefficient, patch-over repairs to an aging HVAC system (paid for through its M&O budget) instead of replacing the system (which, as a larger expense, would be paid for with capital budget funds).

Education industry standards for facility spending

The categories of Facility Operations, Routine Maintenance, and Capital Renewal have commonly used standards for gauging whether actual spending is adequate within each category. These standards are calculated as a small percentage of the value of the building/facility asset, known as a facility's CRV. These investment standards are nationally recognised standards and widely used in the infrastructure and facility operations

Table 2. Categories of K-12 school facility expenditures and annual investment standards.

Facility Spending Category	Description	Local Budget Category	Primary Source of Funds	Annual Investment Standard based on Current Replacement Value (CRV)
Facility Operations	The services required to keep a facility clean, sanitary, and tidy, so that its occupants are comfortable, healthy, and productive. Operations include utilities, support services to assist occupants; security; and custodial services.	M&O	District operating budget[a]	1% of CRV[c]
Routine Maintenance	Routine recurring work (preventive and emergent), including scheduled inspections, record keeping, equipment servicing, emergency repairs, patching holes, and repairing furniture and fixtures.	M&O	District operating budget[a]	2% of CRV[c]
Capital Renewal	Major repair, alteration, and replacement of building systems, equipment, and components that will sustain or extend the useful life of the entire facility campus (school). Work includes roadway and drainage improvements, playing field replacement, roofs, HVAC, windows, doors, structural repairs, building refurbishments, minor additions, modernization projects, and replacement or provision of long life assets to a facility campus such as portable classrooms and furniture, fixtures, and equipment.	Capital	Local G.O. bond[b]	4% of CRV[d]
Major Modernization	Major alteration of the entire building (s). Projects typically involve design changes and/or educational suitability alterations of building(s).	Capital	Local G.O. bond[b]	Above and beyond 4% of CRV
Obsolete Building Replacement	Complete or partial building replacement based on determination that it is more cost effective to fully replace building(s) rather than do major modernization.	Capital	Local G.O. bond[b]	Above and beyond 4% of CRV; Major upfront capital needed
New Construction for Growth	Additional capacity needed to keep up with growth in enrollment.	Capital	Local G.O. bond[b]	Above and beyond 4% of CRV; Major upfront capital needed

[a]District operating budgets are mostly funded by state aid through the Local Control Funding Formula (LCFF).
[b]Funding sources can also include developer fees, state SFP funds, and other sources.
[c]Current Replacement Value (CRV) is the total value of the building asset, as estimated by the cost to rebuild the facility in today's construction economy.
[d]The 4% of CRV investment standard includes: 2% for meeting basic building code and operations standards, 1% for costs associated with addressing accumulation of deferred maintenance, and 1% for altering buildings and site for education, environmental, and/or resiliency design deficiencies.

fields. According to the National Research Council (1990) report on maintenance and repair ownership, an appropriate budget allocation for routine maintenance and repair (M&R) for a substantial inventory of facilities will typically be in the range of 2–4 percent of the aggregate current replacement value of those facilities (excluding land and major associated infrastructure). In the absence of specific information upon which to base the M&R budget, this funding level should be used as an absolute minimum value. Where neglect of maintenance has caused a backlog of needed

repairs to accumulate, spending must exceed this minimum level until the backlog has been eliminated.

Additionally, a report by the Council of the Great City Schools' (2014) provides guidance to school districts on using these benchmarks. The report suggests that owners should spend between 2 and 4 percent of the CRV of a building annually for maintenance, with maintenance including routine, preventative, repairs, and capital replacements. This spending rate is linked to the facility's life expectancy, with a 2 percent estimate for a 50-year life expectancy and a 4 percent estimate for a 25-year expectancy. These standards are most valid as a guide for budget allocations for a large inventory of buildings with useful lives of 25 years or more and are a reasonable estimate for the stocks of school buildings, thus making them appropriate for use at an aggregate state level as well as an individual school district level.

In Table 2, we draw on the literature in the field to assign annual investment standards to California school facilities' needs, by categories across the M&O and capital budgets. The standard for M&O spending per year is 3% of CRV (1% for facility operations plus 2% for routine maintenance). For capital renewals, the annual standard we apply is 4% of CRV because there is strong evidence of past underinvestment and high levels of deferred maintenance statewide, as described earlier. A 2% CRV level would only be appropriate where there is zero existing deferred maintenance. For example, a school district with a brand new school building should plan to invest about 2% of CRV annually on capital renewals to keep the building fully functional as built.

Meeting both basic benchmarks (3% of CRV for M&O and 4% of CRV for capital renewal) will keep school buildings clean, safe, and functional, minimise lifecycle costs, and should help districts catch up (albeit slowly) on deferred maintenance backlogs. As shown in Table 3, to meet the 3% of CRV school facility M&O standard, California's school districts should be spending about $11.34 billion in total each year (an average of about $1,889 per student or $15.53 per square foot). To meet the 4% of CRV capital renewal standard and address the buildup of deferred maintenance, California's school districts should be spending about $15.12 billion in total (an average about $2,484 per student or $20.71 per square foot) each year.

But overall, meeting these minimum standards of annual operating and capital expenditures will keep existing school facilities in a steady state of repair. These minimum standards do not address the need for new construction for crowding or enrollment growth, fully address the accumulation of deferred maintenance, remove seismic and other deficiencies, or major facility alterations needed for educational programming.

Table 3. M&O and capital renewal standards for California K-12 School Facilities.

	Annual M&O Spending Standard (3% of CRV)	Annual Capital Renewal Investment Standard (4% of CRV)
Statewide Total	$11,340,074,679	$15,120,099,572
Average per Student	$1,889	$2,519
Average per Square Foot	$15.53	$20.71

Note: Total square feet of public K-12 school facilities used is 730,072,793. Total enrollment used is 6,002,523 in 2020–2021 as reported by California Department of Education's DataQuest website.

Results

We now look at our results to gauge the good stewardship of California's public K-12 facilities by comparing the average annual school district facility investment to the two investment standards (M&O and capital renewal). To do so, we benchmark each school districts' actual facility spending against the standards listed above. Each district's recent annual M&O spending (2018-2019) is compared to 3% of the district's CRV of its facilities. Each district's capital spending is averaged over five years (2015–2019), adjusted to 2020$, and compared to 4% of the district's CRV of its facilities. Five years of annual capital spending is averaged because capital spending can vary significantly from year to year as districts implement larger projects. M&O spending should be – and typically is – much more stable year over year. We first analyze the characteristics of districts meeting the benchmarks and those not meeting the benchmarks. Then we look at those patterns in relation to measures of local wealth.

Looking first at M&O spending, California school districts collectively spent about $6.8 billion on M&O during the year 2018-2019, with an average per-student amount of $1,382. However, there were wide differences across districts; the minimum spent was $28 per student, while the maximum spent was $14,666 per student.

In Table 4, we categorise school districts by how well they are meeting the annual M&O standard of 3% of CRV. Districts spending more than 75% of the standard are considered 'good,' while districts spending 50% to 75% of the standard are considered 'fair,' and districts spending less than 50% of the standard are considered 'poor.' Only 14% of California's school districts fell into the 'good' range by spending more than 75% of the annual M&O standard in 2018-2019. These districts, which enroll about 28% of California's students, averaged spending $1,794 per student. The rest of California's school districts were about evenly split between 'fair' and 'poor.' Thus, more than two-thirds of California's 5.85 million public school students attend school in districts that are falling short of necessary M&O investment. More than a million students are in districts falling drastically short by spending less than half of what is needed for their facilities ('poor').

Table 4. Characteristics of school districts based on levels of annual M&O spending.

	Rating	Number of School Districts	Total Enrollment, 2018–19	Average Annual M&O Spending per Student	Average District Share of High Need Students*	Average Assessed Property Value per Student	Median Assessed Property Value per Student
More than 75% of M&O Standard	Good	127 (14%)	1,698,940	$1,794	60%	$2,665,191	$1,036,761
50% to 75% of M&O Standard	Fair	390 (44%)	3,114,596	$1,337	60%	$1,842,585	$1,041,692
Less than 50% of M&O Standard	Poor	379 (42%)	1,102,095	$1,291	60%	$2,507,554	$1,382,013

Note: 'High need' defined as unduplicated student status.

Interestingly, we find the patterns of local wealth (share of disadvantaged students and property values per student) to be less stark than anticipated. We find that districts within each rating category enroll a similar share (60%) of high-need students (as measured by share of unduplicated students). We find that the 'good' and 'poor' districts had similar average property values per student ($2,665,191 and $2,506,554, respectively), with the 'fair' districts averaging about a third less ($1,842,585).

Turning to capital expenditures, California public school districts collectively spent $7.8 billion (2020$) in capital outlay during the years 2015-2019, with an annual average of $8,742,920. Like M&O spending, there were wide differences across districts: the minimum spent was $0 per student, the average spent was $1,284 per student, and the maximum spent was $26,051 per student. Of course, some of this variation is likely explained by any entirely new schools a district built in any one of these years. Constructing a new school is a large undertaking, typically costing $25 million or more depending on size and other factors.

In Table 5, we categorise school districts by how well they are meeting the average annual capital spending standard of 4% of CRV. Districts spending more than 75% of the standard are considered 'good,' while districts spending 50% to 75% of the standard are considered 'fair,' and districts spending less than 50% of the standard are considered 'poor.' Only 15% of California's school districts fell into the 'good' range by spending more than 75% of the annual capital investment standard. These districts, which enroll about 20% of California's students, averaged spending $3,768 per student. The districts meeting the standard are significantly wealthier in terms of local property values and have lower shares of high-need students on average. Most districts (763) spent 75% or less of the standard, with the majority of these districts (71%) spending less than 50% of the standard. In other words, over half of California's public-school students are enrolled in districts that received a 'poor' rating for facilities capital investment.

Of course, these capital spending numbers overestimate the actual capital renewal work being done on existing facilities in these districts because new construction

Table 5. Characteristics of school districts based on average annual capital spending, 2015–2019.

	Rating	Number of School Districts	Total Enrollment, 2018–19	Average Annual Capital Spending per Student	Average District Share of High Need Students*	Average Assessed Property Value per Student	Median Assessed Property Value per Student
More than 75% of Capital Renewal Standard	Good	133 (15%)	1,171,078	$3,768	51%	$2,633,826	$1,804,561
50% to 75% of Capital Renewal standard	Fair	129 (14%)	1,726,738	$1,794	60%	$1,719,569	$1,039,728
Less than 50% of Capital Renewal standard	Poor	634 (71%)	3,017,815	$659	62%	$2,263,922	$1,120,137

*'High need' defined as unduplicated student status.

spending is included in the totals. The data are not reported in a way that enables us to discern how much was spent on new construction and how much was spent on existing facilities. Therefore, even with new construction spending being counted, we find that 85% of school districts could not have met the 4% capital renewal benchmark for minimum spending *even* if all their capital expenditures were for capital renewals and no part of them had been for new construction or other capital projects. Thus, the number of districts not meeting capital renewal benchmarks is likely significantly *hig*her than shown in Table 5.

Looking at both standards together in Table 6, we find that only 4% of California's school districts are rated 'good' on both M&O spending and capital investment. These districts only enroll 322,525 students. Only 22% of school districts met at least one benchmark. Most alarming is that 74% of districts (who enroll more than half of California's students) did not meet either spending standard. Once again, we find that districts meeting both standards have significantly higher property wealth per student and smaller shares of high-need students on average.

Now we turn to look at facility investment equity. First, we look at facility spending in relation to locally AV per student. Then, we look at facility spending in relation to student poverty (percentage of students in the district qualifying for free or reduced-priced meals (FRPM)). As previous researchers have found, both local wealth factors are important predictors of facility revenue and spending (Brunner and Vincent 2018; Brunner, Schwegman, and Vincent 2023) and FRPM is limited in its ability to measure student poverty (Fazlul, Koedel, and Parsons 2021). The heat matrix (Figure 1) shows the relationship between student poverty and local property values, with darker colors showing higher density of districts.

Dividing all school districts into quintiles of local AV per student, from low to high, we find a distinct relationship between M&O spending and capital outlay. The districts with the highest property values per student spent about twice as much on average as all other groups on both M&O and capital outlay, as shown in Figure 2. The districts in the two lowest quintiles of property value per student, averaged spending the least on both M&O and capital outlay. Based on this trend, it is highly likely that the wealthiest communities in California have the highest quality of school facilities for their students.

Dividing all school districts into quintiles based on the percentage of district enrollment qualifying for FRPM, we find that how districts spend on facilities varies significantly with FRPM levels. Districts with the highest shares of low-income students (where more than 81.3% of students qualify for FRPM) spent less on capital outlay per student and more on M&O per student than districts serving higher income students, as shown in Figure 3. These 'highest poverty' districts spent more than a third less per student on capital outlay on average, compared to the lowest poverty districts ($981 compared to $1,643). Districts in the two quintiles of highest poverty student share, averaged spending about 12% to 14% more per student on M&O compared to all other districts. This finding means that districts serving lower-income children and families tend to spend more per student on basic facility M&O out of their district operating budgets than districts serving higher-income families.

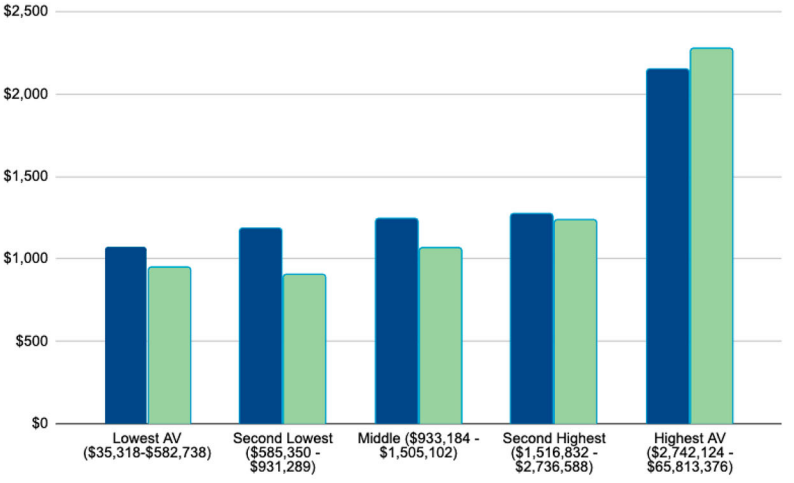
Our findings suggest that communities and school districts serving lower-income students and their families are more often under-spending on capital needs and are thus forced to over-compensate for this with higher M&O spending out of their operating

Table 6. Characteristics of school districts based on average annual capital spending and annual maintenance and operations spending.

	Number of School Districts	Total enrollment, 2018–19	Average Annual M&O Spending per Student	Average Annual Capital Spending per Student	Average District Share of Disadvantaged Students	Average Property Value per Student	Median Property Value per Student	Average Annual Capital Revenue from State of California
Districts Rated 'Good' on both M&O and Capital Spending	32 (4%)	322,525	$1,756	$3,094	54%	$3,230,565	$1,560,580	$391
Districts Rated 'Good' in One Spending Category	196 (22%)	2,224,968	$1,466	$2,476	56%	$2,459,296	$1,409,657	$334
Districts Rated 'Fair' or 'Poor' in Both Spending Categories	668 (74%)	3,368,138	$1,340	$848	62%	$2,128,818	$1,115,547	$208

			Quintiles of Student Poverty as Measured by FRPM				
			Low Student Poverty				High Student Poverty
			1	2	3	4	5
Quintiles of Assessed Property Value per Student	Low AV	1	6	22	28	47	73
		2	18	34	41	50	37
		3	30	37	43	37	36
		4	55	43	44	25	12
	High AV	5	75	40	21	22	20

Figure 1. Number of California School Districts in Quintiles of Student Poverty and Assessed Property Value per Student, 2020.



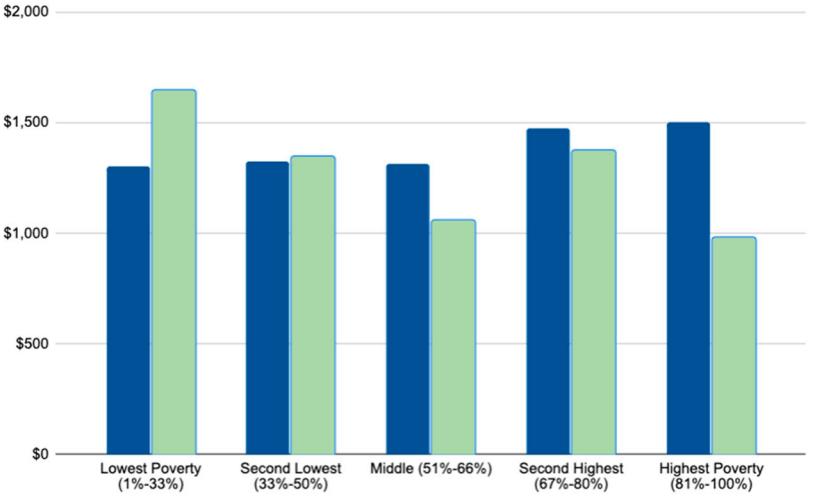
Average Annual Maintenance & Operations per Student	$1,072	$1,187	$1,239	$1,269	$2,147
Average Annual Capital Outlay per Student	$949	$900	$1,069	$1,234	$2,277

Figure 2. Average Annual School District Expenditures on M&O and Capital Outlay by Quintiles of Assessed Property Value per Student. Note: Annual capital outlay expenditures are averaged for the years 2015 through 2019 and adjusted to 2020$ using the Turner Construction index. M&O expenditure is from the single year 2018–2019 and unadjusted. Both are divided by total district enrollment in 2018-2019.

budget. This means building operations cost more in these poorer districts, leaving fewer dollars for education programmes. In summary, our results indicate inadequate and inequitable school facility spending across the state.

Discussion

In this study, we find the vast majority of California students are attending schools that fail to meet the minimum industry standard benchmarks for M&O spending, capital



Average Annual Maintenance & Operations per Student	$1,300	$1,322	$1,314	$1,476	$1,499
Average Annual Capital Outlay per Student	$1,643	$1,349	$1,058	$1,376	$981

Figure 3: Average Annual School District Expenditures on M&O and Capital Outlay by Quintiles of Student Poverty. Note: Annual capital outlay expenditures are averaged for the years 2015 through 2019 and adjusted to 2020$ using the Turner Construction index. M&O expenditure is from the single year 2018–2019 and unadjusted. Both are divided by total district enrollment in 2018–2019.

renewal spending, or both. The finding raises concerns that cumulative building deficiencies are likely compounding each year in schools across the state. It underscores the urgent need for the State of California to address its funding scheme for school districts to improve facility disparities. However, given the lack of empirical analysis on school facility conditions, further research is needed to reform the state's funding scheme. The bioecological theory emerges as a valuable framework for enacting reform, offering insight into the intricate relationship between school facilities and student outcomes (Bronfenbrenner 1977). According to the bioecological theory, student learning is induced not only by individual factors but also by the physical conditions in which they occur. Thus, the stewardship of school facilities holds the potential to create improved learning environments for students.

Our use of available data on K – 12 public combined with district-level data in California allowed us to investigate school facility expenditures and quantify the square footage of buildings at each school. The data revealed California has at least 730 million square feet of public K-12 school facilities that must be continuously kept. Our analysis found a concerning pattern, only 14% of school districts were allocating more than 75% of the annual M&O standard rating. Similarly, for capital investment, a mere 15% of California's school districts were found to be spending more than 75% of the annual capital investment standard. This suggests that a significant majority of school districts, approximately 85%, are falling short in both capital spending and M&O. The implication of this discrepancy becomes even more pronounced when

considering that the remaining 15% of districts investing adequately in facility expenditure only enroll about a quarter of the total students in California. Our analysis suggests that only a minimal number of students are in optimal learning environments in California.

In light of persistent inequities in California's public-school facilities, it becomes imperative to address a critical concern, are there districts with limited taxable property value? Because facility funding is tied to AV, we compare a district's total bonding capacity to the 4% of CRV needed over 5 years (because it is conceivable for a district to do a local bond every 5 years). Since 4% of CRV represents the minimum basic annual capital needs for a school district, our findings reveal that 38% of school districts ($N = 341$) lack sufficient taxable property wealth (at the statutory bonding capacity limits) to raise enough local bond dollars to cover five years of basic capital facilities needs.

Moving forward, the state should ensure that all school districts can reasonably meet both facilities maintenance and capital investment needs through an appropriate combination of local and state funding/financing sources. Growing inequality in school facility funding jeopardises the public-school system's ability to provide structurally sound and clean school facilities to students in California. The underfunding of school facilities has led to decaying physical conditions and poor-quality school facility conditions have been found to undermine student achievement and can risk childhood health (Fisk et al. 2016; Maxwell 2016). Additionally, school conditions have been linked to teacher attraction and retention. In particular, poor facility conditions have been found to increase the likelihood of teacher turnover, while good facility conditions help reduce teacher turnover (Loeb, Darling-Hammond, and Luczak 2005).

Looking ahead, educator leaders must prioritise equalising school facility funding or integrating school facility funding into school districts' budgets. By implementing these measures, education leaders can take significant strides in reducing educational funding inequities between high and low-income school districts. It is worth noting a report released by the Urban Institute revealed that state funding policies that emphasised equalising capital funding are advantageous for overcoming wealth disparities among students (Blagg, Terrones, and Nelson 2023). The analysis suggests that both states and the federal government can take measures to mitigate facility disparities. However, achieving facility equity may demand substantial investments, requiring a greater allocation of funding resources to schools.

Limitations

This study has several potential limitations. It builds upon the methodology of Vincent and Jain (2015) who estimated the total square footage of school districts by utilising district enrollment and the California Department of Education's recommended square footage space standards by grade. According to their method, California's statewide total public K-12 school facility square footage was estimated to be between 520–575 million square feet with an estimated CRV ranging between $208-$230 billion in 2014$, which is $271-$300 billion in 2020$ (Vincent and Jain 2015). Our approach incorporates new and improved data, enabling the quantification of square footage using parcel ownership data from all 58 county offices of education. Our new analysis with improved data reveals California has at least 730 million square feet with an estimated CRV of $378 billion. Our estimate suggests

they underestimated the statewide inventory by about 27% or roughly 155–210 million square feet. However, the data assumes one floor for each school. The reality is many schools have two or more floors, potentially resulting in undercounted estimates.

In addition, we do not adjust for different costs according to regional differences; the data cannot discern geography within a state. Looking at M&O spending reported in the federal data reveals that district-level M&O spending sees very little fluctuation from year to year. Capital spending, however, can vary greatly from one year to the next. Therefore, we opted to use one year of M&O and a five-year average of capital spending. We felt five years of capital spending would illustrate the most recent years 2015-2019. Future analysis should study additional and longer time periods of spending to improve understanding of local spending.

Lastly, our paper uses investment levels as a proxy for actual physical conditions of school facilities. Future research should test more specifically the relationship between investment levels and conditions in schools, paying particular attention to different types of schools, ages of schools, and characteristics of local communities.

Note

1. We arrived at an estimated square foot replacement cost of $517.76 by looking at numerous data points. First, in 2016 the national State of Our Schools report (Filardo 2016) used $400/sf for California, based on a survey of state-level school facility offices across the country. Adjusting this figure to 2020$ using the Turner Construction Index, is $522 (2016 to 2020 index inflator = 1.305). Second, we obtained detailed cost data on 21 recent school construction projects in California from Colbi Technologies. These projects averaged close to, but slightly less, than the first method. Erring on the conservative end we used the lower number.

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No potential conflict of interest was reported by the author(s).

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