

UCSF

UC San Francisco Previously Published Works

Title

Achieving Healthy School Siting and Planning Policies: Understanding Shared Concerns of Environmental Planners, Public Health Professionals, and Educators

Permalink

<https://escholarship.org/uc/item/3kv765cz>

Journal

NEW SOLUTIONS A Journal of Environmental and Occupational Health Policy, 20(1)

ISSN

1048-2911

Author

Cohen, Alison

Publication Date

2010-05-01

DOI

10.2190/ns.20.1.d

Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial-NoDerivatives License, available at <https://creativecommons.org/licenses/by-nc-nd/4.0/>

Peer reviewed



Published in final edited form as:

New Solut. 2010 ; 20(1): 49–72. doi:10.2190/NS.20.1.d.

Achieving Healthy School Siting and Planning Policies: Understanding Shared Concerns of Environmental Planners, Public Health Professionals, and Educators

Alison Cohen

Department of Education and Department of Community Health, Brown University

Alison Cohen: Alison.Cohen@fulbrightmail.org

Abstract

Policy decisions regarding the quality of the physical school environment—both, school siting and school facility planning policies—are often considered through the lens of environmental planning, public health, or education policy, but rarely through all three. Environmental planners consider environmental justice issues on a local level and/or consider the regional impact of a school. Public health professionals focus on toxic exposures and populations particularly vulnerable to negative health outcomes. Educators and education policymakers emphasize investing in human capital of both students and staff. By understanding these respective angles and combining these efforts around the common goals of achieving adequacy and excellence, we can work towards a regulatory system for school facilities that recognizes children as a uniquely vulnerable population and seeks to create healthier school environments in which children can learn and adults can work.

Introduction: Why Should We Care About the Physical School Environment?

Questions about the quality of the physical school environment have historically been overlooked, and research is just beginning to emerge regarding the connections between the environment, health and academic outcomes. Research is especially important because 20% of Americans (students and staff combined) go to school every day.¹² Students spend over 1300 hours in school facilities annually (second only to the amount of time spent at home), but approximately 50% of all public schools—and disproportionately urban schools and schools serving low-income students or students of color—have at least one “unsatisfactory environmental condition”.³ According to data from 1998, the average age of a school building was 42 years, with three-quarters of schools built before 1970, when lead paint was commonly used.¹ The quality of school facilities is a critical, but understudied, education issue.

This paper analyzes three disciplines that have a stake in the physical school environment – environmental planning, public health, and education policy — and explores how and why each discipline engages in school facility policy. Environmental planners have considered how the physical school environment fits into larger regional planning endeavors, and some of the environment impacts and implications associated with the quality of the land and facility. Public health scholars have demonstrated that environmentally healthy schools lead to healthier students who perform better in school and that school facilities have a larger impact on student performance than commonly accepted factors like student attitudes

towards learning.⁴ Education policymakers consider how investments in school infrastructure will increase the human capital of the students and staff learning and working there. A brief content analysis of support letters sent to the House Committee on Education and Labor regarding a school facility bill introduces the perspectives of various stakeholders. An application of these lenses to illustrative examples of major lawsuits and relevant research endeavors follows. Given the limited research on school siting and school building, these examples are dispersed across the country and provide diverse entry points to the issue.

Who Cares About the Physical School Environment?

The multitude and variety of supporters of the 21st Century High-Performing Public Schools Facilities Act, which was passed by the House in May 2009 with the goal of modernizing school buildings to make them more efficient, illustrate the types of stakeholders involved in and/or affected by school planning decisions. Groups publicly supporting the Act included: school professional associations (including the American Federation of Teachers and the National Education Association), labor unions/professional associations (including the Building and Construction Trades Department of the AFL-CIO and the International Union of Painters and Allied Trades), environmentalists (including Environment America and the US Green Building Council), and groups devoted to school facility improvement (including Rebuilding America's Schools and Californians for School Facilities).⁵

The official letters of support submitted to Representative George Miller, chair of the House Committee on Education and Labor, in reference to the 21st Century High-Performing Public School Facilities Act highlight the different ways in which stakeholders are affected by school facility planning decisions.^A In a qualitative analysis of the content of each of the 18 letters, four different rationales of support for the bill emerged: the environment, health, education, and the economy. Not surprisingly, as this bill originated in the Education and Labor Committee, all 18 letters mention the benefits of the legislation for education, including by raising student achievement. Most commonly, letters referred to new facilities helping to improve student achievement. Similarly, and perhaps due to the nature of the committee's dual focus on education and labor, six letters were from associations of builders or tradesmen, and 15 of the 18 letters discuss the benefits of the bill on economic development. In particular, these arguments focused on the creation of new jobs through investment in infrastructure, with only four of the letters mentioning preparing students for future economic success. The environment and health were much less frequently mentioned. Seven letters mentioned benefits for the environment, namely energy efficiency and the use of renewable resources, and only three mentioned potential health benefits—that this legislation would help all school facilities meet basic health and safety codes. This snapshot of the stakeholder positions on a single school facility bill underscores the emphasis on economic and education outcomes, in line with the mandate of the committee, and a relative de-emphasis on the environment and health. The research body, on the other hand, emphasizes environment and health as key components of school planning policies. Researchers and policymakers should collaborate to consider how to overlap to support research-informed policy.

The diversity of stakeholders in healthy school facility policy decisions is complicated by the lack of communication and lack of analytical overlap in methods: city planners rarely talk to education professionals, and neither is likely to learn about school siting or facility planning in their professional training.⁶ The review of environmental plans tends to be

^AThese letters are all available on the following website (accessed 16 Sept. 2008): <http://edlabor.house.gov/issues/schoolfacilitiesact.shtml>.

confined to particular technical levels of analysis and compartmentalizes the impact of certain discipline-specific regulatory decisions.⁷ This makes it more difficult to understand and address the variety of stakeholders and policy realms a particular siting decision may affect.

Why Do Environmental Planners Care About the Physical School Environment?

In a 1955 commentary about community planning and education, Francis Violich remarked, “without the land itself, and with any [physical] conditions lacking, the ability of the educational plant to serve human needs is impaired.”⁸ Over the past fifty-plus years, public education has changed in many ways, but the reliance on adequate land and physical conditions remains. There are two major sources of environmental problems in schools: the quality of the land on which the school is built, and the quality of the school facility itself. Environmental planners use two lenses to tackle these two issues: focusing on the local environment of the particular facility, and focusing on the regional environment of the larger area in which the facility is located. The facility focus considers the quality of the school environment and how the facility is managed. From a school staff perspective, this is where teachers and especially custodial staff may be involved. The facility focus considers questions of environmental injustices affecting a particular school’s student and staff population. The regional focus considers how the quality of the school may affect or influence other buildings and developments in the neighborhood, city, or region, often within the context of building social capital.

The Local Environment: Environmental Justice

Around the country, including in Providence, RI, people have raised concerns about the environmental quality of a particular school facility and how it affects the people at that school, and it is primarily environmental planners and managers who have worked to address these questions. Often, these schools are located in low-income communities or communities of color, raising questions of environmental justice. On an elementary level, environmental justice is the right of all people, regardless of race, class, or background, to live, work, play, and learn in a safe and healthy environment.⁹¹⁰ The environmental justice movement integrates concerns about the environment, health, and civil rights to consider the disproportionate environmental pollution and health burden that disenfranchised communities—primarily low-income communities and communities of color—bear. The Environmental Protection Agency defines environmental justice specifically as the “fair treatment and meaningful involvement” of all people in the “development, implementation, and enforcement” of environmental policies and regulations.¹¹ However, school facilities may perpetuate environmental injustice in two ways.

First, schools may be sited on contaminated land, or a brownfield. Brownfields are properties that are contaminated or believed to be contaminated that are being underused or not used at all.¹² In many Northeastern cities (including Providence, RI), land is scarce, and most available land for building purposes is a brownfield.¹³ Brownfields tend to be located in poorer communities and low-income communities of color.¹²¹⁴ At the same time, however, poorer districts are more likely to be overcrowded and in need of new schools.¹⁵ Building a school on a brownfield may be the only way in which a school can be proximal to the students it serves.¹⁶ Schools may also be sited near environmental polluters. Grade schools located closer to environmental hazards in a Florida school district were disproportionately black and Hispanic and more highly segregated, while schools located further away were disproportionately white.¹⁷ Similarly, schools that serve primarily students of color are more likely to have higher rates of exposure to hazardous air pollutants

and have a higher risk of associated health problems.¹⁸ The frequency of building schools on brownfields is an environmental justice issue that has only recently gained traction, despite how critical it is to ensuring healthy school environments.

Second, schools may themselves be in sub-par condition. Fifty percent of all public schools—and disproportionately urban schools and schools serving low-income students or students of color—have at least one “unsatisfactory environmental condition,” including ventilation and heating problems.³ The General Accounting Office (now General Accountability Office) determined in 1995 that one-third of all public school facilities were in a “serious state of disrepair”; a 2000 NEA report estimates this will cost \$322 billion to redress.⁶ Facilities in disrepair are concentrated in urban areas that tend to serve students with low socioeconomic status.⁶

The Regional Perspective: Neighborhood Quality and Community Development

Not all environmental planners operate on the level of an individual school. Some, who emphasize neighborhood quality and community development, consider how school facilities may affect the quality of the greater community’s built environment, and how the quality of the school—whether it be poorly-maintained or an exercise in innovation and urban renewal—makes the neighborhood more or less desirable.

The quality of the school affects perceptions about the quality of the neighborhood. A well-maintained school not only makes it a healthier place for students to learn, but it affects perceptions about the surrounding neighborhood, and a poorly-maintained school or a school located close to a polluter can be less desirable, making the neighborhood a less desirable place to live.¹⁷ Vincent argues that public schools offer both a “physical and social” infrastructure, so that, in addition to the actual property investment, schools can help build a community’s social environment.⁶ The concept of a social infrastructure means that healthy schools have the potential to contribute to healthy communities. In poorer districts with the double problem of brownfields and school overcrowding, building new schools on remediated brownfields can help revitalize a neighborhood by reducing perceived blight.¹⁹ Alternatively, if the brownfields are left unremediated before school construction begins or if the construction site is left fallow for an extended period of time, perceived blight can persist in the neighborhood.

School quality is a motivating force in driving people out of cities and into suburbs, leading to residential and school re-segregation.²⁰²¹ As planners try to counteract sprawl with “Smart Growth” initiatives, they must also consider urban education policies. For example, Maryland’s Smart Growth planners prioritize school rehabilitation to begin to address underlying education issues, including racial desegregation in schools and working towards smaller, community-centered schools.²⁰ LEED-certified schools can be beacons of innovation in a community and encourage both people and innovation to concentrate in the community. However, LEED certification and green design is only beginning to catch on across the country. Only 13% of districts currently have policies to include green design principles in school construction projects.¹ Furthermore, LEED standards focus more on reducing resource consumption rather than on reducing hazardous exposures, with only one category (indoor environmental quality) explicitly addressing such potential exposures. While brownfields remediation and upgrading to achieving LEED certification do not have to be mutually exclusive solutions for creating healthier school environments, the Providence case study reveals that typically only one of these methods is offered as a solution, depending on where the school is located and what population the school serves.

Environmental Adequacy and Environmental Excellence

Environmental Adequacy: Brownfields—Two examples of brownfields remediation for schools—the Triad approach used in New Jersey and the Child Proofing Our Communities approach recommended by the Center for Health and Environmental Justice—focus on ensuring safety. The Triad Approach is one approach used to identify if a site is suitable for construction. It was used in New Jersey to characterize the environmental quality of a brownfields site that was identified as the potential location of an elementary school that needed to be built to help reduce overcrowding.¹⁵ Endorsed by the US Environmental Protection Agency (EPA) and the New Jersey Department of Environmental Protection, the Triad Approach describes the conditions of the site to help reduce the amount of time it takes to construct a new school, something that has been an explicit goal of the state of New Jersey.²²¹⁵ The Triad Approach to brownfields remediation offers a policy solution to a common problem of the brownfields remediation process—that city officials get permits without doing background research about the environmental quality of the site.¹⁹ There are three components of the Triad: strategic planning, dynamic work strategies that allow the project to be completed more rapidly and less expensively, and real-time measurement technologies that make rapid data collect possible.²³ By using field analysis methods, scientists collecting environmental samples to determine contamination levels can analyze their samples on-site, which makes it easier to collect more samples in a more targeted and thorough manner.²²

The Triad Approach also expedites the entire data collection process: at one New Jersey school site, only two months elapsed between the preliminary site visit and the analysis of the data collected; the process typically takes twice as long.¹⁵²² The Triad Approach's emphasis on expedited review and the role of highly specialized professionals in collecting the data circumvents extensive community engagement in the planning process, since meaningful community engagement requires additional time and resources and an emphasis on specialization simultaneously deemphasizes the importance of local knowledge. Triad Approach data may be strong, but it is not disseminated at the community level. Just seventeen states require school planners to open up their plans for public comment.¹⁶ This is a potential barrier to environmental equity because the regulatory decision-making process often overlooks questions of disproportionate pollution burden and environmental justice, so when community members' opinions about the site go unheard, so too do these concerns. Not only is involvement in the regulatory process a key tenet of the environmental justice movement, but it is also something that residents in minority neighborhoods are interested in: three-quarters of study respondents in a minority neighborhood with many brownfields expressed a desire to participate in the redevelopment process.²⁴

The Child Proofing Our Communities Campaign (CPOC), an initiative by the Center for Health, Environment, and Justice, developed model federal school siting legislation. Their essential components are: ensuring public participation in the decision-making process by having a citizen group that democratically decides upon the progression of the project, categorically denying the use of some sites due to particularly harmful environmental pollution present, and conducting a thorough environmental hazard and health assessment. Then, if a contaminated site must be used, CPOC advocates for developing and implementing a remediation plan that includes certain key steps, such as minimizing exposure to contaminated soil and developing a system to vent volatile organic chemicals.¹⁶

Environmental Excellence: High-Performance Schools—At the first Rhode Island Sustainable Schools Summit in September 2008, multiple panelists, who came from both the sustainability movement and from school planning and facilities management, focused on building and renovating schools to the highest environmental standards as the way to

achieve healthy and sustainable schools. High-performance schools have societal benefits in addition to benefits for the individuals attending: they can help the environment and reduce costs by being more energy efficient, freeing up other funds for important policy priorities.² The highest environmental standards most often used are the US Green Building Council's LEED (Leadership in Energy and Environmental Design) rating system, which was originally designed as a tool to change the market for commercial buildings but has quickly been taken up in the public sector and government as well.²⁵ Key components of the general LEED certification process include: the choice of site (with points offered for redeveloping and reusing existing sites); water-use reduction and efficiency; renewable and efficient energy use; waste reduction, reuse, and recycling; improving the quality of the indoor environment (air, temperature, physical space, etc.); and innovative design features.²⁵

As of 2006, the US Green Building Council (USGBC) reported that seven federal agencies, eleven states, and 43 cities had legislation or incentives that encouraged the development of LEED-certified buildings.^{26,27} The USGBC launched a nationwide initiative to work with state lawmakers to promote green schools to increase the number of green schools across the country (USGBC has currently registered over 1,000).²⁸ State laws vary widely, ranging from little or no regulation to examples like Washington state's High Performance Public Building Act of 2005. The Act requires all Washington state public school facility projects receiving state funding to achieve at least LEED silver standard or follow the Washington Sustainable Schools Design Protocol.²⁹ The Washington Sustainable Schools Protocol was developed by a 34-member committee that included 9 representatives from public school districts across the state, 9 members of architecture and/or engineering firms, 7 government representatives (4 from the office of the superintendent for public instruction, 3 from others), 2 representatives of public utilities, 2 interior designers, 4 members from energy efficiency groups, and 1 sustainable design consultant³⁰, signaling the diversity of perspectives within the realm of environmental planning and design. Washington's policy and similar policies in other states engage many types of public planners, but their great limitation is that they apply only for the creation of new facilities and do little, if anything, to address issues with existing buildings.

A Tale of Two Schools in Providence, Rhode Island—The two policy solutions of brownfields remediation and LEED certification/energy efficiency described above offer different approaches for how to improve the school environment. In Providence, RI, both approaches have been used, in two neighborhoods serving two different populations. Brownfields remediation focuses on achieving environmental adequacy, whereas LEED certification and efficiency focus on environmental excellence. Given this distinction, brownfields remediation tends to be a policy most commonly considered in urban areas and low-income communities, where brownfields are concentrated. Here, the environmental planning focus is on ensuring that the school environment causes no harm. On the other hand, LEED certification is optional and requires more funding, so is most commonly considered in wealthier districts. Here, the environmental planning focus is on making the school an even healthier place to be.

In the case of brownfields, Anthony Carnevale Elementary School and Springfield Middle School (“the Springfield Street schools”) were built upon Providence's former city dump in the Hartford Park neighborhood in 1999. Sixty-six percent of Hartford Park's residents are people of color, whereas in Providence, 55% of residents are people of color. The neighborhood is almost 50% Hispanic, twenty percent more than Providence as a whole. Forty percent of families are below the poverty level, as compared to 24% of Providence residents overall (Providence Plan, 2007).^{31,32} Over 80% of the students attending the two schools were students of color and from low-income families.³¹ In 1999, Rhode Island Legal Services filed a lawsuit on behalf of local residents against the RI Department of

Environmental Management (DEM) alleging that the DEM had violated hazardous waste clean-up laws by approving the school siting and minimal clean-up plan.³³ The civil suit alleged that the plan was environmentally racist and inequitable because a low-income community of color would be disproportionately burdened.³⁴ While the RI Superior Court found that the DEM protected students from toxic exposures from the ground pollution, the court ruled that the DEM did not achieve state requirements for environmental equity or community involvement in its rushed approval of Providence's plan.³³ Achieving an adequately clean environment was insufficient, and parents of children in Hartford Park and the greater neighborhood community who were minimally engaged in the planning process argued that they deserved greater access and power in the planning process to determine what their local school should look like. Further analysis by the Brown University Superfund Research Program Community Outreach Core has determined that the Springfield street schools are indicative of larger trends: environmentally burdened schools are most concentrated in Providence's low-income communities and communities of color.³⁴

Across town, in one of the wealthiest neighborhoods in Providence,³⁵ a different story unfolded. In response to declining enrollments, the Nathan Bishop Middle School on Providence's East Side is currently undergoing a \$35 million refurbishment to help make public schooling a more appealing option to families living on the East Side.³⁶ One article from the Providence Journal summed up the situation as: "after years of white flight to the suburbs, some East Side families are willing to give the public schools another chance, especially now that the city is building a new Nathan Bishop Middle School on the East Side".³⁷ After initial plans for its closure, parents of both current and prospective students advocated for the renovation and reopening of the school. Parents formed the East Side Public Education Committee, a structured advocacy group, and the then-Superintendent engaged these parents in the school planning process through a formal advisory committee.³⁶ This extensive parental and community involvement in the planning process is unusual. One reason why parents may have been more heavily involved here is because of the combined political and economic power they held: parents on the East Side had the socioeconomic flexibility to move to another town with better private schools and/or to send their children to private schools. Additionally, since parents were so involved in the planning process, it follows that they would advocate for a school plan that would improve the quality of their neighborhood. The parent community hopes that environmental improvements like a rainwater collection system and energy-efficient systems at Nathan Bishop, one of the Providence Preservation Society's Most Endangered Properties in 2007, are part of what will draw families to public schools.³⁸ Here, the particularly excellent school environment is a "pull" factor for families considering public schools.

These examples explore the two ways in which environmental planners conceptualize the physical school environment: environmental adequacy, as evidenced by the environmental justice approach to brownfields, and neighborhood improvement, as characterized by high-performance schools and schools as beacons for the community. Turning to another group, we explore how public health professionals build upon the framework of environmental justice to consider how people are affected by disproportionate exposure to pollution.

Why Do Public Health Professionals Care About the Physical School Environment?

The public health perspective is people-oriented: it focuses on how the environment—including how the environment is regulated—affects people's lives. This includes focusing on toxic exposures—environmental exposures known or presumed to cause harm—and a special emphasis on populations especially vulnerable to such exposures who may be

disproportionately burdened, including youth. The public health focus on health disparities deepens the environmental justice perspective observed in environmental planning and focuses on the human rights and disparate health implications associated with environmental injustice.

Vulnerable Populations

Vulnerable populations experience greater health effects, given the level of their exposure, than the average person exposed. Depending on whom these people are, this can again raise issues of justice and equity. Children are a vulnerable population because they are still developing and are more susceptible to toxicants altering their developmental processes. Children have elevated rates of exposure to environmental hazards because they spend more time on the floor (especially younger children) and put more things in their mouth. Additionally, children breathe in proportionately more air than adults.¹ Once children have been exposed, they can experience different toxicological effects than adults that may be particularly harmful to their brain and other organs due to different absorption and metabolism severity.¹⁸ Furthermore, health problems with long latency periods will have adequate time to develop in children, whereas they may not have ample time to manifest in adults.¹ In fact, President Clinton issued Executive Order 13045 in 1997 to call for the federal government to consider children's especial vulnerability to environmental health risks.³⁹ Additionally, communities that are already exposed to myriad pollutants in their neighborhood—and such pollution is concentrated in low-income communities of color⁴⁰—are also vulnerable.

Toxic Exposures

Environmental exposures are much easier to quantify than health outcomes, so exposures to toxic substances and environmental hazards are often measured as a proxy for quantifying negative health outcomes. Much of the public health literature focuses on where people live, but students may not go to school in the same community in which they live, given the increase in busing and magnet school policies.¹⁸ Since students spend a significant portion of their day in school, it is important to consider the school environment.

School buildings—especially older, more rundown schools—are plagued by a number of environmental health threats, including lead paint, mold, and even asbestos.¹⁶ Lead paint was commonly used in buildings pre-1978, so the risk of lead paint exposure alone can be significant in older school buildings. These dilapidated schools also tend to disproportionately serve low-income communities and communities of color.¹⁶

Indoor air quality of schools is of particular concern: 20% of American schools have reported that their indoor air quality is unsatisfactory,⁴¹ and one study found schools to have elevated levels of carbon dioxide, humidity, and allergens (like dust and mold) in the indoor air.¹ Formaldehyde exposure is also a problem, particularly in portable classroom trailers.⁴² However, indoor air quality issues have been overlooked by the majority of states: only ten states, or one-fifth, require districts and schools to prevent and resolve any indoor air quality problems (often using the EPA's Indoor Air Quality Tools for Schools program as a model).¹ That said, schools are more likely than other buildings to have poor indoor air quality because omnipresent funding problems mean that facilities are often inadequately maintained.⁴³ Indoor air quality problems may trigger asthma and can lead to fatigue, headaches, and eye, nose, and throat irritations.¹ One study found that almost two-thirds of teachers who were unable to open classroom windows reported health problems, as compared to just over one-third of teachers who were able to open their windows.⁴⁴ Pesticides are widely used in schools—especially schools in already poor quality that, for example, offer easy indoor access to pests through cracks in the walls and floors. Students

may become acutely ill due to pesticide exposures in their school.⁴⁵ These numerous indoor environment issues can cause health problems and distract children from learning.

In addition to having environmental health problems in the schools, schools can also be located near polluters and other sources of toxic exposures. Despite a growing case for concern, only fourteen states have policies that restrict or prohibit the siting of schools on or near toxic sites or sources of pollution. Twenty-four states have no policies requiring school planners to assess environmental hazards at sites being considered for new schools, and twenty states have no policies requiring school planners to consider the environment when siting or building a school.¹⁶ Even common sources of pollution pose a health risk to school children. For example, schools located near high-traffic roads have a larger percentage of students of color than schools further from traffic, and living near high-traffic roads is associated with health problems.⁴⁶

Environmental Health Adequacy and Environmental Health Excellence

Because public health professionals consider the entire population and are concerned about equitable offerings, they have focused almost exclusively on achieving environmental health adequacy for schools, with little attention being paid to environmental health excellence. Unlike the realm of environmental planning, policies and research for the creation and maintenance of particularly healthy schools are rare, if they exist at all, in the field of public health.

Environmental Health Adequacy—In a study with implications for all metropolitan areas, children of color in Los Angeles Unified School District (LAUSD) were at a higher risk for health problems (both non-cancer and cancer problems) associated with exposure to air toxics, even when controlling for land use patterns, socioeconomic status, and other potential confounders.¹⁸ For both average lifetime cancer risk and respiratory health risk, Latinos, African Americans, and Asian students face a higher risk than white students.¹⁸ Students of color bear a disproportionate health burden due to differential environmental exposures, a clear environmental injustice.

Air pollution increases health problems, primarily respiratory problems, which can in turn lead to reduced academic performance.⁴⁷ On the school level, exposure to environmental hazards (as measured by proximity to a Toxic Release Inventory site) is associated with decreased academic performance.⁴⁷ Most data regarding academic performance is aggregated on the school level. Schools with the highest exposures to respiratory hazards perform significantly lower on school-level measures of academic performance (the relationship is linear and dose-response), and students of color are more likely to attend schools with higher risks of health problems related to air pollution.³⁹ Problems of toxic exposures affecting particularly vulnerable populations in schools can be further explored in the case study of the Belmont school in Los Angeles.

A Tale of Countless Schools—The construction of the Belmont Learning Complex in Los Angeles was proposed to address overcrowding in a primarily Latino neighborhood.⁴⁸ However, the school was built on top of a heavily contaminated former oil field. Although the Los Angeles Unified School District knew about the presence of toxic chemicals on the site, the District kept quiet about the problem to speed up the construction process, as was also the case with the Carnevale and Springfield schools in Providence. Midway through the construction process, media and government investigations revealed the contamination history to the community and the general public, and a scandal arose.¹⁸⁴⁸ The elected school board, a political entity representing voters, worked to hold the school district administrators who had expedited the plan without public review accountable for their

actions.⁴⁸ When the community's opinion was finally voiced, development ceased—but only after over \$100 million had already been spent on the project.⁴⁸

We read only about the schools where a community has somehow discovered that the land beneath their school may be increasing their risk of health problems. However, low-income communities and communities of color have lower rates of mobilization and less civic support than more advantaged communities.⁴⁸ Therefore, we are less likely to know that such problems exist. This lack of empowerment compounded by inequitable management of toxic exposures, as observed with the Springfield street schools in Providence and elsewhere, increases the pollution burden borne by such communities. Hence, the environmental and political injustices observed in school siting translate into health inequities.

In addition, health problems related to toxic exposures may take a long time to develop. Community members identified that an unusually high number of alumni of Beverly Hills High School, located in one of the wealthiest neighborhoods of Los Angeles, had developed cancer at young ages. Beverly Hills High School, it turned out, was sited on top of an oil field, and had been for decades.⁴⁹ However, because cancer is not an immediate reaction to environmental exposures—Beverly Hills alumni did not get diagnosed until at least 10–15 years after attending the high school—it is harder to track and connect back to a specific source of exposure. The Beverly Hills High School case demonstrates that, although poor communities are more likely to be burdened with schools sited in unhealthy locations, no community is immune. With the long latency of many health problems, and the ubiquity of pollution, it may be difficult to identify the health risk of a particular toxic exposure—like being exposed to pollution at school—but it is within our best interest as a society to reduce toxic exposures, especially among vulnerable populations.

These case studies indicate that public health professionals focus on how vulnerable populations are exposed to toxic substances and consider how remediations and regulations may help improve health outcomes. Education policymakers are similarly people-oriented, but rather than a focus on health, they focus on investing in human capital, adopting an economic framework that considers school facilities as a requisite input for the “production” of student achievement.

Why Do Education Policymakers Care About the Physical School Environment?

Education policymakers are interested in investing in human capital—of both students and staff. Human capital, or the ability of each individual to contribute to his or her community's economic growth, implies a consequential emphasis on the economy and the workforce as a natural extension of successful investments in human capital, and compares school facilities to workplace environments. Improving the school physical environment benefits everyone who spends time at the school, in a number of ways, including increased student performance, better workplace environments, and additional jobs related to facility construction and management. Rather than the vast majority of education policies and programs that target a particular group served by the school system (enrichment classes for gifted and talented students, free and reduced-price lunch for low-income students, union provisions for teachers and staff), infrastructure development policies benefit everyone learning or working at a school.

Investing in Human Capital of Students and Staff

A significant body of research exists linking educational facilities to improved student learning experience and improved staff working experience, and inadequately maintained

school facilities affecting teacher and student morale.⁴² Some scholars have declared that the correlation between school facility quality and academic performance is well-established,⁴² while others conclude that relationship may not be conclusively causal.⁵⁰ (However, education research is rarely able to prove causality—for instance, we must also recall that teaching has not been conclusively linked to student achievement, and we can reasonably estimate that a connection exists.⁵¹) Education level and student achievement is often used as an indicator of human capital⁵², because student achievement is viewed as leading to increased economic capacity.⁵³ Investing in the infrastructure benefits everyone served by the school, rather than separate subpopulations.¹ Furthermore, education researchers like Greenwald et al⁵⁴ tend to take on the perspective often espoused by economists: that the school setting can be considered to be an education production function, with school inputs including facilities and resources, and school outputs including student achievement and social and human capital.

The body of occupational and ergonomic research describing the effect of the workplace on the quality of work can be extrapolated to underscore the importance of maintaining a good working and learning environment for students and staff.⁴ The age and condition of the facility, including temperature, light, ambiance, and noise, have been found to be associated with student performance.⁴ Facility age and maintenance also affect student achievement.⁵⁵ One study compared students in the oldest and newest schools in a rural school district and found the students in the new building performing significantly better on reading and math tests, in addition to being in better health and having better attendance records.⁵⁶ One study of the effect of building quality on time spent learning revealed that over one-third of Virginia school districts had closed at least one school because of facility problems like extreme heat or extreme cold over the course of two years.⁵⁷ At the same time, school districts are moving towards year-round schooling to reduce overcrowding or the need for portable classrooms.⁵⁸ The districts that need to implement year-round schools are often the most resource-poor, but they would need to invest in climate control infrastructure for their schools in order to make them functional at all times of year, thereby, trading the problem of overcrowding for the problem of extreme indoor temperatures. Furthermore, inappropriate and/or insufficient space for classes is widespread and decreases the effectiveness of teaching.⁵⁷ Finally, facility-related problems, including allergies and injuries, caused students to be absent from school in 7% of Virginia districts.⁵⁷

Students are not the only ones affected by the quality of school facilities. Researchers have found that school facility quality has a larger effect on teacher satisfaction than complaints about salary and contributes to a teacher's decision to quit.⁵⁹⁶⁰

Investing in Labor

In addition to investing in students and staff, investing in physical infrastructure necessitates a major investment in labor to construct the infrastructure needed. Education policymakers' emphasis on labor may be because education and labor are often combined in the same legislative committee, as is the case in the US Congress. As noted in the earlier analysis of letters of support for the 21st Century High-Performing Public School Facilities Act, one-third of the letters came from labor associations who would stand to benefit economically from increased investments in school construction. However, the benefits of improved school facilities on labor have been discussed almost entirely in the political arena rather than the research literature. There are two possible explanations for this discrepancy: that the same legislative committee often addresses education and labor policy issues, and that the labor benefits associated with school facilities are not a primary motivation for building healthy schools. Regardless of the rationale, this component represents another way in which investing in school facilities leads to investment in human capital.

Education Adequacy and Education Excellence

Education policymakers define adequacy and excellence in terms of the quality of the “inputs” available at schools that lead to improved student achievement.

Education Adequacy—Adequacy can be defined in three ways: how inputs such as funding are used, the process for how facilities are used, and how outputs like student performance are improved.⁴² The distinction between adequacy and equity is blurred, because major inequities imply that there is also gross inadequacy.⁶¹ School finance adequacy cases offer two solutions to address inadequacy through resource infusion. One method, which requires fewer resources, raises schools to a higher standard as compared to their previous quality, but still keeps them below the top schools in the district or state. The other method requires additional resources to bring all schools on par with the top schools in the region.⁶¹

A Tennessee state report finds that there is a positive relationship between “the adequacy of a school facility,” or the condition of the classrooms and facilities, and academic achievement.⁴ They note that a possible mechanism of action explaining this relationship is that school facility problems, like overheating classrooms, decrease the amount of time spent teaching and learning, the most important variable for student performance.⁴ Overcrowded schools also have a significant effect on student achievement.⁴¹

Students of color and limited-English proficiency students are disproportionately likely to attend schools with concentrated poverty and overcrowding and/or deteriorating schools.⁶² This compounds adequacy problems with social justice and equity concerns. The American Civil Liberties Union identified this special impact on students of color and low-income students when they filed the *Williams v. State of California* case in 2000, discussed in further detail in the below tale of California schools.⁶³

Education Excellence—While policymakers have traditionally assumed that achieving minimum standards for school buildings would raise students to the point where their learning would be determined by the quality of the curriculum rather than the quality of physical environment, building quality continues to play a role in children’s learning at all grade levels.⁴ As a result, education policymakers work towards creating and maintaining excellent school environments to help improve student achievement. While education policy has primarily focused on maintaining minimum standards for school facilities, which have proved difficult enough to maintain, the introduction of the 21st Century High-Performing Public Schools Act signals that there is growing interest in educational excellence. The push for excellent facilities parallels the rise of standards-based reform policies that encourage academic excellence in the schools, just as the push for adequate facilities paralleled the educational equity movement.

A comprehensive study of all Wyoming public schools, carried out in the wake of increased interest in school finance adequacy lawsuits, found that school facilities do not impact student performance when controlling for other factors known to affect achievement, assuming that all children attend safe and healthy schools.⁶⁴ This study conflicts with the established research literature that school facility quality is associated with student performance, but agrees with anecdotal evidence like that stated by a parent advocate: “Transplanting an ineffective school from an old building to a new one is not going to change the quality of education. No one would be upset about school construction if students were already receiving a top-flight education.”⁶⁵ Perhaps this is because there is not a significant amount of variation in quality of school building in Wyoming: the study found only 7% of school facilities to be inadequate in Wyoming, and no correlation between the socioeconomic status of students and the school building quality was found.⁶⁴ This lack of

correlation implies that Wyoming is not necessarily generalizable to all fifty states, because other studies in other states¹⁸³⁴ have demonstrated an association between socioeconomic status and school facility quality. That said, this finding also implies that school facility adequacy, not excellence, is the appropriate tactic to take in the realm of education policy, because there are no additional student achievement gains to be made with excellent school facilities.

A Tale of California Schools—As with public health concerns about school health, education policies regarding innovation and excellence in school facilities are only beginning, and there is no standard procedure yet. Plaintiffs in the *Williams v. State of California* case argued, on behalf of California school children, that some school facility conditions are inadequate for quality education to take place, driving educational inequities.⁶²⁶⁶⁶⁷ Community members were engaged in the preparation and litigation of the suit and the subsequent monitoring of the settlement. The suit, filed by the American Civil Liberties Union (ACLU), describes the heating and air conditioning insufficiencies, pest infestations, and poorly functioning plumbing that deprives students of the educational opportunities they deserve.⁶⁷ *Williams*'s focus on resource allocation emphasized achieving adequacy for all and called for investments to address overcrowding and facility deterioration.⁶⁷ The *Williams* case called for all students to have the opportunity to learn the content material assessed by state standardized tests by ensuring access to textbooks, qualified teachers, and schools in good repair.⁶⁸⁶⁹ By focusing on improved facilities and resources as a way to achieve these opportunities to learn, the *Williams* case implied that investing in adequate infrastructure was critical for investing in students' human capital.

While focused on achieving adequacy for all, the *Williams* case inherently emphasized working towards equity in education (interestingly, it was filed in 2000, on the anniversary of the *Brown v. Board of Education* decision), and many civil rights groups united to support the ACLU.⁶²⁶⁹ The movement for educational equity has been centered in the judicial branch of government, rather than the legislative branch, beginning with *Brown v. Board of Ed.*, and *Williams* follows in this model. ACLU attorneys described their rationale for a lawsuit: legislators had been unresponsive to their concerns.⁶⁶

This example demonstrates how policy advocacy and legal wrangling can be more effective when community members integrate school facility adequacy and civil rights equity rationales.

Conclusion

Numerous disciplines have contributed to our understanding of the effects of school facilities on students and the surrounding communities, and numerous groups have advocated on behalf of improved school facility policies. In addition to the quality of the school itself, both schools located closer to Toxic Release Inventory facilities and schools with higher respiratory health risks perform worse academically (as measured by the school-level Academic Performance Index score), in a study of Los Angeles public schools.⁴⁷ This finding links environment, health, and education and underscores the importance of addressing all three.

Environmental planners, public health professionals, and education policymakers are the primary people working on school facility research and policy, and the three fields approach the problem from different disciplinary lenses. Environmental planners offer a local perspective that emphasizes environmental justice and a regional perspective that considers the interaction between the school and the greater neighborhood towards community development. Public health professionals study toxic exposures and work to understand the

effect of such exposures on vulnerable populations, including low-income children and children of color. Education policymakers consider how investments in school facilities translate into investments in human capital. Currently, the policy approach is divided by discipline, allowing each area to address school siting and school building policies from its particular area of expertise. These divisions mean that a number of government agencies may be involved in a particular project—or responsibility may be passed from one agency to another, with no one taking charge or having accountability. Our current regulatory system for school facility planning is almost non-existent and does not necessarily consider schools as requiring especial attention above and beyond other buildings that may not be serving particularly vulnerable populations like children. Future public policy could benefit from encouraging interdisciplinary policies and regulatory oversight of school facilities by understanding the common ground these three disciplines share.

Underlying each discipline's work is a commitment to first achieving adequate school environments and, secondly, promoting excellent facilities. On a basic level, education policymakers have been addressing issues of educational adequacy and educational excellence for decades in other contexts, and environmental planners and public health professionals have considered issues of environmental justice and community-level disparities for years. By focusing on establishing what an adequate school environment is, and how all schools can reach adequacy in an equitable manner, environmental planners, public health professionals, and education policymakers will be able to effectively bridge their different disciplines to develop a more cohesive strategy for school siting and school building policy. Policymakers first need to develop minimum standards for school facilities and sites using evidence from each of the three fields to comprehensively define what an adequate school environment looks like. Community engagement is key to developing these definitions, and implementing such school facility policies.

The case examples described in this paper highlight low-income communities and communities of color advocating for adequate school environments as a way to work towards equity and justice, in comparison to wealthier schools and communities that often serve as beacons of excellence. While the three different disciplines have different names for this phenomenon—environmental justice, vulnerable populations, and civil rights—these communities share the same goals. Unfortunately, these same communities are often limited in their political power due to a legacy of disadvantage and disenfranchisement. The Providence case studies of environmental planning reveal that the school district voluntarily engaged with residents of a wealthier neighborhood working towards an environmentally excellent school, and failed to consider community members' ideas and concerns regarding schools that were environmentally inadequate until mandated by a lawsuit settlement. This limitation makes it that much more important for school facility planning policies to emphasize meaningful community engagement in the research and policy decision-making process. The *Williams* lawsuit settlement led to increased community involvement in monitoring the quality of local schools in California. The settlement's website⁷⁰ offers resources and routes of action for community members who act as local watchdogs as a way to empower those most affected. In addition to engaging communities in the democratic process, the examples of community-based research in public health and community-driven legal strategies in environmental planning and education indicate that more rigorous research can be developed and more effective policies can be created.

However, regulations take time to develop and implement. As regulations requiring adequacy begin to be implemented, policymakers can begin to look towards creating inspirational models to encourage and challenge current conceptions of school facilities and instill the fundamental belief that exemplars are necessary for innovation. The LEED certification model of environmental excellence, and education policies that set both

minimum standards for teacher quality and optional standards to recognize excellence, are examples of excellence movements in both environmental planning and education policy. By combining tactics from the fields of environmental planning, public health, and education policy, and aligning them to tackle issues of adequacy and excellence, we can more effectively address issues surrounding school siting and school facilities.

Acknowledgments

This publication was made possible by grant number 5 P42 ES013660-02 from the Superfund Research Program of the National Institute of Environmental Health Sciences, NIH. Thanks to Laura Snyder, Phil Brown, and Laura Senier of Brown University for guidance and feedback throughout the development of this article, as well as anonymous reviewers.

References

1. Jones, Sherry Everett; Axelrad, Robert; Wattigney, Wendy A. Healthy and safe school environment, part II, physical school environment: results from the School Health Policies and Programs Study 2006. *Journal of School Health*. 2007; 77:544–556. [PubMed: 17908107]
2. Frumkin, Howard. Introduction. In: Frumkin, Howard; Geller, Robert J.; Leslie Rubin, I.; Nodvin, Janice, editors. *Safe and Health School Environments*. New York: Oxford University Press; 2006. p. 2-9.
3. Jones, Sherry Everett; Brener, Nancy D.; McManus, Tim. Prevalence of School Policies, Programs, and Facilities That Promote a Healthy Physical School Environment. *American Journal of Public Health*. 2003; 93:1570–1575. [PubMed: 12948982]
4. Young, E., et al. [accessed Sept. 7, 2008] Do K-12 School Facilities Affect Education Outcomes? Staff Information Report. Tennessee State Advisory Commission on Intergovernmental Relations. 2003. http://www.state.tn.us/tacir/PDF_FILES/Education/SchFac.pdf
5. Committee on Education and Labor. 21st Century High-Performing Public Schools Facilities Act, HR 3021 | Committee on Education and Labor; June 2008; US House of Representatives; <http://edlabor.house.gov/issues/schoolfacilitiesact.shtml>
6. Vincent, Jeffrey M. Public Schools as Public Infrastructure: Roles for Planning Researchers. *Journal of Planning Education and Research*. 2006; 25:433–437.
7. Lejano, Raul P.; Piazza, Bill; Houston, Douglas. Rationality as social justice and the spatial-distributional analysis of risk. *Environment and Planning C: Government and Policy*. 2002; 20:871–888.
8. Violich, Francis. The City Planning Process: A Framework for Community Education. *Annals of the American Academy of Political and Social Science*. 1955; 302:8–16.
9. People of Color Environmental Leadership Summit. [accessed Nov. 25, 2008] Principles of Environmental Justice. Oct 27. 1991 <http://www.ejnet.org/ej/principles.html>
10. Schweizer, Errol. [accessed Nov. 25, 2008] Environmental Justice: An Interview with Robert Bullard. *Earth First!*. Jul. 1999 <http://www.ejnet.org/ej/bullard.html>
11. Environmental Protection Agency. Frequently Asked Questions- Environmental Justice. US EPA Compliance and Enforcement; Oct 21. 2008 <http://www.epa.gov/compliance/resources/faqs/ej/index.html>
12. Greenberg M, et al. Brownfield redevelopment as a smart growth option in the United States. *Environmentalist*. 2001; 21(2):129–143.
13. Sack, Joetta L. [accessed Sept. 14, 2008] Scarcity of Property Is Growing Obstacle to Building Schools. *Education Week*. Mar 24. 2004 <http://www.edweek.org/ew/articles/2004/03/24/28land.h23.html>
14. Litt, Jill S.; Burke, Thomas A. Uncovering the Historic Environmental Hazards of Urban Brownfields. *Journal of Urban Health*. 2002; 79(4):464–481. [PubMed: 12468667]
15. Ellerbusch, Fred; Mack, James; Shim, Jeong Seop. Using the Triad Approach to Expedite the Acquisition of an Abbot District School Site. *Remediation*. Spring;2004 :85–105.

16. Child Proofing Our Communities Campaign. Building Safe Schools: Invisible Threats, Visible Actions. Center for Health, Environment, and Justice; Dec. 2005
17. Stretesky, Paul B.; Lynch, Michael J. Environmental Hazards and School Segregation in Hillsborough County, Florida, 1987–1999. *The Sociological Quarterly*. 2002; 43(4):553–573.
18. Pastor, Manuel; Sadd, James L.; Morello-Frosch, Rachel. Who’s Minding the Kids? Pollution, Public Schools, and Environmental Justice in Los Angeles. *Social Science Quarterly*. 2002; 83(1): 263–280.
19. Greenberg, Michael. Should Housing Be Built on Former Brownfield Sites? *American Journal of Public Health*. 2002; 92(5):703–705. [PubMed: 11988428]
20. Baum, Howell S. Smart Growth and School Reform: What if We Talked about Race and Took Community Seriously? *Journal of the American Planning Association*. 2004; 70(1):14–26.
21. Massey, Doug S.; Denton, Nancy A. *American apartheid: Segregation and the making of the underclass*. Cambridge, MA: Harvard University Press; 1993.
22. Crumbling DM, et al. Managing Uncertainty in Environmental Decisions: Applying the concept of effective data to contaminated sites could reduce costs and improve cleanups. *Environmental Science and Technology*. 2001; 35(19):404A–409A.
23. Crumbling, Deana M. “Summary of the Triad approach,” white paper. Washington DC: US EPA, Office of Superfund Remediation and Technology Innovation; Mar 25. 2004 (available online at: www.triadcentral.org/ref/doc/triadsummary.pdf)
24. Greenberg, Michael; Jane Lewis, M. Brownfields Redevelopment, Preferences and Public Involvement: A Case Study of an Ethnically Mixed Neighborhood. *Urban Studies*. 2000; 37(13): 2501–2514.
25. Gowri, Krishnan. Green Building Rating Systems: An Overview. *American Society of Heating, Refrigerating and Air-Conditioning Engineers*. 2004; 46(11):56–60.
26. Christopher Wedding G, Crawford-Brown Douglas. Measuring site-level success in brownfield redevelopment: A focus on sustainability and green building. *Journal of Environmental Management*. 2007; 85(2):483–495. [PubMed: 17240521]
27. Katz, Ashley. US Green Building Council; Aug 27. 2008 News release: Schools Rapidly Turning Green Across America: Smart new Designs Boost Learning, Cut School Energy Bills and Provide Better Indoor Environments for Students and Teachers. http://www.usgbc.org/Docs/News/Green%20Schools%20Press%20Release_082708.pdf
28. United States Green Building Council. [accessed Oct. 2, 2008] Press release: USGBC Launches Nationwide Green Schools Effort: “Fifty for Fifty” Initiative to Engage State Legislators in Every State to Develop Green Schools Caucuses. Sep 4. 2008 <http://www.usgbc.org/News/PressReleaseDetails.aspx?ID=3811>
29. Jatczak, Patricia. School Facilities: High Performance School Buildings Program. Washington Office of Superintendent of Public Instruction; 2008. <http://www.k12.wa.us/SchFacilities/HighPerformanceSchoolBuildings.aspx>
30. Washington Sustainable Schools Protocol Committee. [accessed Oct. 2, 2008] Washington Sustainable Schools Protocol: Criteria for High Performance Schools. Jan 15. 2006 <http://www.k12.wa.us/SchFacilities/pubdocs/HighPerformanceSchools/WSSPFinalDraft2006.pdf>
31. Fischbach, Steven. Schools on Toxic Sites: An Environmental Injustice for School Children. *Human Rights Magazine*. 2005; 32(4):14–15.
32. Providence Plan. [accessed Oct. 14, 2008] Hartford. Mar 21. 2007 http://204.17.79.244/profiles/hfd_main.html
33. Lord, Peter B. New school on polluted site energizes environmental coalition. *Providence Journal*. May 15.2008
34. Senier, Laura. Public Schools and Contaminated Land in Rhode Island: Using Superfund Basic Research Program Research Translation and Community Outreach to Foster Research and Advocacy. Superfund Basic Research Program Wetterhan Award presentation; 1 Dec. 2008;
35. Providence Plan. [accessed Oct. 9, 2008] Maps and Rankings: Economics. May 24. 2005 http://204.17.79.244/profiles/cw_mrecon.html
36. Borg, Linda. ‘New’ Nathan Bishop aims to bring public back to public schools. *Providence Journal*. Oct 3.2008

37. Borg, Linda. At Gregorian, a sense of anticipation. Providence Journal. Aug 26.2008
38. van Zuylen-Wood, Simon. Ceremony marks new life for Nathan Bishop. Brown Daily Herald. Oct 7.2008
39. Morello-Frosch, Rachel; Pastor, Manuel; Sadd, James. Integrating Environmental Justice and the Precautionary Principle in Research and Policy Making: the Case of Ambient Air Toxics Exposures and Health Risks among Schoolchildren in Los Angeles. *The Annals of the American Academy of Political and Social Science*. 2002; 584:47–68.
40. Bullard, RD., et al. [accessed Nov. 23, 2008] Toxic Wastes and Race at Twenty, 1987–2007: Grassroots Struggle to Dismantle Environmental Racism. United Church of Christ report. 2007. www.ejrc.cau.edu/TWART-light.pdf
41. Axelrad, Robert. Indoor Air Quality. In: Frumkin, Howard; Geller, Robert J.; Leslie Rubin, I.; Nodvin, Janice, editors. *Safe and Health School Environments*. New York: Oxford University Press; 2006. p. 2-9.
42. Ortiz, Flora Ida. Essential Learning Conditions for California Youth: Educational Facilities. *Teachers College Record*. 2004; 106(10):2015–2031.
43. Heath, GA.; Mendell, Mark J. Do Indoor Environments in Schools Influence Student Performance? A Review of the Literature. *Indoor Air Conference Proceedings*; 2002.
44. Schneider, Mark. [accessed 25 Nov. 2008] Facilities and Teaching: Teachers in Chicago and Washington DC Assess How Well School Buildings Support Teaching. 21st Century School Fund: Building Educational Success Together initiative. 2002. http://www.21csf.org/csf-home/documents/Teacher_Survey/SCHOOL_FACS_AND_TEACHING.pdf
45. Alarcon, Walter A. Acute Illnesses Associated with Pesticide Exposure at Schools. *Journal of the American Medical Association*. 2005; 294:455–465. [PubMed: 16046652]
46. Green RS, et al. Proximity of California Public Schools to Busy Roads. *Environmental Health Perspectives*. 2004; 112:61–66. [PubMed: 14698932]
47. Pastor, Manuel; Sadd, James L.; Morello-Frosch, Rachel. Reading, writing, and toxics: children's health, academic performance, and environmental justice in Los Angeles. *Environment and Planning C: Government and Policy*. 2004; 22:271–290.
48. Anderson, Susan. The School That Wasn't: Politics and Pollution in LA. *The Nation*. Jun 5.2000 : 32–36.
49. Horowitz, Joy. *Parts Per Million: The Poisoning of Beverly Hills High School*. New York: Penguin Group, Inc; 2007.
50. Hanushek, Eric A. Assessing the Effects of School Resources on Student Performance: An Update. *Educational Evaluation and Policy Analysis*. 1997; 19(2):141–164.
51. Wayne, Andrew; Youngs, Peter. Teacher Characteristics and Student Achievement Gains: A Review. *Review of Educational Research*. 2003; 73(1):89–122.
52. Wossmann, Ludger. Specifying Human Capital. *Journal of Economic Surveys*. 2003; 17(3):239–270.
53. O'Neill, June. The Role of Human Capital in Earnings Differences Between Black and White Men. *Journal of Economic Perspectives*. 1990; 4(4):25–45.
54. Greenwald, Rob; Hedges, Larry V.; Laine, Richard D. The Effect of School Resources on Student Achievement. *Review of Educational Research*. 1996; 66(3):361–396.
55. Lemasters, Linda Kay. PhD Dissertation. 1997. A Synthesis of Studies Pertaining to Facilities, Student Achievement, and Student Behavior.
56. Howard Bowers, J.; Burkett, Charles W. Relationship of Student Achievement and Characteristics in Two Selected School Facility Environmental Settings. Annual International Conference of the Council of Education Facility Planners, paper presentation; Oct. 1987;
57. Duke, Daniel L.; Griesdom, Jacqueline. Where Our Children Learn Matters: A Report on the Virginia School Facilities Impact Study. Charlottesville, VA: University of Virginia; 1998.
58. Orellana, Marjorie Faulstich; Thorne, Barrie. Year-Round Schools and the Politics of Time. *Anthropology and Education Quarterly*. 1998; 29(4):446–472.
59. Buckley, Jack; Schneider, Mark; Shang, Yi. Fix It and They Might Stay: School Facility Quality and Teacher Retention in Washington, D.C. *Teachers College Record*. 2005; 107(5):1107–1123.

60. Loeb, Susanna; Darling-Hammond, Linda; Luczak, John. How Teaching Conditions Predict Teacher Turnover in California Schools. *Peabody Journal of Education*. 2005; 80(3):44–70.
61. Briffault, Richard. Adding Adequacy to Equity. In: West, Martin R.; Peterson, Paul E., editors. *School Money Trials: The Legal Pursuit of Educational Adequacy*. Washington, DC: The Brookings Institution; 2007. p. 25-54.
62. Oakes, Jeannie. Investigating the Claims in *Williams v. State of California*: An Unconstitutional Denial of Education's Basic Tools? *Teachers College Record*. 2004; 106(10):1889–1906.
63. American Civil Liberties Union—Northern California. [accessed on 25 Nov. 2008] ACLU of Northern California: *Williams v State of California*. Mar 23. 2005 http://www.aclunc.org/cases/closed_cases/williams_v_state_of_california.shtml
64. Picus LO, et al. Understanding the Relationship Between Student Achievement and the Quality of Educational Facilities: Evidence from Wyoming. *Peabody Journal of Education*. 2005; 80(3):71–95.
65. Hu, Winnie. *New York Times*. Sep 9. 2008 Despite Tight Economy, New Jersey Presses On With School Projects; p. B4
66. Asimov, Nanette. *San Francisco Chronicle*. Aug 11. 2004 Landmark deal reached for state's poor schools: 1 million low-income students to get equal access to good facilities and textbooks.
67. Timar, Thomas. Exploring the Limits of Entitlement: *Williams v. State of California*. *Peabody Journal of Education*. 2005; 80(3):126–153.
68. American Civil Liberties Union—Southern California. *Williams v California: The Statewide Impact of Two Years of Implementation*. ACLU Foundation of Southern California and Public Advocates, Inc; Aug. 2007 <http://www.decentschools.org/settlement/WilliamsReportWeb2007.pdf>
69. Oakes, Jeannie; Rogers, John; Lipton, Martin. *Learning Power: Organizing for Education and Justice*. New York, NY: Teachers College Press; 2006.
70. Morrison and Foerster, LLP. [accessed 5 Jan. 2009] Decent Schools for California. 2008. www.decentschools.org
71. Providence Preservation Society. [accessed Oct. 9, 2008] PPS Announces 2007 Most Endangered Properties List. 2008. <http://www.ppsri.org/?section=advocacy&page=20&submenu=Most%20Endangered%20Properties%20List>