

Addressing Health Equity through Design: A Case Study

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While an interest in healthy building has been steadily increasing, COVID-19 has elevated health equity as a priority across architecture, engineering and construction initiatives, as evidenced by the recently launched WELL Health Equity Initiative and the LEED Safety First: Social Equity in Pandemic Planning Credit. This paper outlines preliminary findings from an exploratory case study on how a hybrid elementary school/YMCA can support health equity through design and affiliated programming. Supported by the Robert Wood Johnson Foundation’s Interdisciplinary Research Leaders Program, the research focuses on exploring how the uniquely designed environment of an elementary school impacts the physical, mental, and emotional health of students, staff, and the greater Southeast Raleigh community. The case school was designed through a highly participatory approach, engaging a health equity lens early in the process to address the needs and wants of an often-overlooked community. This paper outlines findings from initial surveys that aimed to better understand not only the effectiveness of healthy design strategies, but also how the design of this unique environment has impacted aspects of equity in the context of physical and mental health. Opportunities for increasing health equity through built environment design will be outlined and recommendations will be provided to expand future research in this discipline.

SECTION 1. INTRODUCTION

The COVID-19 pandemic brought to light deeply ingrained systemic health inequities as the virus disproportionately affected racial and ethnic minorities, people with disabilities, and other marginalized groups at alarming rates. While an interest in healthy building has been on the uptick, COVID-19 has quickly elevated health equity as a priority across the architecture profession. This paper outlines preliminary findings from an exploratory case study seeking to unpack design and health equity in an under-resourced community in Raleigh, North Carolina. This research contains a critical health equity lens; the primary case study building was designed through a highly participatory process, seeking to address the needs, rights, and wants of a community that is often overlooked in design initiatives. This

paper outlines preliminary findings from survey research that explores the effectiveness of healthy design strategies with a specific focus on physical and mental health outcomes. The paper concludes with a discussion on the connection between the findings and health equity and recommendations for future opportunities to address health equity through design.

SECTION 2. BACKGROUND

Health equity is a broad and complex topic, requiring wide reaching expertise across disciplines to ensure that everyone has a fair and just opportunity to be as healthy as possible.¹ Recently, design standards such as WELL Building and Fitwel have introduced connections between the built environment and public health. While such initiatives have brought to light the significant role buildings can play in advancing public health, the evidence base for supporting linkages between design and health equity remains relatively nascent.² This study explores health equity using the Social Determinants of Health (SDOH) as a guiding framework to understand how conditions in the environment affect health, functioning, and quality-of-life outcomes and risks.³

The need for further research on health equity and design spans across all types of places including those where we live, work, play, worship and learn. As highly impactful building types for children, this research prioritizes the exploration of schools through the joint lenses of design and public health. There are a multitude of factors that impact physical, mental, and emotional wellbeing, including exposure to school programming and the associated designed environments. For example, lighting strategies have been shown to increase mood and positively impact mental health,⁴ outdoor recreational spaces and playgrounds have the potential to increase physical activity,⁵ and views to nature and biophilic elements have been proven to improve mental and emotional wellbeing.⁶ Such findings become more resonant given the significant amount of time children spend in school. In North Carolina, students spend 6.75 hours/day in school for 180 days/year.⁷ And yet, when it comes to the built environment and surrounding site, only 28% of new or renovated schools are incorporating aspects of green design and only 14% of districts consider the ability for students to walk or bike to school as “very influential” during the selection of future school sites.⁸ While data on schools and health is still emerging, it is

likely that health disparities hit public and lower funded schools hardest, both of which trend toward having more racially and ethnically diverse populations of students, teachers and staff.⁹ To facilitate change, more research is needed to identify design guidelines and inform policies focused on increasing levels of health in vulnerable communities through built environments and services already present and/or planned. This research introduces a first step in exploring how the design of the built environment can positively and holistically impact the physical and mental health of students, faculty, staff and the greater Southeast Raleigh community.

SECTION 3. STUDY DESIGN

The research project is a 3-year study funded by the Robert Wood Johnson Interdisciplinary Research Leaders Program to explore connections between design of the built environment and physical and mental health. Following a comparative case study framework, this study uses mixed methods to address the research question: How does the unique designed environment of the hybrid YMCA/elementary school impact the physical and mental health of students, staff, and the greater Southeast Raleigh community? Yin states that a case study is “an empirical inquiry that investigates a contemporary phenomenon within its real-life context” focusing on questions framed in How and Why.¹⁰ With the goal of exploring how the joint YMCA and elementary school can best support communities to increase community health development, the case study approach uses primary qualitative and quantitative data. Creswell identifies this approach as “a type of mixed methods study in which quantitative and qualitative data collection, results, and integration are used to provide in-depth evidence for a case.”¹¹ Creswell also notes that the most popular strategy is a convergent design,¹² which allows both types of data to contribute to building a “more nuanced and complete understanding” of the case.¹³

CASE SELECTION

The purposeful case selected for this study is a hybrid elementary school and YMCA located in Southeast Raleigh, North Carolina. The co-location of a Wake County Public School and YMCA is an innovative concept for the school system, the 14th largest in the country, which warrants further investigation as to how the wellbeing of students, staff, YMCA members, and nearby residents can be positively impacted by the built environment in a rapidly growing community. Having just opened its doors in August 2019, and given the continued issue of the COVID-19 pandemic, the facility is in the process of not only welcoming its first cohorts of students, but also growing YMCA membership and establishing robust afterschool and summer programs. The surrounding census tracts that are served by the facility are 90% non-White, with 56% of households having an income less than \$40,000/yr, and only 21% of adults being college educated. Southeast Raleigh is also an area identified by the local John Rex Endowment’s report *Mapping Social Determinants of Health for Children and Families in Wake County* as a place having “high opportunity for positive change.”¹⁴ The elementary school was

uniquely designed through a highly participatory process in collaboration with the project architect; school administrators; a quarterback organization serving as an advocate for community members living in Southeast Raleigh; leaders from the YMCA of the Triangle; and the Wake County Public School System (WCPSS). As WCPSS includes students from a wide breadth of Southeast Raleigh, the results from this research can be transferable to other systems with similar conditions and context. To better understand opportunities within the hybrid location, a matched elementary school within the same Southeast Raleigh community was selected. This additional case serves as a standard school design case for comparison to strengthen external validity and generalizability of the findings.¹⁵

DATA COLLECTION

Data collection methods for the larger, overarching study include surveys, interviews, community canvassing, focus groups, and site observations. This paper focuses on surveys across the case school and the nearby matched school that were completed in spring and summer of 2021. Electronic surveys were distributed to the staff, faculty, and administrators at both schools to gauge occupant experiences of the built environment in relation to their physical, mental, and emotional health. The survey instrument used the SDOH as a framework and asked a mix of open-ended and closed Likert scale questions. Surveys were distributed by email through each school’s administration. All surveys were taken anonymously without the requirement to participate and all methods and measures were approved by the university Institutional Review Board (IRB). At the completion of the survey, participants were given the option to provide their email to enter a drawing for one of six gift cards per school.

SECTION 4. RESULTS AND ANALYSIS

PARTICIPANT DEMOGRAPHICS

Given the context of COVID-19, the survey was framed for responses from teachers and staff, eliminating the need to directly interact with students or further burden parents and caregivers. It was assumed that the teachers answering the survey were well-connected with their students and, by proxy, the families of the students, and would be able to answer with a certain amount of expertise and certainty on behalf of the students and families. A total of 48 surveys were received: 29 from the case school and 19 from the matched school. For the case school, 44% of the responses were between the ages of 26-35, with 28% between 46-55 and 16% between 36-45. The matched school was nearly a flip of the results from the target school with 42% respondents between the ages of 46-55, and 21% in both age brackets of 26-35 and 36-45. For both schools, the majority of the responses were overwhelmingly women with 88% of the case school identifying as a woman, and 95% identifying as a woman in the matched school. Sixty percent of the respondents from the target school identified as Black or African American, with 28% identifying as White and 12% as Hispanic or Latinx. The percentages at the matched school were 43% Black or African

My school actively prioritizes the students'...

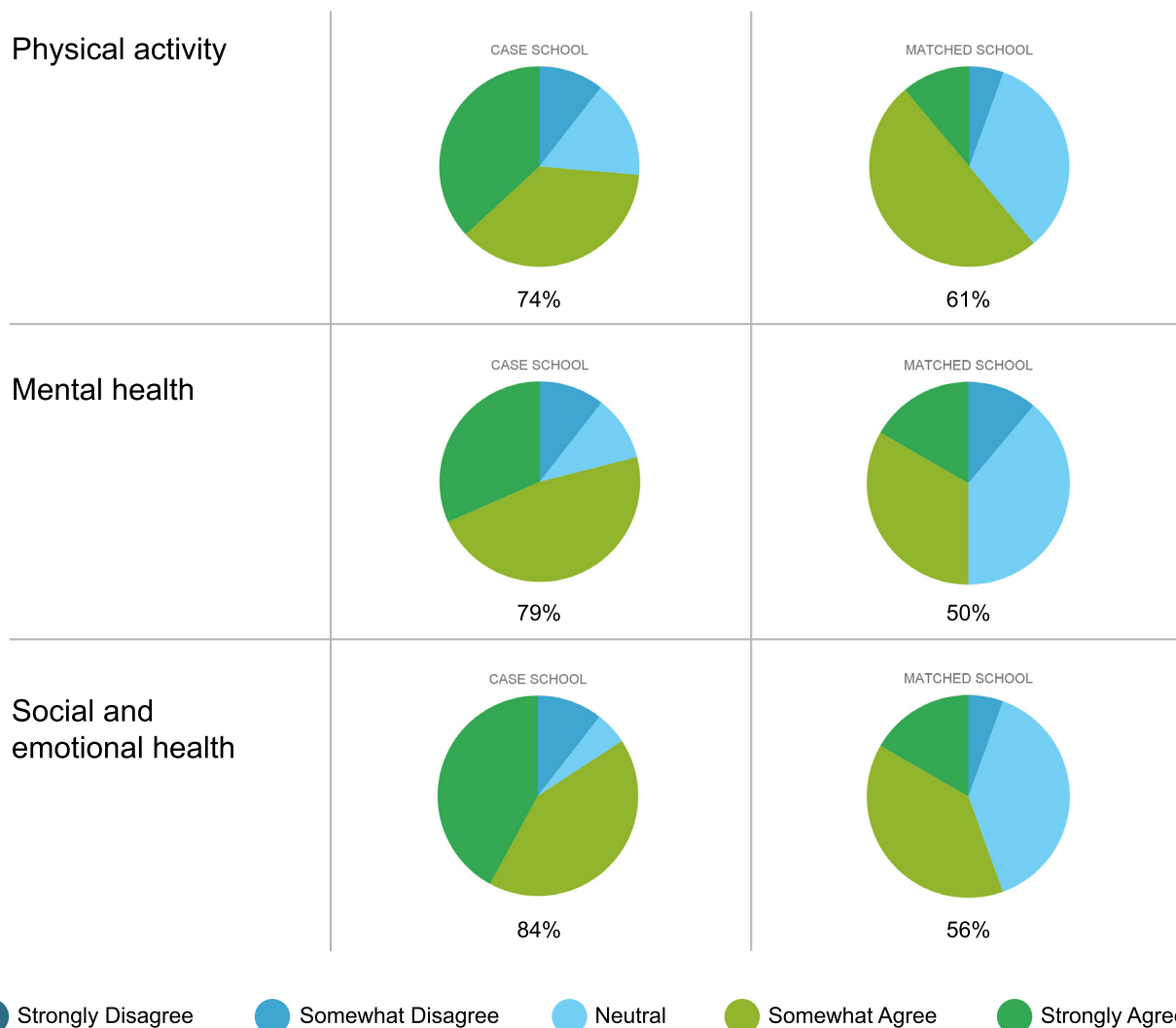


Figure 1. Findings on the impact of design on physical, mental, and emotional health for the case and matched schools.

American, 24% White, 8% preferred not to say, and 4% identified with both American Indian or Alaska Native and mixed race. Findings from this study aim to explore possible connections between health equity and design for future research and cannot be generalized broadly at this time. Note that not all participants responded to all demographic questions.

PHYSICAL AND MENTAL HEALTH

Based on a preliminary analysis of the surveys collected, emergent themes arose on issues related to physical and mental health. The *Health Care Access and Quality* category of SDOH was distilled for this survey into components of physical and mental health for the staff and students. While the SDOH category speaks to issues like access to primary care providers and screenings, it also addresses interventions for special services for children, and support across physical, mental, and emotional

health. When asked if their school prioritizes physical activity in support of physical health (Figure 1), the case school responses of those that somewhat or strongly agreed had an absolute difference of 13% (74% to 61%). When asked about prioritizing physical health, responses were slightly closer with an absolute difference of only 7% (74% case school to 67% matched school). These physical supports are often prescribed and built into the school days, including physical education classes and recess. When asked about prioritizing mental health and social/emotional health, the absolute difference of those that somewhat or strongly agreed was larger at 29% and 28%, respectively, with the higher percentages at the case school. The views on actively supporting a healthy diet and nutrition are similar, with an absolute difference of 28% in favor of the case school (63% to 35%). The results from the survey indicate that the faculty and staff from the case school perceive a bigger emphasis on mental

I believe my school is appreciated by...

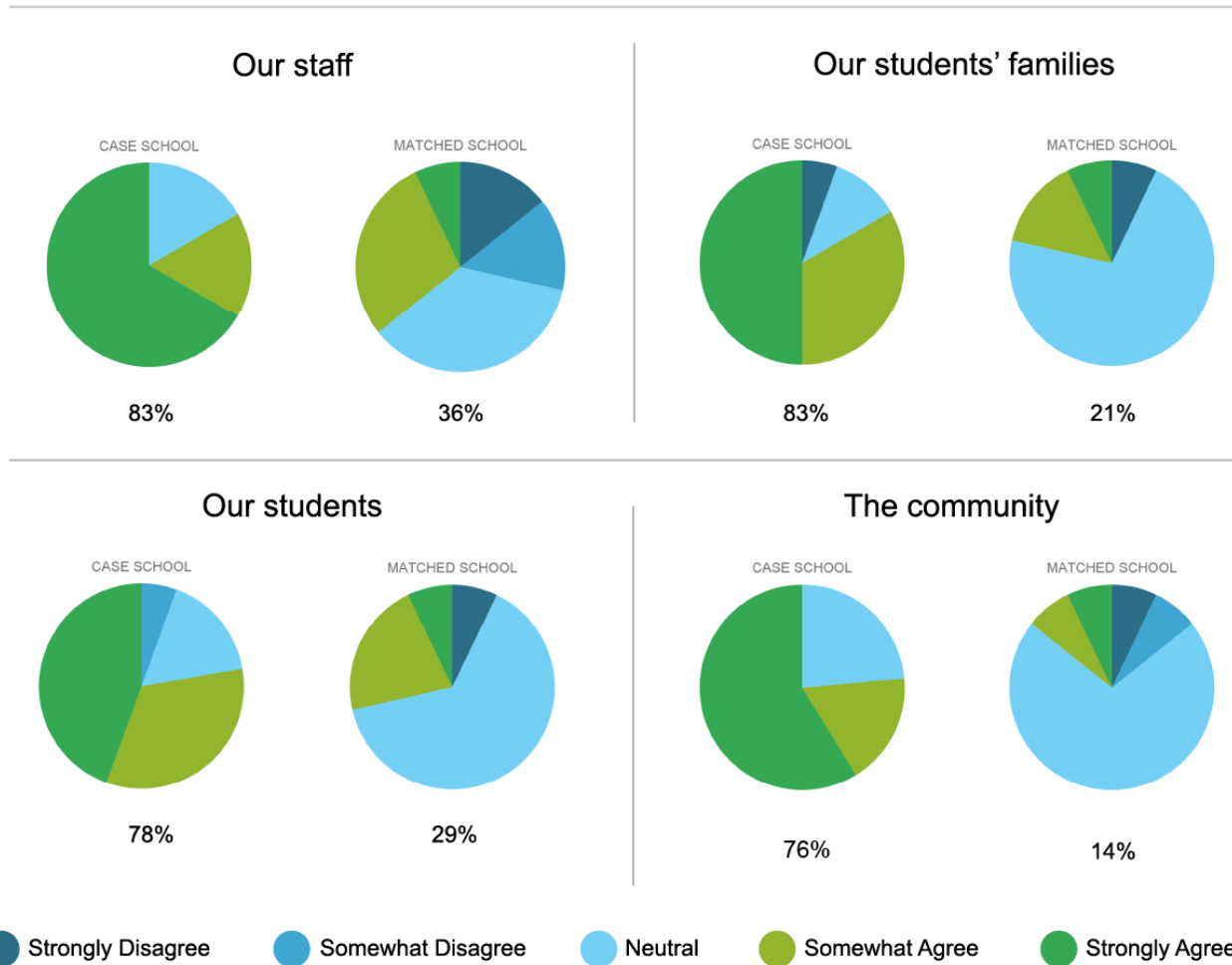


Figure 2. Findings on the levels of appreciation from faculty and staff for the design of the case and matched schools.

health, social/ emotional health, and healthy diet and nutrition than the matched school. When asked if they agreed that their school actively promotes the importance of student counseling, psychological services, and social services, the responses were much more comparable between schools. The percentage of the matched school was actually higher in two of the categories: counseling (79% case school v 89% matched school) and psychological services (58% case school v 67% matched school). The responses for social services were nearly equal at 74% case school v 72% at the matched school. The closeness in scores are likely due to the overarching school system approach and standardization of these types of services across the county school system.

In an open field question about how participants felt their school supports physical and mental health, respondents from both schools mentioned counselors and interventions, but the case school participants offered a wider range of opportunities for

health support and regulation. Many examples reflected design choices in the built environment, such as zones of regulation for emotional outbursts, as well as programmatic offerings that are facilitated by the unique environment, including cooking nights at their community kitchen.

Directly inquiring about how the designs of the schools are interpreted by the faculty and staff, the case school was perceived to notably outperform the matched school in terms of the design being appreciated by the staff (47% absolute difference), students (49% absolute difference), families (62% absolute difference), and community (62% absolute difference) (Figure 2).

To address impacts as a product of the physical design, participants were also asked if they felt that the design had a positive impact on students, staff, and the community. Again, the case school was perceived to outperform the matched school significantly; there was a 46% absolute difference in the responses

indicating a positive impact on students, 42% absolute difference relating to the impacts on staff, and a 68% absolute difference around the impact on the community.

As another way to address supporting mental health, the survey asked if participants felt that the design of the school and grounds made students, families, and staff feel valued. Once again, the case school was seen to outperform the matched school. The difference in the perceived impact on students was less, however, with an absolute difference between the perception of impact being 29%. Families and staff differences were similar to previous questions with absolute differences of 50% addressing both categories.

The survey asked about the amenities at the site particular to the case school, including the community garden, community kitchen, indoor walking track, outdoor walking trail, and meditation circle. Participants were asked if they felt that these design elements positively impacted their mental and physical health. Nearly 50% of participants said that they felt like the community garden and indoor walking track positively impacted their physical and mental health; 60% said that their physical and mental health were positively impacted by the outdoor walking trail. The community kitchen was felt to impact the two types of health less, with 37% of participants indicating that the kitchen positively impacted their physical health and only 7% felt that it positively impacted their mental health. The positive impact was felt to be even less for the meditation circle with no one indicating that the circle helped their physical health, and 7% felt it positively impacted their mental health.

Participants were also asked how they felt design elements impacted the physical and mental health of their students, addressing the community garden, collaboration areas, community kitchen, outdoor walking trail, meditation circle, outdoor play areas, and swimming pool. Over half of the participants felt that student physical health was positively supported by the community garden (60%), outdoor play areas (67%), and the swimming pool (53%). For physical health, the outdoor walking trail was perceived by slightly less than half (47%) to be impactful. From the perception of the participants, community kitchen (27%), collaboration areas (13%), and the meditation circle (0) were even less effective at positively impacting students' physical health.

In terms of students' mental health, the same design elements were assessed. The community garden and outdoor play areas were seen to be the most impactful on students' mental health at 60%, while collaboration areas (53%), the outdoor walking trail (40%), and the swimming pool (40%) were felt to be the next most effective. The meditation circle was very low as a perceived benefit to student's mental health (7%), and no participant indicated that the community kitchen was helpful.

Given the context of COVID-19 and the amount of time spent remote in the months immediately before the survey was

distributed, participants were asked what design strategies they were most looking forward to using upon reentry. Eighty-seven percent of the participants indicated that they were looking forward to using the community garden, while the indoor walking track and outdoor walking trail were selected by 67% of participants. The community kitchen was an anticipated benefit by 53%, while 40% were interested in the meditation circle. Other design elements mentioned in an open field option included the swimming pool, outdoor instructional spaces, the food pantry for students, and HR Accommodations to work remotely.

When given an open-ended question about how the design of the facility and programs are felt to contribute to the health of faculty, staff, and students, participants provided a number of options. One noted that the chapel (meditation garden) was still under construction, but hoped it would be used and beneficial. Another noted that providing an academic environment with an accessible exercise area and healthy living support was contributing to overall levels of health. A strong sense of pride was felt to contribute to overall health, as did taking care of children as a whole. One participant also mentioned that the community is not aware of the gem they have available.

SECTION 4. NEIGHBORHOOD AND BUILT ENVIRONMENT

The planned and built environment of local communities have an incredible impact on individual and community health.¹⁶ Factors such as violence, air and water quality, and other health and safety risks can be mitigated through intentional design. A series of questions were posed to explore perspectives on the impact of the indoor and outdoor environments on physical, mental, and emotional health.

In the interior of the building, participants were asked about issues such as access to clean air, natural elements, natural daylight, quiet spaces, spaces that promote physical activity, spaces that promote mental health and wellness, quality lighting, pleasant view, and pleasant colors. The case school percentages of agree/ strongly agree were around 30% higher than those from the matched school in the areas of natural elements, natural daylight, pleasant views, and pleasant colors (Figure 3). The percentages of agree/ strongly agree were around 20% higher than the matched school for the categories of spaces that promote physical activity, spaces that promote mental health and wellness, and quality lighting. The difference in the responses for the quiet spaces was smaller, with the case school only showing a 5% absolute difference above the matched school. The only category in which the matched school showed higher percentages of satisfaction than the case was pertaining to clean air, showing agreement at 7% absolute difference higher than the case school. This is likely because the case school does not have operable windows while the matched school, being built under a time of different construction policy, does have operable windows. Given the emphasis of fresh air since the emergence of COVID-19, operable windows have gained much greater importance.

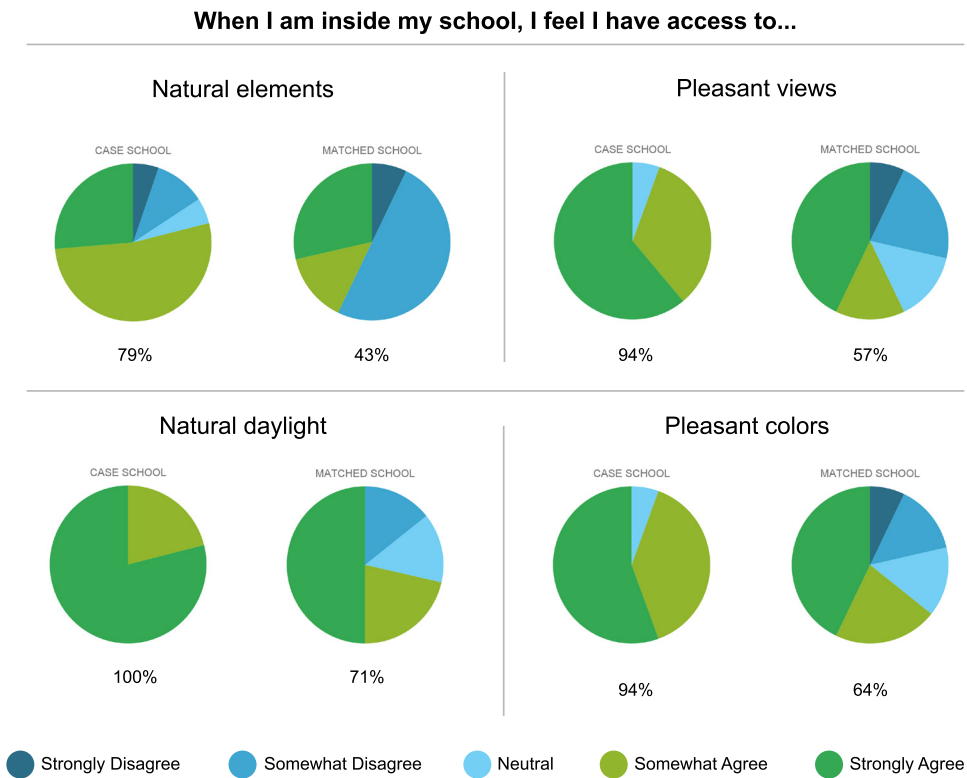


Figure 3. Findings on experiences of the interior built environment and programming for the case and matched schools.

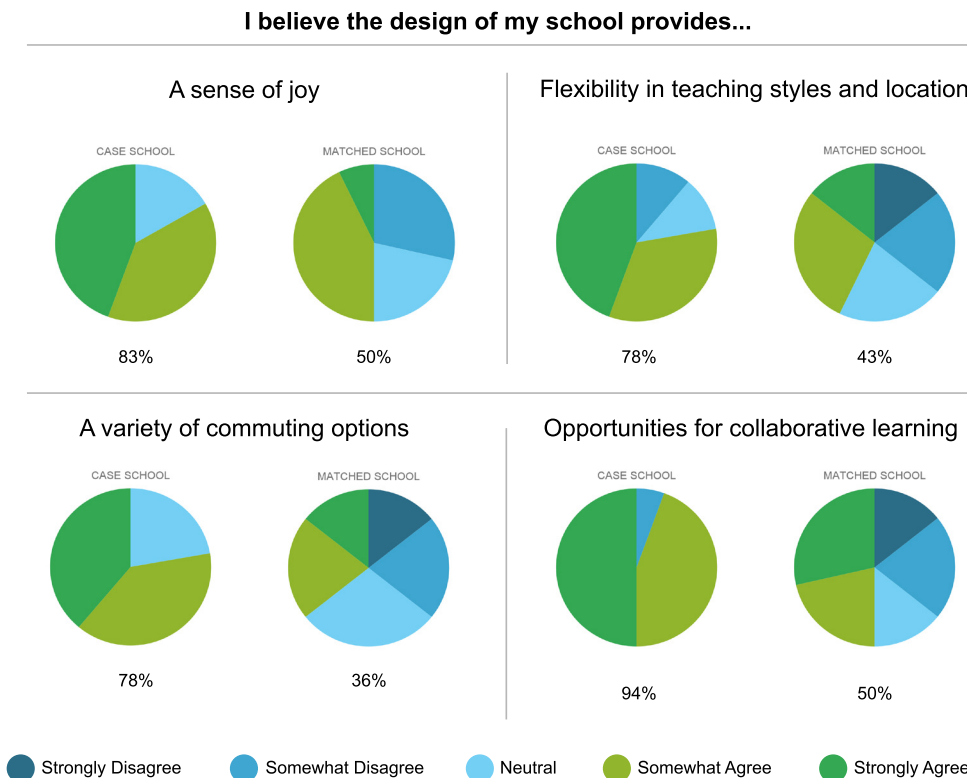


Figure 4. Findings on the impact of design on mental and emotional health for the case and matched schools.

A question was posed focusing on some of the ways in which mental and emotional health can be operationalized. These elements included a sense of safety, a sense of joy, a variety of commuting options, equal access for students with disabilities, a sense of pride, easy access to outdoors, flexibility in teaching style and locations, and options for collaborative learning. Again, the case school outperformed the matched school in the perception of most of these considerations with the exception of equal access to students with disabilities (67% satisfaction in the case school with 79% in the matched school). The case school outperformed the matched school by nearly 30% in the categories of perceived sense of joy, variety of commuting options, flexibility in teaching styles and locations, and opportunities for collaborative learning (Figure 4). Smaller absolute differences of satisfaction were seen in the considerations of a sense of safety (8%), a sense of pride (19%), and easy access to the outdoors (8%).

A series of questions also asked whether the participants perceived that the facilities available support physical activity, social interaction, mental health, healthy eating, and healthy lifestyles. The case school outperformed the matched school in all considerations, with the strongest absolute difference in agreement being around the support of healthy eating (base school 84% and matched school 43%). The absolute difference in agreement across other categories were at most 21% around supporting social interaction, 19% in introducing healthy lifestyles, 14% in promoting physical activity, and 10% in promoting mental health. However, the case school was uniformly perceived to provide more support for each of these elements.

SECTION 5. CONCLUSION AND RECOMMENDATIONS

Given that racial and ethnic minority groups experience higher rates of illness across a variety of health conditions,¹⁷ the topic of health and schools, particularly in under-resourced communities, becomes an issue of equity. Findings from this research reveal that the design of the built environment has a significant impact on the physical and mental health of students, staff, and members of an under-resourced community. These preliminary findings underscore the importance of *neighborhood and built environment* as one of the five SDOH that plays a critical role in supporting people's health, wellness, and quality of life. While ample standards exist to support the development of healthy buildings, limited guidelines exist to help architecture practitioners ensure that health equity is reflected in project design. In the absence of a larger "design equity" framework for schools, architects are using decentralized information in a piecemeal fashion to ensure healthy buildings address those in need. To address this gap, it will be critical for scholarship on architecture and health equity to explore how the design of the built environment impacts people across all SDOH categories. Additional knowledge in this area will help us to understand how design can help to resolve health inequities as one of the most pressing concerns of our time.

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