Exploring Health Equity and the Built Environment through the Social Determinants of Health

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ABSTRACT: As COVID-19 disproportionately impacted the world's most vulnerable populations, health equity programs burgeoned across disciplines, including public health, business, and architecture. To inform such initiatives, the relationship between health equity and the built environment must be more closely explored. This research examines the relationship between health equity and the built environment through a 3-year study funded by the Robert Wood Johnson Interdisciplinary Research Leaders Program. The study aims to answer the research question: How does the unique designed environment of a hybrid YMCA/elementary school impact the mental and physical wellness of students, families, staff, and the greater community? Findings can inform health equity as the school facility, designed through a highly community-centered process, seeks to support the under-resourced population of Southeast Raleigh, North Carolina, that is often overlooked by design initiatives. Using the Social Determinants of Health as a guiding framework, this study explores the impact of design across the five areas of (1) *economic stability*, (2) *education access and quality*, (3) *health care access and quality*, (4) *social and community context*, and (5) *neighborhood and built environment*. Preliminary findings from surveys address the following discussion points: What are ways in which design can impact health equity? What are the current barriers to health equity that can be impacted by design? And what opportunities exist to increase health equity through design?

KEYWORDS: Health Equity, Social Determinants of Health, Neighborhood and Built Environment, Equity

INTRODUCTION

Connections between the built environment and public health are now widely recognized by policymakers, building professionals, and public health officials. As an example, the Social Determinants of Health (SDOH) include "*neighborhood and built environment*" among five key indicators that affect human health and quality of life (ODPHO n.d.). The disproportionate impact of COVID-19 on vulnerable populations has shed a glaring light on existing health inequities across the world (Raza et al. 2021). Scholars, industry leaders, and policymakers are beginning to look more closely at the built environment's role in advancing health equity (Fedorowicz et al. 2020; Frumkin 2005). This research seeks to forward the conversation on health equity by exploring the design of the built environment using the Social Determinants of Health (SDOH) as a guiding framework. Under a 3-year study funded by the Robert Wood Johnson Interdisciplinary Research Leaders Program, the project seeks to understand how the design of a hybrid elementary school/YMCA located in an under-resourced area of Southeast Raleigh, North Carolina impacts the physical and mental health of a community. Preliminary findings of survey research with school staff address the following questions: 1) What are ways in which design can impact health equity? 2) What are the current barriers to health equity that can be impacted by design? And 3) What opportunities exist to increase health equity through design? Intended audiences for this study include public health and architecture researchers, policymakers, and industry professionals who seek to impact health equity through design.

1.0 BACKGROUND

Researchers and public health experts have long sought to address systemic health inequities facing Black, Indigenous, and People of Color (BIPOC), low-income households, and people with disabilities, among other vulnerable populations. Initiatives promoting health equity strive to ensure that everyone has "a fair and just opportunity to be as healthy as possible" (Braveman et al. 2012). As connections between public health outcomes and the built environment continue to emerge, emphasis is being placed on the built environment's role in impacting health equity (Frumkin 2021). Addressing health equity includes the active removal of barriers that may exist in programs, policies, and environments that impact one's ability to be as healthy as possible (Brooks-LaSure et al. 2021). In the context of the built environment, which can be defined as human-made places where occupants live, work, learn, acquire services, and recreate on a daily basis (Roof & Oleru 2008), some such known barriers to health include lack of natural light, poor indoor air quality, and sedentary design.

The built environment influences aspects across all five Social Determinants of Health – (1) *economic stability*, (2) *education access and quality*, (3) *health care access and quality*, (4) *social and community context*, and (5) *neighborhood and built environment*. Understanding how population groups "experience 'place' and the impact of 'place' on" health is fundamental to understanding the Social Determinants of Health, including both social and physical determinants (ODPHP n.d.). However, design remains relatively unexplored as a strategy for eliminating health disparities. There is a significant opportunity to deepen our understanding of strategies that promote health equity in the context of *neighborhood and built environment.* As an example, less than half of the recommended interventions for addressing *neighborhood and built environment* include design-specific strategies (DHHS n.d.b). Emerging research further underscores this gap by identifying health equity interventions in the form of financing, urban planning, and programming, with little emphasis on design (Fedorowicz et al. 2020). More research is needed to explore how the SDOH can be operationalized through built environments designed to support specialized social initiatives, through both physical form and programming.

1.0 METHODOLOGY

2.1. Study Design

This larger project adopts a case study methodology (Yin 2006) to explore physical and mental health outcomes connected with the built environment by conducting occupant surveys, in-person interviews, building assessments, and community canvassing. The case school selected through purposive sampling is an academic facility co-located with a YMCA in Southeast Raleigh, North Carolina, an area identified as having "high opportunity for positive change" (NCIPH 2018). The project was designed through a highly community-centered approach, which included school administrators, a community-based advocacy organization, directors from the YMCA of the Triangle, and members of the Wake County Public School System. The integrative process critically elevated the needs of a community that is 90% non-white, with 56% of households earning less than $40,000/year and only 21% of adults having a college education. The case school opened in August 2019 but closed within months of operation due to the COVID-19 pandemic. After reopening in March 2020, the facility is in the process of welcoming its first cohorts of students, growing YMCA membership, and establishing robust afterschool and summer programs. To strengthen findings, the research team selected a matched elementary school serving the same surrounding census tracts in Southeast Raleigh. The study applies a health equity lens 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. This paper focuses on findings from participant surveys to understand how the design of a school in this community context can uplift health equity.

2.2. Data Collection

An online, anonymous survey was created in Qualtrics and distributed to the staff, administrators, and faculty at both the case and matched schools in the spring and summer of 2021. Given the stresses of COVID-19, the school administration distributed the survey to all staff between March – August 2021, along with several reminders. The survey instrument included a mix of open and close-ended questions that were developed using the SDOH as guiding categories. Each SDOH "module" in the survey had approximately 3-5 close-ended questions using a Likert scale that aimed to operationalize aspects of health equity in the context of the school environments; the exception was the *neighborhood and built environment* module which contained 10-15 close-ended questions about participant experiences and usage of the indoor and outdoor environments at their school. Summarizing each module was an open-ended question allowing participants to share additional experiences regarding connections between the built environment and their physical, mental, and emotional health. Participants who indicated that they were at the case school were routed to an additional module that more deeply explored "healthy building" strategies specific to the case school. Data gleaned from this additional module will be used in future research to further operationalize *neighborhood and built environment* as a SDOH. The survey instrument was approved by the university IRB and distributed to all participants by email through each school's administration. Surveys were non-mandatory; however, participants were offered an opportunity to provide their email address to enter a drawing for one of six gift cards per school.

A total of 48 surveys were received – 29 were completed from the case school and 19 were completed from the matched school. Among the 48 survey respondents, most were between the ages of 26-35 and 46-55 (66%); most identified as a woman (91%), and most identified as Black or African American (52%). See Figure 1 for complete participant demographic information; note that some participants did not respond to all demographic questions. Given the exploratory nature of this study, the findings cannot be generalized. The goal of this research is to explore possible relationships to be further studied. Even then, findings would be potentially transferrable to similar communities and projects, not generalizable.

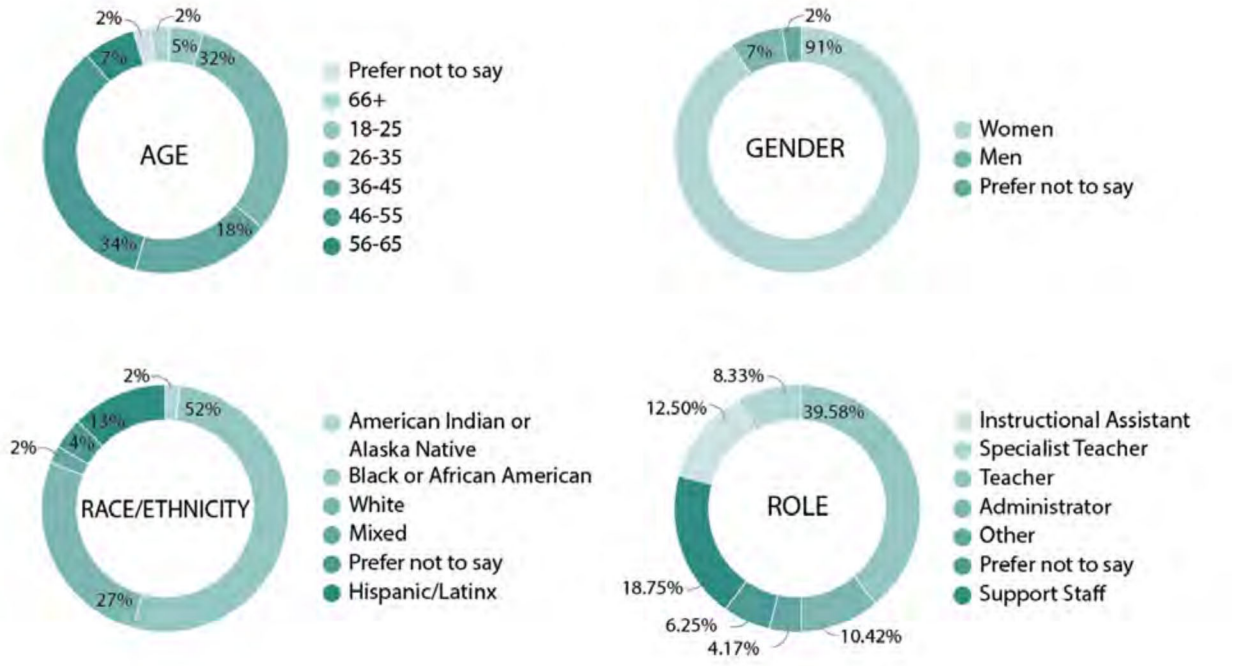

Figure 1: Participant demographics from survey results. Source: (Authors 2021)

2.0 RESULTS AND ANALYSIS

The findings from survey research across each of the SDOH are presented below.

3.1. Education Access and Quality

There are a myriad of ways that access to quality education can positively impact health and wellbeing over the life course (Hahn and Truman 2015). While access to quality education is beyond the scope of a single site or a single building, and somewhat inherent in these selected projects because they are educational buildings, some questions were included in the survey to align with the SDOH pillar of *education access and quality*. These questions minimally address how the building might increase active engagement and student learning in design. However, because these are educational facilities within the same larger school administration system, it was anticipated that the responses would be similar.

In comparing learning and educational development across the case school and matched school, participants from both populations were asked about the active engagement of their students in the learning curriculum, learning activities, and organized school activities. The matched school outperformed the case school in each of these categories. The absolute difference of participants that either agreed or strongly agreed was in favor of the matched school in learning curriculum by 15%, by 22% in learning activities, and by 30% in organized school activities. When specifically addressing issues of diversity and inclusion, participants were asked if they felt their school promoted diversity, inclusion, and a sense of belonging. The participants from each school equally somewhat or strongly agreed that their school promotes diversity at 74% and were still generally in agreement about the promotion of inclusion in the school (74% at the case school and 63% at the match school). The perception on promoting a sense of belonging, however, was somewhat different with participants at the case school indicating 70% agreement while only 44% of the match school agreed (Figure 2).

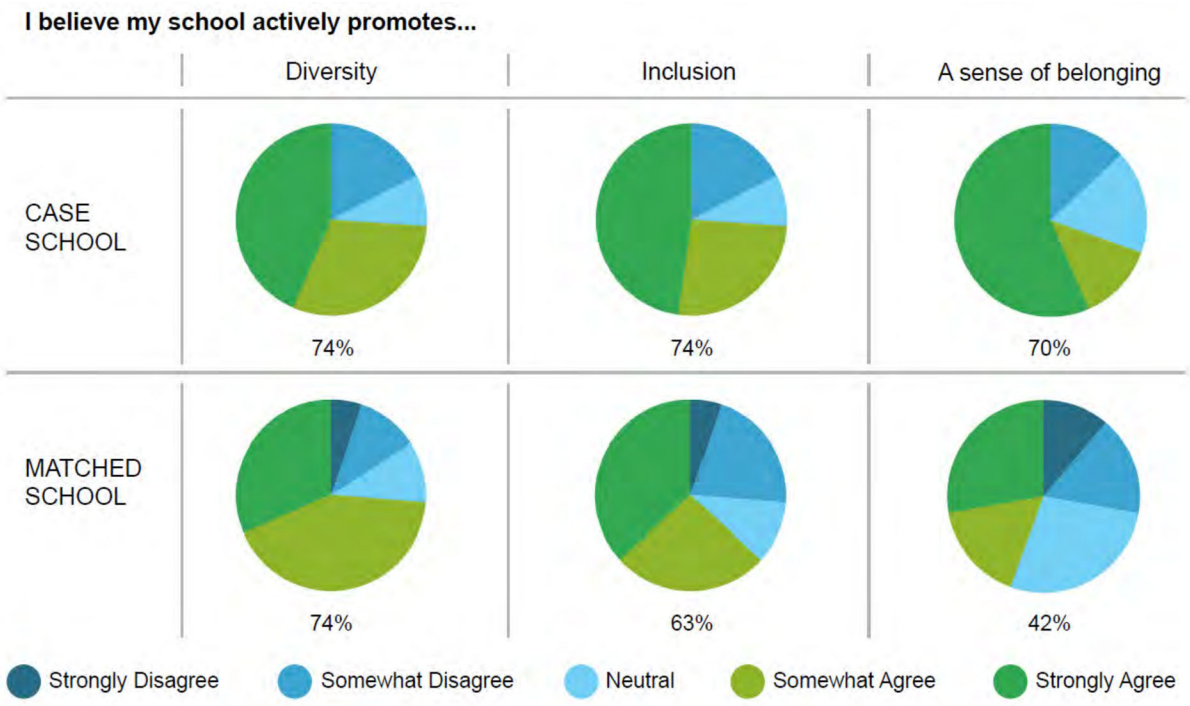

Figure 2: Survey results for SDOH questions on Education Access and Quality. Source: (Authors 2021)

3.2. Social Connection and Community Engagement

The SDOH category of *social and community context* was addressed next. Social and community contexts are extremely important, likely impacting individual health and healthy behaviors. As such, these questions addressed issues around family engagement and connection to community, and how the school contributes to social connection and community engagement. The intent was to better understand how the school and its supported programming can play an active role in community cohesion.

The survey asked about perceptions of community engagement. While the matched school indicated more active engagement of families (74% v 52% for the case school), the case school outperformed the matched school in terms of perception of their schools' engagement with the community, their feeling connected to the community, and perception of the community feeling connected to their school (Figure 3). There was at least a 30% absolute difference in these responses, with an absolute difference of 41% on the question addressing how connected the community felt to the school. While the sample sizes were too small to indicate statistical significance, this is a notable difference.

When asked in an open-ended question about other ways in which the school contributes to social connection and community engagement, if at all, the case school respondents listed considerably more unique opportunities. While both schools had responses around standard communications, texts and apps for communication with parents, school websites, and food distribution, the case school also mentioned additional community connections such as providing targeted and individual family assistance; food drives; farmers markets; YMCA events; staff participation in YMCA activities; community partnerships; interpreters; family nights; popsicles in the park; and movie nights. While the matched school responses also included elements such as access to the playground and free library books for community, they also included negative feedback such as uncertainty around whether efforts fit community need and staff not bought in/ overburdened already.

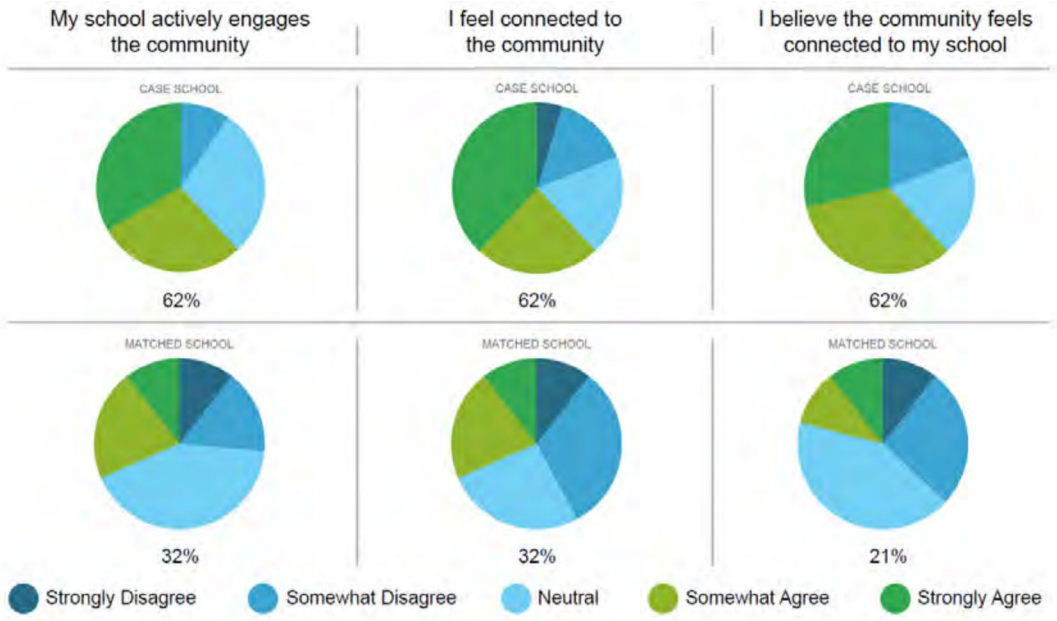

Figure 3: Survey results for SDOH questions on Social and Community Context. Source: (Authors 2021)

3.3. Physical and Mental Health

The SDOH category *health care access and quality* addresses broad aspects of health including primary care visits, programmatic interventions, and individualized health agendas (DHHS n.d.a). For the purposes of this study, this determinant has been distilled as aspects of physical and mental health that are impacted by the built environment.

Findings from the survey showed that participants from the case school felt more supported across aspects of physical, mental, and emotional health. Specifically, when asked about how their school promoted physical activity in support of physical health, responses from the case school were 13% higher than the matched school (74% to 61%). Regarding mental health, when asked about how their school supported mental and social and emotional health, the deltas of those that somewhat or strongly agreed were higher percentages from the case school, at 29% (mental health) and 28% (social and emotional health) respectively (Figure 4). However, when asked about support programs such as student counseling, psychological services, and social services, the matched school responses showed a slightly higher percentage (79% case school v 89% matched school). Similar absolute differences were seen in psychological services (58% case school v 67% matched school). It is suspected this slim margin is likely due to systemic measures implemented by the schools to increase student services to support physical, mental, and emotional health based on the individual student populations and needs.

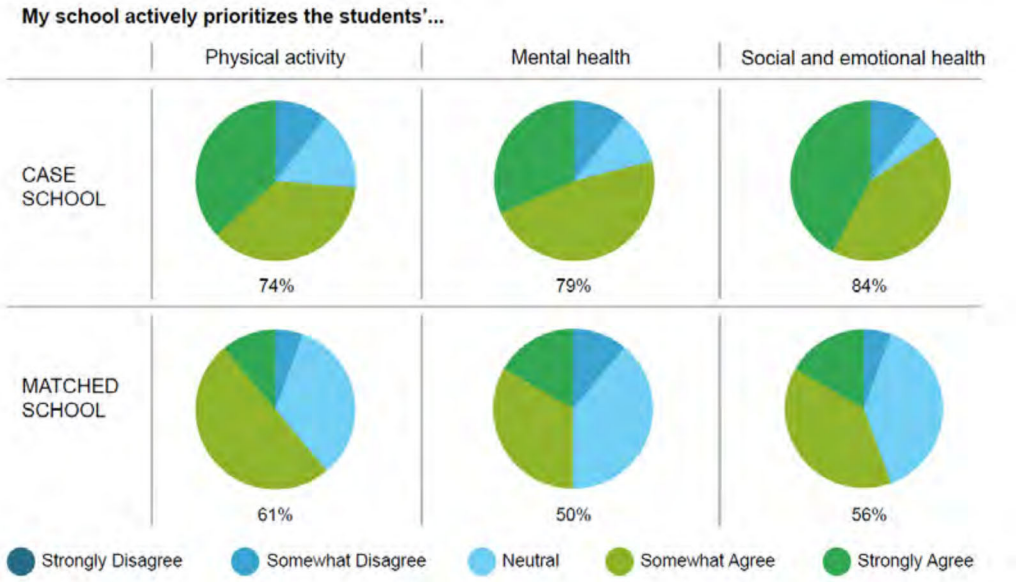

Figure 4: Survey results for SDOH questions on Physical and Mental Health. Source: (Authors 2021)

3.4. Economic Security

While difficult to address through built environment strategies, *economic security* is an important pillar of the SDOH framework. Therefore, the survey addressed these concerns through the lens of overall support to mitigate additional stressors. When asked about school support pre-COVID, participants were asked about their views on employee development, general employee happiness, their ability to conduct work safely, and their ability to work from home as needed - both pre-COVID and after reopening. Pre-COVID, the case school participants' agreement was larger than those participants at the matched school in terms of general employee happiness (44% absolute difference), employee development (36% absolute difference), and the ability to conduct their work safely (23% absolute difference). The matched school, on the other hand, outperformed the case school in the ability to work from home as needed (30% absolute difference).

The same issues were given to address reopening. The general trends were the same, though with slimmer absolute differences. The case school participants' agreement was larger than those participants at the matched school again in terms of general employee happiness (37% absolute difference), employee development (9% absolute difference), and the ability to conduct their work safely (14% absolute difference). The matched school, again, outperformed the case school in the ability to work from home as needed (11% absolute difference) (Figure 5). When asked about other ways in which the schools may have contributed to economic stability beyond salaries, the case school participants had little to share. One noted that they lived close by so could save on gas. Another shared that there were none. The matched school, however, shared the ability to work from home, and administrative emails about benefits such as vaccines, loans, and job fairs.

Figure 5: Survey results for SDOH questions on Economic Stability. Source: (Authors 2021)

3.5. Neighborhood and Built Environment

Previous research has readily associated the built environment with both physical activity behaviors and health outcomes such as obesity, cardiovascular disease, diabetes, and cancers (Sallis et al. 2012). This survey aimed to understand how participants' physical, mental, and emotional health might be impacted by the interior environment and surrounding site elements at their schools. To assess interior spaces, participants were asked whether they felt they had 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 views, and pleasant colors. Case school participants that agreed or strongly agreed were approximately 30% higher than the participants in agreement from the matched school when asking about natural elements, natural daylight, pleasant views, and pleasant colors. The percentages of agree or strongly agree remained approximately 20% higher than the matched school when asking about spaces promoting physical activity, promoting mental health and wellness, and having quality lighting. The absolute difference in percentages addressing quiet spaces was smaller, with the case school outperforming the matched school by a slim 5%. Clean air was the only aspect in which the matched school performed higher satisfaction, recording an agreement of a 7% absolute difference higher than the case school (Figure 6). This shift is not surprising, particularly after an airborne pandemic. The case school was not built with operable windows while the matched school, designed and constructed about 10 years prior and under different system standards, does have operable windows. The pandemic has placed fresh air and operable windows at the front of the minds of those teachers in static classrooms.

Figure 6: Survey results for SDOH questions on Neighborhood and Built Environment. Source: (Authors 2021)

3.0 DISCUSSION

This study aims to address significant questions around advancing health equity in under-resourced neighborhoods including: 1) What are ways in which design can impact health equity; 2) What are the current barriers to health equity that can be impacted by design; and 3) What opportunities exist to increase health equity through design? Key themes that emerged during data analysis help to address these questions, with a specific focus on understanding how the built environment can begin to impact each SDOH category. For the case school, it is possible that the built environment had an increased beneficial impact on learning and educational development by facilitating a sense of belonging and supported social connection by providing programming and collaborative spaces that foster community engagement. Furthermore, clear direction for design strategies can be gleaned based on participants agreeing/strongly agreeing with survey responses that emphasized health-promoting design features around clean air, natural elements, natural daylight, quiet spaces, spaces that promote physical activity, spaces that promote mental health and wellness, quality lighting, pleasant views, and pleasant colors. Barriers to health equity in the built environment can be presumed as the converse; environments that fail to promote a sense of belonging, community engagement, and health-promoting design features challenge the ability to support equity. Instances where educational facilities miss opportunities to address health-promoting indicators will provide less opportunities for students, staff, and the community to achieve health equity. Opportunities exist to continue to explore health equity in the context of the built environment, including the future operationalization of design strategies that promote physical, mental, and emotional health. One future goal of this study is to distill design recommendations promoting physical, mental, and emotional health across K-12 schools.

CONCLUSION

While future research is undoubtedly needed, this study is an important step in exploring the connection between design and the built environment through a health equity lens using the Social Determinants of Health as a framework. Through case study research on a hybrid YMCA / elementary school located in Southeast Raleigh, North Carolina, the project has identified clear connections between design and health. In the context of health equity, key themes that emerged in findings from the case school surveys - a sense of belonging, community connection, and health-promoting design features - warrant further exploration. Subsequent phases of this research study including qualitative interviews, community-based focus groups, and on-site building observations will continue to apply a health equity lens to understand how design impacts the physical, mental, and emotional health of an underserved community.

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