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Research Article

Evaluating the HEAT Corps Medical-Community Engagement of a COVID-19-Themed School Curriculum

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Abstract

In response to the coronavirus disease 2019 (COVID-19) pandemic, the HEAT Corps team at launched an interdisciplinary virtual health literacy program in the first 2-years of the public health crisis. The program offered just-in-time training and accurate public health messaging on the COVID-19 pandemic and vaccine rollout to schools across Baltimore City. This report summarizes the methods, evaluation, and results of the HEAT Corps Model to promote COVID-19 safety and vaccine awareness in Baltimore City Public Schools from January 2021 to June 2023. A total of 1,524 students were taught throughout Baltimore City, with a majority of the students residing in the most socioeconomically disadvantaged neighbourhoods of the city. When reviewing the sociodemographic by race and ethnicity at the end of the curriculum implementation, the HEAT Corps team found that in the "Already Vaccinated" category, rates were 54.3% for Black/African American, 69.3% for White/European American, 60.1% for Hispanic/Latinx, and 59.6% for Mixed/Other ethnicities respondents. These findings show that a school-based curriculum can impact behaviors and perspectives on public health measures, warranting further resources and efforts to continue such collaborations between health systems and communities.

Keywords: Health Equity; Community Engagement; COVID-19; Vaccines

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had challenging effects on families, their children, and respective scholastic social networks, both directly and indirectly. In the first years of the public health infectious crisis, youth in the United States have had significant rates of infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as compared to other age groups, along with dire health outcomes including acute complications, long COVID, and mortality [1-3]. In addition to the health consequences of infections for children, a significant portion of families have lost a parent or caregiver to COVID-19 [4]. Thereby, children and adolescents have not been spared by this pandemic. Further, children in vulnerable populations (based on race, ethnicity, and socioeconomic status) have been disproportionately impacted by COVID-19 [4,5]. It is critical to learn about the impact of this pandemic in order to prepare for future evolving public health crises.

Given the impact of the pandemic on youth, schools became an important setting for reaffirming public health messaging, policies, and information regarding COVID-19. From face mask requirements, to social distancing and virtual classrooms, many academic institutions implemented public health actions meant to mitigate the spread of SARS-CoV-2 within the scholastic buildings [6,7]. While evidence confirmed that schools could resume in-person attendance when critical prevention strategies were implemented to curb SARS-CoV-2 [7], such findings were not generalizable in the United States due to disparities in schools' health-promoting environments and hesitancy towards COVID treatments by certain populations. Such disparities are the result of decades of underinvestment by state-sanctioned policies and practices (e.g. redlining) that have gradually thinned tax bases in many urban school districts [8-10]. The resulting public-school infrastructures left such districts poorly equipped to respond to COVID-19, from implementing prevention policies or public health messaging to their students or both [9].

In May 2020, we launched a multi-disciplinary school-based virtual health literacy curriculum to foster an academic and public health-community collaboration for scholastic organizations [11,12], specifically in a district ravaged by redlining and gentrification [13]. The Health Education and Training (HEAT) Corps was intended to achieve several public health objectives: a) provide scientific information and health literacy regarding the pandemic and updated COVID-19-related prevention strategies, b) create a comfortable environment to discuss mental health concerns, c) develop access to COVID-19 clinicians and public health experts in real-time, and d) dispel COVID-19-related myths due to vaccine hesitancy [11]. Additional objectives set forth from the collaboration between the HEAT Corps team and the schools centered on student compliance with preventive strategies (e.g. face masks) to COVID-19 vaccination.

In this review, we highlight the outcomes of the HEAT Corps COVID-19 school-based initiative over two years of the pandemic, specifically during the time the COVID-19 vaccines became available. We hypothesize that through pedagogy and implementation of the curriculum, students' behaviors and attitudes towards COVID-19 strategies resulted in compliance with the public health requests of the schools, along with an uptake in COVID-19 vaccination.

Methods

HEAT Corps Curriculum

The HEAT Corps curriculum was previously published, with regard to its composition and training of instructors to the source material [11]. In brief, the curriculum focused on COVID-19-related themes on the genesis of the pandemic, the role of prevention strategies (e.g. face masks), and impact of vaccines aimed to prevent severe COVID-19. Further, the sessions offered opportunities for students to engage with HEAT Corps instructors, openly asking questions that concern them about COVID-19, preventative strategies, or both. In addition, mental health concerns as consequences of the pandemic were explored during these classes. Finally, all volunteer instructors for the HEAT Corps went through intense training of the curriculum by physicians, scientists, and public health professionals [11].

The HEAT Corps curriculum was updated to include information regarding COVID-19 vaccines and specifically modulated by grade bands (e.g., elementary, middle and high school level) to align with best practices in curriculum and child development. Specifically, the curriculum focused on how vaccines work, the goal for COVID-19 vaccines during the pandemic, and how to share such public health messaging with their respective community. The HEAT Corps team and the Baltimore City Health Department collaborated to implement the curriculum within the Baltimore City Public School system on COVID-19 mitigation strategies and vaccination campaigns.

Scaling Methodology

All students received evaluations to rate the impact and understanding of the HEAT Corps teachings. The Course Review Scale (CRS) consisted of substantive statements linked to a Likert-scale for COVID-19 Vaccine Awareness and Health-Literacy Class Session (Figure 1). Using a conventional psychometric approach, each of the items received a rating value of one to ten that represented a student's level of understanding. The two content

areas measured by the inventory were "COVID-19 Vaccine Awareness" or "Health-Literacy Class Session." Below is a schematic representation of the Likert-scale response system used for the two substantive CRS inventory sections.

As shown in Figure 1, the highest level of understanding elicited a response of "Strongly Agree," which was assigned a value of ten. When the student's understanding level was very low regarding a statement, the response of "Strongly Disagree" was offered and a value of one assigned to that item. Eight intermediate response options represented varying levels of understanding. These ordinal-level item ratings were subsequently combined into a composite "score" to represent a student's overall understanding for a particular content area. Scores ranged from 1 to 10 points, with higher values reflecting better understanding. In addition, the survey asked the student if they were planning to receive the COVID-19 vaccine ("Yes", "No", "Already Vaccinated").

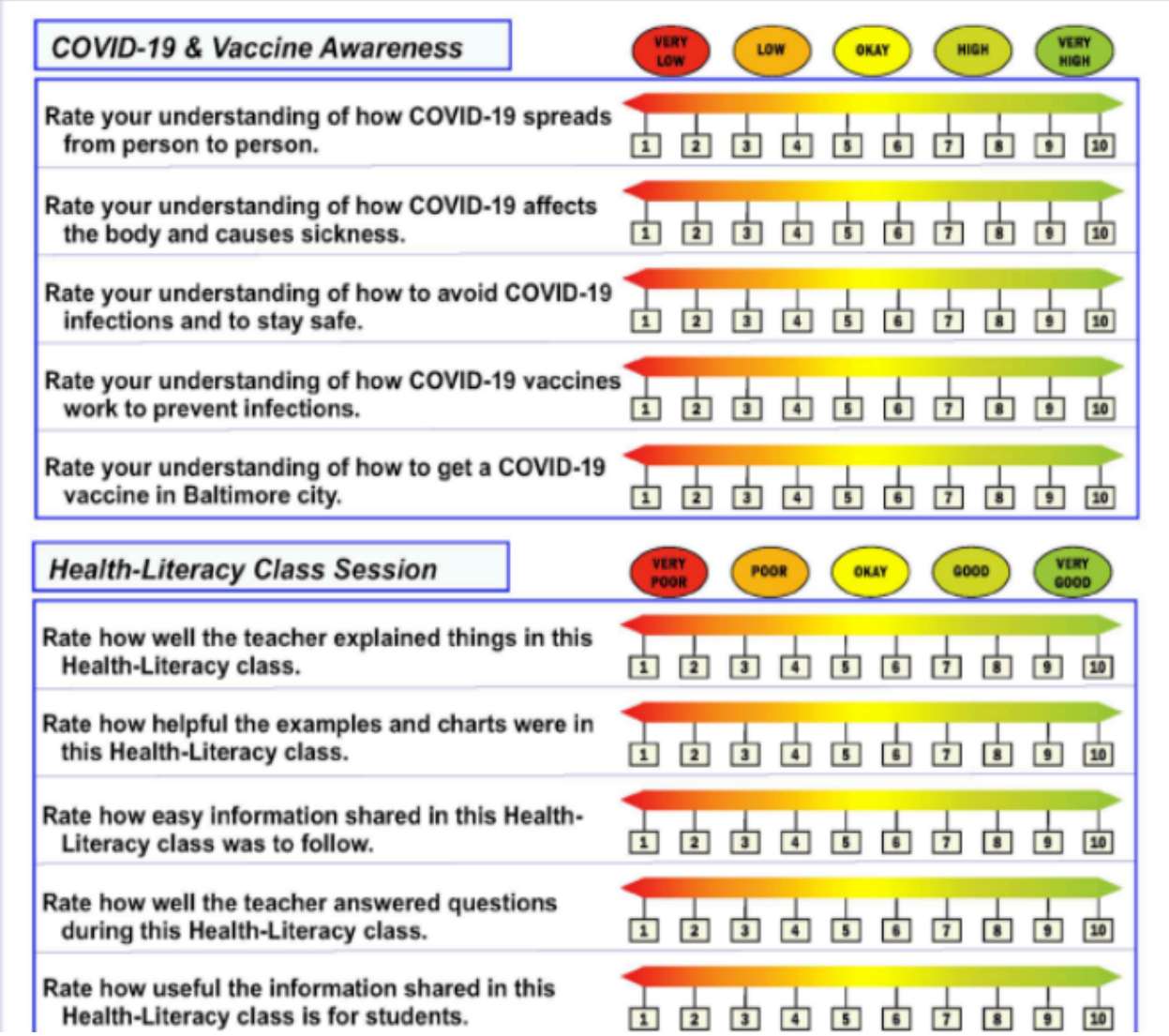

Figure 1: Course Review Scale (CRS) linked to a Likert-type response scale for COVID-19 Vaccine Awareness and Health-Literacy Class Session.

An internal consistency analysis was conducted for the two substantive areas of the CRS inventory. For the COVID-19 & Vaccine Awareness content area, a reliability coefficient of 0.83 was found for the five items comprising that area. A coefficient of 0.93 was found for the five items comprising the Health-Literacy Class Session content area. Note that the conventional behavioral science standard for acceptable scale reliability is >0.70 [14]. Thus, the CRS inventory is psychometrically sound relative to the consistency of items to measure the designated content.

In addition to the scales, socio-demographics were also collected. Gender, race, and ethnicity were self-reported by the students. They are presented as means with standard deviations or categorical values with percentages where applicable. Socioeconomic status of each school's geographical location was designated by the area deprivation index (ADI), which is a national scale from 1 to 99 (the greater the number, the more socioeconomically disadvantaged the census tract is), and the percentage of families living in poverty [15,16]. All analyses were conducted by SAS and SPSS software.

Results

The research sample (N=1,524) represents public school students (1st-12th grades) enrolled in the initiative in schools all located in socioeconomically challenged areas of Baltimore City. The mean ADI was 81.1 + 14.2 (range 64 to 98). Regarding poverty, the schools were located in neighbourhoods with the highest rates of families living in poverty (24.2 + 11.3%). The range of families living in poverty for the residential high schools was 10.1% to 37.2%.

Based on the total sample of students, (44%) were 12 to 13 years of age, (36.2%) were 14 to 15 years, (12.8%) were 16 to 17 years, and (7.0%) 18 years & above. The cohort represented (47.5%) who identified as Female, (49.0%) as Male, and (3.5%) as Non-binary. By race/ethnicity, (64.1%) identified as Black/African American, (9.3%) as White/European American, (15.8%) as Hispanic/Latinx, and (10.8%) as Mixed/Other ethnicities.

Table 1 displays stratified subscale values for COVID-19 & Vaccine Awareness and Health Literacy Class Session CRS, categorized by gender, race/ethnicity, and age group.

Category	Frequency	Percent	Cumulative Percent
Gender			
Female	722	47.5%	47.5%
Male	744	49.0%	96.5%
Nonbinary	53	3.5%	100.0%
Ethnic Background			
Black/ African American	973	64.1%	64.1%
White/ European American	141	9.3%	73.4%
Hispanic/ Latinx	240	15.8%	89.2%
Mixed/ Other	165	10.8%	100.0%
Age of Participant			
12-13 Years	671	44.0%	44.0%
14-15 Years	551	36.2%	80.2%
16-17 Years	196	12.8%	93.0%
18 Years and Above	106	7.0%	100.0%
[1]Note: Frequencies for the demographic variables reflect the actual responses, as some participants did not provide background information			

Table 1: Sample Characteristics for Secondary School Participants in COVID-19 Safety and Health Awareness Program (N=1,524[1]).

Within the CRS surveys (Tables 2 and 3), participants were asked, "Do you plan to get the COVID-19 vaccine?" Of the total sample, (57.1%) were "Already Vaccinated," (12.8%) responded "Yes," and (30.1%) responded "No." When stratified by gender, (55.3%) of female respondents, (59.3%) of male respondents, and (51.9%) of nonbinary respondents were "Already Vaccinated." Approximately (13.8%) of female respondents, (11.7%) of male respondents, and (15.4%) of nonbinary respondents responded "Yes." An estimated (30.9%) of female respondents, (29%) of male respondents, and (32.7%) of nonbinary respondents indicated "No."

Subgroup	COVID-19 and Vaccine Awareness		Health Literacy Class Session	
	Mn	SD	Mn	SD
Gender				
Female	78.4	17.4	76.0	21.8
Male	77.0	17.3	75.1	20.8
Nonbinary	72.4	21.9	71.1	23.2
Race/Ethnicity				
Black/ African American	78.4	16.7	75.2	21.8
White/ European American	79.9	17.7	76.9	19.8
Hispanic/ Latinx	73.4	19.0	74.6	21.3
Mixed/ Other	76.2	19.1	76.5	20.4
Age Group				
12-13 Years	74.1	18.6	71.8	22.0
14-15 Years	79.6	16.5	76.1	20.7
16-17 Years	80.5	15.7	82.1	18.5
18 Years and Above	81.9	16.2	81.6	20.8
Total Sample	77.5	17.5	75.4	21.3
[1]Note: Mean scores for the sample subgroups represent those cases for whom scale scores were available				

Table 2: Means for the Two Course Review Scale (CRS) Indexes Stratified by Sample Subgroups (N=1,524[1]).

Subgroup	"Yes"	"No"	"Already Vaccinated"
Gender			
Female	13.8%	30.9%	55.3%
Male	11.7%	29.0%	59.3%
Nonbinary	15.4%	32.7%	51.9%
Race/Ethnicity			
Black/ African American	13.6%	32.1%	54.3%
White/ European American	7.1%	23.6%	69.3%

Hispanic/ Latinx	16.7%	23.2%	60.1%
Mixed/ Other	7.5%	32.9%	59.6%
Age Group			
12-13 Years	14.8%	37.3%	47.9%
14-15 Years	10.3%	26.5%	63.2%
16-17 Years	14.1%	22.9%	63.0%
18 Years and Above	11.3%	17.9%	70.8%
Total Sample	12.8%	30.1%	57.1%

[1]**Note:** Percentage for the sample subgroups represent those cases for whom demographic and response data were actually available

Table 3: Responses to the CRS Question: "Do you plan to get a COVID-19 Vaccine?" Stratified by Sample Subgroups (N=1,524[1]).

In terms of race/ethnicity, the "Already Vaccinated" rates were (54.3%) for Black/African American, (69.3%) for White/European American, (60.1%) for Hispanic/Latinx, and (59.6%) for Mixed/ Other ethnicities respondents. Among Black/African American respondents, (13.6%) answered "Yes," and (32.1%) responded "No." Among White/European American respondents, (7.1%) answered "Yes," and (23.6%) responded "No." Among Hispanic/ Latinx respondents, (16.7%) said "Yes," and (23.2%) said "No." Among Mixed Race/Other respondents, (7.5%) reported "Yes," and (32.9%) responded "No."

By age group, among respondents aged 12 to 13 years, (47.9%) were "Already Vaccinated." Additionally, (14.8%) responded "Yes" and (37.3%) responded "No" to plans of getting vaccinated. For those aged 14 to 15 years, (63.2%) were "Already Vaccinated," with (10.3%) indicating "Yes" and (26.5%) indicating "No" to vaccination plans. Among respondents aged 16 to 17 years, (63%) were "Already Vaccinated," with (14.1%) indicating "Yes" and (22.9%) indicating "No" to vaccination plans. For respondents aged 18 years and older, (70.8%) were already vaccinated, while (11.3%) indicated "Yes" and (17.9%) indicated "No" to vaccination plans.

Discussion

In implementing our COVID-19 curriculum in an urban school district impacted greatly by the infectious pandemic, we found that there was an influence in participating youth regarding preventive strategies, specifically regarding vaccinations. By working with schools and their respective students, we were able to demonstrate a desire for children and adolescents to learn more about the pandemic, specifically ways that could mitigate spread and health impact. Additionally, the students were engaged with the material, instructors, and scientifically, fact- based resources. Such findings should have particular interest for university programs collaborating with schools to implement health education and prevention campaigns with youth and their families.

Vulnerabilities of these youth are reaffirmed by the high rates of hospitalization of school-aged children during the COVID-19 pandemic's early viral waves, from delta to omicron, amplified this global public health crisis [5,17]. That vulnerability was compounded as the initial COVID-19 vaccines were developed for and only available to adults. Therefore, when the immunizations became available for school-aged children in October 2021 in the U.S., awareness towards their efficacy was warranted in an effort to mitigate, if not prevent altogether, the aforementioned rise in youth hospitalizations from COVID-19 [5]. The efficacy of the vaccines to prevent hospitalizations among children was reaffirmed from various observational studies, demonstrating a disproportionate amount of unvaccinated children were hospitalized, at times upward of 90% as compared to those vaccinated [5,17]. Therefore, ensuring awareness of school-aged children regarding vaccines and their purpose was vital in public health messaging. It was also imperative to make sure that the lessons were delivered so that the students could take this information back to their families and their communities. As evident by our results, the HEAT Corps curriculum had an influential role in students acquiring COVID-19 vaccinations. Given the curricular guiding pedagogy, the information was comprehensible and actionable to make a conscious and confident decision to prevent severe COVID-19.

Public health messaging for diverse communities is a significant strategy to ensure populations are aware of resources and information necessary to mitigate any health concerns they may face. Schools are a significant community for receipt of such public health messaging; however, each school and school district face significant inequities and disparities in its ability to properly disseminate messaging, resources, or both. COVID-19 policy

decisions were influenced by many factors, with sociohistorical and socio-political factors evident in their impact [18,19]. For example, Cowger et al. found that school districts that chose to maintain face mask requirements for longer tended to have school buildings with limited physical infrastructure and poorer indoor ventilation, along with more students per classrooms [20]. Baltimore City Public Schools face similar challenges with aging infrastructure serving overcrowded classrooms. Therefore, cost-effective strategies such as face masking and vaccination were ideal in an effort to assure these school buildings did not become hubs for spreading COVID-19. Messaging such policies through a curriculum that employs experts, appropriate pedagogy, and actionable and accessible resources assisted in the reaffirmation of the strategies through this medical-scholastic collaboration.

A strength of the HEAT Corps curriculum is centered on assuring that the lessons are adapted to the students' developmental level and for each scholastic community. When scheduling classroom sessions, HEAT Corps team members spoke with teachers to discuss the educational status of their students. This allowed the HEAT Corps team to adapt the curriculum to meet any identified needs. Feedback was also provided instantaneously to make any specific changes prior to the next teaching session. In addition, the HEAT Corps instructors were informed of the classrooms and students, providing sociohistorical context so that they could adapt their teaching and engagement to align with the needs of the students. This personalized approach assisted in establishing both learning and trust from the instructors, factors that likely contributed to mitigating any concerns about COVID-19 that may have stemmed from misinformation [21]. Specifically, the personalized approach allowed for both an understanding of the material and confidence in the instructors, both of which are key to establishing trust and assuring proper action by the students and scholastic community.

Several limitations warrant attention in this community engagement effort for public health dissemination. First, the scholastic community was one centered in an urban setting. How such a curriculum would translate to other geographic regions, from suburban to rural, warrants further attention to assure such efforts can be generalizable to more diverse school communities. Second, for students where English is their second language, it is unclear if the teachings had a similar influence. Similar pedagogic changes could not occur for other languages, especially for languages stemming from ethnicities with specific sociohistorical insight and cultural competency. Finally, the lessons were often implemented in school settings with aging infrastructure and ventilation, which prompted students to discuss why their schools are not resourced more appropriately for such health concerns. The limitation drawn from such insight by the students warrants our curriculum, and others, to allow for additional content around advocacy that students and their school networks can engage in. Recognizing immediate actions are necessary to address an acute public health crisis and should be coupled with appropriate and informative advocacy if such immediate actions reveal chronic, systemic failures.

From local concerns that are specific to a geographic region to global issues that impact many, public health crises will continue. Our results reaffirm the impact of collaboration with scholastic communities when implementing, in real time, health messaging that has been tailored to the school and its students. Our results also suggest that such a platform of engagement that is active between academic universities and health systems' personnel and scholastic leadership allows for the ability to implement such public health curriculum efficiently and effectively. School districts should consider such findings to assist with current public health issues (e.g. youth epidemic electronic cigarette usage, gun violence, mental health), as well as position them to be prepared for future public health crises, through strong collaborations with local health systems and health departments. In addition, health systems and institutions of higher education should continue to invest in their respective community engagement infrastructure to strengthen community-academic partnerships.

Competing Interests: The authors have no conflicts of interest and have no competing interests to declare.

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