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Youth Sports in a Pandemic Age

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Abstract

Problem: Youth sporting events is a public health concern as infected youth with coronavirus disease 2019 may unknowingly spread the virus, as many show little to no symptoms (Zimmerman & Nigel, 2020). This project aimed to identify level of adherence to posted *Youth Sports Guidelines*, which were designed to mitigate the spread of virus at youth sporting events.

Methods: An observational descriptive design was utilized. Two observers tallied guideline violations by participants and spectators at six high-contact (basketball) and six low-contact (swimming) public high school youth sporting events.

Results: A total of 726 youth sport participants and 139 spectators were observed. Mean total number of violations were higher at high-contact events (145.33 ± 68.86) compared to low-contact events (87.50 ± 35.42). The majority of violations involved social distancing and mask violations. Low-contact sporting events had more social distancing violations compared to high-contact events, 391 and 253, respectively. High-contact sporting events had a significant higher number of mask violations compared to low-contact events, 414 and 120, respectively (alpha value of 0.05, $p = .032$). No significant correlations were identified between violations to the guidelines at the observed youth sporting events and concurrent virus case rates.

Implications for practice: Results can guide future decision making related to youth sports, and by implication, other school-sponsored activities. Opportunities for educating the public by advanced practice nurses can improve adherence to health policies and thereby improve health outcomes.

The coronavirus disease 2019 (COVID-19) pandemic prompted schools to undergo substantial adaptations to all school-sponsored activities. In March 2020, as information became available regarding the virus's airborne spread to individuals in close contact, a Midwest county's officials ordered a lockdown of non-essential sectors of the community; the goal was to limit human contact and manage virus spread (Centers for Disease Control and Prevention [CDC], 2020; Saint Louis County Cares, 2020a). In response to the public health directive, school districts closed, suspending all in person classes and athletic events (Clancy, 2020).

At the start of the Fall 2020 school semester, only sports practices were permitted, according to county guidelines (Olmos, 2020). These restrictions were lifted in late September 2020 associated with a decline in virus cases. Low and moderate-frequency contact sports between high schools, such as swimming and volleyball, resumed (Banker, 2020). High-frequency contact sports, including football and basketball, resumed play between school districts by October of 2020 (Madaras & Millitzer, 2020).

Though continued engagement in sports activity remained permissible as winter sports started, the county COVID-19 cases were increasing. In mid-November 2020, the average number of daily cases was 643 (Saint Louis County Public Health, 2020b). This number is in comparison to 225 per day in August 2020 (Saint Louis County Public Health, 2020a).

Youth sporting events, as is true in other person-to-person contact, is a public health concern as infected youths can show little to no symptoms; thus, athletes may unknowingly spread the virus (Zimmerman & Nigel, 2020). Nonetheless, youth sports are essential for the well-being of adolescents. High-school-age youth benefit not only from

physical exercise but also improved mental health from social interactions experienced as part of a team (Pluhar, 2019). Unfortunately, the quarantining necessitated by the pandemic subsequently led to negative effects on youth's mental health, including depression, increased loneliness, nervousness, and irritability (Orgiles, Morales, Delvecchio, Mazzeschi, & Espada, 2020).

Risks related to COVID-19 infections vary between school districts because of an unequal distribution of resources between communities. A cross-sectional study conducted in Washington, D.C. found minority children from low-income communities had higher rates of COVID-19 compared with children from higher socioeconomic status (Goyal et al., 2020). Based on these data, income was used in this project as the primary sampling criterion. Six public high schools were selected based on high median household income and a school-based proxy measure for income, a low percentage of students eligible for free and reduced-price lunch (Snyder & Musu-Gillette, 2020) (Table 1). A companion project using the same methodology focused on six low-income zip codes as determined by income and free and reduced-price lunch eligibility.

To better understand the effects of school-based restrictions on youth sports, this project evaluated adherence to a Midwest county's Department of Public Health (DPH) *Youth Sports Guidelines*, published November 18, 2020, at high-income high school youth sporting events (Saint Louis County Cares, 2020b). The aim of the project was to identify level of adherence to posted *Youth Sports Guidelines* at six area high-income high schools over a two-month period. The primary outcome was number of violations to *Youth Sports Guidelines* at high-income high school youth sporting events. The question for this project was the following: During the COVID-19 pandemic, what is the impact of

local DPH *Youth Sports Guidelines* on high school sporting events during the winter sports season?

Review of the Literature

A comprehensive review of literature was performed to determine the current knowledge of COVID-19 and its effect on youth sports. Medline, CINAHL, Cochrane Library, and Google Scholar were utilized with key search words including the following: *youth sports, reopening schools, depression, anxiety, pathophysiology, transmission, and COVID-19*. The initial search produced 221 publications from Medline, 72 from CINAHL, 13 from Cochrane Library, and 54 from Google Scholar. Key search words were adjusted to find correlations between youth sports and other topics such as depression and COVID-19 and were limited to research studies involving pediatrics and adolescents. Inclusion criteria were publication dates from 2019 to 2020, sources from research articles or academic journals, and publications that included COVID-19 or variations of the name of the virus within the text. Publication dates prior to 2019 and studies involving other viral diseases were excluded. When inclusion criteria were applied to the search, publications were narrowed to 34 from Medline, nine from CINAHL, eight from Cochrane, and 35 from Google Scholar. Exclusion criteria further narrowed results to 23 from Medline, seven from CINAHL, three from Cochrane, and 15 from Google Scholar. Eleven research studies were selected in the review of literature.

Literature on transmission of the virus in children and adolescents has expanded since the start of 2020. A retrospective study completed in September 2020 of child care facilities in Salt Lake City, Utah, reported children, including those who are asymptomatic, play a significant role in transmitting the virus (Lopez et al., 2020).

Approximately 35% of infected children show no signs or symptoms of the virus at all (Zimmerman & Nigel, 2020). Since children can often be asymptomatic when infected, careful monitoring of activity, such as youth sports, was identified early as essential in preventing a silent spread of the disease. There is anticipation COVID-19 transmission will be better controlled now that the COVID-19 vaccine is available to pediatrics. On December 11, 2020, Pfizer-BioNTech COVID-19 vaccine was authorized by the United States Food and Drug Administration (U.S. FDA) for emergency use and on May 10, 2021, the authorization was expanded to include all persons 12 years and older (U.S. FDA, 2021). Pfizer-BioNTech expects to be ready to submit for an emergency use authorization for children 2-11 years old by September 2021 (Pfizer, 2021).

Though results from the literature are conflicted regarding transmission in children, prevention guidelines for children are largely consistent. Social distancing, mask-wearing, and sanitization of hands and frequently touched surfaces are the key precautions associated with mitigating the transmission of COVID-19 (CDC, 2020). Failure to abide by prevention guidelines continue to be associated with spread of the virus. Observations of an outbreak at a Georgia youth camp during the pandemic concluded a lack of adherence to social distancing and mask-wearing guidelines was associated with the uncontrolled spread of the virus (Szablewski et al., 2020). Failure to properly sanitize hands and frequently touched surfaces are another factor found to contribute to the spread of the virus. An investigation of a cluster of cases connected to a squash court in Slovenia suggested the virus can be transmitted through indirect contact by touching a contaminated object and then touching the eyes, nose, or mouth; results indicate sanitization of hands and frequently touched surfaces could prevent spread of the

virus (Brlek, Vidovič, Vuzem, Turk, & Simonović, 2020). These early studies suggest adherence to fundamental guidelines during sports activities are strategic to mitigate transmission from student athletes and to ultimately keep youth sporting activities open during the pandemic.

The Midwest county's DPH determines guidelines for school districts on participation in youth sports (Saint Louis County Cares, 2020b). Guidelines from November 2020, which remained in effect throughout the data collection period, included guidance on masks wearing, social distancing of six feet, limiting two spectators per athlete, disinfecting shared equipment between use and play period, prohibiting spectators from congregating, hand greetings, team huddles, and sharing water bottles. School districts are required to submit a plan to DPH for approval in order for sports teams to be able to compete against other schools (Saint Louis County Cares, 2020b). The school plan must outline methods schools use to screen and quarantine individuals as needed, implement COVID-specific safety measures, comply with contact tracing, and manage and limit spectators at indoor and outdoor events.

The John Hopkins Nursing Evidence-Based Practice Model guided development and implementation of this clinical scholarship project (CSP). This model uses three components, *inquiry*, *practice*, and *learning* (Dang & Dearholt, 2018). *Inquiry* involves formulation of questions and ideas to identify opportunities for improvement. This included creating a data collection plan integrating DPH guidelines used to determine if these guidelines were followed during youth sporting events. Because this project was evaluating implementation of *Youth Sports Guidelines*, a summative evaluation framework was used. Summative evaluation provides valuable feedback on program

performance, in this case information about realistic use of DPH guidelines, whether or not guidelines were followed, and potential barriers to guideline implementation (Rossi, Lipsey, & Henry, 2019). *Practice* are the procedures implemented based on what is known about COVID-19 guidelines, determined in this CSP by on site observations and existing data. The final component, *learning*, is the knowledge gained by translating observations and archived data related to guideline adherence into documentation of guideline adherence during selected sporting events, expressed as a total number of violations (Dang & Dearholt, 2018). A description of adherence to guidelines served as the primary outcome, revealing what was learned in regard to implementation of *Youth Sports Guidelines* at youth sporting events.

Methods

Design

This project used an observational descriptive design. Participants and spectators were observed to determine the degree to which individuals practiced strategies outlined in the *Youth Sports Guidelines* to mitigate the spread of the virus. Complaints received by DPH in regard to youth sports were collected to evaluate potential reasons for non-adherence to guidelines.

Setting

The setting was youth sports events in six high-income public high schools in a Midwest county. High-income high schools were defined as public high schools serving zip codes with household median incomes greater than $106,000 and public high schools where eligible students who receive free and reduced lunch make up less than 18% of the

student body (Table 1). Sporting events observed were a high-frequency contact sport, basketball, and a low-frequency contact sport, swimming.

Sample

The sample assessed were all individuals involved in public high school sports that serve six high-income zip codes as identified in the setting (Table 1). Inclusion criteria were coaches, officials, spectators, and male and female adolescent athletes in attendance at the youth sporting event being observed. Exclusion criteria were individuals not affiliated with the youth sporting event, such as students passing through the gym or maintenance workers.

Procedures

Based upon DPH *Youth Sports Guidelines*, an instrument using selected key elements of the guidelines was developed and used to determine level of adherence at youth sporting events. Inter-rater reliability was evaluated prior to data collection to determine the degree of consistency in scoring observations (McHugh, 2012). Baseline inter-rater reliability at a local retail company was established after four pretests; scoring difference were discussed to bring about consensus between observers. Final testing reached 95% consistency. Two observers monitored each event for a continuous period of 30 minutes, with one observer monitoring spectators, officials, and coaches and the other observer monitoring athletes. In the event observers were not allowed to attend the event, observers collected data via livestream.

Public high schools were coded using letters A through F. Coaches, athletes, and officials were defined as participants to assure anonymity. Indicators observed and tallied as violations included: social distancing of approximately less than six feet, improper

mask wearing, fist bumps/high-low fives, handshakes, team huddles, sharing water bottles, sharing equipment without disinfecting between use or play period, and spectators congregating.

Data Collection/Analysis

A total of twelve youth sporting events were observed: one low-frequency contact and one high-frequency contact sporting event from each of the six high-income high schools. School districts' proposed plans submitted to DPH were compared to county guidelines. Data were evaluated for correlations between COVID-19 infection rates and level of adherence to guidelines at sporting events within school districts using a line chart. Adherence to guidelines between low-frequency and high-frequency contact sports was compared and displayed using bar chart.

Approval Processes

Five levels of approval were obtained prior to start of data collection. These included the Midwest county's DPH, high school athletic directors, student's doctoral committee, University of Missouri St. Louis (UMSL) Graduate School, and UMSL Institutional Review Board. There were no ethical concerns identified.

Results

Observers attended twelve youth sporting events at six high-income high schools between December 17, 2020, and February 3, 2021. A total of 726 participants and 139 spectators were observed; number of participants observed at sporting events ranged from 26 to 111 with a mean of 60.5; number of spectators observed ranged from zero to 49 with a mean of 11.58 (Table 1). The majority of students at the six high schools were

white, making up 58-87% of the high schools (Table 1). Black students made up 6-16% and Asian students 2-15% of students at high schools (Table 1).

Mean total number of violations to *Youth Sports Guidelines* were higher at high-contact events (145.33) compared to low-contact events (87.50). There was no statistical significance comparing high and low, using two-tailed independent samples *t*-test analysis [alpha value of 0.05, $t(10) = 1.83$, $p = .097$] (Table 2). The majority of total violations involved social distancing (46%) and mask violations (38%); therefore, further analysis focused on these violations. Social distancing violations were not statistically significant when comparing high and low-contact events, using two-tailed independent samples *t*-test ($p = .182$) (Table 2). Mask violations between high and low-contact events were statistically significant, using two-tailed independent samples *t*-test [alpha value of 0.05, $t(10) = 2.48$, $p = .032$]. High-contact sporting events had a higher number of mask violations than low-contact sporting events (Table 2).

A Pearson correlation analysis found no significant correlations between adolescent COVID-19 infection rates within school districts and the total number of violations (alpha value of 0.05, $p = .122$). Pearson correlation analysis between the county's COVID-19 infection rates and total violations found no statistical significance ($p = .192$). The total number of COVID-19 cases in the county decreased 50% from the beginning of the project period, December 17, 2020, with 600 cases to the end of the project period, February 3, 2021, with 302 cases (Saint Louis County Cares, 2021). Each of the school district's plans were reviewed and all components were indistinguishable from one another. It appeared that school districts submitted the same plan to DPH. Five formal complaints were received during the project period related to youth sporting

events. One complaint was related to an athlete not being able to breath properly while wearing a mask and engaging in sports. The remaining four complaints were from residents concerned that *Youth Sports Guidelines* were not being followed at youth sporting events, citing observations that some individuals were not wearing masks or social distancing.

Discussion

The *Youth Sports Guidelines* impacted the way in which public high schools conducted youth sporting events during the COVID-19 pandemic. Observers noted guidelines were instituted, yet frequent violations still occurred. This study was not able to establish a correlation between total number of violations and the adolescent rate of COVID-19 infection within sampled school districts.

Two of the most frequent violations during swimming events observed were social distancing violations (74.48%) and mask violations (22.68%). Swimmers were instructed to wear their masks until they were ready to enter the pool, at which point masks were placed in a designated spot. After swimmers exited the pool, they dried their face with a towel and donned their face mask. Observers noted face mask and social distancing violations often occurred when swimmers removed their masks and stood closely together in groups as the pool was being prepared for the diving event. In some cases, swimmers did not adequately social distance due to the number of swimmers in a small area, congregating between the edge of the pool and the wall of the pool area.

Mask violations made up a majority of the total violations (47.48%) at basketball games, followed by social distancing violations (29.01%) and hand greetings (15.37%). Some of the basketball athletes were observed wearing their face masks incorrectly on

their chins. Often masks would fall down the athlete's face while running up and down the court. Some athletes and coaches were also observed pulling down their face masks to yell or cheer. Frequently, when a player made a basket or athletes switched out during the game, players would make contact with each other in the form of a hand greeting such as a fist-bump or low-five. Social distancing violations occurred as athletes and coaches stood next to or pulled chairs closer to each other to communicate in the loud gym. There were no significant trends in violations between high schools. Some high schools recorded higher total number of violations in high-contact sports, while others totaled a higher number of violations in low-contact sports, an unpredictable variation. Results indicate no correlation between violations to the guidelines at youth sporting events and concurrent COVID-19 case rates. However, correlating infection rates with sporting event exposure is subject to many confounders, not accounted for in this project.

Limitations to the study include the possibility observers did not observe every violation that occurred due to participants and spectators moving about the youth sporting event and only having two observers. Four of the twelve youth sporting events were livestreamed due to a lack of onsite access. This limited observers' ability to view the entire gym. There was a lower number of spectators than anticipated because participating high schools did not allow spectators at youth sporting events until January 19, 2021 (St. Louis Suburban Public High School Athletic and Activities Association, 2021). By this date, observers attended six games, starting December 17, 2020, despite the DPH permitting spectators at youth sporting events as outlined in the *Youth Sports Guidelines* (Saint Louis County Cares, 2020b). The project was further limited by the short-time frame of the data collection period and lack of access to a total count of daily

COVID-19 cases per high school studied. A longer study period in addition to total number of COVID-19 cases specific to high school studied may have shown correlations between COVID-19 infection rates and violations to guidelines. Therefore, recommendations for further study address these limitations, including recruiting more observers, increasing the time frame of the project, and obtaining better methods to track COVID-19 cases specific to adolescents within individual high schools. Future studies may benefit by observing other sporting events, such as baseball and soccer, to determine potential barriers to adhering to *Youth Sports Guidelines* at outdoor events.

Conclusion

Youth sports are essential for the well-being of adolescents, particularly in a time when adolescent's mental health is threatened by negative impacts of the COVID-19 pandemic. However, youth sports are a public health concern for transmission of COVID-19. This study found that DPH's *Youth Sports Guidelines* were not successfully executed during youth sporting events. DPH will be able to use this information for future decision making related to youth sports activities. In addition, advanced practice nurses will be able to advocate alongside DPH for health policies that address barriers to adhering to guidelines, including guidance on properly fitting masks for athletes during vigorous sporting activity, public funding for modifications to youth sports areas so that adequate social distancing may occur, and the requirement of vaccination for athletes. This study furthermore highlights the importance of advanced practice nurses engaging in public health concerns and educating on the necessity of adherence to health policies.

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Table 1

High School Demographics of High-Income Zip Codes

High School	A	B	C	D	E	F
Race/Ethnicity						
White	70%	60%	77%	58%	87%	77%
American Indian/Alaska Native	0.2%	0.2%	0.2%	0.4%	0.3%	0.1%
Asian	14%	15%	2%	15%	2%	8%
Hispanic	4%	5%	4%	6%	3%	3%
Black	10%	15%	13%	16%	6%	11%
Native Hawaiian/Pacific Islander	0.04%	0	0	0	0.2%	0
Area Median Household Income	$106,250	$178,000	$140,658	$192,500	$106,000	$132,221
Free and Reduced-Price Lunch Eligible Students	15%	17%	12%	8%	11%	11%
Gender						
Male Sporting Events	0	0	1	1	1	0
Female Sporting Events	2	2	1	1	1	2
Contact Frequency						
High Contact (Basketball) Events	1	1	1	1	1	1
Low Contact (Swimming) Events	1	1	1	1	1	1
Total Participants (High-Contact)	111	38	36	36	67	66
Total Participants (Low-Contact)	70	56	26	53	73	94
Total Spectators (High-Contact)	0	0	49	49	0	30
Total Spectators (Low-Contact)	11	0	0	0	0	0

Note. Data on median household income reported in 2019 from United States Census Bureau (2020). Data on race/ethnicity and free and reduced-price lunch eligible students reported in 2019-2020 school year from National Center for Education Statistics (2020).

Table 2

Independent t-Test for Violations by Contact Frequency

	High Contact		Low Contact				
	Mean	Standard Deviation	Mean	Standard Deviation	*t*- value	*p*- value	Cohen's *d*
Total Violations	145.33	68.86	87.50	35.42	1.83	.097	1.06
Participant Social Distancing Violation	39.67	33.35	64.50	26.22	-1.43	.182	0.83
Participant Mask Violation	66.83	43.06	19.67	17.53	2.48	.032*	1.43

Note. Two-tailed independent samples *t*-test results indicate mean of total violations to the *Youth Sports Guidelines* were not significantly different between the high-contact and low-contact sporting events based on an alpha value of 0.05, $p = .097$. Mean participant social distancing violations to *Youth Sports Guidelines* were not significantly different between high-contact and low-contact sporting events based on an alpha value of 0.05, $p = .182$. Mean participant mask violations to *Youth Sports Guidelines* were significantly different between high-contact and low-contact sporting events based on an alpha value of 0.05, $p = .032$.

*$p < .05$