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COVID-19 Planning in United States Adolescent Sports: A Survey of 1880 Organizations Representing More Than 500 000 Youth Athletes

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Context: High schools and youth sport organizations that restarted participation in the fall of 2020 during the COVID-19 pandemic relied on information sources to develop risk-mitigation procedures.

Objective: To compare the risk-mitigation procedures and information sources used by high school athletic departments and youth sport organizations.

Design: Cross-sectional study.

Setting: Surveys of high school and youth sport organization programs from across the United States.

Patients or Other Participants: A total of 1296 high schools and 584 youth sport organizations, representing 519 241 adolescent athletes, responded to the surveys.

Main Outcome Measure(s): Surveys regarding restarting sport, COVID-19 cases, risk-reduction procedures, and the information sources used to develop risk-reduction plans in the fall of 2020 were distributed to high school athletic directors and youth sport directors throughout the United States. The proportions of high schools and youth sport organizations using different risk-reduction procedures and information sources were compared using the χ^2 test.

Results: High schools used more risk-reduction procedures than did youth sport organizations (high schools = 7.1 ± 2.1 versus youth sport organizations = 6.3 ± 2.4; $P < .001$) and were more likely than youth sport organizations to use symptom monitoring (high schools = 93% versus youth sport organizations = 85%, $\chi^2 = 26.3$; $P < .001$), temperature checks on site (66% versus 49%, $\chi^2 = 53.4$; $P < .001$), face masks for athletes during play (37% versus 23%, $\chi^2 = 38.1$; $P < .001$) and when off the field (81% versus 71%, $\chi^2 = 26.1$; $P < .001$), social distancing for staff (81% versus 68%, $\chi^2 = 43.3$; $P < .001$) and athletes off the field (83% versus 68%, $\chi^2 = 57.6$; $P < .001$), and increased facility disinfection (92% versus 70%, $\chi^2 = 165.0$; $P < .001$). Youth sport organizations relied more on information from sport national governing bodies than did high schools (youth sport organizations = 52% versus high schools = 10%, $\chi^2 = 411.0$; $P < .001$), whereas high schools were more likely to use information from sources such as the National Athletic Trainers' Association (high schools = 20% versus youth sport organizations = 6%, $\chi^2 = 55.20$; $P < .001$) and the National Federation of State High School Associations (high schools = 72% versus youth sport organizations = 15%, $\chi^2 = 553.00$; $P < .001$) for determining risk-reduction strategies.

Conclusions: High schools and youth sport organizations reported using a broad range of risk-reduction procedures, but the average number was higher among high schools than youth sport organizations. Use of information from the Centers for Disease Control and Prevention and local health authorities was high overall, but use of information from professional health care organizations was low. Professional health care organizations should consider using additional measures to improve information uptake among stakeholders in youth sports.

Key Words: infections, pediatric athletes, SARS-CoV-2

Key Points

- High school and youth sport organizations that restarted participation in the fall of 2020 during the COVID-19 pandemic used a wide variety of risk-mitigation procedures.
- Compared with youth sport organizations, high school programs relied on a greater variety of risk-reduction procedures.
- Use of information from the Centers for Disease Control and Prevention and local health authorities for guidance regarding risk-reduction procedures was high overall, but use of information from professional health care organizations was low.

The SARS-CoV-2 virus (COVID-19), which was declared a global pandemic in March 2020, reduced children's ability to attend school, play sports, and participate in other social activities. Subsequently, aggressive public health measures were taken in the United States; many schools across the country closed their doors, school instruction was widely switched to a remote model, and youth sports were nearly universally cancelled. School closures and suspensions of extracurricular activity were undertaken in an effort to mitigate the spread of COVID-19, but emerging evidence suggests that children and adolescents were a particularly vulnerable population to

Table. Risk-Reduction Procedures and Information Sources Listed in Surveys

Risk-Reduction Procedures	Information Sources Used
• Player/staff symptom monitoring	• Local health authority guidelines or restrictions
• Player/staff temperature checks at home	• Centers for Disease Control and Prevention
• Player/staff temperature checks on site	• American Academy of Pediatrics
• Face mask use for players while playing	• American Medical Society for Sports Medicine
• Face mask use for players off the field	• National Athletic Trainers' Association
• Face mask use for staff	• National Federation of State High School Associations
• Social distancing for players off the field	• Sport national governing bodies (eg, USA Volleyball, USA Swimming)
• Social distancing for staff	• Other (fill in)
• Increased facility disinfection	
• Staggered arrival and departure times for events	
• Other (fill in)	

disruptions of social and educational support.[1] In fact, widespread school closures were not substantial contributors to the risk of disease spread,[2] whereas other risk-mitigation techniques, such as social distancing and the use of masks, reduced spread.[3] The suspension of social activities for children was widespread, resulting in nearly a full year of limited physical activity and social interaction.

Children tended to have milder physical effects of COVID-19 than adults; the incidence of death from COVID-19 in children was 0.01%, compared with 1.8% in adults.[4] However, early studies[5–8] during the COVID-19 outbreak supported an increased risk of children and adolescents developing posttraumatic stress disorder and depressive and anxiety symptoms during the public health-related closures during the pandemic. Emerging evidence indicated that transmission during sport was rare and the use of proper risk-mitigation techniques reduced the risk of transmission.[9,10] In their survey-based study of US youth soccer players conducted in the fall 2020, Watson et al[9] found that the COVID-19 incidence among youth athletes was relatively low compared with the background incidence among US children in the summer 2020. In a survey of 13 002 US adolescent athletes in the summer 2020, McGuine et al[11] observed that high school students who played a sport during the COVID-19 pandemic reported fewer symptoms of anxiety and depression and better quality of life than did those who did not play a sport.

Safe returns to in-person school, sport participation, and daily activities for adolescents and children were one of the main goals for successful management of and response to the COVID-19 pandemic, and multiple organizations created recommendations and guidelines for these goals. The COVID-19 risk-mitigation strategies were often based on guidance from health authority sources, including local health authority guidelines or restrictions from the Centers for Disease Control and Prevention (CDC), American Academy of Pediatrics (AAP), American Medical Society for Sports Medicine (AMSSM), National Athletic Trainers' Association (NATA), National Federation of State High School Associations (NFHS), and sport national governing bodies.[12–14]

Metrics and policies regarding reopening schools and programs for US youth varied widely, and the sources from which youth sport organizations were drawing guidance in relation to reinitiating sport participation was unknown. Further complications arose because communication chaos regarding proper procedures was documented across many industries.[15] Professional health care organizations should consider additional measures to improve information uptake among stakeholders in youth sports. The purpose of our study was to compare the risk-mitigation procedures used and information sources used by US high school athletic departments and youth sport organizations.

METHODS

Procedures

In September and October 2020, we distributed surveys to high school athletic directors and coaching directors of youth sport organizations nationwide regarding their COVID-19 risk-mitigation procedures and the information sources that were used to develop their risk-reduction plans (Table). Risk-mitigation procedures and information sources were collected as of August 2020 from multiple sources of guidance, including local health authorities, national organizations (CDC, AAP, AMSSM, NATA, and NFHS),[16] and sport national governing bodies (US Olympic & Paralympic Committee, US Soccer). Given the lack of centrally accepted and universally agreed-upon guidelines at that time for the safe return to sport, the risk-mitigation procedures included in the survey were based on the most commonly recommended procedures and our expert opinion. Surveys were delivered electronically via a customized survey platform (Qualtrics) hosted by the University of Wisconsin Department of Orthopedics and Rehabilitation. The same survey was used in August 2020 in a nationwide youth soccer data collection.[9] We separated survey results into high school and youth sport organization responses.

The data were collected anonymously and did not include any identifiable information about individual athletes, so informed consent was not deemed necessary, and the study was exempt from formal review by the Institutional Review Board at the University of Wisconsin. It was approved by the Institutional Review Board of the University of Wisconsin, Madison.

Statistical Analysis

Data were presented as mean ± SD, median, and interquartile range (IQR) for continuous variables and count (proportion) for categorical variables. The number of respondent organizations was aggregated by state, and the nationwide distribution was illustrated using heat maps. The number of risk-mitigation procedures of high school and youth sport organizations was compared using the Wilcoxon rank sum test. The proportions of high schools

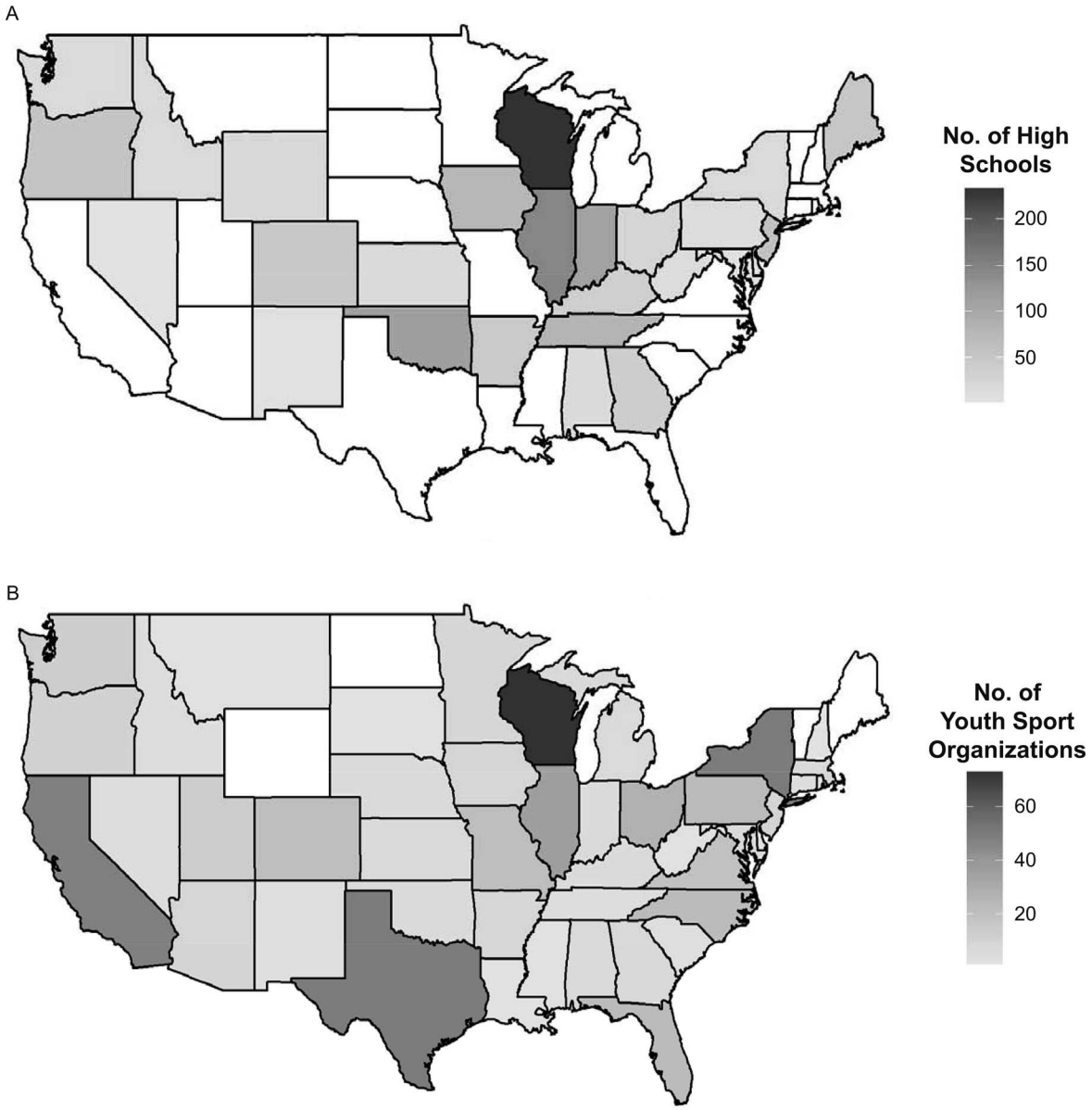

Figure 1. Heat map of geographic distribution of survey responses from A, high school programs, and B, youth sport organizations.

and youth sport organizations that reported using different procedures and information sources were compared using the χ^2 test. The associations between the reported use of different information sources and different risk-mitigation procedures were evaluated using Spearman correlations and presented as correlograms. The α level was set a priori at .05, and all analyses were performed using R (version 4.0.3; The R Foundation).[17]

RESULTS

A total of 1296 high schools and 584 youth sport organizations responded, representing 519 241 athletes from 44 states (Figure 1). Youth sport organizations each represented only 1 sport, and high schools represented 6.6 $\pm$ 3.8 sports (median = 6, IQR = 4–6). The mean number of students at high schools in the sample was 626 $\pm$ 666 (median = 388, IQR = 388–605), and the mean number of athletes at youth sport organizations was 501 $\pm$ 2450 (median = 160, IQR = 160–332). A total of 1874 (99.7%) high school and youth sport programs had formal risk-reduction plans in place. High schools had more risk-reduction procedures than did youth sport organizations (high schools = 7.1 $\pm$ 2.1 versus youth sport organizations = 6.3 $\pm$ 2.4; $P < .001$; Figure 2A). High schools were more likely to use symptom monitoring (high schools = 93% versus youth sport organizations = 85%, $\chi^2 = 26.30$; $P < .001$), temperature checks on site (66% versus 49%, $\chi^2 = 53.40$; $P < .001$), face masks for athletes while playing (37% versus 23%, $\chi^2 = 38.10$; $P < .001$) and when off the field (81% versus 71%, $\chi^2 = 26.10$; $P < .001$), social distancing for staff (81% versus 68%, $\chi^2 = 43.30$; $P < .001$) and athletes off the field (83% versus 68%, $\chi^2 = 57.60$; $P < .001$), and increased disinfection (92% versus 70%, $\chi^2 = 165.00$; $P < .001$) but were less likely to use staggered arrival and departure times (41% versus 66%, $\chi^2 = 106.00$; $P < .001$) than were youth sport organizations. Youth sport organizations relied more on information from sport national governing bodies than did high schools (youth

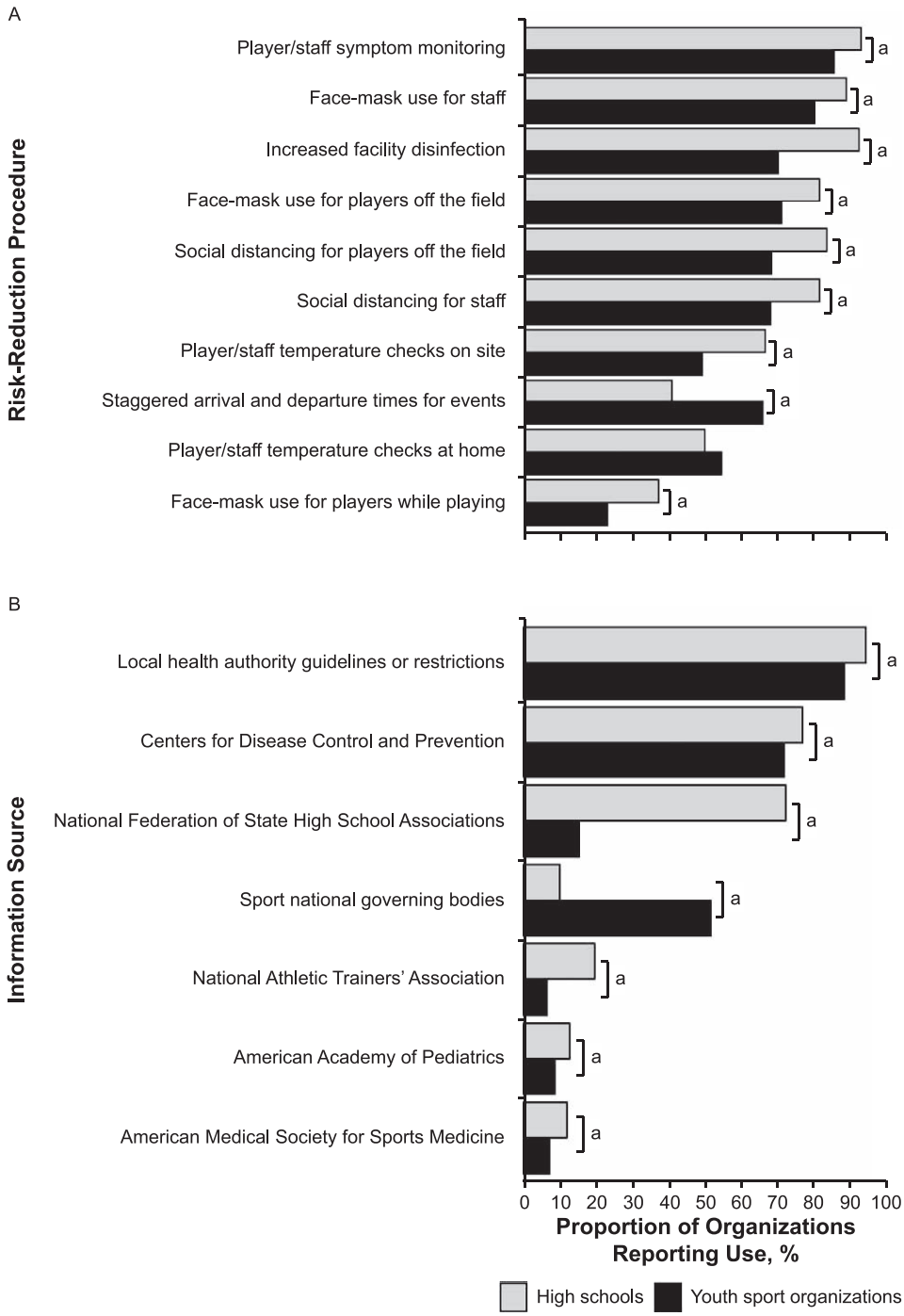

Figure 2. A, Risk-reduction procedures, and B, information sources used by high school sports programs and youth sport organizations.
[a] **significant results ($P < .05$)**

sport organizations = 52% versus high schools = 10%, $\chi^2 = 411.0$; $P < .001$). High schools were more likely to use information from local health authorities (high schools = 95% versus youth sport organizations = 89%, $\chi^2 = 21.00$; $P < .001$), the CDC (77% versus 72%, $\chi^2 = 5.47$; $P = .02$), AAP (13% versus 9%, $\chi^2 = 6.68$; $P = .01$), AMSSM (12% versus 7%, $\chi^2 = 10.00$; $P = .002$), NATA (20% versus 6%, $\chi^2 = 55.20$; $P < .001$), and NFHS (72% versus 15%, $\chi^2 = 553.00$; $P < .001$) for determining risk-reduction strategies (Figure 2B). Relationships among risk-reduction procedures used by high school and youth sport programs are shown in Figures 3 and 4, respectively.

DISCUSSION

Responses to the survey represented youth athletes from across the United States who had reinitiated sport participation in the fall of 2020. High schools and youth sport organizations responded from 44 US states, representing 519 241 high school and youth sport athletes. We found that both high school and youth sport programs used a broad range of risk-reduction procedures, but the average

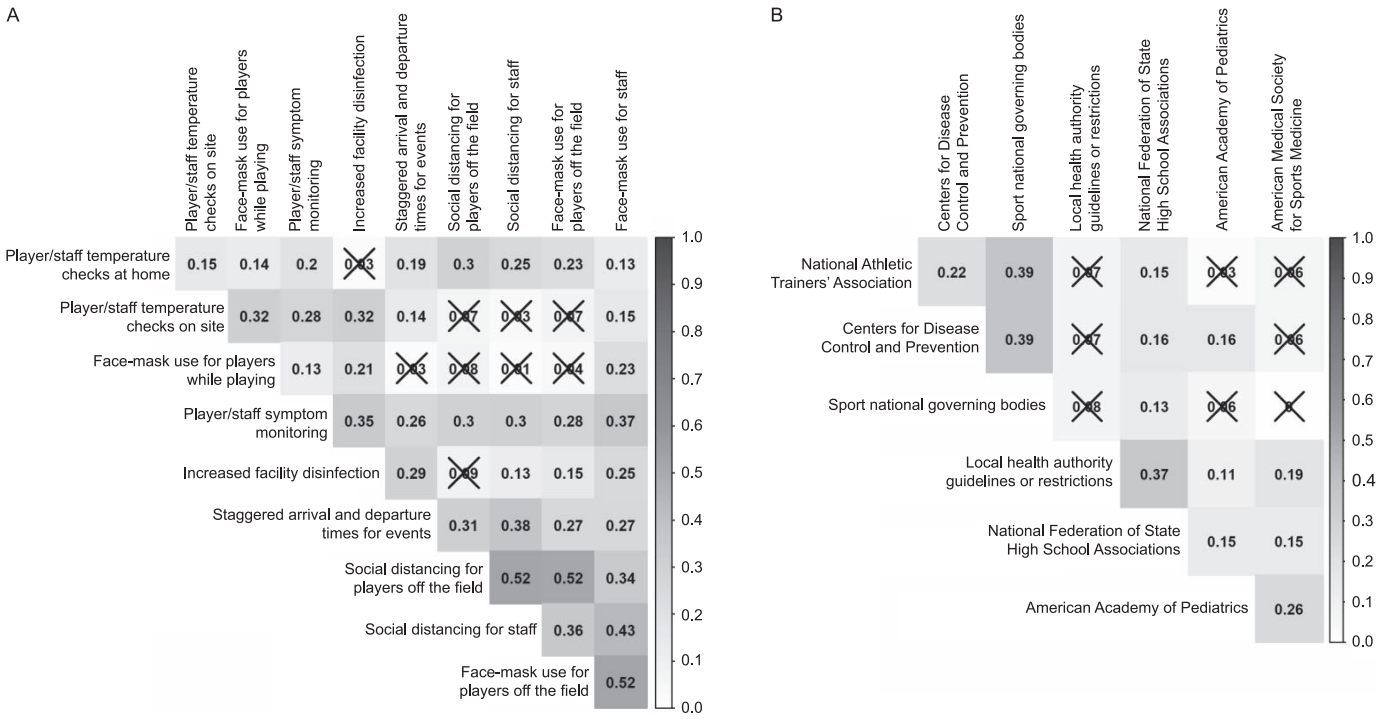

Figure 3. Correlogram of correlation coefficient, A, among procedures used, and B, among information sources in high school programs. Shading is scaled to the size of the correlation coefficient. Relationships with $P > .001$ are overlaid with a cross.

number used was greater among high schools than youth sport organizations. Use of information from the CDC and local health authorities was high overall, whereas use of information from professional health care organizations was relatively low. High school programs were more likely to rely on guidance from the NATA and NFHS, whereas youth sport organizations relied more on sport national governing bodies (US Olympic & Paralympic Committee, US Soccer; Figure 2B).

The transmission rate of COVID-19 was known to be reduced when multiple mitigation procedures, including community mask wearing, hand washing, and social distancing, were used.[18,19] However, the risk of transmission during sport participation was widely debated, and the

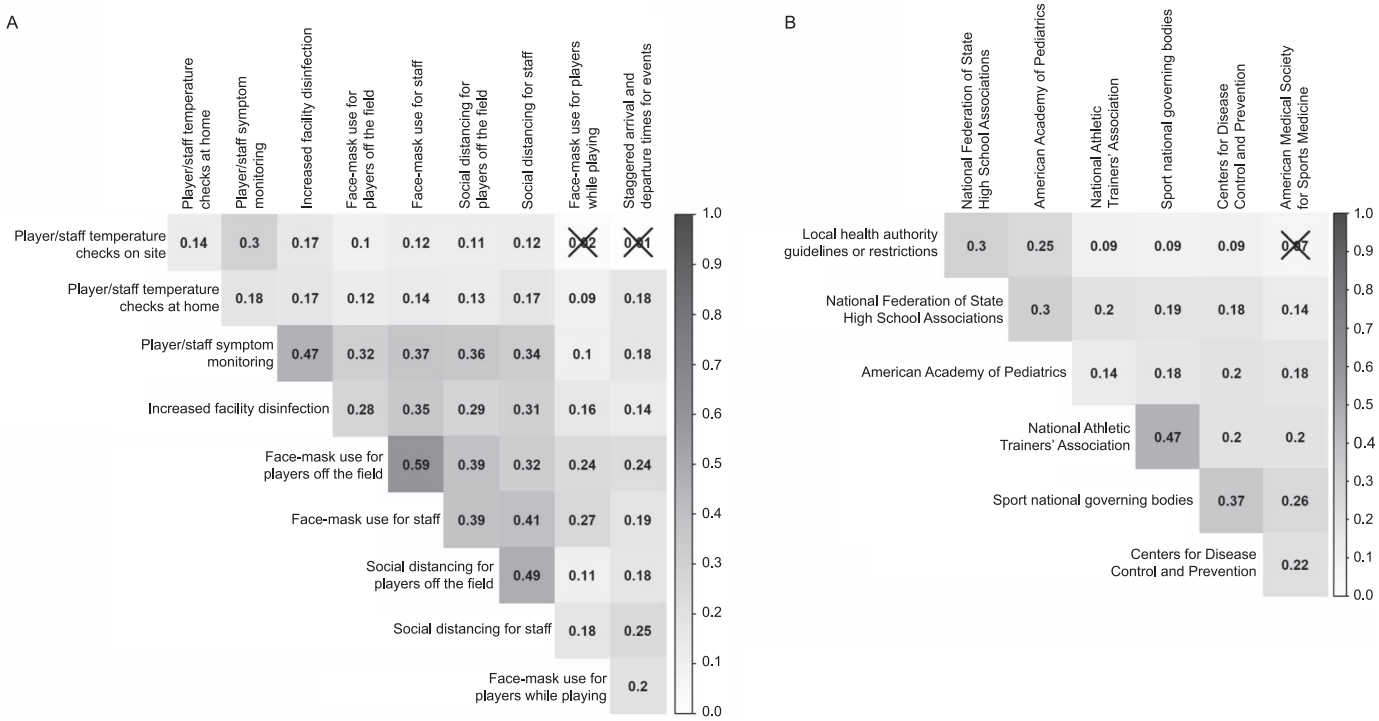

Figure 4. Correlogram of correlation coefficient, A, among procedures used, and B, among information sources in youth sport organizations. Shading is scaled to the size of the correlation coefficient. Relationships with $P > .001$ are overlaid with a cross.

use of risk-mitigation procedures was inconsistent across organizations and teams. We noted that high schools used more risk-mitigation methods than did youth sport organizations except for staggered arrival and departure times. Nearly every responding youth sport organization and high school reported developing and using a formal plan to mitigate the spread of COVID-19, and most high schools and youth sport organizations reported using multiple risk-reduction procedures. Among high schools and youth sport organizations, similar risk-reduction procedures were most commonly used for both players and staff. For example, face mask use for players off the field was most commonly associated with face mask use for staff, and social distancing for players off the field generally was paired with social distancing for staff. These results were encouraging, as similar strategies were used to reduce the risk of the spread of COVID-19 in schools[2] and youth sport settings.[10] Athletic trainers (ATs) should be aware of which strategies youth sport organizations are using and should be involved in selecting and implementing COVID-19 mitigation strategies.

Information sources for COVID-19 risk-mitigation procedures were widespread and conflicting, with no central resource for guidance. Most youth sport organizations and high schools (>90%) reported using information from local health authorities, followed by guidance from the CDC, suggesting that schools and organizations working with youth relied more on local sources of information than on national ones. In fact, specific recommendations and resources for youth and high school sports in relation to risk-mitigation and return-to-play procedures were lacking in the literature, and this was likely because athletic participation in this age group was locally regulated almost universally and standardization was more challenging to monitor.[20] In its recommendations published in May 2020, the NFHS acknowledged that youth sport participants would be less likely to undergo COVID-19 testing.[16] Interestingly, high schools reported more reliance on a greater variety of sources of information compared with youth sport organizations except for sport national governing bodies, with high schools more likely to use information from the NATA and NFHS. This is unsurprising given that in a national survey of high school athletic programs, 70% of responding public secondary schools reported providing ATs at games or practices, and one-third of schools reported having full-time ATs on staff.[21] This may suggest that youth sport organizations were less likely to employ ATs who would rely on the NATA and NFHS for COVID-19 regulation guidance, national organizations were less likely to be successful in providing a visible and central resource for youth sport organizations, and youth sport organizations looked instead to their individual sport governing bodies for guidance. Our survey did not explore the use of information sources by these governing bodies, but no concurrent guidance was centrally followed for the return to higher-level sport.[22]

Participation in sports and social activities confers multiple physical and mental health benefits, particularly for children and adolescents.[23–26] In a 2020 report of youth athletes, McGuine et al[11] found that individuals who participated in high school sports during the pandemic reported less anxiety and depression and better quality of life than those who did not. Given the substantial risks associated with the community spread of COVID-19, it is imperative that organizations offering sport participation for youth have reliable and up-to-date sources of information for risk-mitigation procedures. The field of athletic training encompasses preventing, evaluating, and managing injuries in the athletic environment, where ATs are critical staff members, to ensure that athletes are safe. With a greater emphasis on incorporating research evidence more fully in clinical practice, ATs were relying more on using the professional literature to help guide procedures within teams and organizations.[27] This research indicated that certain types of organizations may have needed to consider methods to improve the dissemination and implementation of appropriate guidance for ATs and organizations to promote safe and healthy sport participation for youth athletes.

Limitations

Our study had limitations. The differences between high school and youth sport organizations may have been due to geographic distribution, the specific sports represented, the age of participants, or the available resources, all of which could have influenced risk-mitigation practices. It is also unknown whether the reporting represented the true use or compliance of member teams. We were unable to evaluate the reasons behind using different information sources or how local guidelines influenced the implementation of certain risk-reduction procedures. Furthermore, our surveys were distributed in early fall of 2020, when little uniform guidance for risk-mitigation procedures was available, and thus, we relied on a collection of sources and our own expert opinion to guide the selection of procedures in our survey. Our study was not designed to collect risk-mitigation procedures and information sources for the high schools in general; therefore, we could not directly compare the high school procedures and sources with those used by the high schools separate from the athletic programs. Because high school surveys were distributed to state associations and those associations chose to distribute them to member schools at their own discretion, high schools may not have received the surveys, and we had no way to verify this. On the other hand, youth sport organization surveys were delivered via a combination of organizations directly to member organizations and may have had a more even distribution throughout the country.

The sample size and survey responses represented >500 000 youth athletes in the United States; however, the distribution of survey responses from high school sports programs was not as wide as that for youth sport organizations—the largest number of responses was from high schools and organizations in Wisconsin. The lack of a better-distributed sample for high school programs may have been a limitation for underrepresented student-athlete populations and sports.

CONCLUSIONS

High schools and youth sport organizations in the United States reported using a broad range of risk-reduction procedures to reduce the COVID-19 risk. Although high schools reported a greater number of risk-reduction procedures on average, this may have been due to differences in available resources and facilities, geographic distribution, participant ages, or types of sports offered. Use

of information from the CDC and local health authorities was high overall, while use of information from professional health care organizations was relatively low. Professional health care organizations should consider using targeted measures to improve information uptake among stakeholders in youth sport regarding COVID-19 risk reduction.

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