COVID-19 Knowledge and Behavior Change among High School Students in Semi-Rural Georgia

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ABSTRACT

BACKGROUND: Many schools transitioned online to reduce viral spread and promote social distancing amid the COVID-19 pandemic. Remote learning may impact health behaviors and coping strategies among adolescents, including reduced physical activity and increased screen time. Social media and peers provide information about the pandemic to adolescents and may influence prevention behaviors. This study aims to assess adolescent knowledge and information about COVID-19, determine students’ behavior change, and identify sources students turn to for information on the pandemic.

METHODS: Students from 2 high schools in semi-rural Georgia participated in a cross-sectional online survey in March 2020 (N = 761).

RESULTS: Common sources for COVID-19 news were peers (80%) and social media (58%). Few adolescents (3%) indicated that teenagers were at higher risk of severe illness due to COVID-19. Responses reveal adolescents understand social distancing and many are participating in prevention behaviors, including handwashing (87%) and staying at home as much as possible (87%). Most respondents reported increases in screen time outside of class (82%).

CONCLUSIONS: Findings suggest adolescents are obtaining COVID-19 knowledge from various sources, including social media, with varying degrees of implementation of prevention practices. Increases in screen time and reduced physical activity may impact long-term health among adolescents.

Keywords: child and adolescent health; health communication; public health; COVID-19; coronavirus; rural health.

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Adolescents are at a pivotal stage in their development of viewpoints on social issues, which may be directed by household opinions, their social network, and the media they consume. Studies suggest that a high number of adolescents are engaging with COVID-19-related news and media. The MyVoice national survey conducted by the University of Michigan in May 2020 reported that half of adolescents and young adults receive news on COVID-19 from media sources that tend to be geared toward an adult audience. In addition, the acceptance of wearing masks and adherence to social distancing may be related to the news source(s) they follow. Information on the pandemic and other news can also be communicated directly from family members to adolescents, or through social media sources. Many adolescents are turning to social media platforms to access information, or possibly misinformation, about health-related topics and COVID-19. More information is needed on how adolescents obtain COVID-19 knowledge and to what extent they understand and act on public health recommendations.

Many adolescents report taking steps toward reducing the viral spread and adopting pandemic prevention behaviors. Adolescents generally follow and accept handwashing, disinfecting, and other health behavior guidelines, although there may be differences in adherence depending on the adolescent’s perception of risk of infection and severity of the illness to themselves and their family. Adolescents are more likely to perceive themselves to be at low risk for COVID-19 and therefore may be less likely to abide by strict social distancing guidelines.

The decision to conduct school in-person or remotely continues to be a point of contention and decision-makers must weigh the risks of viral spread with the importance of in-person learning for the social-emotional health and quality of education for students. As many students transitioned to online schooling in March 2020, studies have shown that remote learning may impact health behavior and coping strategies, including decreasing adolescent physical activity and increasing screen time during leisure. Additional research is needed to understand how adolescents’ behaviors, including poor health behaviors, changed in response to remote learning.

Disparities in health outcomes and access to resources exist among adolescents who identify as a racial/ethnic minority or low socioeconomic status. Pre-existing disparities among these groups have been magnified by the pandemic; these groups have experienced higher rates of food insecurity and higher burdens of COVID-19 infections. There may also be differences in behavioral responses to COVID-19 and gaps in knowledge about viral spread and prevention measures. A survey of US adults found that knowledge of COVID-19 was lower among African-American and Hispanic participants, and among younger participants.

The purpose of this study is to assess adolescent knowledge and information about COVID-19, determine students’ behavior change in response to COVID-19, and identify what resources students turn to for information on the pandemic. Additionally, this study will explore potential demographic differences in student responses.

**METHODS**

**Participants**

A convenience sample of 761 students in grades 9 through 12 attending 2 racially and economically diverse high schools in a semi-rural area in north-central Georgia participated in the survey. All students attending these 2 public high schools were eligible to participate (N = 3946). Additional details about the study are described elsewhere.

**Instrumentation**

The survey administered to students consists of 54 items, of which 9 were used for the examination of COVID-19 knowledge and behaviors. Most items were multiple choice or select all that apply response options. The 4 items on “Coronavirus Information” were adapted from the Data Foundation COVID Impact Survey and recommendations from the US Centers for Disease Control and Prevention. These questions asked participants about sources of information for COVID-19, symptoms, high-risk individuals, and understanding of social distancing behaviors. The 5 “Pandemic Behaviors” survey questions and response options were adapted from the March 2020 AP-NORC Center Poll survey. These items addressed household pandemic behaviors to reduce spread, perception of peer behaviors, individual behavior change, and change in job status. Questions with select all that apply options were collapsed into categories for ease of interpretation. The 9 survey items and response options are listed in Table 1. Demographic information was collected on consenting students and de-identified data were provided by the school system for eligible students, including race, sex, grade, and free or reduced-price meal eligibility.

**Procedure**

To understand students’ responses to COVID-19 and the transition to online learning, a cross-sectional online survey was administered to students from the 2 participating high schools during the first months of school closures. An electronic link was delivered to eligible students’ school email addresses by school administrators on March 30, 2020 and the survey link was active through May 8, 2020. All survey questions
were optional and took participants approximately 10 minutes to complete. The participating students were eligible to enter a raffle to receive one of 50 $25 Amazon gift cards for a study incentive to complete the survey. This survey was conducted online via Qualtrics (Qualtrics, Provo, UT).27

Data Analysis
Descriptive statistics were examined for the participating students in the 2 schools. Survey data were examined for the 9 items and frequencies of item responses were reported to show the percent of students that selected each item response option. Exploratory analyses of selected response items were conducted for differences by race and ethnicity, free and reduced lunch eligibility, and sex using chi-square tests. Free and reduced-price lunch eligibility was used as an indicator for lower socioeconomic status (SES).28,29 Data were analyzed in SAS 9.3 (SAS Institute, Cary, NC).

RESULTS
Among the eligible high school-aged students, 761 students participated in the study (19%) and provided responses to be included in the analysis (Table 2). The number of responses was higher for School A compared to School B (57% vs. 43%). The majority of participants were white (56%), female (62%), and in 9th/10th grade (59%). Almost half (45%) of the participants were eligible for free and reduced lunch eligibility.

COVID-19 Knowledge
When students were asked about their sources of information about the pandemic, 80% of students reported they received news through personal communications (friend, family member) and 91% received their news from 2 or more of the sources listed in the response options (Table 3). Over half of the students (58%) reported social media (Facebook,
Table 2. Characteristics of Survey Respondents (N = 761*)

| Characteristic               | N   | Percent |
|------------------------------|-----|---------|
| Respondents                  |     |         |
| School A                     | 431 | 56.6    |
| School B                     | 330 | 43.4    |
| Grade level                  |     |         |
| 9th                          | 244 | 32.1    |
| 10th                         | 203 | 26.7    |
| 11th                         | 182 | 23.9    |
| 12th                         | 132 | 17.4    |
| Race/ethnicity               |     |         |
| White                        | 425 | 55.9    |
| Black                        | 103 | 13.5    |
| Hispanic                     | 161 | 21.2    |
| Other                        | 71  | 9.3     |
| Sex                          |     |         |
| Male                         | 288 | 38.0    |
| Female                       | 470 | 62.0    |
| Free and reduced lunch eligibility | | |
| Yes                          | 425 | 45.1    |
| No                           | 322 | 42.1    |

*Numbers may not add up to total number of survey respondents due to missing data.

Instagram, Twitter, YouTube) as a source of COVID-19 news. About 6% of students listed “no symptoms” as one of the common symptoms, while over 10% of students reported that they “do not know” what symptoms are associated with COVID-19. The vast majority of students (95%) reported that the elderly are at risk of serious health consequences, while few believed that teenagers were at risk (3%). When asked which behaviors were associated with social distancing, commonly identified behaviors included keeping distance from other people (92%), not shaking hands with people (80%), and not hugging people outside your household (81%). Few students were unaware of social distancing (2%) and only a small percentage endorsed incorrect response options, for example, cutting off communication with others (5%); not leaving your room (5%).

COVID-19 Behaviors

The most commonly reported prevention behaviors were “staying home as much as possible” (87%) and “washing hands with soap more frequently” (87%) (Table 4). Few students indicated they were not taking any measures to social distance (3%) or reduce risk (2%). When asked about the behaviors of their peers, 53% of students believed that all or most of their friends have acted appropriately in slowing viral spread. Screen time behavior was the most common change in response to school closure, with 82% of students reporting an increase in screen time, not including class time. Other common behavior changes included reduced physical activity (41%) and eating less healthy (39%). The majority of students were not employed (72%), but some employed students had
Table 4. Participant Survey Responses to 5 Items Assessing Pandemic Behavior Implementation and Change in Behavior

| Frequency | Percent |
|-----------|---------|
| 591       | 86.9    |
| 523       | 76.9    |
| 515       | 75.7    |
| 509       | 74.9    |
| 410       | 60.3    |
| 166       | 24.4    |
| 17        | 2.5     |
| 6         | 0.9     |

In the past 2 weeks, which of the following social distancing measures did you and your family take in response to the coronavirus pandemic? (select all that apply)

- Staying home as much as possible
- Avoiding or limiting time spent in public or crowded places (eg, grocery stores or drugstores)
- Avoiding group gatherings (eg, going to parties or friends' houses)
- Staying at least 6 ft from other people outside my household
- Avoiding travel
- Not going to work, including working from home
- None
- Other

In the past 2 weeks, did you go to work or was your job put on hold or were you let go because of the pandemic? (select all that apply)

- Went to work
- Worked from home
- Job is temporarily on hold due to the pandemic
- My job is put on hold (8%), or was let go from their job due to the pandemic (2%).

Exploratory Analysis

A few notable differences were found through exploratory analyses by demographic information. Students who were eligible for free and reduced-price lunch eligibility were more likely to report “cleaning and disinfecting surfaces frequently” (78% vs. 69%, p = .011), “stocking up on extra food or water” (49% vs. 31%, p < .0001), and spending “more time spent caring for younger siblings or family members” (44.0% vs. 30.7%, p < .0001) compared to students who were not eligible. Students who identified as non-Hispanic black or Hispanic reported “wearing a face mask” (p = .0011), “wearing gloves” (p < .0001), “stocking up on extra food or water” (p < .0001), and “more time spent caring for younger siblings or family members” (p = .018) more frequently than students of other race/ethnicities. Students who identified as female reported “eating less healthy” (42% vs. 34%, p = .038) and “more time spent caring for younger siblings or family members” (44% vs. 27%, p < .0001)
than male students. Additional results for exploratory analyses are available upon request.

**DISCUSSION**

The findings of this analysis indicate that high school-aged adolescents received information about the COVID-19 pandemic largely from peer connections and social media, some of which may dictate their uptake of knowledge about the virus and their implementation of prevention behaviors. Adolescents report varying degrees of prevention practice implementation for themselves and their peers, although they generally understood what it means to “social distance.” Interestingly, adolescents do not perceive themselves at a high risk of serious illness. This raises concern that the lack of vulnerability may decrease likelihood of participating in measures to reduce viral spread to protect themselves and others. In addition to the risk of COVID-19 infection, adolescents are developing poor health behaviors, such as reduced physical activity, less healthy diets, and increased screen time, which may be harmful for their long-term health. This increase in sedentary behavior has implications for poor health outcomes and obesity risk.

There is increasing evidence to suggest the importance of family, friends, and teachers for communicating reputable health information to this age group. The majority of students received their news from more than one source, including social media as a common platform for updates and information sharing. Due to the large number of students reporting Facebook, Twitter, Instagram, YouTube, and other social media as sources of information, awareness of misinformation on social media and traditional news platforms should be communicated to teenagers to help them assess the trustworthiness of the source. Other studies have examined where adolescents received their news about the pandemic and found that they relied on family members to provide pandemic-related information. Riiser et al. report that families and television were the most common sources of adolescent news among a surveyed population of adolescents in Norway. Social media was not as widely used for health-related information in the Norwegian study as the participants in the present study. For more traditional news platforms, the political leanings of the news consumer and news source may also be related to adherence and acceptance of prevention behaviors and perceived severity of the virus. Further examination is warranted to explore which news source adolescents and their families viewed, and the resulting impact on their behaviors.

Although early research has suggested that adolescents may be less susceptible to severe symptoms from COVID-19, there is concern that adolescents who do not perceive themselves as high-risk or do not believe that the virus is of serious consequence may be less likely to engage in social distancing and disease prevention behaviors. Few students in this study believed that teenagers were at higher risk for serious illness, which suggests that emphasis should be placed on informing adolescents about their potential role to protect others and see beyond their own self-interest. Even if adolescents are practicing prevention behaviors, there is a level of uncertainty in social distancing rules among the younger population. Despite this concern, a large proportion of the students in this study reported washing hands frequently, sanitizing, keeping distance from others, and many could identify accepted social distancing guidelines. More information is needed about how disease susceptibility and knowledge can play a role in social responsibility and increasing disease prevention measures.

Poor health behaviors stemming from the pandemic, such as eating less healthy and reducing physical activity, increases the risk for obesity and other health concerns among this age group. Many of the adolescents in the study and other studies reported behavior changes as their daily life transitioned to being at home. The increase in screen time usage beyond what is needed for remote learning creates additional concern for prolonged sedentary behavior. Changes in diet patterns, reduced physical activity, and more time looking at screens during leisure time activities have been associated with increases in BMI.

As the pandemic continues to impact daily life, there is a concern of job loss and economic downturn that can affect the financial security of adolescents and their families. Many adolescents are at risk of losing their jobs as the pandemic continues, particularly if they are working in food service or retail. Students may find themselves in a situation where they cannot find a job or are unable to continue their current position, which would eliminate a potential source of income. Other considerations should be made for adolescents who are continuing to work during the pandemic. Teenagers who are actively employed may be essential workers, and thus, unable to stay at home to reduce the risk of viral exposure. This was case for 16% of high schoolers in this study, who continued to go to work during the early phases of the pandemic.

Exploratory analyses for behavior change highlighted differences in pandemic responses among students of lower SES and among racial or ethnic minorities. Students eligible for free and reduced-price lunch and students who identify as a racial or ethnic minority were more likely to report stocking up on extra food and water. This may be attributed to limiting exposure through reduced trips to the store or preparing for extended time at home, but also could suggest the need for essential resources. There has been a rise in food insecurity in the US during the pandemic and adults with low income and who identify as a

Journal of School Health • July 2021, Vol. 91, No. 7 • © 2021, American School Health Association • 531
person of color are more likely to be food insecure.\textsuperscript{21} Future research should examine any disparities in food insecurity among this population and determine if students who rely on free and reduced lunch meals are able to receive food through their schools during the pandemic. These students were also more likely to report having caregiving responsibilities for siblings and family members. The added responsibility of supporting family can create more stress for adolescents and present challenges for distance learning if they are unable to attend class or complete assignments due to competing priorities.\textsuperscript{35} Female students were also more likely to report having caregiving responsibilities for siblings and family members compared to male students, as well as eating less healthy.

There are at least 4 strengths of this study. First, the timeliness of the survey administration conducted shortly after school closures. Students were asked about their experiences as the pandemic was unfolding and therefore the responses were not subject to recall bias. Second, the incorporation of several existing survey items and COVID-19 guidelines to inform survey creation. Third, participants in this survey come from an underexamined population of diverse adolescents in a semi-rural area with variability in race and ethnicity and socioeconomic status. Finally, survey data were shared with schools to provide feedback to administration about the well-being of their students and to support them with preparation for the continuation of virtual learning.

Despite these strengths, there are at least 3 limitations to note. First, the cross-sectional nature of the survey creates an inability to account for the temporality of the pandemic. Second, the change in recommendations and guidance about COVID-19 presented challenges for capturing if students were aware of who is at risk, what are the manifestations of the illness, and engaging with prevention behaviors. Evidence and recommendations are developing over time as more information becomes available. Finally, the response rate among the 2 high schools was low, although not dissimilar to other surveys using an online platform, and the majority of the respondents were female, which is a consideration for generalizability.\textsuperscript{36}

Considering the duration of the pandemic, people will continue to change and adapt their lives in response to the shifting world. Adolescents are a vulnerable group that may adopt poor health behaviors and struggle with mental health given the lack of structure and reduced peer interaction. Future research on adolescent lifestyle changes and behaviors during the pandemic are needed to further examine the impact on their well-being. More information is warranted on how news and media may influence these behaviors, promote uptake of prevention practices, and impact social responsibility.

These platforms have the potential to encourage public health practice and interventions could incorporate social media for eHealth among adolescent consumers using the appropriate level of health literacy.\textsuperscript{37} In addition, research is needed to better understand how media sources and messaging have implications for COVID vaccination uptake. Longitudinal research is needed to explore changes among adolescents as the pandemic continues, including additional surveys during and post pandemic. The effects of the COVID-19 pandemic will be long-lasting and extend for years to come with residual economic hardship, mental health concerns, and new social norms.

**IMPLICATIONS FOR SCHOOL HEALTH AND EQUITY**

The results of the survey on adolescent COVID-19 knowledge and behaviors have implications for caregivers and schools to promote best public health practices to adolescents and discourage the spread of misinformation. Schools can encourage students to participate in prevention behaviors and utilize media platforms to support communication of public health messaging. Social media campaigns and school communications may be an effective method to ensure students receive age-appropriate and accurate information about the pandemic, while deterring adolescents from misinformation. In addition, schools can promote peer group discussion and build in conversation opportunities to respond to student’s questions regarding viral spread, vaccination, and other related topics. The combined approach of peer support and information sharing may be more beneficial than simply distributing information alone, given that students report their peers to be an information source.

The findings also suggest that students are adopting more negative health behaviors during the pandemic, such as increasing their screen time usage, developing poor dietary patterns, and decreasing physical activity. For caregivers, implementing more structured time at home may encourage healthier diet patterns and support more regulated sleep patterns, in order to reduce obesogenic behaviors and promote positive mental health.\textsuperscript{19} Positive role-modeling at home can promote healthy coping behaviors, such as walking, reduced screen time, and meditation, and create a conversation around wellness to support mental and emotional health among students. In addition to providing social and emotional support for students under the duress of learning during a pandemic, these recommendations can be implemented to deter the formation of unhealthy behavior patterns.

Health disparities related to COVID-19 are especially concerning as they can widen existing inequalities for
racial/ethnic minority populations and low-income communities. School-level interventions to address diverse population differences can include providing access to resources for adolescents with financial stress, food insecurity, and added caregiving responsibilities. For schools, these resources may include ensuring access to meals for students during remote learning, providing additional academic supports for students who are falling behind in school due to competing demands at home, and providing access to laptops or other devices that enable students to participate in online learning and complete assignments.

Human Subjects Approval Statement

The Emory University Institutional Review Board reviewed and provided expedited approval for this study (STUDY00000408).

Conflict of Interest

All authors of this article declare they have no conflicts of interest.

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