

Impact of COVID-19-related School Closures on the Drivers of Child Health

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The COVID-19 pandemic resulted in large-scale school closures in an effort to reduce the spread of disease. This article reviews the potential impact of COVID-19-related school closures on the health of children in North Carolina, with particular attention to the impact of school closures on drivers of child health.

Introduction

On March 11, 2020, the World Health Organization declared coronavirus disease 2019 (COVID-19) a pandemic. COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), appears to be less severe in children compared to adults, with children representing a minority of COVID-19-related hospitalizations and deaths; however, children have not been altogether spared from the negative effects of this pandemic [1]. To preemptively combat viral transmission, school buildings closed and educational systems opted for various forms of remote learning. Unfortunately, these remote education methods may limit child engagement and optimal school participation, both of which are critical to long-term school attendance and academic achievement, particularly for those children who are most vulnerable and marginalized. Beyond academics, early in the pandemic the American Academy of Pediatrics highlighted the potential impacts on child health and mental health [2]. School closures coupled with the emotional effects of the pandemic, social isolation, and limited access to school-based mental health services may negatively impact child mental health outcomes.

Although the full effects of COVID-19-related school closures will take years to elucidate, we examined the immediate and foreseeable impact of these closures on several drivers of child health, including academic achievement, food insecurity, access to health and mental health services, and physical activity (Figure 1). We evaluate the likely disproportionate impact on the health of low-income, Hispanic, and non-Hispanic Black children because COVID-19 has exacerbated underlying disparities in drivers of child health. We also encourage future investigation into the impact of COVID-19-related school closures on child academic and health outcomes. We highlight several methods that may

mitigate these effects and promote the health of all children in North Carolina.

Decreased Academic Achievement

Poor academic achievement and decreased educational attainment are linked to negative long-term health outcomes. US adults with less than a high school education are 2.4 times as likely as high school graduates and 4.1 times as likely as those with post-secondary education to rate their health as poor [3]. Furthermore, each year of academic attainment has been associated with an additional 1.7 years of life expectancy [4]. Adults with graduate education have projected life expectancies that are more than 10 years longer than adults of the same age with less education than a high school diploma [5]. School absences early in an academic career predict academic achievement; in turn, academic achievement predicts long-term educational outcomes. Eighty-seven percent of children who miss 10% or more kindergarten and first grade days are not proficient at reading by the third grade [6]. These indicators predict a 4-times higher rate of failure to graduate from high school on time [7]. In the aftermath of Hurricane Katrina, which devastated parts of Louisiana in 2005, more than 40,000 displaced children did not return to school for the remainder of the 2005 academic year; these uprooted children faced the most significant academic decline in the following school year [8].

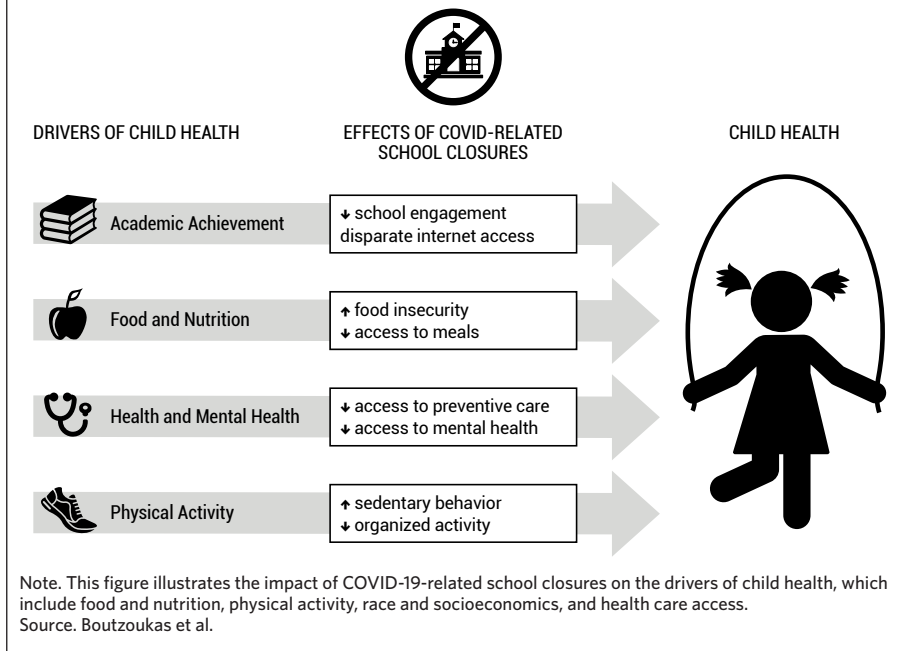
Based on available evidence, COVID-19-related school closures are likely to result in decreased academic achievement among many of North Carolina's children. Even prior to the pandemic, North Carolina had a history of disconcerting disparities in academic achievement. In a 2018 Stanford Center for Education Policy Analysis report of achievement gaps between white and Black students, two North Carolina districts, Chapel Hill and Asheville, were home to the sec-

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FIGURE 1.
Impact of COVID-19-related School Closures on the Drivers of Child Health



ond and fifth largest achievement divides nationally [9]. In recent years, local North Carolina school boards have pursued efforts to address this achievement gap; however, substantial concern exists that prior efforts may be stymied or reversed during COVID-19-related school closures and reliance on virtual education. In North Carolina, a striking number of children have inadequate internet connectivity or lack digital devices that support at-home learning (Figure 2). Furthermore, this digital divide disproportionately affects Black, Hispanic, and low-income youth; lower-income parents report being more worried about their children falling behind during the pandemic [10].

The prevalence of school absences due to a lack of reliable internet is unclear. Recent funding from the federal government aimed to improve broadband connectivity to rural

and underserved populations in North Carolina. Considering the effects of academic achievement on adult health and mortality, as well as pre-pandemic disparities in academic achievement, we must better understand the extent of academic engagement and absenteeism in the setting of virtual school environments and institute targeted efforts to make academic achievement equitable among demographic groups.

Heightened Food Insecurity

Food security is defined by the United States Department of Agriculture as access by all people at all times to enough food for an active healthy life [11]. Lack of food security has been linked to numerous adverse childhood health outcomes. Food insecurity is associated with a 19% increase in

FIGURE 2.
Accessibility to Internet and Devices in North Carolina Homes



Note. This figure illustrates how a striking number of children, as well as some teachers, are impacted by inadequate internet connectivity or lack of digital devices that support at-home learning.
Source. Boutzoukas et al.

asthma diagnosis, a 27% increase in depressive symptoms, and a 25% increase in emergency room visits; additionally, these children are 2-3 times more likely to avoid necessary medical care [12]. Food insecurity affects 13.1% of North Carolina households, compared to 10.5% of households in the United States [11]. Nationally, 13.6% of households with children face food insecurity, with disproportionately higher rates found in marginalized populations (Black, non-Hispanic households [21%], and Hispanic households [16.2%] vs. white, non-Hispanic households [8.1%]) [11].

Schools in the United States have played an important role in addressing food insecurity through the National

School Lunch Program and School Breakfast Program. These programs provide food during the school day for children at 130% and 185% of the federal poverty level, respectively. During the 2019-2020 school year, approximately 903,000 (-59%) children in North Carolina schools were eligible for the National School Lunch Program and 140,582,260 meals were served [13, 14].

Unsurprisingly, COVID-19-related school building closures have led to large disruptions in the distribution of food to children throughout the country [15]. Federal funding and state efforts have encouraged schools to be more innovative with regard to food distribution, allowing provision of meals

to some students at locations near their home. Nevertheless, these altered distribution methods raise concerns about inequality in food access. The Pandemic Electronic Benefit Transfer Program has served as an important stopgap, providing supplemental funds to the families of over 600,000 North Carolina children who qualify for free and reduced-price meals at school, and whose access to these meals has been impacted by school closures. The degree of residual food insecurity impacting the children of our state is, however, still unknown. In a recent national parent survey, 32% faced food insecurity early in the pandemic (March 2020), increasing to 36% by July 2020; however, only 15% of parents reported that their children received free food from

their schools [16]. This discrepancy implies that some children in need of food distribution interventions are unable to access existing food services.

Further complicating the issue of food insecurity in North Carolina is the fact that unemployment is the highest it has been in decades, reaching a peak of 12.9% in April 2020. Unemployment limits disposable income for food; each percentage increase in the unemployment rate has previously been associated with a 0.5% increase in food insecurity [17]. An updated assessment of North Carolina's food insecurity is key to implementing innovative methods of food distribution so that both children returning to school and those remaining remote receive equal access.

Decreased Access to Health and Mental Health Services

Several health services, including speech therapy, occupational therapy, and physical therapy, are often provided in the school setting. For children with intellectual or developmental disabilities, school is the primary location for receipt of these essential interventions, and school closures have limited access to such therapies.

Schools are increasingly access points for crucial mental health services for children. The National Survey on Drug Use and Health found that 8.2 million adolescents aged 12-17 years received mental health care in 2018, and of those, ~40% of care was delivered in an educational setting [18]. Children with public insurance from low-income households (below 400% of the federal poverty level), as well as from racial and ethnic minority groups, are more likely to access mental health care in an educational setting [19]. In a recent national study, 15% of parents report worsening child behavioral health since March 2020, which indicates that the pandemic has placed a variety of social and emotional burdens on children at a time when access to mental health services is limited [16].

School-based health centers also provide critical access to free health care for vulnerable children, including well-child and preventive care visits, sexually transmitted infection testing, and mental and behavioral health visits, the latter of which represent nearly one-third of state-funded visits [20]. In North Carolina, more than 30,000 students receive health care through 140 school-based health centers; of these, 30 centers are state funded and serve children aged 10-17 years [21]. In the 2018-2019 academic year, these centers served 10,763 students via 55,356 visits [20]. Access to school-based health centers has reliably shown improvements in health and academic outcomes of youth and adolescents. Students enrolled in North Carolina school health centers are less likely to report an emergency room visit, but more likely to have visited a doctor or dentist in the last year, received required and recommended immunizations, and missed fewer classes [20]. In the era of school closures, these key safeguards are even less accessible for those children who are the most vulnerable. Children who receive primary care through school health centers risk falling behind on basic care that is necessary to maintain their overall health.

Alternative methods for health care and mental health services must be made available to children during this time when access to school-based health centers is limited. Prior patients of school-based health centers should be assessed for new health care needs, and virtual methods can be used for trauma-informed mental health support for all enrolled students. Additionally, encouraging and disseminating routine childhood vaccinations will be particularly important while school-based health centers are closed.

Lack of Physical Activity

Childhood obesity is a national issue of great public health concern. In North Carolina, 16% of children aged 10-17 years are obese, and an additional 14% are overweight [22]. Childhood obesity is a known risk factor for adult obesity and consequent type 2 diabetes, heart disease, and cancer [23]. School interventions to combat obesity include physical activity programs, low-cost or free organized sports, safe spaces for outside play, and promotion of healthy eating through education and provision of nutritional snacks, fruits, and vegetables. Yet COVID-19-related school building closures, cancellations in organized athletic participation, and local stay-at-home orders have resulted in more sedentary children. In a survey conducted from April to May 2020, parents reported about 90 minutes of school-related sitting and more than 8 hours of leisure-related sitting per day [24]. Compared to pre-COVID-19 activity levels, older children (aged 9-13 years) had greater decreases in physical activity and increases in sedentary behavior than younger children (aged 5-8 years) [24].

A backward trajectory in national childhood obesity during the pandemic is of major public health concern, as significant increases in obesity during this time period will have lifelong effects on the children of this generation. As we continue to learn more about SARS-CoV-2 and its transmission, safe methods of individual and group-based physical activity should be emphasized for social and health benefits.

Conclusions

Based on existing evidence, school building closures related to the COVID-19 pandemic will have long-lasting, significant educational and health impacts on the children of North Carolina, with the largest impact likely being among low-income and marginalized children. Schools should be well-supported in their efforts to safely return children to the classroom as soon as possible. In the interim, statewide efforts should focus on identifying existing vulnerabilities that have resulted from school building closures. Following the guidance of the American Academy of Pediatrics, an investment in focused needs assessments of children who are most likely to suffer from inequity in education and funding of additional supports for these children is critical [2]. This can be accomplished in part through reviewing existing individualized education plans to determine the need for additional supports for lost instructional time. Whether education is occurring in person or remotely, students at risk for academic decline should be ensured safe and equitable access to educational opportunities and services. Students have had and will continue to have varying degrees of educational engagement and achievement during this pandemic, so we must prioritize the identification and development of remediation plans for those who have fallen behind academically. The burden of ameliorating the long-lasting effects

of the pandemic on North Carolina's children cannot lie on schools alone. As a community, we must prioritize the funding and support of efforts that put children's mental, emotional, and physical health first. NCMJ

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