



The buildings and spaces where we work, live, and visit meaningfully impact our health, safety, and well-being.¹ The air we breathe can expose us to environmental pollutants that can cause or exacerbate chronic conditions such as asthma, in addition to airborne infectious pathogens such as SARS-CoV-2 and other viruses. Estimates show that we spend 90% of our time indoors,² where reduced air circulation, filtration, and ventilation can result in lower air quality that leads to higher risk of exposure.¹

The Carolinas Pandemic Preparedness Task Force recognized the role of infrastructure in the COVID-19 pandemic response and identified several improvements to built environments as necessary for preparedness and prevention. Although the influence of other forms of infrastructure such as roads, bridges, housing, and wastewater systems on the health, safety, and well-being of North Carolinians cannot be understated, for the purposes of the recommendations included in **Chapter 4**, *infrastructure* refers to built environments such as schools, workplaces, justice system facilities, and other spaces where health care services can be delivered. *Infrastructure* also refers to the systems and processes necessary to promote health before, during, and after public health emergencies. Recommendations from the task force to strengthen North Carolina’s broadband infrastructure and close the digital divide can be found in **Chapter 7** (Improving Access to Information and Services: Broadband Infrastructure, Telehealth, and Remote Learning).

The Impact of the Built Environment on Health

In the context of the COVID-19 pandemic, several challenges related to our built environments emerged. Many facilities across the state had inadequate systems and processes to ensure air quality when confronted with a novel and highly transmissible airborne virus. Many facilities were also unprepared and unable to provide adequate space for social distancing and isolation or quarantine when infection occurred, contributing to challenges in mitigating the spread of SARS-CoV-2.³

Increased risk of exposure and infection with SARS-CoV-2 and other airborne viruses has been linked to a number of contributing factors. Crowding and close proximity to other people indoors, particularly in the absence of masking and other mitigation measures to reduce transmission, increases this risk.^{3,4} COVID-19 outbreaks have been attributed to indoor spaces where people are in close proximity, such as in justice system facilities (i.e., jails, prisons, and detention centers), buses and other modes of public transport, churches, and certain types of workplaces.⁵⁻⁷ Congregate living settings where people receive long-term care—including nursing homes, hospice facilities, and other institutional settings—and food production locations, such as meatpacking facilities where workers were unable to work remotely, were especially vulnerable at the start of the pandemic. Shortages of personal protective equipment (PPE) and other health care supplies also heightened their risk as described in **Chapter 3** (Building a Resilient Supply Chain).

Defining the “Workplace”

To support COVID-19 surveillance, the Council for State and Territorial Epidemiologists defined **non-residential, non-health care workplace** settings as workplaces where employees do not live onsite, including “food and other manufacturing facilities such as meat and poultry processing, construction sites, office buildings, warehouses, restaurants/grocery stores, personal care and other service providing establishments such as salons, cleaners, and maid services.”⁸ The Occupational Safety and Health Administration defines **health care workplaces** as “hospitals, clinics, dental offices, outpatient surgery centers, birthing centers, emergency medical care, home health care, and nursing homes.” Health care workers are directly or indirectly involved in the provision of services to individuals.⁹

Inadequate air circulation, filtration, and ventilation in indoor spaces can allow airborne viruses to linger in the air for hours, and these conditions have been linked to COVID-19 outbreaks.¹⁰⁻¹² SARS-CoV-2 is more readily transmitted between people indoors, where viral particles are often more concentrated compared to outdoor settings.¹⁰ In addition, the probability of infection indoors depends on the amount of virus inhaled, the number of people present over time, length of exposure, types of activities (such as singing), and the quality of ventilation.¹³

Infrastructure and Health Equity

The roles of poverty and structural racism in infectious disease transmission and lower health status overall have been demonstrated over many years,¹⁴⁻¹⁸ leading the U.S. Department of Health and Human Services to prioritize structural racism and other social determinants of health in Healthy People 2030 plans, objectives, and tools for action.¹⁹ Similarly, Healthy North Carolina 2030 establishes indicators and objectives focused on addressing the harms of structural racism in alignment with North Carolina’s State Health Improvement Plan and the North Carolina State Health Assessment.²⁰⁻²²

“Structural racism refers to the way public policies, institutional practices, cultural representations, and other social norms interact to generate and reinforce inequities among racial and ethnic groups.”²²

Poverty and structural racism have contributed to lower health status at baseline and inadequate access to health care among historically marginalized populations.²³ These populations are disproportionately harmed by food insecurity^{23,24}—including higher rates of food deserts and swamps—and unsafe housing conditions that may expose residents to lead, asbestos, and other environmental pollutants that negatively impact

health and well-being irrespective of the COVID-19 pandemic and other public health emergencies. During the COVID-19 pandemic, crowded housing has been associated with higher risk of transmission because residents may be unable to isolate when infected and may be primary caregivers for others in the home.²⁵ People of color are more likely to live in crowded housing, have frontline essential jobs without the ability to work remotely,²⁶ and rely on public transit to commute to work.^{27,28} While Black employees represent 13.6% of all workers, they are over-represented in certain industries, and they account for 19.3% of all frontline workers. Black employees are especially over-represented in public transit, health care and child care/social services.²⁹ These factors, along with lower baseline health and inadequate access to health care, have led to higher rates of SARS-CoV-2 exposure, infection, and severe disease among historically marginalized populations.

The North Carolina Department of Health and Human Services defines **historically marginalized populations** as “individuals, groups, and communities that have historically and systematically been denied access to services, resources and power relationships across economic, political, and cultural dimensions as a result of systemic, durable, and persistent racism, discrimination and other forms of oppression. Long standing and well documented structural marginalization has resulted in poor outcomes – health, social, political, economic and overall increased vulnerability to harm. Historically marginalized populations are often identified based on their race, ethnicity, social-economic status, geography, religion, language, sexual identity and disability status.”²⁶

Local, State, and Federal Initiatives to Improve Infrastructure

Addressing the infrastructure gaps that contributed to the rapid spread of SARS-CoV-2 is critical to ensuring that North Carolinians are better protected in anticipation of future surges of COVID-19 and other public health emergencies, and healthier overall.^{30,31}

The American Rescue Plan Act (ARPA), passed by the U.S. Congress and signed into law by President Biden on March 11, 2021, provided \$1.9 trillion in relief funds to address the ongoing impact of the COVID-19 pandemic on the economy, individuals and businesses, local and state governments, and public health. ARPA also builds on many of the goals of the Coronavirus Aid, Relief, and Economic Security Act (CARES Act),³ which was signed into law by President Trump on March 27, 2020. The U.S. Department of Education received approximately \$122 billion in ARPA funds, which will remain available through September 30, 2023, to support states and local education agencies in implementing strategies to improve infrastructure and address other needs. As part of this plan, the U.S. Department of Education received

appropriations to distribute to states, which will in turn distribute funds to local education agencies to support heating, ventilation, and air conditioning-related projects and other efforts to reduce exposure to COVID-19, other airborne viruses, and environmental pollutants.^b

North Carolina received more than \$5.7 billion in total in ARPA funds.³² Governor Cooper’s proposed budget for North Carolina’s use of these funds included a number of infrastructure investments to address the ongoing effects of COVID-19 and support the state’s recovery.³³ These investments include assisting families and communities most impacted by the pandemic, strengthening the workforce, encouraging business development and innovation, and upgrading infrastructure, in addition to other key priorities. The North Carolina General Assembly allocated ARPA funds in Senate Bill 105, which Governor Cooper signed into law on November 18, 2021.

In April 2022, the Biden Administration unveiled the Biden-Harris Action Plan for Building Better School Infrastructure, which aims to leverage investments from the Bipartisan Infrastructure Law and ARPA to ensure public schools have “modern, clean, energy efficient facilities and transportation.”³⁴ This action plan includes a specific focus on improving indoor air quality in classrooms by supporting states and localities in modernizing heating, ventilation, and air conditioning systems; obtaining air cleaning devices; and increasing air flow through windows and doors that function properly. In alignment with this focus area, the U.S. Department of Energy established a grant program that will provide \$500 million in funding to support energy upgrades in K–12 public schools, understanding the important role that school facilities play in learning, performance, health, and well-being for students and teachers alike.³⁵ Additionally, the Department of Education has provided information to help school districts understand how they can use State and Local Fiscal Recovery Funds for a range of air quality and other school facility improvements.³⁶

In March 2022, the Environmental Protection Agency also introduced the “Clean Air in Buildings Challenge,” which is a call to action that includes a set of guiding principles to reduce the risks associated with airborne viral transmission and other pollutants by improving indoor air quality.³⁷ With recommendations and resources provided by the agency, the challenge asks building owners and operators to develop a clean indoor air action plan, increase fresh air ventilation and air filtration, and ensure community engagement, communication, and education.³⁸

The Andrea Harris Social, Economic, Environmental, and Health Equity Task Force, established by Governor Cooper in Executive Order 1431, represents another important initiative to address the disproportionate impacts of the COVID-19 pandemic on North Carolina’s communities of color.^{39,40} The first report produced by the task force, released in December 2020, emphasizes

^a Senate Bill 3548 <https://www.congress.gov/bills/116th-congress/senate-bill/3548/text>

^b Public Law 117-2, American Rescue Plan Act, <https://www.congress.gov/117/plaws/publ2/PLAW-117publ2.pdf> page 17. March 11, 2021



that the COVID-19 pandemic has created an opportunity to address the issues caused by declining and poorly maintained public and private infrastructure. The report also elevates the importance of modernized heating, ventilation, and air conditioning systems to reduce exposure to SARS-CoV-2 and environmental pollutants in schools.³⁰

“Nowhere is this problem more apparent than in NC’s public schools, especially those in hyper-segregated, concentrated poverty communities. Due to aging and poorly functioning HVAC systems, young people attending these schools are exposed to a host of chemical and biological contaminants that adversely affect their health and overall well-being and their ability to learn. Reopening these schools amid the pandemic is likely to exacerbate the problem, as buildings with poor ventilation, already a crucible for building related diseases, can potentially become hotbeds for the spread of the coronavirus.”³⁰

- NC Department of Administration. Andrea Harris Social, Economic, Environmental Health Equity Task Force Biannual Report, 2020.

RECOMMENDATION 4.1

Universal masking and widespread testing followed by isolation of infected individuals can significantly reduce the spread of COVID-19 and other airborne pathogens, but both measures have their limitations. Although masking has been widely accepted in other countries before and during the COVID-19 pandemic, it has become a politically charged topic in many areas of the United States and in North Carolina. At-home testing with rapid antigen tests produces less reliable results in asymptomatic individuals with the rise of the Omicron variant and its subvariants, and polymerase chain reaction (PCR) testing can continue to detect the presence of the virus long after an individual is contagious. PCR testing sites can also be challenging to find, with disparate access across many areas of the state making it less practical for routine screening and decision-making purposes. It is important to note that the COVID-19 vaccines produced by Pfizer/BioNTech, Moderna, and others carry a very low risk profile and remain highly effective at preventing hospitalization, severe disease, and death.⁴¹ The Omicron variant and its subvariants, however, have been associated with higher rates of breakthrough infection among vaccinated people, enabling transmission of the virus to immunocompromised and unvaccinated individuals who remain vulnerable and in need of protection.^{42,43}

While masking, testing, and other prevention measures require individual-level action, system-level actions can also be undertaken to protect individuals and populations from infection and promote health and well-being. Improving indoor air quality through increased ventilation and other measures can help to reduce the spread of COVID-19, the common cold, and other airborne infections, while also reducing exposure to allergens

and other environmental pollutants that can cause or exacerbate acute and chronic conditions such as asthma. Carbon dioxide (CO₂) monitoring has emerged as a cost-effective method of assessing air flow and ventilation in indoor spaces—higher CO₂ levels indicate inadequate air flow that can increase the risk of exposure and infection with SARS-CoV-2 and other airborne infectious diseases. Research has also confirmed the relationship between elevated indoor CO₂ levels, which reflect the number of people in a given space, and infectious disease transmission during the COVID-19 pandemic.^{44,45}

The strategies in **Chapter 4** represent actions recommended by the task force to improve North Carolina’s infrastructure with the goal of ensuring indoor air quality before, during, and after infectious disease outbreaks and other public health emergencies. When an outbreak does occur, these strategies will support efforts to keep schools and other indoor facilities open by reducing the spread of disease and better protecting frontline essential workers and vulnerable populations, along with their loved ones and communities. Additionally, these strategies address the ways in which historically marginalized populations may be at greater risk of infection and illness due to disparities in infrastructure quality in homes, schools, and other facilities. It is important to note that the task force discussions did not include all built environments; instead, the discussions focused on environments where closures would be (or were) highly disruptive, impact large numbers of people, and/or impact highly vulnerable individuals, such as workplaces, schools, and prisons. In response, the task force recommends five strategies to improve indoor air quality and strengthen infrastructure to deliver services to communities in need:

RECOMMENDATION 4.1

Upgrade existing structures and construct new facilities with infection control measures in mind.

Strategy 4.1a: To reduce the spread of airborne pathogens among students, teachers, and school system employees, the North Carolina General Assembly should provide funding to (1) support ventilation upgrades and carbon dioxide (CO₂) monitoring in schools and (2) ensure proper ventilation and CO₂ monitoring in the construction of new school facilities in accordance with the recommendations for reducing airborne infectious aerosol exposure provided by the Centers for Disease Control and Prevention, Environmental Protection Agency, American Society for Heating, Refrigerating and Air-Conditioning Engineers, and the North Carolina Department of Health and Human Services.

Strategy 4.1b: The North Carolina Department of Public Instruction and the North Carolina Department of Health and Human Services' Occupational and Environmental Epidemiology Branch should work together to develop and provide ongoing guidance for school systems and state agencies to (1) understand the risk of exposure to airborne infectious aerosols based on carbon dioxide (CO₂) level monitoring and (2) identify effective strategies to reduce exposure and infection risk.

Strategy 4.1c: The North Carolina Department of Health and Human Services, North Carolina Society for Human Resource Management, Office of State Human Resources, and other private sector partners should work together to (1) establish minimum standards to reduce the risk of exposure to airborne infectious aerosols in workplaces and (2) evaluate and assess opportunities to provide incentives for employers and employees that implement additional evidence-based strategies to reduce the risk of exposure to airborne infectious aerosols in workplaces.

Strategy 4.1d: The North Carolina General Assembly should provide additional funding to the North Carolina Department of Public Safety to (1) upgrade heating, ventilation, and air conditioning (HVAC) systems to improve indoor air quality and reduce airborne infectious aerosol exposure in North Carolina prison facilities and (2) create a multidisciplinary team to provide infection control guidance and other forms of technical assistance to state prisons, county jails, and detention centers with the goal of promoting the health, safety, and well-being of justice-involved populations and staff.

Strategy 4.1e: North Carolina Emergency Management, North Carolina Office of Emergency Medical Services, North Carolina Healthcare Association, and other partners should work together to develop a plan to (1) ensure that existing assets can be quickly converted into mobile care units and (2) identify locations that would most benefit from the deployment of mobile care units during declared emergencies. This plan should consider the need for potential revisions to existing statutes to allow for payment for mobile services within and/or outside the context of declared emergencies.

The following organizations and entities are responsible for implementing the strategies included in Recommendation 4.1:

- **STATE AND LOCAL GOVERNMENT:** North Carolina General Assembly, North Carolina Department of Public Instruction, North Carolina Department of Public Safety, North Carolina Department of Health and Human Services, North Carolina Department of Health and Human Services' Occupational and Environmental Epidemiology Branch, Office of State Human Resources, North Carolina Office of Emergency Medical Services

- **PUBLIC SAFETY:** North Carolina Department of Public Safety, North Carolina Emergency Management
- **HEALTH:** North Carolina Healthcare Association
- **OTHER:** North Carolina Society for Human Resource Management, private sector partners

Strategy 4.1a

Improve indoor air quality in schools through modernized ventilation and carbon dioxide monitoring.

To improve indoor air quality and reduce the spread of airborne pathogens among students, teachers, and school system employees, the North Carolina General Assembly should provide funding to (1) support ventilation upgrades and carbon dioxide (CO₂) monitoring in schools and (2) ensure proper ventilation and CO₂ monitoring in the construction of new school facilities in accordance with the recommendations for reducing airborne infectious aerosol exposure provided by the Centers for Disease Control and Prevention, Environmental Protection Agency, American Society for Heating, Refrigerating and Air-Conditioning Engineers, and the North Carolina Department of Health and Human Services.

DESIRED RESULT

Modernized ventilation systems and CO₂ monitoring in schools to reduce the transmission of airborne infectious diseases among students, teachers, school system staff, and their families and communities. Improved air quality in schools will also reduce exposure to allergens and other pollutants that can cause or exacerbate acute and chronic conditions.

WHY DOES THE TASK FORCE RECOMMEND THIS STRATEGY?

Strategy 4.1a aims to improve air quality in schools through adequate ventilation of indoor spaces and CO₂ monitoring to provide a cost-effective method of assessing the risk of airborne infectious disease transmission.

Strategy 4.1a also takes a system-level approach to protecting these populations and their communities rather than relying on individual-level measures to reduce infectious disease transmission.

Indoor air quality directly impacts the transmission of airborne infectious diseases and other health conditions, while also influencing learning outcomes and work performance. Investing in modernized ventilation systems and CO₂ monitoring to ensure indoor air quality can have many benefits, including:

- Driving down health care costs for infectious diseases, asthma, and other conditions by reducing exposure to airborne infectious diseases, allergens, and other pollutants;



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- Supporting efforts to keep schools open to reduce learning loss and absenteeism, and protect the social-emotional health and well-being of students and school system staff,^{46,47} and
- Creating safer, healthier working environments for teachers and other school system staff to improve quality of life and contribute to their retention and productivity.^{46–48}

ADDITIONAL CONTEXT

The importance of indoor air quality to prevent the transmission of COVID-19 and other infectious airborne diseases has been established,^{49,50,51} leading the Centers for Disease Control and Prevention, the Environmental Protection Agency, and the North Carolina Department of Health and Human Services to issue guidance on ventilation in classrooms as a critical means of preventing exposure and infection among students, teachers, school system staff, and the people they interact with outside of school.^{38,52,53} The American Society for Heating, Refrigerating and Air-Conditioning Engineers convened a task force in spring 2020 that issued core recommendations and guidance on specific actions to reduce airborne infectious aerosol exposure to SARS-CoV-2.^{54,55} These recommendations address the deployment of ventilation, filtration, and air cleaners to reduce airborne infectious aerosol exposure. **Strategy 4.1a** also builds on existing efforts by the North Carolina General Assembly to protect the health of children from toxicants at school, which are reflected in the School Children’s Health Act (SL 2006-143/HB 1502). This legislation, enacted on July 10, 2006, outlines specific actions to be undertaken by the State Board of Education to “address public health and environmental issues in the classroom and on school grounds.”^c

Strategy 4.1b

Support the interpretation and translation of data and other information into effective strategies to reduce exposure and infection risk.

The North Carolina Department of Public Instruction and the North Carolina Department of Health and Human Services’ Occupational and Environmental Epidemiology Branch should work together to develop and provide ongoing guidance for school systems and state agencies to (1) understand the risk of exposure to airborne infectious aerosols based on carbon dioxide (CO₂) level monitoring and (2) identify effective strategies to reduce exposure and infection risk.

DESIRED RESULT

Evidence-based, actionable guidance to help school system staff interpret and apply the results of CO₂ monitoring to classroom practices, and technical assistance to identify effective, tailored strategies to reduce the risk of exposure to airborne infectious aerosols.

WHY DOES THE TASK FORCE RECOMMEND THIS STRATEGY?

CO₂ monitoring has emerged as a cost-effective method of assessing the risk of airborne infectious disease transmission by providing data that reflect the air flow and resulting air quality of spaces.^{44,45} While these data can help school system staff to make decisions about whether to open windows, require face masks, or implement another strategy to reduce the risk of airborne infectious disease transmission, the task force also identified the need for guidance and technical assistance to support school systems in their decision-making. **Strategy 4.1b** also reflects survey findings published by the Center for Green Schools and the American Society for Heating, Refrigerating and Air-Conditioning Engineers, which underscore the need for clear guidance on acceptable CO₂ levels to help schools monitor and translate their indoor air quality data into tailored infection control and prevention strategies.⁵⁶

ADDITIONAL CONTEXT

The North Carolina Department of Public Instruction and the North Carolina Department of Health and Human Services’ Occupational and Environmental Epidemiology Branch—which provides guidance and technical assistance to state agencies, schools, and other facilities on indoor environmental air quality⁵⁷—are the responsible organizations involved in **Strategy 4.1b**. This strategy builds on the work that the North Carolina Department of Health and Human Services, North Carolina Department of Public Instruction, and the State Board of Education have already done to provide guidance to local school systems in navigating the challenges presented by the COVID-19 pandemic in *Lighting Our Way Forward: North Carolina’s Guidebook for Reopening Public Schools* (2021) and other technical assistance resources.⁵⁸

Strategy 4.1c

Establish and implement standards to reduce exposure and infection risk in workplaces.

The North Carolina Department of Health and Human Services, North Carolina Society for Human Resource Management, Office of State Human Resources, North Carolina Department of Labor, and other private sector partners should work together to (1) establish minimum standards to reduce the risk of exposure to airborne infectious aerosols in workplaces and (2) evaluate and assess opportunities to provide incentives for employers and employees that implement additional evidence-based strategies to reduce the risk of exposure to airborne infectious aerosols in workplaces.

^c Session Law 2006-143, HB 1502, Schoolchildren’s Health Act of 2006. <https://www.ncleg.net/sessions/2005/bills/house/html/h1502v5.html>

DESIRED RESULT

Concerted efforts to reduce airborne infectious disease transmission in public and private sector workplaces to promote the health, safety, and well-being of employees and their families and communities.

WHY DOES THE TASK FORCE RECOMMEND THIS STRATEGY?

COVID-19 and other infectious disease outbreaks frequently occur in the workplace.⁵⁹ While some employees may be able to work remotely, other employees—particularly health care and frontline essential workers—may be unable to do so. **Strategy 4.1c** aims to establish minimum infection control standards that employers should implement to reduce the transmission of COVID-19 and other infectious diseases in the workplace.

Establishing and implementing standards to reduce the transmission of infectious disease in workplaces can improve economic stability for employers and North Carolina's economy overall. Fewer outbreaks of COVID-19 and other infectious diseases will reduce the number of employees out sick, fostering productivity and lowering health care costs. Safer, healthier workplaces can also make employees feel more protected, supported, and valued, leading to improved job satisfaction and better retention and recruitment. The protection of immunocompromised and vulnerable people inside and outside of the workplace is another essential component of building healthy communities across the state.

ADDITIONAL CONTEXT

The North Carolina Department of Health and Human Services, North Carolina Society for Human Resource Management, Office of State Human Resources, North Carolina Department of Labor, and other private sector partners identified by these entities are the responsible organizations involved in **Strategy 4.1c**. The Office of State Human Resources has published guidance to support North Carolina's employers and employees in navigating the many challenges of the COVID-19 pandemic⁶⁰ that aligns with the guidance provided by the Office of Safety and Health Administration and the North Carolina Department of Health and Human Services.⁶¹ Governor Cooper also issued Executive Order 224 on July 29, 2021,^d requiring state employees to furnish proof of vaccination or submit to weekly COVID-19 testing, and the Office of State Human Resources issued a policy to promote adherence to Executive Order 224 that has since been revised and updated as the state's response to the pandemic has evolved.^{62,63} **Strategy 4.1c** recognizes these important steps in controlling the spread of COVID-19 in the workplace and beyond, and asks these entities to develop minimum standards to reduce transmission in anticipation of future outbreaks of COVID-19 and other infectious diseases.

The North Carolina Society for Human Resource Management—the local chapter of the Society for Human Resource Management—is another important partner in establishing standards to reduce airborne infectious disease transmission in North Carolina's workplaces.

Strategy 4.1d

Improve air quality in justice system facilities to reduce exposure and infection risk and protect staff, justice-involved populations, and communities.

The North Carolina General Assembly should provide additional funding to the North Carolina Department of Public Safety to (1) regularly/continuously upgrade heating, ventilation, and air conditioning (HVAC) systems to improve indoor air quality and reduce airborne infectious aerosol exposure in North Carolina prison facilities and (2) create a multidisciplinary team to provide infection control guidance and other forms of technical assistance to state prisons, county jails, and detention centers with the goal of promoting the health, safety, and well-being of justice-involved populations and staff.

DESIRED RESULT

Reduced transmission of airborne diseases in justice system facilities to promote healthy, safe environments for justice-involved persons, staff in these facilities, and their families and communities. Improved air quality in justice system facilities will also reduce exposure to allergens and other pollutants that can cause or exacerbate acute and chronic conditions experienced by those who live and work in justice system facilities.

WHY DOES THE TASK FORCE RECOMMEND THIS STRATEGY?

Justice system facilities involve close living arrangements, necessitating the implementation of evidence-based strategies to reduce the transmission of infectious disease. During the COVID-19 pandemic, justice-involved populations and staff in North Carolina and across the United States have been particularly vulnerable as a result of overcrowding, high transmissibility, and racial disparities.^{64,65} In response, scientists and other preparedness experts have prioritized the importance of strategies such as improved ventilation to mitigate the spread of the virus and elevate equity in justice system facilities.^{65,66}

In alignment with recommendations and guidance from the Centers for Disease Control and Prevention,⁶⁷ **Strategy 4.1d** will improve indoor air quality to reduce the transmission of airborne infectious diseases and promote health among justice-involved populations and staff. **Strategy 4.1d** takes a system-level approach to protecting these populations and their communities, while aiming to reduce the burden of infection control on staff in justice system facilities, which have been strained throughout the COVID-19 pandemic.⁶⁸ By reducing the burden on staff, **Strategy 4.1d** also supports the North Carolina Department of Public Safety's strategic plan,⁶⁹ which prioritizes retention, morale, and wellness among staff in the Division of Prisons.

^d July 29, 2021, Executive Order 224, <https://files.nc.gov/governor/documents/files/EO224-COVID-19-Measures.pdf>



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ADDITIONAL CONTEXT

North Carolina’s budget for the use of American Rescue Plan Act funds included \$30 million for the North Carolina Department of Public Safety to address the need for heating,³³ ventilation, and air conditioning systems to be installed in 40 facilities without such systems. With this funding, which was ultimately approved by the North Carolina General Assembly in November 2021,⁷⁰ the North Carolina Department of Public Safety estimated that air quality and overall conditions would be improved for more than 15,000 justice-involved persons and nearly 9,000 staff in these facilities.³³ These funds enabled meaningful upgrades in facilities that had been relying on air purifiers to improve air quality during the COVID-19 pandemic.⁷¹ However, the task force noted that additional funds are needed to resolve remaining issues and to meet the need for modernized ventilation and other upgrades or equipment in other justice system facilities across the state, many of which are more than 50 years old.⁶⁹ These infrastructure upgrades can lessen health care costs for the state in the short and long term.

The state’s plan for allocating ARPA funds also included resources for detection and mitigation of COVID-19 in confinement facilities;⁶ Governor Cooper’s budget proposed specific plans to establish a “multi-disciplinary team to provide infection control guidance, outbreak management and technical assistance to state prisons, county jails and detention centers.”³³ **Strategy 4.1d** supports this proposed work, while including other needed forms of technical assistance to prioritize health equity, improve safety, and promote the well-being of North Carolina’s justice-involved populations and staff.

Strategy 4.1e

Ensure the rapid conversion and deployment of mobile care units based on community-level needs.

North Carolina Emergency Management, North Carolina Office of Emergency Medical Services, North Carolina Healthcare Association, and other partners should work together to develop a plan to (1) ensure that existing assets can be quickly converted into mobile care units and (2) identify locations that would most benefit from the deployment of mobile care units during declared emergencies. This plan should consider the need for potential revisions to existing statutes to allow for payment of mobile services within and/or outside the context of declared emergencies.

DESIRED RESULT

The development of an equity-centered plan to ensure the rapid conversion of existing assets into mobile care units in order to provide services including testing, treatment, and distribution of personal protective equipment, and the strategic deployment of these mobile care units to communities in need.

WHY DOES THE TASK FORCE RECOMMEND THIS STRATEGY?

Mobile units are important tools in the delivery of health care services to historically marginalized and underserved communities that are at higher risk of COVID-19 and other health conditions^{72,73} and at the same time isolated or otherwise unable to access services.⁷⁴ The distribution of fixed medical assets, such as clinics, urgent care centers, and other facilities, is not uniform across our state, resulting in fewer sites of care in communities that are more rural, have a lower average income, and have higher percentages of residents of color. Mobile care units can bridge gaps in North Carolina’s health care safety net, particularly in the context of rural hospital closures⁷⁵ and other systemic barriers to care. Mobile care units also help to address structural barriers to care^{74,76} such as transportation or inflexible work schedules, by bringing services to those in need, and their flexibility and adaptability make them ideal resources to deploy before, during, and after public health emergencies.⁷³ **Strategy 4.1e** will facilitate North Carolina’s ability to quickly convert and deploy mobile care units to areas of the state in need, while also increasing the state’s ability to provide assistance to neighboring states if needed.

ADDITIONAL CONTEXT

North Carolina Emergency Management, North Carolina Office of Emergency Medical Services, North Carolina Healthcare Association, and other partners identified by these entities are the responsible organizations involved in **Strategy 4.1e**. These organizations collaborate on the North Carolina Healthcare Preparedness Program, which develops plans, training, exercises, and guidance as the lead Emergency Support Function 8 organization of the State Emergency Response Team under the North Carolina Emergency Operations Plan.^{77,78}

During the COVID-19 pandemic, mobile care units have been deployed to support the North Carolina Department of Health and Human Services’ vaccination campaign and increase access to COVID-19 testing and screening and treatment services for a variety of health conditions. Another example involves the North Carolina Healthcare Foundation, the 501(c)3 affiliate of the North Carolina Healthcare Association, which established the COVID-19 Fill the Gap Response Fund to help health care organizations and community-based organizations implement mobile care models and other strategies to expand access to care.^{79,80} **Strategy 4.1e** will increase planning, coordination, and support for mobile health units by leveraging the strengths of organizations partnered in the work of the North Carolina Healthcare Preparedness Program.

⁶ Session Law 2021-180. Senate Bill 105, An Act to Make Base Budget Appropriations for Current Operations of State Agencies, Departments, and Institutions and for Other Purposes.

CHAPTER 4: References

1. Megahed NA, Ghoneim EM. Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture. *Environ Res.* 2021;193:110471. doi:10.1016/j.envres.2020.110471
2. United States Environmental Protection Agency. Healthy Buildings, Healthy People. October 2001. https://www.epa.gov/sites/default/files/2014-08/documents/hbhp_report.pdf. Accessed July 25, 2022.
3. Frumkin H. COVID-19, the Built Environment, and Health. *Environ Health Perspect.* 2021;129(7). doi:10.1289/EHP8888
4. Rocklöv J, Sjödin H. High population densities catalyse the spread of COVID-19. *J Travel Med.* 2020;27(3):1-2. doi:10.1093/JTM/TAAA038
5. Cohen J, Rodgers Y van der M. Contributing factors to personal protective equipment shortages during the COVID-19 pandemic. *Prev Med (Baltim).* 2020;141:106263. doi:10.1016/j.ypmed.2020.106263
6. von Seidlein L, Alabaster G, Deen J, Knudsen J. Crowding has consequences: Prevention and management of COVID-19 in informal urban settlements. *Build Environ.* 2021;188:107472. doi:10.1016/j.buildenv.2020.107472
7. Leclerc QJ, Fuller NM, Knight LE, Funk S, Knight GM. What settings have been linked to SARS-CoV-2 transmission clusters? *Wellcome Open Res.* 2020;5. doi:10.12688/WELLCOMEOPENRES.15889.2
8. Council of State and Territorial Epidemiologists. Proposed Investigation Criteria and Outbreak Definition for COVID-19 in Non-Residential, Non-Healthcare Workplace Settings. <https://preparedness.cste.org/wp-content/uploads/2020/08/OH-Outbreak-Definition.pdf>. Published July 2020. Accessed July 25, 2022.
9. Occupational Safety and Health Administration. Healthcare Overview. <https://www.osha.gov/healthcare>. Accessed July 25, 2022.
10. Centers for Disease Control and Prevention. Ventilation in Buildings. <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>. Accessed July 25, 2022.
11. Burrige HC, Bhagat RK, Stettler MEJ, et al. The ventilation of buildings and other mitigating measures for COVID-19: a focus on wintertime. *Proc R Soc A.* 2021;477(2247). doi:10.1098/RSPA.2020.0855
12. Nishiura H, Oshitani H, Kobayashi T, et al. Closed environments facilitate secondary transmission of coronavirus disease 2019 (COVID-19). *medRxiv.* April 2020:2020.02.28.20029272. doi:10.1101/2020.02.28.20029272
13. Buonanno G, Stabile L, Morawska L. Estimation of airborne viral emission: Quanta emission rate of SARS-CoV-2 for infection risk assessment. *Environ Int.* 2020;141:105794. doi:10.1016/j.envint.2020.105794
14. Gitterman BA, Flanagan PJ, Cotton WH, et al. Poverty and child health in the United States. *Pediatrics.* 2016;137(4). doi:10.1542/PEDS.2016-0339/81482
15. Bower KM, Thorpe RJ, Rohde C, Gaskin DJ. The intersection of neighborhood racial segregation, poverty, and urbanicity and its impact on food store availability in the United States. *Prev Med (Baltim).* 2014;58(1):33-39. doi:10.1016/j.ypmed.2013.10.010
16. Yearby R. Racial Disparities in Health Status and Access to Healthcare: The Continuation of Inequality in the United States Due to Structural Racism. *Am J Econ Sociol.* 2018;77(3-4):1113-1152. doi:10.1111/AJES.12230
17. Friedland G. Marking Time in the Global HIV/AIDS Pandemic. *JAMA.* 2016;316(2):145-146. doi:10.1001/JAMA.2016.9006
18. Khazanchi R, Evans CT, Marcelin JR. Racism, Not Race, Drives Inequity Across the COVID-19 Continuum. *JAMA Netw Open.* 2020;3(9):e2019933-e2019933. doi:10.1001/JAMANETWORKOPEN.2020.19933
19. Office of Disease Prevention and Health Promotion. Health Equity in Healthy People 2030. <https://health.gov/healthypeople/priority-areas/health-equity-healthy-people-2030>. Accessed July 25, 2022.
20. NC Department of Health and Human Services Division of Public Health. 2019 North Carolina State Health Assessment: Introduction and Data Tables-A Companion to Healthy North Carolina 2030. December 2019. <https://schs.dph.ncdhhs.gov/units/ldas/docs/SHA-REPORT-Final-2-24.pdf>. Accessed July 25, 2022.
21. NC Department of Health and Human Services. North Carolina State Health Improvement Plan. <https://schs.dph.ncdhhs.gov/units/ldas/docs/SHIP-REPORT-Final-030121.pdf>. Published December 2020. Accessed July 25, 2022.
22. North Carolina Institute of Medicine. Healthy North Carolina 2030. <https://nciom.org/wp-content/uploads/2020/01/HNC-REPORT-FINAL-Spread2.pdf>. Published January 2020. Accessed July 25, 2022.
23. Arasteh K. Prevalence of Comorbidities and Risks Associated with COVID-19 Among Black and Hispanic Populations in New York City: an Examination of the 2018 New York City Community Health Survey. *J Racial Ethn Heal Disparities.* 2021;8(4):863-869. doi:10.1007/S40615-020-00844-1/TABLES/4
24. Bustamante AS, Dearing E, Zachrisson HD, Vandell DL. Adult outcomes of sustained high-quality early child care and education: Do they vary by family income? *Child Dev.* 2022;93(2):502-523. doi:10.1111/CDEV.13696
25. Baidal JW, Wang AY, Zumwalt K, et al. Social Determinants of Health and COVID-19 Among Patients in New York City. *Res Sq.* September 2020. doi:10.21203/RS.3.RS-70959/V1
26. Do DP, Frank R. Unequal burdens: assessing the determinants of elevated COVID-19 case and death rates in New York City's racial/ethnic minority neighbourhoods. *J Epidemiol Community Heal.* 2021;75(4):321-326. doi:10.1136/JECH-2020-215280
27. Zachary C. The American Rescue Plan Act: Protecting and Supporting Frontline Workers. *N C Med J.* 2021;82(5):345-349. <https://www.ncmedicaljournal.com/content/ncm/82/5/345.full.pdf>. Accessed July 25, 2022.
28. Cox-Ganser JM, Henneberger PK. Occupations by Proximity and Indoor/Outdoor Work: Relevance to COVID-19 in All Workers and Black/Hispanic Workers. *Am J Prev Med.* 2021;60(5):621-628. doi:10.1016/j.amepre.2020.12.016
29. Racial Inequality Among Workers in Frontline Industries: Black Workers are Overrepresented and Undercompensated - Center for Economic and Policy Research. <https://cepr.net/racial-inequality-among-workers-in-frontline-industries-black-workers-are-overrepresented-and-undercompensated/>. Accessed September 19, 2022.
30. NC Department of Administration. *Andrea Harris Social, Economic, Environmental Health Equity Task Force Biannual Report.* Raleigh; 2020. <https://files.nc.gov/ncdoa/Andrea-Harris-Task-Force/AHTF-December-2020-Biannual-Report.pdf>. Accessed July 25, 2022.
31. Allen J. 'Sick Buildings' Add to COVID-Linked Inequity. <https://www.northcarolinahealthnews.org/2020/12/19/sick-buildings-add-to-covid-linked-inequity/>. Published December 19, 2020. Accessed July 25, 2022.
32. NC Pandemic Recovery Office. American Rescue Plan Act Information and Resources. <https://ncpro.nc.gov/covid-19-funding/arpa>. Accessed July 25, 2022.



CHAPTER 4: References

33. North Carolina Office of State Budget and Management. *A Shared Recovery for a Stronger NC.*; 2021. <https://www.osbm.nc.gov/media/1882/download?attachment>. Accessed July 21, 2022.
34. Biden-Harris Administration. The Biden-Harris Action Plan for Building Better School Infrastructure. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/04/fact-sheet-the-biden-harris-action-plan-for-building-better-school-infrastructure/>. Accessed July 25, 2022.
35. U.S. Department of Energy. The Biden-Harris Administration Announces \$500 Million Program for Better School Infrastructure. <https://www.energy.gov/articles/biden-harris-administration-announces-500-million-program-better-school-infrastructure>. Published 2022. Accessed July 25, 2022.
36. Questions VI, Answers I, Closing V. American Rescue Plan Elementary and Secondary School Emergency Relief (ESSER) Program Using COVID-Relief Funds for Facility Upgrades, Renovations, and Construction I. Introduction II. Review of ESSER Construction and Remodeling Uses of Funds III. Additional Department Communications IV. EPA and DoE Resources V. State and Local Examples. 2021.
37. US EPA. Clean Air in Buildings Challenge. <https://www.epa.gov/indoor-air-quality-iaq/clean-air-buildings-challenge>. Published March 22, 2022. Accessed July 25, 2022.
38. US EPA. Clean Air in Buildings Challenge. https://www.epa.gov/system/files/documents/2022-03/508-cleanairbuildings_factsheet_v5_508.pdf. Published March 2022. Accessed July 25, 2022.
39. Office of the Governor. Governor Cooper Signs Executive Order to Address Disproportionate Impact of COVID-19 on Communities of Color. <https://governor.nc.gov/news/governor-cooper-signs-executive-order-address-disproportionate-impact-covid-19-communities>. Published June 4, 2020. Accessed July 25, 2022.
40. NC Department of Administration. The Andrea Harris Social, Economic, Environmental, and Health Equity Task Force. <https://ncadmin.nc.gov/ahtf>. Accessed July 25, 2022.
41. Johns Hopkins Medicine. Is the COVID-19 Vaccine Safe? <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/is-the-covid19-vaccine-safe>. Published April 1, 2022. Accessed July 26, 2022.
42. Reshwan S, Malahe K, Hoek RAS, et al. Clinical Characteristics and Outcomes of Immunocompromised Patients With Coronavirus Disease 2019 Caused by the Omicron Variant: A Prospective, Observational Study. *Clin Infect Dis*. July 2022. doi:10.1093/CID/CIAC571
43. Smith Rogers L. Omicron Q&A: Making Some Sense of the Messiness of This Moment | Johns Hopkins | Bloomberg School of Public Health. <https://publichealth.jhu.edu/2022/omicron-qa-making-some-sense-of-the-messiness-of-this-moment>. Accessed September 2, 2022.
44. Mainini AG, Košir M, Blanco Cadena JD, et al. Use of Low-Cost Devices for the Control and Monitoring of CO₂ Concentration in Existing Buildings after the COVID Era. *Appl Sci* 2022, Vol 12, Page 3927. 2022;12(8):3927. doi:10.3390/APP12083927
45. Segala G, Doriguzzi-Corin, Peroni C, Gazzini T, Siracusa D. A Practical and Adaptive Approach to Predicting Indoor CO₂. *Appl Sci* 2021, Vol 11, Page 10771. 2021;11(22):10771. doi:10.3390/APP112210771
46. Johns Hopkins Center for Health Security. School Ventilation: A Vital Tool to Reduce COVID-19 Spread. May 2021. https://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2021/20210526-school-ventilation.pdf. Accessed July 25, 2022.
47. US EPA. Indoor Air Quality in High Performance Schools . <https://www.epa.gov/iaq-schools/indoor-air-quality-high-performance-schools>. Accessed July 25, 2022.
48. National Education Association. Alarming Number of Educators May Soon Leave the Profession. <https://www.nea.org/advocating-for-change/new-from-nea/survey-alarming-number-educators-may-soon-leave-profession>. Published February 1, 2022. Accessed July 25, 2022.
49. Prather KA, Wang CC, Schooley RT. Reducing transmission of SARS-CoV-2: Masks and testing are necessary to combat asymptomatic spread in aerosols and droplets. *Science* (80-). 2020;368(6498):1422-1424. doi:10.1126/SCIENCE.ABC6197/SUPPL_FILE/PAPV4.PDF
50. Chillon SA, Millan M, Aramendia I, Fernandez-Gamiz U, Zulueta E, Mendaza-Sagastizabal X. Natural Ventilation Characterization in a Classroom under Different Scenarios. *Int J Environ Res Public Heal* 2021, Vol 18, Page 5425. 2021;18(10):5425. doi:10.3390/IJERPH18105425
51. Prather KA, Marr LC, Schooley RT, McDiarmid MA, Wilson ME, Milton DK. Airborne transmission of SARS-CoV-2. *Science* (80-). 2020;370(6514):303-304. doi:10.1126/SCIENCE.ABF0521
52. NC Department of Health and Human Services. Update on Guidance for K12 Settings. <https://covid19.ncdhs.gov/media/164/open>. Published June 24, 2022. Accessed July 26, 2022.
53. Centers for Disease Control and Prevention. Operational Guidance for K-12 Schools and Early Care and Education Programs to Support Safe In-Person Learning. https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-childcare-guidance.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fcommunity%2Fschoo%2Fschools-childcare%2Fk-12-guidance.html. Published May 27, 2022. Accessed July 26, 2022.
54. ASHRAE Epidemic Task Force. Schools & Universities. [https://www.ashrae.org/file library/technical resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf](https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf). Published May 14, 2021. Accessed July 26, 2022.
55. ASHRAE Epidemic Task Force. Core Recommendations for Reducing Airborne Infectious Aerosol Exposure . [https://www.ashrae.org/file library/technical resources/covid-19/core-recommendations-for-reducing-airborne-infectious-aerosol-exposure.pdf](https://www.ashrae.org/file%20library/technical%20resources/covid-19/core-recommendations-for-reducing-airborne-infectious-aerosol-exposure.pdf). Published October 19, 2021. Accessed July 26, 2022.
56. Bueno De Mesquita PJ, Chan WR, Heming A, Shannon C. *Managing Air Quality During the Pandemic: How K-12 Schools Addressed Air Quality in the Second Year of COVID-19.*; 2022. [https://www.ashrae.org/file library/technical resources/covid-19/managing_air_quality_during_the_pandemic.pdf](https://www.ashrae.org/file%20library/technical%20resources/covid-19/managing-air-quality-during-the-pandemic.pdf). Accessed July 26, 2022.
57. NC Department of Health and Human Services Division of Public Health. Occupational and Environmental Epidemiology: Indoor Environmental Quality. <https://epi.dph.ncdhs.gov/oe/programs/iaq.html>. Published December 17, 2019. Accessed July 26, 2022.
58. NC Department of Public Instruction . *Lighting Our Way Forward: North Carolina's Guidebook for Reopening Public Schools*. <https://docs.google.com/document/d/1z5Mp2XzOOPkBYN4YvROz4YOyNIF2UoWq9EZfrjvN4x8/edit>. Accessed July 26, 2022.
59. Ingram C, Downey V, Roe M, et al. COVID-19 Prevention and Control Measures in Workplace Settings: A Rapid Review and Meta-Analysis. *Int J Environ Res Public Health*. 2021;18(15). doi:10.3390/IJERPH18157847/S1
60. NC Office of Human Resources. COVID-19 Employee and Agency Resources. <https://oshr.nc.gov/state-employee-resources/workplace-safety/covid-19-employee-and-agency-resources>. Published May 17, 2022. Accessed July 26, 2022.
61. OSHA. Protecting Workers: Guidance on mitigating and preventing the spread of COVID-19 in the workplace. <https://www.osha.gov/coronavirus/safework>. Accessed July 26, 2022.

CHAPTER 4: References

62. NC Office of State Human Resource. Vaccination or Testing Policy. <https://oshr.nc.gov/vaccination-or-testing-policy>. Accessed July 26, 2022.
63. NC Office of State Human Resources. State Policy on Face Coverings and on Vaccination or Testing. <https://oshr.nc.gov/media/4455/open>. Accessed July 26, 2022.
64. Natoli LJ, Vu KL, Sukhija-Cohen AC, et al. Incarceration and COVID-19: Recommendations to Curb COVID-19 Disease Transmission in Prison Facilities and Surrounding Communities. *Int J Environ Res Public Health*. 2021;18(18):9790. doi:10.3390/IJERPH18189790
65. Barnert E, Kwan A, Williams B. Ten urgent priorities based on lessons learned from more than a half million known COVID-19 cases in US prisons. *Am J Public Health*. 2021;111(6):1099-1105. doi:10.2105/AJPH.2021.306221
66. Pfeiffer O, Antony S, Jacquot G, Huynh A, Kostioukhina E, Kumar A. COVID-19 mitigation strategies for reduced transmission in U.S. prisons. 2021. doi:10.38105/spr.ows1yan96v
67. Centers for Disease Control and Prevention. Guidance on Prevention and Management of Coronavirus Disease 2019 (COVID-19) in Correctional and Detention Facilities. <https://www.cdc.gov/coronavirus/2019-ncov/community/correction-detention/guidance-correctional-detention.html>. Published May 3, 2022. Accessed July 26, 2022
68. Kesri R. Update on North Carolina Budget, COVID Prison Conditions. Wilson Center for Science and Justice. <https://wcsj.law.duke.edu/2021/12/update-on-north-carolina-budget-covid-prison-conditions/>. Published December 30, 2021. Accessed July 26, 2022.
69. North Carolina Department of Public Safet. *Division of Prisons Strategic Plan 2020-2024*. <https://files.nc.gov/ncdps/documents/files/Division-of-Prisons-Strategic-Plan.pdf>. Accessed July 26, 2022.
70. Commissioners NCA of C. No Title. ARPA Fundin Overview. <https://www.ncacc.org/wp-content/uploads/2022/03/ARPA-Funding-Overview.pdf>. Published 2022. Accessed September 19, 2022.
71. North Carolina Department of Public Safety. Air Purifier Installation in Progress in State Prisons. Press Releases. <https://www.ncdps.gov/news/press-releases/2021/01/07/air-purifier-installation-progress-state-prisons>. Published January 7, 2021. Accessed July 26, 2022.
72. Hendl K. The Case For Investment In Mobile Health Care Solutions To Reduce Health Inequities. Health Affairs. <https://www.healthaffairs.org/doi/10.1377/forefront.20220411.842564/>. Published April 12, 2022. Accessed July 26, 2022.
73. Attipoe-Dorcoo S, Delgado R, Gupta A, Bennet J, Oriol NE, Jain SH. Mobile health clinic model in the COVID-19 pandemic: Lessons learned and opportunities for policy changes and innovation. *Int J Equity Health*. 2020;19(1):1-5. doi:10.1186/S12939-020-01175-7/FIGURES/1
74. Rader B, Astley CM, Sy KTL, et al. Geographic access to United States SARS-CoV-2 testing sites highlights healthcare disparities and may bias transmission estimates. *J Travel Med*. 2020;27(7):1-4. doi:10.1093/JTM/TAAA076
75. Sheps Center for Health Services Research. Rural Hospital Closures. <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>. Accessed July 26, 2022.
76. Chaudhry N. Mobile Health Clinics to Mitigate COVID-19 Systemic Barriers. <https://globalhealth.duke.edu/news/mobile-health-clinics-mitigate-covid-19-systemic-barriers>. Published November 30, 2021. Accessed July 26, 2022.
77. North Carolina Emergency Management. *2020 North Carolina Emergency Operations Plan*. https://files.nc.gov/ncdps/documents/files/Divisions/EM/EOP/NCEOP_2020_FINAL-Entire-Plan-488-Pages.pdf. Accessed July 26, 2022.
78. North Carolina Hospital Planning and Preparedness . Preparedness Unit Responsibilities, Goals, and Objectives. <https://hpp.nc.gov/planning-and-preparedness/>. Accessed July 26, 2022.
79. North Carolina Healthcare Association. Filling the Gaps in Underserved and Rural Communities. It Takes a Hospital. <https://nchealthcare.org/filling-the-gaps-in-underserved-and-rural-communities/>. Accessed July 26, 2022.
80. North Carolina Healthcare Foundation. <https://dev.ncha.org/foundation/>. Accessed July 26, 2022.