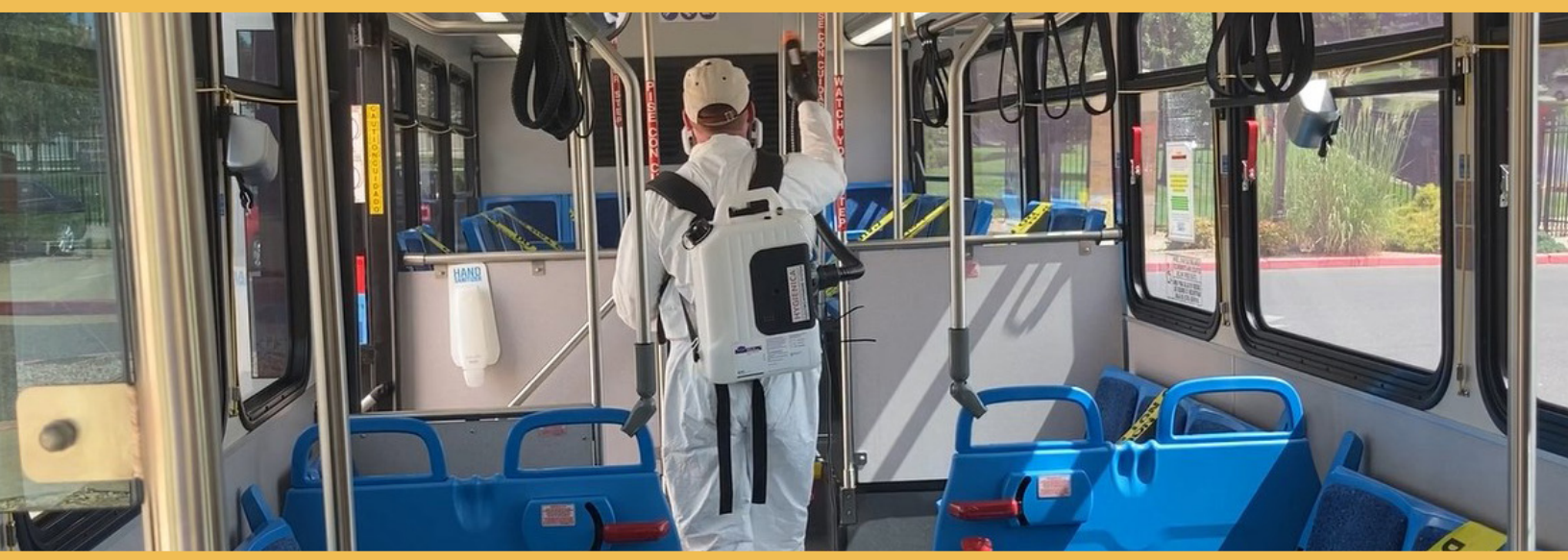
Technical Memo: Public Health and Scientific Findings on COVID-19 and Their Implications for Transit

PREPARED IN SUPPORT OF THE:

VIRGINIA TRANSIT CRISIS RESPONSE + RECOVERY HANDBOOK



DRPT

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About this Memo

This memo was developed as part of the DRPT Virginia Transit Crisis Response + Recovery Handbook project. The Virginia Transit Crisis Response + Recovery Handbook is one component of DRPT's COVID 19 Transit Recovery Toolkit, whose development was funded by the Federal Transit Administration's (FTA) COVID-19 Research Demonstration Grant Program to support strategies that address the operational challenges that agencies faced during the pandemic.

The full handbook can be found at: TransitVA.org

This technical memo outlines the public health research and information which provided the foundation for the recommendations in the Virginia Transit Crisis Response + Recovery Handbook related to protocols that public transit agencies should consider to keep operators and passengers safe while riding transit.

1 About COVID-19 and Virus Transmissibility

1.1 How COVID-19 Spreads and the Associated Symptoms

COVID-19 is a respiratory disease caused by a new coronavirus (SARS-CoV-2) discovered in 2019. At the beginning of the pandemic in the U.S. in early April 2020, the CDC provided information about the virus and broad guidelines for slowing and preventing transmission, including ones specific to the public transit industry.[1] This information was updated as more research was conducted.

1.1.1 How the Virus Spreads

As we now know, COVID-19 is largely spread in three ways:

- **Inhalation**: Breathing in air in the vicinity of an infected person who is exhaling virus particles.
- **Deposition**: Having particles containing the virus land on the eyes, nose, or mouth (i.e., when an infected person coughs or sneezes around a non-infected person).
- **Touching**: Touching the eyes, nose, or mouth with hands that have virus particles on them.[2]

Risk of transmission varies considerably according to the type and amount of virus exposure. The greatest transmission risk occurs when someone is within three to six feet of a concentrated infectious source of fine droplets and particles. Larger droplets settle out of the air within seconds to minutes while smaller droplets, and the aerosol particles created when they rapidly dry, can remain suspended in the air for minutes to hours.[3] For both inhalation and deposition, the most significant risk of transmission occurs when closeness to a concentrated infectious source is greatest. To date, the dose of infectious particles inhaled or deposited that leads to transmission has not been determined. Current evidence strongly suggests that touching contaminated surfaces (i.e., fomites) does not substantially contribute to new infections.

Exhaled infectious particles and droplets move outward from their source over time. Increasing time after exhalation and distance from the source can help to decrease the infection risk, hence the importance of social distancing. While less likely, infections from inhalation can still occur at distances greater than six feet, particularly indoors. When an infectious person is exhaling virus particles indoors for an extended period of time (at least 15 minutes), the concentration of infectious particles and droplets can be enough to transmit infections to people greater than six feet away. Even if everyone in an enclosed room is wearing a mask, prolonged indoor exposure (several hours) is still likely to lead to infection. **Error! Reference source not found.** represents a peer-reviewed estimate of how long infectious virus particles can linger in the air around a person who is either silent, talking, or shouting/singing.[4]

Knowing how the virus spreads and the risks associated with different types of exposure has helped to shape the public response effort. Adoption of social distancing measures such as enhancing personal and environmental hygiene and sanitation; staying home when possible; wearing masks; and keeping a distance of six feet between individuals who do not live in the same household are examples of ways to mitigate the spread from inhalation, deposition, and touching. More detailed information on the pandemic response effort, particularly for the public transportation industry, is included in a later section of this chapter.

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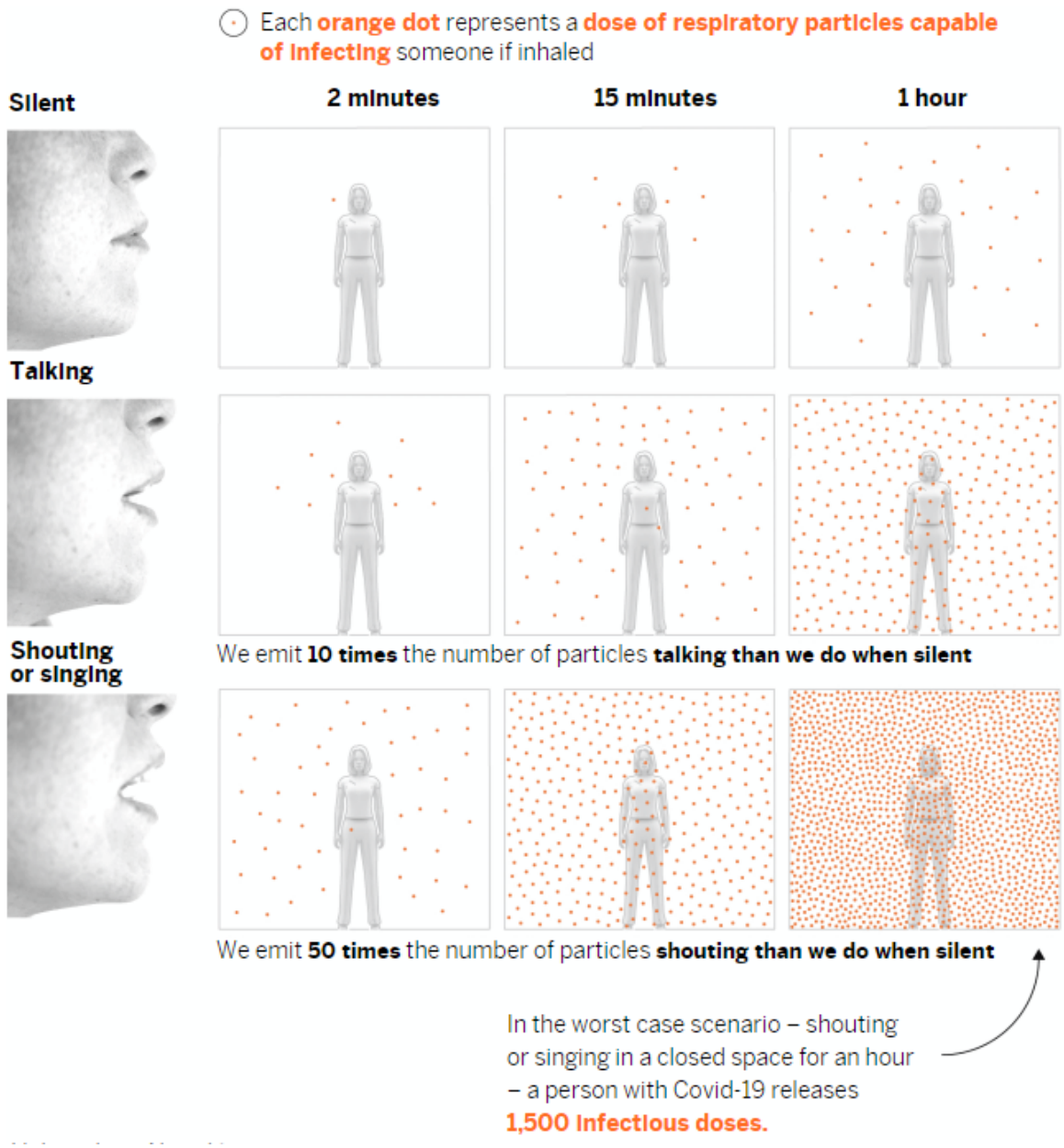
[1] APTA, The COVID-19 Pandemic: Public Transportation Responds: Safeguarding Riders and Employees.
[2] CDC, How COVID-19 Spreads.
[3] CDC, Scientific Brief: SARS-CoV-2 Transmission.
[4] El País, Coronavirus: A Room, a Bar and a Classroom: How the Coronavirus is Spread Through the Air.

Figure 1: Estimate of How Long Infectious Virus Particles Linger in the Air



1.1.2 Associated Symptoms of the Virus

COVID-19 infection typically causes mild symptoms though some people can become severely or fatally ill. While anyone can be impacted by COVID-19, older adults, anyone with underlying health conditions, and pregnant or recently pregnant people are particularly vulnerable.[5] Some people who are infected with COVID-19 are asymptomatic, or do not exhibit any symptoms. This means that even healthy-feeling individuals can carry and transmit the virus to others. The symptoms associated with COVID-19 infection can appear two to 14 days after someone is exposed to the virus and may include:

- Fever or chills

[5] CDC, People at Increased Risk.

- Cough
- Difficulty breathing or shortness of breath
- Fatigue
- Muscle or body aches
- Vomiting or nausea
- Diarrhea
- New loss of taste or smell
- Headache
- Sore throat
- Congestion or runny nose.

The CDC recommends seeking immediate emergency care if someone is exhibiting any of the following symptoms:

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Pale, gray, or blue-colored skin, lips, or nail beds, depending on skin tone.[6]

Long Term Health Impacts

While most people recover from COVID-19 within weeks, others can experience a wide variety of new, returning, or ongoing health problems more than four weeks after first being infected with the virus. The CDC has currently identified three types of long-term effects from COVID-19: long COVID, multiorgan effects of COVID-19, and the effects of COVID-19 treatment or hospitalization.

Long COVID

Long COVID refers to the condition of having a range of symptoms that can first appear weeks after infection or last weeks or months after initial infection. Anyone who has had the virus, even asymptomatic individuals, can experience long COVID symptoms, which may include different combinations of tiredness or fatigue, chest pain, difficulty concentrating (i.e., "brain fog"), headache, shortness of breath, joint or muscle pain, depression, and/or worse symptoms after physical or mental activities.

Multiorgan Effects of COVID-19

Some post-COVID conditions, such as swelling and inflammation of body parts or autoimmune conditions, have multiorgan effects that can impact multiple organ systems within most, if not all, of the body's brain, skin, kidney, lung, and/or heart functions.

Effects of COVID-19 Treatment

Similar to the impacts of a hospitalization for other respiratory infections or critical illnesses, possible side effects of COVID-19 treatment or hospitalization can include post-intensive care syndrome or post-traumatic stress disorder.

Variants

Viruses like SARS-CoV-2 constantly change through mutation, so new variants of a virus are always emerging. The more circulation of a virus, the more mutations occur. Sometimes new variants emerge and then disappear, but some persist. Scientists monitor the diverse changes viruses can undergo to learn how those

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[6] CDC, Symptoms of COVID-19.

changes might affect how it spreads and how sick people will get from it. Some variations allow a virus to spread more easily or make it more resistant to treatments or vaccines. Those variants must be monitored more carefully.

According to the Variant Classification scheme created by an interagency U.S. governmental group, there are three defined classes of SARS-CoV-2 variants:[7]

- **Variant of Interest (VOI)**
  - Affect transmission, diagnostics, therapeutics, or immune escape.
  - Cause increased proportion of cases or unique outbreak clusters, according to evidence.
  - Limited prevalence or expansion in the U.S. or other countries.
- **Variant of Concern (VOC):** Includes attributes of VOIs
  - Widespread interference with diagnostic test targets.
  - Substantially decrease response to therapies.
  - Significantly decrease neutralization by antibodies generated during previous infection or vaccination.
  - Increase transmissibility.
  - Increase disease severity.
- **Variant of High Consequence (VOHC):** Includes attributes of VOCs and VOIs
  - Causes significant reduction in effectiveness of prevention measures or medical countermeasures (MCMs) such as vaccines relative to previously circulating variants.
    - No variants of high consequence exist in the United States as of mid-2021.

The VOI B.1.427 (California) can cause about 20 percent increased transmission but was deescalated to a VOI in late June 2021 due to the significant decrease in the proportion of this variant lineage type circulating nationally. As of June 2021, four VOCs have been found in the United States: B.1.1.7 (Alpha from the United Kingdom), B.1351 (Beta from South Africa), B.1.617.2 (Delta from India) and P.1 (Gamma from Brazil).[8] The variant B.1.1.7 (Alpha from the United Kingdom) is currently the most common form of COVID-19 variation, including in the United States, and can cause about 50 percent increased transmission, along with the B.1351 variant (Beta from South Africa).[9]

To date, the CDC has found that the vaccines currently authorized for circulation effectively offer protection against these variants of COVID-19. However, the more the virus is circulating globally, the greater the likelihood that additional variants of concern will emerge, and the possibility still exists for a variant against which currently available vaccines do not offer as much protection to emerge. For this reason, it is in the interest of everyone to curb the pandemic's spread everywhere.

1.2 Trajectory of the Pandemic and Population Immunity

Prior to the development of vaccines, the trajectory of worldwide socioeconomic and public health impacts caused by the coronavirus's sudden and rapid spread seemed pessimistic. In 2021, increasing availability of vaccines and declines in COVID-19 cases across many parts of the U.S. offered a more optimistic outlook, though significant variation exists within the U.S. across regions, states, and demographic groups.

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[7] CDC, SARS-CoV-2 Variant Classifications and Definitions.
[8] CDC, About Variants of the Virus that Causes COVID-19.
[9] CDC, SARS-CoV-2 Variant Classifications and Definitions.

Cases and Deaths

As of October 2021, there had been nearly 43 million recorded cases of and over 695,000 deaths from COVID-19 in the United States, which experienced the most COVID-related deaths of any country worldwide.[10,11] In the U.S., the death rate among recorded COVID-19 cases is around two percent; in reality, the mortality rate from COVID-19 is likely lower due to many cases going undetected and unreported. Therapeutics for treating SARS-CoV-2 have advanced over the course of the pandemic, reducing the mortality rate.

Vaccines

The CDC defines a vaccine as "a product that stimulates a person's immune system to produce immunity to a specific disease, protecting the person from that disease."[12] The first COVID-19 vaccines approved for emergency use authorization (EUA) by the U.S. Food and Drug Administration were the two-dose Pfizer-BioNTech and Moderna vaccines in December 2020, followed by others in 2021.[13] As of October 2021, roughly 64 percent of the U.S. population had been fully vaccinated and over 55 percent had at least one dose.[14] Despite significant regional variation in terms of vaccination rates, the trajectory of the vaccination campaign initially exceeded predictions from 2020 about the vaccine rollout; however, reluctance to receive the vaccine among many Americans in mid-2021 led

Population Immunity

The CDC defines population (or "herd") immunity as a condition in which enough people in a community are protected from getting a disease because they have already had the disease or they have been vaccinated that it becomes difficult for the disease to spread from person to person, and it protects those who are not or cannot be vaccinated. While experts do not yet know the threshold at which population immunity for COVID-19 will be achieved, researchers at Johns Hopkins University find that usually between 50 percent and 90 percent of a population needs immunity before infection rates start to decline.[15] According to the CDC, vaccination is a safer and more reliable way to build protection than contracting COVID-19.[16]

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[10] Johns Hopkins University & Medicine, Coronavirus Resource Center.
[11] The New York Times, Coronavirus World Map: Tracking the Global Outbreak.
[12] CDC, Immunization: The Basics.
[13] U.S. Food & Drug Administration, COVID-19 Frequently Asked Questions.
[14] Washington Post, Coronavirus: Vaccine Tracker.
[15] Johns Hopkins School of Public Health Expert Insights, What is Herd Immunity and How Can We Achieve It with COVID-19?.
[16] CDC, Social Media Toolkit: COVID-19 Vaccinations.

2 Effective Practices in Enhancing Safety

To mitigate the spread of COVID-19 while still maintaining transit service, transit agencies implemented a variety of practices based on guidelines from the CDC, the FTA, and other transit-related sources, including industry organizations such as APTA. These practices, and their efficacy, similarly evolved with the scientific community's continued research into and understanding of the virus.

Understanding the Chain of Infection

It is important to understand the ways in which a virus can spread, or the chain of infection, in order to understand how to respond and contain the potential hazard. The chain of infection refers to the germs, and therefore infectious diseases, that result from interactions between agent, host, and environment.[17] As depicted in **Error! Reference source not found.** below, germs live in reservoirs, such as people and animals, and get emitted by those reservoirs. Those emitted germs then spread through portals of entry like the mouth, eyes, or cuts on the skin and make the next susceptible host sick.[18]

Infectious agents like viruses differ in terms of how they are transmitted. Modes of transmission can be either direct (i.e., direct contact or droplet spread) or indirect (i.e., airborne, vehicleborne, vectorborne).

Direct Transmission

- Direct contact with infectious organisms occurs through skin-to-skin contact, kissing, and sexual intercourse.
- Droplet spread refers to the large and small droplets and aerosols produced from sneezing, talking, or coughing.

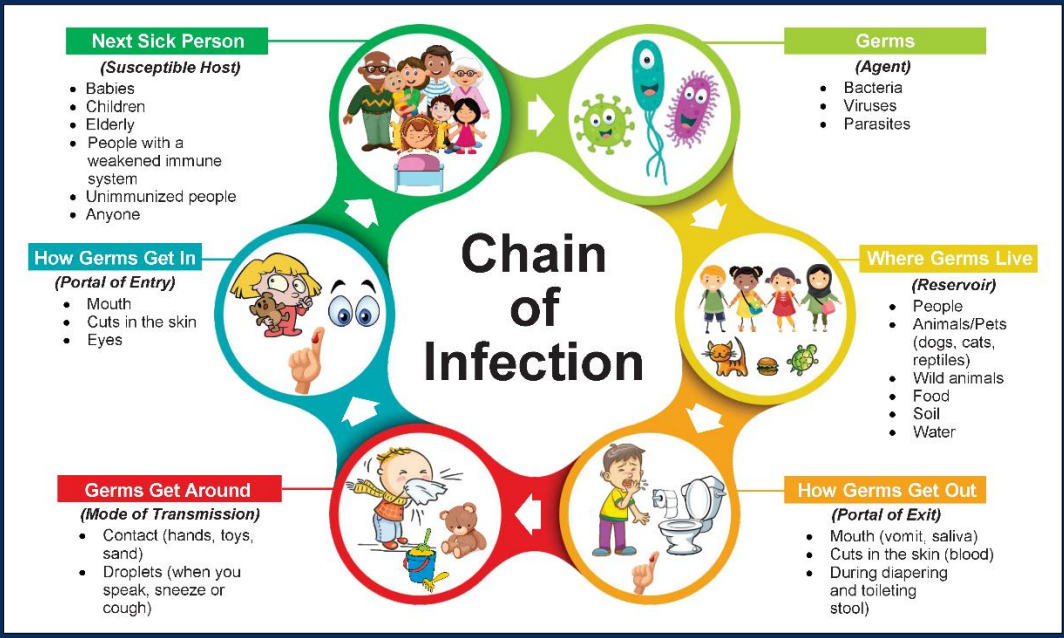
Indirect Transmission

- Airborne transmission occurs when infectious agents are suspended in the air by dust or droplets.
- Vehicleborne infectious agents include food, water, blood, and objects like handkerchiefs, bedding, or surgical tools.
- Vectorborne infectious agents include mosquitoes, fleas, and ticks which physically carry germs or may support growth of germs in the host.

How a virus spreads has significant implications for what measures should be taken to keep people safe. The measures described in this section are specifically for airborne viruses like SARS-CoV-2.

[17] CDC, Lesson 1: Introduction to Epidemiology.
[18] Ottawa Public Health, Chain of Infection.

Figure 2: Germs and the Chain of Infection

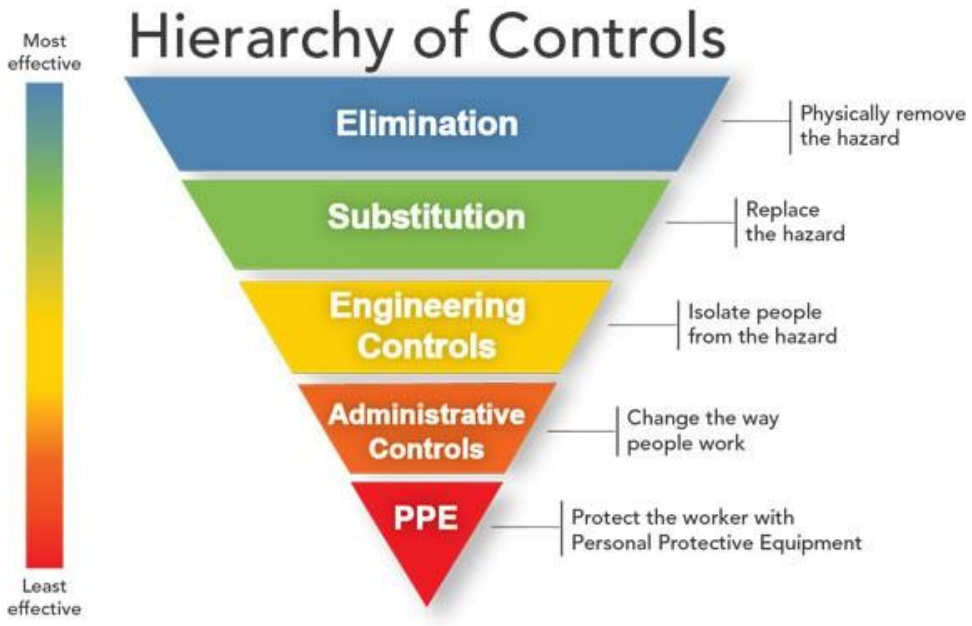


The CDC promotes a Hierarchy of Controls to determine how to implement effective control solutions for exposures to occupational and environmental hazards such as COVID-19.[19] This methodology focuses on keeping workers safe in their workplaces but can also be generally applied. As shown in **Error! Reference source not found.**, elimination (i.e., physically removing the hazard) is the most effective form of control, while protecting the worker with Personal Protective Equipment (PPE) is the least effective.

Given the unexpectedness and rapid transmission rates associated with COVID-19, less effective control solutions have often been the foundation of agency hazard response. Ideally, a combination of interventions in the Hierarchy of Controls would be optimized to prevent airborne transmission most effectively. The next sections provide details of the effectiveness of safety practices that have been utilized throughout the pandemic as determined by the CDC's Hierarchy of Controls.

[19] CDC, NIOSH, Hierarchy of Controls.

Figure 3: CDC's Hierarchy of Controls



2.1 Elimination and Substitution

While most effective at reducing hazards, elimination and substitution control solutions are also the most difficult to implement. In the context of transit agencies continuing to operate to serve riders and their essential trips, elimination and substitution do not apply.

2.1.1 Vaccine

While they do not completely eliminate COVID-19 even in the vaccinated population, COVID-19 vaccines are currently the most effective avenue for reducing the risk of COVID-19 because they dramatically help to reduce the overall spread of the disease and reduce the risks associated with potentially severe COVID-19 complications.[20] Generally, vaccine effectiveness studies conducted by the CDC and other experts have provided increasing evidence that vaccines—and the mRNA vaccines such as Pfizer-BioNTech and Moderna in particular—have been effectively offering protection both in clinical trial settings and in real-world conditions.

Reaching Population Immunity

Population (or "herd") immunity is when enough people in a community are protected from getting a disease that it becomes difficult for the disease to spread from person to person. While still unknown, experts believe between 50 percent and 90 percent of a population needs immunity before infection rates decline.

2.2 Engineering Controls

Engineering control solutions, including but not limited to teleworking, front line barriers, and ventilation, are designed to isolate people from the hazard. These solutions can be highly effective in protecting workers and are generally seen as more preferable vis-a-vis administrative and PPE controls, despite having a higher initial cost. Over time, engineering controls can reduce costs in some cases.

[20] CDC, COVID-19 Vaccines Work.

2.2.1 Teleworking

Teleworking—defined by Telework!VA as "a work arrangement where managers/supervisors permit employees to perform their usual job duties away from their central workplace, in accordance with their same performance expectations and other agreed-upon terms"—significantly reduces the risk of COVID-19 transmission in the workplace.[21] Teleworking is not a solution that can uniformly apply to a transit agency's workforce due to the diversity of functions within the organization. It is more feasible for office-based employees to telework since their tasks primarily rely on access to a computer, a phone, and the internet, and in many cases, transit agencies in Virginia and throughout the country did employ some teleworking strategies to reduce virus exposure both to employees whose work could be done remotely, as well as to those whose in-office presence continued to be required.

2.2.2 Front Line Barriers

The CDC's COVID-19 guidance for bus transit operators includes the recommendation of establishing physical barriers between bus operators and passengers where possible.[22] Barriers such as plexiglass, strip curtains, plastic barriers, or similar materials create impermeable dividers that can protect operators from the most concentrated airborne virus particles deposited or exhaled in their vicinity. The U.S. Occupational Safety and Health Administration (OSHA) recommends plexiglass because it is easy to clean, smooth, readily available, transparent, and easily worked.[23] There is no definitive answer as to how effective front-line barriers are at protecting workers from infection, but they are thought to be most effective when coupled with other mitigation strategies, such as reducing passenger capacity and requiring the use of face coverings on transit.

2.2.3 Ventilation

While the risk of spreading COVID-19 through ventilation systems is currently not well understood and thought to be low, ventilation is still an important part of combatting the spread of the virus.[24] As we know, the risk of virus transmission is greatest through inhalation or deposition, and the risk of exposure increases with the concentration of small droplets and particles containing the virus. This means that any effort to reduce the airborne concentration of microdroplets and other particles containing the virus will help to mitigate the risk of transmission associated with these exposure types.

While routine heating, ventilation, and air conditioning (HVAC) maintenance is recommended for all buildings, increasing ventilation and the amount of outdoor air used by the system can be a consideration because it removes virus particles from the air or, if windows are open, introduces other outside particles into the indoor air (see **Error! Reference source not found.**).[25] For bus operators, ensuring buses are well-ventilated can maximize the amount of fresh air delivered to occupied spaces while maintaining humidity at 40 percent to 60 percent, the humidity threshold at which transmission of respiratory viruses is reduced.[26]

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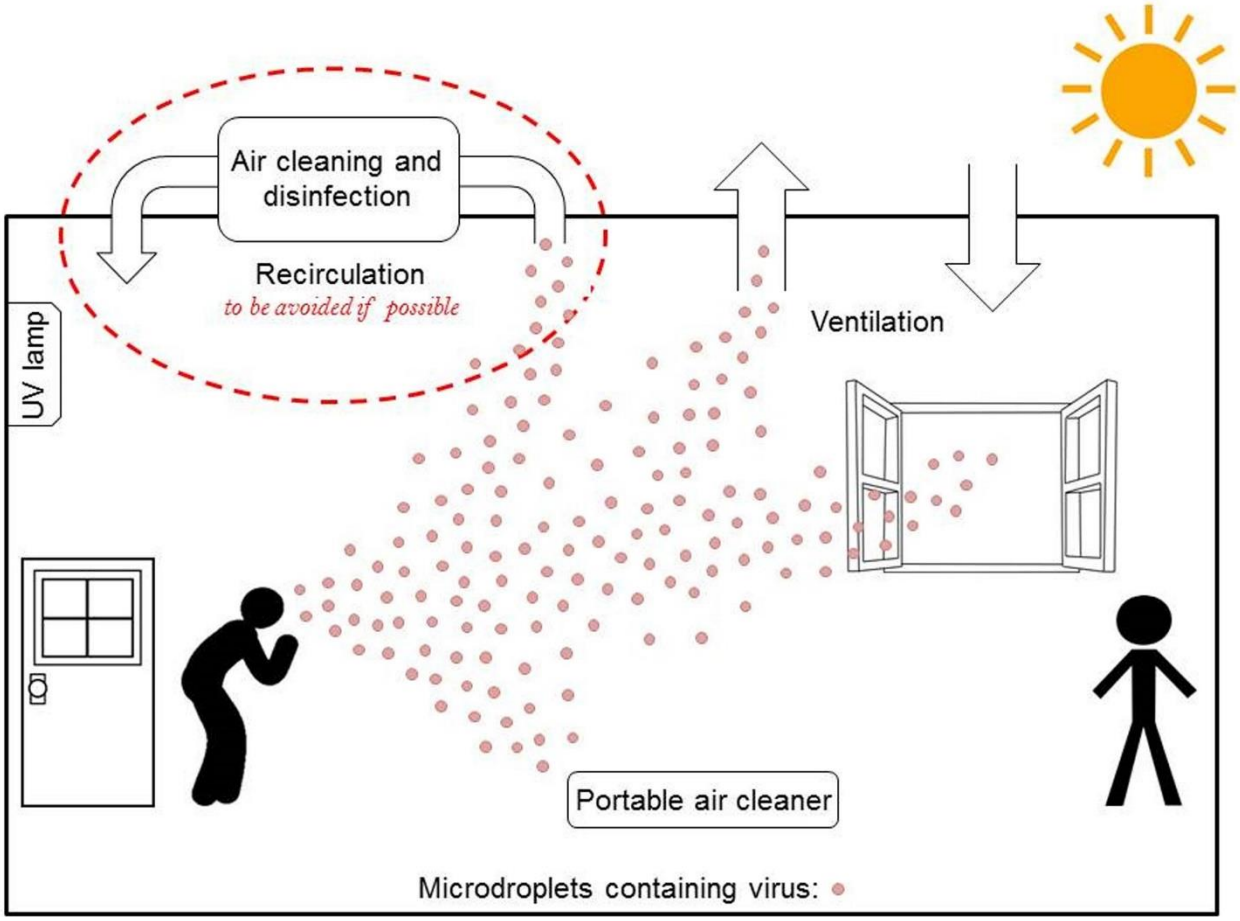
[21] Government of Virginia, Telework!VA, What is Telework?.
[22] CDC, COVID-19 Employer Information for Bus Transit Operators.
[23] OSHA, COVID-19 Guidance on Social Distancing at Work.
[24] CDC, COVID-19, General Business Frequently Asked Questions, Ventilation.
[25] Rhode Island Department of Health, COVID-19 Information, Preventing the Spread of COVID-19 By Circulating Air in Schools and Other Buildings.
[26] CDC, COVID-19 Employer Information for Bus Transit Operators.

Figure 4: Understanding How Ventilation Impacts Virus Microdroplets



2.3 Administrative Controls

Administrative controls, such as providing training and other administrative policy changes, are designed to mitigate the spread of COVID-19 by changing the way people work. These strategies are typically used in situations where hazards are difficult to control, as is the case with COVID-19. While inexpensive to establish, controls that change the way people work can be costly to sustain over the long term and may be more difficult to establish effectively because they require knowledge of the hazard and training to ensure practices, such as consistent sanitation, are followed. For less effective controls on the hierarchy, multiple controls simultaneously may help to achieve the most effective means of protection.

2.3.1 Cleaning and Disinfecting

Cleaning and then disinfecting high-touch surfaces and objects, especially on buses, can be an effective administrative control to help slow or control the virus's spread. Perhaps equally importantly, cleaning and disinfecting can give riders the perception that they are safer when riding transit. According to the CDC and the Transportation Research Board (TRB), transit facilities and vehicles should be cleaned at least daily with particular focus paid to high-touch surfaces such as workstations, operator controls, seats, kiosks, ticket machines, door handles, and restrooms.[27]

[27] APTA, Standards Development Program, Cleaning and Disinfecting Transit Vehicles and Facilities During a Contagious Virus Pandemic.

The CDC recommends a few key ways to inactivate the virus through cleaning and disinfecting:

- For hands:
  - Soap/detergent for scrubbing the hands with water for at least 20 seconds.
  - Alcohol mixtures for hand sanitizer (at least 60 percent alcohol).
- For high-touch surfaces:
  - Disinfectant, such as sodium hypochlorite (bleach), to break down the viral envelope, or the outermost layer of the virus.
    - Alcohol mixtures for disinfecting surfaces (at least 70 percent).

These guidelines can be followed and encouraged by implementing preventive measures like placing hand sanitizer dispensers in high traffic areas and enhancing cleaning and sanitizing of vehicles and other high-touch surfaces and objects. While COVID-19 is not thought to be highly transmissible via contaminated surfaces, other viruses may be more likely to spread in this way (via fomites), so enhanced cleaning and sanitizing practices may be especially useful to develop and maintain as needed. In addition to the practical benefits of enhanced cleaning, it can be especially valuable not only for agencies to perform cleaning and disinfecting, but also to *communicate* their procedures and practices to their riders and the general public to assuage any lingering personal health and safety concerns or stigma for hesitant or potentially new riders.

2.3.2 Social Distancing and Space Sharing

Because the virus is spread mainly through close physical contact with others in confined spaces, and people can spread the virus before they know they are sick, social distancing, handwashing, cleaning, and disinfecting have become the most vital means of controlling the spread of the virus. Social distancing, sometimes also called "physical distancing," is generally defined as keeping at least six feet of distance, both indoors and outdoors, between individuals from different households.

> "People can be [infected] with the virus that causes COVID-19 through contact with contaminated surfaces and objects. However, evidence has demonstrated that the risk by this route of infection of transmission is actually low."
>
> —CDC Director Dr. Rochelle Walensky

What is an Essential Trip?

Essential trips are ones that must be completed. These include: employment trips for front-line healthcare workers and first responders; employment trips for those working in groceries, pharmacies, and restaurants; trips to purchase food and medicine; and non-emergency trips.

See **Policy Decisions to Protect the Transit-Dependent** in Chapter Three for more information.

Engineering the environment to regiment both in-vehicle and off-vehicle social distancing can also be an effective means to mitigate the spread of COVID-19. Transit agencies have relied on vehicle occupancy and service changes to reduce the number of people riding transit at any given time. The CDC recommends making foot traffic single direction in narrow and confined areas, and using visuals like floor decals, colored tape, and signs to remind workers and passengers to maintain a distance of at least six feet.[28] Some agencies have additionally created signage on

[28] CDC, COVID-19 Employer Information for Bus Transit Operators.

seats that encourage social distancing (i.e., putting signage on empty seats to create space barriers between passengers).[29]

Another recommended policy to encourage social distancing on transit is to eliminate the need for transit staff and operators to directly collect fares by handling customer credit, debit, or rechargeable transit cards and cash. To protect bus operators, some transit agencies have been encouraging rear-door or all-door boarding for all passengers not needing mobility assistance; rapidly implementing contactless fare payment and mobile ticketing options; and/or eliminating fare collection altogether.[30] If necessary, cash and cards should be handled with care by changing gloves between each transaction or using hand sanitizer between passengers.[31]

2.4 Personal Protective Equipment (PPE)

PPE, such as masks and gloves, is identified as the least effective solution in the Hierarchy of Controls. Providing disposable PPE can be costly to sustain over the long term and is more difficult to use effectively than other measures because it requires training to ensure consistent correct use of equipment and knowledge of the hazard. For less effective controls on the hierarchy, applying multiple controls simultaneously may help to achieve the most effective means of protection.

2.4.1 Face Coverings and Masks

The use of face coverings or masks is intended to protect other people, as well as the wearer, by helping to keep the wearer's exhaled droplets from reaching those around them.[32] Masks and face coverings should be placed correctly and tightly (i.e., with no gaps) over both the nose and the mouth. This PPE control measure works best when used in conjunction with social distancing protocols and is especially relevant for asymptomatic wearers who may feel well but can still infect others. In 2020, no federal mask mandate existed so agencies followed guidance set by themselves or their respective state agencies. On January 21, 2021, a federal mandate was passed by Executive Order requiring masks on all domestic modes of transportation.[1] As of July 2021, the CDC no longer recommends that vaccinated individuals wear a face covering or mask around other vaccinated individuals, either indoors or outdoors. Because there are likely both vaccinated and unvaccinated individual on board a transit vehicle at any given time, however, the federal mask mandate is an effective policy for protecting riders, particularly those who are unvaccinated.

As **Error! Reference source not found.** depicts, the risk of transmission is considered "very low" when two people, one with COVID, are both wearing a face covering or mask in addition to being at least six feet apart.[33] Without keeping at least six feet apart, the chance of spreading COVID-19 to healthy individuals drops to a "medium" likelihood, even if an infected person is wearing a mask. This means that the effectiveness of this mitigation strategy is reliant upon human behavior and the proper use of face coverings and masks by all unvaccinated individuals.

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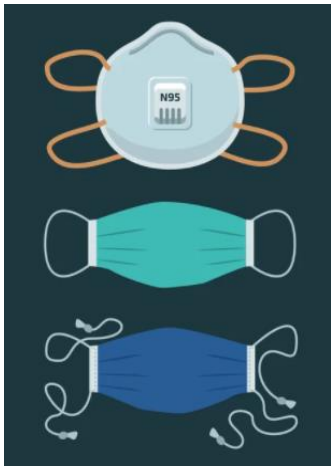
[29] FTA, COVID-19 Recovery Practices in Transit.
[30] Ibid.
[31] CDC, COVID-19 Employer Information for Bus Transit Operators.
[32] CDC, Guidance for Unvaccinated People: Guidance for Wearing Masks.
[33] Washington Department of Health, Overview of COVID-19 Statewide Face Covering Requirements.

Figure 5: Wearing a Face Covering or Mask to Reduce the Spread of COVID-19

Effectiveness of Different Mask Types

Many types of masks can be used to protect people from getting and spreading COVID-19, including cloth masks, surgical masks, and N95 filtering facepiece respirators (see **Figure 6**). According to the CDC, non-valved, multi-layer cloth masks can block up to 50 percent to 70 percent of fine droplets and particles and should be made from washable, breathable fabric.[34] Surgical masks, like cloth masks, can block large particle droplets that contain viruses and bacteria but by design cannot block very small particles due to their loose fit.[35] N95 respirators, which are regulated by the CDC National Institute for Occupational Safety and Health (NIOSH) and OSHA, filter out roughly 95 percent of very small particles (0.3 micron) and are specifically recommended as priority PPE for healthcare workers.[36]

Figure 6: Different Types of Masks



[34] Johns Hopkins Medicine, Coronavirus Face Masks & Protection FAQs.
[35] U.S. Food and Drug Administration, N95 Respirators, Surgical Masks, and Face Masks.
[36] CDC, Personal Protective Equipment: Questions and Answers.

3 Implications for the Transit Industry

In response to the outbreak of the pandemic, agencies across the country undertook several common measures in an effort to protect the safety of operators, riders, and the public at large. A survey from APTA conducted in March 2020 sought to understand the impact of COVID-19 on its members' operations and their responses (**Figure 7**).[37]

Figure 7: Findings from March 2020 APTA Survey regarding Operator Adaptations for COVID-19

A later APTA report from April 2020 that surveyed 121 members indicated that 87 percent of responding agencies had either gone zero fare or stopped enforcing fare collection.[38] Over 200 agencies, 21 of which are in Virginia, joined APTA's Health and Safety Commitments Program. The program is a pledge that agencies took to enact health and safety measures to make riders feel comfortable. The measures were informed by responses from over 2,200 transit riders across the country indicating which safety measures would make them feel comfortable on transit.[39]

To aid agencies, national industry associations such as APTA and the Community Transportation Association of America (CTAA) released safety strategies based on CDC recommendations throughout the pandemic. The recommendations covered vehicle and transit facility cleaning and disinfecting, rider and driver PPE, social distancing, fare collection, and limiting passengers to essential trips. In April 2020, CTAA recommendations included: requiring masks of all passengers and, specifically, N95 masks for drivers; building barriers between the driver and passengers or cordoning off the first rows of seats; disinfectant fogging of vehicles on a regular basis; cleaning high touch surfaces multiple times throughout the day; abandoning fare collection policies for the duration of the pandemic; and restricting services to essential trips only.[40] In August 2020, APTA revised its April 2020 COVID-19 Pandemic guide to include updated recommendations based on CDC guidelines. The updated recommendations included requiring operators and riders to wear masks, emphasizing the importance of ventilation systems, and suggesting that agencies encourage customers to refrain from speaking loudly to minimize dispersion of respiratory droplets.[41]

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[37] APTA, Continuing Impacts of COVID-19 on Public Transit Agencies.
[38] Ibid.
[39] Ibid.
[40] CTAA, CTAA Recommended COVID-19 Safety Protocols.
[41] APTA, The COVID-19 Pandemic: Public Transportation Responds: Safeguarding Riders and Employees.

Federal Mask Mandate

In 2020, there were no federal mask mandates, so agencies were left to follow their state guidelines or requirements, or CDC recommendations. On January 21, 2021, the U.S. President signed an Executive Order mandating masks on all domestic modes of transportation.[42] Within the following ten days, the CDC and the Transportation Security Administration (TSA) implemented the Executive Order by requiring face masks be worn by all people while on public transportation and at transportation hubs (as in the example in **Figure 8Error! Reference source not found.**).[43,44] In June 2021, the CDC updated its mandate to not require fully vaccinated individuals to wear a mask in outdoor transportation hubs.[45]

Figure 8: Woman Riding a Bus with a Mask On

3.1 Resources for Guidance on COVID-19 Response and Recovery

There is an abundance of COVID-19 resources available that provide ongoing guidance on the current pandemic situation and recovery efforts that is relevant to transit service providers. Listed below are some of the key resources from major entities that are regularly updated with information and guidelines. Resources are categorized by national and state since thresholds for reducing social distancing measures should align with local coronavirus caseloads and conditions.

[42] The White House, Executive Order on Promoting COVID-19 Safety in Domestic and International Travel.
[43] CDC, Requirement for Face Masks on Public Transportation Conveyances and at Transportation Hubs.
[44] TSA, TSA to Implement Executive Order Regarding Face Masks at Airport Security Checkpoints and Throughout the Transportation Network.
[45] CDC, Requirement for Face Masks on Public Transportation Conveyances and at Transportation Hubs.

National Resources

- American Public Transportation Association – Covid-19 Resource Hub
  - Resource hub specifically designed for public transportation agencies and operators.
- Centers for Disease Control – Latest COVID-19 Information
  - Scientific resource for up-to-date information on COVID-19 including toolkits with easy-to-understand graphics for public engagement and announcements.
- Federal Transit Administration – Novel Coronavirus (COVID-19)
  - Resource hub that prioritizes the need of transit agencies while also providing up-to-date information on federal policies and guidelines regarding the pandemic.
- Federal Transit Administration – COVID-19 Recovery Practices in Transit
  - Extensive list of COVID-19 practices by topic; updated regularly.
- Institute for Health Metrics and Evaluation (IHME) – COVID-19 Resources
  - Resource hub for scientifically valid resources including health policies and practices nationally and globally.
- Johns Hopkins University – Coronavirus Resource Center
  - Leading research institute providing up-to-date scientifically sound resources and guidance for a variety of audience types.
- National Association of City Transportation Officials (NACTO) – COVID-19: Transportation Response Center
  - Resource hub for transportation agencies and city governments acting as a clearinghouse for pandemic response guidance and best practices shaping our streets.
- National Center for Mobility Management – COVID-19 Resource Center
  - Resource hub providing updated information and quick links to a variety of other resources, including but not limited to local health department information, local public housing agency information, and transit recovery practices.
- U.S. Department of Health and Human Services – Public Transportation Workers Toolkit
  - Toolkit aimed at increasing confidence in and uptake of COVID-19 vaccines among public transportation workers.

State Resources

- Virginia Department of Rail and Public Transportation – COVID-19 Pandemic Response and Mitigation
  - Virginia DRPT's resource hub for pandemic response and mitigation, including but not limited to vaccination resources, federal and state actions, commuter guidance, and resources for transit agencies.
- Telework!VA - Resources
  - Virginia-specific resources for teleworking and continuity of operations during the pandemic.
- Vanpool!VA – Commuting Safely and Confidently
  - Living resource document containing tips for businesses and commuters in the COVID-19 environment.
- Forward Virginia – Coronavirus
  - Resource hub for Virginia-specific guidelines, updates, and support regarding the local pandemic situation.
- Virginia Department of Human Resource Management – COVID-19
  - Coronavirus hub with Virginia-specific workforce resources and other state public health guidance and announcements.

3.2 Planning for the Future of Public Health on Transit

Key public health lessons learned from the COVID-19 pandemic include the importance of emergency preparedness and having a plan in place in the case of a contagious disease or other hazard. Through guidance from the scientific community, transit and other agencies have learned what it takes to mitigate transmission of an airborne virus such as SARS-CoV-2 as effectively and quickly as possible while also continuing to provide vital services.

3.2.1 Contagious Virus Response Plan

APTA has issued guidance on developing a Contagious Virus Response Plan (CVRP) for transit agencies to use alongside their Continuity of Operations Plans (COOP) to ensure comprehensive response planning.[46] A CVRP plan is comprised of specific elements: identification of alert phases that trigger specific action; information and education program; disinfection program; sanitary aids to limit spread; vaccine/antiviral medications; and service reduction, shutdown, and restoration. It is recommended that plans of this nature be shared with and reviewed for comment by the local health department. The ability to convey information to passengers, staff, and the public is crucial to emergency response preparedness. Employees must be trained to understand, communicate, and execute emergency procedures as needed. Communications need to be coordinated with local and state emergency management for consistent messaging and is a core component of establishing a CVRP plan.

3.2.2 Reopening Metrics

Most transit agencies must also address questions about when it is safe to resume pre-pandemic operations in terms of relaxing physical distancing and other COVID-19-related restrictions. The CDC notes that recommended reopening thresholds vary based on a variety of criteria and, therefore, must be coordinated with state and local emergency management.

Figure 9: CDC Indicators and Thresholds for Community Transmission of COVID-19

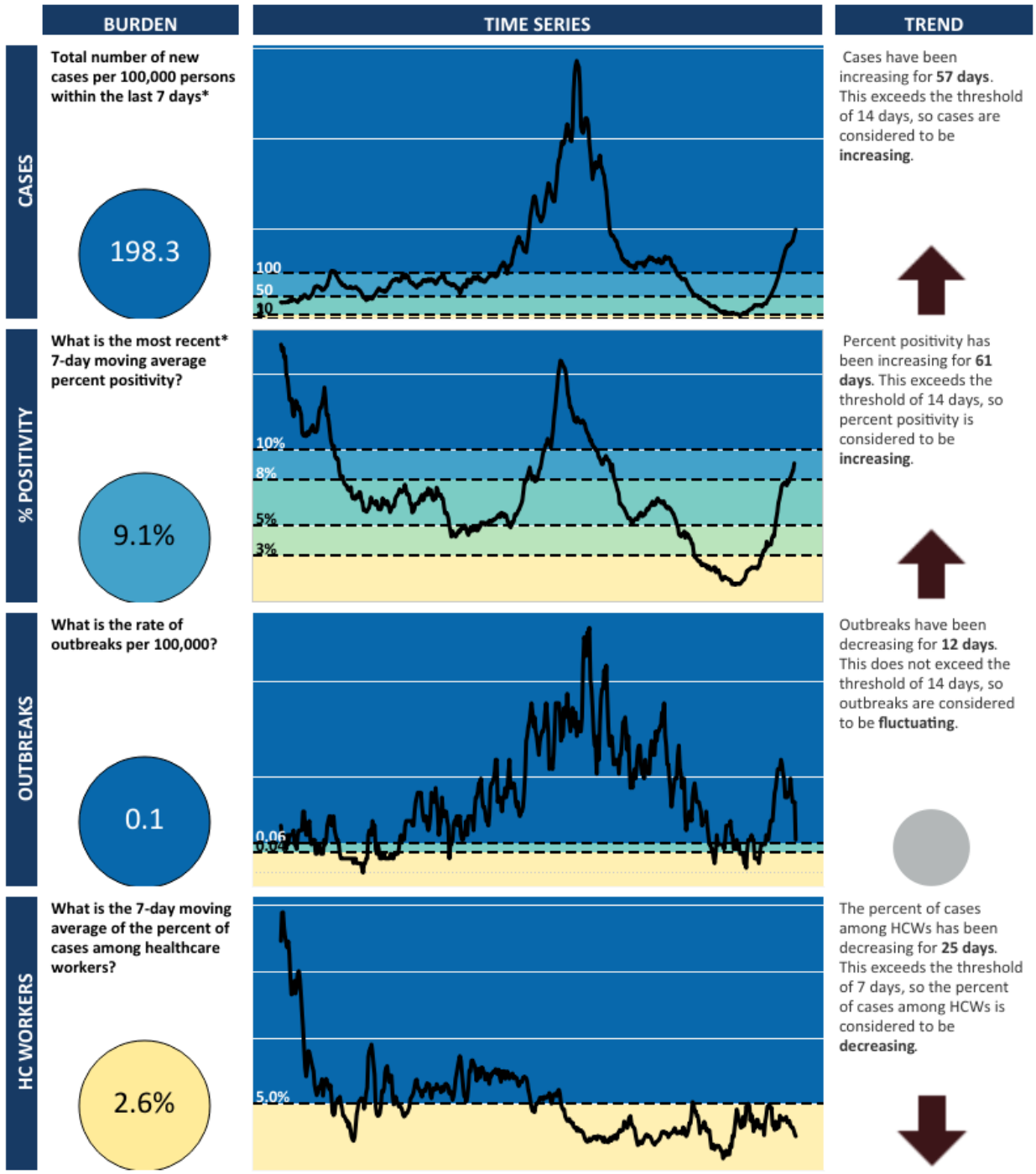
Indicator	Low Transmission Blue	Moderate Transmission Yellow	Substantial Transmission Orange	High Transmission Red
Total new cases per 100,000 persons in the past 7 days[2]	0-9	10-49	50-99	≥100
Percentage of NAATs that are positive during the past 7 days[3]	<5.0%	5.0%-7.9%	8.0%-9.9%	≥10.0%

The CDC recommends two measures that can help to determine the level of risk of transmission: total number of new cases per 100,000 persons in the past seven days, and percentage of positive COVID-19 tests (i.e., nucleic acid amplification tests, including RT-PCR tests) during the last seven days.[47] The transmission thresholds for these indicators can serve as the basis for understanding current conditions associated with community virus transmission (see **Figure 9**). The lower the level of community transition, the less likely that

[46] APTA, APTA Standards Development Program, Developing a Contagious Virus Response Plan.
[47] CDC, Operational Strategy for K-12 Schools through Phased Prevention.

the virus will be introduced into a given community. The higher level of the two indicators should be selected if showing different transmission levels.

Figure 10: Sample Community Transmission Metrics from the Virginia Department of Health



The Virginia Department of Health monitors these indicators as well as several others, including the rate of outbreaks per 100,000 persons; percent of healthcare workers with COVID-19 cases (7-day average); emergency department visit rate; rate of current confirmed COVID-19 intensive care unit (ICU) hospitalizations per 100,000 persons; percent of occupied hospital beds; and 7-day average of number of hospitals reporting

difficulty acquiring PPE (see **Figure 10**). This data is then compared to thresholds to calculate an indicator value that helps to determine the current burden of community transmission.[48]

Because future viruses of potential concern could vary considerably regarding transmissibility, method of transmission, and vulnerable populations, establishing a baseline strategy for emergency response is a vital first step to combatting another contagious virus outbreak. The recommended "all-hazards" approach (i.e., whether geological, weather-related, or hazardous materials-related) to emergency management includes four core components—mitigation, preparedness, response, and recovery—and can apply to a pandemic situation like COVID-19.[49] Implications for future pandemics include ensuring that emergency management protocols are established and regularly updated.

Implementing a Safety Management System (SMS) according to regulations and guidance from the FTA requires: evaluating the risk associated with hazards and system changes; maintaining awareness in regard to the pandemic's impacts on the transit and rail environment; and introducing changes that could create risk trade-offs.[50] The reality of adjusting strategies to an emergency situation is that there is often little time to prepare, so taking these proactive steps can often make a big difference in terms of saving lives and maintaining a safe transportation service.

[48] Virginia Department of Health, Region Metrics.
[49] National Academies of Sciences, Engineering, and Medicine, A Guide for Public Transportation Pandemic Planning and Response.
[50] APTA, The COVID-19 Pandemic: Public Transportation Responds: Safeguarding Riders and Employees.