Three Steps to Smart Covid-19 Testing
A Guide for Employers

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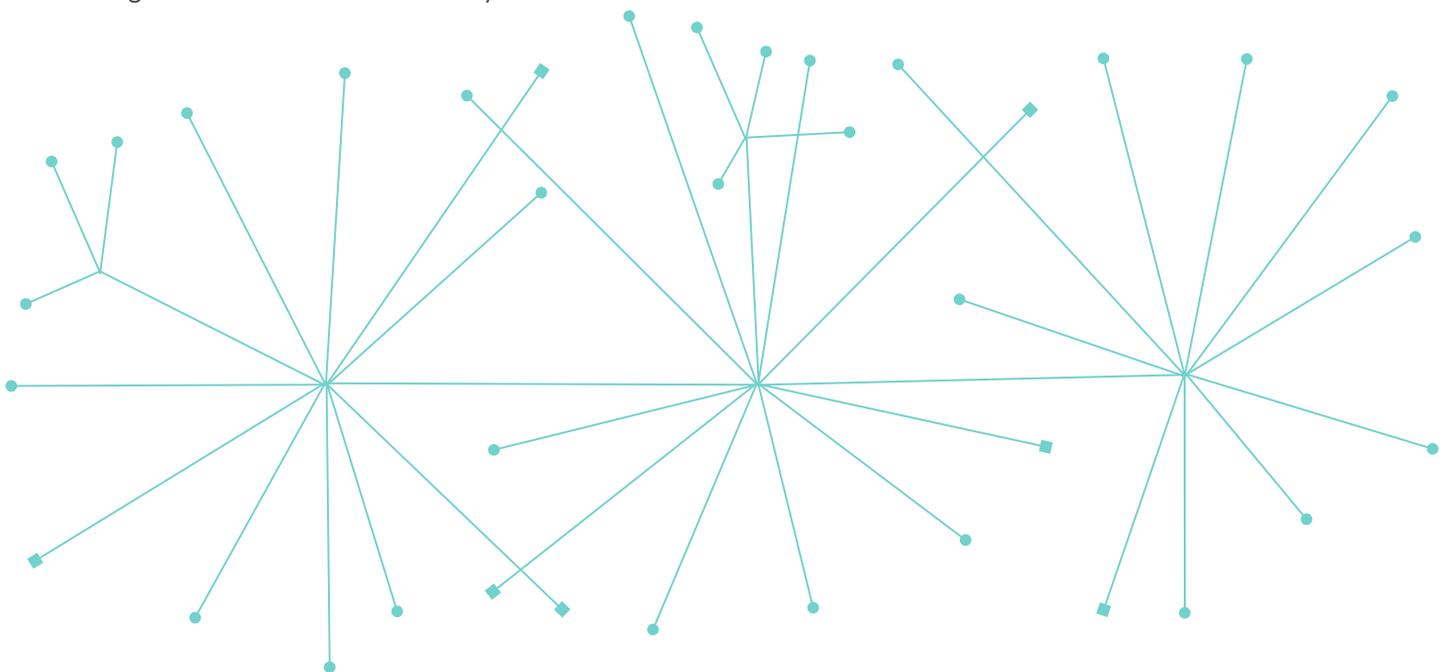Duke-Margolis Center for Health Policy

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Executive Summary

This guide is designed to help businesses and other organizations develop appropriate Covid-19 testing plans to enable safe operations during the pandemic.
Testing is one of several important measures to help reduce the spread of the novel coronavirus and keep workers, customers, and others as healthy as possible.
There is no ideal one-size-fits-all testing strategy.
This guide walks you through the three key steps to shape a testing plan best suited to your organization's needs:

Three Key Steps

1   ASSESING YOUR RISK (PAGES 5–13)

2   CHOOSING THE BEST TESTING STRATEGY (PAGES 14–24), AND

3   PUTTING YOUR STRATEGY INTO ACTION (PAGES 25–29).

As facts on the ground change, so will your risk assessment. As such, you need to be prepared to change strategies over time – whether due to localized outbreaks or because most of your employees have been vaccinated. However, even as vaccines become more available, testing will remain important. Not everyone will seek vaccination, the vaccines do not guarantee complete protection from infection and spread, and new variants of the virus that causes Covid-19 may not be covered by available vaccines.
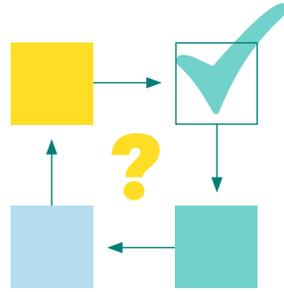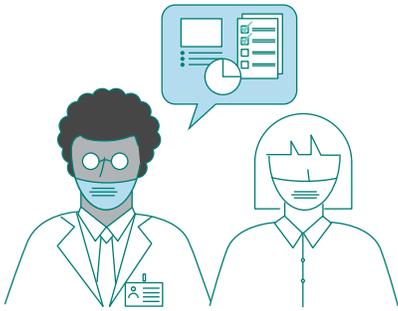
This guide will help you identify a testing strategy that makes sense for your specific situation, understand the logistics involved in setting up that strategy, and provide examples of and advice on implementation.

FIGURE 1 **Three steps to developing and implementing your Covid-19 testing plan**

STEP 1
ASSESS YOUR BUSINESS'S COVID RISK

The risk that someone with Covid-19 will enter your worksite

The risk of workplace transmission if someone infected does enter the worksite

The consequences of a workplace outbreak of Covid-19

STEP 2
CHOOSE THE BEST TESTING STRATEGY FOR YOUR BUSINESS
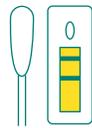
Understand the testing options in your area and how to tailor these options to your business

Match your business's risk assessment to the best testing options available to you

In very low risk environments, test employees only if they are symptomatic or exposed

In low-moderate risk environments, test employees 1-2×/month to provide assurance, help with decision-making, and ensure mitigation methods are working

In higher risk environments, test unvaccinated employees 1-2×/week to reduce on-site transmission

Recognize that risk factors can change quickly

STEP 3
PUT YOUR TESTING STRATEGY INTO ACTION

Communicate the testing strategy as clearly as possible to your workers

If someone in your business tests positive, quickly identify any workplace close contacts

Engage Employees

COMMUNICATE AND BE TRANSPARENT

UNDERSTAND AND ADDRESS CONCERNS YOUR WORKERS MAY HAVE REGARDING TESTING

TESTING IS JUST A SNAPSHOT IN TIME!

ENCOURAGE VACCINATION

Why Test for Covid-19?

Routine testing can help keep your employees from transmitting Covid-19 to each other and provide assurance to both your workers and your customers that your workplace is safe.

Implementing a testing strategy allows businesses to quickly identify employees who are infected with Covid-19 and respond with appropriate measures. Testing can also help you better understand the risks of Covid-19 infection and transmission within your workplace. Catching infections early can reduce absenteeism and make your workers more comfortable with the mitigation measures in place, keeping your business open and productive.

Most viral spread occurs when people have the virus but do not have symptoms. This is because they are **asymptomatic**, which means that they do not experience noticeable symptoms at all, or **pre-symptomatic**, meaning that they have not yet started to show symptoms. Research has shown that as many as 60% or more of people who test positive are asymptomatic. This fact can lead to unknowing spread of the virus, including through "super-spreader" events in which one seemingly healthy individual infects many others.

Frequent, routine testing of asymptomatic individuals (called **screening testing**) can guard against this asymptomatic spread. As such, it may be a useful piece of an overall mitigation plan for higher-risk workplaces. Finding infections before an individual can transmit the virus to others can prevent many employees from being infected at the same time, reduce disruptions to your organization, and provide assurance that the mitigation measures you have in place are working to protect your employees.

But why start a testing program now that vaccines are available? Per guidance from the U.S. Centers for Disease Control and Prevention (CDC), routine testing is not recommended for vaccinated individuals unless they are working with unvaccinated individuals at increased risk of severe Covid-19 disease. Nevertheless, it is unlikely that everyone in a workplace will be vaccinated in the near-term. Some may choose to not be vaccinated or, rarely, vaccination may not be recommended for medical reasons. A survey by the Kaiser Health Foundation in March 2021 showed that 37% of adults in America planned to either wait to get the vaccine or not get vaccinated. Therefore, implementing a longer-term testing strategy remains critical for employers to protect their workforce and customers.

Recent research shows employers continue to have concerns about testing programs, that testing will be too costly or too complicated to implement. But testing has become more commonplace in the workplace. The research, conducted in spring 2021, found 68% of surveyed companies were testing at least some of their workforce. Of the companies doing testing, 72% reported testing employees at least once per week. It has also become easier to start a testing program. In late March, the U.S. Food and Drug Administration (FDA) granted permission for two rapid test manufacturers to sell their tests over-the-counter for serial testing. This means that no prescription is required, no special site licenses are necessary, and your adult employees can perform the test themselves and get results in less than 30 minutes. Organizations may also be concerned about the accuracy of tests or are unsure of what tests to use or how often to test. This guide works to address these concerns and questions in the interest of helping organizations weigh the costs and benefits of testing their workforces.

1

Risk Assessment

Remote work is the safest solution to prevent Covid-19 spread amongst your employees, but not all organizations can or will shift wholly or partly to such work arrangements. Those that remain open to employees, customers, or others must assess their risks and current mitigation measures to determine what type of testing may be required for their organization.

No guide can enable you to rate your risk level in these areas with precision, but a "ballpark" understanding of overall risk level is helpful. Below, we provide compiled guidance on important factors to consider when estimating risk (see Figure 2), using information from CDC, the Occupational Safety and Health Administration (OSHA), and other expert resources, which are linked throughout the text. The "Resources" guide at the end of this section links to external guides that walk you through this process, including some tailored to certain sectors or industries, as well as to the relevant CDC and OHSA webpages.

Risk assessments are composed of three parts:

1. **The likelihood of introducing a case of Covid-19 into the facility,**

2. **The risk that a single case becomes multiple cases through transmission within the facility, and**

3. **The consequences of an outbreak for residents and staff**

LIKELIHOOD OF INTRODUCING AN INFECTION

RISK OF TRANSMISSION

CONSEQUENCES OF INFECTION
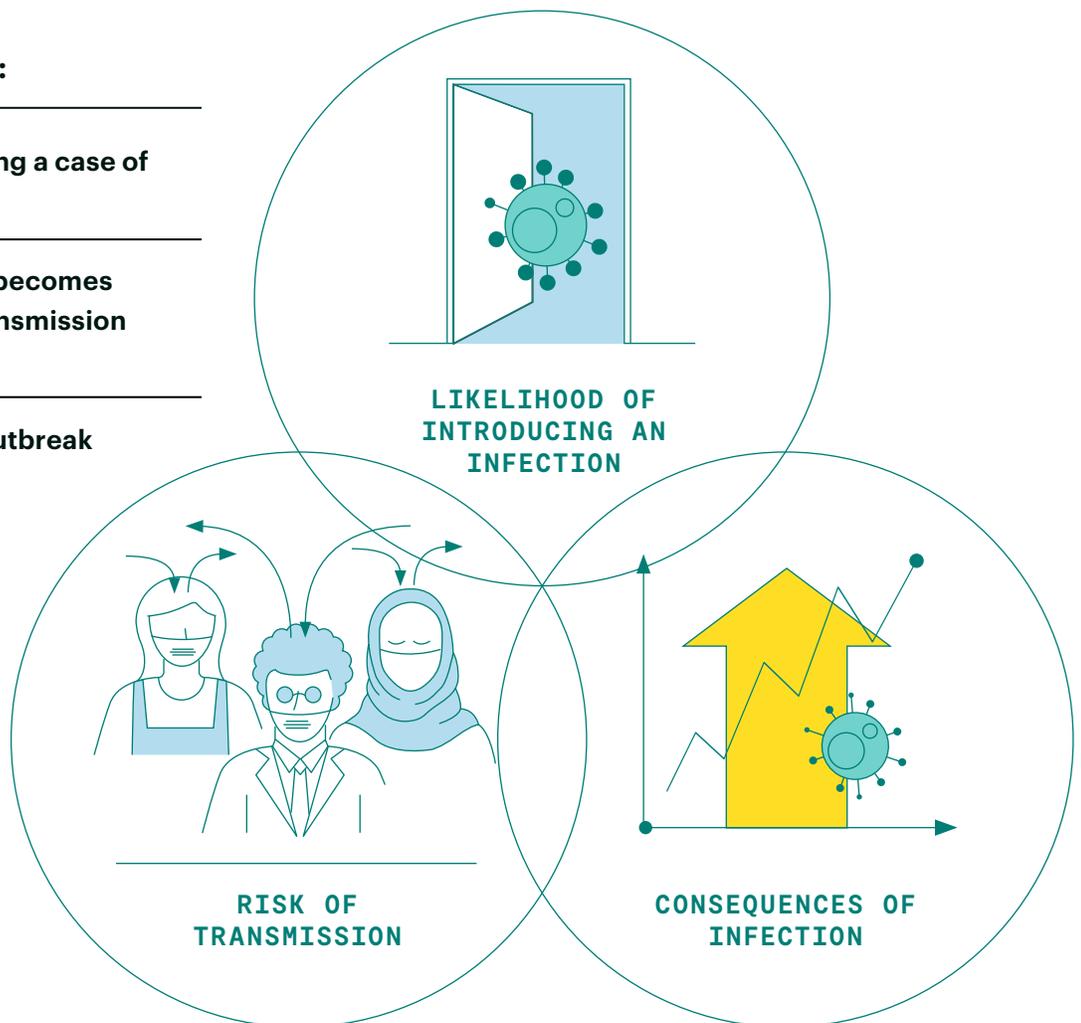
Likelihood of an Infected Individual Entering the Workplace

The risk that someone has Covid-19 and enters your place of business depends on local infection rates, the number of people entering the workplace, and whether your employees and customers are at higher risk of contracting Covid-19.
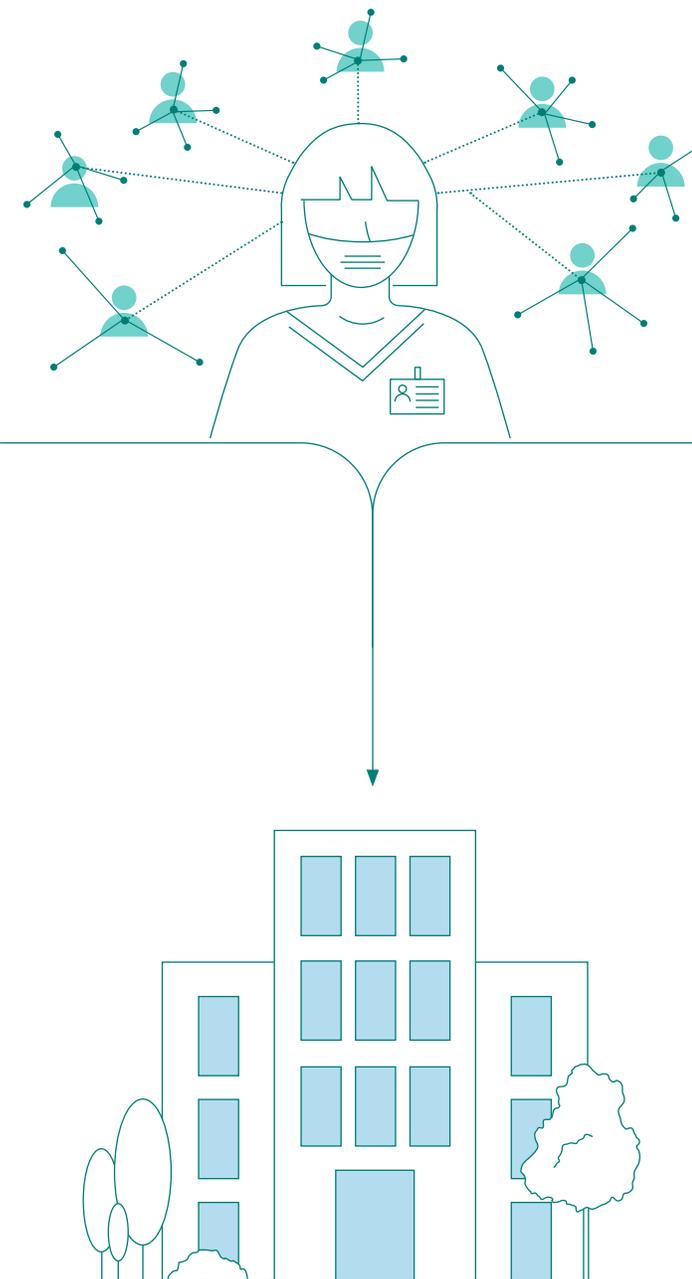
Background or "Community" Risk

The first factor to consider in your risk assessment is **the rate of Covid-19 infection in your area** – that is, how widespread the virus is currently throughout the areas in which your employees and customers live. The higher the rate of infection in these areas, the more likely it is that one of your employees or customers will be infected (see Table 1). The rate of active infection can be estimated by the number of new confirmed cases (often reported as cases per 100,000 people) and the test positivity rate – the share of Covid-19 tests done in which people tested positive for the virus – although these rates are affected by the level of testing available in the community.

If your organization has more than one location, you will need to complete this part of the risk assessment for each individual location, unless the locations are physically close enough that your employees and customers live in the same areas and you use the same internal safety protocols at the locations.

The best sources of information on infection rates will show data at the county and state level. State and local health agencies may have the best and most up-to-date information on confirmed Covid-19 infection rates, so organizations can start by checking the websites of these agencies. The CDC's COVID Data Tracker also provides information on cases by county. Table 1 shows how the CDC recommends you use these infection risk indicators to better understand infection risk. Note that, as more individuals in your community are vaccinated, you should expect a significant decline in local cases, reducing the risk for your employees and business.

It is important to recognize that risk based on local infection rate can change quickly. You should monitor and re-assess your strategy if local rates of infection change significantly.

TABLE 1 **CDC community infection risk indicators at the county level**

Table 1 is modified from CDC guidance SARS-CoV-2 Testing Strategy: Considerations for Non-Healthcare Workplaces. The indicators listed in the table can be found by county on CDC's COVID Data Tracker website under "county view." If the two indicators suggest different transmission levels, the higher level should be used. For example, if the county where your workplace is located currently has a 4% test positivity ratio but 35 new cases per 100,000 persons over the last 7 days, you would be in the moderate transmission category.

LEVEL	INDICATORS	
	Sum of new cases per 100,000 persons in the past 7 days[1] Conversion to an average daily rate	PCR test positivity ratio[2]
LOW TRANSMISSION	**0–9** NEW CASES PER 100,000 PERSONS AVERAGE DAILY RATE: 1 CASE PER 100,000 PERSONS	**<5.0%**
MODERATE TRANSMISSION	**10–49** NEW CASES PER 100,000 PERSONS AVERAGE DAILY RATE: 1–7 CASES PER 100,000 PERSONS	**5.0%–7.9%**
SUBSTANTIAL TRANSMISSION	**50–99** NEW CASES PER 100,000 PERSONS AVERAGE DAILY RATE: 7–14 CASES PER 100,000 PERSONS	**8.0%–9.9%**
HIGH TRANSMISSION	**>100** NEW CASES PER 100,000 PERSONS AVERAGE DAILY RATE: 14+ CASES PER 100,000 PERSONS	**≥10%**

[1] Number of new cases in the county (or other administrative level) in the last 7 days divided by the population in the county (or other administrative level) and multiplied by 100,000.

[2] Number of positive test results in the county (or other administrative level) during the last 7 days divided by the total number of tests results in the county (or other administrative level) during the last 7 days.

Risk Factors Specific to Your Organization

Once you understand the background risk of Covid-19 infection and disease in your specific location, it is important to consider other factors that may either diminish or increase the likelihood that your employees may contract Covid-19. It is not known which of these factors has the greatest impact on increasing or reducing risk, but all are known to contribute in some manner. In general, you can rate your organization in these areas below to develop an overall picture of risk.
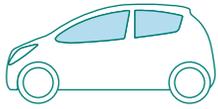
TRANSPORTATION

If your workers travel to and from work by public transportation or carpool, they may be at somewhat higher risk of infection than if they walk or bicycle to work or travel alone by car. Airborne spread of the virus on public transportation has been found to occur and risk may increase if people are traveling long distances.
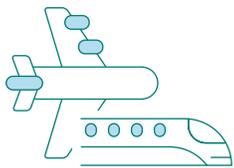
OTHER TRAVEL

Travel in general increases the risk of contracting and spreading Covid-19. Consider whether your employees have to travel regularly for work, meet with clients outside of your setting, and whether they engage in regular personal travel.
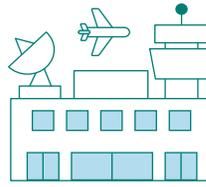
PROXIMITY TO OTHER TRAVEL HUBS

If your workplace is located in or near a vacation hotspot, large train station, or airport, this may increase the risk of contact with infected individuals.

MULTIPLE JOBS

Many workers, particularly in the service industry, hold multiple jobs and may be exposed to different levels of risk in those various settings.

PERSONAL LIVING SITUATIONS

Living with more people – for example, when large or extended families share housing or workers live in dormitories or other group residences, increases the risk of infection.

VACCINATION

It is still possible to contract Covid-19 even after an individual is fully vaccinated (two weeks after the last shot), but encouraging early evidence suggests it is rare. However, because vaccination reduces the likelihood of severe disease, it may also increase the proportion of infected people who are asymptomatic or have mild symptoms that go unnoticed. Research is ongoing to understand the extent to which vaccines protect individuals from contracting and spreading Covid-19.

Risk of Disease Transmission in the Workplace

What are your existing strategies for mitigating viral spread? Risk of on-site transmission depends on the mitigation measures you have already put in place to prevent spread. As Figure 2 demonstrates, none of the individual measures (such as masks; hand washing; improved ventilation; and policies to encourage social distancing, quarantining, and isolating) are perfect, so it is important to layer strategies on top of one another to create stronger, more resilient protection against viral transmission.

OSHA and CDC guidance agree that the most important mitigation measures are masking, ventilation, distancing, and having policies that encourage people who are sick or exposed to stay home and get tested. Studies have demonstrated the particular effectiveness of N95 masks and well-fitted surgical masks as well as some other types of masks. Social distancing and observing the "6-foot rule" are helpful but less effective in poorly ventilated indoor settings, especially when people are in the same location for several hours (such as sitting in an office). Regular handwashing for at least 20 seconds is also effective in stemming viral transmission.

Reduce Covid-19 spread by layering mitigation measures

Figure 2 illustrates the "Swiss cheese" model of risk mitigation. Multiple types of precautions must be taken in order to effectively reduce Covid-19 spread. As none of these methods are 100% effective, a combination of many layers of protection is needed. Where one method fails (a "hole" in the "Swiss cheese"), another layer may succeed in blocking transmission. Together, the mitigation measures make a more solid and resilient barrier to transmission.

MASKS   HAND WASHING   VENTILATION   DISTANCING   SCREENING TESTS   VACCINES
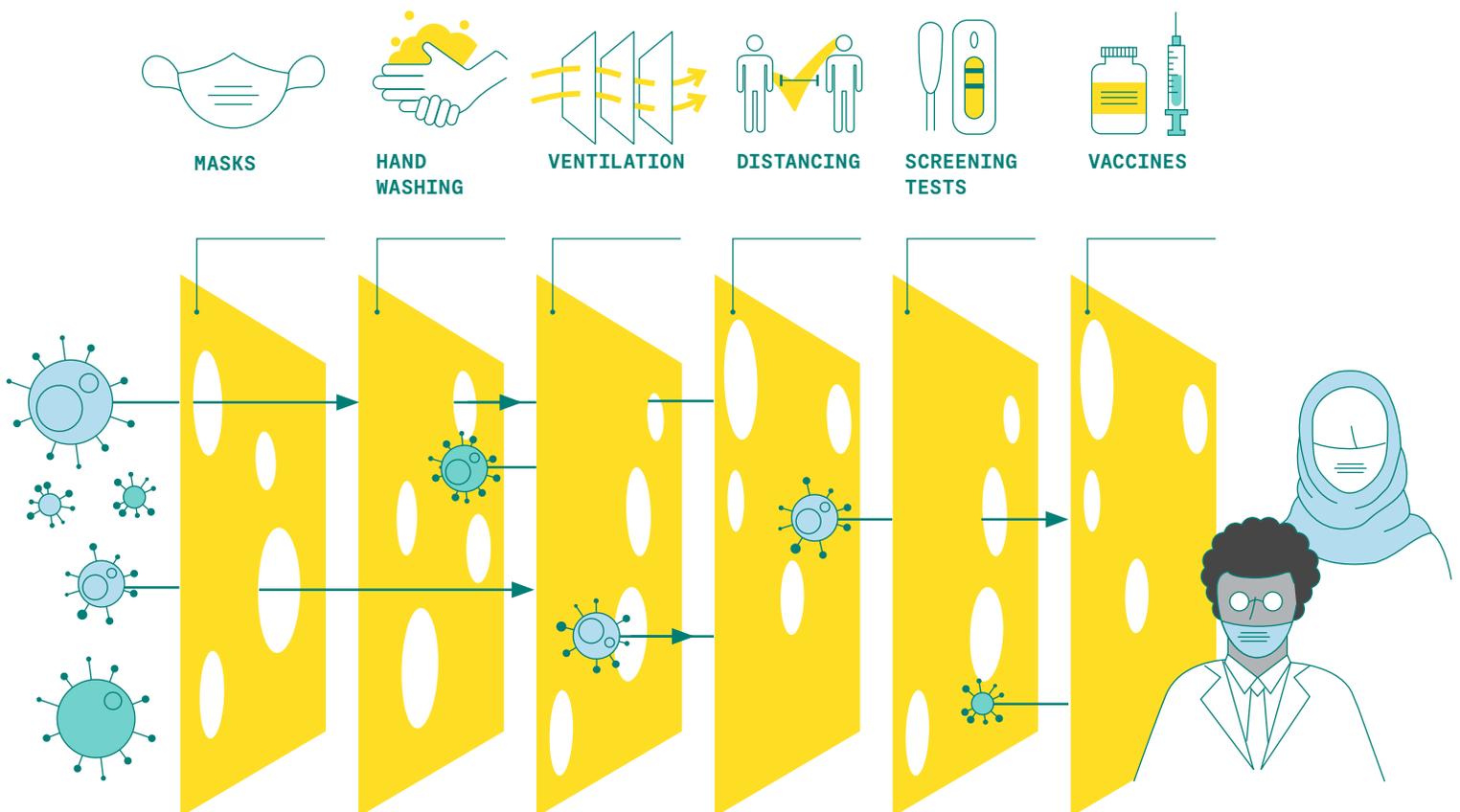
Rigorous cleaning of surfaces may or may not be helpful, as there is mixed evidence on how often surface transmission of the virus occurs, although it can reduce the likelihood of other respiratory illnesses with similar symptoms.

Consider how your workers, customers, and others interact in your setting. Is your workspace closed and not well ventilated or is there significant air exchange, ventilation, and consistent air filtration (such as with HEPA filters)? Do you have a closed floor plan where people can remain separated from others or an open plan where many people share the same space? Are there common areas where large groups congregate or small spaces such as elevators where people are unable to keep appropriate distance?

What are your policies for dealing with people in your setting who are possibly infected with the virus? Organizations should have clear policies in place regarding individuals who are displaying Covid-19 symptoms or have reason to believe they have been exposed. These individuals should quarantine at home if they suspect exposure or are sick. You should determine whether your other workforce policies support these actions, such as offering resources about where your employees can access free diagnostic testing and providing paid time off for employees awaiting test results or isolating after positive results.
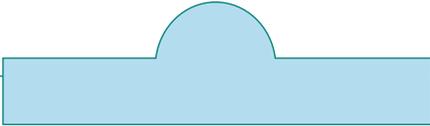
ASK YOURSELF THESE QUESTIONS, WHICH WILL HELP YOU GAUGE THE RISK OF VIRAL TRANSMISSION AT YOUR SITE:

Is your setting primarily indoors or outdoors? If indoors, is the space well-ventilated?

Do the same people enter your setting every day or are there new people each day?

Do employees move around the entire workplace or stay in one area throughout the day?

Do large groups enter at the same time, creating bottlenecks where people are in close contact, or are entry times staggered?

Do areas exist where people must stop and potentially congregate while entering or exiting your setting (e.g., security lines)?

Do people perform labor-intensive tasks that could result in heavy breathing, loud talking, shouting, or singing, which can all increase the spread of Covid-19?

Do people in your workspace correctly and consistently wear masks throughout the entire time they are there?

When masks are removed for eating and drinking, can employees maintain appropriate distance in well-ventilated areas?

Consequences of Infection
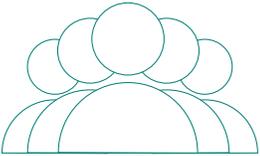
PRESENCE OF HIGH-RISK INDIVIDUALS

Among your workers, customers, and others in your setting may be people whom CDC categorizes as "people at increased risk for severe illness" and "people who need to take extra precautions."

People at increased risk for severe illness include older adults, people who are pregnant, and individuals with certain medical conditions. CDC also recommends that the following groups take extra precautions: racial and ethnic minority groups (due to long-standing systemic health and social inequities); people from rural communities; people experiencing homelessness; people with disabilities; and people with developmental and behavioral disorders.

VACCINATION

Vaccines significantly reduce the consequences of Covid-19. However, difficulties in accessing appointments may have delayed some of your employees in getting fully vaccinated and the vaccines have not yet been authorized for children under 12. In addition, some individuals may be unable or choose not to be vaccinated.

If you have significant numbers of high-risk individuals within your workforce or your customer base and they are either unvaccinated or of unknown status, there is a greater risk that any viral spread will result in serious illness or death.
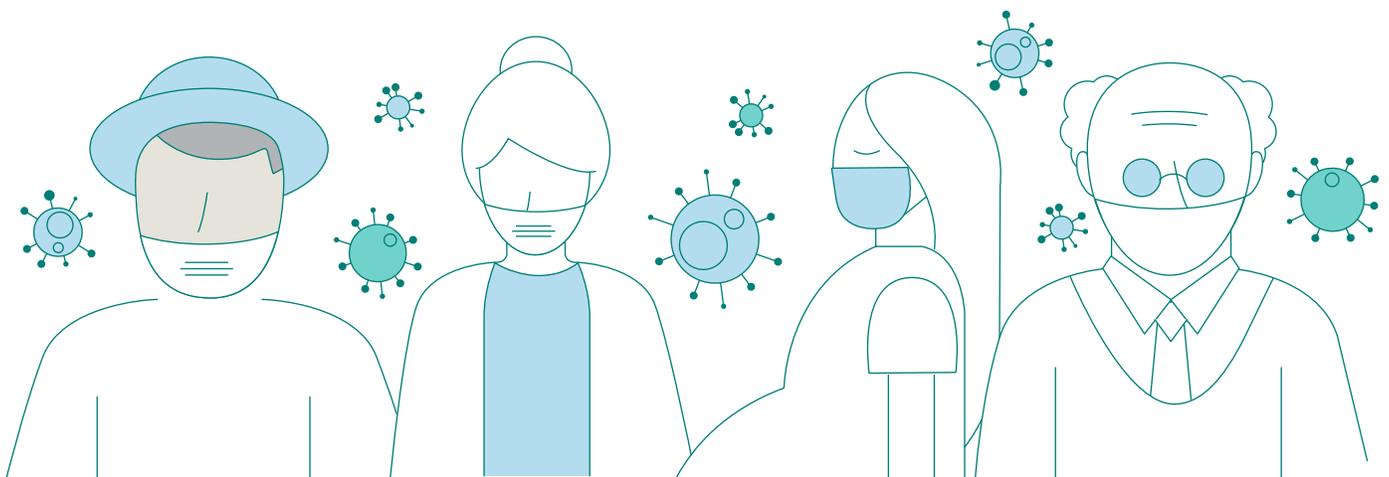
Timber Pizza Co., a restaurant with one location in Washington, D.C., has adapted its workflow to better mitigate the spread of Covid-19. Restaurants face relatively high risk, being businesses that rely on in-person customers and unable shift to virtual work. Nonetheless, rethinking the organization's physical workflow can be an effective alternative. After briefly shutting down the business following an employee testing positive in May 2020, the restaurant's owners implemented new precautions to limit close contact between their employees as much as possible.

Timber employees now work in small pods, sharing shifts with the same coworkers each day they report to work, a change from the previous scheduling system in which a given employee might have worked alongside different people each day. This means that if one employee is exposed to the virus, their close contacts in the workplace are limited, which restricts spread and allows for more rapid contact tracing. Management also began to stagger shifts to limit overlap between different "pods" within the organization. Staff responsible for cleaning the kitchen, for example, enter separately and complete their work before those responsible for cooking and filling orders arrive. This further reduces the likelihood of an infection spreading from one "pod" to another.

Assessing Total Risk

Your overall risk assessment will need to consider each of the three risk factors described above, as well as your tolerance for risk. Your testing strategy will depend on where your business falls on the very low to high spectrum of risk.

It may be helpful to take advantage of existing resources that provide guidance for managing Covid-19 as you work through the questions cited above. One example is a suite of tools developed by Greenlight Durham through a partnership with Duke Health, the City of Durham, and the Pandemic Response Network. They developed a playbook that includes scalable strategies for employers to monitor their employees for symptoms, including access to a symptom monitoring app. Through their business scorecard, employers can anonymously complete an interactive survey that is tailored to your business sector, helping you assess your risk within five domains (individual prevention strategies, symptom monitoring and management, environmental prevention strategies, communication and auditing, and industry-specific guidelines). This scorecard generates recommendations to help mitigate risk of Covid-19 outbreaks. Greenlight Durham also has provided testing and recovery resources for employers. Together, these tools have helped businesses manage Covid-19 outbreaks while still managing their business safely amid the pandemic.

You should also consult CDC and OSHA regularly for updated guidance on protecting workers and preventing spread:

• Workplaces & Business: Plan, Prepare, and Respond (CDC)
• Protecting Workers Guidance (OSHA)

Both of these resources are updated regularly to provide the most up-to-date information on best practices concerning health checks, testing, PPE, distancing, ventilation, and actions to take if a worker is sick or diagnosed with Covid-19.

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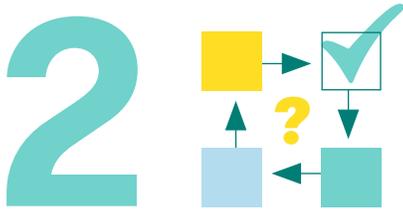
Choose the Best Testing Strategy

The next step is to choose a testing strategy based on both your risk level and testing goals. Testing protocols need to be customized for individual settings based on the risk assessment described above, community priorities, test availability, and budget. Some organizations have been able to route employees to local city- or county-run resources that exist outside the workplace for free, routine testing. However, some of these sites attempt to bill health insurance and your employees' insurance may not cover routine testing for employment purposes. Therefore, ensure that you and your employees understand any costs associated with this option if you pursue it. In some cases, it may be more efficient to set up testing on-site or partner with an existing testing site or company. The testing strategies you select should also be adaptable to changes in Covid-19 case levels in your company and community.

Testing alone will not prevent the spread of Covid-19; it must be combined with other mitigation methods and, as much as possible, vaccination. For testing to be effective, individuals with a positive Covid-19 result must also be promptly isolated, and their close contacts need to be identified, quarantined, and tested. The section of this guide entitled "Putting Your Strategy into Action" (page 25) includes more details on how your company might implement public health measures alongside your testing strategy.
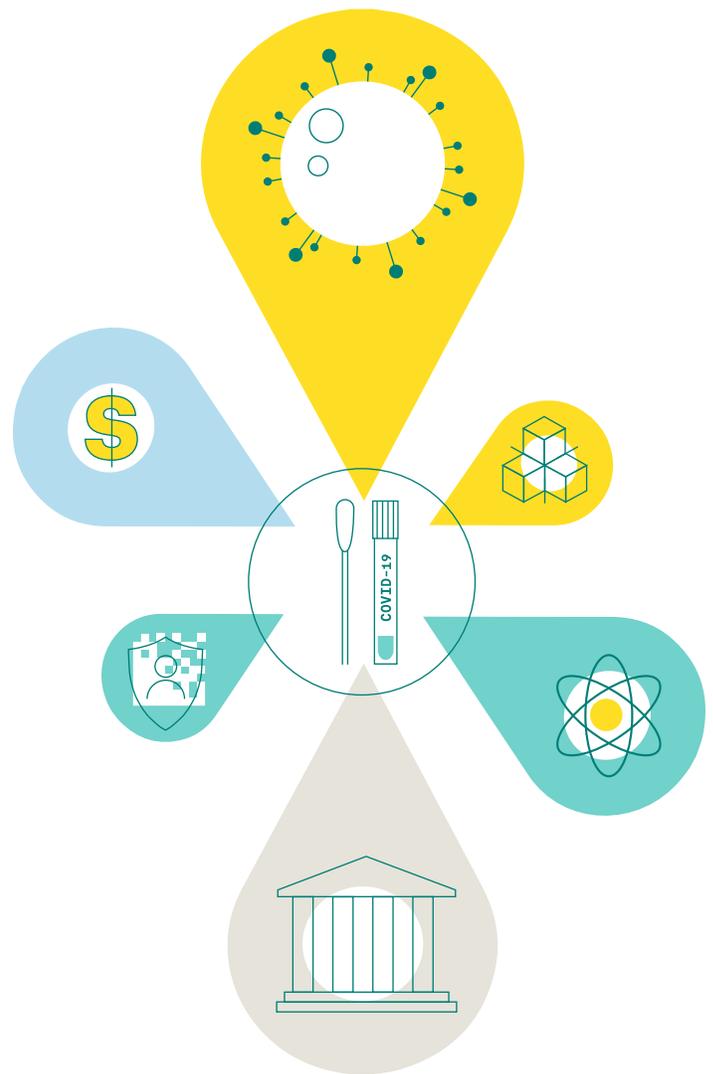
A global manufacturing company with 35,000 employees across every U.S. state partnered with Accolade, a personalized healthcare advocacy company, to design a program allowing essential employees to continue in-person work safely. Employees participated by completing an online self-assessment at least 3× per week to report any symptoms of or potential exposure to Covid-19. Those whose self-assessments warranted further attention would be routed to virtual communication with a nurse, who would direct them to testing or telemedicine as needed. Those who tested positive or had active symptoms would be connected with ongoing telemedicine resources to guide them in quarantining, monitoring symptoms, and eventually safely returning to work. This process was accompanied by contact tracing with a clinical team for those employees who tested positive.

The program achieved significant successes: it connected employees quickly with reliable healthcare resources, tested virtually every employee with suspected exposure, and within 24 hours notified the overwhelming majority of close contacts of those who tested positive. The program had high levels of participation from employees (95% of those working in the field, 80% overall) and a 92% satisfaction rate.

While not all steps taken by this global manufacturing company will be feasible for smaller businesses, some of the lessons learned are universal. In particular, generating employee buy-in is key for any workplace testing program to function effectively. Clear communication with staff around the medical and public health rationale behind a testing strategy may encourage this, along with ongoing support for those who test positive even while they are not present in the workplace.

Testing Strategies

Testing Strategies for Moderate- or High-risk settings

Screening testing

If your company is at moderate- or high-risk as determined by the above risk assessment, your business may benefit from a regular screening test program, meaning routine testing of all asymptomatic employees 1-2x per week. Screening tests are used to identify and isolate employees who are "silently" infected, to prevent spread to other employees or customers. To be effective, as many employees[1] as possible should be part of the program. The U.S. Equal Employment Opportunity Commission's guidance indicates that employers may require testing as a condition for entering the workplace because it is a necessity for workplace safety. However, testing must only be conducted with employees' consent, and employers should make reasonable accommodations for those who do not consent, such as telework alternatives. *Note: Employees and customers who are experiencing symptoms or have been exposed to the virus should be referred for clinical diagnostic testing via their health care providers and/or diagnostic testing sites, rather than relying on the screening program results.*

Research shows that the frequency of testing (days between scheduled screening tests) and the time between test and result return are more important than using a perfectly accurate test. For this reason, rapid tests that return results in 15-30 minutes are very useful for screening, even though they may be slightly less accurate, and are often less expensive than individual PCR testing. However, for this type of testing to be useful as a mitigation measure (reliably breaking chains of transmission), all in-person employees should be tested at least 1-2× per week.

According to CDC, fully vaccinated individuals should not be frequently tested. In high-risk settings and for essential workers, less frequent testing (1-2× month) may continue to be useful for surveillance and assurance, particularly if Covid-19 variants are a concern.

Surge testing

An alternative to routine screening is "surge testing." Such a program may start with relatively infrequent testing – perhaps testing all workers 1-2× per month — but increases testing frequency if a positive case of Covid-19 is detected (either through routine workplace testing or diagnostic testing due to symptoms or known exposure).

For example, after a Covid-19 infection is confirmed, a site might increase its screening test rate from monthly to every 2-3 days, and maintain that pace until 10 consecutive days pass with no new infections found (which covers the incubation time of the virus). This increase in testing frequency could be applied to only those in the vicinity of the positive individual(s) or to the entire group of people at that site.

"Test-out-of-quarantine" approach

This strategy can be applied in cases where those exposed to an infected person (with a positive test) are essential workers and do not display Covid-19 symptoms. Please refer to the complete CDC guidance if you are considering this strategy. Note that vaccinated individuals do not need to quarantine if they are not experiencing symptoms.

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[1] For certain business types where a large number of customers are in close contact indoors, such as arts or sporting events, screening strategies may be expanded to include customers to increase consumer confidence and safety.
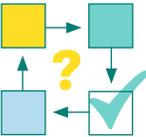
Testing Strategies for Lower-Risk Settings

In a community where the current spread of Covid-19 is low and your risk assessment concludes that your organization is at low-risk, frequent screening testing strategies may not be needed. Less frequent testing (e.g., 2× per month) or testing only a subset of employees will not significantly reduce infection rates, but can help you understand your workplace risk to enable better decision-making. Monitoring the number of positive cases in your company can be used to understand whether your other mitigation measures are sufficient to prevent workplace transmission and whether your risk level may be increasing.

Table 2 provides examples of potential testing strategies matched to risk levels, ranging from very low to high.

TABLE 2 **Example testing strategies for your workplace.**

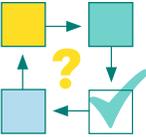|	VERY LOW	LOW
Risk Level, as determined through the risk assessment	**An example of a business with a very low risk level may include:** **>1** new daily reported case per 100,000 people in the community; **2%** community test positivity; **>90%** adherence to proper masking, social distancing, hand washing, and good ventilation; **P** a strong program to allow rapid contact tracing within the business; ↓ low levels of in-person contact with non-employees during the workday.	**An example of a business with a low risk level may include:** **4** new daily reported cases per 100,000 people in the community; **5%** community test positivity; **>90%** adherence to proper masking, social distancing, hand washing, and good ventilation; **P** a strong program to allow rapid contact tracing within the business; ↓ low levels of in-person contact with non-employees during the workday.
Example Testing Strategy	Continue mitigation measures such as social distancing and mask wearing. Refer employees with symptoms or known exposure to testing sites or their healthcare provider for diagnostic testing and support their ability to isolate until results are received.	Undertake relatively infrequent testing of your workforce, for example 1-2x per month. Pooled testing or testing a random subset of your workforce can be considered to reduce costs. If an employee tests positive, support that individual's ability to isolate and notify any close contacts within the workplace. Depending on risk of on-site transmission, consider surge testing as well. In addition to the above, you may consider more frequent routine screening tests for employees who have close contact with many other people throughout the day. Vaccinated individuals do not need to be routinely tested unless they work with at-risk unvaccinated individuals. If they show symptoms, they should be directed to seek diagnostic testing. Refer employees with Covid-19 symptoms to testing sites or their healthcare provider.

MODERATE	HIGH

Risk Level, as determined through the risk assessment

Example Testing Strategy

MODERATE	HIGH
An example of a business with a moderate risk level may include:	**An example of a business with a high risk level may include:**
10 new daily reported cases per 100,000 people in the community;	**15** new daily reported cases per 100,000 people in the community;
7% community test positivity;	**11%** community test positivity;
>80% adherence to proper masking, social distancing, hand washing, and good ventilation;	**<80%** adherence to proper masking, social distancing, hand washing, and good ventilation;
P a less effective program for contact tracing within the business;	**P** no contact tracing within the business.
↑ moderate or high levels of in-person contact with non-employees during the workday.	
Implement a routine screening testing program for all employees. This program should be frequent (such as 1-2x per week) and results should be returned quickly.	Move to remote work if possible and reduce in-person close interactions.
If an employee tests positive, support that individual's ability to quarantine and notify any close contacts within the workplace. Consider surge testing all individuals working that same shift.	Allow only critical staff to enter the work setting and employ strict mitigation measures.
	Conduct 2x per week screening testing for employees on site.
Vaccinated individuals do not need to be routinely tested unless they work with at-risk unvaccinated individuals. However, you may consider 1-2x per month testing for surveillance and assurance.	Vaccinated individuals do not need to be routinely tested unless they work with at-risk unvaccinated individuals. However, you may consider 1-2x per month testing for surveillance and assurance.
Refer employees with Covid-19 symptoms to testing sites or their healthcare provider.	Refer employees with Covid-19 symptoms to testing sites or their healthcare provider.

Table 2 shows hypothetical examples of businesses at varying risk levels and potential testing strategies that could be implemented based on the respective risk level. However, these are only meant as illustrative examples. Specific risk assessments and testing strategies will need to be determined based on the individual circumstances and risk tolerances of each workplace and community.

Choosing the Type of Test

There are multiple types of tests available for screening purposes. In general, they fall into two categories: (1) rapid tests (most of which are antigen tests), which can take just a few minutes to deliver results while you wait without lab equipment, and (2) PCR tests, which are processed in laboratories and usually take 1-3 days to yield results, although times can increase during outbreaks.

No medical test is perfect and none guarantee 100 percent accurate results. This is true of all Covid-19 tests, which can produce different rates of "false positives" (meaning that people test positive for the virus when they really don't have it) and "false negatives" (meaning that people test negative for the virus when they really do have it).

The various types of Covid-19 tests all have advantages and disadvantages, as summarized in Table 3. New types of tests that could be used for screening purposes, such as breath tests, may become available later in the year.
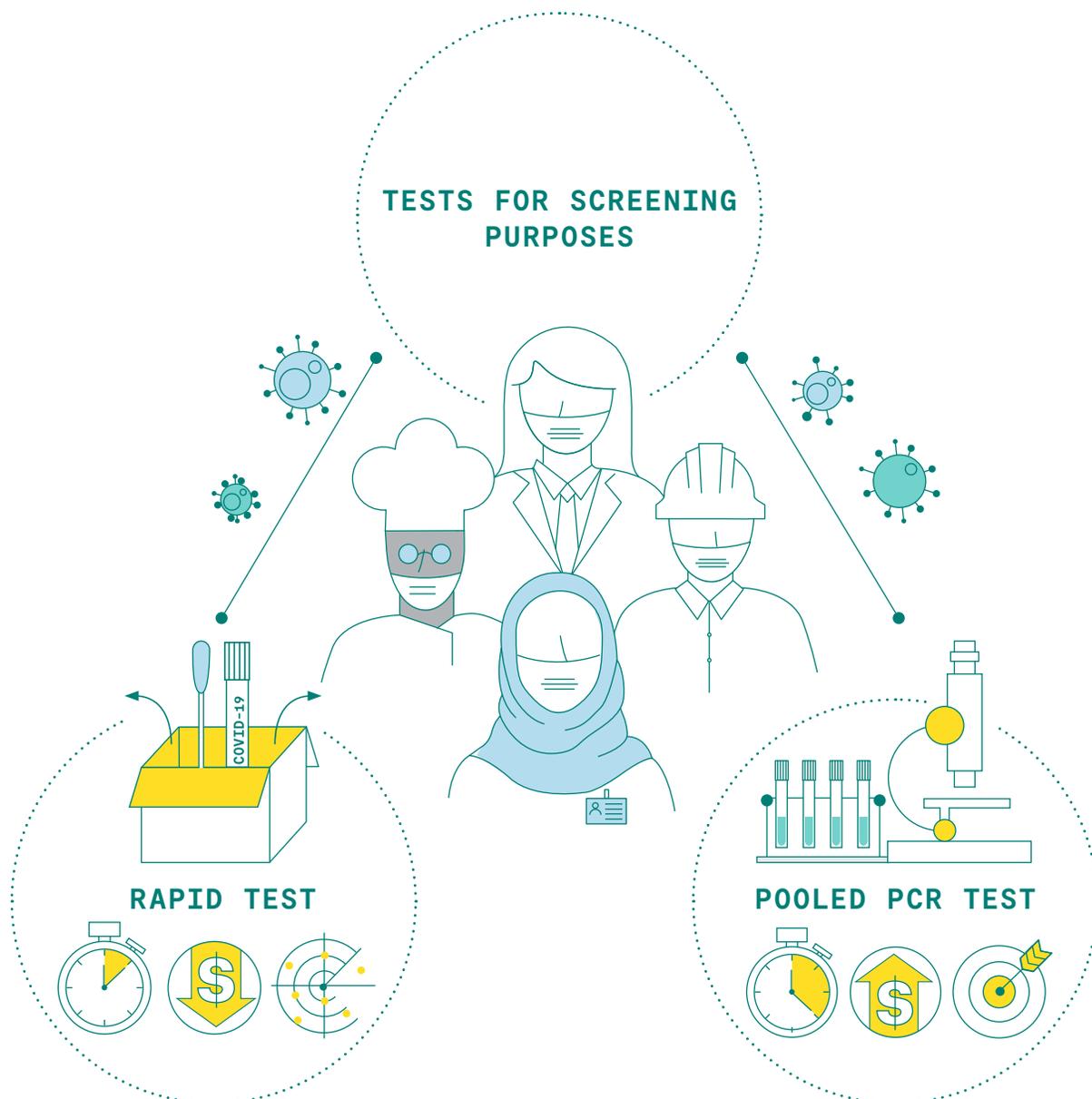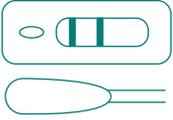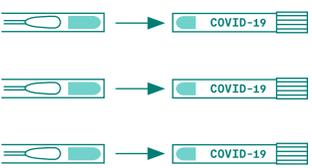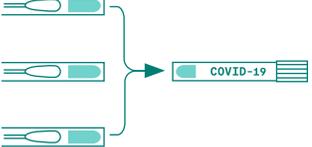

TESTS FOR SCREENING PURPOSES

RAPID TEST

POOLED PCR TEST

TABLE 3 Characteristics of rapid and PCR tests

	ADVANTAGES	DISADVANTAGES
Antigen Tests	Quick turnaround time (15-30 minutes)	Less sensitive than PCR tests, may miss an early case
	Cheaper than PCR tests	Some antigen tests require licensing to conduct on-site. Tests labeled as "at-home" or "over-the-counter" (OTC) do not require licensing.
	Identifies people with high viral loads who may be more contagious	
Individual PCR Tests	Considered the gold standard – most sensitive test	Slower turnaround time (24 hours +)
	Sample collection can be done at home or at the work-place without site licenses (see specific test directions)	Expensive
		May test positive after a person is no longer contagious
Pooled PCR Tests	Lower testing costs than individual PCR testing for low-risk settings	Slower turnaround time (24 hours +)
	Sample collection can be done at home or at the workplace without site licenses (see specific test directions)	Lower sensitivity than an individual PCR test
		May test positive after a person is no longer contagious
		Everyone within a positive pool will need to be retested individually. This may occur automatically at the lab or employees may need to seek out individual testing, depending on the testing contractor.

Rapid Tests for Screening

The majority of rapid tests on the market are antigen tests. Rapid tests may have slightly higher false positive rates than PCR tests when used for screening purposes with asymptomatic individuals, so positive results should be confirmed with a second test (ideally PCR). Individuals who test positive during screening should be isolated from others and instructed to receive this confirmatory PCR testing. In addition, individuals who are experiencing symptoms associated with Covid-19 or have been exposed to the virus should be directed to seek out diagnostic testing, even if they recently received a negative result on a screening test.
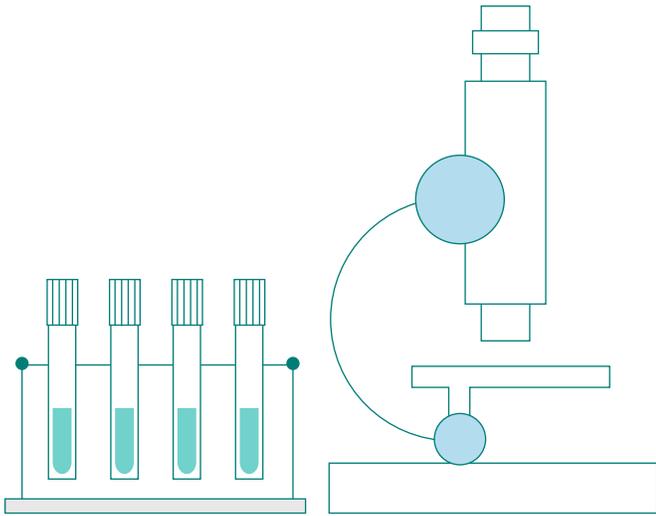
Previously, most rapid tests were classified as "point-of-care" (POC) or "CLIA-waived" tests. These require testing sites to be registered with the state and comply with reporting and other requirements. In late March 2021, several brands of rapid antigen tests received permission from FDA to be sold over-the-counter (OTC) for use in serial testing (meaning 2 tests performed over 3 days with 24-36 hours between tests, depending on the manufacturer). These tests do not require a prescription from a clinician, and they can be performed at home or at the workplace without special certification. Tests marked as "direct-to-consumer" (DTC) or OTC can be fully executed – sample collected and results read – by any adult. FDA maintains a list of authorized tests on its website.
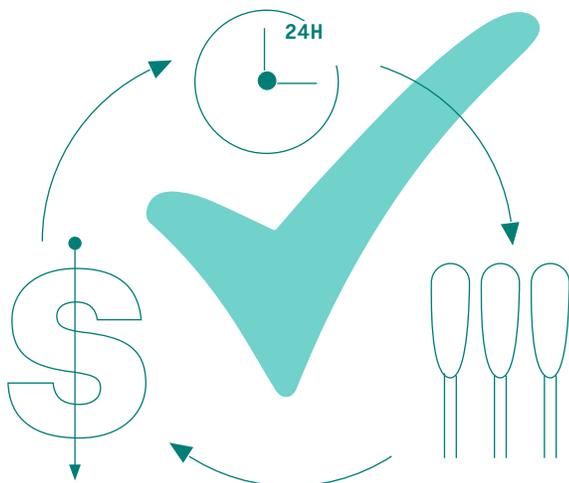
EXAMPLE IN ACTION

Morehouse College, a liberal arts college in Atlanta, Georgia with about 2,200 students and 1,200 faculty and staff, laid out a comprehensive program including diagnostic, screening, and surveillance testing to keep employees safe on campus during the spring 2021 semester. At most three days before reporting to work for the first time in the spring, all employees took a diagnostic PCR test (Morehouse provided resources for employees on how to locate testing). Upon arrival, employees were screened again with a rapid antigen test administered by the school. Finally, Morehouse planned to continue surveillance of Covid-19 cases throughout the semester using self-administered tests for all faculty and staff 1× per week.

This testing plan was accompanied by further precautions including staggered entries and exits for staff shifts, required mask-wearing, contact tracing, and daily self-assessment of symptoms. As of late March 2021, more than two months after Morehouse's spring semester began, the school's Covid-19 tracker had reported just 14 total cases.

contact with each other (such as staff in a small restaurant kitchen). In this latter case, everyone in the pool would be a close contact of whoever the positive individual is, and would need to quarantine and test for that reason anyway.

As community levels of Covid-19 increase, pooling can become less efficient because the likelihood of a positive pool increases and all the individuals in that pool will need to be retested individually.

PCR Tests for Screening

For PCR testing, samples must be sent to a lab for analysis. Sample collection does not require a CLIA waiver, and tests designed for screening purposes generally use saliva or nasal swabs (those that only go into the first quarter inch of the nose). Some tests allow self-collection of samples, while other require trained collectors or supervision of collection.

If you are using individual PCR tests for screening, positive results are considered conclusive, and the employee should immediately quarantine and workplace close contacts should be informed.

You may also use a "pooled PCR testing" strategy where samples from group of employees are sent to a lab but then combined and tested as one. Many testing facilities that provide pooled testing will reserve some of each sample to test individually in the event of a pool testing positive (referred to as **deconvolution** or **reflex testing**), so the positive individual is identified fairly quickly. However, some labs only provide testing for the pools so individuals need to isolate and seek out separate testing to determine who tested positive. This is generally only efficient when individual testing can happen quickly (some schools are using rapid tests to identify the positive person in a pool) or in cases where the pools are made up of people that are in regular close

Cost and Benefit Trade-Offs of Screening Strategies

The example strategies described above will help your company identify Covid-19 cases and isolate infectious employees to prevent spread. That said, there are costs inherent to testing. These include not only the cost of arranging testing but also the costs of absent employees due to quarantine and isolation requirements and the time required for employees to take frequent tests.

At present, worksites and businesses must generally absorb the costs of buying and administering screening tests. For large businesses, the costs can be significant; for example, in August, the Wall Street Journal reported that one Connecticut manufacturing company spent more than $30,000 a month to administer screening tests to its 150 employees on a biweekly basis. Fortunately, test costs have fallen as capacity grows to produce different types of tests.

For example, some large laboratory companies and testing suppliers have agreed to make pooled testing available to schools at 75% lower costs than individual testing. Rapid antigen tests cost between $5-$30, although there may be additional administrative costs. OTC serial rapid tests are now available for purchase at major food, drug, and mass merchandiser retailers nationally and online, as of late April 2021.

In some areas, local or state governments may offer free testing sites that do not ask for insurance information and even encourage frequent testing of asymptomatic individuals. Organizations may choose to utilize this option if available, eliminating the direct costs of purchasing tests for employees.
Sites that ask for insurance information may try to bill the costs to the insurer, however, and insurers are not currently required to cover testing costs for employment purposes.

Whatever the costs, the expenses of purchasing and administering tests as well as carrying out a screening program must be weighed against the benefits of screening testing. These benefits include potentially preventing organization-wide outbreaks. The costs of such an outbreak can be devastating, both with respect to employee health and mortality as well as to the business's finances and reputation.

It will be difficult for any single workplace or business to undertake an actual cost-benefit analysis along these lines, and it is therefore more realistic to think in general terms: What would happen if, in the absence of screening tests and other appropriate strategies, 10 percent of my workforce was exposed to the virus and unable to work for an extended period or even became hospitalized or died? What would be the impact on workers' families? What if the numbers rose further to 20 or even 50 percent?


EXAMPLE IN ACTION

Van Alston, owner of Slim's Downtown Distillery, a dive bar and grill in Raleigh, North Carolina, has been ensuring employees get tested 2× per week by utilizing free and easily accessible local testing sites. Employees simply drive up to one of the testing sites run by the county, local hospitals, CVS, or Walgreens and get tested 2× per week regardless of whether they think they have been exposed or not. Mr. Alston explains, "Employees drive up, are handed a package, and they self-swab. Within three to eight hours, the results are in the employee's email. That is how we've been operating now for five months. It is because we want a safe place." Every person who enters Slim's, including staff and Mr. Alston, scans their driver's license upon entry. This way they know who came through the door and when to facilitate accurate contact tracing.

There are several recently developed tools that may help you estimate testing needs and costs. Massachusetts Institute of Technology and the National Institutes of Health have published an online interactive tool to create testing recommendations specific to your company. After entering details about your company, including mask usage, number of employees, and number of people in unmasked groups, the calculator recommends how often screening tests should be given and estimates the costs of the recommended program. These recommendations are meant to estimate how often employees should be tested to prevent widespread transmission in your company.

Another calculator, developed by United in Research, allows users to enter the details of their screening test strategy and projects potential infections and costs under that strategy. These tools are based on mathematical equations and require several simplifying assumptions (including effective isolation of infected individuals).

After determining what type of test you will use and how often, a new resource from National Institutes of Health and Arizona State University called Connect To Test allows businesses and other organizations to compare and purchase tests or testing services.

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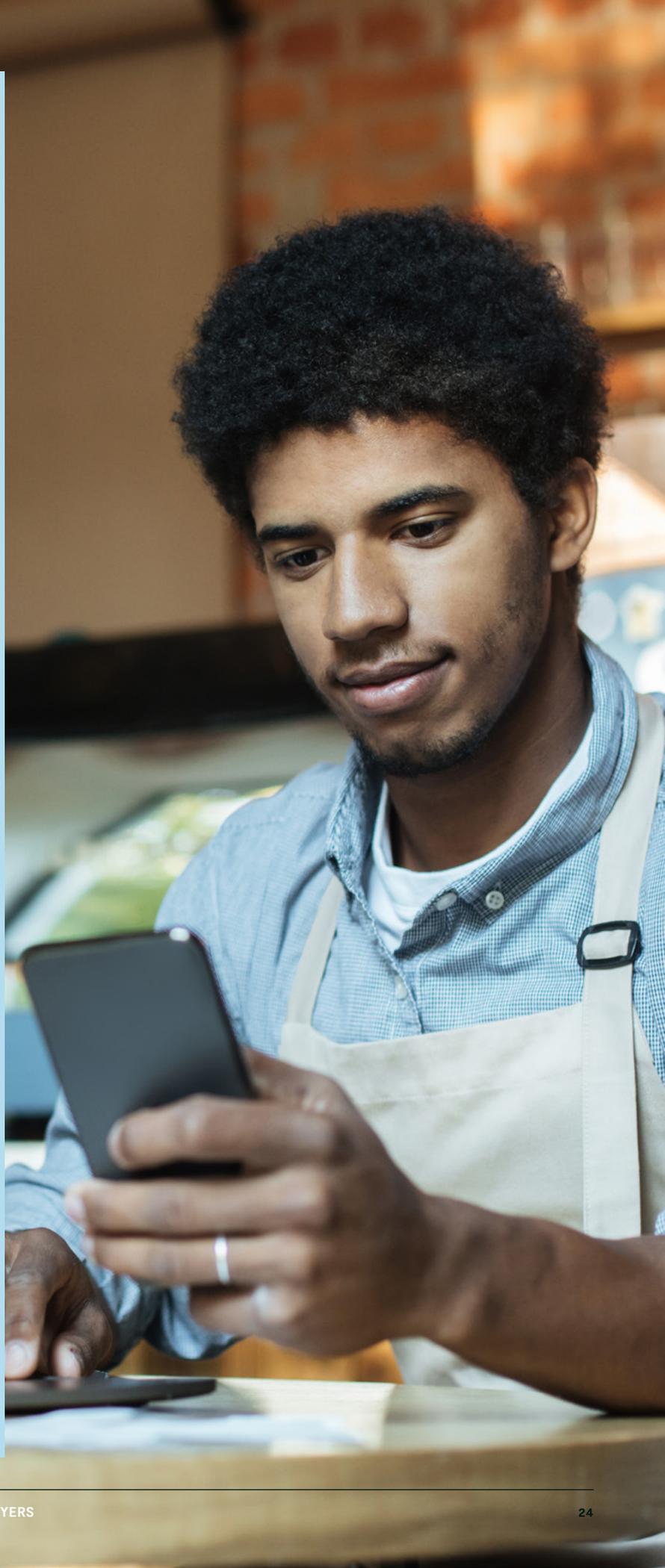
Putting Your Strategy into Action
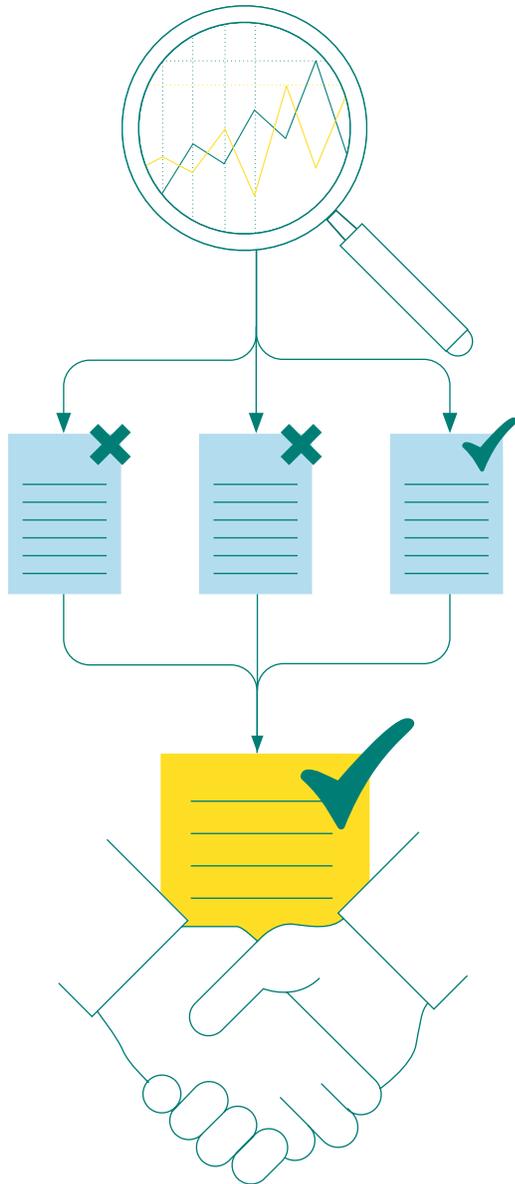
After assessing your risk and choosing a testing strategy, the next step is putting your strategy into action. All response plans should address positive and negative test results, as described above.

Contact Tracing

For routine screening to be most effective as a mitigation measure, it is very important to quickly identify, quarantine, and encourage testing for all on-site close contacts of positive individuals. While contact tracing is the responsibility of your local public health agency, it often takes time and depends on the memory of the employee. Internal protocols may allow faster identification and quarantine of other employees. Note that employees will be more likely to agree to routine testing and reporting positive external results (either for themselves or someone living in their house) if employees are given paid time off during quarantine, while waiting for test results, and while sick with Covid-19.

CDC defines close contact as someone who has been within 6 feet of an individual who is positive for Covid-19 for at least 15 total minutes over the course of 24 hours. However, your business may choose to also identify and ask less-close contacts to be tested. For example, within your workplace there may be groups of people who spend prolonged periods of time in a confined, indoor space or groups who congregate during break times when masks are removed for eating or drinking.

Your organization's leadership should make a plan that identifies in advance who oversees on-site contact tracing and notification of on-site close contacts (and, if applicable, less-close contacts). Whoever conducts contact tracing should be prepared to advise the people they notify about the steps they should take next, including quarantine and diagnostic testing if needed.

CDC guidelines recommend that close contacts of someone who tested positive for Covid-19 should quarantine for 14 days after exposure. Individuals who have been vaccinated or previously tested positive within 3 months of exposure do not need to be tested unless they have developed new symptoms.

As discussed previously, you may be able to use testing to allow quarantined individuals to return to work before the end of the standard 14-day quarantine period or choose to stay with the recommendation that no quarantined individual should return to work until 14 days have passed. However, please familiarize yourself and ensure your policies are in line with local public health authorities' guidance regarding quarantine duration, as they have final jurisdiction.
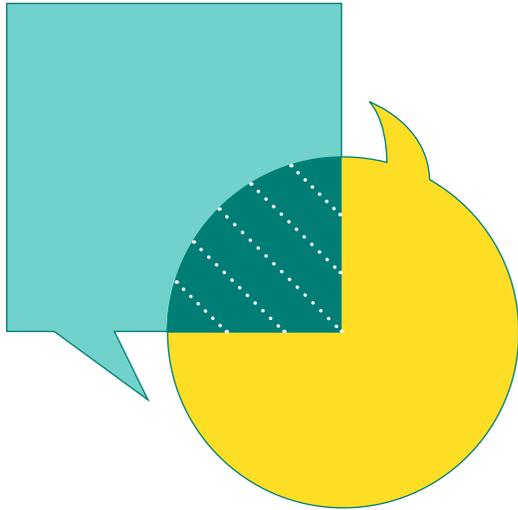
Communicating Your Testing Strategy

Whatever testing strategy you select, it is very important to clearly communicate the strategy to your workers. You should update these communications as your strategies change. As noted above, you may want to adapt your testing plan based on changes in the risk of Covid-19 spread within your community or as new information on testing strategies becomes available.

Employees should be informed about the tests and the testing plan you choose – for example, how frequently tests will be performed. Depending on your organization's population, it may be beneficial to provide information on your plan in multiple languages and with easy-to-understand diagrams showing people what to expect.

Employees should also be told in advance what they should do if they test positive for Covid-19 or have reason to suspect that they have contracted the virus. You may also want to consider providing information on locations where your employees can receive appropriate diagnostic testing if they do think they have been infected – for example, through a local pharmacy or health system. If you do not provide health insurance as an employee benefit, you may want to provide information that by law individuals should not be billed for diagnostic testing or ensure they know about local community testing sites that do not ask for insurance information.

Lastly, familiarize yourself with the U.S. Equal Employment Opportunity Commission guidance on Covid-19 to ensure your testing strategy and communication plan comply with medical information confidentiality and workplace safety laws. Note that the Americans with Disabilities Act allows an employer to test employees for Covid-19 (consistent with current CDC guidance) as well as bar an employee from physical presence in the workplace if they refuse to answer questions about whether they have Covid-19, have symptoms associated with Covid-19, have tested positive for Covid-19, or are awaiting results of a Covid-19 test. Recent federal guidance suggests that employers may require vaccines provided that they make reasonable accommodations for religious and medical exemptions regardless of whether the vaccine was authorized by FDA under an Emergency Use Authorization (EUA) or through the full FDA approval process. However, there continues to be debate about this topic. Additionally, a number of bills proposed in state legislatures would prohibit employers from requiring Covid-19 vaccines for employees. You should consult a lawyer to be aware of the relevant laws around testing and vaccination in your state.

Communicating Test Results

If your organization is made aware of a positive individual result or pool, you should have a plan in place for communicating those results and respective actions to individuals who have tested positive, close contacts, and, if applicable, members of a pool that tested positive. For example, a response to a positive test result should include isolation of the infected individual and quarantine of their close contacts. Even those who have been fully vaccinated should isolate if they test positive for the virus. In cases of confirmed infection, you should also contact the local health department to help manage the processes of quarantine and isolation.

Though quarantine and isolation are often used interchangeably, the difference between the two is important. Quarantine is recommended for asymptomatic people who may have been exposed to Covid-19 but have not yet tested positive and entails staying at home for 14 days and monitoring for symptoms. Isolation is recommended for those who have tested positive and is stricter than quarantine; these individuals should avoid close contact even with others who live in the same home by staying in a separate room and using a separate bathroom if possible.

You should also have a plan to communicate with your local or state public health department for reporting any positive cases. If you are working with a third-party testing vendor, you should clarify whether they will be reporting to local and state health officials.

EMPLOYEES AND CUSTOMERS

PLAN

COVID-19

STATE AND LOCAL PUBLIC HEALTH AGENCIES
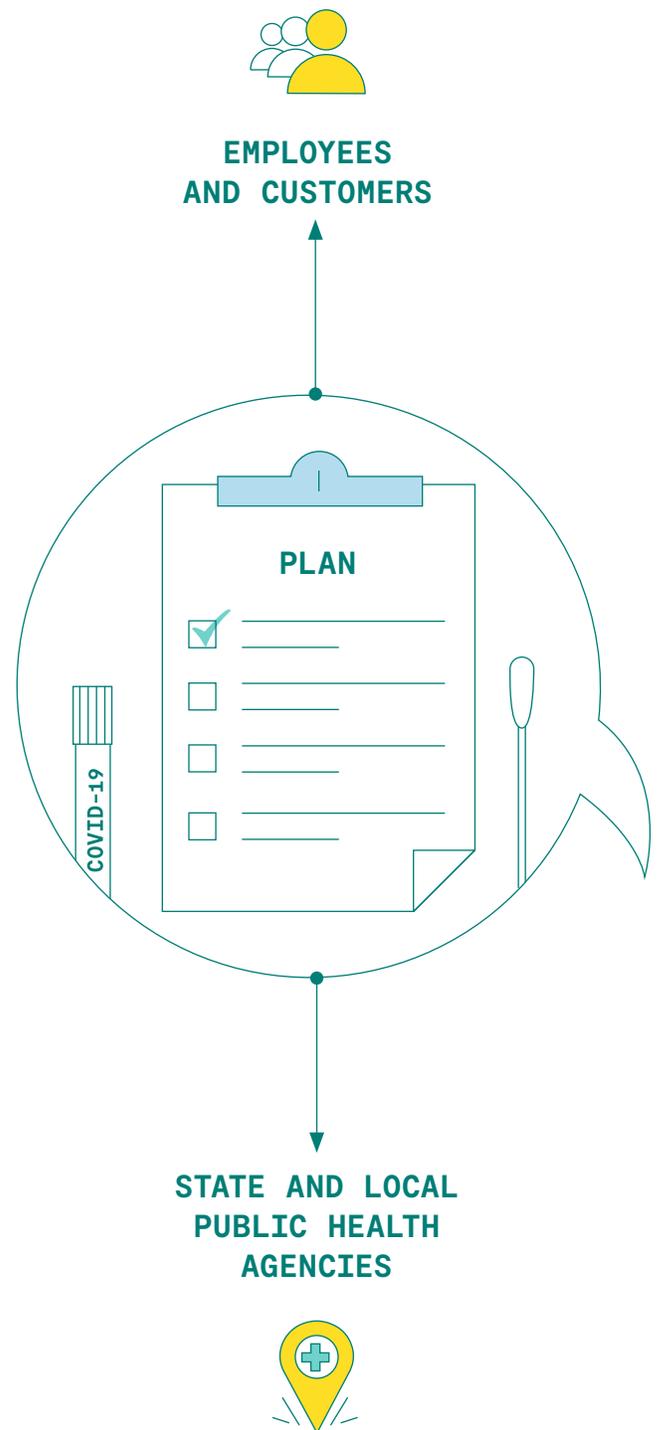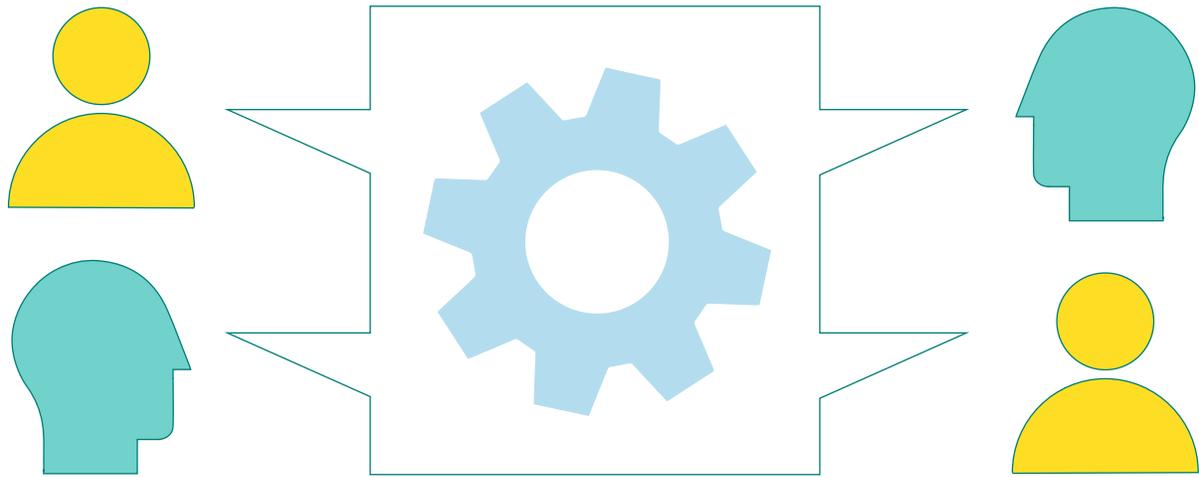
Communicating Other Policies

Your organization should develop a plan for clearly stating expectations regarding the steps that everyone should take to minimize Covid-19 spread. For example, employees should be aware of daily practices such as regular and thorough handwashing, mask-wearing, and distancing.

Your organization should communicate policies for sick leave and how these policies may have been modified during the pandemic. For example, employees should be aware if you have adopted a policy of guaranteed paid sick leave if individuals either test positive and need to isolate or have been exposed to others who have tested positive and need to quarantine. Such policies have been useful in reducing the spread of the virus (see this analysis of the emergency sick leave provision in the 2020 Families First Coronavirus Response Act). Paid sick leave gives people the ability to stay home when sick, thus reducing the spread of infection and preventing "contagious presenteeism behavior," in which people come to work while contagious because they do not have paid sick leave available.

You should also consider providing "wrap-around services" to support workers who are in quarantine or isolation. Such services can include transportation to and from testing sites as well as financial support, all of which can allow individuals to better comply with testing and quarantine protocols. Some of this extra support may be provided by local public and private organizations. If so, identifying these organizations and sharing a list with your employees will be helpful.

Communicating with Local and State Health Authorities

Your organization should develop a plan for communicating with local and state health authorities. Local health officials can provide support and guidance in the case of an outbreak. Additionally, communicating with local health departments helps them improve their knowledge of what is happening and enhance the accuracy of their own data on both testing and Covid-19 infection rates.

To ensure free and easy access to reliable information about Covid-19, Arizona State University's College of Health Solutions has developed tools that are free, easily accessible, and valuable for business owners worldwide. These tools include:

The COVID-19 Workplace Commons, which fosters worldwide exchange of information on best practices in the workplace to address the coronavirus pandemic.

The COVID-19 Testing Commons, which provides comprehensive information about all Covid-19 tests available worldwide.

Back to the Workplace: Are we there yet? provides findings from the global survey in spring 2021 of employers in 31 countries, 24 industry sectors, 1,168 companies and 1,339 facilities. This report provides data on the impact of the Covid-19 pandemic on seven different pandemic-related workplace practices: vaccination, testing & contact tracing, employee wellbeing, the future of work, coming back and remote work, pandemic response & preparedness, and the financial impact due to the pandemic.
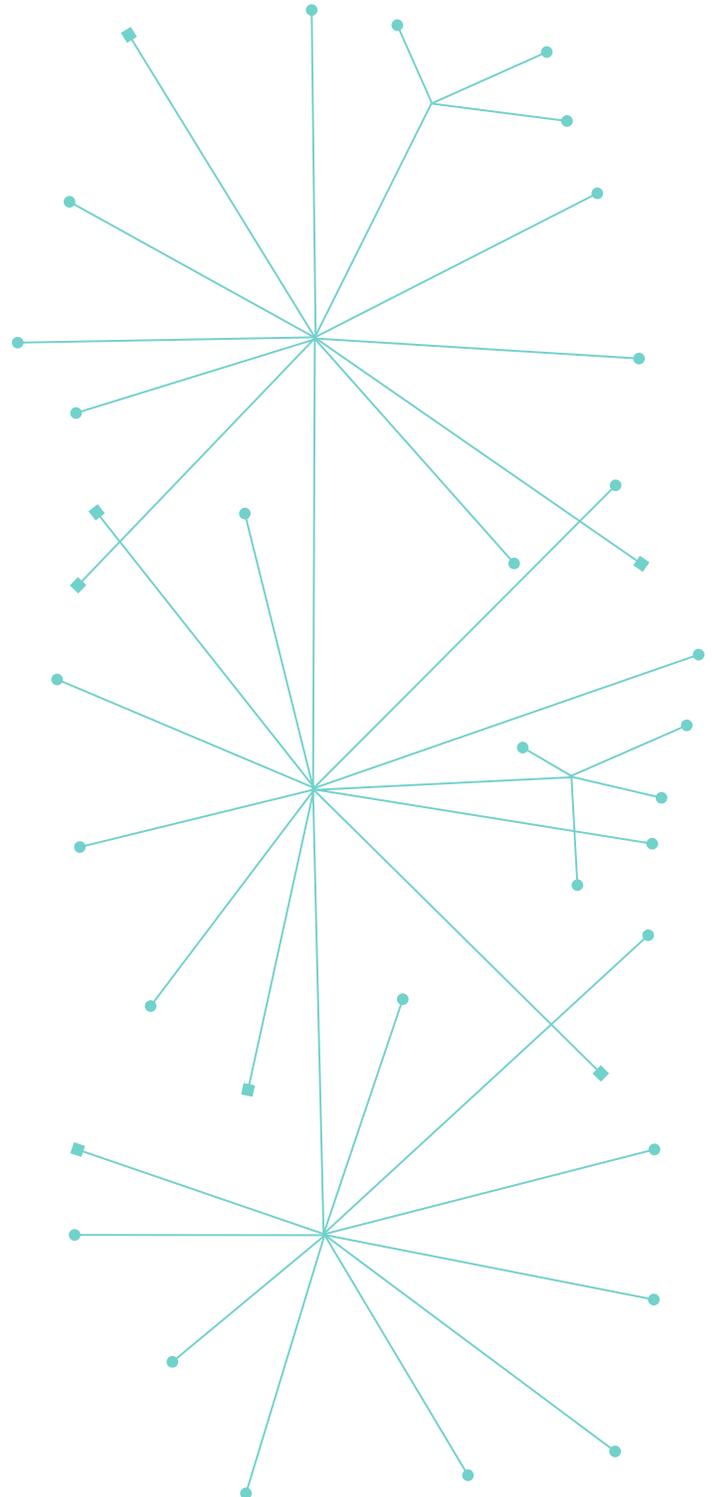
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Disclosures

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The Robert J. Margolis, MD, Center for Health Policy at Duke University is directed by Mark McClellan, MD, PhD, and brings together expertise from the Washington, DC policy community, Duke University, and Duke Health to address the most pressing issues in health policy. The mission of Duke-Margolis is to improve health and the value of health care through practical, innovative, and evidence-based policy solutions. Duke-Margolis catalyzes Duke University's leading capabilities, including interdisciplinary academic research and capacity for education and engagement, to inform policy making and implementation for better health and health care. For more information, visit healthpolicy.duke.edu.

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