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COVID-19 Vaccine Indicators

States need to prepare now to share vaccine-related data to inform decision-making and provide accountability and transparency in vaccine rollout. These data will become increasingly important as vaccine supplies increase in the months to come. We propose six vaccine indicators to supplement previously recommended <u>15 essential indicators</u> to control COVID-19, and highlight best practices among state COVID-19 vaccine dashboards.

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Since emergency use authorization of COVID-19 vaccines in December 2020, state and local public health departments in the United States have worked hard to distribute and administer vaccines, all the while maintaining infrastructure for COVID-19 testing, case investigation and contact tracing.

As the nation accelerates vaccination efforts and states prepare to vaccinate broader, more diverse segments of the population, data on vaccine supply and vaccination coverage will become increasingly important to guide vaccine distribution. More complex and tailored distribution strategies will be required to ensure that vaccines reach all segments of the population, including historically marginalized populations and persons without access to routine health care; supply and coverage data can inform when and where vaccine clinics are held, how interventions to address low vaccine uptake are targeted, and crucially, when we have achieved sufficient levels of immunity to relax public health and social measures in our communities. Public reporting of vaccine data also provides accountability and transparency to help rebuild trust in public health agencies.

Most states, some local health departments, and the U.S. Centers for Disease Control and Prevention (CDC), have begun publishing initial data on vaccine rollout. These initial data releases lay the groundwork for cohesive, actionable vaccine data, but variability in existing public reporting limits its usefulness for decision-making. To build on what is currently available, states should adopt consistent indicators and terminology, which are needed to assess progress over time, compare performance across regions and encourage improvement by identifying best practices. Standardization is particularly important for COVID-19 vaccine rollout because states are prioritizing groups for vaccination in different sequences and local jurisdictions are moving through vaccination phases at different times. This has generated confusion among public health officials, vaccine providers, and the public about the supply available and how it is being used.

States need to prepare now to update existing COVID-19 dashboards to include key vaccine indicators. We recommend indicators that together convey a high-level view of COVID-19 vaccine rollout with a focus on equity. The recommended indicators cover three key domains: vaccine rollout phase, vaccine supply and vaccination coverage.

Recommended Indicators for COVID-19 Vaccine Tracking

	Indicator or information	Stratification	Suggested target
1	**Current phase of vaccination, including who is eligible to be vaccinated now**	County, prioritized subgroups or tiers within phases	
2	**Number of full vaccine regimens distributed to jurisdiction per capita (100,000 population)** Numerator: cumulative number of vaccine regimens arrived in the jurisdiction[1] Denominator: population age 16 or older[2] divided by 100,000	County	≥0.8
3	**Percentage of population that could be fully vaccinated with vaccine distributed** Numerator: cumulative number of vaccine regimens arrived in jurisdiction[1] Denominator: population age 16 or older[2]	County	≥80%
4	**Percent of doses administered[3]** Numerator: cumulative number of doses administered in jurisdiction Denominator: cumulative number of doses arrived in jurisdiction	County	≥80%
5	**Percentage population partially vaccinated** Numerator: cumulative number of people who have received first dose of 2-dose regimen Denominator: population age 16 or older[2]	Age, sex, race, ethnicity, county, prioritized population (e.g., long term care facility residents and staff)	
6	**Percentage population fully vaccinated** Numerator: cumulative number of people who have completed a vaccine regimen Denominator: population age 16 or older[2]	Age, sex, race, ethnicity, county, prioritized population (e.g., long term care facility residents and staff)	≥80%

For each of the six recommended vaccine indicators, we highlight why it matters, key findings from our review of state vaccine dashboards or reports, recommendations for improvement and best practice examples.

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1   Currently authorized vaccine regimens require 2 doses for full vaccination so the number of regimens distributed would be equal to the number of doses divided by 2; if single dose vaccines are authorized, the cumulative number of full regimens that have arrived in the jurisdiction should be used.

2   Currently vaccine emergency use authorizations are only for persons age 16 and older. If vaccines are authorized for use among children or adolescents, denominators should be expanded accordingly.

3   Tracking the percentage of doses administered within 7 days of distribution is also an important indicator of the speed of vaccine rollout while shipments are arriving weekly; if shipments are moved to biweekly or monthly, the percentage of doses administered within those intervals should be monitored in addition to the cumulative percentage of doses administered.

Overall Findings

As of January 25, 2021, 46 states had established COVID-19 vaccine reports or dashboards (Appendix B).

The best dashboards presented information clearly on who is currently eligible to be vaccinated, quantity of vaccine distributed to the state, and progress toward vaccinating their community, including information on vaccination coverage by subgroup (e.g., nursing home residents, Black, Latinx, and Native American people). These best performers combined data transparency and key information on vaccine rollout with effective communication to the public and key stakeholders.

Three key areas for improvement of these early vaccine dashboards are:

- **Key demographic data were missing.** Only 21 of 46 dashboards included any data stratified by race and ethnicity, which is essential in the assessment of equity in vaccine distribution, particularly among historically marginalized groups. Twenty-six states included data on vaccination coverage stratified cumulatively by age; one included trends in coverage over time by age group, and none included trends over time by race and ethnicity. This information is available to many states; presenting trends by race and ethnicity over time would not require additional data collection, just presentation which enables ongoing tracking of the effectiveness of outreach to different groups over time.

- **Vaccine data were often siloed.** Only 16 states integrated vaccine data into existing COVID-19 dashboards; 15 created new pages with links to existing dashboards and 15 did not include a direct link to other COVID-19 data. Vaccination is a new tool in COVID-19 response that should be integrated with existing COVID-19 response strategies; similarly, vaccine data should be integrated with other COVID-19 data, as on CDC COVID-19 Data Tracker.

- **Terminology was inconsistent.** The same terms were used with different meanings across states, and some states also used multiple terms interchangeably to describe a single indicator. For example, the term "doses received" most often referred to the doses distributed to the jurisdiction but was also used to indicate the number of doses of vaccine administered. As a result, it was difficult to determine what states were measuring and compare metrics across states. Use of clear, consistent language reduces confusion and should be recommended at the federal level and cascade to states and local health departments.

State Reporting on Vaccine Indicators

KEY FINDINGS, RECOMMENDATIONS, AND BEST PRACTICE EXAMPLES

During January 22–25, 2021, we used internet searches to locate COVID-19 vaccine data dashboards and reports for each state, Washington, D.C. and Puerto Rico (Appendix B) . Multiple webpages were accessed for some states. We used a standardized template to document the indicators presented by each state, including whether data were included from each domain (phase, supply, coverage); whether data were stratified by vaccine manufacturer, county or local health department region, age, gender, race, ethnicity; and whether trends over time were measured.

VACCINE ROLLOUT PHASE

#	Indicator or information	Stratification	Suggested target
1	Current phase of vaccination, including who is eligible to be vaccinated now	County, prioritized subgroups or tiers within phases	

WHY IT MATTERS: National recommendations for prioritizing vaccine distribution are changing rapidly, states are prioritizing groups in different sequences, and counties are moving through vaccination phases at different times. This has overwhelmed public health department systems and caused confusion among the public about who can be vaccinated in their community and when. Much like a risk-alert level system can be used to communicate information about risks and restrictions, a phase indicator helps to reinforce the key message of who is eligible to be vaccinated now.
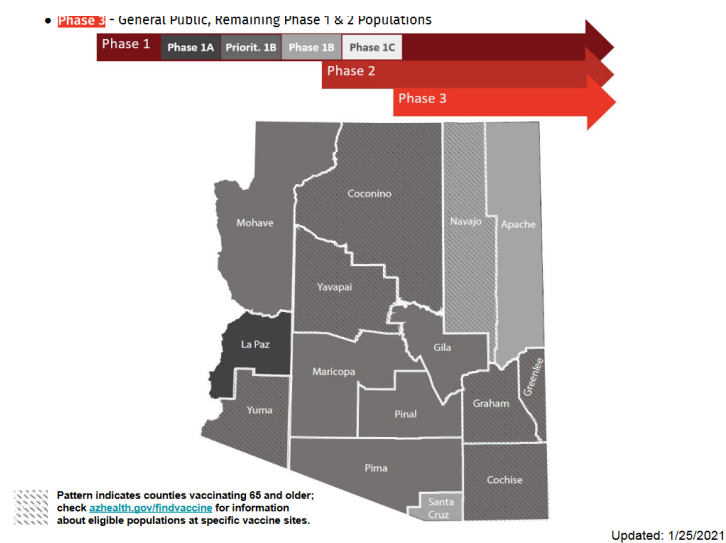
KEY FINDING: Nine states indicated their current vaccination phase and eligibility within their vaccine dashboard or report, or in text above the dashboard; seven other states specified a phase number (e.g., 1B) without any description of who was eligible in that phase, and two included a diagram of all phases without indicating which phase the state was currently working in.

RECOMMENDATION: We recommend a prominent indicator showing the current vaccination phase and a brief description of who is eligible for vaccination now, where vaccine is available, and estimated timing of future phases. If counties within the state are operating in different phases, phase information should be displayed by county. It may also be helpful to link to communication materials with detailed eligibility criteria, estimates of the number of people eligible in each phase, and the vaccination process, such as local health department websites. Boldly highlighting phase information reinforces current eligibility and helps the public contextualize data about vaccine supply and coverage. Although many states have developed infographics to explain vaccination phases, they miss the opportunity to integrate this information into dashboards or reports.

BEST PRACTICE EXAMPLES: The Arkansas dashboard shows who is eligible and where they can get vaccinated. Hawaii created a simple interactive graphic that includes key eligibility criteria. Important geographic variation was captured in Arizona's map showing the current phase by county.

Figure 1. Succinct description of current phase from Arkansas
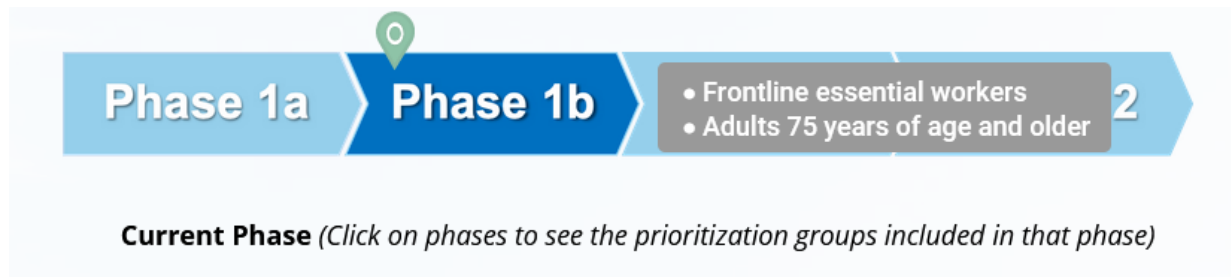
VACCINE SUPPLY

#	Indicator or information	Stratification	Suggested target
2	Number of vaccine regimens distributed to jurisdiction per capita	County	≥0.8
3	Percentage of population that could be fully vaccinated with vaccine distributed	County	≥80%
4	Percentage of doses administered	County	≥80%

WHY IT MATTERS: As vaccine supplies increase and with new vaccines likely to enter the market, states should be transparent with the public about how many vaccine regimens have arrived in the state and what proportion of the population that supply can cover. Some vaccines require a two-dose series, whereas others may only require a single dose for full vaccination. The word "regimen" should be used to disambiguate from doses and avoid referring to vaccine series once single-dose vaccines are available. Because a speedy and efficient vaccine rollout is essential to save lives, states should also report what percentage of doses distributed have already been administered.

KEY FINDING: Thirty states and Washington, D.C. included at least one supply indicator; however, none reported the number of vaccine regimens distributed per capita. Instead, states reported variously on the number of doses allocated, delivered, distributed, ordered, promised, received, requested or shipped. Twelve states stratified counts of doses by vaccine manufacturer and 10 stratified by county; nine states reported the percentage of doses administered. Vaccine supply was the domain with the most variation in indicators and terminology; variability in what was reported and the terminology used was confusing and made it difficult to compare vaccine supply across states.

RECOMMENDATION: Dashboards should report "vaccine regimens distributed per capita", meaning the cumulative number of complete vaccine regimens that have arrived in the state and therefore available for administration. State dashboards should display regimens per capita instead of raw counts and provide breakdowns by county and over time so that the public can understand changes in vaccine supply. Using the term "distributed", consistent with CDC, will reduce confusion. Although not explicitly part of the 6 recommended indicators, tracking the percentage of doses administered within 7 days of distribution is also an important indicator of the speed of vaccine rollout.

BEST PRACTICE EXAMPLES: Michigan displays comprehensive detail about doses distributed by county, provider type, and vaccine manufacturer, and includes trends over time. Massachusetts was the only state publishing the percentage of its population that could be vaccinated with doses distributed, shown in a map by county. Minnesota reported the percentage of doses administered within 3 and 7 days of distribution, and specified goals for each. New York shows the percentage of doses administered by region.

OTHER CONSIDERATIONS: Seven states[4] reported the number of providers participating in vaccine rollout and five states[5] reported the number of doses administered by provider type (e.g., hospital, pharmacy, public health, etc.). Public health officials should carefully track information on geographic distribution of vaccination providers and percentage of doses administered per provider to ensure access to vaccine in all communities as vaccine supplies increase. Local health department websites may provide the most up to date and detailed information on vaccine providers.

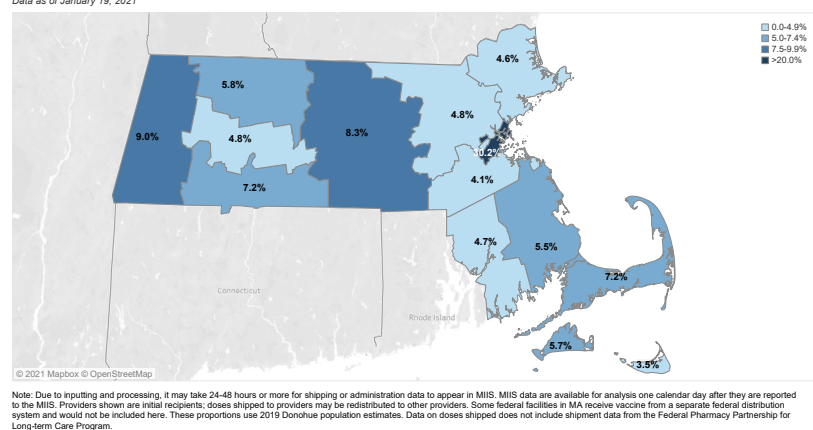4   Colorado, Georgia, Louisiana, Michigan, Minnesota, New Jersey, and North Dakota

5   Massachusetts, Michigan, Minnesota, Texas, and Virginia
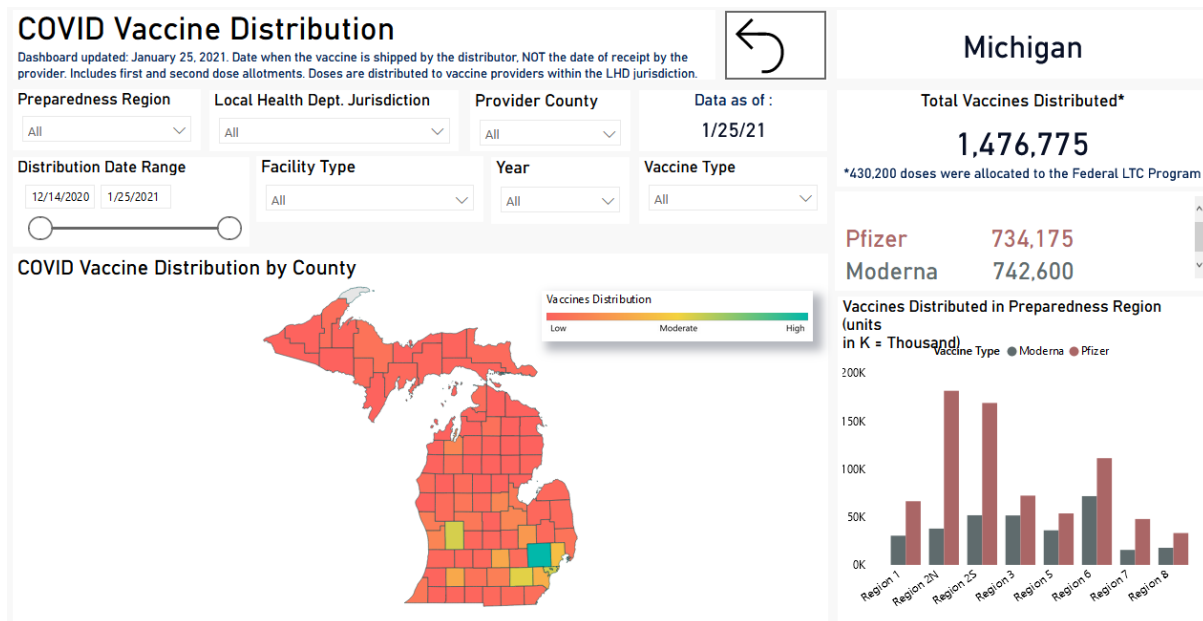
Figure 4. Vaccines distributed by county, preparedness region, and manufacturer in Michigan

Figure 5. Percentage of population that could be vaccinated by county in Massachusetts

Figure 6. Percentage of doses administered within 3 and 7 days of distribution in Minnesota

VACCINATION COVERAGE

#	Indicator or information	Stratification	Suggested target
5	Percentage population partially vaccinated[6]	Age, sex, race, ethnicity, county, prioritized population (e.g., long term care facility residents and staff)	
6	Percentage population fully vaccinated	Age, sex, race, ethnicity, county, prioritized population (e.g., long term care facility residents and staff)	≥80%

WHY IT MATTERS: The ultimate indicator of a successful vaccination campaign—the percentage of people who are fully vaccinated against COVID-19—should be tracked by all states. Tracking vaccination coverage tells us when we can relax public health and social measures. Both partial and full vaccination should be tracked because people who are partially vaccinated may experience some protection from severe COVID-19 disease. The suggested target is 80% coverage.

KEY FINDING: Although all state reports or dashboards included at least one coverage indicator, the variety of ways in which these data were reported made it difficult to compare progress across locations (e.g., number of people initiating vaccination or fully vaccinated, number of first and second doses administered, etc.) Authorization of single-dose vaccines in the coming weeks could further complicate how coverage is reported. Only five states[7] reported any per capita rates. Tennessee was the only state reporting percentage of people partially vaccinated whereas 10 states[8] reported the percentage of people who were fully vaccinated.

RECOMMENDATION: We recommend reporting per capita rate (currently reported by CDC) and percentage of people who are partially and fully vaccinated. Currently, most states show counts of doses administered or people vaccinated; because these data do not include information about population denominators, it is very difficult to compare progress across states. A whole-of-society approach to public health reporting should allow for monitoring and comparison of essential data across states and regions.

BEST PRACTICE EXAMPLES: Washington's map of percentage of people fully vaccinated by county is simple and effective; their dashboard also includes a detailed tabular view of the

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6   Someone who is partially vaccinated could be overdue for the second dose, or may not yet have completed the recommended interval between doses. In the near term, as vaccine distribution ramps up, the percentage partially vaccinated will be driven by people who are not yet eligible for a second dose; in this context it reflects early trends in vaccination coverage. In the longer term, partial vaccination will become an indicator of drop-out and can guide public health intervention. In the long term and with sufficient vaccine supply, a suggested target would be to reduce the percentage partially vaccinated to <5% to maximize the proportion of people fully vaccinated.

7   Arizona, Louisiana, Oregon, Utah, and Washington

8   Illinois, Maryland, Minnesota, Nebraska, North Dakota, Ohio, Tennessee, Texas, Washington, and Washington, D.C.

number and per capita rate of people who have received at least one dose and who are fully vaccinated by county. Gauge or thermometer charts also may be effective visualizations for percentage coverage.

OTHER CONSIDERATIONS: Whereas most vaccine dashboards are likely to be published by states, local public health officials are largely responsible for operationalizing vaccine distribution. Local health departments need access to data from state immunization registries and vaccine information systems to analyze coverage at the census tract level and with more detailed demographic stratification; these analyses are critical to inform community engagement, provider recruitment and location of vaccination events.
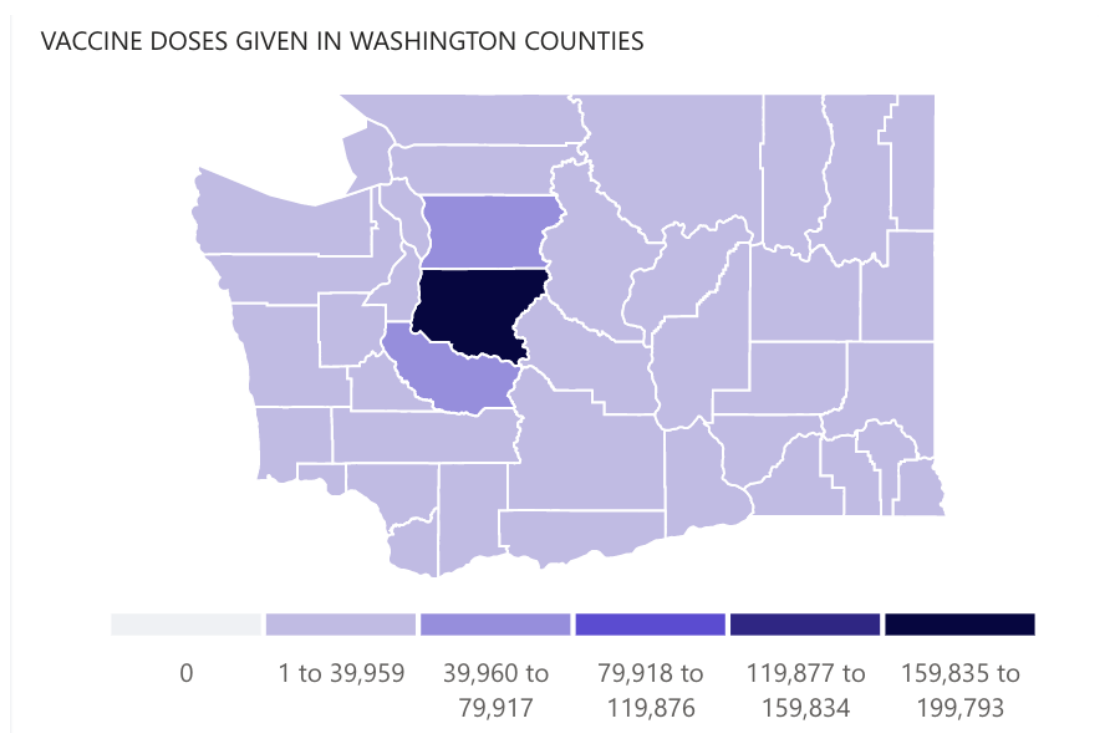
VACCINE DOSES GIVEN IN WASHINGTON COUNTIES

| 0 | 1 to 39,959 | 39,960 to 79,917 | 79,918 to 119,876 | 119,877 to 159,834 | 159,835 to 199,793 |

Figure 7. Percentage of people fully vaccinated by county in Washington

SPOTLIGHT: STRATIFICATION OF COVERAGE ESTIMATES

WHY IT MATTERS: Stratified estimates of vaccination coverage, including trends over time, are crucial to provide transparency about who has received the vaccine, to ensure that all groups have access to vaccine and to help target vaccine campaigns to specific subgroups if needed. Stratified coverage estimates also are important because early data show Black Americans are getting vaccinated at lower rates than white Americans and polls indicate that historically marginalized populations are more hesitant to receive the COVID-19 vaccine as compared with other population groups. Stratified estimates also are needed to track whether distribution has been successful to protect prioritized populations, particularly long-term care facility residents and staff.

KEY FINDING: Demographic stratification of coverage estimates was missing from many dashboards and reports. Thirty-three states included data on cumulative vaccination coverage stratified by county or other geographic subregion, 26 states included data stratified by age, and only 21 included data stratified by race and ethnicity; only one (North Dakota) included stratified trends in coverage over time.

RECOMMENDATION: We recommend tracking and reporting trends in coverage over time by county/ZIP code, race, ethnicity, age, sex, and prioritized population; states may consider additional stratification[9] to ensure equity in their local context.

BEST PRACTICE EXAMPLES: Ohio's dashboard shows the percentage of people partially and fully vaccinated by race, ethnicity, age and sex, statewide and within each county. The North Dakota dashboard shows county-specific trends in vaccination coverage by age and is the only dashboard that includes stratification of vaccination coverage trends over time by any demographic factor (age). Some states, such as Tennessee, show the percentage of people who have been vaccinated who were in different age, sex, race and ethnic categories; this type of stratification using the number of people vaccinated as the denominator is also informative. However, it is not a substitute for stratified estimates of the proportion of the population that has been vaccinated.

KEY FINDING: Stratification of vaccination coverage by prioritized population also was missing from state dashboards. Fifteen states displayed the number of doses distributed to or administered by the federal Pharmacy Long-Term Care Partnership Program, but most did not report vaccination coverage among healthcare workers or long-term care facility residents and staff (populations prioritized for vaccination in all states).

RECOMMENDATION: States should report the percentage of long-term care facility residents and staff who have been partially and fully vaccinated statewide and by facility. Reporting vaccination coverage in the long-term care facility setting is critical because of the high burden of COVID-19 in this population, which accounts for 40% of COVID-19-associated deaths in the US. Facilities could track vaccination coverage by using an optional module from the National Healthcare Safety Network; if made mandatory, this module would provide states with timely information on vaccination coverage in this vulnerable population. Where possible, states also should track vaccination coverage among other prioritized groups, such as healthcare and frontline essential workers. Estimating vaccination coverage among occupational groups may require new, standardized collection of occupational data within immunization information systems.

BEST PRACTICE EXAMPLES: New York reports the percentage of long-term care facility residents and staff who have been vaccinated statewide and by region, but not by facility. South Carolina publishes daily reports from the Pharmacy Long-Term Care Partnership Program, including the number of residents and staff who have received one and two vaccine doses by

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9   Additional stratifications could inform coverage in hard to reach and disproportionately affected communities, for example communities with high social vulnerability index or environmental justice communities, by immigration status, or among persons without health insurance.

facility; these data could be improved by including the total number of residents and staff so that coverage rates could be calculated.
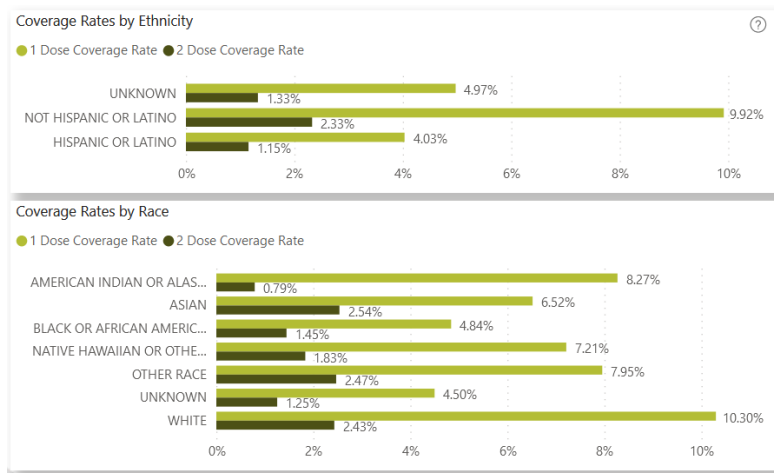

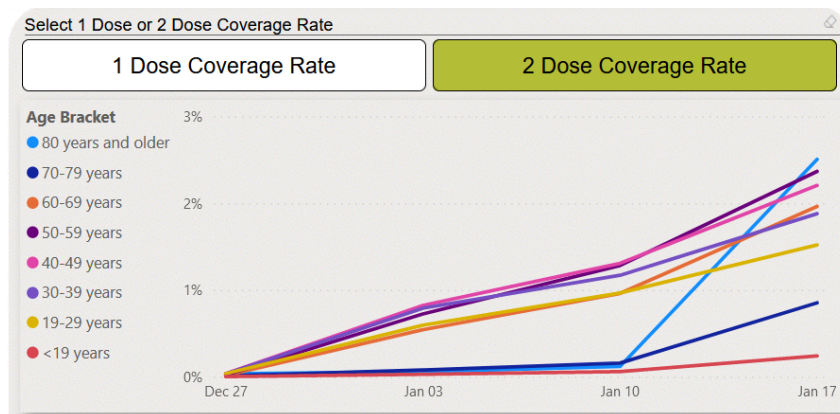Figure 8. Vaccination coverage by race and ethnicity in North Dakota

Figure 9. Trends in vaccination coverage over time stratified by age group in North Dakota.
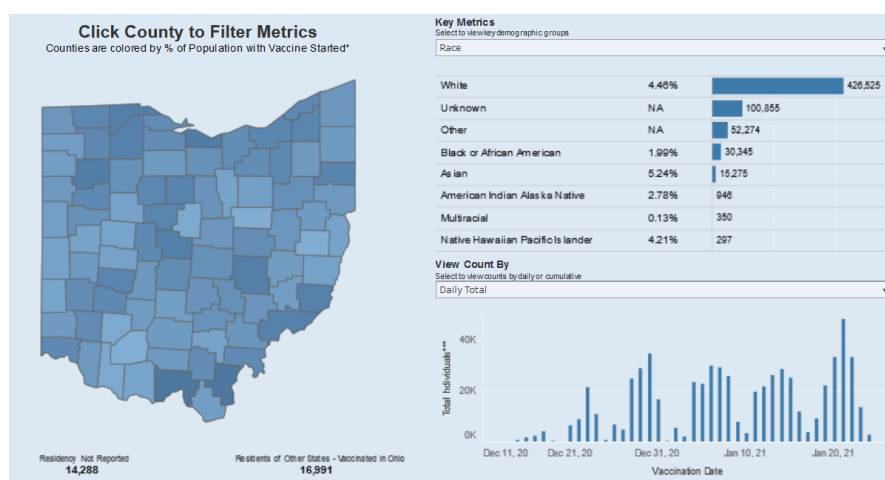

Figure 10. County-level details on vaccination coverage, including percentage of population vaccinated by race and number of people vaccinated by day; data are available statewide or for each county in Ohio

DOMAINS NOT COVERED IN THIS GUIDANCE

Vaccine confidence and acceptability

Regular monitoring of COVID-19 vaccine acceptability and reasons for vaccine hesitancy is essential to detect and address gaps in public confidence that could derail successful vaccination campaigns. We suggest the metric used by the Kaiser Family Foundation: percentage of people who would definitely or probably take a COVID-19 vaccine deemed safe by scientists and available for free, with a suggested target of 80%. Additional questions to identify common concerns among persons hesitant to be vaccinated also are important. Because measuring acceptability and confidence will be challenging, public health departments could consider partnering with community-based organizations, academic institutions, or others for support. For example, the COVID Symptom Survey, a collaboration between Facebook and the Delphi Research Group at Carnegie Mellon University, includes county-level data on vaccine acceptability and hesitancy collected from an average of 250,000 people per day.

Adverse events following immunization

In addition to essential indicators tracked by all states, adverse events following immunization should be reported regularly at the national level. Transparent reporting should include information about enrollment in the V-safe system and use of other adverse event monitoring systems. This recent MMWR is an example of clear messaging around adverse events and vaccine safety monitoring.

Limitations

State dashboards are changing rapidly and the information available may have changed after our review during January 22–25, 2021.

Additional information also may be forthcoming from states; the current wave of COVID-19 cases, which highlights the need for data to guide vaccine distribution to help bring COVID-19 under control, has strained the public health workforce and may have impeded reporting efforts. In addition, given the variety of data visualization formats and terminology, it is possible that some indicators were misclassified. We did not evaluate dashboard usability as part of this report.

Whereas this report focused on state dashboards, county health department dashboards could be leveraged to provide additional information about vaccine rollout at the local level. For example, King County, WA and Chicago, IL report detailed vaccination data by ZIP code. States should consider linking to local-level dashboards, where available.

Recommended indicators in this report focused on publicly reported indicators. State and local public health officials should track additional indicators internally to identify bottlenecks and inform adaptive COVID-19 response. Internal dashboards should include process indicators such as time from receipt to administration of vaccine doses, wastage, temperature violations, as well as vaccine confidence and acceptability, particularly among historically marginalized populations.

Conclusion

Looking ahead to more abundant vaccine supply, states should use these six recommended vaccine indicators to provide data for action and improve COVID-19 vaccine distribution.

Vaccine phase and supply indicators provide transparency with respect to vaccine availability and prioritization of population groups. The combination of phase and supply indicators could allow public health officials to estimate when vaccine will be made available to new population sub-groups and help manage expectations. Coverage indicators show progress toward herd immunity and help prioritize support for historically marginalized communities to ensure access to free, convenient vaccination for all (including community engagement to identify and address vaccine hesitancy). These data can also help public health officials deploy targeted campaigns to areas with low coverage and launch interventions to reduce drop-out if a significant proportion of people do not complete the vaccine regimen for a two-dose vaccine.

One of the main gaps identified in previous reviews of COVID-19 indicators has been reporting of data stratified over time by demographic factors such as age, sex, and race/ethnicity and geographic region (e.g., county, zip code, neighborhood). Stratification over time is essential to understanding vaccination bottlenecks, changing access issues, and identifying groups for targeted campaigns where they are most needed. As vaccine doses reach the general population in the coming months, demographic stratification of vaccination coverage is all the more important to inform what changes are needed in each state's vaccination approach.

Other best practices noted in our previous essential Indicator report also apply to these vaccine indicators, including use of rates rather than counts and explicitly representing targets for vaccine supply and coverage when displaying data;[10] intermediate targets, such as gating criteria for when vaccine will be offered to additional groups, also could be included. Further, because COVID-19 vaccine distribution is changing rapidly, dashboards or reports should be updated regularly, at least 3 times per week, if not daily.

State and local health departments should be applauded for quickly standing up COVID-19 vaccine dashboards. Anticipating accelerated vaccination efforts nationally, the next step is to improve dashboards from what is easy to count (e.g., doses of vaccine administered) to what is most meaningful and important, and to increase standardization to facilitate comparison across states. Refining dashboards to track recommended indicators now may help states be more prepared to use data for decision making as they expand vaccination to the general public. Where possible, states should integrate vaccine indicators with other COVID-19 data to avoid siloed information; they will be added to Resolve to Save Lives' dashboard kit, which states can use with their own data to display all essential indicators. States are encouraged to use terminology recommended here to shift to a clear and consistent approach to reporting on vaccine phase, supply, and coverage indicators. An expanded national dashboard including county-level data and demographic stratification from CDC would alleviate pressure on states and help elevate successful distribution strategies and identify communities needing tailored support. This report can help states prepare new or improved dashboards to provide the most meaningful and usable information to the public and public health entities.

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10   Kentucky, Minnesota, and Washington were the only states that specified targets for one or more indicators in their vaccine dashboards.