Public Health
MADISON & DANE COUNTY

FORWARD DANE

Updating Metrics in Light of
Vaccination Progress

MARCH 2, 2021

The Changing COVID-19 Landscape & the Role of Metrics

Since the first person tested positive in Dane County for COVID-19 over a year ago, we have learned a great deal about how COVID-19 is transmitted and ways to take preventative actions across the risk spectrum. Throughout the pandemic, we have relied on a set of metrics (Appendix A) to help us understand the spread of the virus and its impact on our community, and to help us identify when additional action was needed. These metrics were developed based on what little was known about COVID at the time. The number of cases per day, and percent positivity are some of the key indicators we've used to make decisions on county-wide policies for preventing the virus from spreading.

The landscape of COVID metrics has changed since the beginning of the pandemic. As communities experienced fluctuations in case and hospitalization levels, we learned lessons about where pressure points existed. Communities learned when hospitals were overwhelmed, when public health contact tracing systems were stressed, and where testing levels needed to be in order to identify as many COVID infections as possible. As the pandemic has progressed, these learned experiences became more important to decision-making than the existing metrics. Therefore, fewer communities are linking reopening stages to predetermined metric thresholds. This is due to health systems being better equipped to care for COVID patients than in the Spring of 2020, a shifting baseline level of what we're willing to accept as a 'normal' level of COVID as a society, and the nuances of different scenarios that cause spikes in cases (like a cluster in university students) or percent positivity, for example.

Before the emergence of COVID-19 vaccines, it was challenging to fully control the pandemic or meet all of our goals as the virus moved unpredictably through our communities. Since we have started vaccinating people, we have entered a new era of hope and possibility. The more we can vaccinate vulnerable populations, the more they will be protected; the more people at high risk of severe disease are vaccinated, the less hospitalizations and deaths will occur. As viral immunity increases among all populations, businesses and gatherings will become safer at higher capacities, and people will feel safer resuming more activities. Vaccines are the key to moving Dane County to a new normal, one where people can be healthy and protected while also being able to live, work, play, and learn.

Where We've Been

Given the changing role of metrics and the importance of vaccines in protecting the community, Dane County is re-centering its goals and updating the measures that are monitored regularly. There is no guidebook to metrics, thresholds, or what a county-wide reopening process during a pandemic looks like. Approaches differ between counties, states, and countries. The same set of data can lead to different decisions, and there is no 'right' answer. Alongside data, we have seen values and varying priorities impact decision-making across the country. In addition, the overall goal may impact decisions and policies. Some goals that have impacted our health department, city, and county's decisions are to:

- Protect the most vulnerable populations (older adults, people of color, essential workers, for example)
- Prevent severe outcomes and deaths
- Preserve hospital capacity
- Promote economic well-being particularly among those most impacted by job loss

A cautious, and stepwise reopening has remained Dane County's approach—an approach that has likely contributed to Dane County having one of the lowest case and death rates in the state despite it being a population center. Masking, distancing, and staying outdoors remain key prevention tools. These prevention tools remain critical as spread of more transmittable COVID-19 variant strains is increasing in the U.S.

Where We're At

Although there is still much to learn about COVID-19 and how it spreads, we do know that we have safe and effective vaccines, and we know that the number of vaccines in arms can only go up from here. While we can't predict the future, we know that, barring misfortune, Dane County will only have more immunity to the virus as the days and weeks go on.

Dane County's COVID-19 vaccination status right now:
- **Coverage:** As of March 1, 18.3% of the Dane County population has at least one dose of vaccine
- **Natural Immunity:** As of March 1, 40,376 people have tested positive for COVID (7.4% of population)
  - A [Yale/Harvard model](#) estimates that the true percentage of people living in Wisconsin have been infected (including those who never received a test) is likely three times higher than the known percentage. Therefore, the true percentage of people who have had COVID in Dane County could be somewhere closer to 20%, given the county has had robust testing available through much of the pandemic.
- **Rate:** On average thus far, every day 0.6% of the Dane County population receives either a first or second dose.

In summary, as of mid-February, after two months of vaccination, 15% of the Dane County population had at least some level of vaccine-conferred immunity. Adding the level of people who have had COVID but have not yet been vaccinated (unknown) confers an additional level of population-level immunity. The "true" level of immunity may currently lie in the 25% range. Given natural infection with COVID provides durable immunity for most people [for at least eight months](#), the combination of people who have had COVID with people who have been vaccinated for COVID with people who have both had COVID and have been vaccinated with COVID will all contribute to herd immunity. [Herd immunity](#) means that a high enough percentage of a population has either had the disease, or been vaccinated against it, that the chance of it spreading is very low.

Where We're Going

While we carefully enter the new stage of pandemic response—a stage where vaccination is our main pathway to reopening, our metrics will need to reflect our new reality. Moving forward with a new set of metrics will look like the following:

- Public Health orders will take into consideration new set of measures that emphasize vaccine distribution and uptake
- Specific thresholds will be removed from measures, to be replaced by more flexible goals (to allow us to adapt measures to the pandemic more rapidly)—for example, the threshold of four cases per day qualifying as a 'green' case level will no longer be the framework.

The New Measures

Vaccine Core Measures

The core measures are all measures of herd immunity in Dane County. We do not yet know what level of vaccination leads to herd immunity for COVID-19, or how current or future variants might affect herd immunity. We know based on other diseases that herd immunity is likely *at least* 60%, and if more transmissible variants become more common, that threshold may become higher. We also know we will likely see population-level positive effects on COVID-19 cases and hospitalizations before we reach herd immunity. We have provided a range below to show that there is still much to learn about COVID-19 herd immunity.

Measure	How used
Percent of Dane County population that **is fully vaccinated** (2 doses for vaccines requiring 2 doses; 1 dose for single-dose vaccines)	Monitors the level at which we're approaching herd immunity via vaccination. Current estimates of herd immunity are **60-90%.**
Percent of Dane County population that is at least **partially vaccinated**	Monitors the level at which we're approaching herd immunity via vaccination. Current estimates of herd immunity are **60-90%.** We will see population-level impacts prior to reaching herd immunity.
Percent of Dane County **population aged 65+** that is at least **partially vaccinated**	Monitors the level of vaccination among the age group most at risk of severe outcomes and death with at least partial protection. This number may need to reach **60-90%** to ensure adequate protection of this population.

Current vaccination status as of March 1, 2021:

Partially vaccinated	18.3%
Fully vaccinated	11.5%
65+ partially vaccinated	67.3%
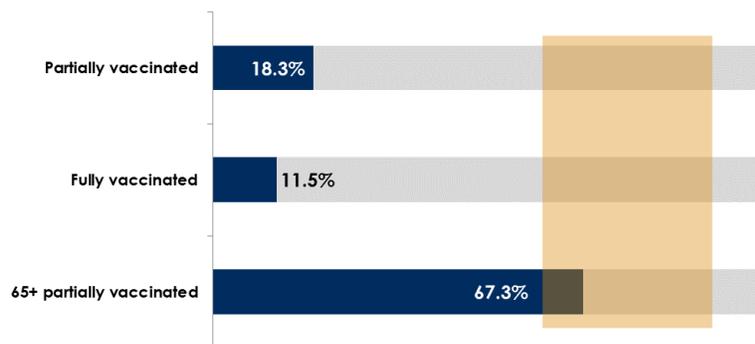
Vaccine Process Measures

In addition to the three core measures, we will explore methods to track additional vaccine process measures. Some of these may include the following:

Measure	How used
Immunity: Percent of Dane County that is fully vaccinated + percent with immunity from past infection	Monitors progress toward herd immunity via both previous infection and vaccination. Due to immunity conferred from natural infection, herd immunity will likely arrive faster than the pace of vaccination.
Rate: rate of vaccination	Monitors the speed with which vaccination coverage is occurring. As of mid-February, an average of 3,000 doses per day were administered to residents. This will change as supply changes.
Equity: Percent of key populations that are partially vaccinated. Groups to monitor may include populations that may either be more vulnerable to severe COVID-19 outcomes OR that may have challenges accessing the vaccine even when widely available (for example, Black, Latinx, and rural populations)	Monitors the level of vaccine protection for vulnerable populations
Variants: Variant strains as predominant version of virus in community	Monitors whether variant virus strains are becoming the dominant strain, which will have impacts on transmissibility

Epidemiologic Measures

In addition to looking at vaccine measures, we will continue to look at disease burden and transmission in the community. We know that if we start seeing a high level of COVID-19 hospitalizations, our hospitals may become stressed which impacts our ability to care for those with COVID and those without. We know that if we see, for example, 300+ cases a day, contact tracing may become stretched, which means that we may not be able to provide isolation and quarantine support to everyone who may need it to decrease the risk of further COVID transmission. We also know that with increasing vaccines, a spike in cases won't always mean a spike in hospitalizations or deaths; we will need to look at the context around these measures when making decisions.

Epidemiologic Measures	How we will use this measure	Was this a previous Forward Dane measure?
Cases: Case count with 2-week trend	This measure tells us whether the number of people with COVID-19 is stable, increasing, or decreasing. Case counts impact all other epidemiologic measures. A sustained increase may be a reason to implement restrictions.	✓
Tests: Percent positivity	This measure tells us the percentage of PCR test results that are positive. An increasing percent positivity may be an indicator of inadequate testing, barriers to testing, or increases in disease, while a percent positivity of less than 5% may be an indicator of adequate testing.	✓ Yes, <5% and <10% used for monitoring testing capacity
Hospitalizations: Inpatient hospitalizations due to COVID-19 with 2-week trend	This measure tells us whether the number of people hospitalized is stable, increasing, or decreasing. A high number of hospitalizations does not necessarily mean that hospitals are overwhelmed, but is indicative that COVID has reached a large number of vulnerable people. A sustained increase may be a reason to implement restrictions to protect vulnerable populations.	No
Deaths: Number of people who died due to COVID-19 with one month trend	This measure tells us whether the number of people who died is stable, increasing, or decreasing. An increase might trigger an investigation of populations impacted and the need for targeted vaccination campaigns when supply is able to meet demand.	No
Contact tracing capacity: Time from specimen collection to public health interview	This measure tells us how quickly the public health contact tracing system is able to intervene to prevent onward transmission. Will include the timing of the lab component and the contact tracing component, while also reporting the proportion of people who refused a public health interview.	✓
Transmission dynamics: Infection rate (R)	This measure tells us how fast COVID is spreading. A rate less than one means that transmission is slowing down.	No

Impact on Public Health Orders

The current trajectories and models (Appendix B) are converging on a summer 2021 timeline for a potential 'return to (a version of) normal.' The gradual lifting of restrictions may take bigger steps—such as larger gathering limits (ultimately resulting in no limits). Family gatherings, weddings, concerts, travel, and so many of the activities we have missed may be back on the table. We could see extreme loosening or dissolving of many pandemic restrictions sometime in summer 2021.

We have heard from so many people, worried about schools being closed, businesses being restricted, and gatherings being postponed. We have heard from just as many people concerned about themselves or their loved ones getting very sick or dying from COVID-19. Those concerns have often felt in conflict with each other throughout this pandemic—that to open up means getting more people in our community sick. But now we have a shared solution that keeps people healthy and allows us to open up Dane County, and that solution is vaccines.

As we've learned repeatedly throughout this pandemic, the situation can rapidly change (Appendix C). The vaccine supply could be interrupted, affecting how quickly it can be administered. The race to protect our population with vaccine could also be impacted by the arrival of variant virus strains not even known today. However, if current trajectories and models stay the course, then we could approach a hopeful situation in a matter of months.

The way out of this pandemic is through vaccines. We strongly encourage everyone to get vaccinated as soon as they are able so that we can all reach the light at the end of this pandemic tunnel.

APPENDIX A: Former Metrics

The graphs below show quantitative metrics for each Forward Dane period since we've been tracking the Forward Dane metrics. The colors indicate where we fell that week in terms of thresholds. We struggled to meet our goals for many of the metrics—we've been in the red for cases, lab timeliness and contact tracing, and community spread for much of the last year.

Average cases for Forward Dane Periods. We never reached our low threshold of fewer than 4 cases per day, and we've been in the red (>20 cases per day) since the June 29 2020 snapshot. We know that high case counts have cascading impacts, but where that line is has become difficult to identify. This is why we do not set thresholds for new measures, but rather case counts and 2-week trends with other measures we'll monitor.
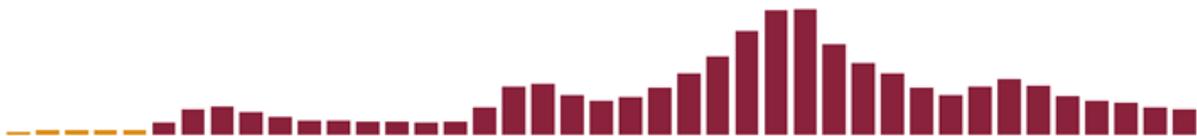

Average percent positivity for Forward Dane Periods. We have stayed below 10% percent positivity throughout our local epidemic, even during surges in cases, and we stayed green (<5%) for many Forward Dane periods. We will continue to utilize these as guideposts in our understanding of testing capacity in our community.


 Average tests for Forward Dane Periods. We have stayed well above 800 tests per day since the June 1 2020 snapshot, and the number of tests has increased substantially over time. We have maintained good testing capacity throughout our local epidemic.

Lab timeliness and contact tracing for Forward Dane Periods. We have struggled to contact at least 70% of people with a positive COVID-19 test within 48 hours of test collection for many Forward Dane periods. This metric is highly sensitive to surges in cases, with our lowest proportion of cases contacted within that time period occurring during the fall 2020 surge in cases. We will continue to monitor this measure, as reducing the spread of COVID-19 will continue to be an important tool as vaccination coverage increases.
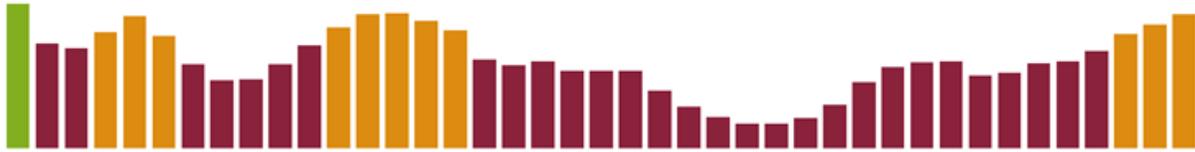
Community spread for Forward Dane Periods. This measure has hovered around 30% over the course of our local epidemic. Since we have not seen much variation, we will discontinue regular monitoring of this measure moving forward.
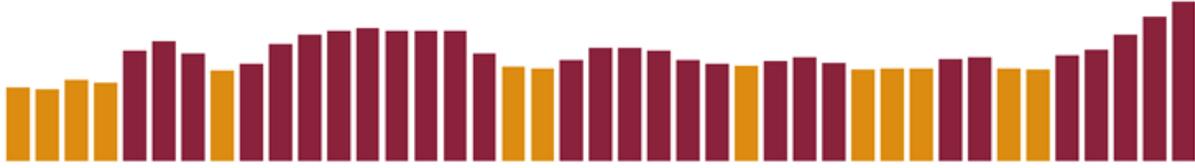
APPENDIX B: Models

Models are one way to get a sense for what may be to come. CDC averages case models from across the country and averages them here. Similar model summaries will emerge regarding vaccination projections. Summaries of a few models:

Model 1 summary:

- "The US will be near COVID-19 herd immunity/normality by summer 2021 (Jun-Aug 2021)."
- "Due to vaccine hesitancy and the later arrival of a children's vaccine, it is possible that we do not reach the levels required for herd immunity in 2021. Nevertheless, herd immunity is not a hard threshold, and being close to herd immunity may be sufficient to prevent large outbreaks."
- "At the time herd immunity is near, roughly half of the immunity will be achieved through natural infection, and the other half will be achieved through vaccination."
  - While it's still unclear if prior infection confers long-term immunity, recent research (here and here) indicates that short-term reinfections are rare.
- "New infections may become minimal before herd immunity is reached. But due to imported cases and localized clusters, it is unlikely that new infections will drop to zero until at least 2022."
- "Deaths may drop to low levels even earlier (May-Jul 2021), in part due to a vaccine distribution strategy that initially prioritizes individuals who are most at risk of severe illness and death."
- "Summarizing the above findings, this model's best estimate of a complete "return to normal" in the US is mid-summer 2021 (June/July 2021)."

Model 2 summary:
- If the country maintains its current pace of administering first doses, about half of the total population would be at least partially vaccinated around early July, and nearly the entire population by early December, assuming supply pledges are met and vaccines are eventually available to children.

Model 3 summary:
- When 0.5% of a population is vaccinated each day, and the infection rate is 1.5, it would take 100 days to reduce the number of new infections by around 80%. This model does not take into account the proportion of the population that may have some immunity due to prior COVID infection, nor does it account for the new variant.

Applying Real-World Vaccination Trends & Models to Dane County Context

It took two months to cover 15% of the Dane County population with at least one dose of the vaccine. It is conceivable, at the current rate (which is dependent on supply and uptake), that we will reach 30% in another two months and 45% another two months later (mid-June). Adding on the (unknown) proportion of people who have had COVID but not been vaccinated, we could see herd immunity achieved this summer. However, we are likely to see impacts of vaccination before this summer: accounting for vaccine distribution, estimated infections in Wisconsin are projected (as of February 23, 2021) to decrease to 473 cases statewide per day by May 2021—meaning an estimated 47 or less

infections in Dane County per day (14 of which would be confirmed through testing). Even with the variant, this model estimates 873 cases per day statewide, or about 87 cases (26 of which would be confirmed) in Dane County per day.

Trajectory of cumulative cases (blue), first dose (purple) and second dose (green) in Dane County
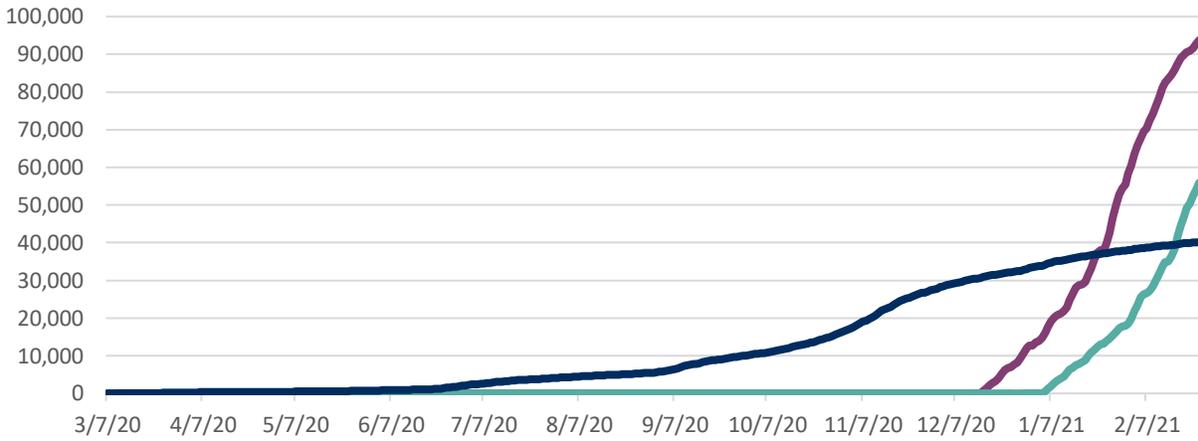
APPENDIX C: Emerging Issues that May Impact Our Local Epidemic & Response

SARS-CoV-2 Variants

Variants of a virus happens when a virus changes, or mutate. It's common for viruses to mutate over time, so SARS-CoV-2 variants are not surprising or unexpected. While there have been several variants that have emerged since the virus was first detected, there are three key variants that we are watching closely: the UK variant (B.1.1.7), the South Africa variant (B.1.351), and the Brazil variant (P.1). Key information about emerging variants that could impact our local COVID-19 epidemic include:

- *Do these variants infect people more easily?*
  There is some evidence that the UK, South Africa, and Brazil variants spread more easily and quickly. A recent study in Manaus, Brazil, has raised questions about the potential for re-infection with the Brazil variant due to a recent surge of infections in a community with a high level of acquired immunity (75%). More research is needed to understand how these variants impact transmission.
- *How widespread are these variants?*
  All three variants have been detected in multiple countries. We have 6 documented cases of the UK variant in Wisconsin as of February 2021. It's unclear how widespread these and other variants are in Wisconsin (and the US) because we have limited genomic sequencing.
- *Do these variants cause more severe COVID-19 disease (e.g., a higher likelihood of hospitalization or death)?*
  There is some evidence that the UK variant may be associated with a higher mortality rate compared to the original strain. Evidence is still emerging, and we will learn more over time about this variant's impact on severe COVID-19 disease.
- *Do vaccines work on these variants?* There is some evidence that the mRNA vaccines (Pfizer and Moderna) are protective with some reduced efficacy. We will learn more over time how protective vaccines are against these variants.

The bottom line: Vaccines appear to be effective against the UK, South Africa, and Brazil variants. However, as we have limited vaccine supply, we must continue to wear masks, practice physical distancing, and limit indoor gatherings to reduce COVID-19 infection and keep the number of new infections due to these variants—and new variants that may emerge—low.

Immunity to SARS-CoV-2

We can reach herd immunity through immunity acquired through vaccines and immunity acquired from having a previous COVID-19 infection. We don't know how long immunity lasts—although emerging research is promising and suggested immunity will last at least 8 months—whether acquired through vaccination or infection. If the duration of immunity is short, we might see more reinfections over time, and vaccine boosters may be needed on a regular basis to assure immunity to SARS-CoV-2. We will continue to learn more about the duration of immunity over time.

APPENDIX D: Questions & Answers

How will you be determining future orders using these new measures?

We will be looking at these measures as a whole when determining orders. We hope to consistently see progress in our three core vaccine measures:

- Percent of Dane County population that **is fully vaccinated** (2 doses for vaccines requiring 2 doses; 1 dose for single-dose vaccines)
- Percent of Dane County population that is at least **partially vaccinated**
- Percent of Dane County **population aged 65+** that is at least **partially vaccinated**

We want to see that progress be steady or increasing. For vaccine process measures and epidemiological measures, we hope to see positive trends in all or most areas.

There is no perfect formula that anyone in the world has developed for setting capacity limits or restrictions. There is no national standard of "if your case rate is x, then your gathering limit is y." Cities, states, and countries are figuring these things out based on local data, national trends and guidance, and public health and health care system capacity. What we do know is that as the pandemic gets better, we can loosen restrictions, and as the pandemic gets worse, we must tighten restrictions. The vaccine gives us assurance that immunization rates can only get better. Unless we see signs of the pandemic getting worse, such as new variants causing more disease or a lack of vaccine supply causing a lag in immunity, we are cautiously hopeful that from here out restrictions will slowly be getting less strict.

Your old metrics had thresholds. Why don't you have thresholds now?

This framework is designed to be more flexible than our old framework. For one, we don't know what some of these measures will look like in the future (such as herd immunity), so we don't want to lock any one number in at this point that may change as we learn more about the virus and herd immunity. Additionally, not having thresholds allows us to take a look at the context around each measure. If a measure is not quite where we think it should be, but trending in the right direction, we can now take that into consideration instead of being locked into a threshold.

Why did you release new metrics now?

The approval of several COVID-19 vaccines in December 2020 and January 2021 has changed the course of the pandemic. With a vaccine, along with other prevention measures, we are able to prevent the spread of COVID-19 more effectively than ever before. This means that we have to adjust our public health response to consider the effects of the vaccine on our county. And we knew we would have to do this; in our original Forward Dane plan, we imagined that a vaccine would lead to a new normal for us. This new iteration will hopefully lead us to a new normal.

What is the science that backs this change in approach?

Please see Appendix B and C for examples of emerging research and modeling that informed this decision. Please also see the CDC's "14 Diseases You Almost Forgot About" for a quick walkthrough of how vaccines have changed the epidemiology of many other communicable diseases throughout history.

What is "herd immunity" and how will we know when we've reached it?

"Herd immunity" is when enough people in a population are immune to a disease that it prevents the rapid spread of that disease. The herd immunity threshold is different for different diseases depending on how contagious they are, so we don't quite know the threshold where our population will be immune to COVID-19. We can guess that it's above 60-70% based on other diseases like it, but we will learn more as more people become vaccinated. For measles, which is more infectious than COVID-19, around 94% of the population must be immune to interrupt the chain of transmission.

Will we be under public health restrictions forever?

No, it is not our intention to keep public health restrictions in place forever (or long term). The sooner our community reaches herd immunity, the sooner we will all be protected from severe outcomes, death, and overwhelming hospitalization rates and the sooner restrictions become less strict.

I want a vaccine right now, but I can't get one. Why aren't you vaccinating people faster?

We also want to be vaccinating people faster. As of right now (February 2021), vaccines are distributed from the Wisconsin Department of Health Services (DHS) to vaccinators throughout the state. PHMDC is one vaccinator of many in Dane County—UW Health, SSM Health, Meriter, Walgreens, and many more also work with DHS to receive vaccines. We ask DHS for a certain number vaccines every week, but have consistently been getting far less vaccine than we ask for, because there simply aren't enough vaccines to go around. This isn't just a Wisconsin issue either—there is a vaccine shortage throughout the U.S.

While we're not in control of the vaccine supply, we are hopeful that in the spring and summer, anyone who wants a vaccine will be able to get one. We're planning on vaccine supply continuing to go up. But even with our current amount of vaccine, we are already seeing significant numbers of people with at least one dose, which is a hopeful sign for the spring and summer.

What about these new variants? How will they affect reopening?

Variants could slow reopening, especially if people are hesitant to get vaccinated or are moving too quickly to reopen and creating opportunities for spreading COVID-19. We don't yet know how vaccines will protect against every variant, and new variants might emerge in the future that pose new threats. We will need to be nimble in responding to variants should they create more disease in Dane County.

Where do you get your data from?

Vaccine data is from the Wisconsin Immunization Registry (WIR). COVID-19 case data is from the Wisconsin Electronic Disease Surveillance System (WEDSS). Both are statewide databases run by the Wisconsin Department of Health Services (DHS).

How do I know if something is "safe"? What if I don't feel safe doing something allowed by public health orders?

Public health orders focus on a *population* level. That means that orders are framed with the question, "what restrictions need to be in place so that we can protect vulnerable people, preserve hospital capacity, slow the spread of the virus, and prevent deaths in our community?"

That's different than a person making a decision for themselves about what is safe or unsafe for them *individually*. Just because gatherings are allowed does not mean that there is 0% risk at a gathering, and someone who goes to one or multiple different gatherings every day may end up testing positive from that behavior. Public health orders are the minimum people need to do to keep our county population as a whole healthy and slow the spread of the virus. Individuals might need to make stricter choices for themselves based on their comfort with the risks.