

Episode 58: A Year at Sea

Chris Dall: [00:00:05] Hello and welcome to the Osterholm Update: covid-19, a weekly podcast on the covid-19 pandemic with Dr. Michael Osterholm. Dr. Osterholm is an internationally recognized medical detective and director of the Center for Infectious Disease Research and Policy, or CIDRAP, at the University of Minnesota. In this podcast, Dr. Osterholm will draw on more than 45 years of experience investigating infectious disease outbreaks to provide straight talk on the covid-19 pandemic. I'm Chris Dall, reporter for CIDRAP News, and I'm your host for these conversations. Welcome back, everyone, to another episode of the Osterholm Update podcast. This is the first episode of our new every other week schedule, and we have a lot of news to catch up on as we bring you up to speed on the latest in the covid-19 pandemic. This week on the podcast, we're going to give you an update on the international spread of covid-19 and what countries are seeing surges and take a closer look at the spread of the newest variant of concern. We'll also discuss the declining vaccine rollout in the United States and how it might shape our covid future, the Biden administration's newly announced global vaccine donation, the ongoing controversy over the origins of sars-cov-2 and the issue of immune passports. And we'll debut a new listener question segment called Covid Queries. But first, we'll begin with Dr. Osterholm's opening comments and dedication.

Michael Osterholm: [00:01:29] Thank you, Chris, it's great to be with everyone again. I am not sure that you missed out in the last two weeks, but I have to say that it truly broke a rhythm for us in terms of thinking about everything you read, everything you see or hear, and how that might be applied to the podcast and then realizing, oh, my, it's actually ten days away or seven days away. And so we did have our own different rhythm this past two weeks. But it's great to be back with you. We appreciate the fact that you're with us again and hope that this new format works. As I mentioned in a previous podcast, if for some reason there are urgent issues that come up where we believe it's important for you to be informed, we will, in fact, go ahead and record a podcast, even if an abbreviated one, to address that issue. But for now, we'll continue to work with every other week approach and hope that that works for you and into your life as you can use this information. Let me start out by saying that from a dedication standpoint, you know, each week we think very long and hard about, you know, who should we dedicate this to? It's not just a trivial issue. It's not just well, we've got to have

something. You know, we try to think through who we all are on this podcast family. And this week, it really came to all of us for one reason or another, because it's something in our own personal lives. And what we're dedicating this podcast to are those who are planning for the future. And what do I mean by that? Who is it that's in charge of the family reunion? Or the class reunion? Or how to reopen your church again? Or how do your kids get together with other family members from families throughout your neighborhood? Do I take that trip? All of these issues that we've put on hold for the better part of 14 months now are front and center. And if you're anything like me, there is uncertainty as to what do I think or feel? How do I approach this? How much of this is about safety and how much of this is just about my own personal insecurity? If you're feeling a sense of angst about planning, welcome to the crowd. We all are. And so this week, I'm dedicating this to all of those planning our future as we try to get back into the next new normal relative to this pandemic issue. Now, I have one last thing I have to address. I know for some of you, this is a pain to have to listen to this. It's the price you pay for being a member of this podcast family. But it is that time, after almost six months of where we now are close to the summer solstice. And I can't waste this moment to say, "Oh, wow, the sunlight". When we look today here in Minneapolis/St. Paul and look at June 10th, today we will have 15 hours and 33 minutes of daylight. That's 17 minutes more than we had back on May 27th when we had our last podcast. Now, interestingly enough, I could go much further into the whole issue of light, but I know we only have limited amount of time. But we did hear from Mary from Michigan and she wrote and said, "You forgot about twilight in your reports about the longer days. Here in Michigan, we have twilight this time of year for another hour after the sunsets. Our twilight is wonderful in the summer. Mary." Thank you, Mary. I appreciate your input and something I think a lot about and have, I just didn't want to bore too many listeners with this. But this week they're going to have to indulge me, OK? You're absolutely right. There are actually several kinds of twilight. One's called civil twilight, which is when the sun is six degrees below the horizon, either early in the morning or late in the evening. And remember, in the summertime here, that decrease in the horizon is much slower than it is when the sun is in the southwest in the wintertime and as opposed to the northwest in the summer. And the civil twilight is defined as enough light for objects to be clearly distinguished. So the sun may not be up, but you can still see it. Nautical twilight is actually when the sun is 12 percent to the horizon. And this means that generally you can make vague outlines of objects that are visible in that regard. If you look at civil twilight right now, we have one hour and 14 minutes of that either side of

sunrise and sunset. Nautical twilight, we actually have one hour and 38 additional minutes. Adding that up, these are bright, long days in the Northern Hemisphere. And just to close off on one last piece, as we all know, and I've been commenting on this, the winter solstice from last December was 8 hours and 46 minutes of sunlight. The summer solstice, which will be upon us before our next podcast is 15 hours and 37 minutes of sunlight. That's an increase of 6 hours and 41 minutes. So we have a peak now. OK, I understand that I'll pay less attention to this, I don't want to bore any of you. But this is a celebration. This is the days of light. And symbolically, I think in the Northern Hemisphere, we should actually celebrate that. Even within the context of covid. For those in the Southern Hemisphere, this is what hope is all about. Now you've turned the corner. It's going to get better for you over the next six months. And oh, my, we are going to see some dark days ahead. But we will have had so much enthusiasm and good feelings built up over this time period right now, it's going to carry us right through that winter solstice. So stay tuned. We'll come up with some new inventive way to help create some imagination on this podcast. And I won't keep beating the sunlight daylight issue into the ground. But now you know about civil twilight and nautical twilight. So you'll be the smartest informed people in your neighborhood on light. So thank you.

Chris Dall: [00:07:52] So, Mike, since our last episode, the situation has gotten much better in India, even though cases there remain very high. But several Asian countries are still seeing surges, Latin America continues to see high viral activity and now Africa appears to be in the eye of the storm. What are you seeing when you look at the international landscape?

Michael Osterholm: [00:08:14] Well, I think that WHO Director General Tedros stated it very well at a press conference this past week when he said that we're seeing a mixed picture around the world and described the current situation as a two track pandemic, with many countries still facing an extremely dangerous situation, while some of those with the highest vaccination rates are starting to talk about ending restrictions. Now, remember, a pandemic is a global worldwide epidemic. As long as you've got a pandemic occurring in many places around the world, it's still there whether it's not occurring in your location or not. So I worry that I hear this discussion often about the situation in the United States is the pandemic is over. No, it's not. Now, it doesn't mean we're not going to see a much improved situation with many fewer cases. But as long as

this virus is circulating around the world at the levels that it is, we are challenged because of this whole variant issue. And we've talked about that in the past. As of this past week, less than 1/2 of 1 percent of the 6.4 billion people living in low and middle income countries have had access to this vaccine. That means a lot of additional infections are going to continue to occur. And as a result of that, more variants are going to come spinning out of those infections. And we don't know exactly what those variants are going to do. So that part we have to keep in mind. It is good news that weekly global cases have continued to decline, with 3.6 million reported the week of May 24th and now only 3 million reported last week, May 31st. This is the 6th straight week of declining cases after the record high of 5.7 million cases in mid-April. Weekly deaths have also continued to decline, although there are still nearly 74,000 reported this week. This is the 5th straight week of declining deaths overall. However, weekly deaths did increase in the Americas, Africa and the West Pacific. If we look at major hotspots as we see them right now, clearly Latin America continues to be an area of great concern. We've seen record high cases in the region with the 7 day average for new daily cases surpassing 150,000 for the first time. So just think about that. As much as we see this mix and match, some places getting better, some places getting worse, right now, not far from us, close to home, Latin America, we're seeing this real challenge. These increasing cases are largely being fueled by continued activity in Brazil and surges in multiple countries such as Argentina, Colombia, Uruguay and Paraguay. 8 of the world's top 12 countries with the highest number of new daily cases per capita are located in Latin America. That includes Uruguay, number 2. Argentina, number 3. Colombia, number 4. Paraguay, number 5. Chile, number 6. Costa Rica, number 7. Brazil, number 10. And Trinidad and Tobago, number 11. Chile, a country where covid deaths just surpassed 30,000, is experiencing another surge in cases and hospitalizations, despite 59 percent of its population having had at least one dose of vaccine and 44 percent considered fully vaccinated. The uptick has prompted local lockdowns, including many areas of Santiago. The vast majority of individuals vaccinated in the country received the Chinese Sinovac vaccine, which has raised big questions about how effective it is. The Chilean Health Ministry in April indicated the Sinovac was about 67 percent effective in preventing symptomatic illness, 85 percent effective in preventing hospitalization and 80 percent effective in preventing death greater than 14 days after the second dose. We are still waiting for additional information to see if those numbers are holding up. To give you some sense of what's happening in Chile, the Health Minister confirmed this past week in a press briefing that

there's been a major increase in deaths in the last few days. It has been reported this past week that with over 8,000 daily infections being reported, the intensive care units of Chile are on the verge of collapse. Peru also announced this past week that its overall covid-19 death toll is nearly 3 times higher than what was officially being reported. After combing through multiple databases and reclassifying deaths after the more thorough investigations, the Peruvian government reported more than 180,000 covid deaths in the country. Prior to this report, the official death toll was only at 68,000. If we go to Africa right now, this is the 4th consecutive week of major increase in cases. Countries reporting sharp upticks include South Africa, Uganda, Namibia and Zambia. The B1617.2, now called Delta by the World Health Organization, has been detected in at least 12 African countries. The B1351 originally seen in South Africa and now called Beta by the WHO, has now been recorded in at least 20 countries and is responsible for a number of the second wave increases. And 29 African countries have reported cases of B117, or now what is called Alpha. According to the WHO's latest weekly bulletin on Africa, the continent has only enough vaccine to cover about 1 percent of its total population, highlighting what was described by the WHO as a shocking imbalance in the global distribution of vaccines. Moving to Asia and the Middle East, the average number of daily cases in the region is now down to 200,000 cases per day after having reached 500,000 cases per day in late April. The majority of the region's cases continue to be reported from India. Cases in India continue to decline after the country experienced that record setting wave. As you recall, the record wave hit high on May 8th at 392,000 cases reported a day. And now the 7 day moving average per day is down to 118,000 cases reported per day. Confirmed deaths in India are also declining, although the country still leads the world in the daily average number of deaths reported. About 1 out of every 4 deaths in the world right now are still being reported from India as one of those lagging indicator issues. Other hard hit countries in the region, such as Nepal and Bahrain, are also reporting declining cases, though the overall rate there remains relatively high and somewhat stable. Other countries in the region, including Malaysia, Mongolia, Taiwan and Vietnam, are still being challenged by notable surges. And although many of these countries have been highly successful in limiting covid activity for most of the pandemic, they are struggling right now to obtain adequate supplies of vaccine to address their current outbreak situations. If we look at Europe as a whole, nearly every country in Europe is reporting declining covid activity. The one exception to this trend that's worth keeping an eye on is the UK. Cases in the UK have slowly been increasing over the past month, with a 7 day average for new daily cases below 2000

the first week of May, and now it's up to more than 5000 cases as of this week. The uptick in cases is being attributed to the rapid rise of Delta, that B1617.2 variant, which has now replaced by B117, or Alpha, as the dominant variant circulating in the country. On Monday, the UK's Health Minister reported that Delta is at least 40 percent more infectious than was the B117. This particular virus, as you know, B117, was considered to be 50 to 100 percent more infectious than previous strains. So you can see how significant this issue with Delta is. According to the Financial Times, North-West England, where Delta established itself early on, is now reporting a clear and substantial uptick in hospitalizations. The increase is being driven largely by younger adults, among whom admissions are climbing at the same rate as they did last September. Fortunately, hospitalization rates for 65 years and older individuals in the region are continuing to decline, and really a direct response to the double vaccination. Deaths in the UK remain low, with the 7 day average of daily deaths at 8 as of June 7th. UK vaccinations continuing with 60 percent of the population receiving at least one dose, 42 percent are fully vaccinated, as I mentioned before, including 90 percent of the Brits aged 65 years of age and older. UK officials are keeping a close eye on the latest data as June 21st approaches, which is when they plan to remove all remaining covid restrictions. Officials are currently discussing a delay in that current reopening plan per what might be happening with the Delta variant. So to summarize the international picture, it's important to understand that we are just seeing what I consider to be a roving set of crisis issues from country to country over time. One group of countries sees a major increase in cases. Other countries have little activity. 4 to 6 weeks later, that's changed, the countries that were houses on fire are now seeing reduced number of cases and then new areas light up. Remember that without vaccine for the world, we're going to continue to see this pattern going on back and forth. And I would just add at this point, we're seeing nothing that supports seasonality of this virus in any location in the world. As I've shared with you before, if you look at what happened in India, Nepal and Pakistan, and you look what's happened in Paraguay, Uruguay and Argentina, two areas of the world that are both 30 degrees latitude, problem is one's north and one's south. That surely doesn't speak to seasonality as what's happening. And so I think we're going to continue to see this pattern of who's next? We don't know. But it's going to happen.

Chris Dall: [00:18:38] So, Mike, just to follow up on that Delta variant, which you talked about in the United Kingdom, what are we learning about this variant, aside from the increased transmissibility? And how concerned are you about it?

Michael Osterholm: [00:18:52] As you know from this podcast, if you've been listening to it over the recent weeks, I have been very concerned about what variants could mean for our future. We never really anticipated variants in those first 8 months of the pandemic in terms of vaccine or in terms of transmissibility. Then we went through that period of November through February/March, where we were concerned about much more transmissible viruses, including to B117, the Alpha virus now. And of course, as every listener on this podcast knows, I, for one, can't explain what happened in April in the United States in terms of B117 arriving, just as we thought it would from Europe, watching what had happened in Europe with the great increase in cases due to the more infectious B117, and the US, other than Michigan and Minnesota, there was actually only very limited increased number of cases. So I use that moment of humility to say, you know, we're not sure what a variant when it arrives into an area may do. But again, the Delta variant, this B1617.2, has demonstrated itself to be a really bad actor in Europe and in India. It is, one, much more infectious. As I just pointed out earlier, the Brits now think it's at least 60 percent more infectious, at the very least over that of B117. We know that it surely has had an impact on the effectiveness of the vaccines. As I just mentioned before, if we look at studies where people have had two doses of the vaccine, such as the Pfizer vaccine, it's still 88 percent effective against that strain. However, if you've only had one dose, both the AstraZeneca and the Pfizer vaccines are only 33 percent effective against symptomatic disease from Delta. So the question we have to ask ourselves, what's the next variant to come? Will Delta be the one that we see in the United States in the next 6 to 12 weeks, and will the impact be similar to what we've seen, for example, in Britain? I think at this point there are several conclusions we can reach. Number one, the variants are not done with us. As long as we continue to see this lack of a global vaccine supply and vaccination of the world, we're going to continue to see variants come flying out of many of these countries in the world. And will the next variant be worse than Delta? If so, what does that mean? More infectious yet again? Will it have even bigger impact on how well our vaccines work or don't work? And so I think this is the the challenging period where everyone wants an answer. And particularly if you're sitting in the United States right now, where most people feel like the pandemic is over with, the answer is no, it's not. But how bad will it

be? We don't know, particularly in the United States. If the variants don't challenge vaccination, if we see only limited increased transmission like we saw with B117, we may end up going months here and feeling like we're done. But we, too, could be like England right now, experiencing this increased number of cases in certain regions where people are under vaccinated and watch what that Delta variant does. So I would say it's a very concerning situation and one that we have to understand is going to be an unfolding chapter in this pandemic that we can't yet really anticipate fully. Right now, the Delta virus is in 60 different countries. It's making up 6 percent of the US variants we find. And I think that number is going to change substantially over the course of the next month, as I think it will cannibalize, you might say, all the other variants that are there. If this gets into those populations, which we'll talk about in a moment that are under vaccinated even in the United States, I think we could see real increases in regional or at least localized surges in cases in this country. So this is a concern. We will watch this closely. We'll continue to watch the B1351, the South African variant, which is now called Beta. We'll watch P1, the one that originated in Brazil, which is now called Gamma. And just know that these variants are surely making this a very, very complicated situation. In summary, let me just say that if anyone tells you what's going to happen in the next 6 to 12 months with covid-19 around the world and the variants, be careful because they also have a bridge to sell you because none of us can really know.

Chris Dall: [00:23:47] Mike, you noted earlier the wide disparity in global vaccination, and this week the Biden administration took a step to address that disparity, announcing a deal with Pfizer to provide 500 million doses of vaccine to 100 countries over the next year. How important is this?

Michael Osterholm: [00:24:04] This is a very important initiative in that it sets a new urgency to the global distribution of vaccine. Let's be really clear that these 500 million doses are just a start on what the world has to deliver in order to really bring this pandemic under control. If you look at the fact that we're talking about 8 billion people on the face of the Earth, 6.4 billion people live in low and middle income countries, we're talking about two doses per person. You can do the math and understand that it's going to take many billions of vaccine to actually effectively protect the world. But I think that the administration is signaling the fact that while we have been very preoccupied with vaccinating America, we do understand both from a humanitarian standpoint, but also

from a strategic standpoint of protecting our current vaccines so that we don't see ongoing transmission with variants spinning out, which is going to happen in this situation. Now, what we need is really a global coordinated effort with the United States, COVAX, all the different parties involved, and let's get it down as to what we can really do. It's not acceptable to say we're going to try to vaccinate 20 percent of the world in the first year. We need hairy, audacious goals where whatever it takes to get it done has to be done. So I again congratulate the administration on this initial step. There'll be those who will be critical saying it is not nearly enough, fast enough. Well, you can't make vaccine by just snapping your fingers or blowing pixie dust. Manufacturing capacity, the ability to actually deliver the vaccines at the local level, all these are going to be limiting factors for us to get vaccine out. And don't for a moment think that the same issues we have confronting us here in this country with vaccine hesitancy or anti-vaccination approaches won't also operate internationally. So it's a long row to hoe. But, you know, again, as people know on this podcast, if you've been following it, we are not political. We don't deal with political issues as such. And so when I say this, I mean this in the most scientific way possible. But it's great to have a vaccinator in chief as your president. No one has been more out there pressing the issue of vaccination than President Biden. And so from that perspective, I think this is great news, but it's just a start. Just to start.

Chris Dall: [00:26:35] So turning to the state of the pandemic here in the United States, the seven day average of new daily cases is now lower than it was in late March 2020 when the first wave was starting and most virus restrictions have been abandoned. As you noted, Mike, the feeling is essentially that the pandemic is over here in this country. Vaccines are clearly making a difference, but vaccine uptake has significantly slowed and several states are well below having 50 percent of their adult population vaccinated. If vaccine uptake doesn't pick up in these states, do you think regional outbreaks are likely in the coming months?

Michael Osterholm: [00:27:10] Well, let me take a step back and just update us on where we're at today. Yes, we have to feel that this is a very different covid environment today than it was just 12 weeks ago. And that's wonderful news. That is wonderful news. But we can't forget we're still reporting this week 13,000 to 15,000 new covid cases a day, and anywhere from 350 to 500 deaths a day. So it is still occurring at a rate that is a challenge. And in addition, when you look at a number of locations

throughout our country, we're very concerned that particularly in under vaccinated communities, which I'll comment on more in a moment, are going to see an increasing number of cases. For example, just take one county in Tennessee, Smith County, where only 20 percent of the people are fully vaccinated. And covid hospitalizations there have risen over 700 percent in just the past two weeks. So here is a much more localized area, surely it's not an entire state, it's not an entire region, but these localized outbreaks can still have a very substantial impact on a localized area. I'm going to summarize a point here in a moment, that really plays to that old saying that when your feet are in the freezer and your head is in the oven, then your temperature must be just right, is, in fact, what we're often talking about when counting the number of people who are vaccinated in this country and those who are at risk for developing covid. If you look overall, we've had great news in Alaska and Nebraska. Both have gone for the last 7 days with not a single death. Additionally, 10 states and the District of Columbia reported under 10 deaths in the past 7 days. Two states, Vermont and South Dakota have also reported less than 100 deaths in the past seven days. Cases in US continue to decline. As I just noted, the lowest 7 day average rates since March of 2020 are something to celebrate. We've had a 39 percent decrease in cases in just the past 14 days. Hospitalizations are down 21 percent and deaths are down fully 19 percent. This week's hospitalizations are the lowest they've been since the first week of March in 2020. That is a remarkable statement to make. We now know that 5 states and the District of Columbia, have seen 14 day case averages increase, however. These states are Alabama with a 47 percent increase. Nevada, 36 percent increase. Louisiana with a 26 percent increase. The District of Columbia, 23 percent. Montana, 11 percent, and Wyoming, 9 percent. Well, why does that matter? What's going on here? Well, when you look at vaccination, we have to acknowledge it's playing a very, very important role in driving case numbers down. But it's not the whole story. This is my moment of humility. Again, I can't understand and explain to you why some areas in this country which have very low levels of covid-19 vaccinations aren't seeing more cases. If you look at the overall number of people vaccinated in this country, the total for all ages, 51 percent have received at least one dose of vaccine. Most of it, of course, when I say one dose, meaning the mRNA vaccines with only a limited amount of J&J vaccine as a single dose and 42 percent have had just one dose. So that tells you that 60 percent of the US population has either had no vaccine or just one dose. And when I talked about Delta just now showing that a 30 percent effectiveness data from England with just one dose of even the Pfizer vaccine, that's got to be somewhat of a reason to have a pause

and ask what's next? If you look at those over age 12, 61 percent have had one dose, 50 percent are fully vaccinated. That means half the population, again, even over 12, have had one dose or no vaccine at all. And the reason I emphasize this is because if you look at the country as a whole, these are the numbers. This is your head's in the freezer, your feet are in the oven. When you break it down and actually look at it on a state by state basis, there are 6 states for which they have not even reached 40 percent vaccination levels with just one dose. Idaho, 38 percent of people have had at least one dose. Wyoming, 37 percent. Louisiana, 36 percent. Mississippi, 34 percent. Alabama, 36 percent. Tennessee, 39 percent. Now, remember those numbers I just cited for you a moment ago where we're beginning to see increases in cases? It's not only just those 6, but if I look at the other states with a single dose now in the population, they too, while they're slightly over 40 percent, they're not much. Take, for example, Georgia, 41.3 percent. South Carolina, 41.7 percent. Ohio, 41.4 percent. West Virginia, 41.4 percent. Get into Indiana, 42.5. Texas, 45.3. North Carolina, 43.9. Missouri, 42.9. North Dakota 42.7. And Oklahoma at 42.1. If you've heard your state called here, this is the percentage of people that has even just a single dose. So we have some parts of the country, such as the Northeast and the upper Midwest, where the levels of vaccination are much, much higher, which is what is getting us towards this idea that we're much more vaccinated than we really are. If you look at what's happened with vaccinations overall, the number of daily vaccine doses delivered continues to slow. The seven day average of doses administered is down nearly 40 percent from the previous week. And so what we're really challenged with right now is how do we continue to get people fully vaccinated over time? As you know, the president has set a goal of trying to get at least 70 percent of US adults vaccinated with a single dose. If you look at those who are 18 and older, 63 percent have at least one dose. 53 percent have both doses. We're still far short of that 70 percent vaccination level in adults that has been really set as a benchmark for the Fourth of July. Now, when you look at this from what we need to do to get to that Fourth of July goal, at least 15.5 million adults need to receive at least one dose over the next 4 weeks. And yet the pace is only at 400,000 doses being delivered per day. So we'll be far short. What I'm worried about is it's not just that one goal. It's these regions of the country. It's these issues of, what's happening in my county? We have counties in southern states with less than 20 percent of the population having at least one dose. Those are the ones that are going to be ripe for a Delta variant to come in and cause us some real trouble yet. And so I commend the administration for all their efforts and using all kinds of creative approaches to get more people vaccinated and

fully vaccinated. And just remember, this virus isn't going to go away. And I just want to remind people of why this virus is in control and we're not if we're not using vaccine. So we have to pay attention to these vaccine numbers every day and we've got to keep pushing for more vaccination or I fear that these variants really will ultimately wreak havoc in some of our communities.

Chris Dall: [00:35:38] So we've discussed immune passports in past episodes, and Mike, I'm wondering if you still see them as being inevitable? Even without the federal government getting involved? And beyond that, given the political pushback that we're already seeing in some states to businesses requiring vaccines and we're seeing this playing out in Texas and Florida with the cruise ship industry, how is this going to play out?

Michael Osterholm: [00:36:03] Well, I have no idea how it's going to play out in that I don't think anyone who is reasonable and thoughtful can say, how will the United States look in 3 months, 6 months, 10 months, just given our political system? And, you know, we stay away from politics on this podcast and just try to call balls and strikes the best we can. Unfortunately, the whole passport area has now become immersed in the whole political issues that's been raised about covid-19 in our communities. Now, I have to say right from the outset that this is a very personal issue for me as much as it is professional. Just imagine the following. I'm fully vaccinated, but I still have that discomfort of being in large crowds where I don't know who's vaccinated and who's not. We're indoors. We're at a restaurant. We're at a bar. Who am I sitting next to? I don't know. What's their status? I don't know. Do I feel like my vaccines are going to protect me? I do, but, well, maybe not. You know, it's only 90 to 95 percent effective. If it's a variant, maybe only 88, 85 percent protective. Would I like to go somewhere where I can feel safe? Yeah I would. And I keep coming back to those days here in Minnesota where we led the way with non-smoking restaurants and bars. Our Clean Indoor Air Act in the mid 70s was the icebreaker that started the whole movement of non-smoking public locations. And at first the bars and restaurant owners came back and said, "Oh, my, this is going to do us in. These patrons won't come back here if they can't smoke." What they forgot is, is that 30 to 35 percent of the people that smoked, they weren't the same 65 to 70 percent of the people who didn't smoke, who wanted to go to a smoke-free environment. And business actually picked up, it didn't decrease. I can tell you personally from many conversations, if I had a way to verify that I was vaccinated and

my friends and colleagues and people I don't know were vaccinated and they were at a public venue where admission was allowed only for those who were vaccinated. You know what? I couldn't wait to go there. I'd pay a premium price. Now, is that a violation of someone else's rights? No, we're not saying you can't go to restaurants or bars. But in these, I want to go where I feel safe. No one, I think, would disagree if this person had drug resistant TB, that we wouldn't want them in that bar or restaurant. Well, why would we want them in there if they may be infected with covid-19 virus? So I think you're going to see the market driven factors start to play out here in the near term. Where you now have governors of states like Florida and Texas who say, you know, "The cruise line industry, you want all the people on your ships to be vaccinated? You want all the workers to be vaccinated? It's not going to happen in our state. We're going to prohibit you from doing that." Why would you do that? No one is denying someone a opportunity to go and do whatever they want, they just can't go on that cruise ship if they, in fact, aren't vaccinated. And so I think that, you know, the fact that Texas has now just put in place a bill that the governor signed this week that not only prohibits the use of knowing your vaccine status, but that, in fact, it puts your company in jeopardy of getting new state contracts or doing any business with the state, it's just punitive. And what we've done, again, is made this somehow personal rights issues. I think you will see, just as we've seen with the Excelsior Pass issue in New York, some of you are familiar with this. The Excelsior Pass was basically an initiative where New York residents could provide, in this case, IBM as a company who is also, from a contractual standpoint, obligated to maintain your confidentiality. It provides them with the information on your vaccine status, which then would actually develop a card or a mobile device information site, which would include the personal details like your age, your driver's license number and other health records that could be scanned for only the presence of vaccination. Don't say that this isn't happening. I mean, I gave away my eyeball screen and my finger prints to a private company so I could get on and off a plane quicker. This has happened. Because we do this. OK? And right now, roughly two million New Yorkers have downloaded the pass as of this past week. That was up from just 1.1 million 2 weeks ago. And we know that tens of thousands of people who want passes have been unable to download them because of some technical delays. So this is going to take off even more. And I do think that ultimately more and more people are going to say, "I want this. I want to go to a place where I can feel confident that we're all protected." And people who say this is a violation of privacy, it's not. It's voluntary. You don't have to do it. But then you don't also have to go to that restaurant or that bar or

that particular theater venue or wherever. And I think we need to have much, much more discussion about this. You know, what are the confidentiality issues? You know, again, I remind people, Clear, the eyeball screen, the fingerprint issue. What constitutes discrimination, where people who don't have a phone or a mobile phone, which is very few people today, what other kinds of forms of information can they use or provide to a vendor that would verify their vaccination and allow them to carry that with them? So I think you're going to see many, many more broad uses of passports coming up in the near term. And, you know, I hope we don't get fully bogged down into the politics of this in a way that prohibits this potential very positive use. I find it unbelievable that the governor of Florida would say to the cruise line industry, "You're not going to sail from Florida if you're going to make people get vaccinated to be on your cruise ships." I think incredibly responsible activity on the part of the cruise ships. And are Florida really prepared to lose that business? Is that how far we're going to take the politics of this? So stay tuned. Passports, I think, are going to have a future. I look forward to them. I'm willing to participate. I hope many others are. And if you're not willing to participate, that's fine. That's your choice. But just know then that you may not have access to some venues that are going to be places where people will feel the confidence of being with like people. We're all vaccinated. We care.

Chris Dall: [00:43:31] Another issue that we've touched on throughout this podcast is the debate over the origins of the sars-cov-2 virus, but the debate has become much more heated in recent weeks. There's clearly growing openness to the idea that the virus could have leaked from a laboratory in China. But has any new evidence been presented? And also, Mike, I'm wondering if you can explain for listeners the role that gain of function research plays in this whole controversy.

Michael Osterholm: [00:43:58] Well, if I were to summarize this answer based on new information, I'd be done right now. That's it, we're done. But as you and I both know, that's not where we're at. Let's just be really clear. When we talk about the source of sars-cov-2, the issue has really boiled down into two separate buckets. One, is this a man made virus? Did somebody engineer this virus that then either intentionally released it or accidentally released it? Or is this a lab leak versus a natural animal spill over source? Meaning that the virus emerged in the animals, but how did it get out? And those are two separate issues. Just to come at this from kind of a realistic standpoint, what's happened over the course of the past several weeks has been what I would call

the weaponizing of words and targeting of individuals. It's not really been about new information. I think there's been some rather sloppy journalism that has contributed to this. In some cases, I think has been malicious. I don't need to go further than that. You all know what I'm talking about and what's happened here. But let's just stick to the facts as we know them and see what happens. And understand I have a bias here. I can't help it. I've spent my career dealing with this issue. If you look at what I've done in the last 20 years, in 2005 I was appointed to the National Science Advisory Board on Biosecurity, the group here in the United States, to oversee lab safety and the issue of gain of function work, the work that people do to actually make a potential infectious agent even more transmissible, causing more serious illness, evading immune protection or even treatment. And in that experience, in NSABB from 2005 until 2014, I was at the center of the debate in 2012 about the research that was attempting to make H5N1 avian influenza virus readily transmitted between mammals, in this case ferrets, with the idea of trying to look at it from the standpoint of what changes occurred to make it mammalian transmissible, that then therefore could be interpreted in the field if we started to see the virus genetic changes looking more like this mammalian transmitted virus. I raised major concerns, along with a small group of us on the NSABB about the lab safety. What if that got out? So from that standpoint, I have been very involved. In 2002, as some of you know, I was actually spending half of my time as a special assistant to Secretary Tommy Thompson and the other half here at the University of Minnesota. And one of the areas that I worked a lot in was a newly established federal select agent program looking at lab safety and how to monitor what was happening in our labs, as well as how can we improve on the safety of those issues. And that was a program I helped stand up actually at the CDC. And then, interesting, in my 2017 book *Deadliest Enemies* with my co-author Marl Olshaker, we detail, page 121, the scenario that has always left such a major impression with me, and that is where did the 1977 H1N1 influenza virus come from? Remember when influenza viruses have caused pandemics prior to that, once the pandemic began, that new virus became the dominant virus, the other previous virus disappeared. We assume that's what happened in 1918. We saw that happen in 1957 when H2N2 came along, H1N1 disappeared. Then in 1968 when H3N2 came along H2N2 disappeared. And then lo and behold all of a sudden in 1977 both H1N1 and H3N2 were there, and H1N1 came out of nowhere. And when you go back and look at it from a genetic perspective, it was almost the same virus that we last saw in 1957 with very little change. If that virus hadn't been sitting in a freezer for all those years it would have changed substantially. Well, to make a long story short, and I

described this in the book, what happened was the Russians were actually working on influenza virus vaccines in far eastern Russia, right on the Chinese border, which is, by the way, where this virus first emerged and was found. In fact, in 1977, they actually requested from the United States the 1976 swine flu isolate that had been isolated from the soldiers at Fort Dix, New Jersey so that they could work with it as part of this vaccine work they were doing. Well once that virus basically got into the public in eastern Russia in 1977, it spread quickly around the world, literally, in a sense, a type of pandemic of its own. I have no doubt that this was either a leak, an accidental release of the virus, or they released it with the idea that they were doing their influenza vaccine work and that it wouldn't spread. So that just shows you that a virus can get out of a lab, or in the work in the lab, and cause this kind of situation. So I come at this from that perspective. Some will say, "Well, you're so biased, you're automatically going to think everything's a lab leak." Well, let me just take a step back and say what's happened here? Well, the first real document that has been raised over and over again as a challenge was published on March 7th of 2020 in The Lancet by a number of distinguished researchers, scientists of international respect. And the title of the article was 'Statement in Support of the Scientists, Public Health Professionals, Medical Professionals of China Combating Covid-19'. What this article was addressing was the underlying suggestion out there that this virus may have originated from China as a manmade virus. And what they basically said in the article is we stand together to strongly condemn conspiracy theories suggesting that covid-19 does not have a natural origin. And all the data up to that point in March actually supported that this, in fact, was a naturally occurring coronavirus that had gone through evolutionary pressures in the animal kingdom. Well, not much happened over the course of the next year. Part of it was the fact that the Trump administration so strongly indicated that this likely was released by the Chinese, if not intentionally it was an accident and that it might be manmade, the China virus, as they call it. I saw many of my scientific colleagues who at that point felt that any kind of statement suggesting a leak might be possible basically resisted doing that because of fear that they would somehow then be brought into the Trump world of where it clearly was a conspiracy theory concept. Now, I weighed into it, as you know, on this podcast. I weigh into things sometimes that people have to ask, why would I ever do that? And I've been very nuanced the entire time. I've said, "You know what, of all the data I see, we don't know where it came from. It could be a lab leak of a virus that was originated from the animal kingdom, or it is, in fact, a direct spillover. I don't know." Well, now, fast forward. In the last three months, there has been

this intensive effort to show, one, that this was a manmade virus and two, that in fact, China was responsible for intentionally releasing it, or at least an accidental release in the lab that they could have controlled. And I think this is where the story starts to get really unfortunate in that so much misinformation came around. Well, let me give you just a sense of what we might want to think about in concern with regard to the laboratory leaks. Just to give you a better sense, I think most public is unaware of this. From 2006 to 2013, labs in the United States notified the federal regulators at the CDC and the USDA of about 1500 incidents with select agent pathogens. In more than 800 cases, workers received medical treatment or evaluation. So, again, a select agent pathogen is one that we'd be worried about might be weaponized or used somehow against others. 15 people contracted laboratory acquired infections and there were 3 unintended infections of animals. Remember, this is right here in the United States, OK? This is here under our watchful eye. To move the story forward, let's look now at 2015 through 2019. US laboratories reported more than 450 such accidents during that same time, while experimenting with some of the world's most dangerous germs. And again, these issues range from animal bites to needlestick to failures of safety equipment and mistakes that resulted in infectious particles becoming airborne inside of labs. So this is the United States. In nearly all the reported cases, the regulators deemed that the breaches serious enough to put workers at risk of becoming infected. More than 660 US scientists and other lab workers involved in the incidents underwent medical assessment or treatment with preventive medications. Again, this is the United States where this is happening. So we shouldn't be surprised that lab accidents may happen in other countries. And a number of these lab accidents happened at really prestigious labs, including the Centers for Disease Control Laboratories. So given that, could this not have been a lab leak? And the Chinese have not been forthcoming, as I've seen it, with any data that we can say convincingly says, no, it wasn't. We have heard that there are studies done on all the workers that were in those labs at that time of 2019 of blood samples drawn. Nobody was infected or evidence in blood samples that they actually had been infected, even asymptotically, that could have been a way for the virus to get out. The WHO team that was in China most recently indicated that that's what they were told. But again, how much information was actually directly provided to support that? We're not sure. People think the Chinese are hiding something because they have not been forthcoming in their investigation. That could be the case. But I would promise you this. If we had a major outbreak in a US city, particularly of one in Atlanta or Washington, D.C., and the Chinese and Russians said, "We want to come in and co-

investigate this with you because we don't believe you. We think that there's potentially more to this than meets the eye." Do you think we'd let them in the United States? What they're doing is exactly, I think, what we would do. So that by itself doesn't mean that there's some kind of a smoking gun behind this screen. It's behavior that I think we, too, would actually exhibit. So now where are we at in terms of what's happened? Well, recently, Dr. Anthony Fauci's emails have been released from the Freedom of Information. This was the start of what I consider to be a concerted effort to discredit Tony and the administration in saying that this was NIH sponsored research that was a gain of function where people were intentionally ginning up these viruses and they got out. Well, if you read the entire email exchanges, it's just not true. For example, one that has been focused upon by particularly the group at Fox News, Tucker Carlson specifically, is one from a colleague of ours, Kristian Anderson, who I've talked about before on this podcast from Scripps, one of the brightest minds in the business, an email to Tony early on saying we don't quite understand what's all in this virus, it's obviously unusual, we need to take a look at it. That was inferred by many to suggest that, in fact, this was a weaponized virus, this was something manmade. They didn't follow up with the subsequent emails or the subsequent paper that after Kristian's group had a chance to really go into depth and look at that virus where they concluded, no, we don't see any evidence that this was a manmade virus. That part hasn't come out yet. Second of all, there were contractors to our intelligence community during the Trump administration that produced a report that received very little attention until recently, suggesting that there were at least 3 individuals who were in the Wuhan lab in November of 2019 who then needed to seek medical care, likely hospitalization. And the whole point of this was the fact that they somehow were the infected people that got infected inside the lab and brought the virus out. Well, as any of us who have worked in the government and particularly in the area of intelligence, which sometimes seems almost like a counterintuitive term to me, when you look at those data from these contractors and say, "Well, I don't know what this really means, it could have been anything." Well, I think it was notable that on Tuesday, US Secretary of State Anthony Blinken actually reported on this issue at a congressional hearing in which he basically said that, in fact, the hypothesis of a virus from a Chinese lab was not supported necessarily by the information from this intelligence report. I saw the report. I think it's, on a number of levels, incorrect. And in terms of going through this, suddenly those clear cut confirmed cases that supported that this is how it got out of the lab suddenly begin to disappear. And then to pile on, a May 5th article appeared in the Bulletin of the

Atomic Scientists. It's not a peer reviewed scientific journal, but it is a definitely respected publication. This article was written by science writer Nicholas Wade, and it has now become one of the most often cited pieces in support of the laboratory leak hypothesis. He interviewed Dr. David Baltimore. Doctor Baltimore said in that article, "A feature of the virus's genome known as the fear and cleavage site, was a smoking gun for the origin of the virus." In other words, he basically said in shorthand, the features make it a powerful challenge to the idea of a natural origin for sars-cov-2. Well, since that article was published, he's now walked back his statement and most recently told the Los Angeles Times, "I believe that the question of whether the sequence was put in naturally or by molecular manipulation is very hard to determine. But I wouldn't rule out either origin." Suddenly no longer is this a smoking gun. So if you start to peel off all of these different possible explanations for what happened, we're still left with I don't know. I do believe this could have been a potential leak from the Wuhan Institute lab. We need much more information and open access to this lab to better understand that. But it also very, very well could be a true spillover event from an animal species, knowing that we're still trying to understand the spill over moments with ebolavirus after studying it for decades in Africa. It took us literally many years to better understand the spill over event of SARS itself, the original coronavirus of concern that was first seen in 2003. And also we have to understand the conditions by which this virus might have emerged in a metropolitan area. Some people say it's coincidence it was in Wuhan near the lab, therefore, they have to be related. Kind of reminds me of that idea that President Lincoln's secretary was named Kennedy, President Kennedy's secretary was named Lincoln, you could very definitely tie the two assassinations together, right? Well, let me just pose the following. If you know anything about Wuhan, it is located in a relatively limited area of China, in the Hubei province, for which it's about 71,000 square miles. 60 million people live there. In comparison, if you look at the Northeast United States, that's 162,000 square miles for which there's only 55 million people that live there. To get food to the people of the Hubei province, we know that meat, produce, etcetera, is trucked in from long, long distances away. Also, Wuhan happens to be the transportation hub of all of China. All the fast trains, airplanes, all of that goes through Wuhan to get from Beijing to Shanghai, to Shanghai to Hong Kong, and all other cities. So this is a hub where someone bringing the virus into that community surely could have started this potential pandemic without even having to come from the food markets, that that being something that happened later into the process. So I would just close by saying this. Imagine the following. A new exotic virus emerges in the Caribbean and we don't

recognize that there, there aren't the medical laboratories, etcetera. But because Atlanta is a hub of all transportation in and out of the Caribbean, it might get picked up there, particularly with medical care as it is. I can tell you, if a new exotic virus today got identified in Atlanta, I wouldn't be surprised a bit if the first thing to come out of everyone's mind is this must have leaked out of the CDC. Must have been CDC. Even though it had nothing to do with it. So I just urge everyone to take a step back, deescalate these horrible, horrible, very personally damaging and I think dangerous accusations that are being made. We do need the WHO and the rest of the world, and China in particular, to come forward with more information that might help get us some understanding was this, in fact, a lab leak or a natural spillover event? Let's take the manmade piece off the table. It's not that. And then we can find out. And it's important because you know what? We need to beef up lab safety no matter what. Some of us have been saying this for a long time. Our safety levels at many of our labs around the world are just not adequate to prevent a potential leak from happening. Second of all, if it's a spillover event, how do we better detect these? How do we deal with the human food supply that often involves large numbers of wild animals? So there's a lot to digest here and we have a lot of work to do. But doing what we're doing right now to weaponizing this situation into politics, into persecution, into total misstatements, if not intentional lies, I think is really, really unfortunate. And I hope that we can eventually find the source of this virus just so we can learn how to prevent any future events from happening.

Chris Dall: [01:03:51] Now to our new segment, which we're calling Covid Queries. These are the questions we get, and we get many of them, about the decisions that you, our listeners, are trying to make, the situations you're trying to navigate, and the risks you are assessing on a daily basis in this post-vaccination covid world. Kicking off this segment is a question from Gabriella who asks, "What are your thoughts on traveling abroad once vaccinated? Do you think that traveling to a place where you can spend time outdoors, like Mexico, would be risky? Or be behavior that will delay the end of the pandemic due to contributing to variant development?" So, Mike, this is a really good question, because after more than a year of being cooped up in our homes, many people now want to travel. Your thoughts?

Michael Osterholm: [01:04:34] Well, let me just say at the outset, every answer is going to be individualized. Why? Because it really comes down to understanding,

number one, if you're vaccinated, do I have any other underlying risk factors for potential severe disease, even though I'm vaccinated? So if I should be a breakthrough infection, will I, in fact, have a higher risk of having a potential serious outcome? Is there anyone else in my family that I get infected that I could then in turn infect because I picked it up somewhere out in the community? This is all about understanding the medical risk of, what I would call, your own home situation, or that where you're in a work setting and close colleagues. The second one really is about what is my willingness to take on risk? And we're all different that way. You know, I'm a long distance swimmer, an English Channel swimmer, OK? I find it wonderful to go swim across the lake that's two miles wide and get all the way across and back. And people say, "Oh, that's dangerous doing that all alone." You know, to me, it's just like out for a run. And others would find that risk absolutely, totally unacceptable. And yet I don't find it that, I find it very pleasurable. So I think that if you want to look at risk issues, we all have different tolerances. 38,000 to 40,000 people a year die in this country in automobile accidents. When's the last time you refused to get into a car and drive because that automobile accident? Well, you know, you can argue I wouldn't get in a car with a drunk driver. OK, that changes the risk issue, etcetera. So it's really about how do you deal with your own risk tolerance? And then it's really more about what are the other kinds of conditions that we have to deal with? So, for example, you raised the question about if I go to Mexico? Well what if Mexico is sitting right now in the middle of a very hot outbreak of Delta related variant sars-cov-2? Do you want to be in that setting like that? Do you want to be in a crowded bar or restaurant if, in fact you're still worried about your own health and safety? And so part of the challenge is that there is no right or wrong answer and people are looking for that. They want that right or wrong answer. Is it safe or not? Nothing is safe. It's safer. It's all relative to the conditions. Some people look at me as being totally unsafe, you know, swimming two miles across the lake with nobody accompanying me. Others would look at that and say, "Well, I do that every day." This is a challenge, I think, that we have to address as a society to say we've got to talk about how do we manage risk right now? And it's not always going to be rational. You know, I used to fly 150,000 air miles a year before March of 2020. I've not been in a plane since then. Now, part of it is I like the convenience of not flying so much. But part of it also is do I find myself prepared mentally to put myself back in that plane? Even though I know that the risk is relatively low, I can wear my N95 respirator and I can avoid as much traffic as possible in the airport, etc.. I think my risk of getting infected is very, very low. Particularly given where we're at now, but if I took that airplane and went

to a hot spot in the world, what I feel that same way? So, Gabriella, I wish I could give you more clear information about this, but just know it's really about what is your potential risk if you do get infected, if you have a breakthrough with a vaccine? Which is going to be a very low risk event. What is it that makes you feel comfortable or uncomfortable? Talk about that with your family and friends and then what are the circumstances involved? Now, one of the things that I urge you to do is, we're going to put on our website again links to two articles. One by Dr. Leana Wen, which was in The Washington Post back last April, and one by Dr. Aaron Carroll, which was in The New York Times this past week, all discussing this issue. How do you make your pandemic related decisions? And how do you internalize the information? Both of these articles provide the context that I was just talking about. How do you communicate risk? What did you consider to be something that is too risky for you? Or too risky for your family and why? And then from there make that decision. The most important message I can leave you with today is there is no right or wrong answer. It's up to what you feel you can do today and how you can feel comfortable about it. That is going to be going forward a big challenge for many of us. But it's the challenge that, unfortunately, we're going to have to deal with.

Chris Dall: [01:09:46] So, Mike, for today's closing, we have a brief essay from one of our listeners about the friends and small daily acts of kindness that helped sustain her during the pandemic. Can you share it with our listeners?

Michael Osterholm: [01:09:57] Again, this is from Kaya, and thank you very much for submitting this as an act of kindness, I think indeed it is just that. And it frankly, it's an act of wise perspective. Kaya wrote an essay and submitted it to us, and she sent it under the following cover. She said, "I wrote this essay on the day I hit the two week mark after my second dose of the vaccine and I realized I was fully vaccinated. Hitting that milestone gave me the pause I needed to breathe and caused me to look back and reflect on how I survived the pandemic year. Besides my wonderful husband and my two sweet boys, it was my three closest friends and fellow moms that got me through. While there was no single grand act of kindness between us, we gave each other hundreds of small kindnesses and those were what allowed us to survive parenting in a pandemic and cope with our fears and frustrations with this country, our society and the world. This is dedicated to them." Kaya's 'A Year at Sea' for Jill, Marit and Tricia, my life preservers. 'The beginning of the pandemic was like getting dropped from a helicopter

into the ocean. Disorienting, terrifying. It was hard to breathe from the shock. We knew we needed to get back to shore, but we couldn't see it, so we didn't know how far we had to go or how much energy to expend or save on a given day. The end of the pandemic is like wading out of the ocean. Sometimes it seems like we're back on solid ground and then the next thing we know, we realize we stood in the wet sand too long and our feet are sinking in. The ground was not as solid as we thought. Or we wake up to find the water is somehow back up to our knees and the shore is far away again. One day soon, we're going to look around and the sand under our feet will be dry. We'll turn to look over our shoulder and the edge of the surf will be far behind us. And we will wonder if it really was as scary as we remember, being dropped in the ocean. Were there really people who had insisted we were not in danger of drowning? Who were those people? We haven't kept in touch. There will be tangible clues that it was not just a dream, though. A mask forgotten in the pocket of a coat. An expired bottle of hand sanitizer that rolls under the seat in the car and got stuck. An ice pack at the bottom of the freezer from when groceries were delivered. A pair of kids blue light glasses relegated to the costume trunk. A wine glass at the back of a cabinet that your friend had emblazoned with the words 'because distance learning'. And in our core, our souls will forever hold sacred the people who reached out to hold our hand and pull us when we were too tired to swim. Or floated alongside, when we were all too tired to swim, simply saying, 'we're here with you, let's just ride this wave together, tomorrow we will be closer to the shore'. Hopefully we will remember the beautiful moments too, like when the water was warm and smooth and we quietly watched the sunset. When we saw the stars, as we'd never seen them before, mostly because we had never stopped to look up.' Thank you, Kaya, for this incredibly beautiful piece, and I hope every one of us goes back and listens to this again and just appreciate the beauty of Kaya's words. This is where we're at today. This is how we need to move forward, is we need to understand what it means to have been in a year at sea. And so I thank you for that. And thanks again to all of you who have spent time with us on this podcast. Again, I used a lot of numbers. These are not real just numbers, they are people. They're our brothers and sisters, our mothers and our fathers, our friends and colleagues. And we can't forget what we've been through. But like what we see from Kaya, we can surely begin to reflect on that year at sea. So all of you be well, be safe. Thank you so very, very much for all that you are doing to help us make this transition through this pandemic. And again, we look forward to being with you in two weeks. Thank you very much.

Chris Dall: [01:14:28] Thanks for listening to this week's episode of the Osterholm Update. If you're enjoying the podcast, please subscribe, rate and review. And be sure to keep up with the latest covid-19 news by visiting our website CIDRAP.umn.edu. The Osterholm Update is produced by Maya Peters, Cory Anderson and Angela Ulrich.