

# Dr. Mateus answers teachers' questions about ventilation and COVID-19 at Alabama rank-and-file meeting

**Benjamin Mateus**  
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On February 27, the Alabama Educators Rank-and-File Safety Committee hosted an online meeting titled “The CDC vs. Science: What teachers, parents & students need to know.” The meeting was organized after the release of politically motivated guidelines on school reopenings by the Centers for Disease Control and Prevention (CDC) on February 12.

An Alabama public school teacher chaired the meeting, which was attended by educators from across that state as well as California, Georgia, Hawaii, Florida, Illinois, Massachusetts, Michigan, New Mexico, Ohio, Pennsylvania, Tennessee, Texas and Virginia. The featured speaker was *World Socialist Web Site* health care writer Dr. Benjamin Mateus, who gave a report on “The critical role of ventilation and infection control in classrooms” and answered questions.

The following is an edited transcript of Dr. Mateus’s report and the Q&A.

**Dr. Benjamin Mateus:** I want to focus my report on the critical role of ventilation and infection control in classrooms, because it’s glaringly absent in the CDC guidelines. And I think once we get into it, it’ll be clear why it’s important. Given a respiratory pathogen like SARS-CoV-2, it becomes imperative to ensure that school heating, ventilation, and air conditioning systems are constantly running and meticulously maintained.

On the National Air Filtration Association website, in the section on air filtration for school, it quotes the American Public Health Association: “Every child and school employee should have the right to an environmentally safe and healthy school that is clean and in good repair.” It emphasizes the fact that schools are even more densely populated than a typical commercial building, making the “bio-burden” much more significant and leading to some of the worst air conditions in any environment.

The US Government Accountability Office (GAO) report published in June 2020 found that 54 percent of public-school districts require the overhaul or replacement of multiple building systems or features in their schools. Specifically, 41 percent of school districts, or 36,000 schools across the country, need to update their HVAC systems.

The same report explains that in 2019, before the pandemic, California did a study of its schools’ HVAC systems. These were 94 newly installed HVAC systems in K-12 schools. It found that 85 percent of them didn’t provide adequate ventilation, meaning fresh outdoor air was not coming into the rooms. So even though they’re putting in these \$100,000 or \$1,000,000 units into their school systems, they don’t know how to run them. They don’t have the expertise.

The GAO report also notes that a recent inspection of 21 schools in New Haven, Connecticut, found that two-thirds had dirty or poorly maintained ventilation systems. The inspection revealed years of neglect that predated the pandemic.

In an article published earlier this month, on February 12, Christopher

Ruch, the director of training at the National Energy Management Institute, said that “poor ventilation is an age-old problem that predates the current COVID-19 crisis. Many classrooms did not have HVAC units operating at the minimum required ventilation rates even before the pandemic. The benefits of adequate ventilation, including reduced absenteeism, improved cognitive retention, and improved productivity, have been well documented in multiple publications. This issue needs to be addressed regardless of the COVID-19 pandemic.”

The term “aerosolization” becomes a critical factor in our discussion here. Dr. Kevin Fennelly wrote in July 2020 in the *Lancet*, “data show that infectious aerosols from humans exist in a wide range of particle sizes that are strikingly consistent across studies, methods, and pathogens. There is no evidence to support the concept that most respiratory infections are associated with primarily large droplet transmission. In fact, small particle aerosols are the rule, rather than the exception, contrary to current guidelines.”

This was a tremendous leap forward in our understanding of the pandemic. It confirmed that preventative measures had to address this critical issue: the ventilation of indoor spaces. The concept of contaminated surfaces and respiratory droplets dates back to 100 years ago. It’s only recently that we’ve had the ability to identify how respiratory pathogens really work.

An article published in October 2020 in *USA TODAY* titled “Ventilation and air filtration play a key role in preventing the spread of COVID-19 indoors” includes a lot of important information from experts like Dr. Shelly Miller, professor of mechanical engineering at University of Colorado Boulder, as well as representatives from the American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE) Epidemic Task Force.

The article states that most HVAC systems cycle in about 20 percent fresh air, and the remaining 80 is recirculated air. This is done for energy efficiency. However, some aerosolization scientists recommend moving the air out completely and bringing in 100 percent fresh air. That means a greater energy burden. But the safety of children and teachers is more important than the extra cost of running these HVAC systems.

As the article further explains, minimum ventilation rates depend on the type of activity occurring in that room. So, we need to ask not only how many people are in that classroom, and how big is it, but also, is this wood shop? Is it a gym class? And what season is it? Because the temperature and humidity will be different.

For the school nurse’s office, having a negative pressure room is critical. And being able to isolate students and having some method by which to take students or a teacher from a class to the nurse’s office is also critical.

ASHRAE recommends that in one hour, the HVAC system should

provide six complete changes, and it recommends ventilating the room one hour to two hours before classes are opened, and one to two hours after classes are finished.

There have been a lot of studies that have looked at infectious disease outbreaks and the use of ventilation. There's one study from an outbreak of tuberculosis in 2019 at Taipei University in Taiwan. They noticed that rooms were under-ventilated. And they found out that the CO2 levels in these rooms were running around 1,200 to 2,000 parts per million. It's supposed to be somewhere between 500 to 600 parts per million.

They increased the ventilation by 20-fold, and the outbreak ended. Before the ventilation, the CO2 reading was at 3,200 parts per million. Once the ventilation was improved, the CO2 readings went down to 600 parts per million.

“CO2 Sensor Helps to Reduce the Risk of COVID Transmission Indoors” is the title of an article in the November 2020 edition of *Electronic Engineering Times*. It explains that in conjunction with improving and having appropriate HVAC systems, it is critical to have CO2 sensors in your room. People spend 90 percent of their time indoors, which means concentrations of pollutants indoors are often two to five times higher than outdoors.

CO2 concentration is a key indicator of air quality. When your CO2 level reaches 1,000 parts per million, you can get headaches. You can get drowsy, and it can affect your concentration. When you get to 2,000 parts per million, it can actually have an impact on your cognitive abilities, and it can lead to health risks. If you have asthma, it can exacerbate that.

Exhaling CO2 into a room can be a proxy for potential aerosolization of COVID-19 particles. And that means if your sensor goes off, you probably have a problem. If that happens, then you need to evacuate the room and ventilate before you bring students back into that classroom.

In conjunction with running an appropriate HVAC system, it's critical to use Minimum Efficiency Reporting Value Filters, or MERV filters. Many of you have already heard of these. The higher the value, the fewer particulates get through, but it puts more strain on your ventilation. So MERV-13 has been the agreed minimum standard. And the reason for that is because COVID particles tend to be in the range of 0.5 microns to 50 microns, and mainly between 1 and 5 microns. MERV-13 removes about 95 percent of the particulates in this range. That's why it's very important to have these filters in place.

Another thing that teachers need to know is that acrylic dividers in classrooms are probably not a good thing. Dr. Shelley Miller, who's done research on this, especially with music classes, found out that plexiglass barriers change the aerodynamics in the room, and it can create dead zones where aerosols build up. She tweeted on September 9, 2020, “We do not recommend acrylic room dividers for reducing risk of airborne transmission. At best it does NOTHING, at worse it changes the airflow patterns in the room and can cause pooling of air, hot-spots, and reduced ventilation effectiveness.”

On February 15 of this year, a group of scientists including Dr. Michael Osterholm signed a letter demanding that the Biden administration acknowledge that SARS-CoV-2 is an aerosolized pathogen as opposed to the current emphasis on respiratory droplets. The title of their letter is “Immediate action is needed to address SARS-CoV-2 inhalation exposure.”

They write, “For many months it has been clear that transmission through inhalation of small aerosol particles is an important and significant mode of SARS-CoV-2 virus transmission. ... Numerous studies have demonstrated that aerosols produced through breathing, talking, and singing are concentrated close to the infected person, can remain in air and viable for long periods of time, and travel long distances within a room and sometimes farther. Gatherings in indoor spaces without adequate ventilation place participants at particularly high risk, an important component of which is driven by asymptomatic and pre-symptomatic viral

shedding of infected individuals.”

One new study of the coronavirus in buildings found that because of the viruses' transmissibility and tendency to hang in the air over time, administrators may not be able to rely on the normal rate of air flow from their ventilation systems to clear virus particles from the air. A separate new study of Dutch schools found aerosols built up steadily in school gyms even when they had ventilation, but the combination of increased ventilation and the use of mobile air filters cut the concentration of aerosols in the rooms by 80 to 90 percent.

The CDC does recommend bolstering ventilation beyond opening doors and windows. But what if each fan costs \$100, portable filters cost \$500, and putting ultraviolet germicidal irradiation into your ventilation ducts could cost upwards of \$1,500? This could run into hundreds of thousands to millions of dollars, depending on the school.

High-poverty school districts spend on average \$300 less per student on capital projects like HVAC upkeep and replacement. There are more than 96,000 buildings nationwide ranging in size, age, and location, and according to the GAO, 36,000 of them have “sub-standard” HVAC systems. A Learning Policy Institute (LPI) article from December cites the GAO figure and adds that these systems could cost about a million dollars per building to upgrade, and even more for systems that have to be totally replaced. It estimates that about \$72 billion would need to be spent to guarantee safe air quality in all classrooms.

But the funding for school facilities, as we know, primarily comes from local sources—about 82 percent of it, according to the LPI. State funding is about 18 percent, and federal support is less than 1 percent. The LPI writes that “Most states, for their part, are trying to fend off cuts to their K-12 education budgets and are not in a position to increase funding for facilities. In short, the federal government is the only entity that can provide the needed resources to ensure safe and healthy air quality in our schools.”

In its push to support the Biden administration's efforts to open schools rapidly, the CDC has altogether ignored the aerosolization of the virus. Its guidelines make no mention of these transmission mechanisms. This is because the acknowledgment of airborne routes of spread would necessitate ensuring that physical conditions at schools were thoroughly assessed and addressed before approving any reopening plan. A national project to refurbish school districts' facilities and bring them up to code would have to become the primary focus over the intervening months as schools shifted to complete remote learning until the fall or whenever it is deemed safe.

Teachers must realize that the science is with them. Their resistance isn't based on fear, but the recognition that the pandemic is serious and the dangers are certain. It comes out of a deep consideration for the well-being of their students, their families, and communities. And it is for these reasons that they actually put up such a heroic fight.

The working class supports their fight. And the working class is the only class that can ensure that society's resources are used in the rational manner that is required to stop this pandemic.

Thank you for allowing me to speak.

#### Questions & Answers

**Q: The CDC said that if community spread of COVID was above a certain level, schools should not open, but now the government is pushing to open schools regardless. How should the level of community spread affect the decision to open schools?**

**Dr. Mateus:** Well, first Biden said that all we're looking for is just one school open at K-8, then suddenly they change it to all schools K-12 open five days a week. So, this is a moving target. And yes, they even said that as long as you can maintain every mitigation effort, it's safe to open schools regardless of how high the community transmission is.

I would warn teachers that there's a direct correlation between school openings and the development of community spread.

The data is clear that children can be infected, and they can spread the virus. And the belief that somehow there's going to be 100 percent use of masks and appropriate social distancing in class five days a week for nine hours is ludicrous.

Even [CDC Director] Dr. Walensky had to admit that the compliance with mask usage in the United States among students was probably 50 to 60 percent, not the 100 percent that they're looking for. And their guidelines say that if you can't maintain these mitigation efforts, you have to close.

But it's a moving target because they need to have kids back at school and parents back to work, and they need to get the economy rolling.

There was at first a big emphasis on how they're going to do testing of children once a week, and teachers twice a week, but now that's gone by the wayside. Now, it's a suggestion as opposed to something that is definitely going to happen. Testing in the United States has remained at 2 million or less per day. They haven't expanded testing, and they haven't expanded contact tracing and symptom checks.

So, I don't know what to tell teachers except that the CDC is not acting with the interests of the public in mind. They have the interests of the state in mind, and they are going to fudge and move the goalposts to ensure that teachers and students are back to school. And once they're back to school, there's no shutting it down again.

If you look at the population-based studies and modeling studies that have been cited repeatedly, we understand that the closure of schools is a critical factor for mitigating the pandemic.

In the UK in December, after a partial closure, businesses and schools were reopened as the B.1.1.7 variant was climbing. They sent an urgent message to the media, to [UK Prime Minister] Boris Johnson, saying the pandemic is out of control, on January 4. Their health care systems were inundated. And on January 5, Boris Johnson ordered the hardest shutdown possible, and they closed the schools, they closed businesses, and the numbers began to come down.

We are now dealing with a situation in the US where we're seeing the decline in cases come to an end. It is plateauing, and it's going to start climbing again. Dr. Osterholm and other scientists have made it clear that when this B.1.1.7 becomes dominant, because of its increased transmissibility, whatever mitigation that we're doing now is not going to be enough and we're going to see numbers climb.

It is a perfect storm situation, in that not only do we see a dominant new strain, we're also opening schools. So, we're throwing fuel into the fire that is raging. And the children are that fuel.

They're playing with the lives of the working class. I don't know how else to explain it. This is a dangerous situation, and we need to raise the alarm.

**Q: The CDC says that opening schools is safe. What study is that based on?**

**Dr. Mateus:** In order to answer that question, you have to go back to all the references they loaded into the reference section and start examining them.

First, they are predominantly referencing respiratory droplets as a source of infection. That's where the six-foot rule comes from, and wearing the mask. But what we now understand about the pandemic is that, first of all, you're infective before you're symptomatic. Infection can happen when you're asymptomatic.

What we also understand is that young people and children are usually asymptomatic. That means they carry the infection and they can infect, but they don't know they're infected. And there's nothing in the schools that is checking—there's no symptom check. There's no checking what they call a screening PCR test or screening antigen test at all.

But what the CDC is referencing is these small studies that are done over a period of four weeks to six weeks in one particular school district, where the school knows that they're being evaluated. And at a time when

they're not even doing the appropriate testing, they don't really see rising infections in the school while the surrounding community is seeing rising infections, and they say, aha, looks like this is safe.

Well, then data comes out later in Montreal, where there is week-to-week analysis of what's happening. And they see, no, in fact children are getting infected and they're actually going home and infecting their parents. We didn't realize that at first, but now we do. Then there's large contact tracing studies that are happening in India where they're tracing everybody, and they're realizing children are passing it to the elderly.

Then in Germany, where they also said children are not susceptible, they do a seroprevalence study where they discover children have six times the antibody levels than we expected them to have, meaning that most of them were undetected. Then they do a study in Austria on seroprevalence in kids, and they see the same thing.

The studies that the CDC makes reference to are very small studies and often they are studies from May or June when we didn't have a lot of information as to how the pandemic was working, and schools were shut down and huge lockdowns were in effect, so we couldn't tease out how kids are part of it.

It's critical for them to push this agenda where they say kids are not susceptible for severe disease. However, kids do die, we've seen it. They can get MIS-C, which is devastating, and to say that they rarely get it is disingenuous. One child getting MIS-C is too many.

If they were serious, they would analyze all the data, even those that go against their position, and say, well, where does the truth lie?

Instead, they claim schools are safe, based on a Wisconsin study of about 11 schools, where they all got new masks and they had health monitors watching everybody there, and they're all behaving well, and they didn't do a symptom check at all. Even though Wisconsin was seeing their numbers go up, their conclusion was schools are safe.

I think there's a lot of political pressure to produce data and push data that supports the Biden agenda.

**Q: The media has been pushing the narrative that the mental health of students has suffered and there has been a rise in the suicide rate among youth due to not being able to attend school in-person. Can this really be any worse than the emotional stress caused by the fear of becoming infected and infecting others? Is it a tactic to press teachers into returning? And could the mental anguish that may be caused from not attending school be addressed without reopening schools?**

**Dr. Mateus:** It is a tactic. But I think children are having a very difficult time. Who could say they're not? Parents are having a difficult time. The elderly are having a very difficult time. The pandemic, and the response to the pandemic, which is the response of the ruling elite, has essentially created a situation where things are a mess and they only want to make a bigger mess.

You can open schools and maybe parents will die and grandparents will die. We're not out of the woods here.

Mental health providers need to address issues with children. But we need to have a working-class response to the schools, to keep them closed. We need to provide the resources that families need to support them financially. I mean, how much of the stress is related to the fact that financially families are having hardships? What about in Texas, where homes were destroyed, or the family's lost a week's worth of wages? How are they going to deal with those issues?

So, the mental anguish isn't just with kids. It's with adults, grandparents, with the community. It's disingenuous to suggest it's only children, and therefore we have to open schools. We will see the pandemic run away again. Health care systems are going to be inundated, and you'll have nurses and doctors with post-traumatic stress disorder. Then there's all the people that can't see their loved ones who are dying in the hospitals.

The situation is catastrophic, but it isn't because schools are closed. In the United States, they've never suppressed the infection rates down to any controllable level, and they never built a contact tracing system. They can't even get the population vaccinated.

So, this is the capitalist ruling class. And they are playing with the emotions of the working class.

**Q: Is there such a thing as herd immunity if the virus continues to mutate? They are already saying new strains are resistant to vaccines.**

**Dr. Mateus:** The only variants that have shown some resistance to vaccines right now have been the South African variant and the Brazilian. The South African variant is the B.1.351, and the Brazilian variant is P.1.

That's because these two variants have a mutation called E484K mutation, which alters what is called the "immune evasion." It's not 100 percent immune evasion, but when the Pfizer vaccine encounters the South African variant, the amount of antibodies it produces is much lower. Or you can see the AstraZeneca vaccine in South Africa had a very low response. But other vaccines seem to work well enough.

We need more study, but what the vaccines are doing is preventing moderate to severe disease. No one has died after getting the vaccine. So, it does protect you. But it doesn't necessarily mean that you can't get infected, and you can't transmit it. That's very important to understand.

If countries like the US and Brazil and the UK just let it rip, eventually the virus will become endemic, but at a great cost to the population's health and well-being. What happens then is that everybody develops some level of immunity, and they develop antibodies and T-cell responses. And they will develop some ability to suppress infection, so even if they get infected it won't be as bad.

What endemic also means is that children now become the primary people who acquire the infection. The population as a whole has been immunized because they get it as children, and they don't get it as adults, or they get a very mild version of it. This is what happened with the common cold with the other corona viruses, and so they are anticipating that the SARS-CoV-2 will eventually become similar to other cold viruses.

But remember, we're at a point now where COVID-19 is not endemic. Actually, a majority of the population has not seen the virus. And we can suppress it, we can bring it down to no transmission in the community. We can prevent further loss of life. Other countries have shown that it is possible. This is not an unstoppable virus.

**Q: Our school district in Pennsylvania has just gone from hybrid to full in-person learning for grades 7 – 12 Monday through Thursday and virtual on Fridays. As a result, there will be 40+ students riding on a school bus. They tell us to open windows and use the cabin fan directed toward the back of the bus. And a lot of times we need to use the heating/defrost system. Is this safe?**

**Dr. Mateus:** I think if you have 40 kids in the school bus, and the windows are closed, it's a super-spreading event waiting to happen, period.

With the windows open it's all about the dynamics of the situation that you're in, but let's say the kids are huddled in the back and they're coughing or sneezing because they're cold. You're going to have a super-spreading event. It needs to be evaluated, and I think you need to be very careful about suggesting that school buses filled with kids with windows open is going to be somehow safe.

**Q: Two-part question: What does proper indoor air quality look like in schools? And can you also talk about how contact tracing works to slow the spread?**

**Dr. Mateus:** When you have a lot of people in one room, they breathe, they cough, and this produces a "bio-burden." Schools tend to be very dirty environments for air.

There are no CO2 detectors in most schools that I know of. Teachers can correct me if I'm wrong. But the purpose of the CO2 sensor is to make a

measure of how much CO2 is in a room, and as we said, when you reach 1,000 parts per million, you get groggy, you get sleepy. You're not thinking straight because you're not getting the oxygen needed.

So, that's what we mean by poor air quality. And many schools that are located in poorer neighborhoods are already dealing with highly urbanized centers where there's significant pollution, whether it's lead in the water or air pollution. So, we have a lot of work to do on fixing the environment, not just air pollution, but paint on walls, asbestos, water quality, both in schools and in residential areas.

With regards to contact tracing, this is a comprehensive package. Contact tracing follows up on somebody who has been exposed to someone with a known infection, and then checks to see who their contacts are and see what the risks are. We do tests on them and isolate them. The job of the contact tracer is to identify where the virus is going and spreading, and what has to be done to stop it from continuing to spread in the community.

The United States has not built its contact tracing system. In December, at the peak of the pandemic, it had about 10 percent of the manpower it needed to appropriately track all the infections.

One of the things about community spread is that if you don't have sufficient contact tracing, you're really going blind and you're in a situation where you need to shut down and get control of the pandemic. When you're blind to where the virus is, it will continue to spread. And then what you're going to end up with is a series: you have a surge, you lock down, you open, another surge, another lockdown.

**Q: How can we get an asbestos report on a particular school building? Alabama teachers have run in circles trying to find out who is certified to test our conditions. We've been told that since the school was built in the 1980s it shouldn't have asbestos, but we have also seen reports that say asbestos was used in some cases until the 1990s.**

**Dr. Mateus:** What I would do is contact ASHRAE and ask them who their representatives are in Alabama and specifically for the city and the district. And then you can make a request for asbestos support or an assessment, for someone to come in and look and do a thorough investigation.

Asbestos is serious, as you know. Mesothelioma is a serious health issue. It can be fatal. And if you have dilapidated buildings, you can get asbestos airborne. And it can cause long-term, serious health damage.

**Q: Good ventilation is a key factor. This has been known for decades, yet nothing has been done. How have they been allowed to go this long putting people at risk without addressing it? We keep being told we don't have the funding.**

**Dr. Mateus:** Well, on the *World Socialist Web Site*, we've said that the pandemic is a trigger event. And what we mean by that is that the pandemic has completely exposed all the most irrational inner processes of capitalism that were already at work.

So, for instance, why did the 11-year-old boy [Christian Pineda] in Texas have to freeze to death, when we knew the electrical grid is outdated and nothing has been done about it? Why did the hurricanes devastate New Orleans and then Houston and nothing's been done about it?

Because there's no profit incentive. There's no money for critical infrastructure because from the point of view of a capitalist, it's a waste of money. All they're trying to do is make more profits and they want people to work, but they don't want to make life better for them.

We're in a situation where workers are paying more for their health care, but quality of life is deteriorating. We're even seeing life expectancy go down, and that's really a measure of the inability of capitalism to support the population. When we have so much science, when we know so much, and yet, you can't support the population. So, I think the answer to your question lies in a deep analysis of capitalism and its contradictions.



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