

## Creator

Madeleine Hum

## Title

The Malaria Epidemic and the New WHO-Recommended Malaria Vaccine | Dr. Patrick Kachur

## Image



Dr. Patrick Kachur

Image Credit: <https://mobile.twitter.com/patrickkachur>

## Tag/Key Words

Patrick Kachur, Malaria, Epidemic, Vaccine

## Podcast Episode Details

Recording Duration: 30:01 minutes

Size of File: 58.3 MB

Date Recorded: November 2, 2021

## Biography

In this episode of “What is Global Health,” Madeleine Hum (CC’24) spoke with Dr. Patrick Kachur from Columbia University’s Mailman School of Public Health on the malaria epidemic. Dr. Kachur gives insight into traditional prevention and treatment solutions used to combat

malaria and explains the significance of the new malaria vaccine that has been approved and recommended by the World Health Organization.

Dr. Patrick Kachur is a professor at the Mailman School of Public Health at Columbia University Medical Center. He directs the Advancing Research on Comprehensive Health Systems (ARCHes) program in the Heilbrunn Department of Population and Family Health which focuses on designing and testing health systems interventions at scale and driving evidenced-based improvement of these initiatives. Dr. Kachur is also a faculty member of the Program on Forced Migration and Health which develops evidence-based approaches to humanitarian response and in training the next generation of global leaders.

His research focuses on experimental and observational epidemiology and health systems studies examining the effectiveness and equity of malaria and child health interventions, with an emphasis on real world research that shapes policies and programs. He contributed to interdisciplinary research establishing the efficacy of insecticide-treated nets in western Kenya and the feasibility and impact of routine use of artemisinin-based combination therapy in Tanzania. For much of his career, he was based at the Centers for disease Control and Prevention where he held leadership roles in the Malaria Branch and Center for Global Health. He currently serves on the World Health Organization's Malaria Policy Advisory Group.

## **The Malaria Epidemic and the New WHO-Recommended Malaria Vaccine | Dr. Patrick Kachur | Transcript (via Sonix)**

**Madeleine Hum:** [00:00:07] Hello, everyone, welcome to this episode of the podcast of “What is Global Health?” My name is Madeleine Hum Humm, and on today's episode, we are going to talk with Dr. Patrick Kachur about the malaria epidemic and the new milestone to fighting malaria with a groundbreaking malaria vaccine that has been recently recommended by the World Health Organization. Our guest today, Dr. Kachur, is a public health physician with 30 years of experience in global health practice. He completed his clinical and residency training at the Mary Imaging Bassett Hospital and Johns Hopkins University, and a community health fellowship at the University of Ilorin in Nigeria. For much of his career, he was based at the Centers for Disease Control and Prevention, where he held leadership roles in the malaria branch and Center for Global Health, receiving the agency's highest service award. His research and scholarship have focused on experimental and observational epidemiology and health system studies that examines the effectiveness and equity of malaria in child health interventions, with an emphasis on real world research that shapes policies and programs. He contributed to interdisciplinary research establishing the efficacy of insecticide treated nets in western Kenya and the feasibility and impact of routine use of artemisinin-based combination therapy in Tanzania. Dr Kachur joined the faculty at the Columbia University's Mailman School of Public Health in Twenty Eighteen, where he coordinates implementation science partnerships with a focus on expanding access to quality global health programs and services. He now serves on the World Health Organization's Malaria Policy Advisory Group. Hello, Dr. Kachur. Thank you for joining me on this episode. We are happy to have you with us and hear more about your research and malaria expertise to get us started. Can you tell us how you became interested in studying the malaria epidemic and your journey from a practicing physician to a malaria expert and researcher?

**Dr. Patrick Kachur:** [00:01:59] Sure. I grew up just west of New York in a small town in northeastern Ohio. Interestingly, the village I grew up in is on Mosquito Lake in northern Ohio, but I didn't have any ambitions of studying malaria growing up there. I, when I started my training in medical school, I had an opportunity very early on to learn about public health, and I had some good experiences working in a local health department and kind of knew that's the kind of medicine I wanted to practice. So, all throughout my medical school training, I found opportunities to not only learn how to care for individual patients one at a time, but to develop my skills understanding the health impacts that different diseases and conditions had on whole communities and populations. And one of those experiences was an opportunity to study community health at a medical school in West Africa, in Nigeria. And it really was there that my whole perspective of what I could do as a physician branched out from even more than moving from clinical individual clinical medicine to public health as a focus. Really understanding that I could not only work at a community level, but at a global level was a real revelation for me in my Nigerian medical school. Malaria was overwhelmingly the most common cause of illness among children. And one of the leading causes of death. So, it was really clear to me that that was an illness that no longer existed in the United States that we were able to eliminate through aggressive treatment and health systems approaches, as well as through some efforts to control the mosquitoes that spread it. And after medical school, I had an opportunity to enter a training program at the U.S. Centers for Disease Control and Prevention, or CDC. And really, from there, I spent a number of years working on different health problems, but always coming back to working on malaria and particularly working in African communities. Africa the African continent, is where over 70 percent of all malaria illnesses occur.

**Madeleine Hum:** [00:04:59] So we hear a lot about the statistics of how many children and adults have been infected with and died from malaria each year, but it doesn't really give us insight to the everyday impact that malaria has on the ground. And you said that you visited West Africa. So, can you give us a little insight of what it is like for people living in a country where malaria is endemic and the impact that the disease has on people?

**Dr. Patrick Kachur:** [00:05:21] Sure. Malaria is so common in some communities that the people actually use the word malaria much in the same way that you or I might use the word flu when we say I've had the flu. It generally means that you've that you've felt ill for a couple of days and recovered spontaneously on your own. It doesn't necessarily mean that you went to the doctor or that you got a blood test that confirmed you had the influenza virus. For example, in parts of Africa, very commonly, people use to describe a short illness that they've had by saying I had malaria kept me out of work or out of school for a couple of days. But that really kind of hides the fact that while malaria can be a mild illness in people who have survived being infected with it repeatedly and reached late childhood or adulthood, malaria can be a devastating and fatal disease in younger children when they're first exposed to it or after they've only experienced it once or twice in their life. So, while malaria may be mild in many African school age children or adults, it's it comes. They've developed some immunity to it through prior exposure, and a great portion of children die along the way and never reach that stage. Malaria, when I started my training in 1990, there were over two million malaria deaths every year. Most of them in tropical Africa. And last year there were fewer than 400000 deaths worldwide. So, we've made tremendous progress with some simple tools, but we haven't been able to fully eliminate it.

**Madeleine Hum:** [00:07:34] Can you give us the background on those tools and strategies that are used to reduce malaria transmission and how things have progressed over the past two to three decades?

**Dr. Patrick Kachur:** [00:07:45] One of the most important ways to deal with malaria is when people get sick with an illness with a fever to make sure that they get tested and if it's positive, treated for malaria. So, the idea of treating infections early when people get sick is still very important. It can help prevent that illness from progressing to severe or fatal form. And it can also, by curing that person's infection, you can reduce the risk that they'll transmit it onto other people. So, diagnosing and treating malaria early is a really important way of controlling it, but just waiting until people get sick is often not enough. And so, because we know malaria is transmitted by mosquitoes, we can intervene to prevent contact between people and the mosquitoes that transmit malaria. There are different mosquitoes in different parts of the world that carry the malaria parasite, and the mosquitoes that carry malaria in different areas can behave differently in Africa, particularly in rural Africa. The most efficient malaria transmission transmitting mosquitoes have adapted to bite indoors and late at night. I think that's probably they've learned that that's the best place to find sleeping human beings and a source of the blood meal that they take when they bite. And because of that, that particular behavior, which has come about by adapting together alongside the mosquitoes, the parasites and human communities, adapting alongside one another for tens of thousands, if not hundreds of thousands of years.

**Dr. Patrick Kachur:** [00:09:51] We can target that behavior really specifically. And so, tools like sleeping in a house that's fully screened or enclosed and air conditioned, but that keeps mosquitoes out can be one way of reducing mosquito contact with those night biting mosquitoes or in areas where there's not electricity or power. Sleeping under a mosquito net, especially one that's been treated with an insecticide that not only keeps the mosquito from reaching the people sleeping under it, but the insecticide can then kill them and prevent them from going on and biting another person. We also have other strategies, including providing malaria treatment drugs to people before they get sick, especially. This is especially useful for pregnant women or very young children who we know are at risk of, of or at high risk of malaria. It's not realistic to give them malaria drugs every day, but if we if we provide them with a long-acting malaria drug when they come through, they're for their pre-natal visits to a clinic before they deliver a baby or for children when they come for their baby shots. For other infectious diseases, we can give them an antimalarial drug and that can reduce the risk of them developing infection for about four to six weeks after a dose of a long-lasting drug.

**Dr. Patrick Kachur:** [00:11:43] And then finally, for four decades, we haven't had a vaccine specifically for malaria. But in recent years we have assembled the evidence that a relatively new vaccine can work to prevent about 30 to 40 percent of malaria infections in African children. Um, that isn't as good as our COVID vaccines, which are 90 percent efficacious or even greater. But for malaria, which is highly endemic, it's in in parts of the world that can make a big difference in survival. The tools that we use for malaria, like mosquito nets and diagnosis and treatment are each of them imperfect in their own right. So much like we were using masks and distancing and immunizations to prevent COVID for the last couple of years, in Africa, we layered different interventions on top of each other. So, we provide diagnosis and treatment

when children are ill. We provide preventive drugs when women are pregnant or to small children in their first year of life. And we provide everybody with the mosquito net. And if we have this vaccine, we could add that on top of those things and result in an even greater reduction in the burden of disease and death.

**Madeleine Hum:** [00:13:24] So more on the vaccine, as of now, the World Health Organization is planning on giving the vaccine to children in sub-Saharan Africa, which can be life changing for so many people and families. But many people have been waiting for a vaccine like this for years. Can you give us some background on why it took so long to develop a vaccine? Is it the science behind it? A financial burden? Big Pharma? Is there any specific reason on why the vaccine was in the research and development stage for so long?

**Dr. Patrick Kachur:** [00:13:49] There's an element of all of those things that you suggested. First of all, the malaria parasite is a complex organism. It's a generally a one-sided organism that lives within our red blood cells or in some other cells within our body. But it's much more complex. It has a lot more genetic material than a virus or a bacteria. And so, the malaria parasite has 13 chromosomes and that's, you know, that's an odd couple of orders of magnitude more genetic material than a bacterium or a virus. And so, what that allows the parasite to do is to evade our immune system in some clever ways. There are four different species of malaria that are commonly transmitted in humans. The most serious is called *Plasmodium falciparum*. And we have some understanding of how that parasite manages to infect human cells. But if we, as we've come to understand that more and more closely, each malaria parasite contains 50 different copies of the gene that codes for that protein that allows it to enter cells, and each of those 50 copies is slightly different than the other forty-nine. So, if, for example, our immune response recognizes a malaria parasite is infecting ourselves cells using one of these keys, the parasites can adapt by using one of the other forty-nine that they have. And so, it's very hard for our immune system to fix on the parasite just because it can be very changeable.

**Dr. Patrick Kachur:** [00:15:57] And the other thing is that because it lives within our own cells, sometimes the immune system doesn't see the parasite the same way as it would a bacteria or a virus that is circulating freely. Malaria parasites do circulate freely, but only briefly and at the early stages of infection, right after someone's bitten by an infected mosquito. And this vaccine actually takes advantage of that fact that the parasites are fewest in number and may be most vulnerable to the immune system at the initial stages of infection, right after the parasites have entered the bloodstream and when they set up in the liver and before they've multiplied in the tens or hundreds of thousands or millions that are circulating in the bloodstream. So, by targeting those early pre blood stages, this vaccine has a better chance of catching and stopping a malaria infection from progressing. Um, but in addition to the scientific complexity, there are sort of geopolitical and economic challenges too, because we eliminated malaria from the United States, from much of Europe in the 20th century. There isn't a market for a malaria vaccine in most high-income countries, except perhaps for a vaccine that could prevent malaria in travelers or military personnel deployed to endemic areas. This vaccine is specifically tested and being developed to prevent malaria in African children, and that makes it harder for drug companies to find the financial incentive to develop a vaccine for a disease that's most prevalent in a part of the world where individuals are unlikely to be able to pay for it.

**Dr. Patrick Kachur:** [00:18:30] So in addition to the financial disincentives for international pharmaceutical companies, the ability to conduct high quality clinical research trials in Africa and parts of Asia and Latin America wasn't as well developed as it has been in North America and European countries. So, getting a high-quality clinical research infrastructure established in Africa and across nine different countries took a fair amount of time. And then finally, I think the idea of whether or not the international global community would be ready to pay for a drug vaccine for malaria has taken some time to come together very often. You know, the global effort to provide vaccines for childhood infectious diseases has been a tremendous global health success really since the nineteen eighties. But every time a new vaccine is developed, it adds complexity to delivering the existing program of vaccines. Sometimes they can be combined in the same injection with other common vaccines, but other times the delivery schedule doesn't allow them to be given, even in the same visit. And with this malaria vaccine, it seems to require at least three probably four doses, and three of those doses can be given, at least at the same time.

**Dr. Patrick Kachur:** [00:20:40] It's a separate injection, but at the same time as many of the other childhood vaccines. But the fourth dose really requires that children come back for another visit when they're 18 months or two years of age. And so, I think the challenge has been trying to figure out whether or not it would be possible to get enough children and their parents to bring their children back for an additional visit. And what we've been able to see in in really just the last few months, the World Health Organization looked at some data from three countries Malawi, Kenya and Ghana, where they've been introducing this vaccine and trying to get a sense for how well it can be delivered and how well it seems to be working, as well as how safe it is when delivered at scale. And they're beginning to show that at least through the first three doses, it can be effectively delivered, and it seems to be relatively safe and have an impact on reducing malaria. That's similar to what was seen in earlier experimental trials. So, I think the World Health Organization and its advisors are ready to recommend implementation. Even while we continue to collect data on how important that fourth dose is and how effectively we can motivate people to come back together.

**Madeleine Hum:** [00:22:30] So a few more questions on the rollout of the vaccine. What is the plan for the rollout? Will it be condensed to certain countries or more spread out to cover large areas? If you could give us more insight into the details and logistics.

**Dr. Patrick Kachur:** [00:22:42] Yeah, I think that's to be decided just yet. It will take time for the global, for the manufacturing capacity to reach the global mean for all children in Africa. So, I think there is an interest on the part of the global community to make sure that those countries that participated in the initial trials are able to introduce the vaccine and certainly those families who enrolled their children in the most recent round of studies and were randomized to the comparison group where they got where they didn't get a malaria vaccine. The priority will be providing them those study participants with vaccine doses first, and there is definitely from the very start of the study design. The capacity to produce and distribute vaccines to those study participants has been kept in mind. But I think it will be. A matter it will have to be a phased expansion, and I think that one thing is relatively clear and that is that the global financing mechanism for vaccines called the called Gavi or the global vaccine, the Global Alliance for Vaccines and Immunizations, is looking at what it would cost to procure the vaccine and what the supply capabilities are going to be in the coming years. And they'll work with countries that

apply to introduce it in an effort to make sure that as we start to introduce it, we learn as much as we can about what are the most efficient ways of delivering it, knowing that it will take several years for the full-scale capacity production to be achieved. The company that has the ownership of the vaccine, GlaxoSmithKline or GSK, has also entered into. A partnership with an Indian pharmaceutical company to increase production not only in the northern countries, but also in southern malaria affected countries as well.

**Madeleine Hum:** [00:25:42] Kind of related, but on a separate note, COVID 19 has passed many travels bans and restrictions, so getting help and resources to Africa has been difficult. So how will COVID 19 affect the malaria vaccine rollout and the malaria epidemic in general?

**Dr. Patrick Kachur:** [00:25:55] Mm hmm. We were certainly worried about this when COVID 19 was first recognized as a global pandemic and from past experiences when the Ebola virus outbreak occurred in West Africa and restricted movement there and undermined confidence in the health systems in those countries. We saw a big impact on people's ability to come for malaria treatment and diagnosis, and we saw as many as many deaths from malaria as probably from Ebola over the course of that infection. I think we were concerned that with the. Uh, shutdowns and restricted movement and in some cases, closing of health facilities, except for COVID in some highly affected areas. That that was going to adversely affect malaria and in actual fact, it did disrupt malaria care and prevention services in a lot of countries. But that was relatively short lived. And I think the World Health Organization and its partners made a concerted effort to ensure that childhood immunization programs continued that distribution of malaria mosquito nets continued that routine care and treatment for pregnant women, for small children, for people with illnesses that all of those continued. They were disrupted in many countries for three or four months in early 2020. But in many places, they've started to bounce back and the challenge will be is as the as the COVID epidemic is felt, unless it is unless the progress of the COVID epidemic is slowed further in malaria endemic countries by making COVID vaccines available for their health workforce and for their populations, then there is the threat that that widespread transmission of COVID could again disrupt those systems. Our progress against malaria over the last two decades is really impressive. We've saved more than seven million lives even before the vaccine is available, but it's also very vulnerable progress that we've made. And so, disrupting our ability to get mosquito nets out there to get diagnostic tests and treatment drugs out there and get them to the people that need them is really vitally important.

**Madeleine Hum:** [00:29:16] And it's wonderful that we now have this malaria vaccine and that COVID 19 did not greatly disrupt the strategies and resources to reduce malaria. And thank you so much for being with us here today, Dr. Kachur.

**Dr. Patrick Kachur:** [00:29:27] No, I'm really happy to talk with you and thank you so much for your interest.

**Madeleine Hum:** [00:29:32] It was great to learn more about the malaria vaccine, and we are excited to see the improvements in the in the malaria epidemic as the vaccine begins to be delivered in Africa. If anyone is interested in learning more about the malaria epidemic and the vaccine, please visit the World Health Organization in the center of disease control websites.

