# When Science Finds a Way

## Season 2, Episode 6 Combating cholera: can technology really turn the tide?

### Show notes

#### Episode description:

Despite efforts to eliminate cholera by 2030, it remains a formidable global threat. Could technology hold the key to combating this deadly disease? Alisha sits down with Professor Iruka Okeke to talk about the factors driving cholera's spread and the innovative mapping techniques being used in Kenya to identify hotspots.

#### Mentioned in this episode:

<u>Cholera</u> - an acute diarrheal infection caused by consuming food or water contaminated with the bacterium *Vibrio cholerae*.

Kenya Medical Research Institute (KEMRI) - national body responsible for carrying out research in human health in Kenya.

<u>Waterborne diseases</u> – waterborne diseases are caused by drinking or coming into contact with contaminated water. Increasing temperatures caused by climate change increase the risk of waterborne diseases.

<u>Cholera vaccines</u> - a new generation of vaccines could help control outbreaks and protect people's health.

#### (Music starts) 00:00

**IRUKA CLIP 00:06** - "Every little step you make in controlling cholera can have a huge impact. If you think about the fact that every cholera case is somebody who's eating or drinking Vibrio cholerae and falling sick, if you can just prevent one person eating and drinking cholera, you saved more than one person."

#### Alisha Wainwright 00:28

Welcome to When Science Finds a Way - a podcast about the science changing the world. I'm Alisha Wainwright, and I'm here to tell you about the ideas that are actually making a difference at a local level right now. And as we'll discuss today, these ideas don't have to be complicated to be transformative.

We're going to hear from Kenya, where an innovative research project mapping cholera outbreaks, has led to simple but effective solutions on the ground, and has got policymakers on board as well.

You may not realise, but according to the World Health Organization, we are currently in a cholera pandemic, which began in 1961. In 2023, the number of cases topped half a million globally - a 13 percent increase from the year before. And while the highest number were

reported in Asia, it's in Africa where the largest proportion of patients are dying from the disease.

So, what do we know about cholera? And how can science work with communities to reduce transmission? Professor Iruka Okeke is a microbiologist from the University of Ibadan in Nigeria, who specialises in why bacteria colonise humans, cause diseases, and gain drug resistance. I'm delighted to welcome her to the podcast to discuss the global prevalence of cholera and the technologies and research methods which are helping us to combat it.

#### (Music ends)

Iruka, thank you so much for joining us.

#### Iruka Okeke 01:55

Hi Alisha, thank you for having me. It's a pleasure to be here.

#### Alisha Wainwright 01:59

Iruka, for anyone listening who maybe has heard of cholera but doesn't know much about it, can you tell us what the disease is and how it affects people?

#### Iruka Okeke 02:09

Yeah, cholera is a very severe diarrhoeal disease. It causes huge amounts of liquid to be flushed out of the body, either as stool - the stool is so dilute that it looks like rice water and in health facilities it's referred to as rice water stool - and vomiting. It's caused by a bacterium known as Vibrio cholerae - the O1 type of strains of Vibrio cholera produce this exaggerated diarrhoea.

And because so much fluid is lost so quickly, cholera can cause death due to dehydration in a matter of hours if no intervention is made. However, if cholera is diagnosed promptly, it is actually possible to treat and cure the disease.

#### Alisha Wainwright 02:56

How do you treat it?

#### Iruka Okeke 02:58

Uh, the very first and most important thing to do when someone has cholera is to replace the fluids that they're losing. So normally, oral rehydration fluids are given, and if the patient can't keep them down, then IV lines - very fast IV lines, faster than you would get for any other condition – are put into the patient's veins so that fluid can be pumped in very quickly.

#### Alisha Wainwright 03:25

How has the global picture evolved over the last 100 years in terms of where cholera outbreaks are most concentrated?

#### Iruka Okeke 03:33

Yeah, cholera is one of those diseases that's known as a neglected disease. It's a disease that has plagued humans for, actually, centuries, but for which there have been very few resources and investments in dealing with the disease.

If you think about COVID 19 - a disease that first existed in 2019, 2020 - and you think about all the diagnostic tests, all the drugs, all the vaccines that are now available for this new disease, and compare that to cholera that's been around for centuries.

And I mean, luckily, we do have effective vaccines now. We do have effective diagnostics. But most of that came to be in the last 20 years. Most people that get cholera are in Africa and South Asia. They live in places where there isn't access to good sanitation or safe water. And they get cholera essentially by drinking down the bacteria, typically after it has been stooled out by somebody else who has cholera.

#### Alisha Wainwright 04:35

So how are human movement, conflict, and climate change playing a role in the spread of cholera outbreaks?

#### Iruka Okeke 04:44

First of all, for someone to be at risk of cholera, a common theme is that they don't have access to water and sanitation. And when people have to move without planning - even if they did have access to water and sanitation at home - they may not have it when they are refugees. And so that kind of migration places a number of people at risk and brings them together, increasing the chance that cholera will spread from one person to another.

Cholera is one of the diseases that we're very worried about in terms of what will happen with climate change. First of all, increasing rainfall means that stool from improperly built sanitation systems or open defecation - and it may surprise you in some parts of Africa, 20 percent of the population is using open defecation as their toilet system - so that means going to toilet with no toilet.

#### Alisha Wainwright 05:46

Sure.

#### Iruka Okeke 05:46

So, when the rains increase, what happens then is that the runoff from open defecation can get into people's water. And what we anticipate is that climate change - with the increasing flooding that we're seeing - will exacerbate this - you're going to have more water that is contaminated from unsafe sanitation. So that's one thing.

The other thing, though, is that, with climate change, we're seeing increasing temperatures. Bacteria do very well when the temperature is above 30 degrees. They do less well when it's cooler. And so, bacteria like Vibrio cholerae are going to be more comfortable in the environment as it gets warmer.

And finally, even though water, increased rainfall and flooding is a risk, drought is also a risk. Because when there isn't enough water, people are more likely to drink risky sources of water. It's even possible that the amount of bacteria in available water will be more concentrated. Now this is particularly important for cholera because what is referred to as the infectious dose - the number of bacteria you need to drink to get sick - it's actually quite large for cholera. So, if you have cholera in your water but you didn't drink enough of it, you might be safe. But if the cholera bacteria are concentrated in the water, then you have a greater chance of falling ill. So, for all these reasons, climate change can actually exacerbate the risk from cholera.

#### Alisha Wainwright 07:19

In many countries and continents, cholera is a disease which people might associate with the 19th century, not the 21st century. So why do we still see cholera outbreaks and deaths happening if it's as treatable as just getting fluids into people?

#### Iruka Okeke 07:35

Yeah, the existence of cholera and the failure to treat it, are symptoms of some very basic facilities not being there. If you can provide everyone with safe water and safe sanitation, then even though Vibrio cholerae bacteria are present, they won't be able to get into humans and then you won't see cholera. So, when you see cholera being very common in certain locations, it's often because water and sanitation are not up to scratch. This is certainly the major thing that's driving cholera outbreaks in Africa today.

The second thing is that, as I mentioned earlier, cholera is actually very easy to treat. Cholera is one of the few diseases that you're allowed to - in an experimental situation you're actually allowed to infect patients and see if trial medications will work. Because it's known that if patients are infected in a controlled situation, they will always recover. And so, when people die of cholera - when people don't recover from cholera - it's a symptom of a health system that's not working. So, cholera itself is a horrible disease, but when it appears, it's a manifestation of things that may be wrong with water, with sanitation, or with the health system.

#### Alisha Wainwright 08:51

I think that's really interesting and also takes the onus off of the people or something just sporadically happening and really puts the onus on the environment in which it is thriving, to kind of step up and have better options for people.

When we look at the continent of Africa, in which countries does cholera regularly appear? In other words, where is it endemic?

#### Iruka Okeke 09:16

Yeah, it varies, but in recent years - certainly in the last two years or so - we've seen a number of outbreaks in Eastern and Southern African countries, and a few West African countries, including Nigeria - which is where I live.

#### Alisha Wainwright 09:30

Okay, so let's go now to Nairobi in Kenya, a country where cholera is endemic. Since 2014 the country has experienced numerous large-scale outbreaks - the last was in 2023 when over 12,000 cases were reported to the WHO. And nearly two patients out of every 100 died from the disease. Outbreaks here often spread to the rest of the region. One of the many places they start is Mukuru informal settlement - a two-kilometre square plot of land in the southeast corner of Nairobi, which houses around one-hundred and fifty thousand people.

They mostly live in temporary structures made of tin and other metals with inadequate water supplies and drainage. Meshak Ong'ori has lived here for over 20 years, and he showed us - through a translator - some of the problems with the water supply that can leave people vulnerable to cholera.

Meshak Ong'ori 10:30 Swahili, fading to

#### Translator

So he says this water is very contaminated because it comes from far. It is supplied by the municipal council. It comes in pipes. And where the pipes pass through, they pass through open sewers. For example, this is an open drain. You can see some, some pipes that, uh, passing through here - those are pipes that are bringing the water here, actually - and sometimes they can leak. So even if the water is treated from there, by the time it gets here,

it's already contaminated. Then many people also do not have toilets here in Mukuru, so these drains will be contaminated also with faecal matter. And because of that, then you'll find the disease-causing germs here that may lead to diarrhoea.

So this boy here is his son and when he was young he started getting diarrhoea - the rice water diarrhoea. At first, they didn't know what it was but then they went to the hospital and they were told that it is cholera. So, they went, and they were managed and the boy survived and came back home.

#### Alisha Wainwright 11:43

Okay so first of all I just want to take a beat and acknowledge the privilege that I have in my life, that when I open my tap and drink water through my municipal system, I'm not getting sick. We heard that even there in a municipal tap, you can still get contaminated water via connections that can run through sewage drains. And this is probably just one of the many ways that the bacterium can spread, right?

#### Iruka Okeke 12:12

Yeah, absolutely. Um, you know, sometimes when people have cholera, they get blamed for being, you know, dirty, so to speak.

#### Alisha Wainwright 12:22

Right.

#### Iruka Okeke 12:23

And, you know, they're doing the right thing - they're getting the water out of the taps.

#### Alisha Wainwright 12:26

Yeah.

#### Alisha Wainwright 12:27

Now, um, in, in many, uh, places where cholera is endemic, there is even no piped water. Certainly, in Ibadan City - which is where I live - many households do not have access to piped tap water and many have invested a huge amount of money digging wells or boreholes, so that they can exploit groundwater. But that requires those wells and those boreholes to be dug properly, to be protected, to be monitored, to be far enough from soakaways and pit latrines that are putting in waste - and many of these controls actually don't exist in Ibadan. In fact, we have found that many of the groundwater sources are actually fecally contaminated, which means that if there is a cholera outbreak at any point in time, they will be vulnerable.

#### Alisha Wainwright 13:14

So how can science help us better understand why outbreaks occur?

#### Iruka Okeke 13:18

I think one area where science is making great progress now compared to a few decades ago, is that there is better surveillance for cholera. Once you do have a cholera case and people can be notified about it, then they know cholera is in the area. And this means everybody has to take enhanced precautions - boiling water, getting vaccinated if that's an option. So surveillance is one way that science has actually managed to protect people from cholera. Outbreaks today are smaller because of good surveillance.

Another way now, is that there are now oral vaccines that are effective and can protect people for a few years from cholera. So that means that if there's an outbreak in your area, you can get vaccinated and be protected from that outbreak and another outbreak that occurs.

Unfortunately, there are limited supplies of these vaccines. And so, we really do need to get the supplies up so that everybody who's at risk can get the vaccines. But the vaccines are another thing that scientific research has brought us in the last couple of decades.

#### Alisha Wainwright 14:30

Okay, well, cholera is normally a disease associated with the wet season in Kenya. But in Mukuru and other informal settlements, it also started to appear in the dry season. And that got the team at the Kenya Medical Research Institute - known as KEMRI - concerned and intrigued.

Led by microbiologist Professor Samuel Kariuki, they launched a study to investigate what vehicles or risk factors were most important in transmitting cholera in Mukuru so they could better understand how and why it spreads. To do this, they turned the entire settlement into what they called a demographic surveillance site.

#### (music, into)

Samuel told us about their methodology and what it showed them.

#### Professor Samuel Kariuki 15:19

At the beginning of our study, we go to the 32 blocks that make up the two villages that we work in, with a total population of nearly 150,000. And we ensure that we go from house to house, asking questions regarding, for example - how many children are within the household? What kind of illnesses have you been reported in the last two weeks or one month or so?

So, if a patient then comes and reports to our health care facility with symptoms that we suspect are cholera, we can then follow them back to their homes, where then we go and take water samples, we take soil samples, we take samples from the siblings and from the guardians within the household. And we subject all these to microbiological analysis, and we want to see the dynamics of transmission within the household and the community.

And utilising our genetic tools for analysis, we can also be able to determine whether, within certain households that are close together, there has been cross contamination and, cross transmission of disease between households and between different blocks. We carried out this study utilising an epidemiological tool that we call Sanitation Pathways Assessment. And among these we found, uh, we investigated a total of 12 different pathways. When we investigate the various pathways that are most crucial or important - in terms of environmental contamination and persistence of cholera in the environment - and then the transmission of cholera from the environment to humans, we map those hotspots where we find the most cholera in terms of quantification.

And we actually literally map those hotspots on a map and then follow up patients to those hotspots. And we can be able to clearly attribute high numbers of clinical cases to hotspots. And we are able to show clearly that some of the pathways were more important than others in terms of one - perpetrating cholera in the environment, - but two - in transmitting this cholera to vulnerable persons who came into contact with these pathways.

We found that the children who are most exposed to surface water, especially on their way to school and back from school. Secondly, in terms of contamination for children, was drinking water. But when they store this water in their homes - because they store it in open containers - you'll find that there's a lot of contamination because they fetch with open cans and there's a lot of dipping of hands in the containers, and that led to massive contamination of water used within the household. For the adults, the most important contamination route that we found important was street foods. So, in general, we assessed a total of 12 pathways, but three of them was the most important.

#### (music, into)

#### Alisha Wainwright 18:44

Studies like this can help us better understand how and why outbreaks are occurring.

As a microbiologist, is there anything specific we know about the cholerae bacterium which might help us understand its continued prevalence in sites like Mukuru?

#### Iruka Okeke 19:01

Well, first of all, cholera is an organism that is very, very comfortable in water.

It's actually a marine organism - the Vibrio cholerae bacterium - it prefers to live in water. And so, this means that as we understand what allows cholerae to persist and live well in water, potentially we can do things about preventing the spread of the bacteria. There's a study done in Asia - several decades ago - that found that you could actually filter out the cholerae in the water using saris.

#### Alisha Wainwright 19:34

Oh, wow.

#### Iruka Okeke 19:35

Now this sounds a bit strange because bacteria are so small and you'd expect them to go through the holes in the fabric. But in actual fact, Vibrio cholerae doesn't float around on its own - it hangs on to other things, like copepods, which are larger organisms that live in water. So, they were able to find that they could filter out the Vibrio cholerae, not because they were filtering out the bacteria, but because they were filtering out the things that Vibrio cholerae was holding onto.

So if we understand the ecology of the Vibrio cholerae, we could devise easy and cheap ways to be able to break transmission chains.

#### Julia Gillard 20:15

Hello! I'm Julia Gillard, chair of Wellcome. Thanks for listening to our podcast, When Science Finds a Way. Wellcome supports researchers around the world to make discoveries and help solve urgent health challenges. We believe in the power of science to build a healthier future, and the need for inclusive collaborative action to ensure that everyone can benefit. To get involved, visit wellcome.org, that's Wellcome with two I's. Now, back to the story.

#### Alisha Wainwright 20:48

Okay, well, all of this data gathered by Samuel and his team was not just for the purpose of understanding cholera and how it was spreading, it has also led to some novel solutions of how the risk of transmission in Mukuru can be minimised and the likelihood of outbreaks reduced. He told us about the recommendations they were able to make for interventions in the community.

#### (music, into)

#### Professor Samuel Kariuki 21:13

We convened a meeting with the municipal council, and actually for the last three years, they have been on the ground improving drainages.

We have now, new roads that are there - improved roads - but amongst that also is a level of improvement of concrete drainages within blocks of households to drain away surface water. Secondly, within the household, we devised a system where we bought a number of large containers with a stopper or a lid that they can use to shut the opening once they fill water. And then at the bottom, we fabricated a tap that could be used to open and close water, when they're fetching it within the household.

The most important intervention here in the short term, is vaccine intervention. The Minister of Health heeded our call, and working together with UNICEF, they got a donation of nearly 2 million doses of oral cholera vaccine. We were able to roll out the vaccine - starting with the most vulnerable groups - at the hotspots where we found most of the cholera cases.

So far, we've been able to significantly reduce the total caseload reporting to hospitals with cholera. But in the longer term, then the interventions that need to improve water, sanitation and hygiene conditions and infrastructure must be attended to.

#### (music, into)

#### Alisha Wainwright 23:10

Wow. It's amazing how many interventions they were able to action as a result of the data that they collected - and we'll talk about the vaccine more in a minute. But in terms of the other solutions he mentioned, there's more - they also came up with new food storage containers for street food vendors and ran information campaigns in schools, and around buying and storing food. These might seem like small changes, but they really can make a big difference, can't they?

#### Iruka Okeke 23:39

Yes, I think every little step you make in controlling cholera can have a huge impact. If you think about the fact that every cholera case is somebody who's eating or drinking Vibrio cholerae and falling sick, if you can just prevent one person eating and drinking cholera, you saved more than one person because that person would then pass out the bacteria and infect other people. So, things that may look small can actually have big impact. And the nice thing about some of these interventions is that in addition to blocking the transmission of cholera, they will block the transmission of other waterborne diseases.

#### Alisha Wainwright 24:17

Meshak, who we heard from earlier, has firsthand experience with one of these interventions - a new water container to collect and store his water and he showed us how it works.

#### Meshak Ong'ori 24:41

This is what they do usually. I put it here.

#### Into Swahili

#### Translator

So, this is the jerry can that he uses to, to put water. This is the jerry can that they were given by KEMRI project.

Meshak 24:56 That I was given by KEMRI, yeah.

#### Translator

Yeah, he was given by the KEMRI project. So, what he does is that he boils the drinking water and puts it in this jerry can or treats the water using the treatment tablets – the aqua tabs - and puts it here. Then he drinks it from there.

#### Meshak 25:10 English into Swahili, fading to Translator

He says that initially he used to use this jerry can - he gets the water from outside, puts it here and then he could scoop the water and drink it directly. But now, this improved jerry can - this jerry can has a tap - because now instead of scooping it from the, from the jerry can itself, hence introducing infection, they get it from the tap directly.

So, for the last six months, they are saying they have not had an outbreak. But two months ago, they had a suspect cholera case, and they called the KEMRI team so that they could come and pick the samples for confirmation.

#### (music, into)

#### Alisha Wainwright 26:01

It's so great to hear what a positive impact these changes have made. And we heard earlier from Samuel about the oral cholera vaccine as well. And he explained his research helps lead to the purchase of 2 million vaccine doses. And this is such an important part of the jigsaw puzzle, isn't it?

#### Iruka Okeke 26:19

Yeah, absolutely. I think vaccines can really help reduce the size of an outbreak. If you can vaccinate people around an outbreak, then you make sure that the most vulnerable people are protected from the disease.

The good thing about oral cholera vaccines - the ones that are available right now - is that they protect for about five years. And so that means that even if you're vaccinating to protect from a particular outbreak happening now, it means that if there's an outbreak next year, that person is protected as well.

I also wanted to point out the fact that the mapping has actually helped them to use the vaccines judiciously - there's a short supply of vaccines and so if you know where your hotspots are, then you can make sure that the people who are most at risk are prioritised for vaccine use.

#### Alisha Wainwright 27:08

Yeah, that's a really good point.

#### Iruka Okeke 27:10

I think vaccines, though - as Sam Kariuki rightly said - I think they're a good solution for now, but we really also need to move on the water and sanitation.

In the first place, we're going to have to come back with vaccines in another five years if we don't deal with the root causes of the cholera outbreaks. And secondly, if we can improve water and sanitation, then we can prevent the spread of other diseases that may not be as severe as cholera but are also detrimental - particularly for children who are growing.

#### Alisha Wainwright 27:42

As you said earlier, there have been challenges with the shortages of the vaccine, especially as they need to be topped up after about five years. Can we accelerate vaccine development to ensure supply meets demand.

#### Iruka Okeke 27:56

Absolutely. I think as a global community, we need to be making more vaccines. Of course, it's difficult to predict how many vaccines you need. And if you make more, then they will go to waste because they do have an expiry date. That being said, when you have a shortage of vaccines, then you need more because less people are protected - so, there is a careful balance that I think we need to understand. And it's possible that mathematical modelers could actually help us determine how many vaccines should be made.

The other thing is that the oral vaccines that are available now, are vaccines that can be produced in manufacturing facilities that are not that high tech. And I think we really need to think about commissioning more of these facilities around the world just to make sure that more vaccines can be produced at short notice when needed.

The reason why oral vaccines are so useful - particularly for a disease like cholera - is that unlike injectable vaccines, you don't need a nurse to give them. So, if a vaccine is injectable, that means getting it to a remote area where there aren't clinics and there aren't nurses and doctors, becomes harder. But oral vaccines can be given by a community health worker - it can be given by anybody essentially once they have the directions.

#### Alisha Wainwright 29:16

Well, Samuel's team's project wouldn't have been possible without the help of health promoters, who they call CHPs, who are embedded in the community. Meshak is one of those community links, and he spoke to us about what his role involves and why it's so important.

#### Meshak Ong'ori 29:35

Swahili, fading to Translator

So, he says that he works in the community. He goes to where people are gathered, either for political meetings - Mbaraza is like where many people are gathered, called either by the village leaders. He goes there and educates people about the importance of treating water - why they should not take water that is not treated. So, they normally listen to him because they are all living in this community. So, they normally listen to him because they have also seen and some of them have gotten cholera as well in the past.

He likes teaching and he loves doing his job because he has been affected before by cholera and he knows what it feels like and what it is like. They play an important role because the KEMRI people do not know here, and also, the other ministry people do not know the community. So, when there is a case - a suspect case within the hospital - they are the ones who are normally contacted, so that they show the health care providers or the KEMRI people where this patient is.

And especially when there are also children who are diarrhoea ridden within the community, the community members know them - the community members know Meshak is the CHP of this area. So, if there is anything that is suspect - health related - may it be TB, may it be diarrhoea, may it be cholera, something like that - Meshak is the first one to be called by the community. Then they'll call either the hospital or they'll call the KEMRI, to be able to intervene.

#### Alisha Wainwright 31:05

You can hear how Meshak 's relationship with the local community is so important in being able to get people to listen to public health messaging, but also in reporting any suspected cases. How vital are health workers in preventing outbreaks?

#### Iruka Okeke 31:21

I think access - for everyone - to information that can prevent disease and to care, is essential. Even though we do have, globally, a shortage of health workers, formerly trained health workers like doctors and nurses - many other people who are just as motivated - can fill in and be supported by a health system. Having community health workers like Meshak, who we've just seen, is vital for ensuring that people are protected from disease and can do something about it when they're sick.

#### Alisha Wainwright 31:54

Why is the granular mapping carried out by Samuel's team also so important?

#### Iruka Okeke 32:01

I think mapping diseases is very important, from many, many points of view - and in particular for cholera. First of all, when we have a cholera outbreak, we need to understand where it came from and then work to break the transmission chain. The mapping information can help us do that.

If cholera outbreaks are occurring again and again in the same place, then we can identify a high-risk source and protect people from that source - so that's also important. And then when resources are limited and when we need to focus resources on particular areas - those resources could be things like health workers or vaccines - knowing where more people are infected or knowing where people remotely are infected, and then creating a way for them to be able to reach healthcare, is very important. So, all of this is information that mapping will derive.

As time goes on, as our climate changes, we can look back on the mapping data and see whether things are getting better or worse, by mapping again and again and again. So, getting that longitudinal information is also important for us to understand how a disease is spreading and also how it's changing.

#### Alisha Wainwright 33:17

How could this, combined with African-led R&D and vaccine development to respond to future cholera outbreaks.

#### Iruka Okeke 33:26

I think we're at an interesting juncture in science - there are technologies like genomic technologies that have made it possible for African labs to be able to finally map diseases in a way that just wasn't possible 10 years ago.

Also, we can create vaccines faster now - I mean, we saw the COVID pandemic where vaccines were created within a year. We can tweak existing vaccines - so if a vaccine ends up not working as well in a few years' time, it can be tweaked very easily using modern technologies. And so, I think it's very, very important for those of us who are doing science in Africa, to have access to these techniques and methodologies, so that we can respond to the diseases that are endemic in our countries.

#### Alisha Wainwright 34:13

As you mentioned earlier, over 50 institutions - including NGOs, universities and UN agencies - have come together to create the global task force on cholera control, and their ambition is to end cholera or at least see a 90% reduction in cases by 2030.

From your perspective, what are the key priorities or strategies for effectively combating cholera in endemic regions like Kenya?

#### Iruka Okeke 34:42

It's a very ambitious goal. It's also a goal that we should have had a century ago.

#### Alisha Wainwright 34:47

Yes.

#### Iruka Okeke 34:49

So, um, the good news though is that in the last couple of decades towards this goal - in part towards this goal - there have been a lot of developments in the field of cholera. We now have a lot of tools that we didn't have before. We now have a better understanding of where the bacteria are and when they are there.

So, this is actually, uh, on the one hand an ambitious goal, but an achievable goal. And my real hope is that we'll keep the momentum until 2030. We can use those stopgap methods to do something very quickly about the disease, while we're building in the more long-term interventions that can help eliminate it altogether.

So, using vaccines, using better water collection devices and storage devices as we saw earlier, mapping the disease very carefully - these are methods that are going to help us to get to that 90 percent reduction that the global task force on cholera control is aiming for. And then improving our water and sanitation could easily help us get rid of cholera altogether.

#### Alisha Wainwright 35:59

Well, either approach, I'm grateful to have both. And I hope that all of these temporary, but incredibly effective solutions, push us towards that goal by 2030. And thank you, Iruka, so much, for this really in depth and expansive conversation about cholera and the strategies to combat it. I really appreciate your time.

#### (Music starts)

#### Iruka Okeke 36:24

Thank you, Alisha. It's a privilege to have had the opportunity to talk about cholera. It's such a neglected disease and so it's nice to get the word out about it.

#### Alisha Wainwright 36:35

Thanks for listening to When Science Finds a Way. Thanks also to Professor Iruka Okeke, Professor Samuel Kariuki, and community health promoter Meshak Ong'ori.

I think this conversation really made me appreciate the role science can play in - not only better understanding infectious diseases - but also delivering effective interventions and strategies to help prevent them from occurring in the first place. And this isn't work scientists do in a silo - working with communities and with health workers has to be key in making that happen.

When Science Finds a Way is brought to you by Wellcome - a charitable foundation that supports the global scientific community, working to build a healthier future for everyone.

Infectious disease is one of Wellcome's priorities, along with mental health, climate and health, and discovery research.

If you visit their website, Wellcome.org/podcast - that's Wellcome with two L's - you'll find a whole host of information about infectious disease, as well as full transcripts of our episodes. It's also where you'll find the episodes about infectious disease from season one of our podcast, or just scroll through the series on your podcast app, and you'll find it there too.

If you've been enjoying When Science Finds a Way, be sure to rate and review us in your podcast app. You can also tell us what you think on social media - just tag at Wellcome Trust - with two L's - to join the conversation.

Next time, we'll be finding out how a large-scale research project into cancer genomes is improving outcomes for patients.

**Dr Peter Campbell CLIP 38:15** "It's a little bit like the kind of revolution that, you know, having a microscope brought to looking at cells, right? You suddenly went from having no idea of what was going on - at a sort of cellular level - to suddenly seeing all this stuff. It was the same for the genome - we were able to see things in these genomes that had never been seen before."

#### Alisha Wainwright 38:35

When Science Finds a Way is a Chalk and Blade production for Wellcome.

(Music ends)