EPISODE 13: PATHS TO A DISEASE-FREE WORLD: CONTROL, ELIMINATE, ERADICATE

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Garry Aslanyan [00:00:08] Hello and welcome to the Global Health Matters podcast. I'm your host, Garry Aslanyan. Infectious diseases have had a profound effect on the health of millions of people. They also have detrimental effects on economies of many nations which can lead to a cycle of poverty. The ultimate goal of public health is to control, eliminate and finally eradicate diseases that pose a threat to human health. Only two diseases worldwide have been successfully eradicated, which means having achieved permanent reduction to zero of incidence of infection. These two diseases are smallpox in humans and rinderpest in animals. Yet many more diseases pose health risks. The World Health Organization has declared this decade the decade of elimination and proposed a multi-disease elimination approach. For today's episode, I spoke to three stellar public health leaders on the value of control, elimination and eradication, and the opportunities and challenges associated with each. First, you will hear from Uche Amazigo about the lessons she learned during her tenure as the Director of WHO's African Programme for Onchocerciasis Control from 2005 to 2011. Uche will be followed by David Reddy. David is the Chief Executive Officer of the Medicines for Malaria Venture, where David will discuss the new and exciting innovations in disease elimination. We end this podcast with a conversation with Aidan O'Leary, the WHO Polio Eradication Director. Aidan makes the case for the value of pursuing the zero end-goal. Let's listen to Uche first. Hi Uche, how are you today?

Uche Amazigo [00:02:11] Hi Garry, I'm fine. Thanks for inviting me to this discussion.

Garry Aslanyan [00:02:17] Uche, you often tell the story of where your passion started for eliminating river blindness. If I recall correctly, back in the early 1990s, you visited some of the most remote villages in Nigeria, where you experienced first-hand the social and economic impact this disease had on women. In 2005, you became the Director of the WHO African Programme for Onchocerciasis Control, otherwise known as APOC. How did these meetings with local communities influence your thinking about how elimination can be achieved?

Uche Amazigo [00:02:55] My initial experience with women in rural villages influenced my thinking. Now, I just want to take you back, Garry, to a statement made in 2009 by a community member. The village leaders and parents have good that health staff who visit us think for our leaders and plan health initiatives for my village. They preach, we, the people, are the heartbeat of the health system. But we are not involved in decisions and have no authority to contribute, to ask questions or modify health providers' plans for providing our health. The meeting taught me the importance of listening to people, including those who are uneducated, engaging the poor and target the beneficiaries of programmes, to co-design ways to implement and improve their health. I think we need more research on the value of listening to the poor and building trust. Meetings with rural women and later with community leaders, changed my perception about, is this prevention? Treatment strategies? Is this control and elimination, at least in sub-Saharan Africa? I was not comfortable with the Global North and health systems defined approaches to health care delivery and began to search for other ways to assist the rural poor so they can have better access to health. Today, I consider the degree of involvement or engagement of beneficiaries as the most essential ingredient of success in health.

Garry Aslanyan [00:04:46] And of course, community involvement became a very important component of your onchocerciasis or river blindness elimination strategy through community-directed treatment, and in global health there is now, I feel, a bigger understanding and push toward communities being the owners of their own health and how best to engage with them actively. How do you see going forward this approach evolving, from your experience, Uche?

Uche Amazigo [00:05:15] With the current great push towards actively engaging the poor and communities in health, scientists and public health experts in developed countries have made exceptional pioneering discoveries of vaccines for smallpox, for polio and now to fight the COVID-19 pandemic. On the contrary, in sub-Saharan Africa, vaccination and delivery systems for tools and medicines to treat diseases of poverty have lacked the same effectiveness as seen in the production of vaccines. Those public health experts often say that the tools are available, but delivery has remained the daunting challenge. Why is this so, I keep asking. For more than three decades, very few delivery systems in sub-Saharan Africa have been effective and widely sustained. If we go back to 1998, the Alma-Ata Conference called for a PHC with strong community engagement, yet, since 1998 countries in sub-Saharan Africa do not have strong PHC (primary health care) programmes with strong community engagement as was advised during the Alma-Ata conference. In sub-Saharan Africa, we are able to create systems and strategies that work, but we make less effort to improve and sustain our own locally designed delivery systems. A good example is the community directed intervention. The community directed intervention was designed by African communities. The implementers were the communities, African researchers, African scientists and African health workers. Why is this strategy not being widely scaled up? At the beginning of the COVID-19 pandemic, this strategy would have been useful to increase vaccination acceptance by communities, including communities in sub-Saharan Africa that are in difficult to reach settings. But we did not do that. This is why we argued in the PLoS NTD article last year that we are convinced the community directed distributors of the CDI programme, because they are selected by their community and trained by health workers and their experienced foot soldiers and some were involved in the Ebola crisis. So we can leverage them and support health workers in the ongoing COVID-19 crisis. And I think this would be very useful.

Garry Aslanyan [00:08:00] Uche, research was an integral part of your elimination strategy as well when you worked on the River Blindness Elimination Programme. Maybe you could share with us what forms of research you employed and also what additional research you think is needed to support the development of innovative tools for elimination.

Uche Amazigo [00:08:21] The first research in the nineties I used the social science method, but going forward we used the implementation research model. We trained many African researchers and scientists based in universities and institutions on how to do implementation research, the value of implementation research. We used the tools for participatory monitoring. And that's for me the interesting part of the work we did. Implementation research gave us the opportunity to develop tools that will allow communities to participate in monitoring community directed treatment with ivermectin in their own communities and be part of even writing the report. Implementation. Research has been really key. But going forward, to achieve elimination of any of the NTDs, we need better diagnostic tools. We need appropriate tools for surveillance and to increase country's technical workforce and capacity for rapid detection of changes in the epidemiology of diseases and also detection of recrudescence.

Garry Aslanyan [00:09:37] That's interesting and good reflection, Uche, particularly the use of implementation research and now having that surveillance approach and with better tools, a very important part of this. Maybe we can come to the last question, Uche, which can be a bit controversial. Considering the benefits of achieving elimination, which we talked about and it's really needed, do you

think low- resourced countries should push further and put more resources to achieve eradication of diseases?

Uche Amazigo [00:10:15] My suggestion here would be for each country to go first and achieve elimination. Once that has been achieved, there is no reason for that country not to push further for eradication because the tools that we use to achieve elimination will help as well to achieve eradication. I don't believe it is prudent for any country to aim at eradication without first aiming at elimination, particularly for the NTDs. I would ask them to use the step-wise approach first, go for elimination and once the World Health Organization has endorsed and cleared you certified elimination, why not, the country should then move towards eradication.

Garry Aslanyan [00:11:06] So this should be a process of policy choices within a country?

Uche Amazigo [00:11:12] Exactly. And that should be country-led. And so there would be the need for increased political commitment by any country that would like to go for eradication. The funding for such effort should not be dependent on donors. That any country that goes for eradication must set aside sufficient funding that would be required to achieve eradication. Without that country-led political will and financing, I don't think it is prudent for any country that has not made up its mind politically and financially to go for eradication depending on donor funding. That will not be appropriate in my opinion.

Garry Aslanyan [00:12:04] That's a very thoughtful reflection on that Uche. Thanks for joining me today.

Uche Amazigo [00:12:09] Thank you very much.

Garry Aslanyan [00:12:13] As we just heard from Uche, country led community involvement, underpinned by rigorous implementation research, were two critical success strategies in the effort to control river blindness in Africa. Coming up, I will speak with David Reddy. David highlights the new tools and innovations that will support the achievement of disease elimination goals. Hi, David, how are you today?

David Reddy [00:12:44] Great, Garry. Thank you very much for interviewing me today.

Garry Aslanyan [00:12:48] So, David, we know that significant progress has been made globally on the path to malaria elimination, but according to WHO data, malaria still claims lives of more than 600,000 people globally each year. And in 2020 alone, we've seen an increase of almost 70,000 malaria deaths due to disruptions caused by the pandemic. So I just wanted to see what you think are the challenges that remain to actively and effectively control malaria.

David Reddy [00:13:20] This is a really good question. I think the first statement to say is just a baseline, and that is that nobody needs to die from malaria today. We have effective drugs and effective prevention measures, but they are not reaching the people that need them. So the first thing is to ensure the availability and accessibility of the interventions we have today. One of the things that we need, and just in addition to the finance and the access for those, is programmatic excellence. Strategies and tools that are tailored to the environment that we're working in, to the objectives of the programmes, and the trained people to implement that. And then that requires ongoing monitoring and continuous improvement to make sure their skills remain up-to-date. If we look at what's been achieved recently in India, that's really an example of what can be done if you take a really strong focus on how programmes are being implemented. And in India, in certain states, that's reaped huge benefits in terms of reducing malaria. In order to optimize our programmes and the way we do things, we need to be nimble, and we

need to be able to adapt. But that needs to be data driven, which means that we need surveillance and real-time access to that data. And that would allow us to focus the investment on really delivering greatest impact. And not surprising, this requires financing. Significant investment, but investment that will pay massive dividends, and the Global Fund replenishment is targeting $18 billion. And in terms of what this could pay back, the dividends would be enormous. And so it's incumbent upon us all to support that. And finally, behind everything, we need a pipeline of new tools to address drug, insecticide and even diagnostic test resistance. Because we're dealing with a pathogen here and there's a biological inevitability to resistance, and we always must remain one step ahead. And we've really felt the consequences of that during COVID.

Garry Aslanyan [00:15:27] You've mentioned there are still obviously some challenges and we're all working in that direction, but there is a lot of optimism we can look forward to, and many new innovations are around with malaria control. Maybe you could tell our audience which innovations in control are most exciting to you and how they may complement the existing approaches.

David Reddy [00:15:52] Let's talk about what is exciting though, also in the global figures. And I think one of the key things is that between 2015 and 2020, there were eight countries that showed three consecutive years of zero malaria cases, including China, which has been certified malaria free. And if you wind back a slightly larger timeframe between 2008 and 2020, there were 23 countries that had achieved three consecutive years of zero Indigenous malaria cases. So progress continues to be made and I think we shouldn't lose sight of that. But the role of new interventions will help accelerate progress towards those types of achievements in other geographies. And you've just mentioned one of the key ones as the RTS,S vaccine. So the first vaccine that we had for malaria, and we shouldn't understate the importance of that. It will have a significant role to play and the availability of that, the more widespread availability, will be critical moving forward. What's particularly exciting is that that vaccine, when used in conjunction with seasonal malaria chemoprevention using drugs, shows extraordinarily good results. So this really gets to the point that we want to be layering our interventions to get, if you like, the maximum impact. If we look also at, then focus on the drug portfolio, what we see is we're bringing through next generation compounds that they are highly active, they work against different molecular targets, so that means they're active against parasite strains that are resistant to the current drugs that can be used to lower doses and could eventually support single dose cures, which could provide huge benefits in terms of the operational feasibility of mass drug administration and elimination campaigns. We've got new drugs and potentially now monoclonals coming along for protection. There's also endectocides and this is a really interesting concept, where you take a drug that doesn't kill you, but what it does is that when a mosquito lands on you and feeds from you, it dies. And what this means is if you do have malaria, it's not going to survive to then pass it on to the next person. We have new vaccines in the pipeline, but also there's the potential for mRNA vaccines to contribute along the way. And we saw what they were able to do for the COVID. And then finally genetically modified vectors. So it's just one of those amazing times in history where we're building up a really strong portfolio, but so many novel technologies are all coming to bear at the same time.

Garry Aslanyan [00:18:31] You mentioned the mRNA vaccine. We actually had our first episode of this podcast season focused on access to vaccines and pharmaceuticals, and the mRNA hub development is very promising. Does the cost of adopting and implementing some of these new innovations merit the cost trade-offs that need to be made, considering that we're still dealing with the economic backlash of the COVID-19 pandemic?

David Reddy [00:19:03] In short, yes, and that's based on the following principles. I think the first thing is that we need new interventions because we're not taking a one size fits all approach anymore. In order to get maximum impact, we need to take a far more nuanced approach and use the interventions that are most suited to the environment. So that means using different interventions in different settings, and that needs to be data driven. But that being said, new interventions need to bring tangible benefits over what we currently have in terms of their impact in reducing cases, reducing deaths, providing better or longer protection, acting against drug resistant parasites, addressing underserved populations like pregnant women, having safety benefits and also economic benefits. I just want to give you an example. It may be cheaper to crush tablets and provide them to kids than to purchase paediatric formulations, but the kids vomit it up. So that's a false economy. And so why spend money on things that aren't going to work? So we need to take a real look at the value and impact of the interventions and the true economy. I think the second point is what's the cost of doing nothing? And the cost of doing nothing is that malaria will come back at alarming rates. And we've seen this in some countries before where progress had been made but then at certain periods of time, there were steps taken backwards, and malaria, there was a resurgence. Morbidity and mortality increase and it's going to make the job harder next time. But also, unfortunately, it will reduce the appetite for people to fund it and take it on. Pulling back now will actually cost more. But if we up the investment in the short term and build upon the progress that's been made, we may actually be able to drive towards an end game and avoid a continuation of high costs that really drag on into the future. I just think the final point to bear in mind is that we're really at risk of a breakdown in trust from our malaria-endemic partners because in the low- and lower-middle-income countries where the brunt of malaria is being borne, I think we've seen a loss of trust with the way that they were able to access or not access COVID interventions. And so to turn away now at a perennial epidemic of malaria, I think that would lead to almost an irreversible breakdown in trust.

Garry Aslanyan [00:21:30] In this episode we are trying to focus on issues around the elimination and eradication of disease. In your opinion, what would it take to finish the job, so to speak, and to ensure that malaria is no longer a threat to human beings or the human species?

David Reddy [00:21:48] My brother-in-law convinced me to do a really crazy thing, and that was to run a marathon. And I'd been running. I used to go for a seven or eight kilometre jog each night, and I found that to actually take on this job, I had to think and do things very, very differently. And there were two things, it wasn't business as normal anymore. I had to push myself. I had to do things very, very differently. That was the first thing. And the second point was that after a really long run, I stopped at the end of my driveway one night and I thought, I'm not going to be able to do this. And then I suddenly realized, you know what? If I don't try, I surely won't be able to do it. But if I try, there's a chance I can. But again, I had to do things differently. And so the thing about this is it's not business as normal. So we've got to have renewed political commitment. We need to optimize everything we're doing, optimize our procurement and the deployment of today's tools so we really reach the last mile and then we need the financing to do that and we need to have the R&D in place so that when adaptations are needed, we have the tools at hand and we're not playing catch up. But if we do that and if we if we adhere to our plans, we've got a really good shot at doing this. The only thing that stands in our way is our will and our commitment.

Garry Aslanyan [00:23:18] David, you've dedicated a significant part of your career to malaria elimination. Could you tell our audience how you became involved in this line of work and what motivates you to get out of bed every morning?

David Reddy [00:23:31] I've worked in drug development most of my career and it was in the pharmaceutical industry initially, and I was fortunate enough to work in the area of HIV/AIDS during what we would call the bad old days, when there were really no effective drugs and before we had heart therapy. And what really hit me was that as we began to make progress in the global north, that the drugs just weren't accessible in the global south. And I once attended a meeting where I just, as a representative of the pharmaceutical industry, said, look, I'm really sorry, we just haven't done good enough, we've really let you down here. And I determined that I just wasn't going to do that again. And another thing that I saw was that some of the most vulnerable and really the heart-breaking cases were kids who had HIV. Then when you look at malaria, it's the kids that are dying of malaria. And I was offered this job and it wasn't just a job, it was a real calling. And I thought, this is something that allows me to build on that and really follow that passion. And within the first month of joining MMV, I was fortunate enough to get out into the field and what did I see? I saw kids in hospitals in Ethiopia who were recovering from malaria and just seeing that overlayered on some of the other health conditions and, nutritional issues, etc., it just hits you and you realize, if I can have any role in changing this condition, then I'm all in. And so that's why I'm here, where I am today.

Garry Aslanyan [00:25:02] Thanks, David, for sharing with us your thoughts on how we can run this marathon and get to our destination. We just need to focus on it and achieve elimination of malaria. Again, thanks for joining me today.

David Reddy [00:25:17] Thanks so much, Garry.

Garry Aslanyan [00:25:21] Listening to David has been very interesting and promising for the future. Real time surveillance tools, the RTS malaria vaccine, monoclonal antibody treatments and new drug pipelines to counter drug resistance will be a key changing situation when it comes to malaria. My final guest is Aidan O'Leary. Aidan makes such a compelling case for not settling only for control or elimination, but also to harness global momentum in order to achieve the worldwide eradication of polio goal. Hi Aidan, how are you today?

Aidan O'Leary [00:26:04] Good afternoon, Garry. All good and greetings from the very windy west coast of Ireland. Many thanks for the opportunity to join you on the show today.

Garry Aslanyan [00:26:14] Aidan, your job title at the World Health Organization is not Director of Polio, but rather Director of Polio Eradication. Would you consider the approach of disease eradication to be a vice or virtue in public health, especially amidst so many other competing demands?

Aidan O'Leary [00:26:34] Thanks, Garry, and I think I would start off by simply saying that I consider it to be a virtue. The human species has been battling wild polio virus since ancient Egyptian times, so for millennia, and what we've basically had with the Global Polio Eradication Initiative is an initiative that started in 1988, at a time when we had almost a thousand children per day across 125 countries across the world being paralyzed as a result of this disease. Where we stand now, at the start of 2022, is a situation where we've had just six children paralyzed during the course of the past 12 months in just three countries. But it's still six children too many. And as the Director-General of WHO advised me on my appointment, my job isn't the Director of Polio it's the Director of Polio Eradication. And what he basically means by that is that the goal is to achieve and sustain zero. So I think kind of the key orientation is to really make sure that we get to a particular threshold. What the virtue brings is a very unique political will and emergency orientation that we see across very, very few disease efforts. What the Polio Eradication Programme is, is the ultimate equity programme. Because what the programme seeks to do is to reach those children who are usually missed through a whole range of other initiatives,

and they can be missed for a whole range of reasons. They're invariably inaccessible through conflict and a whole range of other calamities of that order. They can be marginalized within their countries or within their communities. As a result, they tend to be persistently missed. They are the top priority for the programme, and that's ultimately what we're seeking to do. And I think what is particularly important is that as the programme has progressed, what we've really seen is the lessons learned, we've come across over the last 30, 40 years, they have been really incorporated into the mainstream immunization programmes.

Garry Aslanyan [00:28:51] Aidan, what kind of compromises are made in getting to the zero case goal as compared with what could be considered some other approaches which are control or elimination?

Aidan O'Leary [00:29:05] I think the key issue here, Garry, is when we look at eradication versus control, ultimately you're looking at a trade-off between epidemiological risk and the costs that go with them. What is important to note is that we've seen situations, for instance in the recent past, where the two remaining endemic countries have seen outbreaks of wild polio virus. Back in 2013, we saw an incident where the virus was exported from Pakistan and moved into Egypt, into Syria, into Iraq. And what was needed was a major outbreak response to essentially stop transmission, make sure all the children of the region were protected and ultimately close the outbreak. In the last weeks, we're dealing with a similar situation where there has been an exportation of wild polio virus from Pakistan, that has emerged in Lilongwe, which is the capital of Malawi, and now what we're seeing is a very large scale outbreak response targeting not just Malawi, but its immediately neighbouring countries of Mozambique, Tanzania, Zambia and Zimbabwe. We are basically moving ahead with very, very large scale responses, which basically commence in two weeks' time, because what we want to do is to bring this outbreak rapidly under control. In a controlled scenario, you would not necessarily have this type of emergency, rapid, large scale response. And again, the difficulty with all of that is that for as long as you allow transmission anywhere, then everywhere, children would be at risk. So what's really important for us is that we continue to be highly aggressive in our response and really bring the maximum political will, technical capacities, to really make sure that those outbreaks are contained as rapidly as we possibly can.

Garry Aslanyan [00:31:09] Thanks for that example. And it really shows how the initiative actually works. Aidan, the pandemic really placed significant pressure on national and global health systems. Sometimes eradication is criticized for being a vertical approach that doesn't contribute to the strengthening of broader health systems. Can you give our audience your thoughts on this subject and give us your view on how the programme works with the systems in countries?

Aidan O'Leary [00:31:40] Certainly. I think what you've basically outlined is usually one of the criticisms that is levelled against the programme. If I take the example of a country like Pakistan, which is one of the two remaining pandemic countries, what this meant in practice is that the emergency operations centre, which is basically operating both at the federal level across each of the provinces of Pakistan, down across its 180 districts, down to its 8000 plus unit councils, which is the lowest administrative level, data was being collected, collated, analysed and basically brought into a format to inform decision-making on a daily basis in terms of directing the COVID response. And I think what's really important to know is that the polio infrastructure really brings together three components. One is this ability to identify and assess risk. So where is the risk greatest, so that essentially decision-makers really know where to target the resources. Secondly, it brings together the coordination of operational response. So whether that is testing or tracing, whether that is immunization response, whether it's community mobilization. Again, I think a really important component of our emergency operations. And then last but not least, it brings together the component of accountability and oversight. And I think what's really

important is that what you want to have is the information that's coming from the ground really being brought to decision-makers across the civil and military spectrum to take timely decisions and to really make sure that there's robust follow-up in terms of accountability for implementation. And it's that our mechanism that I think the polio infrastructure really has been used in a highly effective way to support countries on a case-by-case basis in accordance with their particular circumstances. And I think it is particularly important to note that within the region, Pakistan was considered an exemplar in terms of its COVID response. And I do think that a large part of the work on that was really drawing upon the experience, the assets, the infrastructure that was in place as part of the ongoing drive to support polio eradication.

Garry Aslanyan [00:34:18] So preparedness and having the system and its elements in place really played a role in helping the countries, in some of these countries to withstand the pandemic and its potential impact. Eradication comes with the promise of a world free of a specific disease, however, the only disease where eradication has been achieved so far is smallpox. So Aidan, do you believe eradication is a realistic goal for other diseases?

Aidan O'Leary [00:34:47] I very much believe it is a very realistic goal for some but not all diseases. And I think the fact that there is only one disease eradicated to date indicates just how difficult it is to achieve this particular standard, or benchmark. I think there are probably four particular reasons why polio very much fits within this category. The first is that human beings are the only reservoir for this particular virus. Other diseases, they may be transmitted by animals, they may be transmitted by insects, but this involves some degree of spill-over or crossover. This does not apply in the case of polio. The second thing simply to note is that in terms of the means of transmission, polio may only be transmitted by infectious people and their waste. And I think it's important to note that faecal-oral transmission is the only means of infecting children with this particular disease. So again, there's a very particular channel that can be targeted in terms of our response. The third point that I would highlight is that it represents an acute but non-persistent infection. And what I mean by this is that whilst paralysis is irreversible and the consequences are lifelong, it's important to note that the capacity of the virus to transmit is time limited and only has a period of roughly 1 to 2 weeks whereby it can infect its host. So again, that gives us a very real opportunity to really make sure that we can try and interrupt that transmission chain. And then last but not least, it's really important to highlight that immunization is highly effective at both protecting and interrupting transmission of this particular virus. So we do have both oral polio vaccines, as well as injectable vaccines that have proven to be cheap, highly effective, safe and easy to administer. And again, the key point for us is that they both help to protect the individual child, but they also really work to interrupt that transmission across children within a particular community. So when we look at each of those four factors, what we see is a very clear, simple and straightforward, critical path that allows us to succeed in our goal of eradication.

Garry Aslanyan [00:37:32] Aidan, you're very passionate about this subject and the eradication of polio, it looks like you've been working on this for many years. What keeps you going to achieve this goal and share with our audience how did you come to work in this area?

Aidan O'Leary [00:37:48] Firstly, I'm not a doctor, so I'm perhaps a little bit unusual in the polio field, and I've spent the last 20 years of my life working in what humanitarians describe as protracted, complex humanitarian operations that have kind of taken me from Bosnia to the Gaza Strip to Afghanistan to Pakistan, Syria, Iraq and Yemen. And actually my first exposure to the polio eradication programme was working in Pakistan between 2015 and 2017. And I think when you come across children who have been paralyzed and paralyzed for life by a virus that results in disease with lifelong implications, that can be solved with very simple vaccines, it has a very, very profound effect. And for me, coming back to the

programme, coming to work for WHO for the first time was really around making sure that we finish the job once and for all. And with the support of Member States, with the support of the partners, with heroic frontline workers across many countries, I think we have a unique opportunity to finish the job. And I think we have every intention of making sure that we actually do so.

Garry Aslanyan [00:39:08] Thanks, Aidan, for your reflections on this important issue of eradication and much appreciated for joining us today and sharing with our audience as we discuss this topic in the coming years of global health.

Aidan O'Leary [00:39:22] Thanks very much, Garry. It's been my pleasure to do so.

Garry Aslanyan [00:39:28] As you've heard from my three guests today, each of the three approaches: control, elimination and eradication, has its merits and role to play in reducing and removing the risks of infectious diseases and their impact on human health. However, none of this would be possible without dedicated and determined public health leaders such as Uche, David and Aidan. They have dedicated their lives and their professional careers to this marathon, keeping their eyes firmly on the goal, refusing to give up until every man, woman and child is safe from these deadly diseases. On behalf of the global community, we commend them for this important work, as well as all of you who are listening to us today for the work that you're doing in safeguarding your countries from infectious diseases. Before we close today, I want to share another listener's message we received.

Irini Pantelidou [00:40:34] I've enjoyed listening to the Global Health Matters podcast because it focuses on themes that we also consider in our work at Wellcome. It gives a platform to voices from around the world to promote key issues and provides a forum to openly engage with these. Thank you for this initiative.

Garry Aslanyan [00:40:51] Thank you, Irini Pantelidou, for your positive feedback and to all our listeners for your ongoing support. Be sure to join us next month for yet another thought provoking episode.

Elisabetta Dessi [00:41:05] Global Health Matters is produced by TDR, an infectious diseases research programme based at the World Health Organization. Garry Aslanyan, Lindi Van Niekerk and Maki Kitamura are the content producers. Obadiah George is the Technical Producer. This podcast was also made possible with the support of Chris Coze, Elisabetta Dessi, Iza Suder-Dayao, Noreen O'Gallagher and Chembe Collaborative. The goal of Global Health Matters is to provide a forum for sharing perspectives on key issues affecting global health research. Send us your comments and suggestions by email or voice message to TDRpod@who.int, and be sure to download and Subscribe wherever you get your podcasts. Thank you for listening.