

Interview with D.A. Henderson<sup>1</sup>  
National Centers for Disease Control and Prevention  
Atlanta, Georgia  
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Duration: 90 minutes

INTERVIEWER: This is an interview with D.A. Henderson on July 12, 2008, at the Centers for Disease Control and Prevention in Atlanta, Georgia, about his involvement with the smallpox eradication program. The interview is being conducted as a part of a reunion marking the 40th anniversary of the program in Asia and east Africa. The interviewer is Paul O'Grady.

Can you state your name?

HENDERSON: D.A. Henderson

INTERVIEWER: And you understand that this oral history is being recorded?

HENDERSON: Yes, I do.

0:00:40 INTERVIEWER: Thank you. I'd like to start off by having you give us a little bit about your background, what led you to a career in public health, and how you started working for the CDC.

HENDERSON: I was born and brought up in Lakewood, Ohio, near Cleveland. I went to Oberlin College and then to the University of Rochester School of Medicine. After internship at the Mary Imogene Bassett Hospital in Cooperstown [New York], I was told that my deferment from the draft was at an end. I had my choice either to voluntarily enlist, in which case I would be a first lieutenant, or be drafted, in which case I'd be a private. So, like many of my colleagues who'd been deferred (since, in my case, 1946—and this was 1955), I decided I would volunteer.

I was having difficulty making up my mind whether it was Army, Navy, or Air Force, and I figured, *I'm just an intern. All I'm going to do are boring draft physicals of new recruits.* About this time somebody showed up from something called the Communicable Disease Center, which I'd never heard of, and they were from the Public Health Service, which I knew nothing about. They talked about working on infectious diseases, which I didn't really much care for. But as I thought about it, it might be two years and I'd learn something. And as they pointed out, *We don't wear uniforms, we don't salute, you don't do basic training.* I thought, *Well, okay, doesn't sound too bad,* so I enlisted in the Public Health Service.

This was the Epidemic Intelligence Service, which at that time was only four years old, created by Alex Langmuir at the CDC.<sup>2</sup> There were, however, quite a number of applicants every year who were anxious to do their required time in service at CDC—it would be challenging, interesting, and so forth. Fortunately, I had done a history of medicine paper in my last year of medical school. Why had I done a history of medicine paper? Because they offered \$200.<sup>3</sup> A handy subject was something about cholera in upstate New York in 1834—there was material available in the newspapers and so forth, and so I spent

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<sup>1</sup> Transcript edited for clarity and annotated by Leigh A. Henderson.

<sup>2</sup> Dr Alexander Duncan Langmuir was appointed in 1949 as chief of the new agency's Epidemiology Branch.

<sup>3</sup> This was the prize for the best paper. Henderson won, and he and his wife Nana purchased a record player.

time creating this paper, going through the newspapers, plotting cases, doing curves. I didn't know what I was doing in terms of training, but it really was epidemiology. In fact it turned out to be rather fun to see what the responses of the health department were to various challenges, seeing how it spread through the city, and so forth.

So inadvertently I become interested in a subject which we'd had no courses in at all [at medical school] and I got drafted to the Public Health Service. That's where I got into public health. I had no interest in public health either, at that time—I was going to be, in my mind, a cardiologist. This would be two years, out, and then I go back to my residency in cardiology.

0:04:33 INTERVIEWER: What were the major public health concerns at that time?

HENDERSON: There was one dominant major public health problem at that time—or challenge—and that was poliomyelitis. There had been significant cases, significant outbreaks of poliomyelitis in the 1950s. There was a great deal of fear at that time about polio. In the summers, they closed swimming pools, parents kept their children away from other children. If there were outbreaks, there was a great deal of anxiety in the community.

The National Foundation for Infantile Paralysis was a very major foundation. It was the only categorical disease foundation at all at that time. It had been started because of President Franklin D. Roosevelt's poliomyelitis.<sup>4</sup> They'd raised money for the Warm Springs, Georgia, rehabilitation center. They'd been extremely successful, and they took some of this money and they put it into some basic research of very good quality and development of a vaccine.

There was great anticipation in 1954 because they began the first major study of the Salk vaccine. Schoolchildren across the country—I forget how many were involved; as I recall it was 100,000 plus—and the results were coming up in April of that year that I was doing my internship. Very soon thereafter they began to—in April, I guess—they announced the results, and they began vaccination around the country with the vaccine. About this time, they found that some of the lots of vaccine were not quite—the virus was not quite as dead as it should be—and they began to get cases of poliomyelitis (paralytic disease) caused by the vaccine.

So I was being inducted into the Centers for Disease Control. The Epidemic Intelligence Service—Alex Langmuir's group—were doing the work of compiling information on the cases—trying to find out which lots of vaccine were involved, trying to determine the magnitude of the problem and then what to do about it. We were totally immersed, as I came into the service on the 1<sup>st</sup> of July, with what was an ongoing investigation into what really was the end of the largest field trial ever conducted on a vaccine and the introduction of the poliomyelitis vaccine, which had been awaited for so long. At the same time, we had what amounted to a vaccine incident, which was serious, with a number of paralytic cases associated with the vaccine. The question was, *Was it the vaccine of all companies, or was it maybe one company and only some lots of the vaccine, or what was it?* This was all-absorbing for many of those who came aboard at that time.

0:08:17 INTERVIEWER: And how many years were you at CDC? You got a 2-year government required service and then you stayed on?

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<sup>4</sup> The Foundation, better known as the March of Dimes, was established by President Franklin D. Roosevelt in 1938.

HENDERSON: It turned out to be rather more exciting than I had thought. They had a matching program so that those who were recruited, you then submitted your preferences on a list of different positions you could have and they in turn would look at the people who were coming in—about 30-35 of us—and decide which ones they wanted. They'd list their list of priorities and they'd match them up. I matched up with a position which was called Assistant Chief of the Epidemic Intelligence Service, which would be, as they called it, a 'gofer' job—kind of putting things together, helping organize a course, and doing things of this sort.

We had a course, one month at that time, where they taught us epidemiology and biostatistics—basically how to investigate an outbreak. At the end of the one month, you were then a qualified epidemiologist (in our terms). At the end of that course, I had to go off—as the Epidemic Intelligence Service did—to an epidemic. We were constantly being called for various epidemics. There was a big epidemic of diphtheria in Phenix City, Alabama. I went down—I spent three weeks down there—giving vaccine, taking cultures. The patients were housed in a big Red Cross tent. I came back and here was the Chief Epidemic Intelligence Service Officer packing his bags. I said, *Where are you going?* He said, *I have another job. I'm going to be a state health commissioner.* I said, *Well, what do I do?* and he said, *I guess you're the Chief EIS Officer.* I said, *I have no idea what to do.* He said, *You'll learn.*

And sure enough, then I began working in a job which I certainly was not qualified for but plunged in, and with the mentorship of Alex Langmuir, who was a legendary epidemiologist, a rather difficult person, demanding, and just a wonderful teacher, just an extraordinary teacher. At the end of two years of this, I finished my duty. I proposed to him, *You know, we're not keeping many people on. The people we're getting, so many people apply, well-qualified, all of them want to do academic medicine or pediatrics. Just about nobody wants public health, but now if we offered a five-year training program in which you do two years of training, like a residency in cardiology — as I was thinking, for myself — and maybe then three years with the Public Health Service, maybe that would be a way to attract people. By then you'll have stayed in seven years, and we might get people staying longer.* Well, he liked the idea and submitted it up the line to the Surgeon General. He liked the idea.

So I applied for a five-year training program and went back to get my residency. At the end of—well, during the course of—the residency, I found this to be frankly rather boring. I was seeing patients and some of them had some heart disease and heart failure, a little diabetes, a little gastroenteritis, a little constipation. At the end of the day, I felt, *If I really hadn't been there, I wonder if it would've made any difference, and was I making any difference? Am I going to be doing this for my next 40 years?* Meanwhile, I'd been two years in the Epidemic Intelligence Service with some exciting outbreaks here and there, including one, which was an interesting one, in Argentina. There was a big outbreak of foodborne disease. They were stoning the restaurant. The Argentine government was upset. They thought it was a type of food poisoning due to botulinum toxin. They wanted what we [CDC] had in the way of antitoxin to treat them, so I took off for Argentina with such supplies as we had.

0:13:05 INTERVIEWER: And when was this?

HENDERSON: It was 1957. At the end of this, I saw the [Argentine] Secretary of Health and he offered, *Let's go on a hunting trip or shooting trip with me at my lodge.* I said, *You know, I hear you've got an outbreak of smallpox* and he said, *Yes.* I said, *I'd like to go see it.* He said, *Fine,* and so we took off on an old Pan Am Clipper, off the waters in the river La Plata, on up to another place. We got in a small two-passenger Piper Cub and flew into the area where they had the smallpox. They had an outbreak of

smallpox, and the people were in tents in the field, about 30 different patients. We looked at the patients one by one. It was fascinating. At that point I'd never seen a case of smallpox, really didn't know what it looked like. It was my first contact with smallpox.

0:14:14 INTERVIEWER: Was there at that point any national or international interest in trying to organize the fight for smallpox?

HENDERSON: The international concerns about smallpox were there very, very strongly because all travelers were obliged to carry certificates indicating they'd been successfully vaccinated within the preceding three years. Just about every country, including our own, enforced this. If you weren't vaccinated, you wouldn't get admitted, or they might vaccinate you on the spot. There was great concern about importations of smallpox.

It was in 1958, just about a year later, after I'd seen the cases, that the Vice Minister of the Soviet Union<sup>5</sup> proposed to the World Health Assembly that they undertake a program to eradicate smallpox. That was the year the Soviets came back into the UN [United Nations] family of nations. They had withdrawn because of the Korean War, and they'd just come back. So, the proposal, they looked at this—the delegates at the Assembly looked at this—and they really wanted to be helpful and encourage the Soviets at this time. A year later they approved a program to eradicate smallpox.

The only thing was that at that time, the World Health Organization was deeply involved in a program to eradicate malaria and fully a third of all staff were involved in that, and all the spare money they could get together because it was very expensive, very costly. The idea of undertaking another eradication program was really not the intent of the Director General. In fact, the only thing he could do was say, *Fine*. He really gave it very little money and a few countries then did some vaccinating and tried to get rid of smallpox. They did make some progress on this, but it basically was not going anywhere. But that was the beginning—1959—when they decided that they would undertake a global program, but it really was not anything that was happening seriously. It was not until 1966 that they really took it seriously.

0:17:00 INTERVIEWER: What was the attitude of the United States government towards this program that seemed to have gotten some impetus from the Soviet Union? Were there any political peculiarities about that?

HENDERSON: There clearly was an element of Cold War competition. The US was heavily supporting the malaria eradication program, both through the organization—very heavily—and through direct bilateral donations to the countries. The US, you could almost say, 'owned' the malaria eradication program. The Russians had no program at that point that they could say the same thing about. In a way, they came in with the smallpox and said, *Look, we got rid of it in the Soviet Union back in the 1930s when our vaccine wasn't so good, when health conditions were poor, where personnel were not well-trained. We got rid of it, so why can't the rest of the world get rid of it?* That's where they came in. After 1959, every year at the World Health Assembly, they would really give the Director General a very hard time—*Why aren't you putting more money into the smallpox program? Why do you favor the malaria program?* That went on as a continuing piece. The US really took no notice of it, is really what it amounted to, until, really, it came up to 1965, when a change came for the US.

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<sup>5</sup> The Union of Soviet Socialist Republics (USSR) was dissolved in 1991.

0:18:54 INTERVIEWER: Which was?

HENDERSON: In 1965—I'll go back a little bit, 1961. Merck Sharp and Dohme at that time was introducing a new measles vaccine. It caused a lot of fever in children and so in the US they were using it, giving the measles vaccine, and they gave them some immune globulin at the same time so that they wouldn't have so many reactions to the measles vaccine, illness, if you will.

This made little practical sense if you went to Africa. The idea of doing these two together made life a lot more complicated. You really could not do large-scale vaccination and try to preserve the immune globulin and deal with two shots to get this. So they undertook studies in Upper Volta, Benin<sup>6</sup>—I'm sorry, Upper Volta is the place where they were doing the country. They did X number of children— 150, 200. The kids reacted very well—there were no complications. Then the country minister<sup>7</sup> said, *Could you do it for all kids under six years of age?* So they gave them vaccine enough for that. And then there was an organization, a French organization, that had a number of countries, and he said, *Could we do it for six countries now?*<sup>8</sup> and USAID said, *Okay, we'll do it for six countries.*

Well, things didn't go very well with six. I won't go into all the complications but we [CDC] got drawn in at that point to evaluating it, and I sent one person over to evaluate.<sup>9</sup> It was a disaster. Well, not to be deterred, they decided, *We're now going to do 11 countries and we need from you 11 people for six months each to help get the program started in each country.*<sup>10</sup> And I thought, *We can't do that, really.* That was a good segment of my staff and sending people over for six months at a stretch, without families and what have you, this is tough. *But*, I thought, *I really have to work with AID. We've really got to be responsive to them.* I didn't know what to do. So I decided, *All right, let's put together a proposal that we would say is sound from the public health standpoint.*

Why was the measles proposal bad? They were going to give it for just four years and then stop. In other words, USAID would support it for four years, and they expected the countries to continue. It cost \$1.75 a dose and the countries couldn't afford 10 cents a dose for yellow fever vaccine. This is not good public health practice—to start a program, to get the hopes of the public up, and then drop it. This is a terrible way to do it. Smallpox vaccine, however, cost a penny a dose, so we proposed the idea, *Suppose you take this whole block of country—18 countries—and suppose you do smallpox vaccination.*<sup>11</sup>

0:22:19 INTERVIEWER: And you're talking about West Africa?

HENDERSON: This all West and Central Africa, as we called it. And so, we do 18 countries. You give smallpox and develop a smallpox program there. We could get rid of smallpox in that whole area. They would then have an established program for vaccination, and they could continue it easily when it only cost them a cent a dose in vaccinating newborns and so forth. Then if they want to have measles vaccine added and the ministers think this is a good idea, we would be happy to give measles vaccine at the

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<sup>6</sup> Upper Volta was renamed Burkina Faso in 1984. Dahomey was renamed Benin in 1975.

<sup>7</sup> Dr Paul Lambin, Upper Volta's Minister of Health.

<sup>8</sup> The OCCGE (Organisation de Coordination et de Coopération pour la Lutte contre les Grandes Endémies en Afrique de l'Ouest) comprised the countries of the former French West Africa—Côte d'Ivoire, Dahomey, Guinea, Mali, Mauritania, Niger, Senegal, and Upper Volta. The "six countries" extended the program from Upper Volta to the other OCCGE countries, exclusive of Senegal.

<sup>9</sup> Dr Lawrence Altman, later a medical writer for the *New York Times*, was sent in December 1965 to spend six weeks observing and reporting on progress. He eventually spent six months not only observing and documenting but trying to provide technical assistance.

<sup>10</sup> USAID increased the number of countries to 11 (adding Cameroon, the Central African Republic, Chad, and Togo) and then to 16 (adding Gabon, Gambia, Liberia, Senegal, and Sierra Leone) by June 1965. They requested 9 additional CDC staff (presumably staff had already been assigned to the original 7 OGGCE countries).

<sup>11</sup> Adding Nigeria and Ghana, the countries with the greatest populations, to complete a contiguous area, essential for smallpox eradication.

same time, but we can't eradicate it because measles spreads too easily. We couldn't get rid of it. But at least the countries would have to think through, *Was this a good idea to do this with measles vaccine as well?*

I think the cost—what USAID expected to spend was about \$5 or \$6 million. The proposal we submitted was about \$35 million. I knew it was going to be turned down, but on the other hand I thought it was going to be a point of departure for discussion. I didn't know where we were going to find any sort of compromise on this—their demands were so great that it was impossible. So I sent it up through channels to the Surgeon General and very shortly USAID turned it down and we were just debating, along about autumn, what we would do subsequently on this.

0:24:08 INTERVIEWER: And we're still in 1965?

HENDERSON: This is 1965. When all of a sudden, we got information that the president [Lyndon Johnson] had decided to approve the program—the whole program. This shook everybody. My boss Alex Langmuir was absolutely beside himself. As I told him, they were not supposed to accept it. But the president was looking for an initiative which would be something that he could publicize that the US was contributing to a UN International Cooperation Year. There were several proposals that went forward and this, I had no idea it was even being considered. Suddenly USAID was told by the White House, *Fund it*. All of a sudden, we're told we've got 18 programs to set up in West and Central Africa. We [CDC] had never run a program outside the United States at all.

0:25:17 INTERVIEWER: So you must have been faced with a tremendous manpower problem.

HENDERSON: Well, we would need about 54 people that we were going to have to recruit. USAID said that it probably would be—you can't do this under three years. They agreed finally to fund it then on November. They felt we could get it [operational] in three years. I said, *No, this is wrong, there's just too much of a delay. How about 13 months? We'll have the people over there in January 1967*. They thought it was almost impossible—you've got individual agreements with every country, you've got to order the vaccine, you've got to put on training programs, you've got to recruit all the people. We did. We recruited the people, we got the vaccine ordered, we got vehicles. We had to use US American vehicles—there weren't any in all of these countries—no maintenance, no repairs, so we had to set up workshops and everything else and train our people to be mechanics. We had to lay out plans for all of the countries, get everything signed, and we did.

0:26:35 INTERVIEWER: Let's talk just for a second about the attitudes of the countries involved. What was the interaction with the governments like?

HENDERSON: Well, in November, as soon this was approved, I went over with a consultant that I had, Warren Winkelstein, who was a good epidemiologist and spoke French, and another [CDC] person by the name of Dr Henry Gelfand.<sup>12</sup> The three of us went and visited each of the different countries. Fortunately, a number of them were having a meeting so we could present it to all of them at one time.<sup>13</sup> They were enthusiastic. Why were they enthusiastic? Most of them, more because of the measles vaccine, because in Africa this is a very deadly disease, it's 10-15% death rate. The French-

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<sup>12</sup> Dr Clayton Curtis of USAID was also part of the group.

<sup>13</sup> Meetings of the OCCGE and OCEAC (Organisation de Coordination pour la Lutte contre les Endemies en Afrique centrale) included 12 of the 18 countries. Special visits were made to Guinea, Liberia, Nigeria, and Sierra Leone. Time constraints meant Gambia and Ghana could not be visited, but officials communicated with the US embassies.

speaking countries by and large had done some pretty good vaccination with pretty good vaccine. The English-speaking countries had a lot of smallpox; they were more enthusiastic about the smallpox. But they were getting both and they were really very enthusiastic. We were coming up with vehicles, we're coming up with vaccines and consultant help, but not a lot of people. It was by and large one or two people or advisors to be assigned to most of the countries, with a few more in Nigeria.

0:28:02 INTERVIEWER: And how about the Americans that were going to go over there as part of this program? Could you talk a little bit about their attitude?

HENDERSON: Well, the Americans who were going over there, a number of the people, some of them I had known and basically called up and said, *We've got this coming up. Are you free? Would you be interested?* Contemporaries and so forth. I had a couple of people who were already serving in CDC and took them. Basically it was almost word-of-mouth advertising because there just wasn't very much time. Contacts with people at schools of medicine and other places, infectious disease people that might know of people interested in this. People, by word-of-mouth they learned about this. My goodness, we were able to recruit enough so that we were able to begin the training program in July of 1966.

0:29:10 INTERVIEWER: And people were on the ground?

HENDERSON: Well, they had to finish up the training. We had to get all of the agreements signed and I think we got all of them into 16 of the 18 countries. We managed to postpone two, but we had 16 of them by January of 1967.

But meanwhile, there's a little problem. There was a debate coming up in the Assembly in May of 1966, so this is only like about 6-7 months after this approval for the whole West African program had come though.

0:29:52 INTERVIEWER: Debate in the United Nations Assembly?

HENDERSON: Debate in the World Health Assembly. Every year the ministers of health convene in May in Geneva to look at issues of health. They were debating the question of going with an intensified program of smallpox eradication with a budget of \$2.4 million a year and an objective to complete that within 10 years.

The Director General, Marcolino Candau, a very capable Brazilian, knew that it was impossible to eradicate it. He felt you had to vaccinate everybody in the world. He was a Brazilian and he knew that there were tribes in the Amazon that hadn't been found, or were just recently found, or that sort of thing. He knew it couldn't be done. There were a number of countries that were very doubtful of the concept of eradication at all because they were having so much trouble with malaria eradication. There were others who thought this was far too ambitious for an organization like WHO which, except for the malaria, really hadn't run programs or really coordinated that way—operationally—health programs. It came to the debate in the Assembly. The US had been very quiet before this, really, in taking a position. At this assembly, they were going to take a vote finally, because it was very controversial whether they went ahead or didn't go ahead. One of the strong arguments was, the US has already committed funds and personnel to take care of 18 countries, so that's a big start on this whole thing. After three days' debate, they did vote. They had to have 58 votes to start the program, and it passed by just two votes. It was the closest vote they've ever had in the World Health Assembly.

The Director General was furious and felt that the Assembly had committed the World Health Organization to a program which was going to fail. It would bring the organization into disrepute and question the credibility of public health and the World Health Organization. He blamed the US for this. In a way, it was true—if the US had not done this crazy thing in West and Central Africa, almost certainly the voting would not have gone as it did. So, he was blaming the US and he then called the Surgeon General in the US and said, *I want an American to run the program because when it goes down, when it fails, I want it to be seen that there's an American there and the US is really responsible for this dreadful thing that you've launched the World Health Organization into. And the person I want is Henderson.* Well, I was associated of course with the West African program, of having gotten involved, starting it and so forth.<sup>14</sup>

I got called to Washington. I was told was being reassigned to be head of the World Health Organization's global smallpox program. And I declined. I said, *We're just starting this West African program, it's a huge amount of work and we just barely started. The \$2.4 million we got ago were programmed in 50 countries. We don't even have enough money—\$2.4 million won't even buy the vaccine we need.* I'd had some experience in working with the World Health Organization and they really were not working well together. The birth of each of the six regional offices was sort of wholly independent and trying to coordinate them was a terrible job, so I said, *I really can't do it. I think this is a very difficult task. I think if we do a good job in West Africa, we're going to show what can be done and maybe that will encourage the other countries, but that's, I think, where I ought to stay.*

0:34:35 INTERVIEWER: Was this conversation going on between you and the Surgeon General?

HENDERSON: Yes. And so I declined, and I said, *We don't order people in the public health service to go from place to place. We talk about career opportunities and so forth and so on. It's not like the military services.* And he said, *Well, this is your career opportunity.* And I said, *And suppose I decline,* and he said, *You're fired.* I said, *You're serious?* and he said, *I'm very serious. I'll tell you what—make a deal—you go for 18 months and if at any time during that 18 months you really feel it won't go, just send me a telegram. Just put 'NOW' and I'll pull you out.*

So I headed for Geneva to head up the global program. We left in October to go to Geneva, get a house, wife and three kids, left half of our household goods in storage because we knew we'd be back pretty soon and took over a program which is a global program. This provided for headquarters staff—eventually nine of us, it never got bigger than that. So there were five medical officers, two admin officers, and a couple of secretaries. That was our total staff.

0:36:08 INTERVIEWER: Let me ask you about your own mindset at this point. You mentioned the problems with the measles program and that malaria eradication had been problematic. Were you optimistic at this point, at least with respect to the West African piece of the puzzle? Were you optimistic about eradication's success?

HENDERSON: It's a good question as to whether you would characterize what I felt as optimistic. My feeling was it was doable. But without a full appreciation of everything—all the problems we would encounter. And I must say, as I thought back on it, had I any idea of all the problems that we'd face, I

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<sup>14</sup> Dr Henderson fails to note that he worked with Dr W. Charles Cockburn (chief of WHO's Viral Diseases unit), Dr Isao Arita (sole medical officer assigned to WHO's new Smallpox Eradication unit), and Dr Karel Raška (director of WHO's Division of Communicable Diseases) in drafting the detailed smallpox eradication plan and budget presented to the 1966 Assembly for debate.



would have not been optimistic. You can't anticipate civil wars, floods, masses of refugees—one thing after another—and bureaucratic blockage of things, of countries refusing to participate, all of the difficulties you can have with this. But fortunately I was innocent of these problems that you would encounter; we couldn't anticipate, obviously, most of these. It was the fact we had a good vaccine. We knew—we'd done some studies at CDC while I was in charge of the surveillance program showing the vaccine was very good and you could get virtually 100% takes using a proper technique. We had jet injectors that we'd worked with and perfected these with the inventor and the U.S. Army so we could—jet injectors that could vaccinate a thousand people an hour. We looked very optimistic that we could do a lot of vaccination with them. So that we had a good vaccine, you knew something about smallpox, we knew that there were a number of countries—developing countries—who didn't seem to have any cases. But the reporting was so bad that, little did we know, many of them just weren't reporting it. But we just really didn't have an idea, but we thought there were large countries free of the disease—certainly the US was, and Canada was, and certainly there must be others that were involved, too. So it was a feeling of, technically this was doable, but without an appreciation that experience would provide as to just how difficult the problem would be.

0:39:07 INTERVIEWER: Take me back to Geneva. You've arrived, you have your family there, and when did you start to realize that these challenges were going to present themselves?

HENDERSON: We quickly found that we had problems. Within just the first couple of years, we ran into a number of problems.

INTERVIEWER: Can you ...?

HENDERSON: The West African program—basically Don Millar, who took over from me, who'd been my chief of my smallpox unit before, he was running it and he had a good administrative officer, and he had some very good people in the field. My feeling was that they had to run that themselves and the only thing we could help them with—which they needed—was some local costs. I think we gave them a couple hundred thousand a year to permit, in some countries, purchasing gasoline and a few other things that they couldn't get legally with their USAID fund.<sup>15</sup> But other than that, they were on their own.

We looked at the world and saw, well, we've got two countries sitting rather at the far end. One is Indonesia; the other is Brazil. Now, at that time South America appeared to be free of smallpox except for Brazil. They'd done vaccination programs in the other countries and one way or another, with their infrastructure—not perfect, but they'd managed to get rid of smallpox. That, of course, was encouraging. But if we got rid of it in Brazil, then they would be far away from endemic areas, and indeed they could be—basically, the funds that we are putting into a Brazilian program could be withdrawn and we'd put it in other areas like Asia or Africa. Similar with Indonesia. Indonesia, sitting off way over here and the countries nearby are free of smallpox, so the chances of smallpox being imported into Indonesia, if we got that free, would be small. Therefore, the limited amount of funds we could have, we could then transfer that to other countries and at least make a start in trying to get rid of smallpox with the limited funds we had. So that was the strategy.

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<sup>15</sup> USAID and WHO in general funded different types of program expenses. USAID provided vaccine and vehicles (US-made), but not 'local costs' that included gasoline and vehicle repair and maintenance. WHO provided 'local costs' for program operations (exclusive of national health staff salaries) but for vaccine, relied on countries' local production and donations.

We almost immediately found we had a vaccine problem. The Russians had pledged 25 million doses a year. We had no idea how much vaccine we'd really need. Most of the countries were doing some vaccination. The disease was so severe—it was such a problem—that at least they had to vaccinate in the big cities simply because of civil disorder with too much of this epidemic smallpox. It is destabilizing. But all countries were doing some vaccination. We made the assumption that most of them already had vaccine, and we've got 25 million from the Soviet Union. The US is covering all the vaccine needs in their 18 countries (later 20 countries) and so we ought to be all right.

But I thought we need to have some way to determine whether the vaccine is really potent, really good. So I went to the [National Institute of Public Health] Netherlands and asked if they would help in testing the vaccine—vaccine quality—of the production that was there. Then we went to Connaught [Medical Research] Laboratories in Canada, and they agreed to do that as well. So we began getting samples of vaccine from the different countries and they began testing it—5% of it was potent and stable; 5% met international standards.<sup>16</sup> We had a problem almost immediately. We couldn't afford to buy the vaccine, so I made a decision. We won't buy any vaccine. We're going to have to improve the vaccine production facilities that are out there.

So we called a meeting of the vaccine producers from several major laboratories—from Wyeth Laboratories in the US, they were the producer here, we had the Lister Institute in London, we had the Netherlands there, the Soviet Union were there. I think that was it.<sup>17</sup> We brought them together and we talked about vaccination and developing a standard manual. Every country was using—where they were making the vaccine, they were using all sorts of different techniques. Let's get what we think is the best way to do it in a simple manual that I can understand. Let us then help these countries improve their vaccine. We will then work with UNICEF to try to get them to provide some machines so that they could freeze-dry the vaccine. We would use some of the people from these consultant laboratories that we had brought together to go out and train and help develop the vaccine. That's what we did. The vaccine quality began to pick up. It was by about 1972, we had more than 80% of the vaccine was being produced in the endemic countries themselves. And it was good quality, so we were immediately involved in trying to solve just the vaccine problem.

How to administer the vaccine was the second problem and the problem was this—you have a vaccine which is in a vial with about .25 mL of fluid that is reconstituted. You have one vial that has dried powder of the vaccine, you have another which has 1/4 of a milliliter of fluid, which is a very small amount. To use the vaccine, you have to put the liquid into the dry powder and mix it up. Then you have to put it on the arm. The way they did this in most of the developing countries was to take like a glass rod, dip it in, and then tip the rod against the arm and a little drop would be there. And then by and large what they did was scratch through the vaccine, made a number of scratches through the vaccine, an old technique which goes back more than 100 years. In the US we did a little bit differently, but it was the same principle. But it's important that the US did it this way—they took a needle, put the drop on the back on the arm, and then they gently pushed the virus through the skin. The idea was that if you get it just through the skin, it will grow and produce something. If you push too hard, you get bleeding; if

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<sup>16</sup> In *Smallpox and Its Eradication*, WHO's official history of the program, it is estimated that in 1967, not more than 10% of vaccine in use in endemic countries met international standards for potency, heat stability, and bacterial count. (Fenner F, Henderson DA, Arita I, Ježek Z, Ladnyi ID. WHO 1988, pp 543-8).

<sup>17</sup> Participating laboratories were Connaught Medical Research Laboratories, Toronto, Canada; Moscow Research Institute for Viral Preparations, USSR; National Institute of Public Health, Bilthoven, Netherlands; Wyeth Laboratories, Philadelphia, USA.

bleeding occurs then it washes out the virus. If you don't push hard enough, it doesn't go into the skin and so the vaccination fails.

Wyeth Laboratories was developing a new device. I visited Wyeth Laboratories because—it was the question of improving our vaccine production capabilities in the other countries. They showed me this wonderful device which they'd developed. It was a little needle about so long [approx. 2½"] and it had two little prongs on the end, and they called it a bifurcated, or two-forked, needle. The idea was you put the needle into the vaccine and you just withdrew it, and between those two prongs, a little bit of vaccine would be held. Then, they thought, you press it through the skin. This way, the amount of vaccine you could get from a vial was 100 doses rather than 25 doses.

I looked at it and I know how much trouble we'd had in trying to teach medical students how to vaccinate, because they were forever not getting quite enough pressure to break the skin, so it wasn't growing, and then a number of them were getting a little drop of blood and that was thought to be bad. I raised the question of, *Suppose we take a needle and just hold it like this and poke it like this?*<sup>18</sup> We called it multiple puncture. Instead of scratching or pressing it through, do multiple puncture. We're going to get bleeding. So let's see what happens. We tried a few of these. They all got very successful takes. We took it to the field, into Kenya and Egypt, and did several hundred children and we did it very vigorously so that there was a little drop of blood on everyone. Every single one of them was successful.

This was incredible. All of a sudden, we're going to have four times as much vaccine than we thought we had, or were getting, with these wonderful needles. The needles cost us—we shortened them up a little bit to make them cheaper, then we made them out of stainless steel, virtually, so that we could get 1,000 of them for \$5. You could boil them and reuse them—we ran through about 120 vaccinations—perfectly good. So we had needles very inexpensively, we had a vaccine, and suddenly we had four times as much vaccine as we thought we had. Then it was a matter of bringing those into play in the different countries and this went very rapidly. It was another development right at the beginning which made a huge difference.

It was a crazy little thing. Now the important thing, I think, was that the inventor of this, a man by the name of Ben Rubin, received at one time what's called the John Scott Medal of the City of Philadelphia for the best, most important invention of a particular year. Here he was getting this—the award goes back to the 1700s; Marconi's received it, Edison has received it, and so forth. He said, *This is the most insignificant patent or invention I've ever made, and here I am receiving John Scott Medal.* It was just like inventing the safety pin, it was so incredible.

We began using that. We had introduced the jet injectors for West Africa but very soon we said, for this price, we don't have problems with mechanics or repair or what have you. It's very inexpensive, much less expensive than a jet injector. Pretty soon the bifurcated needles took over the whole of the world in terms of vaccination. These were a couple of the very early problems that we had. There were many more.

0:51: 54 INTERVIEWER: Tell me how the smallpox program moved into Asia and East Africa.

HENDERSON: Let me go back to the West African program, which began in 1967. They managed to record their last case in 1971, well ahead of schedule and under budget. Not too many programs come

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<sup>18</sup> Henderson holds the needle perpendicular to the skin surface and jabs several times.

through like that. Meanwhile, I had a man in East Africa and he was working with the people in the different countries, helping them and strengthening what they were doing—a Russian, Ivan Ladnyi—and they began to make very good progress. We from WHO began supporting central Africa—not central Africa, but Sudan and the Congo (DRC),<sup>19</sup> two huge countries across the middle. These were frightfully difficult, but we had some very good people, incredible people—some national, some internationals—and they began to make a good deal of progress. Brazil became free in 1971. Indonesia was a bit of a struggle, but they became free by 1972. In fact, the whole of Africa was free of smallpox except for Ethiopia—the whole of Africa was free of smallpox—by the summer of 1973. We were only six years into the program and here we were with a good piece of the world free now of smallpox.

In the summer of 1973, we were down to just five countries that had smallpox—just five. It was India, Pakistan, Nepal, Bangladesh, in Asia—and Ethiopia. But when you looked at India and that group of countries, I think the population then was maybe about 700 million. You look at it and you say, only four countries in Asia, but 700 million people—at that time almost three times the size of the United States. It was not a small undertaking to deal with that. Meanwhile, in Ethiopia, they were doing a malaria program and they did not want to see a smallpox program. The Minister of Health refused even to have me go and talk with him about starting a program. Nothing had happened in Ethiopia at all on smallpox up until late 1970, before I managed to get into Ethiopia and lay out a plan and by various devices, working through the Emperor, get approval to get started in Ethiopia.

We came to the summer of 1973. We had programs in all the countries, and we were very optimistic that now we're on our way. The big problem, frankly, at that time was India—huge country. A number of people talked about India being like the native—we talk about India being the home of cholera. There were some who said, India was a very dense population, a particular climate, and so forth. There's something special and India maybe is the home for smallpox. Very difficult, you'll never get rid of it there. And that was the general discussion that was going on. We weren't making much progress. India had started a program back in 1962, not so long after the first World Health Assembly had said, *Let's do an eradication program*. By the time it got to 1973, they'd made progress in some of the southern states of India, but most of India, they were still recording as much smallpox as they'd had 11 years before. They were discouraged and really not sure they would continue. There was a lot of discussion about it. It was a problem saying, *We really have to keep going*. They agreed to do so—this was in the earlier 1970s—they agreed to keep on going, but then we met in the late spring of 1973, and we said, *We've got to do something different*.

0:57:13 INTERVIEWER: Who's meeting?<sup>20</sup>

HENDERSON: In India. The strategy that we'd had was not working. They had done a lot of vaccinating. They were doing mass vaccination all the time. They were then beginning to do what we called surveillance and containment, really getting much better reporting and when a report came from a village, they'd send a team out and try to vaccinate and control the outbreak. But it didn't seem to be working. There were still a lot of cases, and they were not making progress.

That spring we decided what we needed to do was find the cases more quickly. Find them before they became outbreaks. The decision was made that we'd try to undertake a village-by-village search

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<sup>19</sup> Now the Democratic Republic of the Congo, its name from 1965-71, the country was known as Zaire from 1971-1997 before reverting to its former name.

<sup>20</sup> WHO headquarters and SEARO smallpox staff, and Indian state and national health personnel, June 1973.

throughout the whole of India in 10 days' time—mobilize the health services for an intensive 10-day search. With this we would employ about 120,000 people. The idea initially was to go to selected parts of a village in a particular pattern to try and find cases and see what you could turn up. There was a lot of planning, a lot of organization went on. We got—Bill Foegen from CDC was sent over. I'd asked for more help. They sent over a couple of people, but India's a big place. We had a very crack team of internationals, from France, from Czechoslovakia,<sup>21</sup> from the Soviet Union, but not a lot. We were very few.

The first search was completed in October. There was one state of India, we were normally getting about 500 cases a week. That first search was completed, and they recorded 10,000 new cases found—10,000 new cases. This wasn't even the high point of the season. This was really almost at the beginning of when the seasonal increase occurred. I thought, *Oh, my God, this is far, far worse than we'd ever imagined*. It was even worse than that, because it wasn't until several weeks later I found that the search teams had not done a great job. They'd really reached only half of the villages, so it was probably twice as bad as I thought it was. They repeated the search in another two months and they got better. By about the third search, it had got to the point where they would do house-to-house. We actually had a team following and doing a sample number of the villages to make sure that they'd really reached at least 80% of the houses.

We began gradually to mobilize this tremendous force. It took 8 tons of paper for one survey. But we began getting more cases; the cases were increasing. The problems were that of mobilizing staff, of supervision, of quality control. It was a really tough job. We went on through the summer of 1974 when, at that time, the smallpox goes down to its lowest point. Somehow or other smallpox transmits best, like measles, in the winter. Measles is a winter disease. Smallpox is the same and, whatever it is, whether it's being drier air and cooler air, that does it—we don't really know all the answers—but certainly the summer months are where it gets to the lowest point. The summers in the states, the northern states where almost all the smallpox was, the summers are terrible—120°. There's a limited amount of electricity and there's certainly no air conditioning.

We were bringing in a lot of people on 3-month volunteer stints to work with their Indian colleagues. That summer, it was murder. We brought them together once a month, looked at what they'd done, reports—reviewed all of these. We had no cell phones; we had no telephones. There were no computers—this was all done by hand. They'd come in for a weekend and we'd work for a day and then they had one day to rest.

1:02:44 INTERVIEWER: Can you identify a turning point in the Indian experience?

HENDERSON: I'll come to that in a moment. There was a turning point, but a strange one. We worked through 1974, but we started going into late 1974, the seasonal pickup. There were more cases than ever, it was really going and there were sort of longer-term trends in the disease in India and this was all consonant with a longer-term trend. It was on its way up and we were not having that much of an effect.

However, by the time we got to around February [1975], we realized that the search system was in place, that we had some very good people supervising this. In fact, I even remember the time—it was

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<sup>21</sup> In 1993, Czechoslovakia was dissolved into the independent states of the Czech Republic (or Czechia) and Slovakia.

with Bill Foege. The two of us were looking at this and wondering, *Now, where were we at this point in time?* Bill said, *I'm not sure I'm going to put out a weekly*—he was putting out, I guess, a biweekly report and the curve was going up and he said, *The only thing I can do that's optimistic is turn it upside down.* But we felt at that time, secretly, that we were on our way. And it got worse. It got worse at a bad time in a way and a good time in others.

India detonated a nuclear device. They had people—press—coming from all over. The theme of all the coverage—news coverage—was, *India detonates its nuclear device—smallpox. Their health system is so bad that they are the world's primary country for smallpox.* Here's this advanced country with such primitive health facilities that it's epidemic for smallpox. This got a lot of interest. The Indian government was not pleased. They were very upset, and they began making more resources available. Higher levels in government began paying attention to it and they assigned to the program, from the Indian side, four of their very best people to work with four of our central people—we called it the Central Appraisal Team.<sup>22</sup>

We got over that and for India, at least, we came to the end of the last cases in May of 1975. We thought we had the last case. It was a beggar woman out on a railway platform in the far eastern part of India going into a whole area and if she had infected a bunch of people going out there ... We had no idea what was going on. By that time—by October<sup>23</sup>—the Minister of Health and the Prime Minister were very excited about this. And we were not confident that we'd gotten rid of smallpox. August 15<sup>th</sup> is India's Independence Day. They were determined to announce that this was India's Independence Day and its freedom from smallpox for the first time in history. I would say, we're chewing our fingernails at that time, thinking, *Oh, my gosh, if they have more cases and the press coverage and these people don't know what they're doing...* It would really have been awful. That was the last case.

Meanwhile, Bangladesh was going through tragedy after tragedy of flood and famine. We had an exhausted group really fighting to get rid of it in Bangladesh, which is a story unto itself. So on August 15, the Director General and I headed for Bangladesh. They only had, I don't know, something like maybe 80 villages infected at that point. It was just really coming way down and we felt, *My gosh, I think we're going to be rid of this bad disease for all the world.* It was a very severe type of smallpox. That would've been it. So we were on our way to the airport and got the word, *All flights are canceled.* The Prime Minister—or the president of the country—the really founding father of the country, Sheikh Mujibur Rahman, had been assassinated along with his entire family. Martial law had been declared, troops were moving to the border, floods of refugees were expected, and we thought, *Oh, my God, once more.* But for some reason ... The international group was laid low. They worked locally, they kept out of the way. The expected civil war that was expected to erupt immediately did not. They went back to work and finally, in October of 1975, it was all done in Asia.

Then we were left with Ethiopia and subsequently Somalia. If you'd like to hear the rest of the story, I can go on to Ethiopia. Ethiopia is a huge country. People look at the map and they say, *Oh, it's about the*

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<sup>22</sup> Dr M.I.D. Sharma, director of the National Institute of Communicable Diseases, two of his epidemiologists, Drs C.K. Rao and R.R. Arora, and Dr Mahendra Dutta, Assistant Director General for Cholera, were newly assigned. Other Indian members of the Central Appraisal Team were Drs R.N. Basu and Mahendra K. Singh of the national smallpox eradication program and Dr S.N. Ray, responsible for vaccine production. WHO members were Dr Nicole Grasset, SEARO's chief of smallpox eradication, SEARO medical officers Drs Zdeno Ježek and Lawrence Brilliant, and Dr William Foege, CDC consultant to WHO.

<sup>23</sup> 'October' is an error. As a general rule, the smallpox eradication program required that 8 weeks elapse without cases before declaring an area free of endemic smallpox. The last case occurred towards the end of May, so Dr Henderson is referring to June and July, not October.

*same size as Georgia*. Not so. It's equivalent to all of the states on the eastern seaboard of the United States in area. It's huge. There are very few roads—all-weather roads or even roads you can drive on. It was estimated, I think, that two-thirds of the population lived more than one day's walk from any accessible road—at least one day. We had just—the government had only, I think, 2,000 health workers in the whole country. For a while, we were working with 20 Ethiopian sanitarians, 14 US Peace Corps, about six Japanese Peace Corps, and some Austrian Peace Corps and some volunteers who kind of wandered in. Anybody who wanted to work, we put them to work and paid them the Ethiopian per diem, which you didn't live high on the hog on that one, I can tell you.

They were making progress slowly, but it was difficult. For the first time we ran into a huge area where the people fought against vaccination—they didn't want it. Trying to solve that problem took us some doing, but finally—they wanted malaria drugs and we could give them malaria drugs. We got malaria drugs to give them provided they got vaccinated first—so they got vaccinated first and got the drugs. Not the way you like to run a program, but that was the only way were going to stop the disease. It was a less severe disease than, let's say, in Asia, so there was less motivation, less concern on the part of government.

All of a sudden—the Emperor Haile Selassie was in charge and had been there as Emperor for a long time—they had a coup, a military coup. A Marxist military group took over and civil war broke out, so there was fighting in different parts of the country. The Emperor was—I don't really know what happened to him; I think he was killed.<sup>24</sup> And then the US Peace Corps had to pull out as did the other groups. A number of the embassy people pulled out and for quite a period of time the only people allowed by the military to go outside of Addis Abeba were the smallpox group.

We had some very good people, particularly our person who was a real leader of the program, a Brazilian fellow named *Ciro de Quadros*. He had a charm and an ability to persuade that was legendary. That's why we had permission to go outside the [capital of the] country, but that wasn't much fun because they had to go to many of the provinces with a military escort because it was too dangerous. They fought through all of that. It was really horrendous. Then they came to a point finally—we got additional people in, and then finally the Surgeon General of the United States came up with a contribution of \$1 million for us to get three helicopters to transport people, it was so big. That made a huge difference. One of them was shot down, one of them was getting up there—I don't know, we don't for what reason—went into Lake Kenya; another one was hit with—they threw a hand grenade at it. We were able to repair those. They took one hostage, they were captured. We had ransom notes—I've still got a copy of the request for ransom—from the people, dictated by the rebels, written by the helicopter pilot who, while he was captured, took the vaccine, got all the rebels vaccinated, so took care of that. He was thinking all the time.

Finally we got to this place in *Dimo*, a little village way down in the desert—the last case. I flew down. We thought we'd get a television crew down there to film this, and we did. We got a lot of footage of *Dimo*, this crazy little village sitting in the middle of the desert. We had a hard time even finding it by helicopter; you couldn't spot it at great distance. And we went back and we waited, and they searched—

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<sup>24</sup> Haile Selassie, who was 82, was placed under house arrest and died about a year later, reportedly from respiratory failure. In 1994, an Ethiopian court convicted several military officers of strangling him.

nothing. Nothing. It went on for eight weeks. We were about ready to make a statement to the press, *We're done*.

And there was a report came in of two cases in Somalia right next door. To make a long story short, the Somali government, even with all the discussions we'd had with them, had been hiding cases. They knew they had smallpox. They were admitting them to a hospital, in a sort of secret ward, what he knew about, and they were trying to stop it but, because they were embarrassed—the only country with smallpox ... They hated the Ethiopians and they hated the thought that Ethiopia was free of smallpox. They refused to believe that they were free, and this went on. They would let our people come in, but they wouldn't let them go out beyond the main city of Mogadishu. The cases kept occurring, but they were having trouble finding out where were they coming from, in other words, who was infecting them.

Finally there was a great discussion about this, and one of the turning points— I think there were a couple of turning points that happened—one being, they captured a Dutch advisor who we had working with Ethiopians. He was kidnapped, if you will, with his team and vehicle and taken to Mogadishu. I think we had eight or nine of these [kidnapping incidents], and the UN Commissioner would intervene and talk to the President and the Minister. This fellow Bert van Ramshorst—they took him, he asked to see the Minister, so he sat down with the Minister and pretty well persuaded him that Ethiopia was free of smallpox, and that that there was a problem, and that WHO would be willing to help, and so forth and so on. He made quite a persuasive pitch here.

Meanwhile, the Assistant Director General Ivan Ladnyi indicated he wanted to come down and visit the city of Mogadishu, the capital, and to meet with the Minister, and the Director General [Halfdan Mahler] was threatening to do the same. I think the pressure was on. And then they began to loosen up (this was about March of 1977) and the number of cases—as I recall there were about 3000 cases finally that they had. They had troubles because they had nomadic groups moving all over the desert area. You couldn't find them, smallpox kept spreading, and you couldn't vaccinate them. They wouldn't resist vaccination; you just couldn't find them.

The great problem was that, come November, was the hajj and Somalia was right near—not near Saudi Arabia—but many people come from Somalia to Mecca, and they would come through Somalia from other countries. All we could imagine was, *Can we possibly have, at this time, one of these groups infected, going into Mecca, and spreading it among hundreds of thousands of people and watching smallpox go like this?*<sup>25</sup> So there was a frantic effort in terms—they flew in vehicles so that we had more mobility, they flew in all sorts of people. The government declared a national emergency and they went all out and on October 26, 1977, Ali Maow Maalin, a cook—23-year-old cook—was the last case of smallpox. And that was the end of the smallpox. We had to spend two more years working in the countries to make sure it was really the last.

1:19:11 INTERVIEWER: How did you find out about that last case? Do you remember?

HENDERSON: Oh, yeah! They'd brought in—at this point in time, they were moving people to an isolation camp to make sure that they be held. Two kids were brought in<sup>26</sup> by a vehicle from outside—one of the program vehicles—and they brought them in, and they stopped at the hospital to inquire about where the camp was. Ali Maalin was a cook at the hospital. He was supposed to have been

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<sup>25</sup> Dr Henderson mimes an explosion.

<sup>26</sup> One, a 6-year-old girl, died of smallpox.



vaccinated, but he wasn't. He'd been a vaccinator, in fact, but he hadn't been vaccinated. Everything went wrong. He got in the vehicle, rode for about 10 minutes till they got to the isolation camp, and got out, and he came down with smallpox; he came down with a rash. And as is often the case, the last is the worst. He was admitted to the hospital and diagnosed as chickenpox, and they actually discharged him with a mild case of chickenpox. It was one of the other people, friends of his, who said, *I don't think this is chickenpox*. It wasn't—it was smallpox. He was a very popular guy and he had contact with all sorts of people. So there were everything from roadblocks to all-night searches throughout Mogadishu, to goodness knows what, trying to find possible other cases, but it was the last.

1:21:10 INTERVIEWER: Do you have any final thoughts, anything you want to share about your experience over the course of the years in the program?

HENDERSON: I think there were several things about the program that were very special. And that is, that we came together, people from across the world worked together very well. I worked very closely with the Russians. It was during the darkest days of the Cold War. Totally cooperative. We shared all sorts of problems. They had some things that needed to be corrected and I flew to Moscow. We talked it over. They corrected them. We had people working across borders from one country to another. We had a mix of nationalities out there. What was perfectly clear was that if we had a goal, we had leadership at all these levels, that it became a very unique situation. Bridges were built such as you can imagine,

This formed the basis for going on from smallpox. We really convened a meeting before the program was over to say, *Vaccination has been so inexpensive, we can vaccinate so many people in a day, so effectively, so efficiently, we should be doing more than smallpox vaccine*. This was an international meeting we held, and from that came recommendations for an expanded program on immunization, which was finally accepted by the World Health Assembly in 1974, even before the end of smallpox. The idea was to add other vaccines—diphtheria, whooping cough, tetanus—the DPT vaccine, measles, and polio and add this to smallpox. That was adopted and then UNICEF got behind it and Rotary got behind the polio side. The goal was, at that time, to reach 80% of the world's children by 1990 with these six vaccines. At the beginning, we estimated that at best about 10% were receiving these vaccines. You had cases of tetanus, of diphtheria—totally preventable diseases. There were whole wards full of whooping cough and so forth, and good vaccines out there.

We made it. By 1990, 80% of the world's children had been vaccinated against these six diseases. This was the Expanded Program on Immunization which has gone on and became in due course the eradication of polio. It served to eradicate measles throughout the Western Hemisphere. Measles is gone. We had so few cases of tetanus and diphtheria that it was amazing. They were exceptionally rare throughout the whole of the Americas. They developed a reporting system which I think, at the beginning, had 500 hospitals reporting once a month. The last count I looked at, they had weekly reporting from 42,000 sites in Latin America. It's better reporting for these diseases than it is in the United States of America. And this has gone on to develop a group that has convened here, have done all sorts of marvelous things and out of this came a feeling of, *We've done this. Why can't we take on something else?* They've done that with great success.

There is a real need for an international organization—WHO—even though there are some of those like our president Bush who have not felt the need to work with other countries. This could never have been

done by the United States, it could never have done by a few countries. It had to have an international organization.

It showed also how much you can do with preventive medicine and public health. Vaccines. We were dealing with 10 to 15 million cases of smallpox a year, two million deaths a year, and 10 years later we have zero cases and zero deaths. This is pretty dramatic. Now you're seeing similar things happening with measles, very dramatic changes. Now we're talking about, with the Gates Foundation supporting a lot of things, why can't we go and tackle malaria in a different way? Why aren't we doing research to get better vaccine for tuberculosis? Why don't we have a vaccine against malaria? It's opened up, it's begun, a whole revolution in prevention which is really something to see. And today, over the last couple of days, we've been hearing reports of now how many different fronts it's moving on very rapidly and really rethinking all of this.

It has, I think, built bridges in the international field that you can't build in agriculture or education. Those are political. Agriculture, for obvious reasons; even education comes quite political. With the health side, you really just don't get into political issues. It's amazing—you don't. And thus it has built relationships in ways that are really quite unique across the Americas, which I've spent more time with recently, and they've been in other areas as well. They had days of tranquility in the Americas where the fighting in Nicaragua—the agreement was they'd stop fighting for two days and they would, and the vaccination teams would go out. This has happened in Afghanistan—days of tranquility. So that even the rebel groups could be approached and could be helpful. We got to Peru and the end of polio in the Americas. The last cases were in the area called the Shining Path, where the Shining Path was. They'd destroyed hospitals, they'd destroyed schools, what have you. The people really behind the scenes, Ciro de Quadros, who was the head of immunization for the Americas, had met with the commanders of the Shining Path and talked it through and got commitments for them not to harm the health workers they went through, *This is what the health workers are doing*. Guess what? They searched this whole area, which was so dangerous, it was a problem for the military to go into.

There is something that I think is unique about health here and something which gives you great encouragement for the future and thus I really feel quite—I feel like we made a difference well beyond smallpox eradication. Smallpox eradication, I think, has been a first step and we're now moving on well beyond that into many more exciting things.

INTERVIEWER: DA Henderson, thank you very much.

HENDERSON: You're very welcome.