DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Centers for Disease Control
And Prevention (CDC)

Memorandum

Date: December 15, 2020

From: WHO Collaborating Center for Dracunculiasis Eradication, CDC

Subject: GUINEA WORM WRAP-UP #273

To: Addressees

We are left with Sadness (*Tristesse*) and a Sigh (*un Sospiro)*

EX-PRESIDENT AMADOU TOUMANI TOURE OF MALI, 1948-2020
PATRIOT AND GUINEA WORM WARRIOR *EXTRAORDINAIRE*

We are profoundly shocked, sad, and aggrieved to report the passing of General Amadou Toumani Toure ("ATT"), the former President of Mali, on November 10, 2020.

Born and educated in Mopti, ATT joined the army and commanded the Parachute Corps before being chosen to lead the Transitional Committee in March 1991 after a revolution against Mali's twenty-three years of military rule. Hugely popular throughout West Africa, Acting Head of State Colonel Toure oversaw drafting of a new constitution and held legislative and presidential elections before turning the country over to an elected civilian government in June 1992 as promised, with the words "Monsieur Le President, I pass on to you what I hold dearest, Mali".

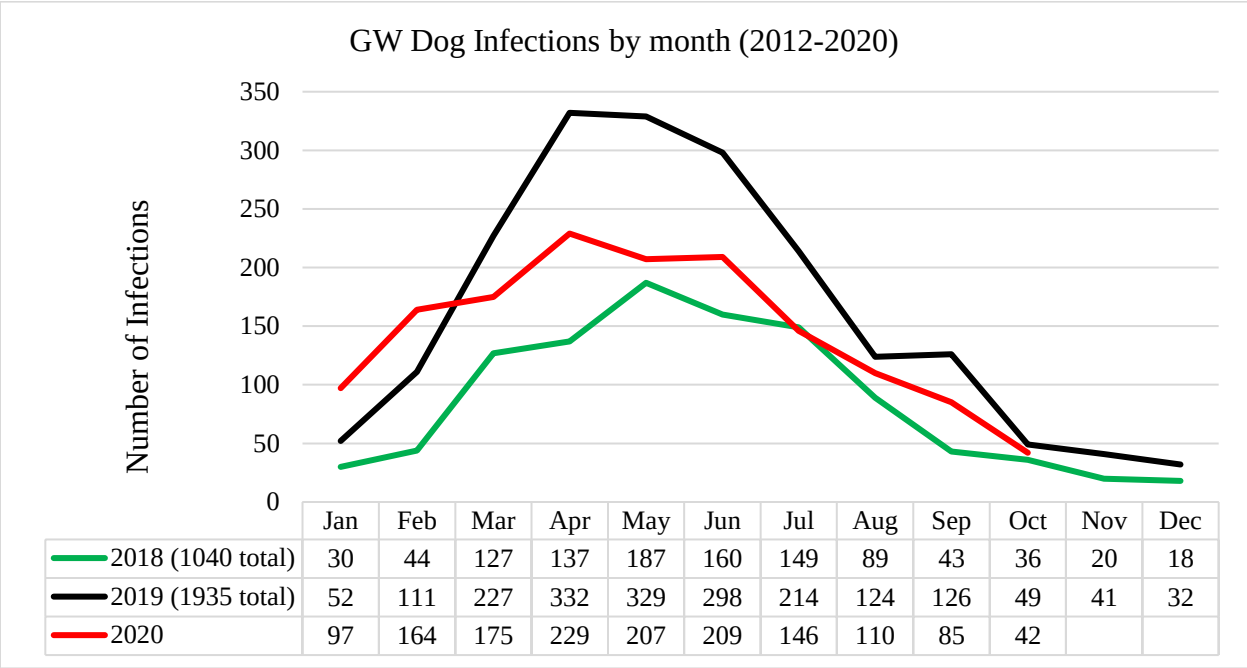
When former U.S. President Jimmy Carter visited Mali as the last stop on his tour of five French-speaking West African countries in September 1992, newly promoted General ATT and Mali's elected President Alpha Konare agreed to Carter's request that ATT help fight Guinea worm disease in Mali. ATT embarked on his new role enthusiastically, saying that "As a military officer, it is a pleasure for me to be involved in planning the strategy and tactics of a campaign designed not to kill people, but to heal them." General Toure advocated passionately for Guinea worm eradication throughout Mali and by visiting all ten other endemic francophone countries over the next two decades, including during his ten years (2002-2012) as Mali's twice elected head of state. In May 1995 he joined Senegal's President Abdou Diouf in a visit to the endemic area of eastern Senegal where President Diouf issued the "Declaration of Bakel for the Eradication of Guinea

Worm" in support of Senegal's program. A powerful public speaker, in April 1998 General Toure electrified the audience at the closing ceremony of the Seventh African Regional Conference on Dracunculiasis Eradication in Bamako when he stressed the importance of winning the battle against Guinea worm disease and issued a "direct order" commanding all concerned to maintain pressure on the disease and to remain resolute in our determination to conclude the eradication campaign successfully. President Carter personally presented President Toure with a Jimmy and Rosalynn Carter Award for Guinea Worm Eradication during a regional Guinea worm conference in Abuja, Nigeria in April 2008, which was the only time the three Guinea worm eradication champions President Carter, President Toure, and former Nigerian Head of State General (Dr.) Yakubu Gowon were together. The award cited President Toure "For his invaluable advocacy in support of the battle against Guinea worm disease in all of the endemic francophone countries since 1993." ATT dedicated the award to his mother, who he said was expelled from school as a young girl because she had missed so many days due to Guinea worm disease. This good and honest man's role in restoring civilian government to his beloved country and his tireless advocacy for Guinea worm eradication are indelible legacies to future generations. We shall miss him greatly. We extend our deepest condolences and utmost gratitude to his family.

CHAD

Chad reported 12 confirmed human cases of Guinea worm disease (40% contained), 1,464 dog infections (86% contained), 61 infected domestic cats (51% contained), and two infected wild cats (uncontained) in January-October 2020. The numbers of infected humans and animals reported in January-October 2020 were reduced by 74% and 21% respectively, compared to the same period of 2019. An updated line graph of cases reported by month in the two years is shown in **Figure 1**. Except for the two human cases in 2020 that occurred in the village of Bogam in Aboudeia district of Salamat Region that was the site of a common source outbreak in 2019, the exact sources of Guinea worm infections in most humans and animals in Chad are unknown (see line list of 2020 human cases in *Guinea Worm Wrap-Up* #272; line list of 2019 human cases in *Guinea Worm Wrap-Up* #266). Genetic analysis of worm specimens from Chad is beginning to suggest some clusters of worm siblings, especially among worms examined from infections in Salamat Region.

Figure 1



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018 (1040 total)	30	44	127	137	187	160	149	89	43	36	20	18
2019 (1935 total)	52	111	227	332	329	298	214	124	126	49	41	32
2020	97	164	175	229	207	209	146	110	85	42		

Table 1 compares some indices of interventions, impact, and surveillance in Chad's Guinea Worm Eradication Program (CGWEP) in 2018, 2019, and 2020. Use of Abate larvicide rose from 24% of endemic villages in 2018 to 68% in both 2019 and 2020, while the proportion of all animal and human Guinea worm infections that were contained was 74% in 2018, 76% in 2019, and provisionally 84% in 2020. An improvement in containment rates was observed in priority at-risk villages since April 2020 due to a new strategy of proactive containment of animals initiated that month, which reached a rate of 80% (424/531) of domestic dogs and cats from April to November 2020.

Table 1

Chad Guinea Worm Eradication Program Interventions, Impact, and Surveillance, 2018-2020*			
	2018	2019	2020*
INTERVENTIONS			
% Abate Coverage	24%	68%	68%
% Infections Contained	74%	76%	84%
% Safe Drinking Water	71%	65%	64%
IMPACT			
# Infected Localities	359	443	412
# Infected Humans & Animals	1,082	2,030	1,539
# Guinea Worms	2,044	4,331	3,453
SURVEILLANCE			
# Villages under Active Surveillance / % Reporting Monthly	1,895 / 99%	2,211 / 97%	2,341 / 99%
# Persons Searched in Integrated Surveys	N/A	N/A	N/A
# IDSR Reporting Units / % Reporting	N/A	N/A	N/A
% Reward Awareness / Amount	53% / US$100; US$20	49% / US$100; US$20	76% / US$100; US$20
# Rumors / % Investigated within 24 Hours	36,207 / 97%	107,442 / 97%	113,439/ 98%
# Persons and or Animals with Laboratory Specimens Sent to CDC	27	87	47

**January-October, provisional*
N/A = Not Available

The number of field staff increased from 288 in 2018 to 693 in 2019, to 1,026 in 2020. Associate Director in the GWEP at Carter Center headquarters Karmen Unterwegner, MPH arrived in Chad on September 20 for a three month long supervisory support visit.

MALI

After reporting zero Guinea worm cases in humans, 46 dog infections, and 4 cat infections in the four years 2016-2019, Mali has reported 1 laboratory-confirmed human case and 8 confirmed dog infections in January-October 2020. Forty-one (69%) of these 59 infections were contained. The locations of detection of this one human case and 58 animal infections by district and year are as follows:

Table 2

Location of detection of human cases and animal infections in Mali, 2016-2019					
District/Region	2016	2017	2018	2019	2020*
Tominian/Segou	11	5	9	4	1
Djenne/Mopti		5	8	3	3
Macina/Segou			2	2	4
Markala/Segou			1		
Baroueli/Segou					1
Total	**11**	**10**	**20**	**9**	**9**

*provisional: January-October

At least 7 of the 11 dog infections found in Tominian in 2016 were believed to be imported from Djenne, Mopti, and Tenenkou districts of Mopti Region. The 1 dog infection in Tominian in 2020 is also believed imported from Djenne district. The human infection in Baroueli district in 2020 lived there but visited Macina district one year before; Baroueli's only known previous GW infection was a human case in 2012, but Macina had known dog infections in 2018, 2019 and 2020. Most infections in Tominian district were detected in Fangasso and Ouan health areas; most infections in Djenne district were detected in Djenne Central health area (Djenne town); most infections in Macina district were detected in Kolongotomo and Macina Central health areas. The known areas of recent endemicity thus appear to be mainly in *Tominian*, *Djenne* and *Macina* districts, although most infected dogs found in Segou Region since 2016 may have originated in *Tenenkou*, *Mopti* and *Djenne* districts of Mopti Region. The 7 infected animals found in Djenne and Macina districts so far in 2020 were resident in their same villages the year before their worms emerged (see line list of 2020 infections in *Guinea Worm Wrap-Up* #272). Four of the infected dogs in 2020 have a history of eating fresh fish. These districts are all located in the Inland Delta of the Niger River where flooding during the peak Guinea worm transmission season and insecurity impede active surveillance. Local health workers seek and report infections in insecure areas but representatives of the national GWEP cannot supervise work in those areas directly.

A ninth dog is a provisional new Guinea worm infection in 2020 (not included in the analysis above) whose worm emerged and was contained in Gomadaga hamlet of Sansanding health area of Markala district/Segou Region on November 3rd (the worm specimen has been sent to CDC for confirmation). The fifteen-month old dog has been resident in this hamlet along the Niger River since he was two weeks old. Abate was applied in three local ponds.

Mali's National Committee for Certification of Dracunculiasis Eradication met on November 10th for the fourth time in 2020, supported by WHO and The Carter Center. It met previously this year on January 6, March 17, and August 12. The meeting discussed holding a workshop on

collaboration with veterinary services in Segou and Mopti Regions, and planned an oversight visit by committee members to Sikasso Region, including a gold mining area.

SOUTH SUDAN: SUSPECT CASE WAS NOT GWD

In response to the suspected case of Guinea worm disease in a young South Sudanese man whose infection was detected in El Radom/Alradoum refugee camp in South Darfur State of Sudan in June 2020 (see *Guinea Worm Wrap-Up* #271), a team of South Sudan Guinea Worm Eradication Program (SSGWEP) staff and state health workers from Western Bahr Al Ghazal conducted a sweep two months after he arrived from his home in Raga County of Western Bahr Al Ghazal State of South Sudan. This sweep reached 91% of 23 targeted villages. They screened 11,076 people and 5,359 animals for Guinea worm disease and detected 153 human rumors, 14 animal rumors, 30 human suspects, and 3 animal suspects, but found no Guinea worm cases in humans or Guinea worm infections in animals. The team corroborated information about the suspect case in the village of Minamba and confirmed that that was his home village. The team also carried out a Guinea Worm Knowledge assessment in eight of the villages in the suspect case's home Boma (Boro Medina district) to assess community members' knowledge of Guinea worm transmission, past cases, and awareness of the cash reward for reporting Guinea worm infections. Less than half (n=19, 45%) of the 42 respondents had previously heard of Guinea worm disease, none reported that they had ever seen a Guinea worm infection in a human or animal, only 9 (47%) of the 19 who had heard of Guinea worm disease knew of the cash reward for reporting human cases, and 8 (42%) knew of the reward for reporting animal infections. All were provided education about Guinea worm prevention, transmission, and the cash reward. The CDC laboratory found that the specimen from this suspected case was not a Guinea worm.

Raja County has a large military presence, with soldiers from many different ethnic groups of South Sudan. This county has never reported a case of Guinea worm disease since the SSGWEP was established in 2006. A case sweep conducted in 2018 by the County Health Department in response to a provisional case targeted many of the same villages as the sweep in 2020.

The SSGWEP also conducted coordinated case sweeps in Awerial, Terekeka, Yirol West, and Yirol East counties in July-August 2020 that screened 55,320 people. In February and October-November 2020, South Sudan's Trachoma Control Program (TCP) conducted integrated screenings of 184,395 persons for Guinea worm infections in Budi, Kapoeta South, and Kapoeta East counties as part of the TCP's mass drug administration (MDA). These screening surveys and those reported above (totaling 254,645 people and 8,814 animals) add to the summary provisional surveillance indices for the SSGWEP in 2020 that were reported in Table 1 on page 2 of *Guinea Worm Wrap-Up* #272 in October. The SSGWEP is also working with Accelerating the Sustainable Control and Elimination of Neglected Tropical Diseases (ASCEND) program through the Christian Blind Mission (CBM) on its upcoming onchocerciasis/lymphatic filariasis MDA, which will target 47 counties, to conduct more screenings.

The SSGWEP detected and investigated 51,188 rumors of Guinea worm disease reported from January to October 2020. Ninety-nine percent (99%) of rumors (n = 50,548) were investigated within 24 hours. There were 67 specimens collected from January to October 2020 (including 12

specimens collected in October) and 52 of those specimens have been sent to the Centers for Disease Control (CDC) for testing.

ETHIOPIA

Ethiopia has reported no new animal infections between September and October 2020, after reporting a total of 15 animals (8 cats, 3 dogs, 4 baboons) with confirmed Guinea worm infections between March and August. The Ethiopian Dracunculiasis Eradication Program (EDEP) has reported 11 confirmed human cases to date in 2020. As reported in previous issues, the human cases occurred in two separate common source outbreaks associated with drinking unfiltered water from Lel Bonge pond near Duli village in Gog district of Gambella Region (7 cases in April), and Ogul Ponds in Abawiri forest located between Pugnido Refugee Camp 1 and Abawiri Village in Gog district (4 confirmed in August-October). Both ponds are known to be frequented by baboons and both are now being treated with Abate regularly. The EDEP has a total of 190 villages under active surveillance in Gog and Abobo districts of Gambella Region, and it has responded to 21,641 rumors of infections in humans (17,181) and dogs (4,460) between January and October 2020. All domestic animal infections and human cases detected this year were contained. The four baboon infections were not contained. A joint mission by Ethiopia Public Health Institute (EPHI), Gambella Regional Health Bureau, The Carter Center and WHO was conducted in August and October 2020 to monitor the outbreak response in Abobo and Gog districts. In both missions, feedback was given to all concerned and a monitoring report was shared.

EDEP held a consultative meeting on November 25-26, 2020 in Adama Town (formerly Nazareth; in Oromia Region). The objective of the meeting was to discuss current Guinea worm eradication challenges and propose practical steps on how the EDEP can best approach interventions differently. The consultative meeting was organized by EPHI with expert technical support from The Carter Center and all three levels of WHO. Financial support was provided by WHO. The meeting was attended by participants from the Ministries of Health, Agriculture and Education; Ethiopia Public Health Institute (EPHI); Ethiopia Wildlife Conservation Authority (EWCA); Gambella Regional Health, Water, and Agriculture Bureaus; and representatives from partner organizations including The Carter Center, World Health Organization, UNICEF, and Members of the National Certification Committee. The meeting was opened by H.E. Dr. Lia Tadesse, Minister of Health, and Dr. Ebba Abate, Director General of EPHI. In his welcoming remarks Dr. Ebba outlined the success of the eradication effort, whereby with the support of The Carter Center and WHO, Guinea worm disease was reduced by more than 99% from 1991 to 2020. It was then mentioned that Ethiopia reported 11 human cases and 15 infections in cats, dogs, and baboons in 2020. Dr. Lia underlined that the eradication effort in Ethiopia is being challenged by increased animal infections and suggested that the transmission dynamics is complicated by ongoing infections in wildlife. At the end of the first day, Dr. Ebba expressed unprecedented commitment of the government to finish the last mile. He underlined the government's determination to allocate the required funding, assign additional staff as appropriate, and finish the battle as soon as possible.

Carter Center Country Representative Dr. Zerihun Tadesse chaired a panel of speakers from the Ministry of Agriculture; EWCA; EPHI; the Ministry of Water, Irrigation and Energy; the Gambella Regional Water Bureau (RWB); and The Carter Center. He noted during the panel that there is an urgent call for action and underlined the need for all stakeholders to be doers. The

failure to construct a single water point was underlined as a major deficiency and the new RWB Head, Kan Gatluak, promised to act promptly. The meeting ended with concrete action points, recommendations, and plan for a follow-up advocacy visit to Gambella to be led by Minister Lia as well as H.E Gambella Regional President Omod Ojulu and his cabinet. The consolidated recommendations that emanated from the consultative meeting will be used as input for developing a comprehensive EDEP plan of action with a clear and defined role to relevant stakeholders for 2021.

Mr. Mesfin Wossen, Director of Disease Surveillance and Response in the Ethiopian Public Health Institute, shared the country's experience in responding to the Guinea worm disease outbreak during the COVID-19 pandemic in the Third Joint Meeting of Preventive Chemotherapy and Case Management NTD National Program Managers in The WHO Africa Region which was held virtually from 7 to 11 December 2020.

The Ethiopia Public Health Institute (EPHI) appointed a new Deputy Director General effective March 4, 2020: His Excellency Mr. Aschalew Abayneh, who earned his Master of Public Health degree from Gondar University. He was Adviser at the Ministry of Health for six years before being appointed as the Deputy Director General of the Ethiopian Public Health Institute. The EDEP welcomes the DDG and looks forward to his stewardship in the eradication of Guinea worm disease from Ethiopia.

ANGOLA

Ms. Giovanna Steel, Associate Director of the GWEP at The Carter Center, arrived in Angola in early November for a joint field visit to Cunene Province with representatives from the Angolan Ministry of Health, the National Technical Certification Committee for Guinea Worm Eradication, and WHO, to follow up on development of community-based surveillance and response to Guinea worm infections.

Approximately 50 community agents were trained in August-September 2020 in 27 of the 35 villages known to be endemic or at risk for Guinea worm infections. Following an assessment, 19 additional villages will be placed under active community-based surveillance. In its first phase of implementation, the Community Based Surveillance (CBS) system enlisted 63 staff comprising 6 health professionals and 57 community-based volunteers, including a traditional leader. Fifty-three percent of the volunteers are men and 47% are women. All volunteers are trained on CBS and proper filtration of unsafe water before drinking. In the three (3) endemic municipalities (Namacunde, Cuvelai, Cuanhama), categorized as Level 1 surveillance districts, with a total population of 650,324, fifty-four (54) villages have been selected for active surveillance (VAS).

Table 3 Number of Villages selected for Active Surveillance (VAS) in Cunene Province, November 2020

Municipalities	Epidemiological status of villages		Total
	# 1+Villages	# of at risk villages	
Cuanhama	1	10	**11**
Namacunde	4	28	**32**
Cuvelai	1	10	**11**
Total	**6**	**48**	**54**

Taking advantage of the training of the Community Based Volunteers, the program reached out to more than 150 families in endemic and at-risk villages where more than 800 community members were sensitized and more than 400 filters distributed.

The joint mission of the Ministry of Health, WHO Angola, The Carter Center, and the National Technical Committee for the Eradication of Dracunculiasis visited the province of Cunene from November 25 to December 5, 2020; the main goal was to strengthen the implementation of interventions towards the interruption of dracunculiasis transmission through enhanced community-based surveillance and partnership strengthening, among others. The mission was able to visit the endemic municipalities and the confirmed cases of dracunculiasis for 2018-2020, and held meetings with local partners, including the representations of UNICEF and the IEBA (Evangelical Baptist Church of Angola) in Cunene. In addition to a WHO focal point entirely dedicated to GWE, the WHO country office is recruiting a data manager and a driver to further support the MoH in rolling out the interventions in Cunene Province, which is the epicenter of Guinea worm disease in Angola.

Table 4

Number of Laboratory-Confirmed Cases of Guinea Worm Disease, and Number Reported Contained by Month during 2020*^
(Countries arranged in descending order of cases in 2019)

COUNTRIES WITH TRANSMISSION OF GUINEA WORMS	NUMBER OF CASES CONTAINED / NUMBER OF CASES REPORTED													% CONT.
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL*	
CHAD^	1 / 1	0 / 2	0 / 3	1 / 2	2 / 2	0 / 0	0 / 1	0 / 1	0 / 0	1 / 1			5 / 13	38%
SOUTH SUDAN	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 1	0 / 0	0 / 0	0 / 0			1 / 1	100%
ANGOLA	0 / 0	0 / 0	0 / 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0			0 / 1	0%
ETHIOPIA	0 / 0	0 / 0	0 / 0	7 / 7	0 / 0	0 / 0	0 / 0	2 / 2	1 / 1	1 / 1			11 / 11	100%
MALI §	0 / 0	0 / 0	0 / 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0			0 / 1	0%
TOTAL*	1 / 1	0 / 2	0 / 5	8 / 9	2 / 2	0 / 0	1 / 2	2 / 3	1 / 1	2 / 2			17 / 27	63%
% CONTAINED	100%	0%	0%	89%	100%		50%	67%	100%	100%			63%	

*Provisional

Cells shaded in black denote months when zero indigenous cases were reported. Numbers indicate how many cases were contained and reported that month.
Shaded cells denote months when one or more cases of GWD did not meet all case containment standards.

§Reports include Kayes, Koulikoro, Segou, Sikasso, and Mopti, Timbuktu and Gao Regions; contingent on security conditions during 2018, the GWEP continued to deploy one technical advisor to Kidal Region to oversee the program.

^ Cameroon reported one case in February that was most likely infected in Chad.

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COUNTRIES WITH TRANSMISSION OF GUINEA WORMS	NUMBER OF CASES CONTAINED / NUMBER OF CASES REPORTED													% CONT.
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL*	
CHAD	0 / 2	1 / 1	1 / 2	2 / 3	8 / 13	6 / 10	3 / 5	3 / 7	2 / 4	0 / 0	0 / 2	0 / 0	26 / 49	53%
SOUTH SUDAN	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 1	1 / 1	1 / 2	0 / 0	0 / 0	0 / 0	2 / 4	50%
ANGOLA	0 / 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 1	0%
ETHIOPIA	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0%
MALI §	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0%
TOTAL*	0 / 3	1 / 1	1 / 2	2 / 3	8 / 13	6 / 10	3 / 6	4 / 8	3 / 6	0 / 0	0 / 2	0 / 0	28 / 54	52%
% CONTAINED	0%	100%	50%	67%	62%	60%	50%	50%	50%	#DIV/0!	0%		52%	

Cells shaded in black denote months when zero indigenous cases were reported. Numbers indicate how many cases were contained and reported that month.
Shaded cells denote months when one or more cases of GWD did not meet all case containment standards.

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^ Cameroon reported one case in March that was most likely infected in Chad.

RESEARCH TO ADVANCE ERADICATION AND SUPPORT CERTIFICATION

The Carter Center, WHO, and CDC have collaborated on a research agenda for Guinea worm disease since 2010. The main objective of the initial research group (The Carter Center, WHO, CDC), with contributions from the International Commission for the Certification of Dracunculiasis Eradication (ICCDE), national programs and donors, was to accelerate eradication by stopping transmission, while also considering research needs to inform the certification process of countries with animal infections (domestic and wildlife). Given the need to scale up the broad research agenda, early in 2020 The Carter Center GWEP hired Fernando Torres-Velez, PhD, DVM and Maryann Delea, PhD, as Associate Director for Research and Staff Epidemiologist respectively. Dr. Torres-Velez, a veterinary pathologist with 20 years of infectious disease research and management experience, has been directed to oversee the biomedical research portfolio as well as the development and implementation of novel veterinary tools and interventions. Dr. Delea, a former South Sudan Guinea worm warrior, has been tasked to develop, co-design, and oversee new/enhanced behavior change interventions through formative research. The research group has expanded significantly since its inception in 2014, particularly in this past year, to now include 9 USA and European academic centers and 5 partnerships with NGOs and private industry. The group meets almost every six months. The research portfolio currently includes more than fifteen priority topics. Some of the most relevant research areas inform both stopping transmission and certification efforts and include

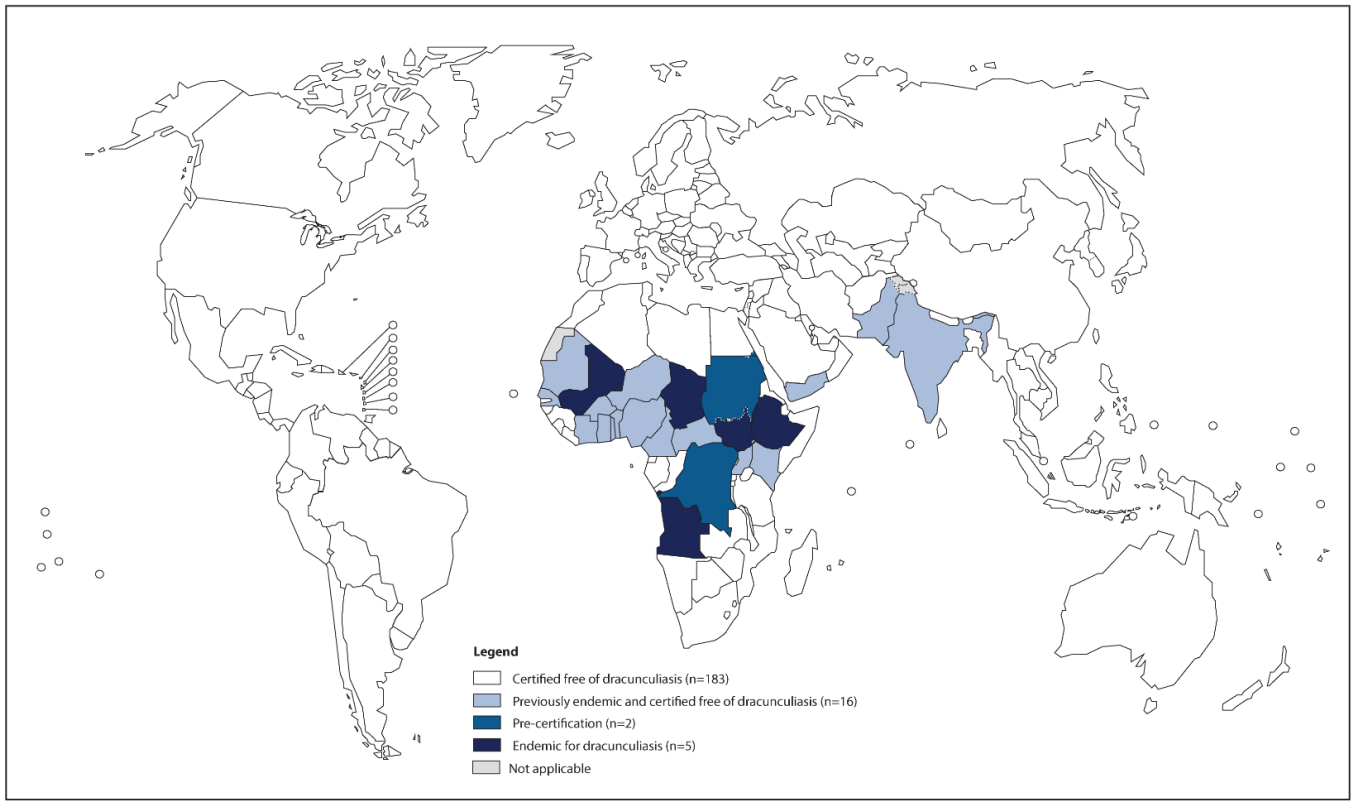
- Genomics:
  - Establishing pipelines for faster processing, sequencing and bioinformatics analysis of worm specimens to allow for time-space analysis of surveillance data (Vassar College, Qiagen, and the Institute for Disease Modeling).
  - Upcoming rolling out of microsatellite analysis pipeline to allow distinguishing between individual worm specimens and the inference of kinship, which can be useful in identifying the immediate ends of a transmission chain.
- Diagnostics:
  - CDC has developed serologic assays to detect Guinea worm infections in humans, baboons, and dogs. The dog assay can detect infection before worm emergence and CDC is currently transferring this assay to a field rapid diagnostic test (RDT) platform. Field validation for both laboratory and RDT dog assays is expected in 2021.
  - Bio Ventures for Global Health (BVGH) has been commissioned to conduct a landscape assessment and R&D mapping for an early infection RDT.
  - Texas A&M will be characterizing *D. medinensis* miRNAs with the aim to develop a diagnostic qPCR for biofluids by FY23. Potential advantages of this assay are broad diagnostic window (early to late infection) and that it is easily adaptable to clinical specimens from multiple species.
- Environmental monitoring:
  - A Loop-mediated isothermal amplification (LAMP) assay to detect GW DNA in copepods has been developed by Exeter University for pond-side test applications (pending validation). Using archived fish tissues from Chad, the University of Georgia will be optimizing and validating a similar assay. As small fish normally

feed on copepods, these could potentially be use as a sampling matrix to indicate water contamination.

- Wildlife (baboon) Monitoring: The Ethiopia Public Health Institute is spearheading monitoring and examination of baboon troops in Gambella Region in cooperation with researchers from the Ethiopian Wildlife Conservation Authority and The Carter Center collaborators. Continuation of this work was delayed due to COVID-19 and administrative issues.

Additional ongoing research and initiatives include: piloting the use of satellite imaging and analysis to detect water sources beneath dense canopy (Maxar Technologies), development of tools to disrupt copepod predatory behavior on L1s (The Center of Biologically Inspired Design, at Georgia Tech), final report of the flubendazole clinical trial and next steps (UGA), field validation of drone boat technology to enhance Abate treatment intervention (SimpleUnmanned, LLC), analysis of behavioral-social factors relevant to Guinea worm infections in humans and animals, evaluation of iris scanning and radio-frequency identification (RFID) to uniquely identify and link domestic animals to households, and mathematical modeling of transmission dynamics and impact of interventions.

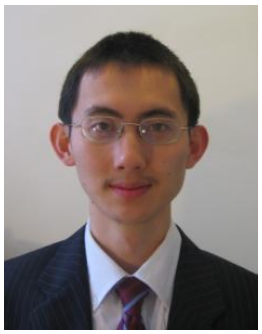
Figure 2: Global status of certification of dracunculiasis eradication, November 2020



Data Source: World Health Organization
Map Production: Control of Neglected Tropical Diseases (NTD)
World Health Organization

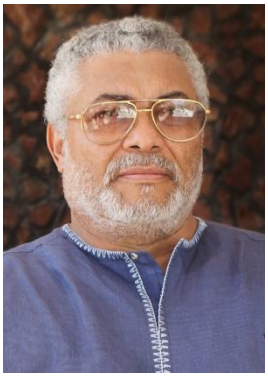
World Health Organization

NEW GUINEA WORM WARRIOR



Mr. Yujing Zhao joined the Guinea Worm Eradication Program at Carter Center headquarters in early November as a Data Analyst. Prior to joining the program, he was a statistician for government healthcare organizations in South Carolina, where he focused on COVID-19, HIV, stroke, and hospital-acquired infections. Zhao holds a bachelor's degree in economics from the University of South Carolina and a master of public health degree from the Medical University of South Carolina. Welcome Yujing!!

EX-PRESIDENT JERRY RAWLINGS OF GHANA, 1947-2020
PASSIONATE GUINEA WORM WARRIOR



We are grief-stricken to report the passing of Flt-Lt Jerry John Rawlings, former Head of State of Ghana, in Accra on November 12, 2020 after a brief illness.

Rawlings entered the Ghana Air Force after completing his early education at the Achimota School in Accra and rose to the rank of Flight Lieutenant as an accomplished fighter jet pilot. He came to power briefly by leading a coup in 1979, and again after another coup railing against corruption at the end of 1981. After ruling as a military officer during Ghana's economically difficult years until 1992, Flt-Lt Rawlings became the democratically elected President of Ghana for two terms, the maximum allowed under Ghana's new constitution, before turning over power to another elected civilian government in 2001.

Son of an Ewe mother from the Volta Region, Rawlings was aware of the depredations of Guinea worm disease, once suggesting publicly that persons who embezzled public funds should be sentenced to serve time on penal farms in rural areas where the disease was rampant, "since such

funds can be used to provide rural folk with water". When the Government of Ghana accepted The Carter Center's assistance in fighting Guinea worm disease, President and Mrs. Carter visited Accra to attend the Second African Regional Conference on Dracunculiasis Eradication in March 1988 and met with Flt-Lt Rawlings and other government officials. To officially inaugurate Ghana's Guinea Worm Eradication Program, Rawlings undertook a highly-publicized, epic eight-day long tour of 21 endemic villages and towns in the Northern Region in early June 1988 (a feat surpassed only by General Amadou Toumani Toure of Mali and General Yakubu Gowon of Nigeria years later). Calling Guinea worm "a disease of underdevelopment", he used a magnifying glass to show chiefs and elders the copepods swimming in their drinking water and personally demonstrated how to filter their drinking water properly through a cloth. As a video of Rawlings' tour was shown at the International Donors' Conference for Guinea worm eradication in Nigeria in 1989, the audience erupted in spontaneous applause. When Ghana conducted a nationwide village-by-village search for Guinea worm in 1989, it counted almost 180,000 cases, making Ghana the second-highest endemic country for the disease in the world. President Rawlings spoke at the Opening Ceremony of the Sixth African Regional Conference on Dracunculiasis Eradication in Accra in 1996 and re-launched Ghana's program during a visit to the Northern Region in 1997. He lived to see Ghana finally end Guinea worm disease nationwide in 2010 and be officially certified as Guinea worm-free by the World Health Organization five years later. We extend our deepest sympathy and heartfelt thanks to his family.

RECENT PUBLICATIONS

Molyneux DH, Eberhard ML, Cleaveland S, Addey R, Guiguemde RT, Kumar A, Magnussen P, Breman JG, 2020. Certifying Guinea worm eradication: current challenges. The Lancet 396:1857-1860.

Perini T, Keskinocak P, Li Z, Ruiz-Tiben E, Swann J, Weiss A, 2020. Agent-based simulation for seasonal Guinea worm disease in Chad dogs. Am J Trop Med Hyg 103:1942-1950. doi:10.4269/ajtmh.19-0466

World Health Organization, 2020. Monthly report on dracunculiasis cases, January-August 2020. Wkly Epidemiol Rec 95:554-555.

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In memory of BOB KAISER

Note to contributors: Submit your contributions via email to Dr. Sharon Roy (gwwrapup@cdc.gov) or to Adam Weiss (adam.weiss@cartercenter.org), by the end of the month for publication in the following month's issue. Contributors to this issue were: the national Guinea Worm Eradication Programs, Dr. Donald Hopkins and Adam Weiss of The Carter Center, Dr. Sharon Roy of CDC, and Dr. Dieudonne Sankara of WHO.

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