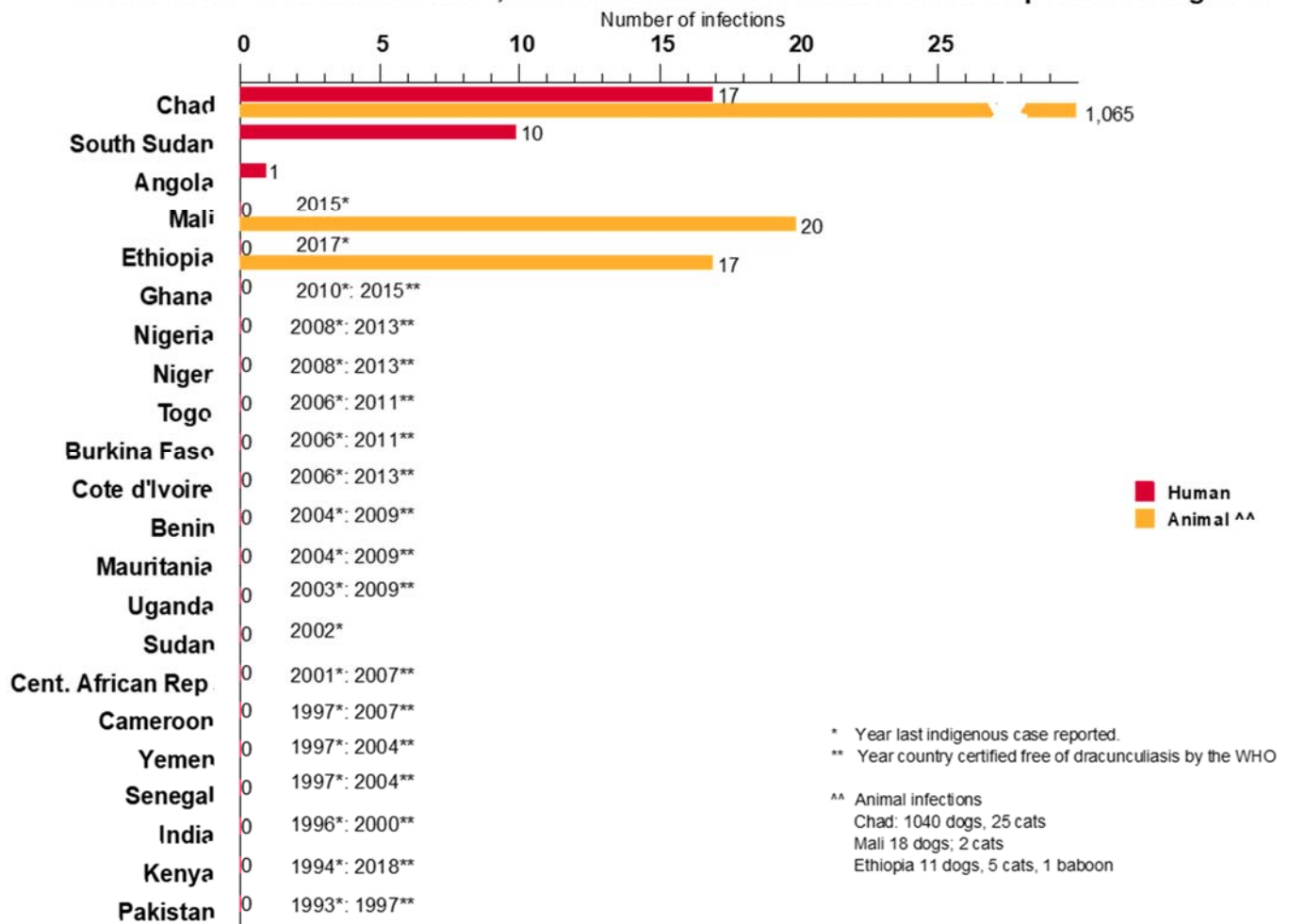


**Date:** April 15, 2019  
**From:** WHO Collaborating Center for Dracunculiasis Eradication, CDC  
**Subject:** GUINEA WORM WRAP-UP #260  
**To:** Addressees

*The war on Guinea worm will be won by village-to-village combat.  
 The Worm will judge the quality of our work this year!*

**28 HUMAN AND 1,102 ANIMAL GW INFECTIONS IN 2018  
 MALI: ZERO HUMAN CASES FOR THIRD CONSECUTIVE YEAR; ETHIOPIA ONE YEAR**

**Distribution of 28 Human and 1,102 Animal Guinea Worm Infections Reported during 2018**



**Chad** reported 96% of all Guinea worms remaining in the world in 2018, with 1,040 infected dogs (328 villages), 17 human cases (11 villages) and 25 infected cats (20 villages), in a total of 340 villages with one or more Guinea worm infections in Chad in 2018. Two villages in Salamat Province had 4 and 3 human cases, respectively. The Guinea worm infected dogs occurred in 21 districts of 7 provinces.

The status of interventions against Guinea worm infections in Chad as of the end of 2018 is summarized in Figure 3. Chad’s GWEP implemented monthly Abate treatments in 83 villages under active surveillance by the end of 2018, compared to 21 VAS in October-December 2017, and it applied Abate in response to specific contamination events in 71 villages, vs. 57 villages in 2017. In 2018 the program also expanded implementation of its mass communication campaign, “Guinea Worm Heroes”, which was launched in July 2017 in partnership with KYNE Communications. Improved surveillance was evidenced by the program receiving 19,591 rumors of human and 16,616 rumors of animal Guinea worm infections in 2018, compared to 3,454 and 2,826 human and animal rumors respectively, in 2017. Chad had 1895 VAS at the end of 2018. This report was presented by Dr. Tchindebet Ouakou.

Table 1

Province	District	Number of infected dogs
Chari Baguirmi	Mandelia	150
	Bailli	129
	Bouso	72
	Massenya	44
	Dourbali	39
	Kouno	21
Sub Total		455
Moyen Chari	Sarh	160
	Kyabe	120
	Danamadji	70
	Korbol	50
	Biobe	9
Sub Total		409
Mayo Kebbi Est	Guelendeng	142
	Bongor	1
Sub Total		143
Mandelia	Moissala	13
	Bedaya	9
Sub Total		22
Salamat	Haraze	3
	Aboudeia	2
	Amtiman	1
Sub Total		6
N’Djamena	N’Djamena Sud	3
	Toukra	1
Sub Total		4
Tandjile	Bere	1
Sub Total		1
<b>TOTAL</b>		<b>1040</b>

**Ethiopia** reported zero human cases of Guinea worm disease in 2018 and 17 animal infections (11 dogs, 5 cats, 1 baboon; in 8 villages/localities), compared to 15 human cases and 15 animal infections (11 dogs, 4 baboons) in 2017. All infections in 2018 were in Gog district of Gambella Region. Abate treatments rose to 4,681 in 2018 vs. 2,982 in 2017. The Ethiopia Dracunculiasis Eradication Program (EDEP) is hiring even more “Abate captains” in 2019 and using hunters to help find water sources in forested areas of Gog district where transmission is believed to occur. The program is proactively tethering all 646 dogs and cats in households of Gog district where an infected animal was found in 2017 or 2018, including four dogs with Guinea worms that emerged after they were tethered. The EDEP responded to 16,035 rumors of human or animal Guinea worm infections in 2018 (13,289 rumors in 2017); it has 156 villages under active surveillance: 80 in Abobo, 68 in Gog, 8 in Anfilo. In January 2019 UNICEF completed a borehole well in the village of Ablen, which is now providing safe water to all three nearby villages in the “Guinea worm triangle” of Ablen, Atheti and Wichini. As reported in the previous issue, this program is receiving increased political support from government authorities. The status of interventions in Ethiopia as of the end of 2018 is summarized in Figure 3. This report was presented by Mr. Nebiyu Negussu Ayele.

Following up with the recommendations of the high level advocacy visit in Gambella earlier this year, a joint team from the Ethiopia Public Health Institute, Gambella regional health bureau, The Carter Center and WHO conducted an assessment of water sources in endemic districts of Gog and Abobo including in the commercial farms. The assessment found that fourteen and eight new safe water points are needed in Gog and Abobo districts, respectively, and 11 water points need partial or full maintenance in both districts. With regard to the investment farms, 39 in both districts should construct safe water point within their farms.

**Mali** reported zero human cases of Guinea worm disease for the third consecutive year in 2018, but continued to detect animals with emerging Guinea worms: 18 dogs and 2 cats, in 18 villages. As in other recent years, most of the infections occurred in the area of the Inland Niger Delta. This program continues to receive relatively few rumors of infections (424 rumors in 2018, 477 in 2017, 557 in 2016), despite the mass communication campaign launched in March 2017. A team from the national secretariat of the program visited Tominian, Macina, Markala and Djenne districts in March 2019. Mali's GWEP had 903 villages under active surveillance in 2018, and plans to increase that to at least 2,000 VAS in 2019. The status of interventions in Mali as of the end of 2018 is summarized in Figure 3. Dr. Cheick Oumar Coulibaly presented this report.

**South Sudan** reported 10 cases of Guinea worm disease, in cattle camps away from previously known endemic villages, in five counties of former Warrap (Tonj N), and Lakes (Rumbek N, Rumbek C, Yirol E) and Jonglie (Nyirol) States in 2018, after reporting no cases in 2017 (Table 2). (South Sudan has reported a dog infection only once, in a household with infected humans in 2015.) Abate was applied within seven days in areas associated with most of these cases. The South Sudan Guinea Worm Eradication Program (SSGWEP) is now tracking migratory patterns of young herders associated with cattle camps, which characterized the Guinea worm cases in 2018, by embedding volunteers and some paid supervisors to move with the herders. Patient #6 in 2018, a 24 year old Dinka male whose worm emerged and was detected on July 25, 2018, for example, was found to have visited over 7 cattle camps in four counties, with repeated visits to some, covering more than 195 miles (291 km) over ten months during the period before his worm emerged (Figure 2).

Figure 2 shows the movement of 2018 Guinea worm case #6, a cattle keeper whose infection was imported from Rumbek North County and was detected in Yirol East County (5) in July 2018 when he was enroute to Rumbek East (7). During the transmission season April-September 2017 the case was in Rumbek North county Cattle Camps (CCs) and travelled from RiakLai CC (1), to Bharadhiak CC (2) to AngokJok CC (3) then to his home village Apaboung, travelling in between cattle camps with repeated visits to many other cattle camps not shown in the map to look for pasture and to protect the cattle from cattle raiders. Following the government disarmament program in April 2018, the case fled to Yirol East (with his cattle) via the border of Panyijar county (5) in Unity state until he reached Yirol East where he was detected with an open wound where the guinea worm emerged later (6). The case visited many cattle camps in Yirol East until February 2019 and returned to his home village in Rumbek North (9). The map depicts one cattle keeper's dynamic movement which is common among the cattle herders in South Sudan.

As shown in Table 2, the highest number of the cases were detected in late May, early June of 2018 indicating that the infection took place between April- August of 2017, which is the rainy

season in South Sudan. The SSGWEP now has 2,165 villages under active surveillance in the five counties of greatest concern, and it is engaging with military forces to help address areas of insecurity. This program recorded 36,239 rumors of Guinea worms in humans and 6 rumors of infected dogs in 2018 (25,182 rumors in 2017). It submitted 46 specimens from 40 persons to the laboratory at CDC in 2018, including 5 spargana and 2 *Onchocerca* infections. The status of interventions in South Sudan as of the end of 2018 is summarized in Figure 3. Mr. Samuel Makoy presented this report.

**Angola** reported one confirmed case of Guinea worm disease in April 2018, and another in January 2019, both in Cunene Province and both in persons without any history of travel outside of the country. The Ministry of Health of Angola has investigated both cases, with assistance of the World Health Organization (WHO), and both investigations are ongoing. A genetic profile of the worm specimen from the case in January 2019 is pending (the specimen from the first patient was of inadequate quality). Surveys of villages in areas around the cases revealed 34 rumors of human infections and 3 rumors of animal infections, but no other cases. Surveys of 981 villagers in Cunene, Cuando Cubango and Moxico Provinces in February 2019 found that 965 (98.4%) of those queried denied knowing Guinea worm disease (including 239 of 252 persons-95%-in Cunene Province), and only about 13% of villages in the three provinces have access to safe drinking water. With WHO's help Angola already has trained 1,366 health professionals and community health workers in Cunene Province to begin health education and social mobilization about Guinea worm disease. A team from The Carter Center is visiting Angola this month, and the Center expects to begin helping the Angolan ministry to establish community-based surveillance in the areas at highest risk within the next several weeks as soon as it is officially registered as a Non-Governmental Organization in Angola. This report was presented by Dr. Sebastio Mavitidi.

**2019.** In addition to the confirmed case reported in Angola in January, Chad has provisionally reported 3 confirmed cases (1 contained) of Guinea worm disease and 157 infected dogs (82% contained) in January-February 2019 (Table 3). The human cases were all male, ages 11, 13 and 33 years old. All three villages where the human cases were found have a history of Guinea worm infections in dogs.

## **TWENTY-THIRD INTERNATIONAL GWEP PROGRAM MANAGERS MEETING**

Co-hosted by The Carter Center and the World Health Organization, the 23<sup>rd</sup> International Review Meeting of Guinea Worm Eradication Program Managers convened at The Carter Center in Atlanta, USA on March 21-22, 2019. About 115 participants attended, including representatives from all seven countries that remain to be certified as Guinea worm-free: the national program coordinators of Chad (Dr. Tchindebet Ouakou), Mali (Dr. Cheick Oumar Coulibaly), and South Sudan (Mr. Makoy Samuel Yibi), as well as representatives from Angola (Dr. Maria Cesar DeAlmeida), Ethiopia (Mr. Nebiyu Negussu Ayele), Democratic Republic of Congo (DRC) (Dr. Gédéon SAMBA), and Sudan (Mr. Chavan Laxmikant). The Ethiopian delegation was led by the most honorable World Laureate Dr. Tebebe Yemane Berhan, Goodwill Ambassador for the GWEP. The DRC expects to submit its Country Report to the International Commission for the Certification of Dracunculiasis Eradication (ICCDE) in November 2019; Sudan plans to submit its documents to the ICCDE by the end of December 2019. ICCDE members Dr. Joel Breman, Dr. Mark Eberhard and Prof. David Molyneux (by telephone) also participated in the meeting.

Researchers from Vassar College/USA, Wellcome Sanger Institute/UK, University of Georgia/USA, University of Exeter/UK, Georgia Tech/USA, and the Centers for Disease Control and Prevention described the latest results of their work and also participated in private follow-up discussions with representatives of The Carter Center, WHO, the Bill & Melinda Gates Foundation, the Children’s Investment Fund Foundation, Vestergaard, and Health and Development International on March 23rd.

Table 2:

<b>South Sudan 2018 Guinea Worm Cases (n=10)</b>					
<b>County</b>	<b># of Cases</b>	<b>Date of detection</b>	<b>Case Contained? (Yes/No)</b>	<b>Date of First Abate Rx</b>	<b>Year Last GW Case Reported (Prior to 2018)</b>
<b>Rumbek Centre</b>	4	28/5/2018	No	29/5/2018	2009 (n=1)
		1/6/2018	No	20/7/2018 (dry water source before July)	
		20/8/2018	Yes	N/A	
		11/9/2018	Yes	N/A	
<b>Tonj North</b>	1	15/7/2018	No	19/7/2018	2012(n=6)
<b>Rumbek North</b>	3	2/6/2018	No	7/6/2018	2009 (n=6)
		6/6/2018	No	9/6/2018	
		19/7/2018	Yes	N/A	
<b>*Yirol East</b>	1	25/07/2018	No	3/8/2018 Cattle Camp was inhabited in July	2010 (n=1)
<b>Nyirol</b>	1	22/8/2018	No	Abate was applied in the Home village Not in village of detection	2013 (n=1)
<b>Total</b>	<b>10</b>	<b>Last Case 11/9/18</b>	<b>30% (n=3) Contained</b>	<b>90% (n=6/7) Abate was applied -excluding Nyirol</b>	

*\*Yirol East Case is an imported case from Rumbek North county*

Figure 2

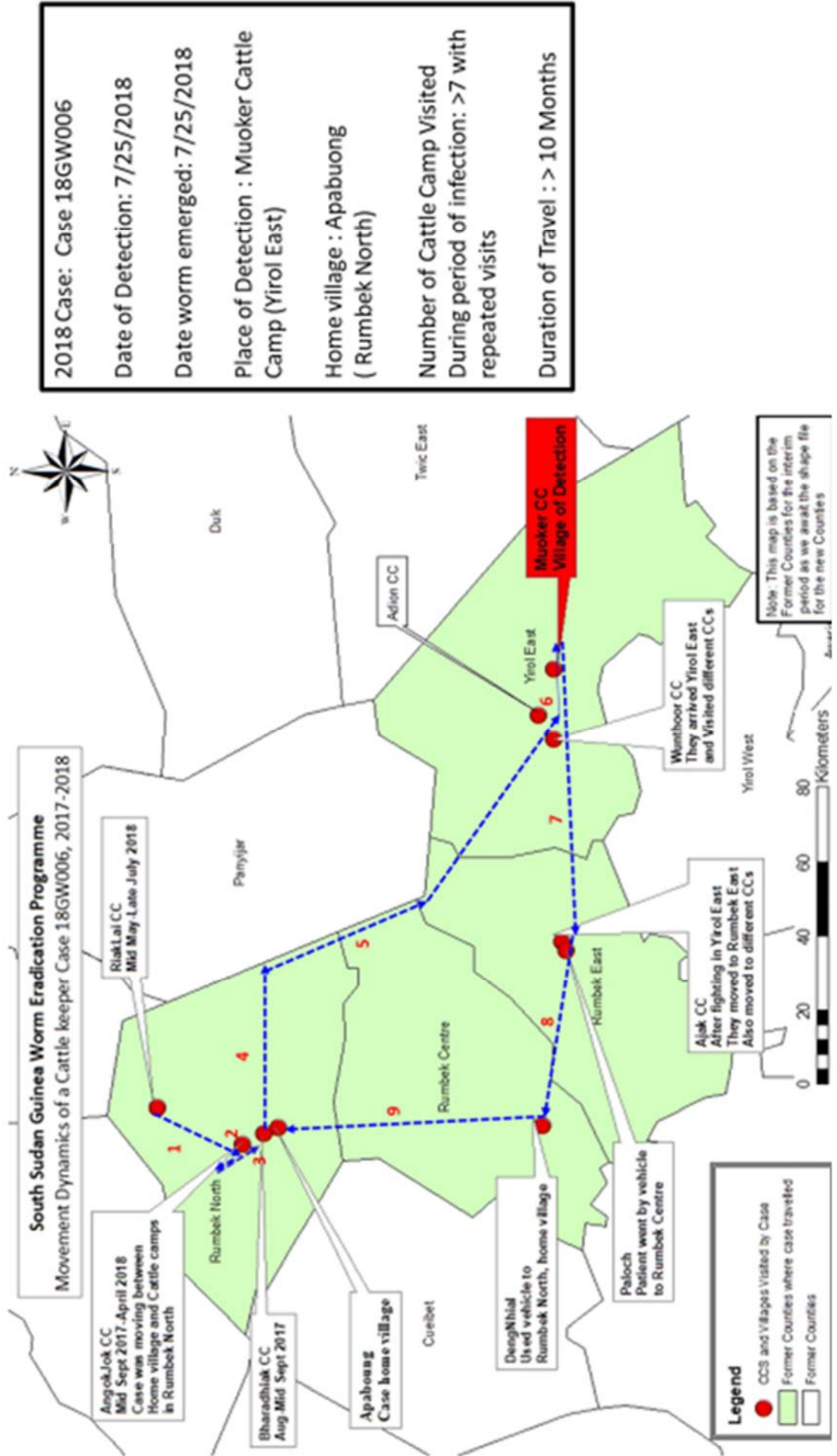
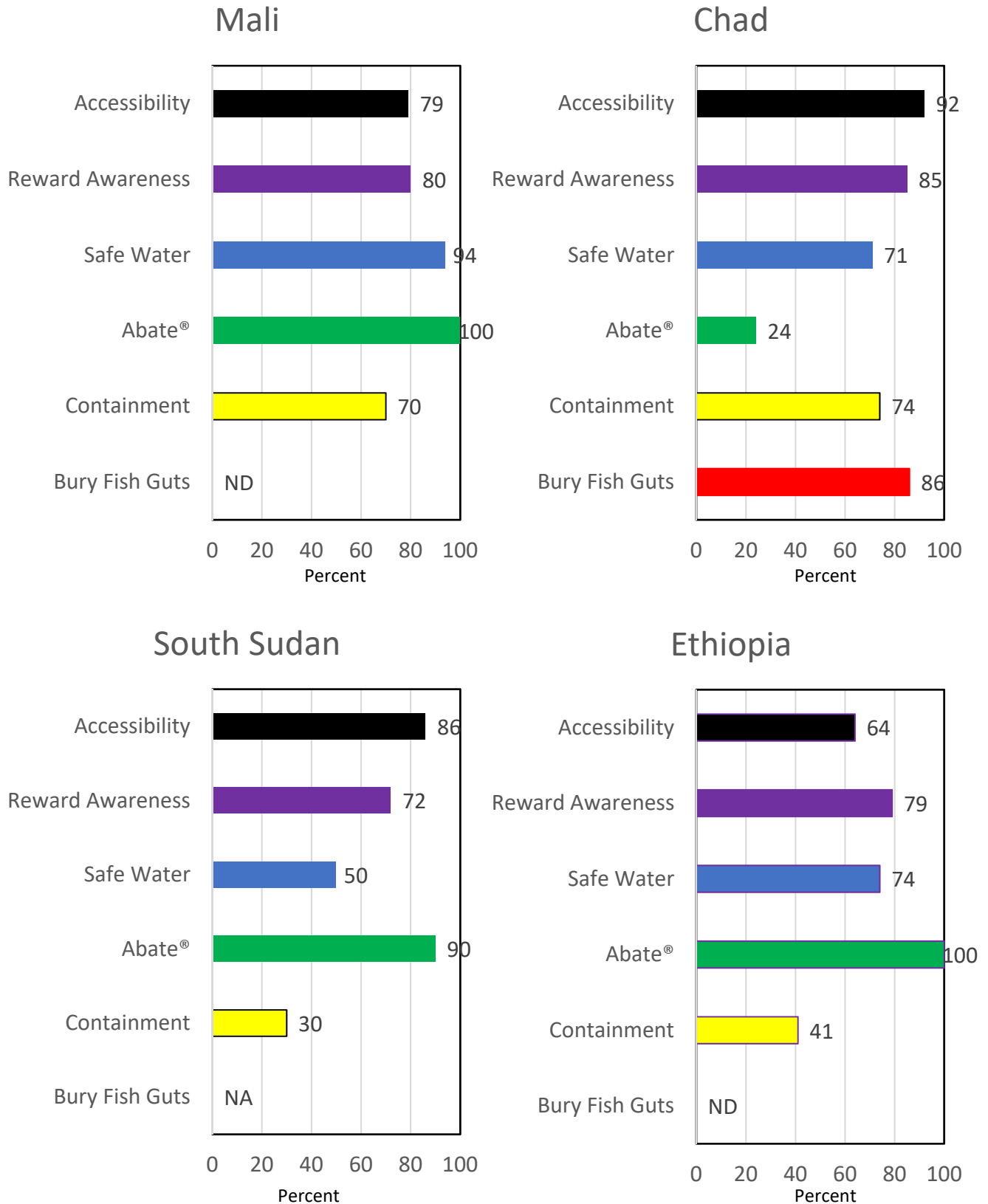


Figure 3

### Guinea Worm Eradication Program Indices Coverage\*



\* See criteria for each indicator in text  
\* December 2018

ND = No Data

NA = Not Applicable

Figure 4

## Animal Guinea Worm Infections, 2018

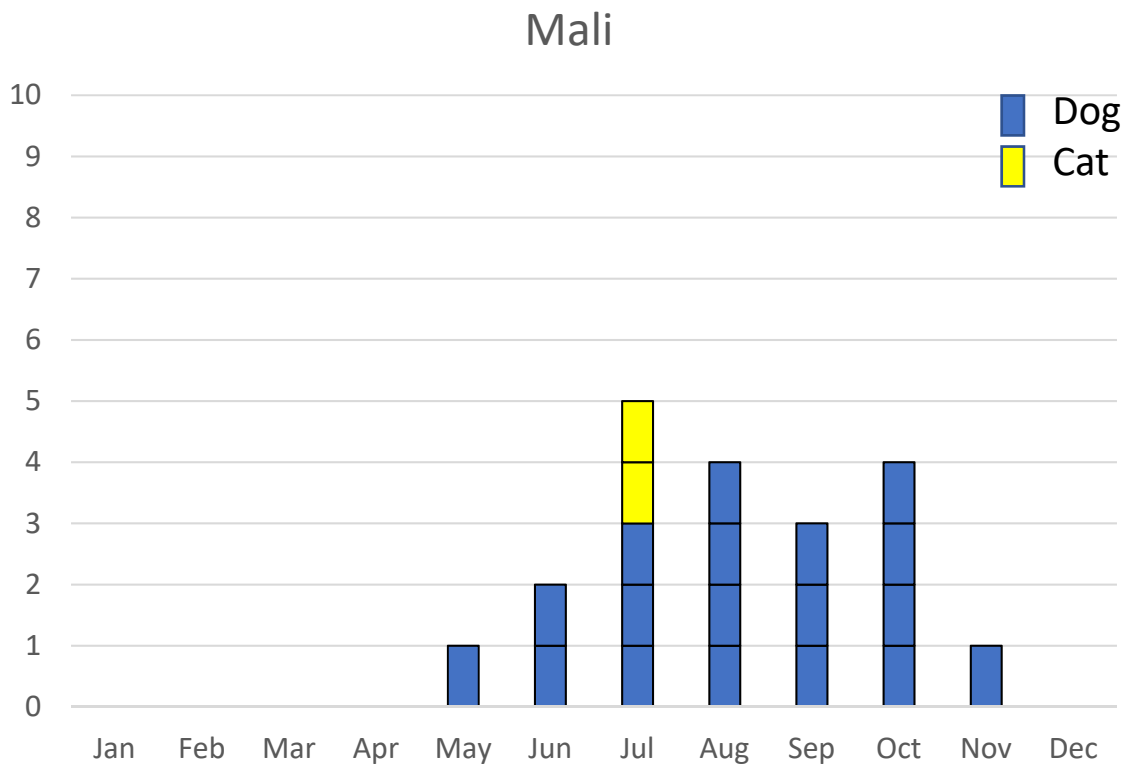
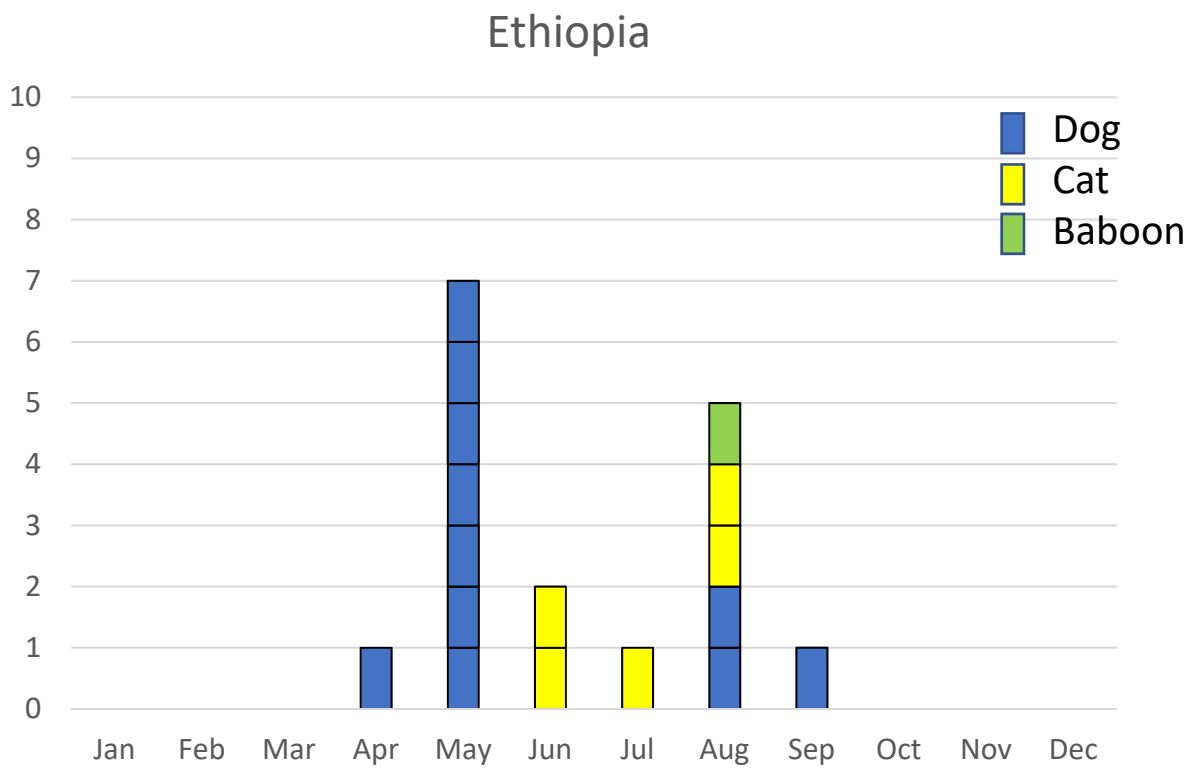




Table 3

**Number of Laboratory-Confirmed Cases of Guinea Worm Disease, and Number Reported Contained by Month during 2019\***  
(Countries arranged in descending order of cases in 2018)

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	0 / 0	/	/	/	/	/	/	/	/	/	1 / 3	33%
SOUTH SUDAN	0 / 0	0 / 0	0 / 0	/	/	/	/	/	/	/	/	/	0 / 0	0%
ANGOLA	0 / 1	0 / 0	0 / 0	/	/	/	/	/	/	/	/	/	0 / 1	0%
ETHIOPIA	0 / 0	0 / 0	0 / 0	/	/	/	/	/	/	/	/	/	0 / 0	0%
MALI <sup>§</sup>	0 / 0	0 / 0	0 / 0	/	/	/	/	/	/	/	/	/	0 / 0	0%
TOTAL*	0 / 3	1 / 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 4	25%
% CONTAINED	0%	100%	#DIV/0!										25%	

\*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.

<sup>§</sup>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.

**Number of Laboratory-Confirmed Cases of Guinea Worm Disease, and Number Reported Contained by Month during 2018\***  
(Countries arranged in descending order of cases in 2017)

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	1 / 1	1 / 1	0 / 0	1 / 1	0 / 0	1 / 5	1 / 4	0 / 0	0 / 1	0 / 0	1 / 3	7 / 17	41%
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%
SOUTH SUDAN	0 / 0	0 / 0	0 / 0	0 / 0	0 / 2	0 / 2	1 / 3	1 / 2	1 / 1	0 / 0	0 / 0	0 / 0	3 / 10	30%
MALI <sup>§</sup>	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%
ANGOLA <sup>^</sup>	/	/	/	0 / 1	/	/	/	/	/	/	/	/	0 / 1	0%
TOTAL*	1 / 1	1 / 1	1 / 1	0 / 1	1 / 3	0 / 2	2 / 8	2 / 6	1 / 1	0 / 1	0 / 0	1 / 3	10 / 28	36%
% CONTAINED	100%	100%	100%	0%	33%	0%	25%	33%	100%	0%	100%	33%	36%	

\*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.

<sup>§</sup>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.

<sup>^</sup> Investigation of the origin of this is case is ongoing. Preliminary outcomes indicate there is no current or historical evidence of human or animal infections in the district of residence.

## MODIFIED INTERVENTION INDICES TO REFLECT VARIABLE MODES OF TRANSMISSION

With *D. medinensis* infections occurring in animals in three of the final four endemic countries (South Sudan. is the exception) and evidence mounting to suggest that the infection is being transmitted to humans and animals not just by drinking water, as before, but likely also by people and animals eating raw or undercooked transport hosts such as small fish (up to 2-3.inches/5-7.5 cm long) and/or raw fish guts, as well as perhaps by eating undercooked aquatic paratenic hosts such as frogs and larger fish, Guinea Worm Eradication Programs have adopted new interventions to counter the new challenges. Given this new situation we suggest that national GWEPs monitor a modified set of operational indicators. Among the former indicators, trained village volunteers, regular health education, and reporting by villages under active surveillance, including endemic villages, can be assumed as at or near 100%. Coverage with cloth filters protects against contaminated drinking water, such as in Ethiopia in 2017, but not against eating an infected transport or paratenic host which may now be the most common mode of infection for humans and animals in Chad, Ethiopia and Mali. The suggested indicators now are:

- **Reward awareness.** Combined results for VAS levels I & II (endemic and high-risk villages), for human and dog Infections: % aware of persons surveyed. *Detect infections quickly.*
- **Containment of infected humans and animals.** % of infected humans and animals contained or tethered. *Prevent contamination.*
- **Abate coverage.** % cumulative villages where Abate applied this year in villages with infections in current or previous year. Water bodies may be ineligible for Abate treatment from time to time when they become too large (>1000mx3) or dry up. *Prevent infection and contamination.*
- **Bury fish guts.** % of people surveyed In VAS level I with demonstrated fish gut burial practice. *Prevent Infection.*
- **Safe water source.** % of VAS level I villages with at least one functioning source of safe drinking water. *Prevent large point source outbreaks.*
- **Accessibility.** % of VAS level I (endemic villages+) that are safely accessible by the program.

The latter new indicator is intended to estimate GW programs' safe access to areas of greatest concern now for supervision and interventions. After transmission is interrupted nationwide, the entire country will need to be accessible for adequate surveillance and certification. Our first concern now, however, is to stop transmission, which requires safe access. The four main considerations for the new indicator are: 1) the denominator = surveillance level 1 (known or suspected endemic) plus option to include other areas if judged. appropriate; 2) scores are 0 = not accessible for supervision and interventions, 1 = partly accessible; 2 = fully accessible; 3) administrative level= district or county; 4) all GW infections count, whether human or animal. Total score is sum of scores for all districts/counties of concern divided by maximal score (2x total number of districts/counties of concern) times 100 = percentage. A country's score may change with changes in security situations on the ground. As of October 2018, initial program estimates using this formula were:

Mali: 6/14 (43%) of endemic/high risk districts accessible  
Ethiopia: 9/12 (75%) of endemic/high risk districts accessible  
South Sudan: 43/54 (80%) of endemic/high risk counties accessible  
Chad: 33/36 (92%) of endemic/high risk districts accessible

## LABORATORY CONFIRMATION OF WORM SPECIMENS

All worm specimens from patients suspected of having GWD or infected animals should be sent to the address below for laboratory and or molecular confirmation of *Dracunculus medinensis* (Guinea worm).

Henry Bishop  
CDC Stat Lab  
ATTN: Unit 52  
1600 Clifton Rd NE Atlanta, GA 30329  
Email: [DPDx@cdc.gov](mailto:DPDx@cdc.gov)  
Telephone: 404-718-4110

## MEETINGS

The 13<sup>th</sup> Meeting of the International Commission for the Certification of Dracunculiasis Eradication will be held in Addis Ababa, Ethiopia on April 25-26, 2019.

The Seventy-second World Health Assembly will be held in Geneva on May 20-28, 2019. The annual Informal Meeting of Ministers of Health of Guinea worm-affected countries will be held on the evening of Wednesday May 22 during the Assembly.

## RECENT PUBLICATIONS

Anonymous, 2019. Guinea worm disease eradication: a moving target (editorial). [The Lancet](#) 393:1261; March 30.

Dumiak M. New challenges to eradicating Guinea worm disease. [Lancet Infectious Diseases](#). 2018;18(8):838.

Ghosh I, Tiwari PK, Mandal S, Martcheva M, Chattopadhyay J. A mathematical study to control Guinea worm disease: a case study on Chad. [Journal of Biological Dynamics](#). 2018;12(1):846-871.

Hobbs EC, Trevisan C, Johansen MV, Dorny P, Gabriël S. Value of Electronic Educational Media in Combatting Parasitic Diseases. [Trends in Parasitology](#). 2019;35(3):173-176.

Losio AAE, Mushayabasa S. Modeling the Effects of Spatial Heterogeneity and Seasonality on Guinea Worm Disease Transmission. [Journal of Applied Mathematics](#). July 2018:1-12.

## OBITUARY: DR. MAHAMAT TAHIR ALI



The former National Program Coordinator of Chad's Guinea Worm Eradication Program during the crucial years of its revival from 2013 to 2016 passed away on February 19, 2019 after a brief illness. He succeeded Mr. Ngarodjel Djimadoumadji on October 24, 2012, and was followed by Dr. Tchindebet Ouakou on May 20, 2016.

Inclusion of information in the Guinea Worm Wrap-Up does not constitute "publication" of that information.  
In memory of BOB KAISER

Note to contributors: Submit your contributions via email to Dr. Sharon Roy ([gwwrapup@cdc.gov](mailto:gwwrapup@cdc.gov)) or to Adam Weiss ([adam.weiss@cartercenter.org](mailto: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.

*WHO Collaborating Center for Dracunculiasis Eradication, Center for Global Health, Centers for Disease Control and Prevention, Mailstop A-06, 1600 Clifton Road NE, Atlanta, GA 30329, USA, email: [gwwrapup@cdc.gov](mailto:gwwrapup@cdc.gov), fax: 404-728-8040. The GW Wrap-Up web location is*

<http://www.cdc.gov/parasites/guineaworm/publications.html#gwwp>

Back issues are also available on the Carter Center web site English and French are located at

[http://www.cartercenter.org/news/publications/health/guinea\\_worm\\_wrapup\\_english.html](http://www.cartercenter.org/news/publications/health/guinea_worm_wrapup_english.html).

[http://www.cartercenter.org/news/publications/health/guinea\\_worm\\_wrapup\\_francais.html](http://www.cartercenter.org/news/publications/health/guinea_worm_wrapup_francais.html)



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