DEPARTMENT OF HEALTH & HUMAN SERVICES

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

Memorandum

Date: October 31, 2018

From: WHO Collaborating Center for Dracunculiasis Eradication, CDC

Subject: GUINEA WORM WRAP-UP #257

To: Addressees

Think ahead. Where are the most Guinea worms?

Distribution of 19 Indigenous Human Cases of Dracunculiasis Reported during 2018^

ETHIOPIA REPORTS NO HUMAN CASES, 17 CONFIRMED ANIMAL INFECTIONS IN JANUARY- SEPTEMBER

One year after the outbreak of 15 cases of Guinea worm disease among migrant farm laborers from Oromia Region in September-December 2017 who were infected by drinking contaminated water at a commercial farm in Abobo district of Gambella Region in 2016, with 8 of those cases occurring in September 2017, the Ethiopian Dracunculiasis Eradication Program (EDEP) has reported no cases in humans in January-September 2018. This provisional good news so far is encouraging, although drinking water supplies for many of the commercial farms in Abobo district are still at risk of contamination, and the outbreak is a reminder of the reproductive potential of

Guinea worm parasites among humans in favorable Ethiopian settings. In September, the EDEP reported a suspect case in a six-year-old Nuer boy from Uror County/Jonglei State of South Sudan who was seen in a refugee camp in Benishangul Gumez Region of Ethiopia on September 6. Despite daily controlled immersion no worm emerged, and the diagnosis of suspected Guinea worm disease was ruled out on September 19. This alleged case is still being investigated by South Sudanese authorities.

The year 2018 is also the second successive year so far of no reported cases in humans in Gambella's Gog district, which reported 2 cases or less annually in the five years before 2017, but where almost all Guinea worm infections in dogs (44 total infections in 2013-2017), and baboons (9 infections in 2013-2017) in Ethiopia have occurred in recent years. In January-September 2018, the EDEP has reported confirmed Guinea worm infections in 11 dogs (6 contained), 5 cats (2 contained) and 1 baboon, compared to 11 infected dogs and 4 baboons reported in January-September 2017. Most of the animal infections have occurred in or near the villages of Atheti, Wichini and Ablen in Atheti sub-district, an area of only about 50 x 25 miles (80 x 40 kilometers) within Gog district. A line-list of Ethiopia's infected animals so far this year is in Table 1. An estimated overall 75% of Ethiopia's areas of most concern to the program are safely accessible as of early October (see article on modified intervention indices elsewhere in this issue).

The EDEP treated 44 surface water sources with Abate in Atheti sub-district in July 2015, 131 sources in July 2016, 165* in July 2017, and 167 sources in July 2018. Ethiopia has treated all 7 localities where infected animals have been found so far in 2018, including Atheti village, as well as Ablen and Wichini villages, for a total of 47 high risk villages treated with Abate in Gog and Abobo districts among the 148 villages under active surveillance (VAS) in those two districts. Evidence suggests that most Guinea worm transmission to dogs, baboons and (formerly) older boys and young men in Gog district in recent years occurs at water sources in the forest. A recent pilot study of GPS tracking of dogs from these villages by Prof. Robbie McDonald and his team from the University of Exeter has identified specific forest areas visited by the dogs for follow up inspection by the program. The program also has begun proactively tethering all 167 dogs in these three villages, even without signs of infection. The Kebele (Sub-district) leader and community chiefs in Atheti-subdistrict have enacted a fine of 300 Ethiopian Birr (~US$11) for anyone found releasing their dog(s) from tethering prematurely. So far this year the EDEP reports an average 82% awareness of the cash rewards for reporting infected persons and dogs in Level I and II active surveillance areas. The program received 11,454 rumors of cases in January-August this year and investigated 99% within 24 hours. In total, 72% of VAS level I villages have at least one source of safe drinking water (Figure 2).

From 19-27 August, a team from the EDEP secretariat, including Carter Center Country Representative Dr. Zerihun Tadesse, program analyst Aragaw Lamesgin and GWEP behavioral change communication manager Kebede Eticha made a supervisory visit to Gog and Abobo districts in Gambella Region and Anfilo district in Oromia Region. During the visit they helped extract Guinea worms from two cats, bandaged two infected dogs and investigated the dead baboon that had multiple worms. They also met with regional and district officials and visited two farms for migrant workers, accompanied by regional council members, in addition to discussions and meetings with technical staff. The Carter Center's Karmen Unterwegner traveled to Ethiopia from September 10 to October 5, 2018 to provide technical support to level 1 areas.

* Correction from *Guinea Worm Wrap-Up #250.*

Table 1

Ethiopia Dracunculaisis Eradication Program

Listing of Animal Infections: 2018*

Animal Infection ID	Region	Zone	Village of Detection	Type of Animal	Name of Animal	Containment (yes/no)	Date Worm Detected	Date Worm Emerged	Water Source Contaminated (yes/no)	Date Abate Applied	Lab Confirmed
A1.1	Gambella	Agnua	Kidane Farm-Athibir	Dog	Opota	yes	15-Apr-18	15-Apr-18	no	On active abate cycle	Yes
A2.1	Gambella	Agnua	Abawiri	Dog	Apanyingo	no	7-May-18	Unknown	yes	Abawiri on abate cycle. Utuyu-Nyikani abated on 10-May-18	Yes
A3.1	Gambella	Agnua	Atheti	Dog	Rangowang	no	10-May-18	10-May-18	Unknown	On active abate cycle	Yes
A4.1	Gambella	Agnua	PRC Agnuak: Pochalla A	Dog	Magor	no	14-May-18	14-May-18	yes	16-May-18	Yes
A4.2	Gambella	Agnua	PRC Agnuak: Pochalla A	Dog	Magor	yes	9-Jul-18	9-Jul-18	no	On active abate cycle	
A5.1	Gambella	Agnua	Utuyu-Nyikani	Dog	Jwokochado	yes	17-May-18	17-May-18	no	On active abate cycle	Yes
A6.1	Gambella	Agnua	Atheti	Dog	Ambach	yes	19-May-18	19-May-18	no	On active abate cycle	Yes
A7.1	Gambella	Agnua	Awukoy	Dog	Watawat	no	30-May-18	30-May-18	Unknown	1-Jun-18	Yes
A8.1	Gambella	Agnua	Atheti	Dog	Jok-ceri	yes	31-May-18	31-May-18	no	On active abate cycle	Yes
A8.2	Gambella	Agnua	Atheti	Dog	Jok-ceri	yes	18-Sep-18	18-Sep-18	no	On active abate cycle	
A9.1	Gambella	Agnua	PRC Agnuak: Akobo E	Cat	Jwokokunyi	no	19-Jun-18	19-Jun-18	Unknown	On active abate cycle. Contaminated ponds abated on 21-Jun-18	Yes
A10.1	Gambella	Agnua	PRC Agnuak: Pochalla D	Cat	Obang	no	22-Jun-18	22-Jun-18	Unknown	On active abate cycle. Contaminated ponds abated on 21-Jun-18	Yes
A10.2	Gambella	Agnua	PRC Agnuak: Pochalla D	Cat	Obang	yes	10-Aug-18	10-Aug-18	no	On active abate cycle	Yes
A11.1	Gambella	Agnua	PRC Agnuak: Pochalla D	Cat	Adokho	yes	31-Jul-18	31-Jul-18	no	On active abate cycle	Yes
A11.2	Gambella	Agnua	PRC Agnuak: Pochalla D	Cat	Adokho	yes	31-Jul-18	31-Jul-18	no	On active abate cycle	Yes
A12.1	Gambella	Agnua	Atheti	Dog	Windex	yes	1-Aug-18	1-Aug-18	no	On active abate cycle	Yes
A13.1	Gambella	Agnua	PRC Agnuak: Pochalla B	Cat	Moabena	no	2-Aug-18	2-Aug-18	Unknown	On active abate cycle	Yes
A14.1	Gambella	Agnua	Akweramero Village	Dog	Ochwiljiey	no	3-Aug-18	3-Aug-18	Unknown	5-Aug	Yes
A15.1	Gambella	Agnua	PRC Agnuak: Pochalla D	Cat	Akwanya	no	9-Aug-18	9-Aug-18	yes	On active abate cycle. Contaminated ponds abated on 10-Aug-18	Yes
A16.1-16.4	Gambella	Agnua	Ablen	Baboon	NA	no	20-Aug-18	Unknown	yes	On active abate cycle	Yes
A17.1	Gambella	Agnua	Athei	Dog	Kwarbakwach	yes	17-Sep-18	17-Sep-18	no	On active abate cycle	

* Provisional Jasnuary - September

Ethiopia has appointed a new Guinea Worm Eradication Case Team Leader (National Program Coordinator), Mr. Mesfin Wossen, as of early October 2018. He earned a Masters of Public Health degree from Debre Markos University in 2015 and a Bachelor of Science degree in environmental health from Hawassa University in 2009. Mr. Wossen served most recently as Public Health and Emergency Preparedness and Response Officer in the Addis Ababa Regional Health Bureau and previously as Sanitation, Hygiene (WASH) and Health Extension Program Officer in the same Regional Health Bureau. Welcome, Ato Wossen!

For prompt reporting of suspected cases and cases of Guinea worm by the refugee community, Guinea worm promotional materials were developed and disseminated in the camps so as to boost the awareness level on the new cash reward among refugees in Gambella and Benishangul Gumuz regions (12,000 posters, 1200 GW ID cards, 600 T-shirts and 6 Billboards).

Proper follow up of GW suspect was conducted by the Ethiopian Guinea worm eradication program team after notification of a potential suspected case from South Sudan who reportedly crossed into the Gambella region of Ethiopia in September 2018. The team shared the report immediately with the South Sudan Guinea Worm Eradication Program team for their further follow up and action as he left Ethiopia immediately by vehicle without contaminating ponds; in the event that it was a genuine GW it would not have posed a risk to the Ethiopian side. To this end, cross border collaboration with South Sudan is sustained.

MALI REPORTS NO HUMAN CASES, 8 CONFIRMED ANIMAL INFECTIONS IN JANUARY-SEPTEMBER

For the third consecutive year Mali's GWEP has reported no cases of Guinea worm disease in humans so far, in January-September 2018. During the same three years however, Mali reported 11 infected dogs in 2016, 9 dogs and 1 cat in 2017, with 6 confirmed GW-infected dogs and 2 confirmed cats so far in 2018. Three (38%) of the 8 confirmed animal infections were contained. A line-list of Mali's infected animals is in Table 2, which includes 7 additional dogs (all contained) whose infections are pending laboratory examination by CDC. Mali reported 8 infected dogs and 1 infected cat in the same period of 2017.

Addressing the problem of residual Guinea worm infections in domestic dogs and cats in Mali for the past three years is now badly constrained by insecurity in much of the endemic area. As summarized in the article on new indices elsewhere in this issue, only one of the seven districts of most concern to Mali's GWEP is fully accessible to the program (Markala/Segou Region). Four are partly accessible (Tominian & Macina/Segou; Mopti & Djenne/Mopti Region), and two are inaccessible (Tenenkou & Yowarou/Mopti), for an estimated overall 43% safe accessibility to Guinea worm-affected or at-risk areas. Mali has just deployed a national technical assistant in Djenne district, where 18 of the 23 health areas are accessible. Much of the inland Niger delta region where dogs are being bred and becoming infected before being transported to Segou Region for sale is inaccessible (Figure 2). The total area of concern in Mali is approximately 120 x 120 miles (200 x 200 km).

Mali reports an average 75% reward awareness for reporting of infected humans (80%) and dogs (69%) so far this year in Level I and II active surveillance areas, with 298 rumors of infected humans provisionally reported in January-September, all of which were investigated within 24 hours. A total of 903 villages are under active surveillance (VAS). Abate has been applied in 6 (40%) of 15 Level I villages under active surveillance so far in 2018. The reasons for not applying Abate in the other 9 Level I villages are diverse: two villages in Djenne district (Kouakourou, Djimatogo) are inaccessible because of insecurity; two villages had no surface water; two infections were detected in town; and three villages had only flowing water. In total, 93% of Level I VAS have at least one source of safe drinking water (Figure 3).

A team from the secretariat of Mali's GWEP that included the new National Program Coordinator Dr. Cheick Oumar Coulibaly and Carter Center Country Representative Mr. Sadi Moussa made supervisory visits on September 2-8 to Tominian, San and Markala districts of Segou Region, and Mopti and Djenne districts of Mopti Region.

World Health Organization

A team from the World Health Organization (Dr. Andrew Seidu Korkor and Ms, Junerlyn Farah Agua) led an external evaluation of Mali's GWEP GWEP from 10 September to 8 October, 2018. at the request of the Ministry of Health, the purpose of which was to confirm interruption of GW transmission and assess the level of preparations during the pre-certification phase. The team visited 9 regions (including Gao, Kidal and Timbuktu), 21 districts, 59 health centers, 121 villages, and interviewed 1,263 persons. At a debriefing with the ministry, they reported on several areas needing improvement, such as discrepancies between data reported to the GWEP and to the national health information system, low knowledge of the cash reward in formerly and never endemic zones, mismanagement of archives at health centers, low coverage of safe drinking water in the north of the country, absence of rumor registers in health centers, and low notification and documentation of rumors in formerly and never endemic zones. Among the recommendations was the urgent need to disseminate information about the new reward scheme (200 000 CFA(~$340 US) and 10 000 CFA (~$17 US) respectively for giving information leading to the detection/reporting of confirmed human and dog infection with GW); improve collaboration and coordination between the National Guinea Worm Eradication Program, Integrated Disease Surveillance and Response (IDRS), and Health Management Information systems (HMIS); as well as ensure integration of GWEP reporting into the weekly and monthly reporting at all levels. The team heard only three rumors of cases in humans in two villages of Segou Region and one village in Gourma Rharous district of Timbuktu Region during their visit. The rumors were investigated and found not to be Guinea worm cases.

Table 2

Mali Ginea Worm Eradication Program

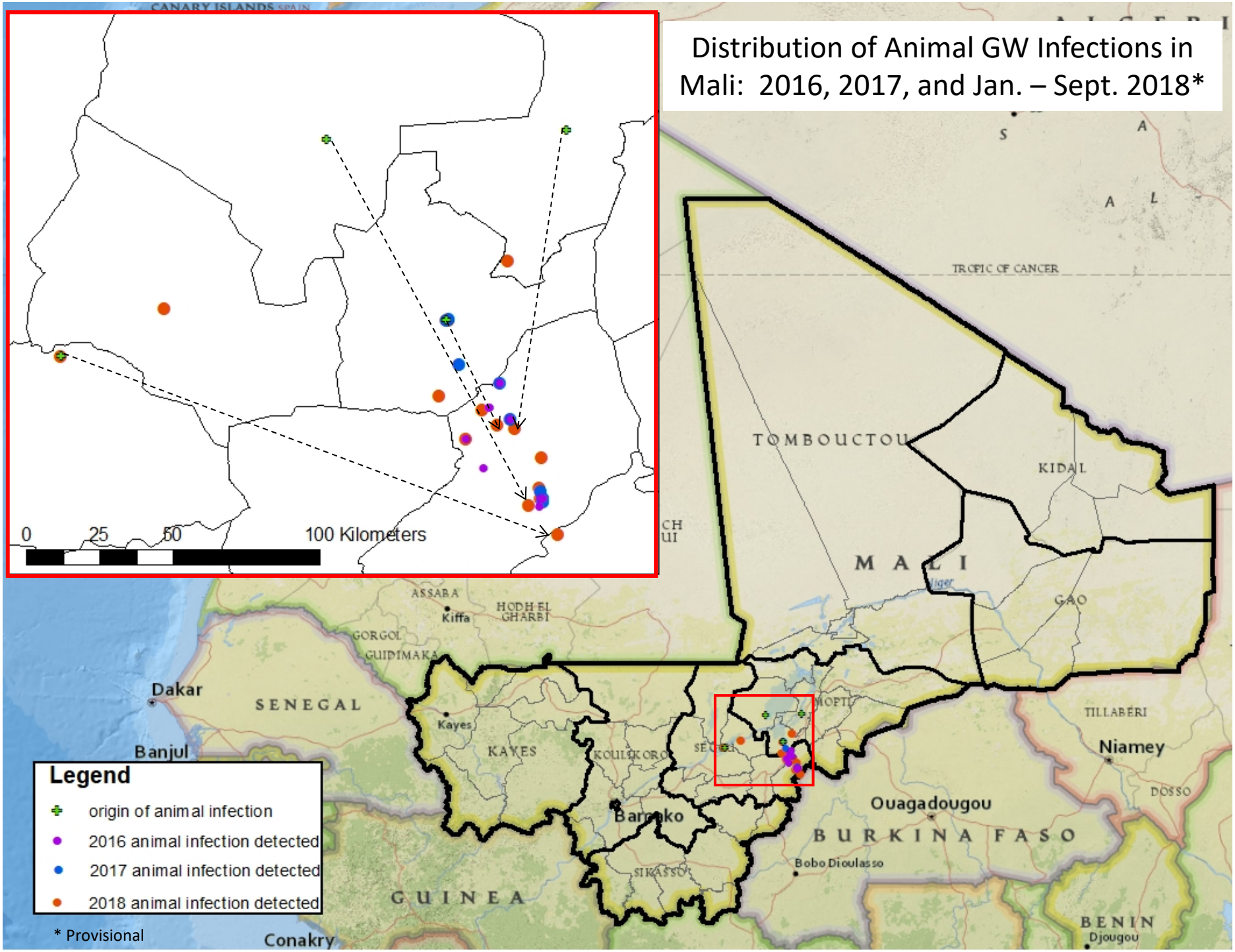
Listing of Dog Infections: 2018*

Animal Serial No.	Region	District	Health Area	Village	Ethnicity of Animal Owner	Occupation of Animal Owner	No. of GWs	Animal	Containment ^ (Yes/No)	Date of detection	Date GW emergence	Water Source Contamination? (Yes/No/likely)	Abate applied (Yes/No)	Lab Confirmed
1	Segou	Tominian	Fangasso	Tierakuy	Bobo	farming	2	dog	Yes	16-May-18	16-May-18	No	No	Yes
2	Segou	Tominian	Togo	Matina	Bobo	farming	1	dog	Yes	9-Jun-18	10-Jun-18	No	No	Yes
3	Segou	Markala	Babougou	Barakabougou	Bozo	Fishing	2	dog	No	26-Jun-18	26-Jun-18	Likely	Yes	Yes
4	Segou	Macina	Central	Gueda	Bambara	farming	1	dog	No	12-Jul-18	12-Jul-18	Likely	Yes	Yes
5	Segou	Macina	Central	Gueda	Bozo	fishing/farming	1	dog	No	11-Jul-18	9-Jul-18	Yes	Yes	Yes
6	Segou	Tominian	Ouan	Ouena	Bobo	housewife	1	cat	No	27-Jul-18	27-Jul-18	Likely	Yes	Yes
7	Segou	Tominian	Fangasso	Soumankuy	Bobo	farming	1	dog	Yes	14-Jul-18	14-Jul-18	Likely	Yes	Yes
8	Segou	Tominian	Fangasso	Mampe	Bobo	farming	1	cat	No	27-Jul-18	15-Aug-18	Likely	Yes	Yes
9	Mopti	Djenne	Kouakourou	Yonga Bozo	Bozo	fishing	1	dog	Yes	08-août-18	13-août-18	No	No	pending
10	Mopti	Djenne	Senossa	Senossa	Peul	farming/fishing	1	dog	Yes	29-août-18	31-août-18	No	No	pending
11	Mopti	Djenne	Keke	M'Biabougou	Bobo	farming	1	dog	Yes	23-août-18	23-août-18	No	No	pending
12	Segou	Tominian	Fangasso	Sounde	Bobo	farming	1	dog	Yes	31-août-18	4-sept.-18	No	No	pending
13	Segou	Tominian	Fangasso	Masso	Bobo	farming	1	dog	Yes	04-sept.-18	6-sept.-18	No	No	pending
14	Segou	Tominian	Fangasso	Sokoura	Bobo	fish trader	1	dog	Yes	09-sept.-18	17-sept.-18	No	Yes	pending
15	Mopti	Djenne	Central	Djenne	Bozo	fishing	1	dog	Yes	4-sept.-18	17-sept.-18	No	No	pending

*Provisional January - September

^ All of the containment criteria must be met:

1. The animal must be detected and tethered with in 24 hours of worm emergence.
2. The animal must not have entered a source of water with an emergent GW.
3. The animal is tethered prior to GW emergence until all worms are extracted, and owners received health education.
4. A supervisor confirms the infection with GW within 7 days of worm emergence.
5. Abate is applied to water sources to prevent the possibility of transmission of GWs within 15 days of the contamination event.


Distribution of Animal GW Infections in Mali: 2016, 2017, and Jan. – Sept. 2018*
0
25
50
100 Kilometers
Legend
origin of animal infection
2016 animal infection detected
2017 animal infection detected
2018 animal infection detected
* Provisional
TROPIC OF CANCER
TOMBOUCTOU
KIDAL
MALI
GAO
MOPTI
TILLABERI
Niamey
DOSSO
Ouagadougou
BURKINA FASO
Bobo Dioulasso
SIKASSO
KAYES
KOULIKORO
Bamako
Kayes
Kiffa
ASSABA
HODH EL GHARBI
GORGOL
GUIDIMAKA
Dakar
SENEGAL
Banjul
GUINEA
Conakry
BENIN
Djougou

SOUTH SUDAN: SEVEN CASES IN MAY-SEPTEMBER

The South Sudan Guinea Worm Eradication Program (SSGWEP) has reported 7 confirmed cases of Guinea worm disease (one contained) in May-August 2018. The cases are reported from five counties: Rumbek Center (2 cases), Rumbek North (2 cases), and Yirol East (1 case) Counties in Western Lakes (former Lakes) State; and 1 case each in Tonj North County (former Warrap State) and Nyirol County (former Jonglei State) (Table 3). The first six cases are highly migratory cattle camp-based youths whose peer relationships are as influential as their familial links. Patient #6, who was detected in Yirol East County where he had migrated from Rumbek North due to disarmament programming, is related to one of the cases detected in Rumbek North County. The SSGWEP is developing robust surveillance in Yirol East cattle camps. Guinea worm transmission dynamics in Rumbek Center County are likely tied to migratory cattle camp movements of the Rupp community/sub-clan. The SSGWEP has conducted several investigations into former and current Rupp migratory routes to ensure that those areas are reached for surveillance and interventions. Investigations are also ongoing into the relationship between the two cases in Rumbek Center this year and a case that occurred in Wulu County (Western Lakes/formerly Lakes State) in 2014, since cattle camp migratory patterns overlap in certain areas and the cases know each other.

South Sudan had over 4,000 villages under active surveillance in 2017. The SSGWEP, through a partner Non-Governmental Organization, UNKEA, is monitoring the suspect case from South Sudan who briefly visited a refugee camp in Ethiopia in September. UNKEA also conducted a follow up investigation of that suspect's home area and the village in South Sudan where he self-reported to a health facility before traveling to Ethiopia. To date there has been no evidence of an emerging Guinea worm in this patient. As summarized in the article on modified interventions elsewhere in this issue, the SSGWEP reports an estimated overall safe accessibility to 80% of areas of most concern to the program.

SUDAN

In order to establish robust and sensitive surveillance system across the border states, the Federal Ministry of Health (with WHO support) rolled out Community Based Surveillance (CBS) in Sudan. The targeted states and localities selected for the CBS are border states where risk of GW importation is high. Currently the target is to train more than 8000 community volunteers from 7100 villages in 115 localities of 11 states. WHO- Sudan in collaboration with FMOH, conducted two days (10-11 October 2018) national level Training of Trainer (ToT) followed by a series of more than 180 state level trainings in progress.

The focus of the training was to strengthen early detection and reporting of common public health threats and events from communities including rumors or any suspected case of Guinea Worm. The states that have rolled out CBS are White Nile, Blue Nile, East Darfur, North Darfur, South Darfur, West Darfur, South Kordofan, West Kordofan, Central Darfur, Sennar and Gedaref.

Sudan is hosting jointly with WHO support a cross border collaboration meeting with seven neighboring countries, during which strengthening of GW surveillance is a key thematic area identified to be discussed. The meeting is scheduled to be helon 20-22 Nov 2018.

Table 3

South Sudan Guinea Worm Eradication Program
Line Listing of Confirmed Cases of Confirmed Dracunculiasis in 2018*

Case #	Age	Sex	Ethnicity	Boma	Payam	County	State	Date GW emerged (D/M/Y)	Worm contained? (Yes/No)	Patient contaminated sources of water (Yes/No)	Date ABATE applied (D/M/Y)	Source* of infection established? (Yes/No)
1.1	25	M	DINKA	ADOL	MAYOM	RUMBEK CENTER	WESTERN LAKES	Mid-May	NO	YES	UNSAFE WATER SOURCES DRY AT THE TIME OF DETECTION	NO
1.2				ABEER	MATANGAI			02/06/18	YES	N/A		NO
1.3								08/06/18				NO
1.4								01/07/18				NO
1.5								04/08/18				NO
2.1	17	F	DINKA	MALEK	MALEK	RUMBEK CENTER	WESTERN LAKES	27/05/18	NO	YES	29/05/18	NO
2.2				CUEI-CHOK ADUKAN	AMOK PINY			05/07/18	NO		11/07/18	NO
3.1	14	F	DINKA	MEEN (MAYEN)	MEEN (MAYEN)	RUMBEK NORTH	WESTERN LAKES	01/06/18	NO	PROBABLE	07/06/18	NO
3.2								07/06/18	YES	N/A	N/A	NO
3.3				ABEER	MATANGAI	RUMBEK CENTER		04/07/18				NO
3.4								09/07/18				NO
4.1	35	F	DINKA	MAGUEN	AKOP	TONJ NORTH	TONJ	14/07/18	NO	PROBABLE	19/07/18	NO
4.2				ATHIENGPUOL				17/07/18	YES	N/A	N/A	NO
4.3								12/08/18				NO
4.4								17/08/18				NO
4.5								18/08/18				NO
5.1	16	F	DINKA	MEEN (MAYEN)	MEEN (MAYEN)	RUMBEK NORTH	WESTERN LAKES	19/07/18	YES	N/A	N/A	NO
6.1	24	M	DINKA	MACHAR-ACHIEK	ADIOR	YIROL EAST	EASTERN LAKES	25/07/18	NO	PROBABLE	3/8/2018 (THE CATTLE CAMP WAS EMPTY)	NO
7.1	7	F	NUER	TUT	THOL	NYIROL	NORTHERN BIEH	21/08/18	NO	YES	ABATE NOT YET APPLIED	NO

EVS= Endemic Villages

NEVS = Non Endeimic Villa

* Provisional January - September

CHAD: 11 CONFIRMED HUMAN CASES, 24 CATS, 965 DOGS

Chad's GWEP has reported 11 confirmed human cases (5, or 45% contained) in January-September 2018, compared to 13 cases reported during the same period of 2017, a decrease of 15%. Table 4 is a line-list of the human cases. The 965 infected domestic dogs and cats are an increase of 29% over the 749 infected dogs and 13 cats reported during January-September 2017. Worm specimens from two other suspect cases are pending examination by the laboratory at CDC. As of August 2018, Chad had 1,878 villages under active surveillance (VAS), including 1,397 level I VAS, with 501 villages having reported an infected person and/or animal in 2018 ("1+ villages"), and had received 10,201 rumors of human cases, of which 97% were investigated within 24 hours. As summarized in the article on modified interventions elsewhere in this issue, Chad's GWEP reports safe accessibility overall to an estimated 92% of areas of concern to the program.

The program has strengthened interventions, adding 5 more technical assistants in 2018 to 14 TAs in 2017. As of August 2018, it had applied Abate this year in 70 of the 85 villages that reported 5 or more infected dogs in 2016-2018, compared to 12 such villages where Abate was applied in December 2017. Those 70 villages treated with Abate monthly this year reported 452 (47%) of the 961 infected dogs reported in January-September 2018 (32 of the 70 villages were treated in August due to increased water levels in the rainy season). The program is expanding Abate treatments to more 1+ villages as fast as possible. Only 62 villages reported 5+ infected dogs in January-September 2018. In total, 75% of infected dogs/cats/humans were contained in 2018 so far, compared to 76% contained in 2017. The average rate of fish gut burial in surveyed 1+ households in 2018 is 86%, compared to 79% in 2017, and the average rate of reward awareness in level I (endemic) & II (high risk) villages has increased from 61% in 2017 to 74% so far this year. In another sign of improved surveillance, Chad's program received almost three times as many rumors related to cases in humans in January – August 2018 (10,201) as in all of 2017 (3,454). In total, 71% of Chad's 1+ villages had at least one safe drinking water source in 2018.

National Coordinator Dr. Tchindebet Ouakou met with Carter Center/CDC epidemiologist Dr. Sarah Guagliardo during her visit to Chad from August 26 to September 4 when she worked with the Chad program's data management team to further analyze of GW risk factors in Chad. Carter Center Country Representative Dr. Hubert Zirimwabagabo accompanied University of Georgia researcher Christopher Cleveland in his field research during August 21-September 4. An Exeter University team composed of Dr. Cecily Goodwin, Jared Wilson-Aggarwal, and Dr. Monique Lechenne completed their field research in Chad on September 2, leaving behind Dr. Sidouin Metinou who will continue to support Exeter's field research in Chad through October this year. A team from Carter Center headquarters (Dr. Dean Sienko and Adam Weiss) and the Bill & Melinda Gates Foundation (Dr. Jordan Tappero and Dr. Nana-Kwadwo Biritwum) visited the Chad program October 14-19 for a brief inspection of field activities in endemic villages.

Table 4

Chad Guinea Worm Eradicaton Program
GWEP Line Listing of Confirmed Cases: Year 2018*

Case #	Age	Sex	Ethnicity	Village/Locality of Detection			Date GW emerged (D/M/Y)	Case contained? (Yes/No/ Pending)	Patient contaminated sources of water (Yes/No)
				Village	District	Region			
1	22	F	Sara Kaba	Madjiyam	Kyabe	MC	27-Jan-18	Yes	no
2	25	F	Sara Kaba	Dangala Kanya	Kyabe	MC	19-Feb-18	Yes	no
3	50	M	Ndam	Guelbodane	Korbol	MC	19-Mar-18	Yes	no
4	7	M	Mouroum	Moursal	Bailli	CB	28-May-18	Yes	no
5	25	F	Rachite	Am-Habilé	Aboudeia	SLM	01-Jul-18	**No**	possible
6	56	M	Arabe	Djoballa 4	Bousso	CB	02-Jul-18	**No**	yes
7.1	45	F	Foulata	Am-Dabri	Amtiman	SLM	03-Jul-18	Yes	no
7.2							10-Aug-18	Yes	no
7.3							18-Aug-18	Yes	no
7.4							22-Aug-18	Yes	no
8.1	20	F	Rachite	Am-Habilé	Aboudeia	SLM	13-Jul-18	**No**	possible
8.2							16-Aug-18	**No**	possible
9.1	20	M	Dadjo	Am-Habilé	Aboudeia	SLM	18-Jul-18	**No**	possible
9.2							29-Jul-18	**No**	no
10.1	60	M	Rachit	Am-Habilé	Aboudeia	SLM	29-Jul-18	**No**	possible
10.2							29-Jul-18	**No**	
10.3							11-Aug-18	**No**	
10.4							28-Aug-18	**No**	
10.5							08-Sep-18	**No**	
10.6							08-Sep-18	**No**	
10.7							11-Sep-18	**No**	
10.8							11-Sep-18	**No**	
11	10	F	Baguirmi	Boubou Tabana	Bousso	CB	18-Aug-18	**No**	yes

* Provisional January - September

MODIFIED INTERVENTION INDICES TO REFLECT VARIABLE MODES OF TRANSMISSION

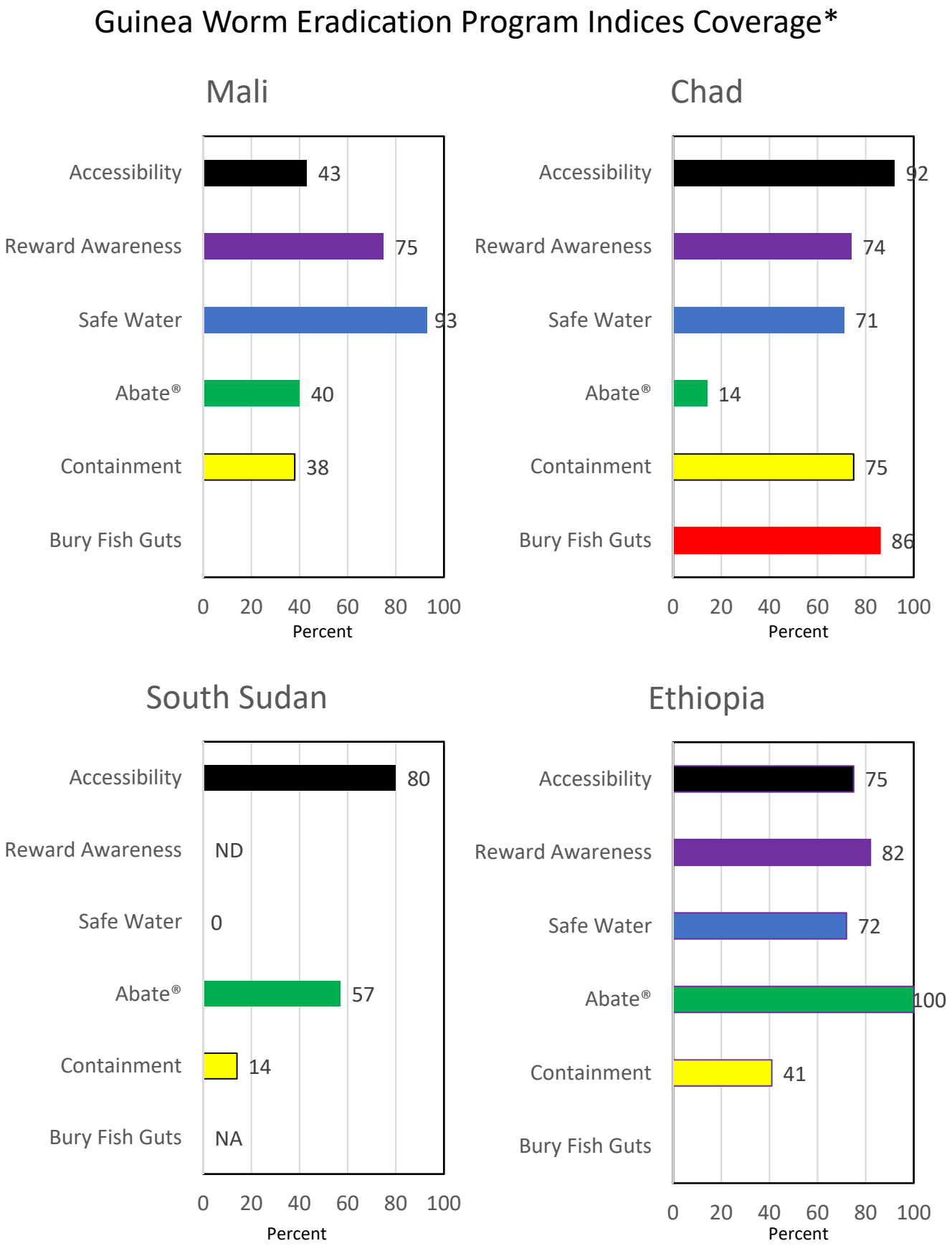
With *D. medinensis* infections occurring in animals in three of the final four endemic countries (South Sudan is the exception) and evidence mounting to suggest that the infection is being transmitted to humans and animals not just by drinking water, as before, but likely also by people and animals 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 I (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 are:

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

Figure 3



- See criteria for each indicator in text; ND -= No Data NA = Not Applicable
- Provisional September 2018

Table 5

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 / 6	0 / 1	0 / 0	/	/	/	5 / 11	45%
ETHIOPIA	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 / 1	1 / 3	0 / 1	0 / 0	/	/	/	1 / 7	14%
MALI §	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	/	/	/	0 / 0	0%
ANGOLA^	/	/	/	0 / 1	/	/	/	/	/	/	/	/	0 / 1	0%
TOTAL*	1 / 1	1 / 1	1 / 1	0 / 1	1 / 3	0 / 1	2 / 9	0 / 2	0 / 0	0 / 0	0 / 0	0 / 0	6 / 19	32%
% CONTAINED	100%	100%	100%	0%	33%	0%	22%	0%	0%				32%	

*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.

^ 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.

Number of Laboratory-Confirmed Cases of Guinea Worm Disease, and Number Reported Contained by Month during 2017*

(Countries arranged in descending order of cases in 2016)

COUNTRIES WITH ENDEMIC TRANSMISSION	NUMBER OF CASES CONTAINED / NUMBER OF CASES REPORTED													% CONT.
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL*	
CHAD	0 / 0	1 / 1	1 / 1	1 / 2	2 / 2	1 / 2	2 / 2	0 / 1	0 / 2	1 / 1	0 / 0	1 / 1	10 / 15	67%
SOUTH SUDAN	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%
ETHIOPIA^	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	2 / 8	0 / 4	1 / 2	0 / 1	3 / 15	20%
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 / 0	1 / 1	1 / 1	1 / 2	2 / 2	1 / 2	2 / 2	0 / 1	2 / 10	1 / 5	0 / 0	1 / 2	13 / 30	43%
% CONTAINED	0%	100%	100%	50%	100%	50%	100%	0%	20%	20%	0%	50%	43%	

*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.

^ 10 of 12 cases laboratory confirmed; 2 of 12 declared cases based on where and when these became infected in 2016, and having had signs and symptoms of GWD at the same time as others.

§Reports include Kayes, Koulikoro, Segou, Sikasso, and Mopti, Timbuktu and Gao Regions; contingent on security conditions during 2017, the GWEP continued to deploy one technical advisor to Kidal Region to oversee the program.

GUINEA WORM RESEARCHERS MEET IN SEATTLE

On September 10-11, approximately 45 participants including Guinea worm researchers, representatives from the Bill & Melinda Gates Foundation, The Carter Center, World Health Organization, Centers for Disease Control and Prevention, the Ministries of Health of Ethiopia and South Sudan, and other experts were co-convened by the Gates Foundation and Carter Center in Seattle, Washington in a "Call to Action". The main purpose of the meeting, which reviewed the current status of the eradication campaign and related on-going research efforts, was to seek ways to accelerate understanding of the dynamics of *Dracunculus medinensis* transmission and identify new interventions and tools to enhance surveillance, diagnostics, and containment of the infection in humans and animals. Among many recommendations the meeting suggested prioritizing as most urgent on-going research to develop a serological test for identifying infected hosts, and to investigate small fish as probable transport hosts of the parasite. It also prioritized new research to study the impact of Flubendazole on development of GW larvae, to identify a substitute for raw fish guts as a food source for dogs (such as processing techniques to kill larvae), and to investigate use of satellite imagery for establishing connections between populations and surface water sources.

Among recent research findings of potential immediate use to programs for targeting Abate applications are GPS tracking data by Prof. Robbie McDonald's group from the University of Exeter indicating that ponds within 200 meters of households with dogs in **Chad** are only a small fraction of all ponds but comprise the vast majority of dog visits, and similar data by the same group illustrating specific forest sites visited by dogs from villages of highest concern in **Ethiopia**. Epidemiologists led by Dr. Sharon Roy from CDC have confirmed ingestion of raw fish guts as an important risk factor for Guinea worm infections of dogs in **Chad**, while Dr. Elizabeth Thiele and her colleagues at Vassar College and CDC have used genetic data to trace intra- and inter-generational lineages of Guinea worms in **Ethiopia**, and Dr. Michael Yabsley and Christopher Cleveland of the University of Georgia have shown that fish can serve as transport hosts and frogs can serve as paratenic hosts for *Dracunculus* species.

ADAM WEISS APPOINTED DIRECTOR OF GWEP AT CARTER CENTER

On September 1, 2018 The Carter Center named Adam Weiss, MPH, Director of the Center's Guinea Worm Eradication Program. Formerly Senior Associate Director and second-in-command in the program, Weiss joined The Carter Center in 2005 as a technical advisor to national Guinea Worm Eradication Programs in Ghana, Ethiopia, and Sudan/South Sudan. Before that he worked on Guinea worm eradication as a U.S. Peace Corps Volunteer in Ghana for two years, focused on community-based health education and access to safe water. He succeeds Dr. Ernesto Ruiz-Tiben, who retired at the end of August.

Weiss graduated with honors from Ripon College, earning a Bachelor of Arts degree in anthropology and politics and government. He holds a Master of Public Health degree from Emory University's Rollins School of Public Health, where he received the Charles C. Shepard Award for his thesis on Guinea worm disease in Ghana.

MEETINGS

The South Sudan Guinea Worm Eradication Program will hold its annual Program Review in Juba on December 6-7, 2018.

Ethiopia's Dracunculiasis Eradication Program will hold its annual Program Review meeting in Gambella town on December 11-12, 2018.

Chad's GWEP will hold its annual Program Review in N'Djamena on January 23-24, 2019.

Mali's GWEP will hold its annual Program Review in Bamako on January 29-30, 2019.

The 23rd International Review Meeting of Guinea Worm Eradication Program Managers will be convened at The Carter Center in Atlanta, USA on March 21-22, 2019.

RECENT PUBLICATIONS

World Health Organization, 2018. Monthly report on dracunculiasis cases, January-June 2018. Wkly Epidemiol Rec 93:415-416.

Thiele, E. A., Eberhard, M. L., Cotton, J. A., Durrant, C., Berg, J., Hamm, K., & Ruiz-Tiben, E. 2018. Population genetic analysis of Chadian Guinea worms reveals that human and non-human hosts share common parasite populations. Plos Neglected Tropical Diseases, 12(10), e0006747. https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0006747

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) 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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