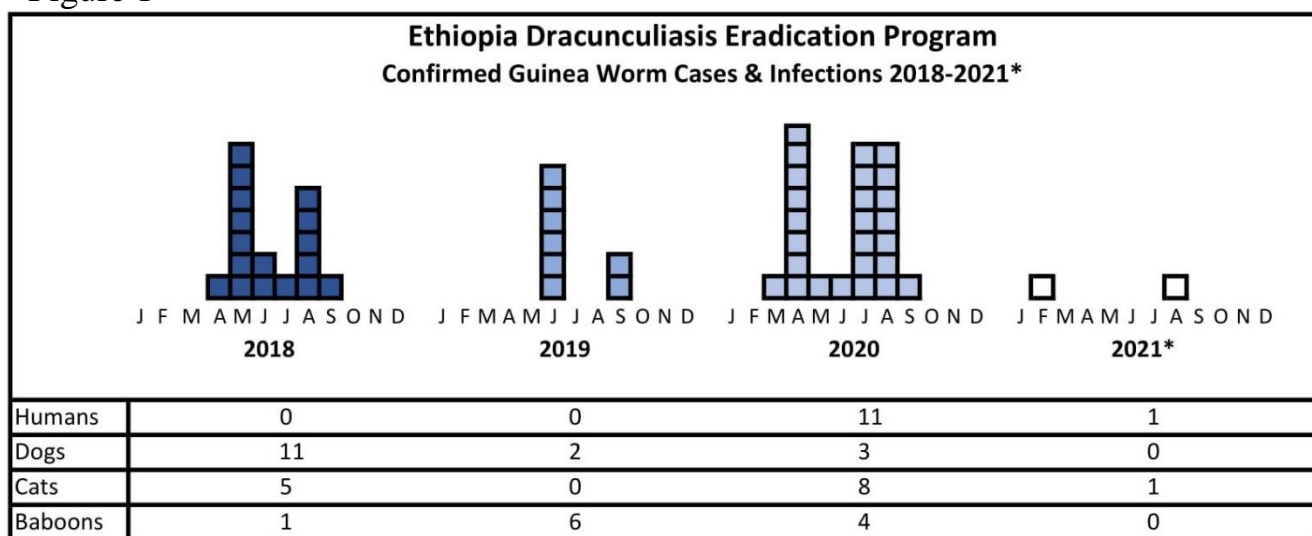




**Date:** September 24, 2021  
**From:** WHO Collaborating Center for Dracunculiasis Eradication, CDC  
**Subject:** GUINEA WORM WRAP-UP #281  
**To:** Addressees

*Every infection comes from somewhere. Find out where. Look there.*

Figure 1



\* January - August

**ETHIOPIA REPORTS 1 GUINEA WORM CASE AND 1 PROVISIONAL ANIMAL INFECTION IN JANUARY-AUGUST**



The Ethiopia Dracunculiasis Eradication Program (EDEP) has reported one confirmed Guinea worm case and one provisional animal Guinea worm infection in January-August 2021. The provisional infection in a domestic cat was detected August 20<sup>th</sup> in Akobo D section of the Pugnido Refugee Camp (PRC Agnua) in Gog district of Gambella Region where 8 infected cats were detected in the same refugee camp in July-August 2020. Ethiopia’s peak Guinea worm transmission occurs during the rainy season in April-August (Figure 1). The EDEP reported no human Guinea worm cases for two consecutive years, 2018-2019, but it reported Guinea worm infections in 13 dogs, 7 baboons, and 5 cats during that time. Ethiopia had only a few human infections over the past decade except for common source water-borne outbreaks in 2017 (15 cases) and 2020 (11 cases). It detected infected dogs and olive baboons (*Papio anubis*) for the first time in 2013, and the first infected cat in 2018. Since 2012, endemic Guinea worm transmission in Ethiopia has been limited to a small, forested area of about 50x25 miles

(80x40 kilometers) in Gog district of Gambella Region. Epidemiologic evidence suggests almost all human cases in recent years were Agnuak males averaging 39 years old, most of whom hunted, gathered honey, wood, or other material in the forest, often accompanied by dogs. Unlike in Chad, a study of the ecology, ranging behavior, and diet of dogs in Gog district found no association of Guinea worm infection and dogs' consumption of fish or frogs\*. The current hypothesis is that except for the common-source outbreaks, that occurred in or near villages, most recent Guinea worm infections in humans, dogs, and baboons in Ethiopia were contracted by drinking contaminated water from transient ponds in the forest.

The EDEP stressed health education and distributed cloth filters to villagers from the outset, and in recent years promoted using pipe filters for drinking water in the forest, and cooking fish thoroughly. About a quarter of villages at risk do not have a source of safe drinking water. By engaging hunters, baboon trackers, and others, the program has identified and treated more and more ponds with Abate in forest areas associated with animal and human infections, increasing from 564 ponds treated in June 2018 to 860 in June 2020 and 764 ponds treated in June 2021 (variable rainfall). It began tethering (containing) infected dogs until their worms were fully emerged or removed since at least 2015, but in a major innovation developed with villagers, the EDEP began helping villagers to proactively tether *almost all* dogs and cats in villages at risk during the peak transmission season in 2018. Villagers proactively tethered 646 dogs and cats in June 2018, 1,632 in June 2019, 2,391 in June 2020, and 2,210 dogs/cats in June 2021. As reported earlier, Guinea worm infections in dogs in Ethiopia declined by 80%, from an average 12.5 infected dogs annually in 2015-2018, to 2 and 3 infected dogs in 2019-2020. Now reported dog infections as well as reported baboon infections have declined to zero so far in 2021.

Awareness of the cash rewards for reporting humans or animals (equivalent of US\$360 and US\$40 respectively, since 2018) with Guinea worm infections remains high. Convenience samples suggest 95% reward awareness in 2020 and 97% awareness in 2021 in areas under active surveillance. EDEP responded to 20,452 rumors of human and animal Guinea worm infections in 2020 and 11,458 rumors in January-July 2021. According to Field Coordinators in the program, community members in high priority villages check wild animals for signs of Guinea worm infection if the animal is caught or trapped alive and check all carcasses of killed baboons for Guinea worm. They report that 81 baboons were killed or found dead in 14 villages in Gog district in April-August 2021 with no sign of Guinea worm infection in any of them. (Villagers chase and sometimes kill baboons to protect their crops--which is how most infected baboons are discovered.) Villagers in Ablen, Atheti, and Wichini, three highly endemic villages in Gog district, killed about 25 baboons in January-September 2016, none of which were infected. The second phase of EDEP's cooperative project with the Ethiopian Wildlife Conservation Authority, Ethiopian Public Health Institute, The Carter Center, and other international partners to support field teams and researchers in tracking, temporarily trapping, examining, and bleeding members of several baboon troops that began in 2018-2019 in peri-domestic endemic areas will resume in October 2021 and provide additional baboon surveillance by using serology developed at CDC. The EDEP and partners also plan to improve detection and treatment of water sources used by baboons by integrating data from baboon tracking, remote sensing, and satellite imagery.

The presumed sources of all 11 human Guinea worm cases in Ethiopia in 2020 are known, and all were successfully contained. Ethiopia has reported only one Guinea worm case in 2021, in February, in a

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\* JK Wilson-Aggarwal, CED Goodwin et.al., 2020. Ecology of domestic dogs (*Canis familiaris*) as a host for Guinea worm (*Dracunculus medinensis*) infection in Ethiopia. *Transboundary and Emerging Diseases* doi: 10.1111/tbed.13711

human whose infection was contained and whose presumed source of infection is known, since he used the same water sources in 2020 that were implicated in the common-source outbreak at Duli Farm that year.

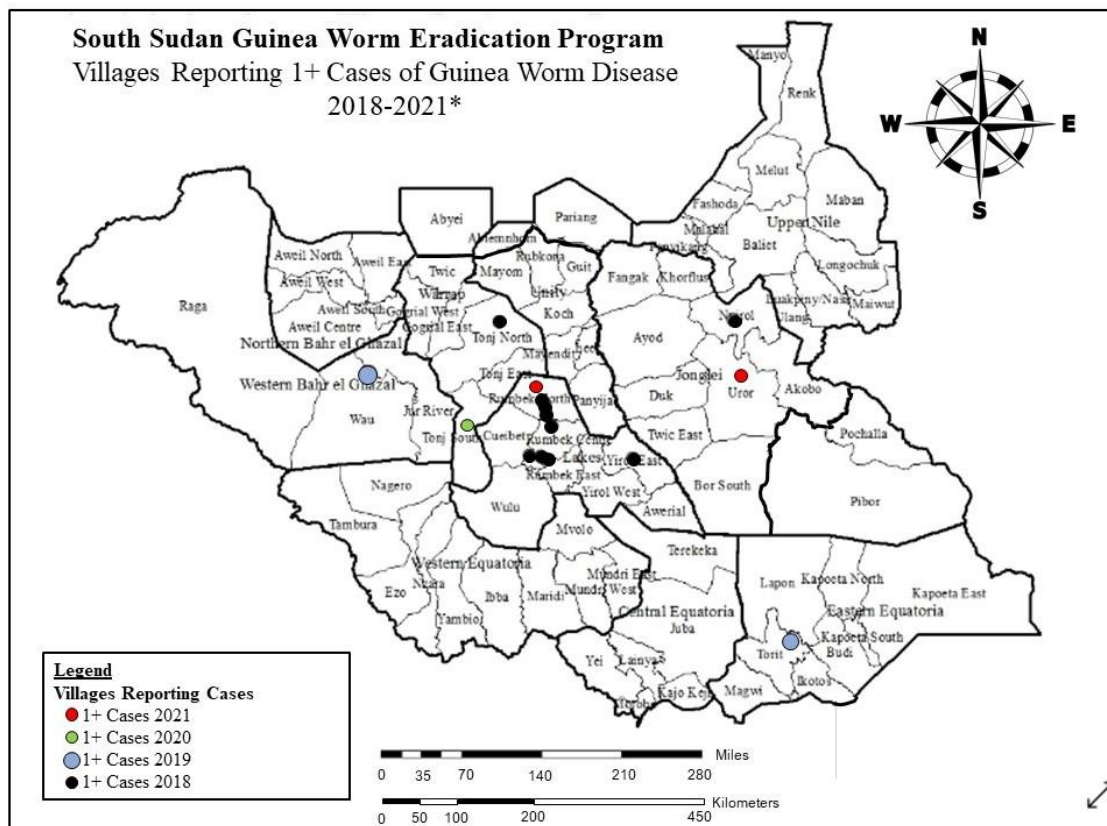
### SOUTH SUDAN: SEEKING SOURCES



The South Sudan Guinea Worm Eradication Program (SSGWEP) has reported two confirmed Guinea worm cases in 2021: a 13-year-old Nuer girl in a village in Uror County/Jonglei State, and a 13-year-old Dinka girl in a cattle camp in Rumbek North County/Lakes State. Both girls’ worms emerged in July. The Rumbek North case was contained; the Uror case was not. The presumed source of infection (see definition in this issue) of neither case is known. The Uror County response included establishing a dedicated Abate team, as well as adding 12 field officers and a lead program officer. In Rumbek an Abate team and 5 field officers were added. The Director General of Public Health Services Dr. John Rumunu informed the public of the two cases, the first in South Sudan since July 2020.

After reporting zero Guinea worm cases for the first time in 2017, South Sudan reported ten cases (3 contained) in cattle camps in five counties of a newly pacified area in 2018, four cases (2 contained) in two villages in other areas in 2019, and one case (contained) in a village elsewhere in 2020. The presumed sources of those fifteen cases are also unknown. The locations of these latest cases are indicated in Figure 2. South Sudan has reported a Guinea worm in an animal only once, a dog in a household with a human case, in 2015.

Figure 2



In 2020 the SSGWEP had 851 villages under active surveillance (2,675 villages in 2019; 4,046 villages in 2017), received reports from 1,434 passive surveillance (IDSR) units (79% reporting rate), and conducted integrated surveys for Guinea worm that reached about 350,000 persons in cooperation with trachoma and onchocerciasis programs. Convenience samples in areas under active and passive surveillance found 71% awareness of the cash rewards (US\$280 and US\$26 equivalent) for reporting Guinea worm infections in humans and animals, and the program responded to 58,051 rumors of human infections and 570 rumors of animal infections. South Sudan submitted specimens to CDC for laboratory testing from 40 persons in 2018, from 44 persons and 2 animals in 2019, and from 27 persons and 29 animals in 2020. Through mid-September 2021, CDC has received specimens from South Sudan from 17 persons and 29 animals.

The SSGWEP has consistently covered over 90% of its known endemic villages with cloth and pipe filters, health education, and Abate treatment of eligible surface water sources since before 2017, including in prompt response to the Guinea worm cases detected since 2017. The proportion of currently endemic villages with at least one source of safe drinking water varied between 20% and 75% in 2018-2020. In addition to consistently strong political support and technical leadership, the SSGWEP's great advantage is not having sustained Guinea worm infections in animals. It is uniquely challenged however, by the legacy of chronic disruption and insecurity, the extreme mobility of at-risk cattle herders and some others, and prolonged isolation of some areas. The inability to identify presumed sources of its few remaining Guinea worm cases suggests the sporadic residual transmission in South Sudan may be associated with a few chains of transmission among undetected human cases. Comparing the genetic profiles of worm specimens may soon help detect or dismiss such potential relationships.

## MALI



Mali reports an additional confirmed infected dog, its 5<sup>th</sup> in 2021, whose Guinea worm emerged on August 20 in the Doteme neighborhood of central Djenne. The infection was contained. The presumed source of this infection is indigenous since there were three infected dogs in central Djenne in August-September 2020. The program also reports eight other suspected dog Guinea worm infections in August-September 2021.

The dog in Kona Hembereni village of Tominian district/Segou was imported from Diafarabe in Tenenkou by a dog trader; and the dog in Lakuy village of Tominian district was imported from Kokrycamp near Kokry Bozo in Macina district in January 2021. These later suspected infections are being investigated. An updated line list is in Table 1.

Table 1

## MALI GWEP LISTING OF HUMAN CASE AND DOG INFECTIONS: YEAR 2021

#	Region	District	Health Zone	Village	Ethnicity	Profession	Host	Probable origin	Date of detection	Date of emergence	Entered water?	Abate Applied? (Y/N)	Contained*? (Y/N)	Confirmed?	Total # of GW
1	Segou	Macina	Macina Central	Nemabougou/Bellah Wèrè	Touareg	Imam	Animal	Nemabougou (Macina Ville)	13/Jan.	13/Jan.	No	Yes	Yes	Yes	1
2	Segou	Markala	Babougou	Barakabougou	Bozo	Fisherman	Animal	Unknown	3/May	4/May	No	Yes	Yes	Yes	2
3	Mopti	Djenne	Sofara	Malabano/Kaka	Bozo	Fisherman	Animal	Unknown	31/July	31/July	Yes	Yes	No	Provisional	1
4	Segou	Markala	Sansanding	Walawala Bozo King (Sansanding)	Bozo	Fisherman	Human	Unknown	3/Aug.	3/Aug.	Yes	No	No	Yes	1
5	Mopti	Djenne	Djenne Central	Tolober (Djenne)	Dogon	Trader	Animal	Djenne town	5/Aug.	5/Aug.	No	No	Yes	Yes	1
6	Mopti	Djenne	Djenne Central	Doteme (Djenne town)	Sonrhai	retiree	Animal	Djenne town	16/Aug.	20/Aug.	No	No	Yes	Yes	1
7	Segou	Macina	Kolongo	Kolongo Bozo (Hamlet)	Bozo	Farmer	Animal	Kolongo Bozo hamlet	19/Aug.	20/Aug.	Yes	Yes	No	Provisional	1
8	Segou	Macina	Kolongo	Kolongo Bozo (Hamlet)	Sarakole	Mechanic	Animal	Kolongo Bozo hamlet	20/Aug.	20/Aug.	No	Yes	Yes	Yes	1
9	Segou	Tominian	Yasso	Lakuy	Bobo	Farmer	Animal	Unknown	3/Sept.	3/Sept.	No	Yes	Yes	Provisional	1
10	Segou	Tominian	Lanfiala	Kona Hembereni	Bobo	Farmer	Animal	Unknown	7/Sept.	7/Sept.	No	Yes	Yes	Provisional	1
11	Segou	Macina	Kolongo	Kolongo Bozo (Dagagnini)	Bozo	Farmer/Fisherman	Animal	Kolongo Bozo	9/Sept.	10/Sept.	No	Yes	Yes	Provisional	1
12	Segou	Markala	Sansanding	Sansanding	Bozo	Fisherman	Human	Unknown	15/Sept.	15/Sept.	No	Yes	Yes	Provisional	1
13	Mopti	Djenne	Senossa	Wekara/Senossa	Bozo	Fisherman	Animal	Unknown	11-Sep	11-Sep	Yes	Yes	No	Provisional	1
14	Mopti	Djenne	Senossa	Wekara/Senossa	Bozo	Fisherman	Animal	Unknown	12-Sep	12-Sep	No	Yes	Yes	Provisional	1

\*See definitions in this issue (pg. 7 -8).

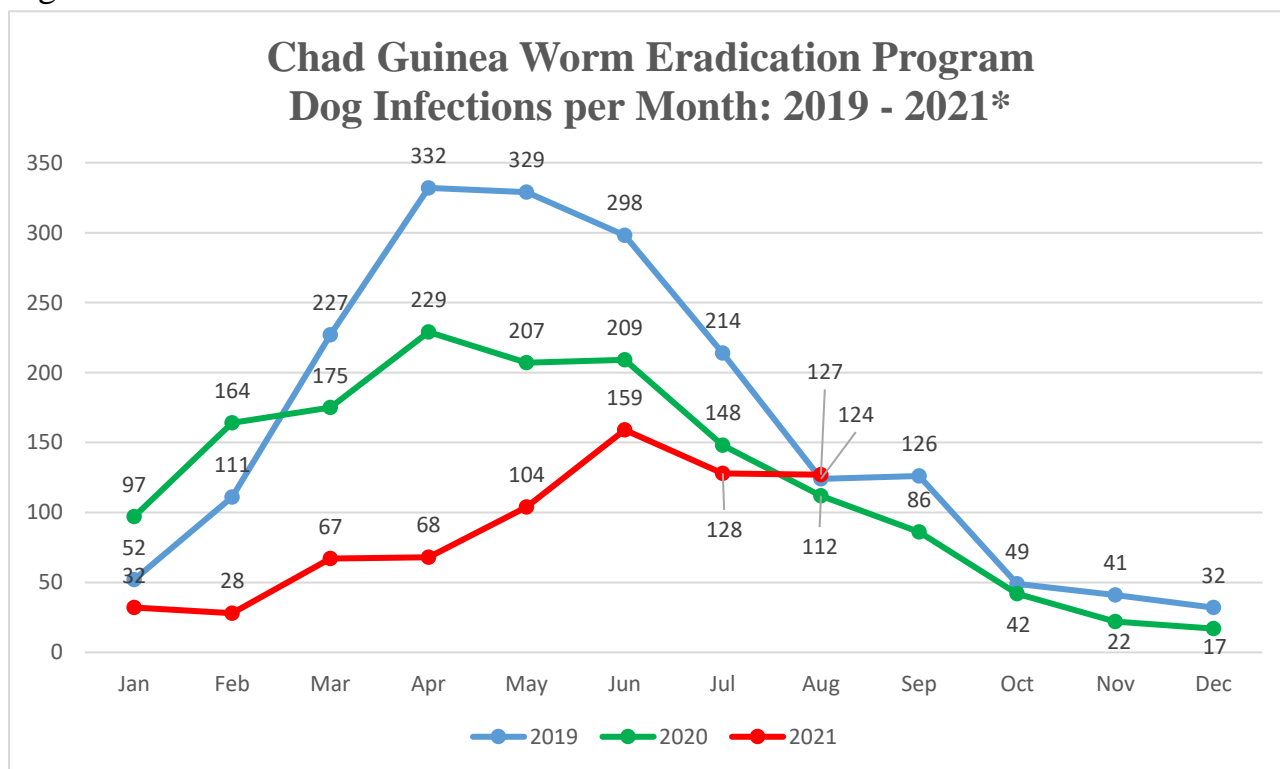
Mali's Guinea Worm Eradication Program (MGWEP) conducted a supervisory visit to Macina and Markala endemic districts of Segou Region on August 20-26. Led by National Program Coordinator Dr. Cheick O. Coulibaly, the mission included Carter Center Country Representative Mr. Sadi Moussa, Regional Focal Point Mr. Daouda Coulibaly, Macina district *Medecin d'appui* Dr. Adama Sobingo, and Markala district *Medecin d'appui* Dr. Cheickna S. Toure. The team discussed the latest strategies for eliminating Guinea worm disease, including proactive tethering of dogs at risk in endemic areas, and the importance of tracing sources of infection. The Macina district communities of Nemabougou (Macina town) and Kolongo Bozo hamlet remain committed to proactive tethering of dogs. In Markala district the populations of Barakbougou, Samsanding, and Gomakoro villages will inspect their dogs and cats for Guinea worm daily. MGWEP Data Manager Mr. Yacouba Traore and Carter Center Consultant Dr. Gabriel Guindo made a supervisory visit to 8 localities in Tominan district/Segou Region, 2 localities in Djenne district/Mopti Region, and 3 health centers in Mopti district/Mopti Region on August 19-28. The village of Ouan in Tominian district indicated their readiness to begin proactive tethering.

### CHAD



Chad has provisionally reported 747 animal infections (713 dogs-83% contained-; 34 cats-88% contained) in January-August 2021. This is a 47% reduction compared to the 1,341 infected dogs (82% contained) and 56 cats (48% contained) reported in the same period of 2020 (Figure 3). Chad also provisionally reported 6 human cases (67% contained) in January-July 2021, compared to 12 cases (33% contained) in January-August 2020.

Figure 3



\*Provisional

Table 2

**Confirmed Human Guinea Worm Cases, January-August 2021  
Status of Containment and Presumed Source of Infection\***

<u>Country</u>	<u>District/Village</u>	<u>Case Date</u>	<u>Contained?</u>	<u>Source Known?</u>
Chad	Amtiman/Amdabri	1 Feb	Yes	No
Chad	Kyabe/Bodobo 1	30 Mar	Yes	Yes
Chad	Aboudeia/Bogam	14 Apr	Yes	Yes
Chad	Moissala/Balimba	19 Apr	No	No
Chad	Guelendeng/Medegue	22 Jul	Yes	No
Chad	Amtiman/Alihilela	29 Jul	No	No
South Sudan	Uror/Wunethony	23 Jul	No	No
South Sudan	RumbeckN/KenegalCC	23 Jul	Yes	No
Ethiopia	Gog/Wadmaro	23 Feb	Yes	Yes
Mali	Markala/Sansanding	3 Aug	No	No
Mali	Markala/Sansanding	15 Sep	Yes	No

\*See definitions in this issue.

### DEFINITION OF A PRESUMED SOURCE OF GUINEA WORM INFECTION

A presumed source/location of a human dracunculiasis case is considered identified if:

The patient drank unsafe water from the same source/location (specify) as other human case(s) or an infected domestic animal 10-14 months before infection, or

The patient lived in or visited the (specify) household, farm, village, or non-village area of (specify) a Guinea worm patient or infected domestic/peri-domestic animal 10-14 months before infection, or

The patient drank unsafe water from (specify) a known contaminated pond, lake, lagoon or cut stream 10-14 months before infection.

If none of the above is true, the presumed source/location of the infection is unknown. Whether the patient's residence is the same as the presumed source/locality of infection or not should also be stated in order to distinguish indigenous transmission from an imported case.

### DEFINITION OF A CONTAINED CASE\*

A case of Guinea worm disease is contained if all of the following conditions are met:

1. The patient is detected before or within 24 hours of worm emergence; and
2. The patient has not entered any water source since the worm emerged; and
3. A village volunteer or other health care provider has properly managed the case, by cleaning and bandaging until the worm is fully removed and by giving health education to discourage the patient from contaminating any water source (if two or more emerging worms are present, the case is not contained until the last worm is pulled out); and
4. The containment process, including verification that it is a case of Guinea worm disease, is validated by a supervisor within 7 days of the emergence of the worm and

5. ABATE is used if there is any uncertainty about contamination of sources of drinking water, or if a source of drinking water is known to have been contaminated.

\*The criteria for defining a contained case of Guinea worm disease in a human should be applied also, as appropriate, to define containment for an animal with Guinea worm infection.



Table 3

Number of Laboratory-Confirmed Cases of Guinea Worm Disease, and Number Reported Contained by Month during 2021* (Countries arranged in descending order of cases in 2020)														
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^	0/0	1/1	1/1	1/2	0/0	0/0	1/2	0/0	/	/	/	/	4/6	67%
ETHIOPIA	0/0	1/1	0/0	0/0	0/0	0/0	0/0	0/0	/	/	/	/	1/1	100%
SOUTH SUDAN	0/0	0/0	0/0	0/0	0/0	0/0	1/2	0/0	/	/	/	/	1/2	50%
ANGOLA	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	/	/	/	/	0/0	N/A
MALI	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1	/	/	/	/	0/1	0%
TOTAL*	0/0	2/2	1/1	1/2	0/0	0/0	2/4	0/1	0/0	0/0	0/0	0/0	6/10	60%
% CONTAINED		100%	100%	50%			100%	0%						
<i>*Provisional</i>														
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.														
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	0/0	0/0	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	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	0/0	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	0/0	0/0	11/11	100%
MALI §	0/0	0/0	0/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	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	0/0	0/0	17/27	63%
% CONTAINED	100%	0%	0%	89%	100%	100%	50%	67%	100%	100%	100%	100%	63%	
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.														

## RECENT PUBLICATIONS

Hopkins D.R., Ijaz K., Weiss A., Roy S.L., Ross D.A., 2021. Reply to: Rethinking disease eradication: putting countries first. *Int Hlth* <https://doi.org/10.1093/inthealth/ihab055>

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.

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*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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CDC is the WHO Collaborating Center for Dracunculiasis Eradication