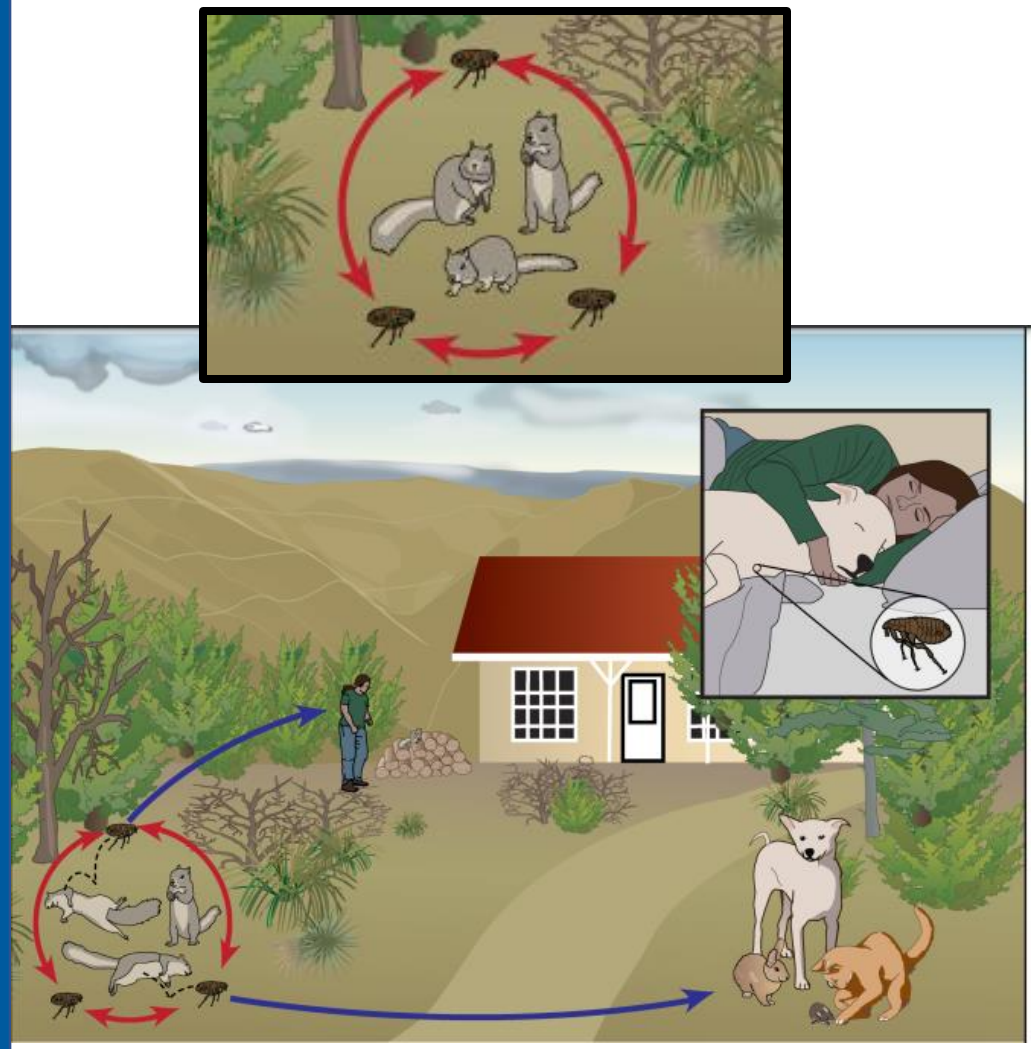
Plague in the African Region

Plague

- Plague is a disease that affects humans and other mammals
- “Famous” for killing millions in Europe during the middle ages
- Caused by the bacteria *Yersinia pestis*, which is typically found in small mammals and their fleas

Plague transmission

- Bacterium is transmitted by fleas and cycles naturally among wild rodents
- Humans/domestic animals bitten by fleas from dead animals at risk
- Cats can become very ill and can infect humans when they cough
- Dogs can bring infected fleas home
- People can also be exposed by handling infected animals
- Inhalation of respiratory droplets/small particles from a patient

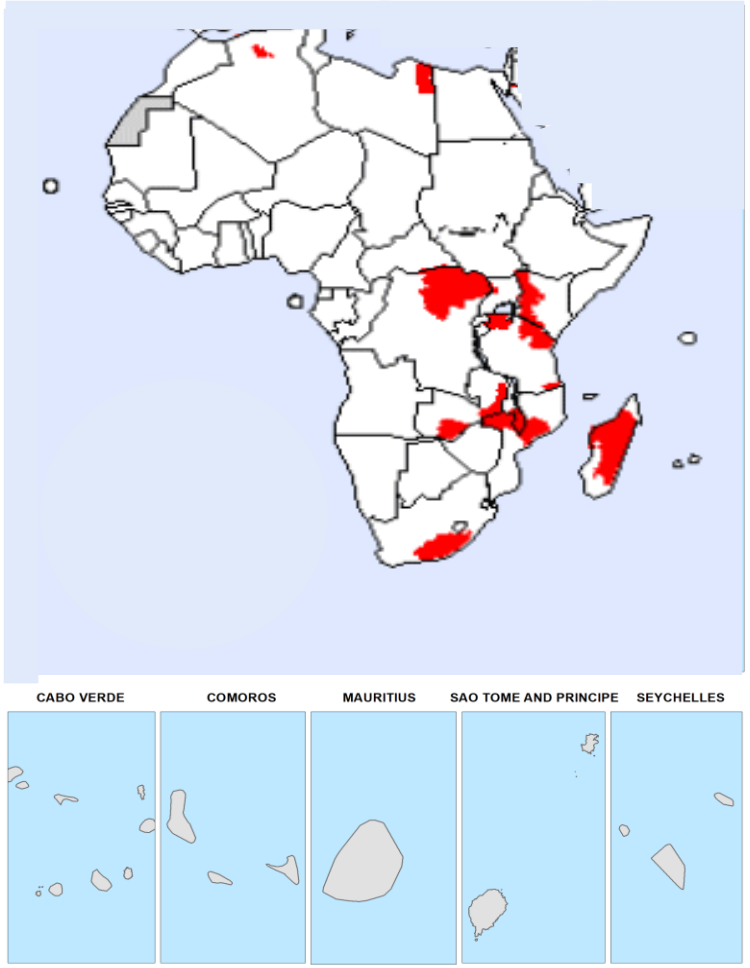


30 types of fleas been shown to act as vectors. The most prominent of these vectors is *Xenopsylla cheopis* (oriental rat flea)

Clinical variations

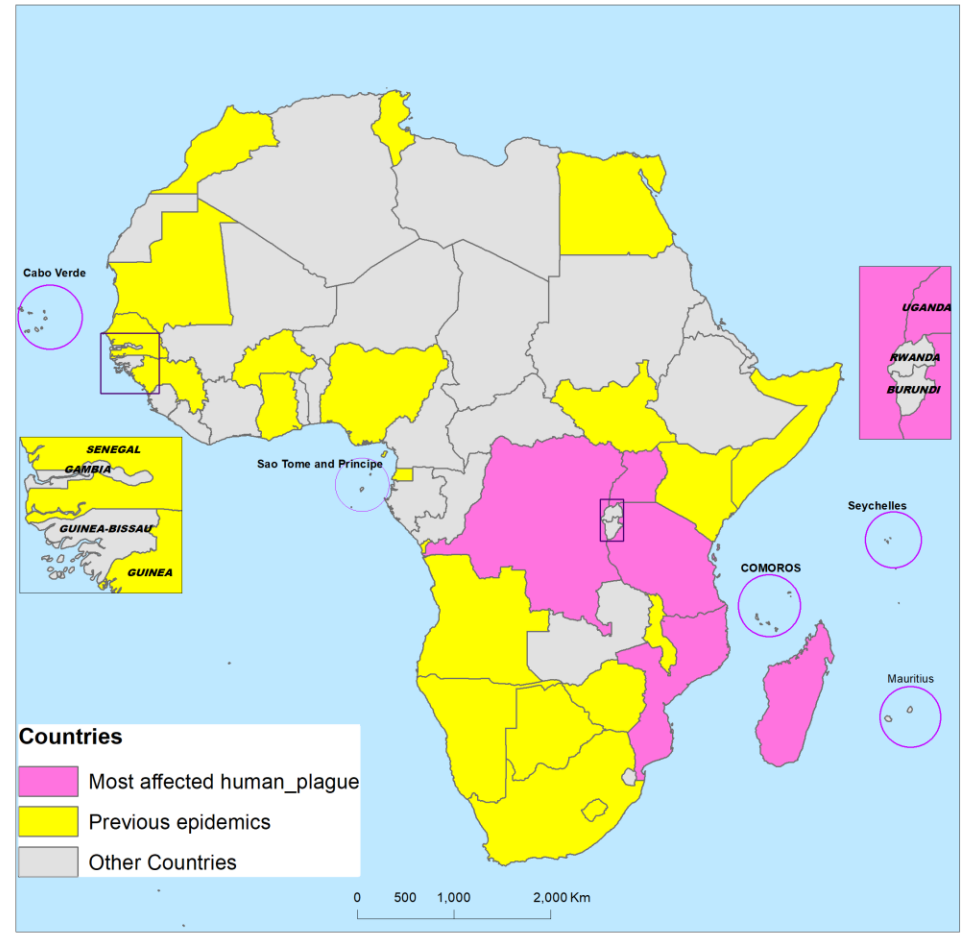
- Bubonic plague: Most common, caused by the bite of an infected, CFR 30-60% untreated, 5% treated
- Pneumonic plague: lung based, transmitted through respiratory droplets, incubation as short as 24 hours, untreated, CFR 100%; treated CFR 50%
- Septicemic plague: bloodstream, CFR 20-35%

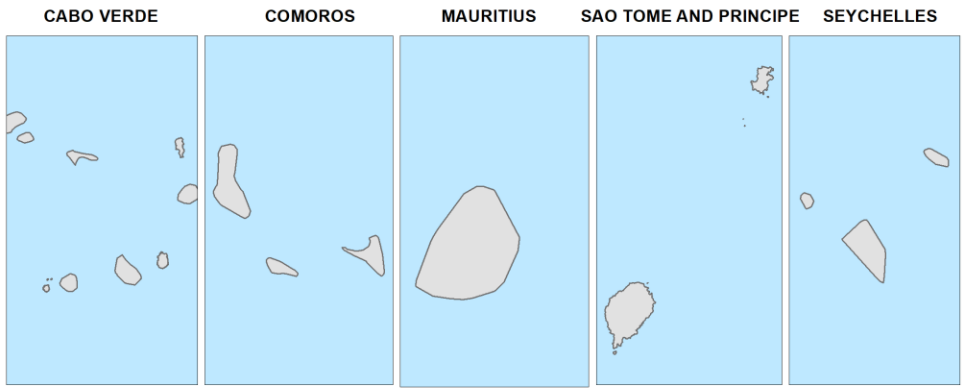
Foci distribution, the bacteria, an animal reservoir and a vector



Distribution of reported cases of plague (2013-2018)

- WHO reports 1,000 to 3,000 cases of plague worldwide every year
- African region accounts >90% of all human cases reported worldwide
- Madagascar and DRC are most heavily affected with cases reported almost every year
- Likely under reported due to lower health care





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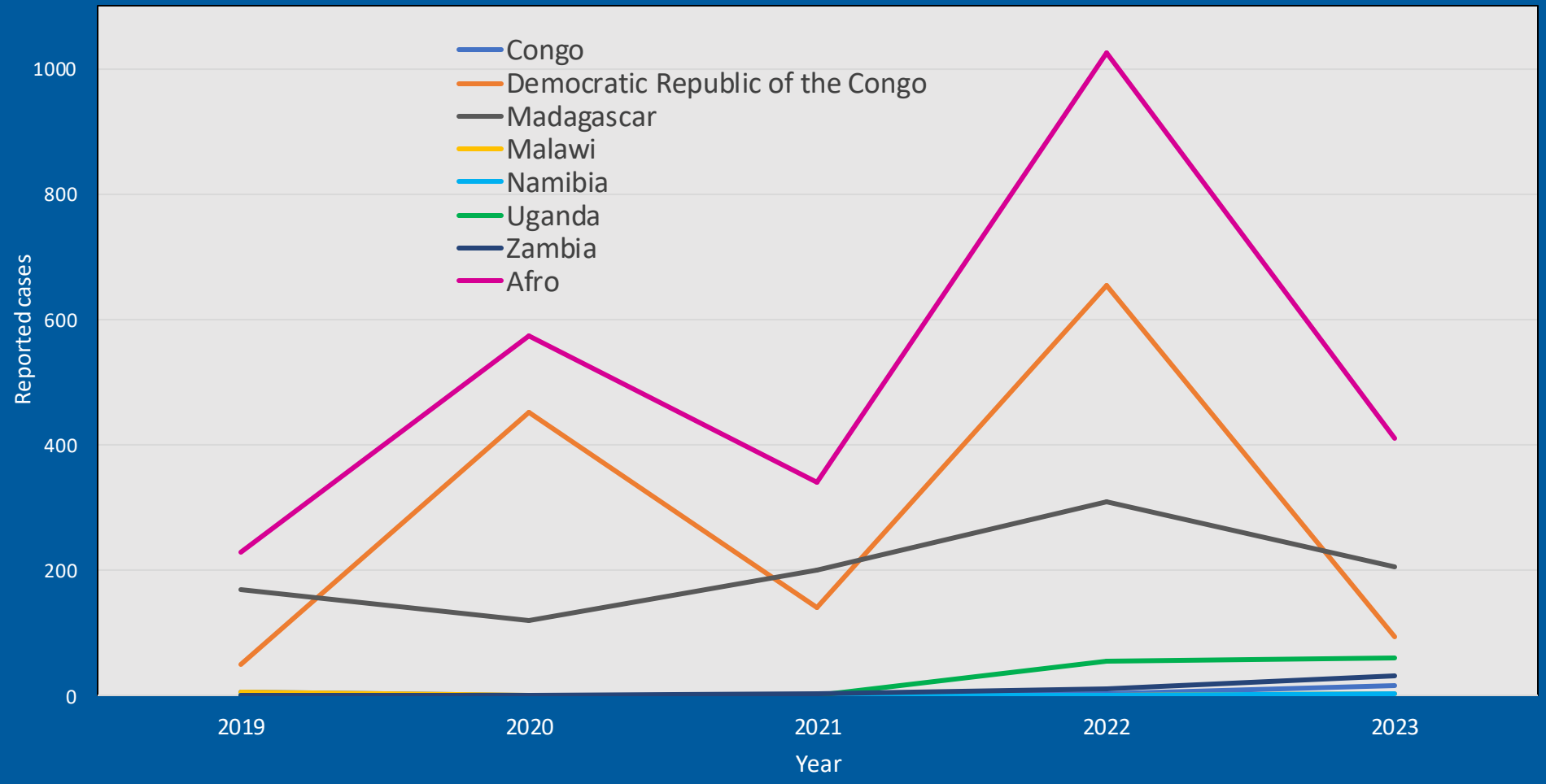
Trends in reported plague cases in the African Region, 2019-2023



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Note: graphic only includes countries that reported one or more cases and does not include countries that no cases in the last 5 years

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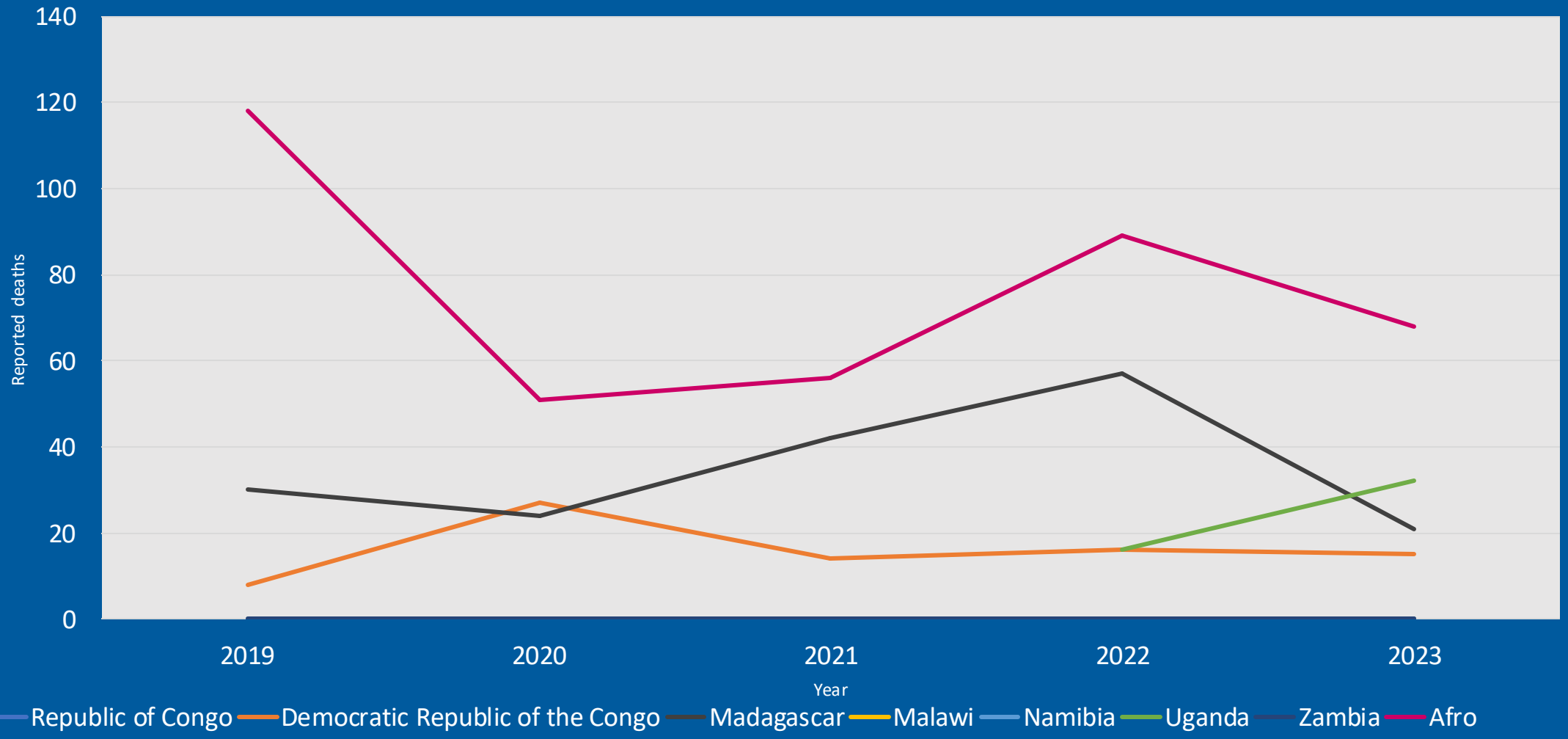
Trends in reported plague deaths in the African Region, 2019-2023



Note: graphic only includes countries that reported one or more cases and does not include countries that no cases in the last 5 years

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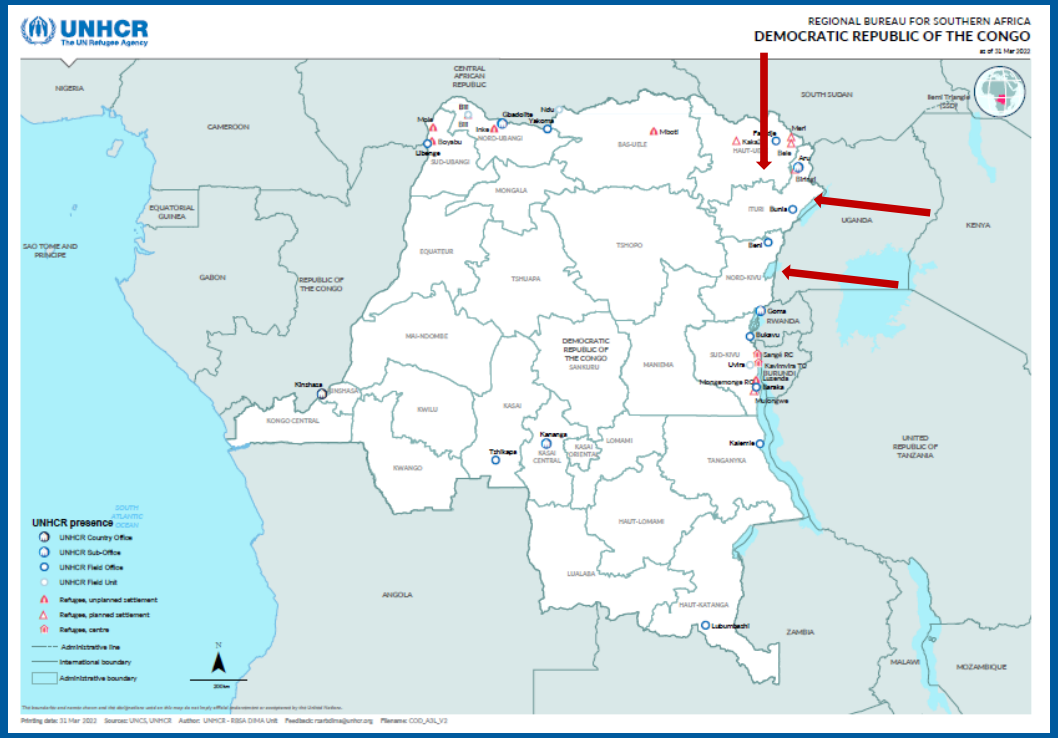
Notable epidemics

Year	Countries	Cases	Deaths
2023[1]	DRC (Ituri)	94	15
2022	DRC	653	7
2021	Madagascar	48	19
2020-21[2]	DRC	461	31
2019[3]	Uganda	2	1
2019	Madagascar	13	1
2018	Madagascar	97	9
2017	Madagascar	2676	238
2016	Madagascar	62	26
2015	Madagascar	14	10
2014	Madagascar	119	40

[1]Since January 2023, DRC has reported cases each week
[2]multiple outbreaks
[3]linked to DRC

Democratic Republic of the Congo

- During 2004–2014, the Democratic Republic of the Congo (DRC) declared 54% of plague cases worldwide
- Foci found in Ituri, North Kivu
  - At least 9 outbreaks documented in Ituri with most recent in 2022
  - 14 of the 36 health zones regularly report cases each year
- Reviews of 2020 outbreak
  - 58% of cases male
  - 93% of cases greater than five years old



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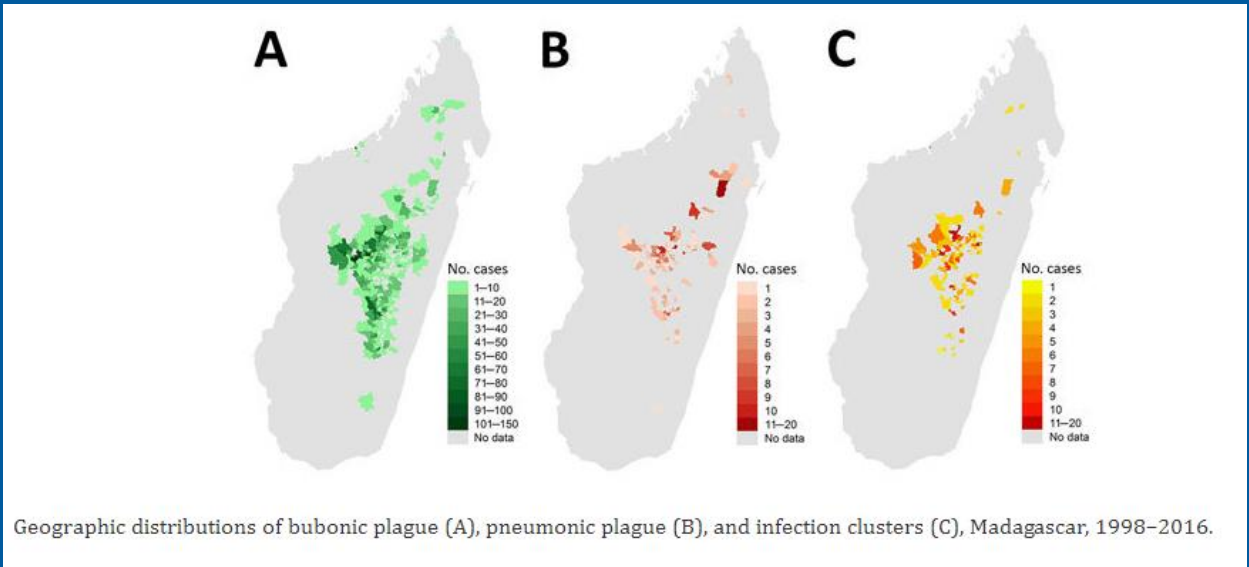
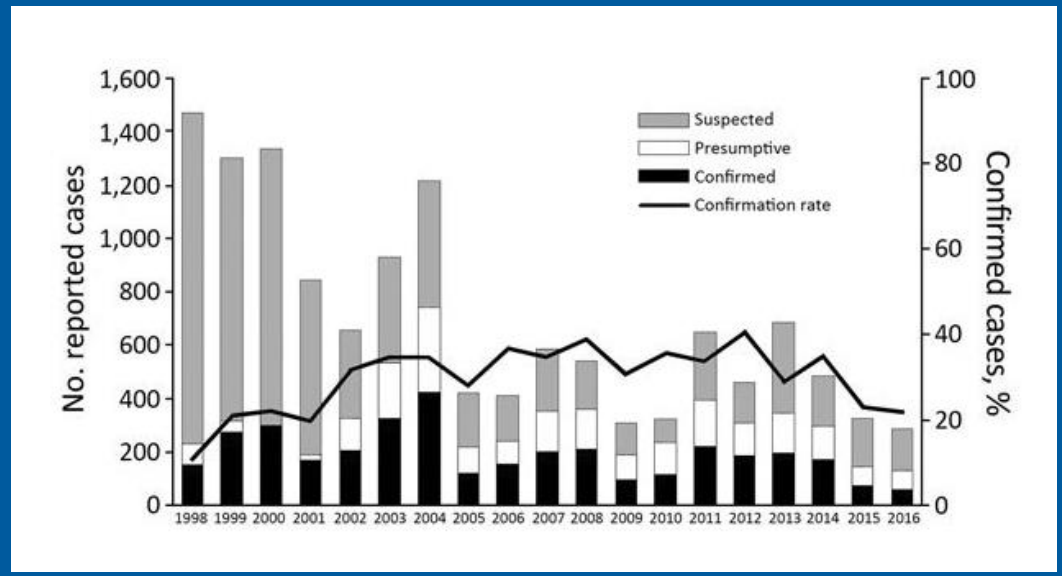
Madagascar

- Most commonly found in the Central Highlands of Madagascar, altitude above 800 m
- Transmission typically occurs between September (often a peak in Nov) and April
- Reports ~200 and 400 cases of plague each year, the majority of which are bubonic form



Geographic distributions of bubonic plague (A), pneumonic plague (B), and infection clusters (C), Madagascar, 1998–2016.



*Note in 2017, over 2500 cases

Characteristics of persons with confirmed, presumptive, and suspected plague cases, Madagascar; 1998-2016

	Bubonic plague case status, no. patients		Pneumonic plague case status, no. patients	
Characteristic	**Suspected, n = 6,454**	**Confirmed and presumptive, n = 5,132**	**Suspected, n = 579**	**Confirmed and presumptive, n = 409**
Median age, y (IQR)	11 (6–20)	13 (8–24)	26 (17–40)	29 (20–42)
Sex ratio (M:F)	1.44 (3,803:2,639)	1.38 (2,972:2,157)	1.08 (300:278)	1.28 (230:179)
Presence of rats, %	15.1	18.6	11.3	9.3
Recent trip, %	6.4	6.9	7.0	13.6
Mean (SE) days to care	2.0 (0.05)	1.7 (0.03)	2.61 (0.15)	2.21 (0.18)
Median elevation, m (IQR)	1,262 (1,111–1,384)	1,275 (1,063–1,409)	1,228 (921–1,333)	1,284 (1,111–1,355)
Contact with other plague cases, %	7	11	21	23

*IQR, interquartile range.

Andrianaivoarimanana V, Piola P, Wagner DM, Rakotomanana F, Maheriniaina V, Andrianalimanana S, Chanteau S, Rahalison L, Ratsitorahina M, Rajerison M. Trends of Human Plague, Madagascar, 1998-2016. Emerg Infect Dis. 2019 Feb;25(2):220-228. doi: 10.3201/eid2502.171974. PMID: 30666930; PMCID: PMC6346457.

Possible factors related to plague persistence in the region

- Climate change -- One study estimated 50% increase in the plague host prevalence with an increase of 1°C of the temperature in spring *
- Tropical and mountainous ecosystem
- Persistent conflict
- Poor healthcare and poverty
- Increased contact with wildlife

Stenseth NC, Samia NI, Viljugrein H, Kausrud KL, Begon M, et al. (2006) Plague dynamics are driven by climate variation. Proc Natl Acad Sci U S A 103: 13110–13115

OBRIGADO

Thank you

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