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Monkey Pox (Next Covid?)

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Introduction

Monkeypox is an infection caused by a virus that is in the same family as the smallpox virus. But monkeypox is far less severe than smallpox, though it causes a similar illness that involves flu-like symptoms and a rash accompanied by lesions.



Why?

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News story

Monkeypox cases confirmed in England – latest updates

Latest updates on cases of monkeypox identified by the UK Health Security Agency (UKHSA).

From: [UK Health Security Agency](#)

Published 14 May 2022

Last updated 6 September 2022 — [See all updates](#)



Related content

[Monkeypox outbreak: technical briefings](#)

[Mpox \(monkeypox\) control: UK strategy 2022 to 2023](#)

[Principles for control of non-HCID mpox in the UK: 4 nations consensus statement](#)

[HCID status of mpox \(monkeypox\)](#)

An outbreak of mpox was confirmed in **May 2022**

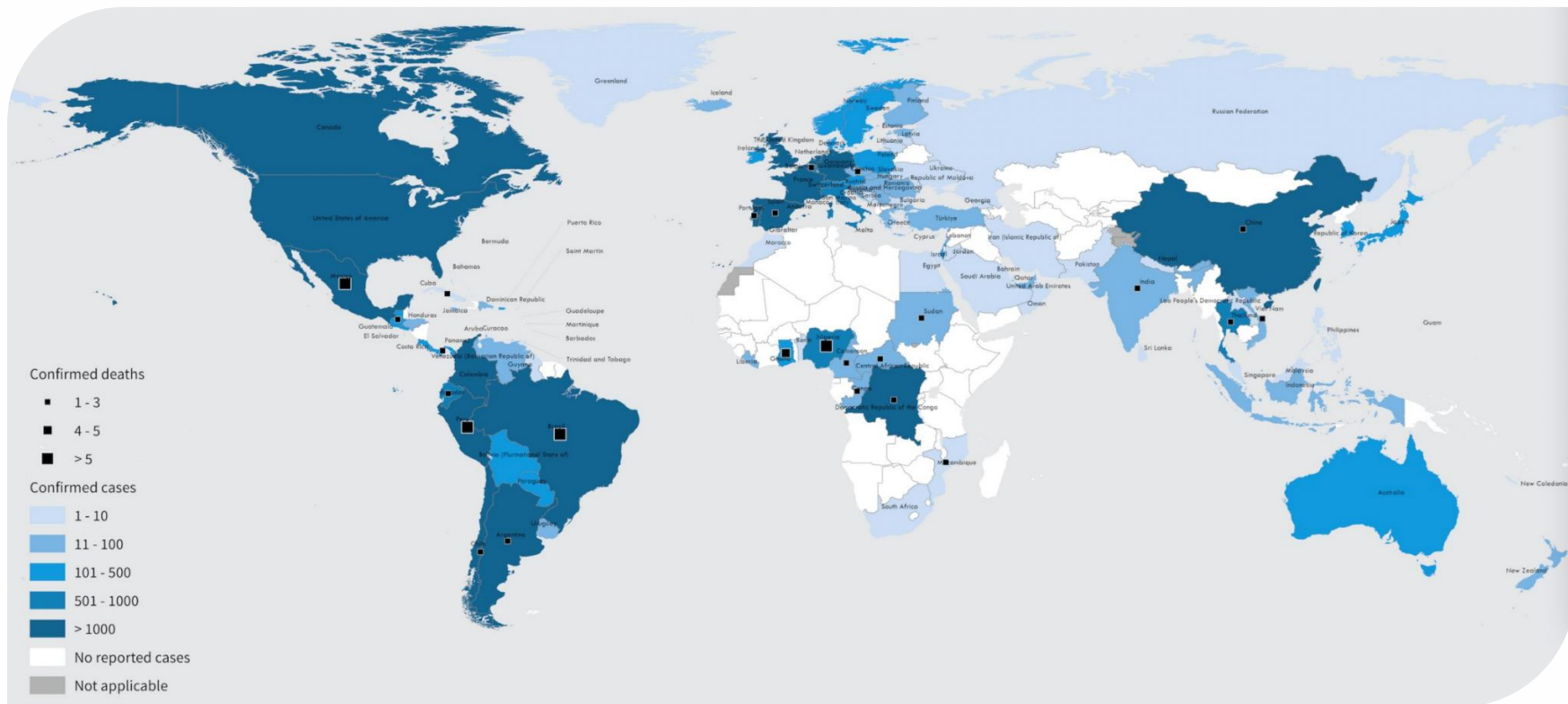
6 May First case in London

16 May UKHSA confirmed **four new cases**

18 May onwards, cases were reported from an increasing number of countries and regions, predominantly in **Europe** and in the **Americas** but also in **Asia**, in **Africa**, and in **Oceania**.

Finally, **In May 2023**, the World Health Organization **declared an end** to the global health emergency declared in response to the worldwide outbreak of mpox virus.

World Map



Geographic distribution of confirmed cases of mpox reported to or identified by WHO from official public sources, from 1 January 2022 to 30 November 2023

Data Overview

This dataset contains historical Mpox Data produced by the World Health Organization

Columns:

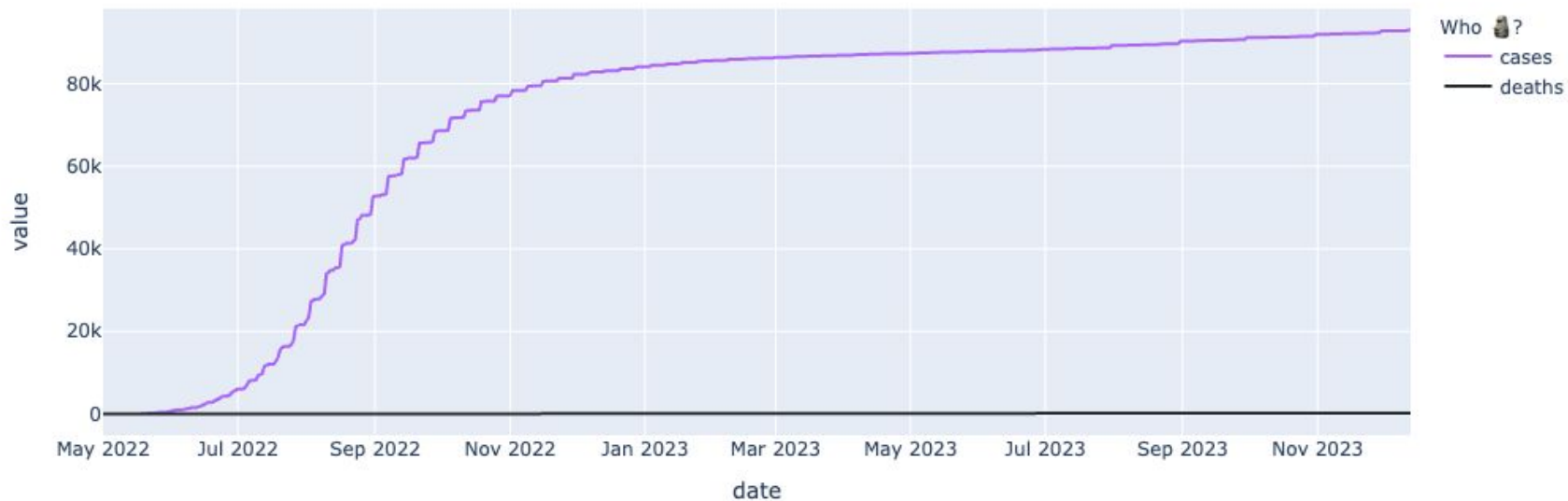
- "location",
- "date",
- "total_cases",
- "total_deaths"

Only deaths among confirmed cases are reported here; the reported number of deaths due to mpox among suspected cases is available at regional or national level.



Data Overview

Mpox (monkeypox)



The SEIRD model is a mathematical model used to study the spread of infectious diseases, such as monkeypox. The model is based on the following concepts:

S (Susceptible): These are individuals who are not yet infected with the disease and are therefore able to contract it.

E (Exposed): These are individuals who have come into contact with someone who has the disease, but have not yet developed symptoms themselves.

I (Infected): These are individuals who have the disease and are capable of spreading it to others.

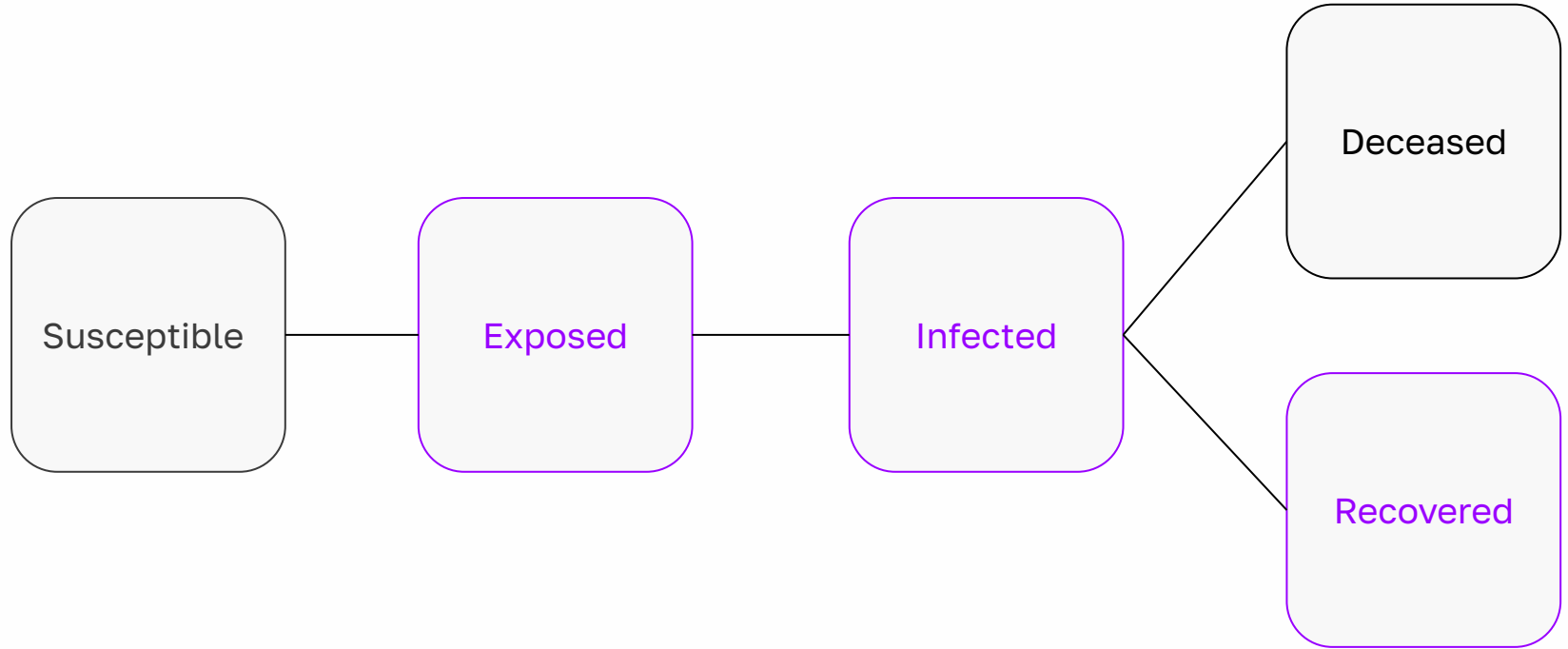
R (Recovered): These are individuals who have had the disease and have fully recovered, either naturally or after receiving medical treatment.

D (Deceased): These are individuals who have died from the disease.



“Handshakes”

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Differential Equations



$$\frac{d\text{Susceptible}}{dt} = -\text{Rate}_{\text{transmission}} \frac{\text{Susceptible} * \text{Infected}}{\text{Population}}$$

$$\frac{d\text{Exposed}}{dt} = \text{Rate}_{\text{transmission}} \frac{\text{Susceptible} * \text{Infected}}{\text{Population}} - \text{Rate}_{\text{incubation}} * \text{Exposed}$$

$$\frac{d\text{Infected}}{dt} = \text{Rate}_{\text{incubation}} * \text{Exposed} - \text{Rate}_{\text{recovery}} * \text{Infected} - \text{Rate}_{\text{death}} * \text{Infected}$$

$$\frac{d\text{Recovered}}{dt} = \text{Rate}_{\text{recovery}} * \text{Infected}$$

$$\frac{d\text{Deceased}}{dt} = \text{Rate}_{\text{death}} * \frac{d\text{Infected}}{dt}$$

Parameters

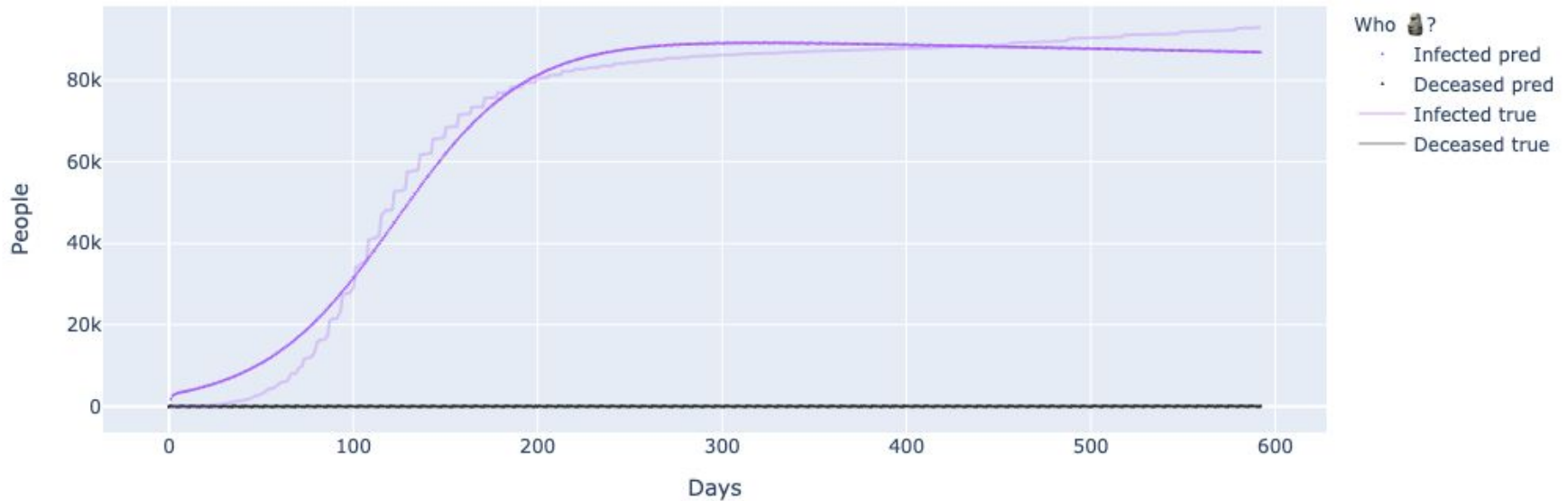


- 65000 – Initial number of infected individuals
- 0,1 – Transmission rate (per day)
- 0,1 – Incubation rate (per day)
- 0,001 – Recovery rate (per day)
- 0,1 – Death rate (per day)
- 7000 – Exposed_0 initial number of exposed individuals
- 0 – Recovered_0 initial number of recovered individuals

Rates are bonded between 0 and 1.

Results

Simulation of Monkey Pox Spread SEIRD



N 9.1×10^4 Trans: 2.9×10^{-2} Incub: 8.7×10^{-1} Rec: 5.8×10^{-6} Death: 1.0×10^{-4} E0: 3.1×10^3 R0: 0.0×10^0

Wrap-up

NO:

LightGBM XGBoost



Hours Logistic Regression

Random Forest Decision Tree

Knn MultinomialNB

GaussianNB ARIMA

ElasticNet GPUs or TPUs req.

YES:



Math (Differential Equations)!

Took almost **no time**!

Can be explained even to toddlers!

Take care!

Referenses



Data: <https://www.kaggle.com/datasets/prajwaldongre/gold-futures-data-from-2012-2023>

DataLore: <https://datalore.jetbrains.com/notebook/RemqSkuJwmr1PM4Gc3cBqB/nxkTrK2vbZx7twOYrYEhR6>

Monkeypox cases confirmed in England – latest updates access mode / URL –
<https://www.gov.uk/government/news/monkeypox-cases-confirmed-in-england-latest-updates>

Multi-country outbreak of mpox (monkeypox) - External Situation Report 31, published 22 December 2023 / URL –
<https://reliefweb.int/report/world/multi-country-outbreak-mpox-monkeypox-external-situation-report-31-published-22-december-2023>

Monkeypox 🐒🦠: EDA and Time Series Forecasting📊 / URL –
<https://www.kaggle.com/code/prashantverma13/monkeypox-eda-and-time-series-forecasting>

Monkey POX <https://www.kaggle.com/code/manishwahale/monkeypox-cases-plotly>

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FOR YOUR TIME!**

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