MALARIA IN AFRICA

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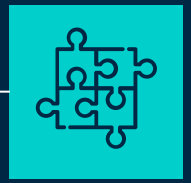
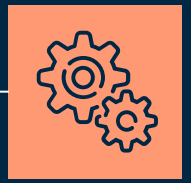


01

PROBLEM & SOLUTION

Overview of problem and proposed solution



02

KEY FINDINGS

Analysis/ processes with visualized findings

03

SUMMARY & RECOMMENDATIONS

Key recommendations and summary

MALARIA

Malaria is a **serious** and sometimes **fatal** disease caused by a parasite that commonly infects a certain type of mosquito which feeds on humans. People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness. *Falciparum* is the type of malaria that is most likely to result in severe infections and if not promptly treated, may lead to death. Although malaria can be a deadly disease, illness and death from malaria can usually be **prevented**.

PROBLEM CONTEXT

According to the world health organisation, Africa carries a disproportionately high share of the global malaria cases. In 2019, Africa was home to a whooping 94% of all malaria cases and deaths.
Some population groups are at considerably higher risk of contracting malaria, and developing severe disease, than others. These include infants, children under 5 years of age, pregnant women and patients with HIV/AIDS, as well as non-immune migrants, mobile populations and travellers[2]. According to the world health organisation, every minute a child dies from malaria in Africa.

PROBLEM STATEMENT

From 2013 to 2017, Africa has seen a general increase of Malaria cases in the Africa. Factors like Use of insecticide-treated bed nets, intermittent preventive treatment (IPT) of malaria in pregnancy, using safely managed drinking water services, using at least basic sanitation services and using safely managed sanitation services amongst others are some important preventive measures and metrics that affect the prevalence of Malaria cases and mortalities resulting from Malaria. The World Health Organisation, wants to understand the reason for this increase of Malaria in the last five years and get insights into how these factors play out in different African countries in order to decide on the best strategy for addressing Malaria in different African countries.

PROBLEM VALUE

This problem is related to SDG 3 - Good health and well being. This particular sustainable development goal is aimed at ensuring healthy living and promoting well-being for all at all ages.

According to the latest World malaria report, released on 30 November 2020, there were 229 million cases of malaria in 2019 compared to 228 million cases in 2018. The estimated number of malaria deaths stood at 409 000 in 2019, compared with 411 000 deaths in 2018.

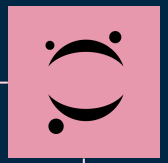
SOLUTION

Perform exploratory data analysis on available malaria datasets in Africa and use the underlying results to understand and shed more light into the distribution of malaria around the continent of Africa. Using the insights gained from understanding how malaria is distributed in Africa, explore how metrics like Use of insecticide-treated bed nets, intermittent preventive treatment (IPT) of malaria in pregnancy, using safely managed drinking water services, using at least basic sanitation services and using safely managed sanitation services amongst others affect the prevalence of Malaria cases in different African countries. And finally, build and deploy a machine learning model to predict the number of cases of malaria given these metrics.

DATA AND TOOLS

DATASET

Latest Malaria dataset from kaggle



JUPYTER

Interactive computing tool

ANALYSIS TOOLS

Numpy & Pandas

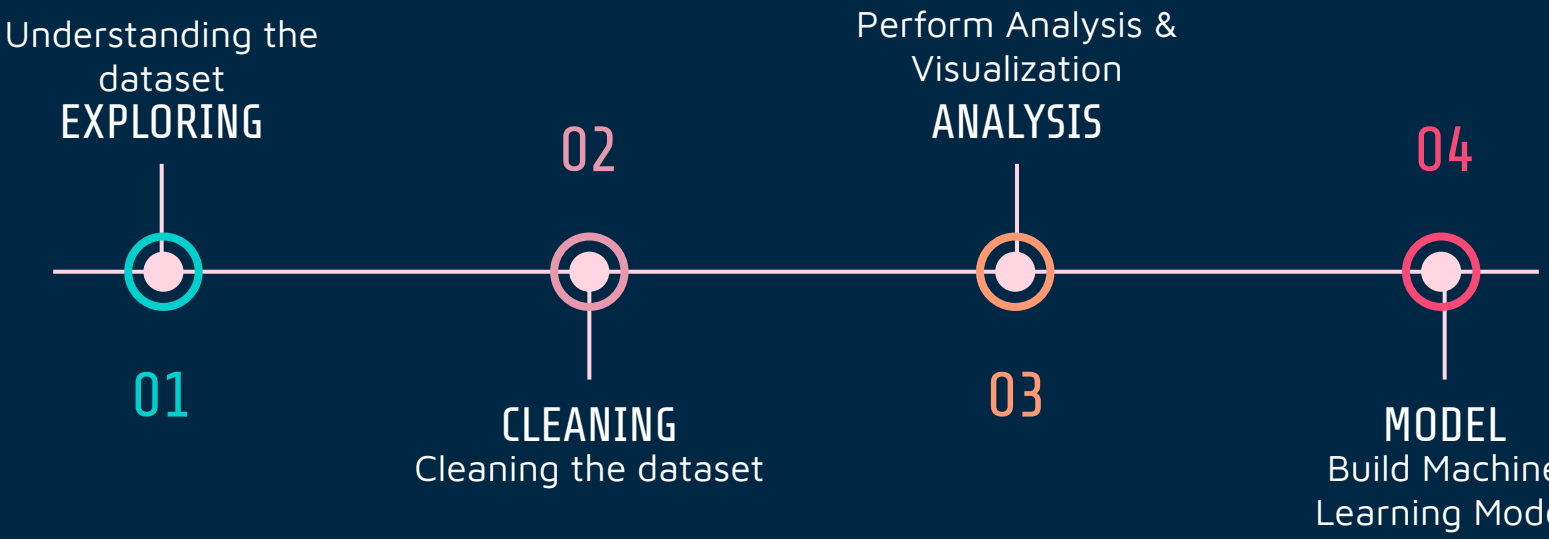
VISUALIZATION

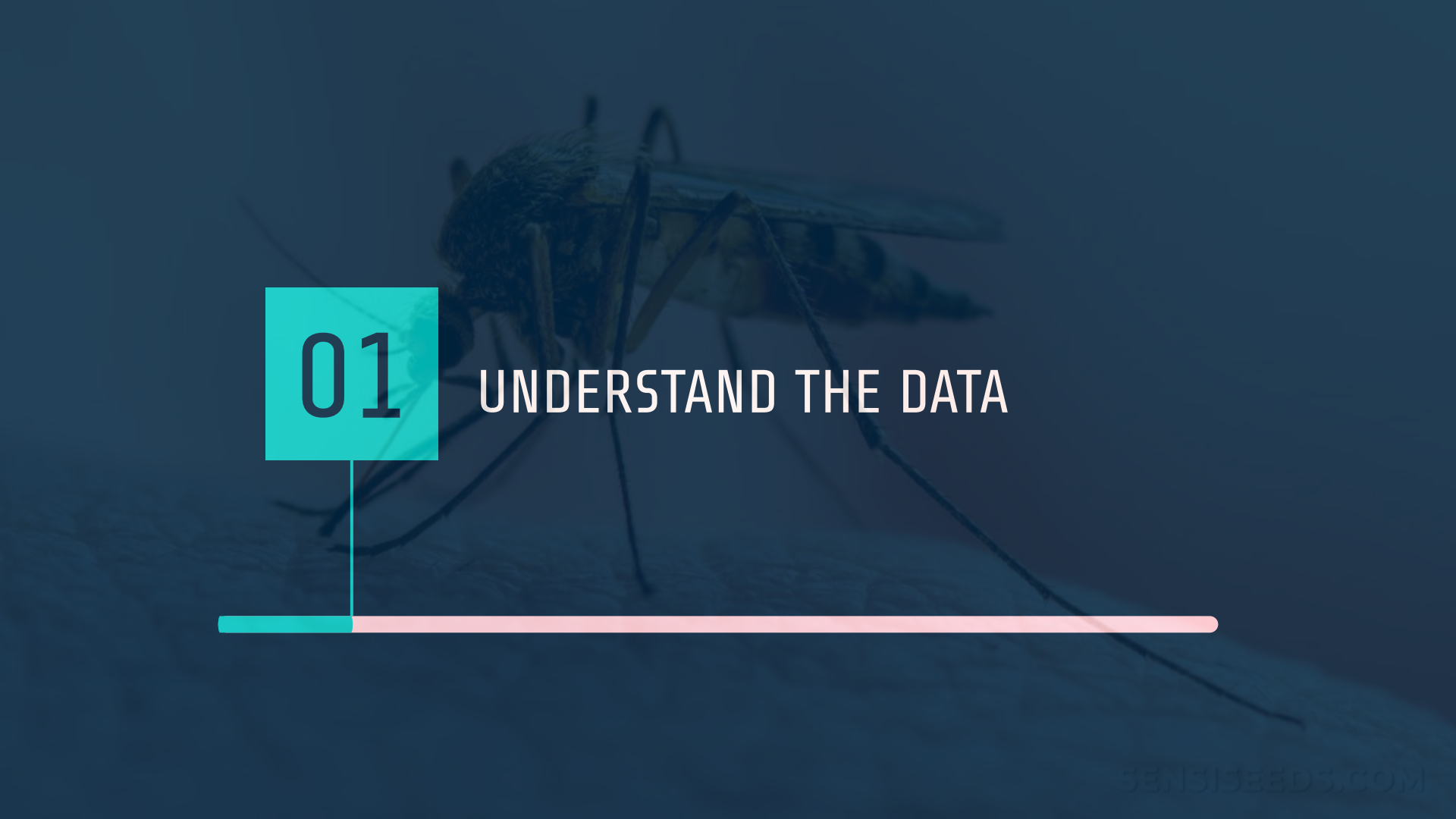
Matplotlib & Plotly

ML MODEL

Scikit-Learn

SOLUTION PROCESS





01 UNDERSTAND THE DATA

DATASET COLUMNS

Country Name	Year	Country Code	Incidence of malaria (per 1,000 population at risk)	Malaria cases reported	Rural population (% of total population)	Rural population growth (annual %)	Urban population (% of total population)	Urban population growth (annual %)	People using at least basic drinking water services (% of population)	People using at least basic drinking water services, rural (% of rural population)	People using at least basic drinking water services, urban (% of urban population)
Algeria	2007	DZA	0.01	26	34.65	-0.60	65.35	2.71	91.68	85.83	94.78
Angola	2007	AGO	286.72	1533485	42.48	1.91	57.52	5.01	47.96	23.77	65.83
Benin	2007	BEN	480.24	0	58.44	1.99	41.56	4.09	63.78	54.92	76.24
Botswana	2007	BWA	1.03	390	42.07	-1.44	57.93	4.80	78.89	57.60	94.35
Burkina Faso	2007	BFA	503.80	44246	77.00	2.16	23.00	5.91	52.27	45.13	76.15

DATASET COLUMNS

People using at least basic drinking water services, rural (% of rural population)	People using at least basic drinking water services, urban (% of urban population)	People using at least basic sanitation services (% of population)	People using at least basic sanitation services, rural (% of rural population)	People using at least basic sanitation services, urban (% of urban population)	latitude	longitude	geometry
85.83	94.78	85.85	76.94	90.57	28.033886	1.659626	POINT (28.033886 1.659626)
23.77	65.83	37.26	14.00	54.44	-11.202692	17.873887	POINT (-11.202692 17.873887)
54.92	76.24	11.80	4.29	22.36	9.307690	2.315834	POINT (9.307689999999999 2.315834)
57.60	94.35	61.60	39.99	77.30	-22.328474	24.684866	POINT (-22.328474 24.684866)
45.13	76.15	15.60	6.38	46.49	12.238333	-1.561593	POINT (12.238333 -1.561593)

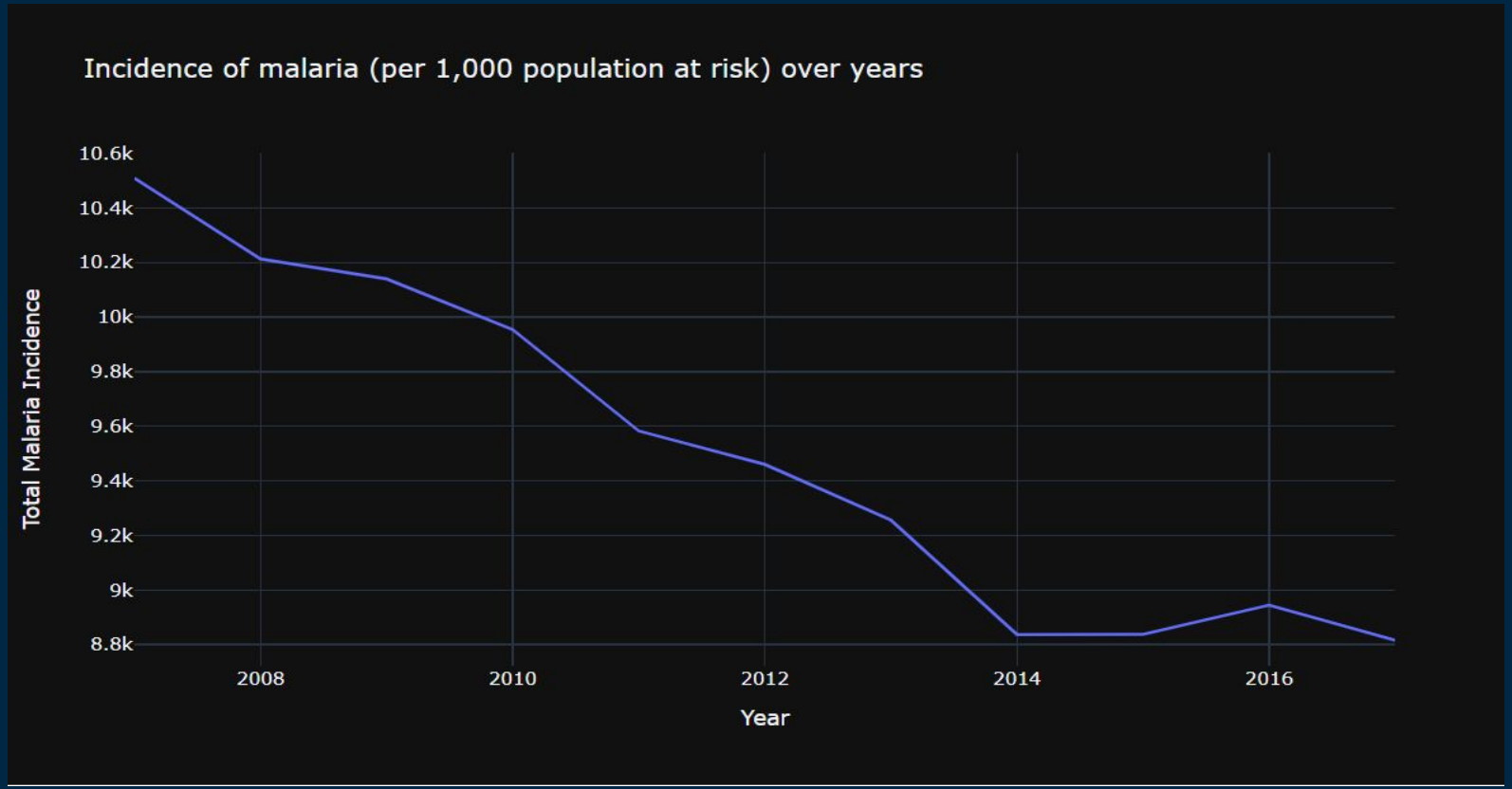
DATA ANALYSIS & VISUALIZATION

03

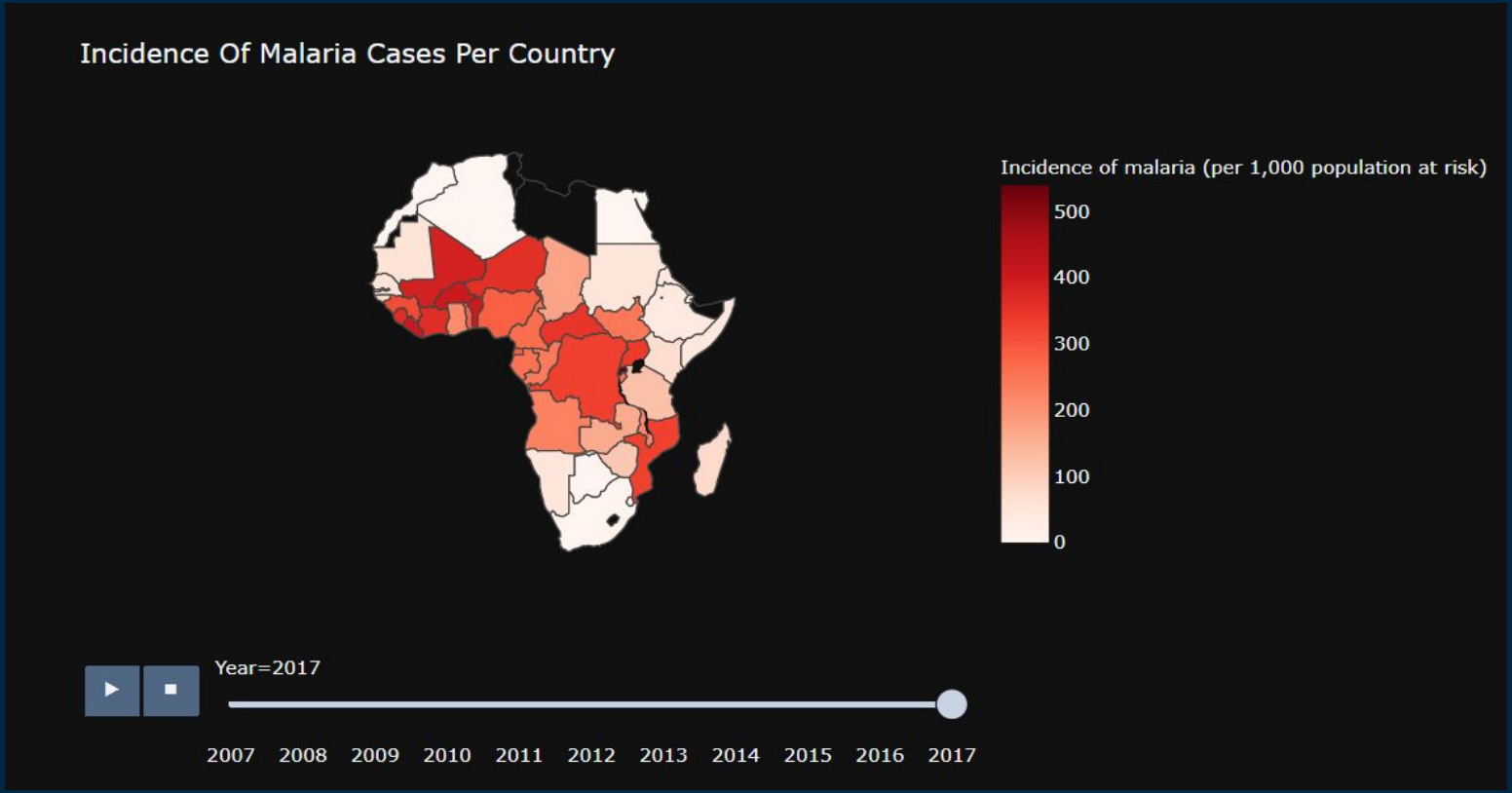
ANALYSIS GOALS

- Give the World Health Organization a report of the countries in need for aid (countries with malaria cases spikes).
- Give insights on the malaria cases spike over the past years.
- Figure out which features do contribute to the increase of cases from the given data.
- Specify models to go into the Machine Learning model to predict the number of malaria cases.

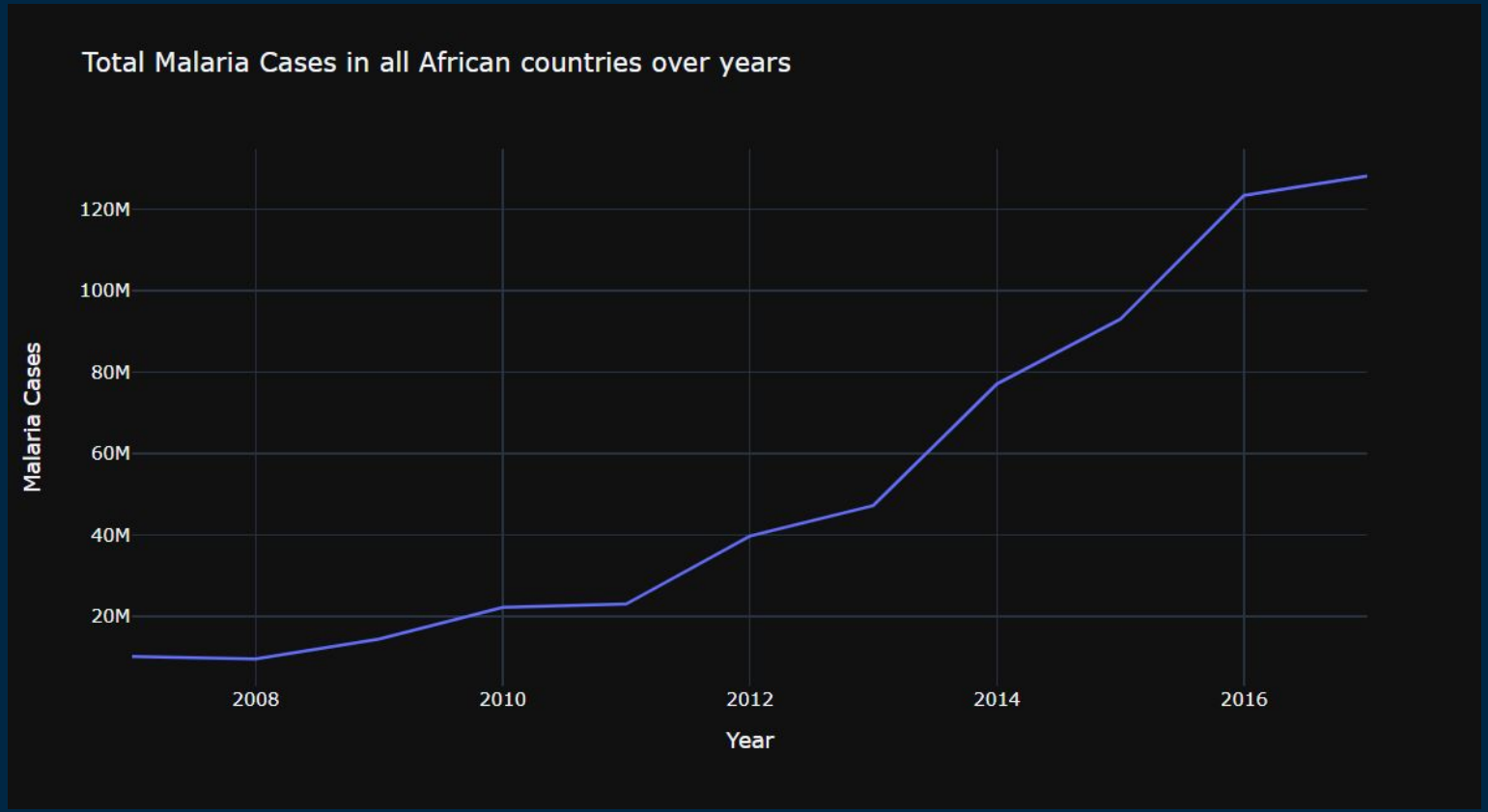
INCIDENCE OF MALARIA



INCIDENCE OF MALARIA



TOTAL MALARIA CASES



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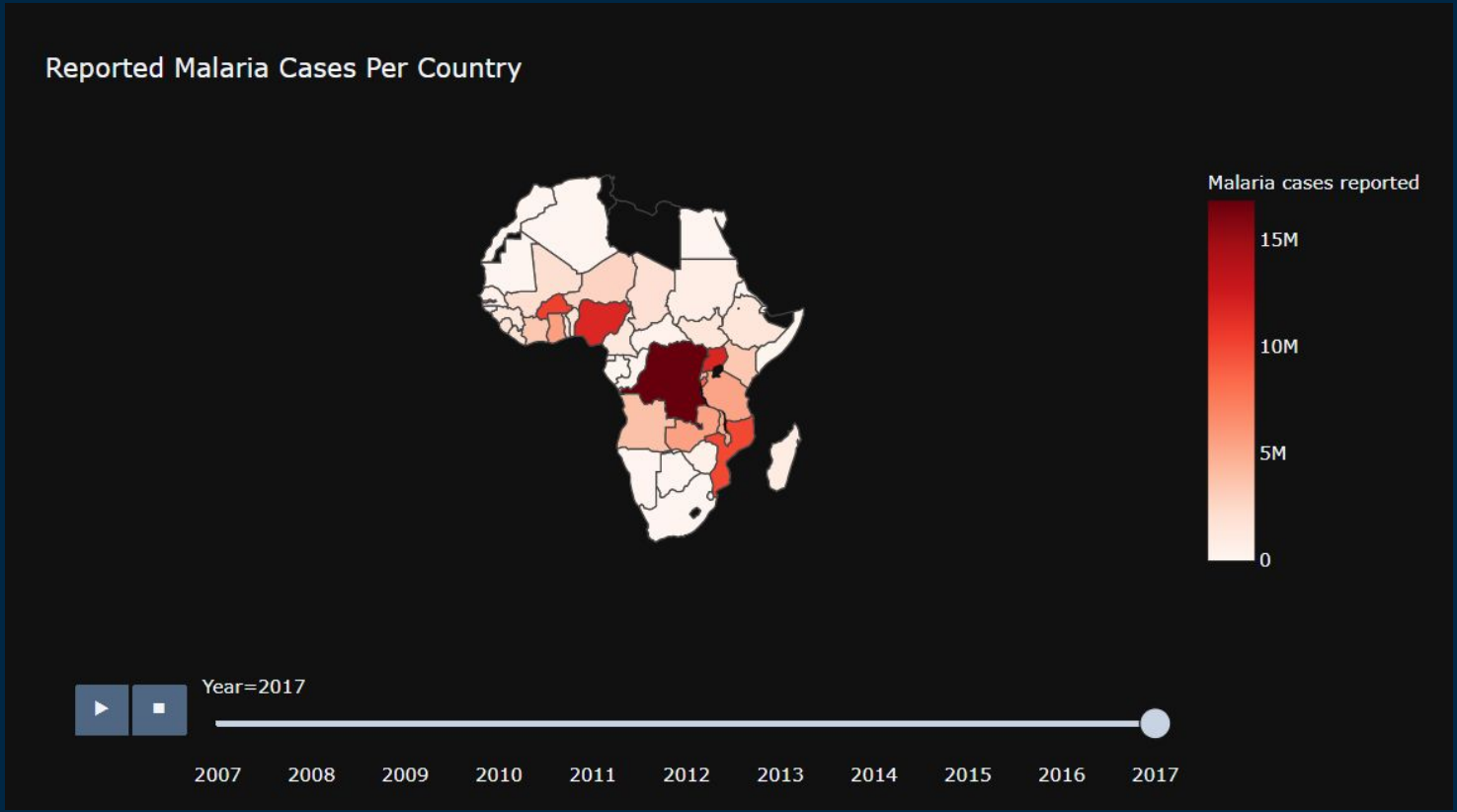
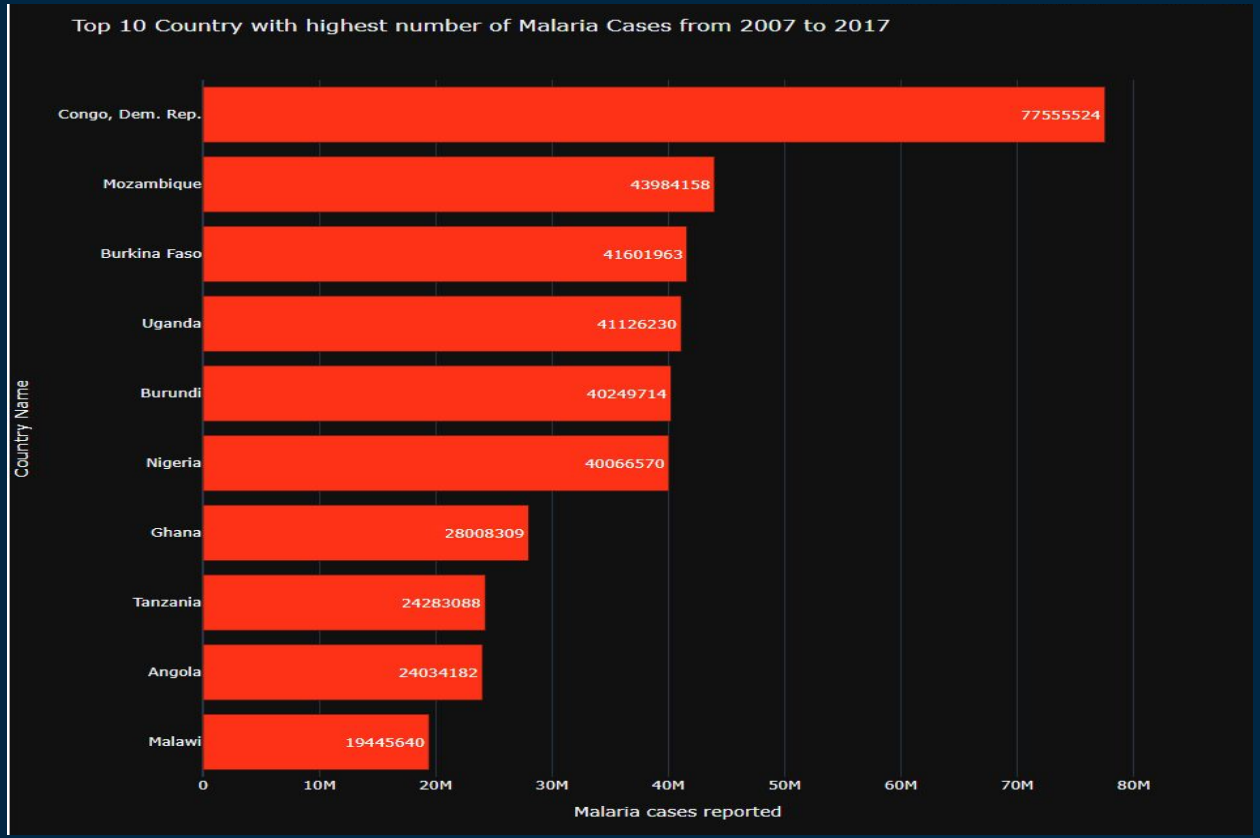


TOP COUNTRIES IN MALARIA CASES



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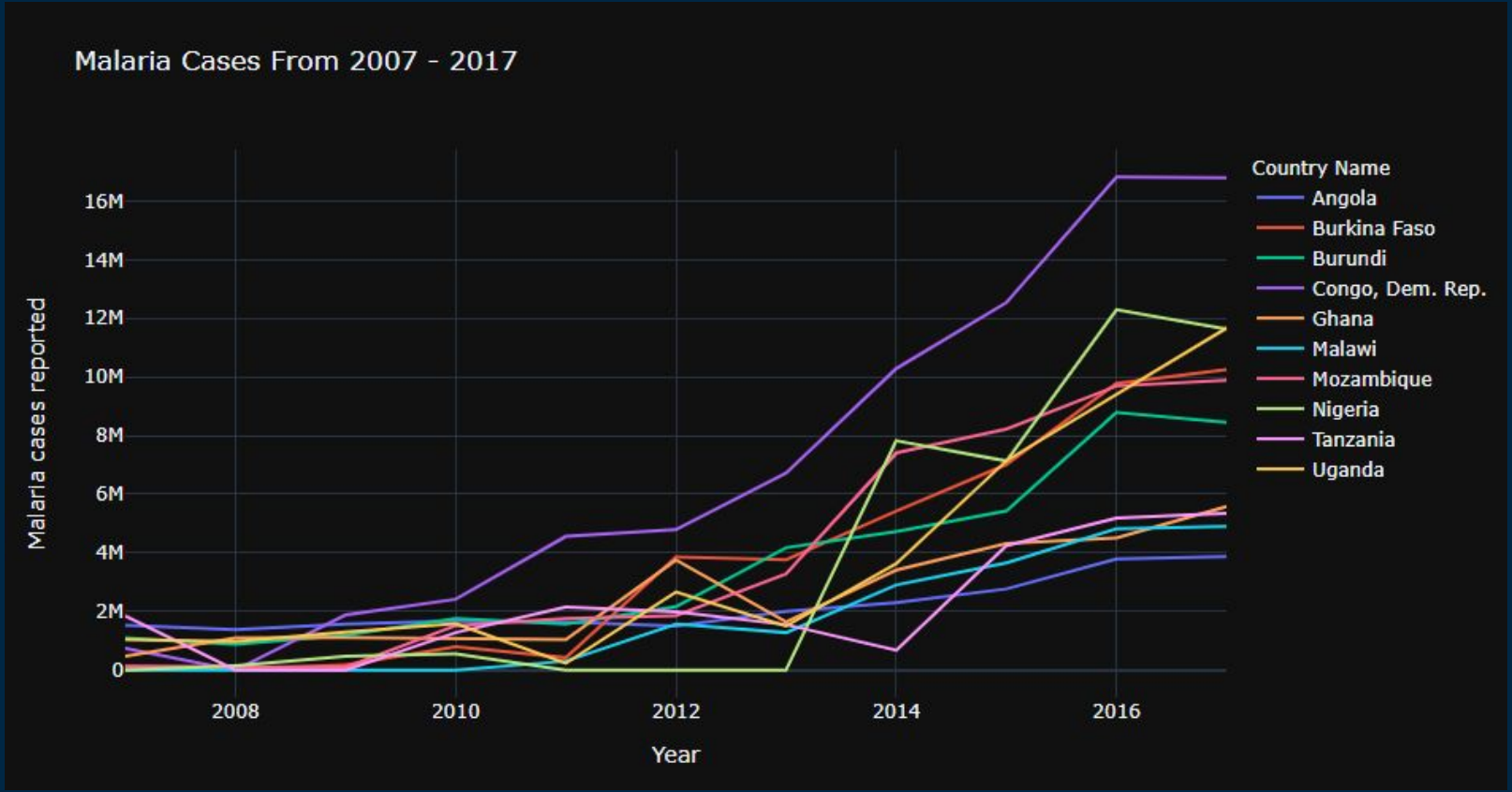
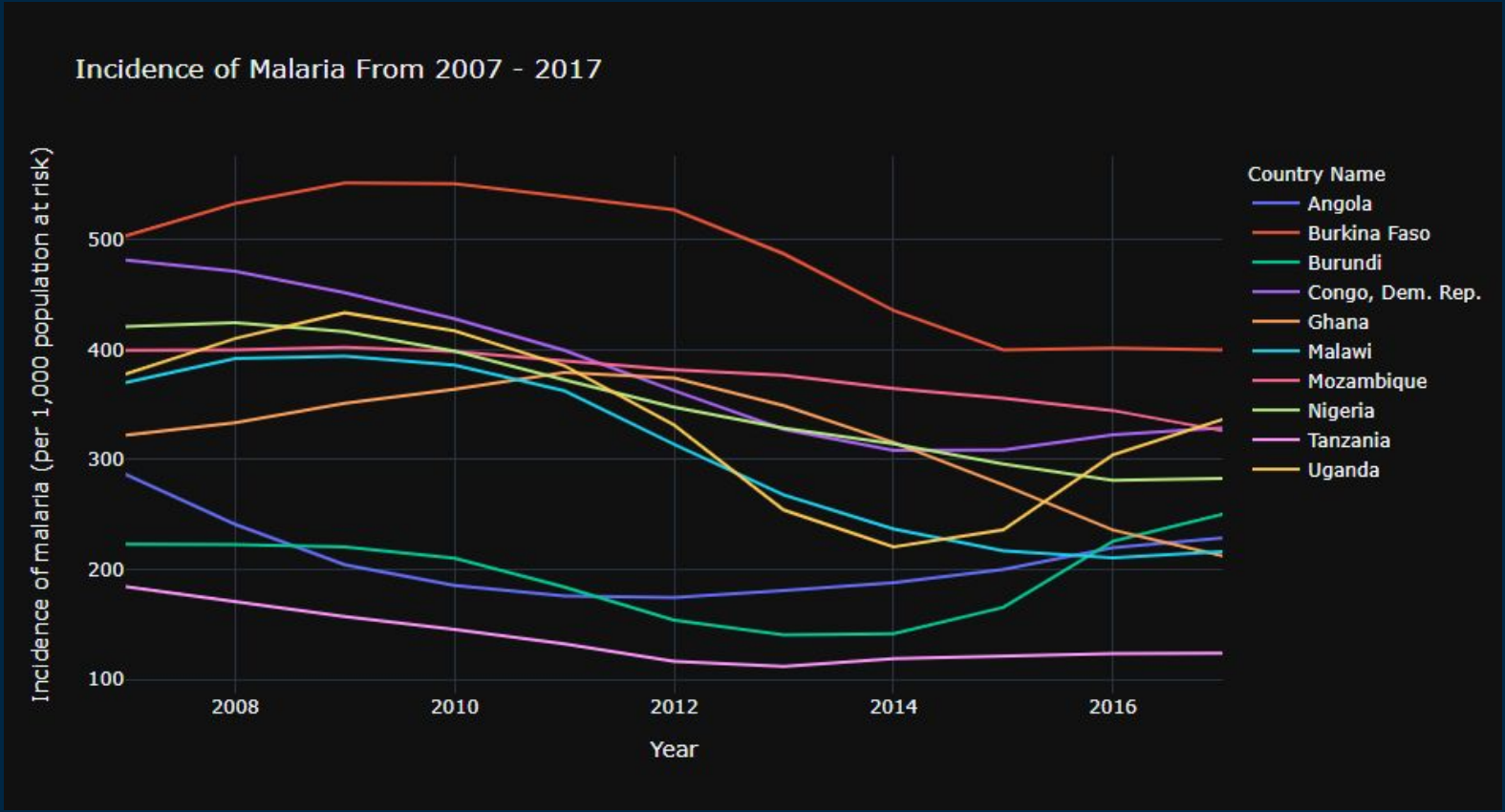


MALARIA CASES ANALYSIS

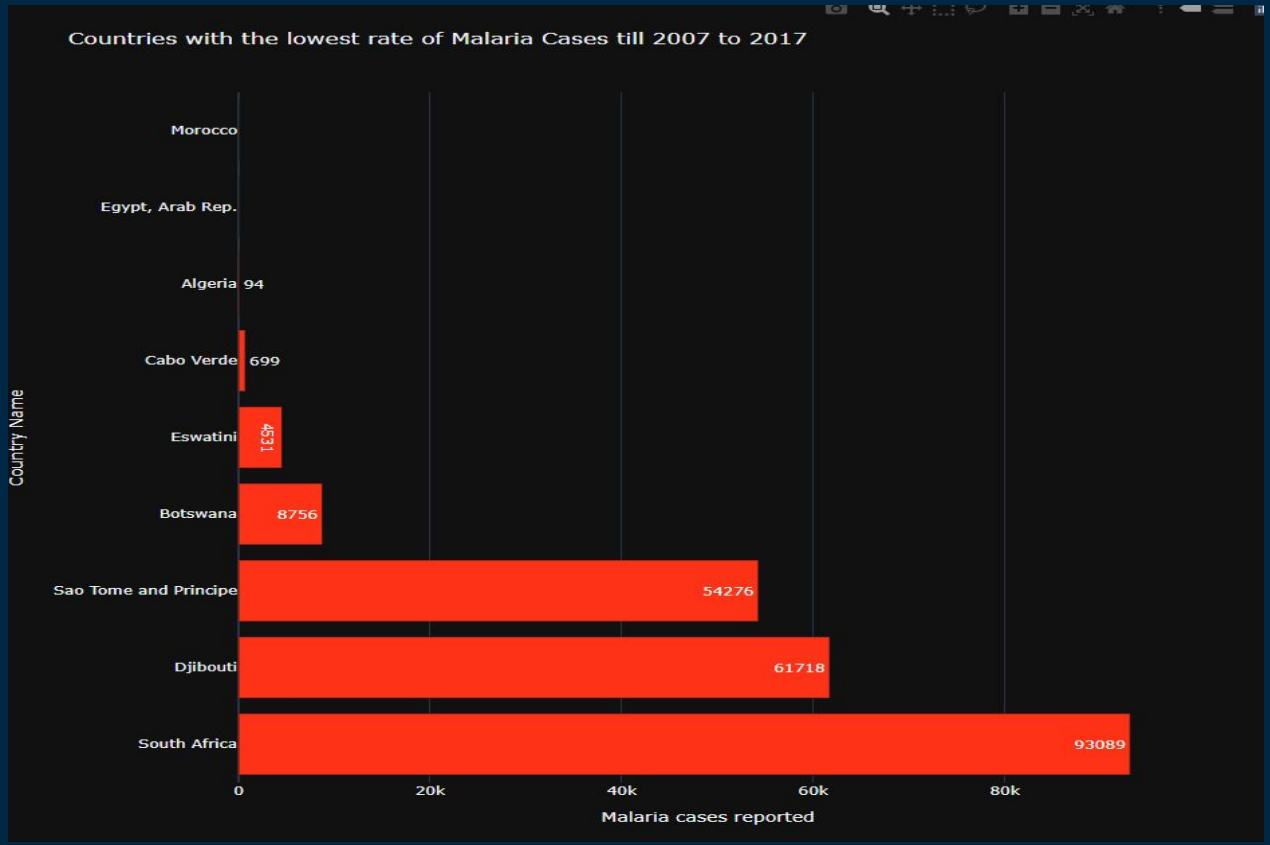
55%

Congo Democratic Republic has around 77M malaria cases which is 55% more than the second top country in malaria cases.

TOP COUNTRIES - INCIDENCE OF MALARIA



COUNTRIES WITH LOWEST RATE OF MALARIA CASES



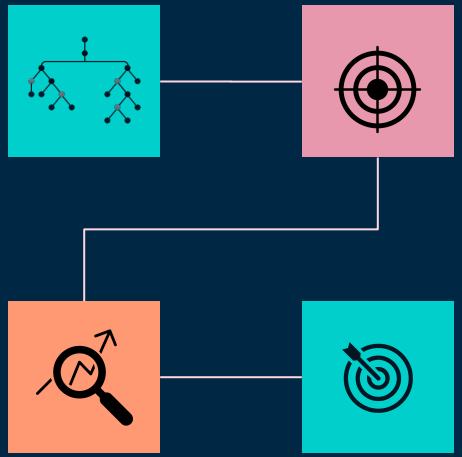
MALARIA CASES CORRELATION

MACHINE LEARNING MODEL

04

MACHINE LEARNING MODEL

MODEL
Decision Tree



TARGET
Predict Malaria Cases

ACCURACY MATRIX
R Squared

ACCURACY SCORE
90% - 92%

FINAL THOUGHTS

RECOMMENDATIONS

- World Health Organization (WHO) should offer medical and public health support in mentioned countries with several malaria cases especially in Congo Democratic Republic as the number of malaria cases reached 16.7M in 2017 which is 55% higher than any other African Country.
- Nigeria, Uganda and The Democratic Republic of Congo account for the most numbers of Malaria cases in Africa, the World Health Organisation should channel more efforts(e.g funding, education, etc) into these countries with a higher prevalence rate.
- Use our Machine Learning model to predict such spikes in the future and get prepared to face it.
- More data should get collected across all African Countries such as the number death cases and medical facilities to test their relevance to the increase in Malaria cases.
- A new vaccine for malaria has been developed by scientists at the Jenner Institute of Oxford University. Initial trials showed up to 77% efficacy in treatment of malaria of 450 children in Burkina Faso over 12 months. The WHO should expand this vaccine to other African countries.

SUMMARY

Over the past 4 years (2013 - 2017), malaria cases have been increasing dramatically and efforts to control malaria in Africa have met with less and less success. For example, the number of malaria cases has reached 16.7M in Congo Democratic Republic compared to 4.7M in 2013. Also, cases in Nigeria has reached 12.3M in 2017 compared to zero cases reported back in 2008. Not only is there a need to find a means of curbing these cases but governments also need a way to predict case spikes in the future. This will help them to prepare adequately prepare for medical emergencies.

THANK YOU!

Do you have any questions?

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[1]"Malaria", WHO | Regional Office for Africa, 2021. [Online]. Available: https://www.afro.who.int/health-topics/malaria. [Accessed: 23- Apr- 2021].

[2]R. Snow and J. Omumbo, "Malaria", Ncbi.nlm.nih.gov, 2021. [Online]. Available: https://www.ncbi.nlm.nih.gov/books/NBK2286/. [Accessed: 23- Apr- 2021].

[3]"Fact sheet about Malaria", Who.int, 2021. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/malaria. [Accessed: 29- Apr- 2021].

[4]"Oxford malaria vaccine proves highly effective in Burkina Faso trial", *the Guardian*, 2021. [Online]. Available: https://www.theguardian.com/world/2021/apr/23/oxford-malaria-vaccine-proves-highly-effective-in-burkina-faso-trial. [Accessed: 29- Apr- 2021].