MALARIA IN AFRICA
GROUP 2C1

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GITHUB LINK: https://github.com/ahmedmeshref/Malaria-in-Africa-Analysis

PRESENTATION LINK: https://drive.google.com/file/d/1mtYqCs2qAxAbxHO_GJVHscU

Problem Context and Background: Malaria is a mosquito-borne infectious disease that affects humans, caused by protozoan parasites belonging to the genus Plasmodium. Four species account for almost all human infections but the species *P falciparum* causes the majority of infections in Africa and is responsible for the most severe forms of the disease, with the highest mortality rate.[1] When an infected mosquito bites a human, it introduces the parasite from its saliva into the person's blood. Many different species of mosquito transmit malaria this way. *Plasmodium falciparum* is the most common of the four human malaria parasites across much of Sub-Saharan Africa. (The other three parasites are *P. vivax, P. malariae*, and *P. ovale*.) The distribution of *P. vivax* is concentrated in the Horn of Africa, covering Djibouti, Eritrea, Ethiopia, Somalia, and Sudan. *P. falciparum* accounts for almost all the malaria mortality in Sub-Saharan Africa, and it is often stated that the continent bears over 90 percent of the global *P. falciparum* burden[2]. According to the world health organisation, African 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.

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.

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: 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 might affect the prevalence of Malaria cases and mortalities resulting from Malaria. The World Health Organisation, wants to understand 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 Statement Analysis: Malaria infection is very common in Sub-Saharan Africa, but death directly attributed to malaria is comparatively rare. This is largely because of acquired functional immunity[2]. Rather than focusing on the mortalities due to Malaria, the problem focuses on the prevalence of Malaria cases and the underlying factors responsible for this across all the different countries in the African continent.

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. Exploring this problem would enable the World Health Organisation answer questions like:

1) Do countries that take more preventive measures see an overall decrease in Malaria cases?

2) Of the aforementioned metrics & factors, (eg: improved drinking water & sanitation facilities) which of them helps decrease the cases of Malaria?

3) Which of these factors have the most impact on the reduction of cases of Malaria? This is so that countries can focus more on factors with the biggest impact.

4) What do countries with high rates of malaria infection do wrong?

5) How do these factors play out in countries with high Malaria cases?

6) What can countries with high Malaria cases learn from countries with low malaria cases?

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. A detailed analysis has been provided in the jupyter notebook file for this project.

Contribution:

Name	Contribution Percentage	Comment
Ahmed Meshref	40%	Did the analysis + Helped in building the slides (data visualization + ML model)
Agnes	25%	Help in building the slides + presentation
Paul Arah	35%	Helped in documentation + slides problem and solution statement

References: [1]"Malaria", WHO | Regional Office for Africa, 2021. [Online]. Available: https://www.afro.who.int/health-topics/malaria. [Accessed: 29- Apr- 2021].
[2]R. Snow and J. Omumbo, "Malaria", Ncbi.nlm.nih.gov, 2021. [Online]. Available: https://www.ncbi.nlm [Accessed: 29- Apr- 2021].
[3]"Fact sheet about Malaria", Who.int, 2021. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/malaria. [Accessed: 30- Apr- 2021].