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SDG GOAL 03: GOOD HEALTH AND WELL-BEING
CASE STUDY: MALARIA IN AFRICA

Presented to: Computer Science Faculty (AI Course)
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Introduction

According to UNICEF, they reported that Malaria kills a child under the age of five every two minutes. As of 2019, there were 229 million malaria cases worldwide, with 409,000 deaths. Children under the age of five accounted for 67 percent of the deaths (274,000). This equates to almost 750 children under the age of five dying of this disease every single day. [2]

According to the most recent World Malaria Survey published on November 30, 2020, there were 229 million malaria cases in 2019, up from 228 million cases in 2018. Malaria deaths were reported to have totaled 409,000 in 2019, down from 411,000 in 2018. The global malaria burden tends to fall disproportionately on the WHO African Area. The field accounted for 94 percent of all malaria cases and deaths in 2019. [3]

One of the Sustainable Development Goals is Good health and Wellbeing. Africa as a continent has struggled within the health sector with diseases such as HIV, Typhoid, Malaria, and other tropical diseases and as a result, many lives have been lost. The United Nations estimates that 405,000 deaths have occurred in African as a result of Malaria [6]. This calls for action since there are several challenges faced in the prevention of the disease such as:

- The parasite that causes malaria is developing resistance to the drug
- The mosquito vector is developing resistance to the insecticides

However, with the right strategies, many of these deaths can be significantly prevented, and the existing cases treated before the severity of death. This is why we decided to conduct a case study with the aim of identifying patterns in the deaths caused by malaria and using this data, we can drive more informed data-driven decisions.

Key Words

Malaria, Insecticides, SDG, Health, Prevention, Resistance, Data.

Problem statement

With 94% of global malaria cases in the WHO African Region which is an estimated 290 million cases and 409,000 deaths from the Africans living in the WHO Region[7] over the past ten years, how can we use AI-driven solutions to predict the possible number of malaria cases, so that Governments and Health Institutions can use our analysis and findings to drive better data-driven decisions on ways to mitigate the issue?

Analysis Questions

- Which country in Africa has the highest number of Malaria cases?
- Which year had the highest number of malaria cases?
- What is the correlation between the incidences of malaria and malaria cases reported

Problem Value

On the 22nd of April 2021, on World Malaria Day, WHO Regional Director for Africa, Dr. Matshidiso Moeti, said “It is World Malaria Day 2021 and we grieve over the 384,000 preventable malaria deaths

in the WHO African Region in 2020" [7]. Knowing that these large numbers of deaths would have been preventable and hundreds of thousands of lives would have been saved with the right measures and strategies in place, we are taking on this analysis to find out how to predict the possible number of malaria cases, work with stakeholders, and possibly bring the numbers of infections and death rates down. With data on possible infection rates, pharmaceutical companies would be prepared to produce the right amount of medication to treat cases in the early stages to serve the community. As the old adage goes, prevention is better than cure. Overall, with numbers on how malaria could spread, measures can be put in place to prevent massive spread in the first place and this domino effect overall saves lives.

Solution Artefact

- Our solution is an AI model that predicts the number of people that will be affected by Malaria in the following year when data is inputted into the model
- This model will help the government know the amount of medicine that is needed to be manufactured because of the exact number of people that are affected
- Furthermore, it will help the government plan the steps that are needed to be taken to prevent malaria

Data Analysis Libraries Used

- Numpy, Pandas, Matplotlib, Seaborn, Sklearn, Sklearn.utils, Sklearn.svm

Data Cleaning Strategies

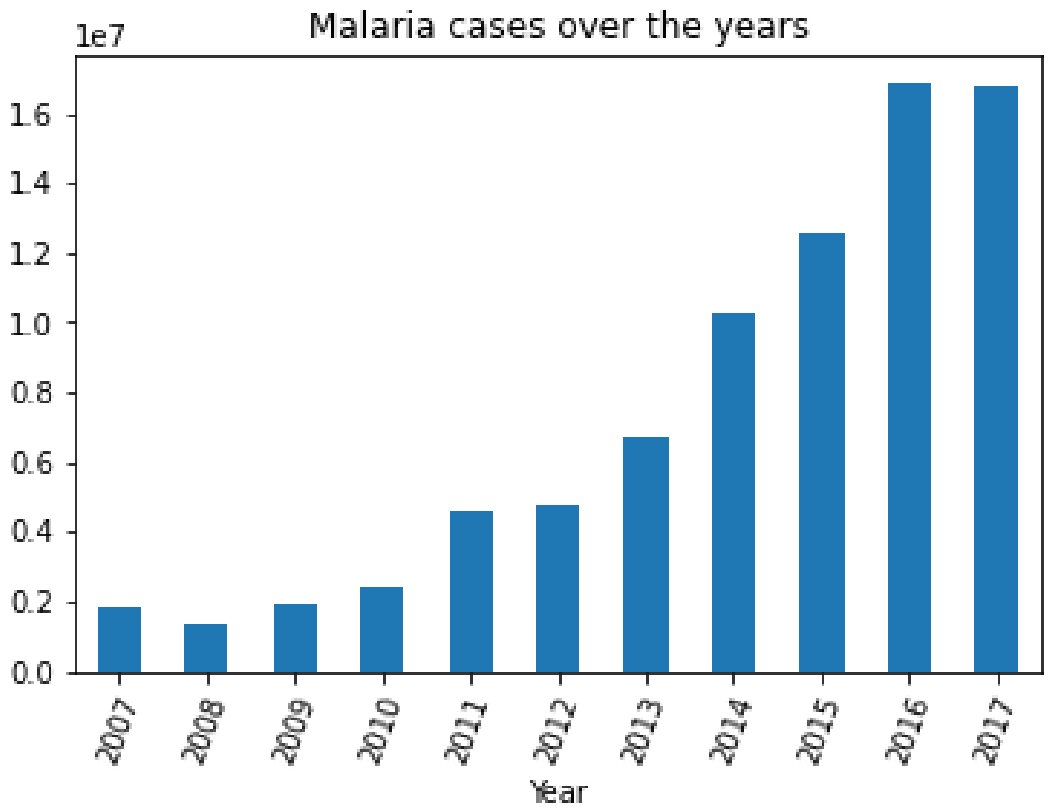
- Dropping null values to remove outliers that would interfere with our analysis
- Checked the types of data to ensure consistency across columns
- Dropped unwanted columns that would not be relevant during the analysis
- Replaced missing values with average values to avoid skewing the results of the analysis

Data Analysis Visualizations

1. Bar Graph visualization showing the trend of Malaria Cases over the years

Graph Interpretation

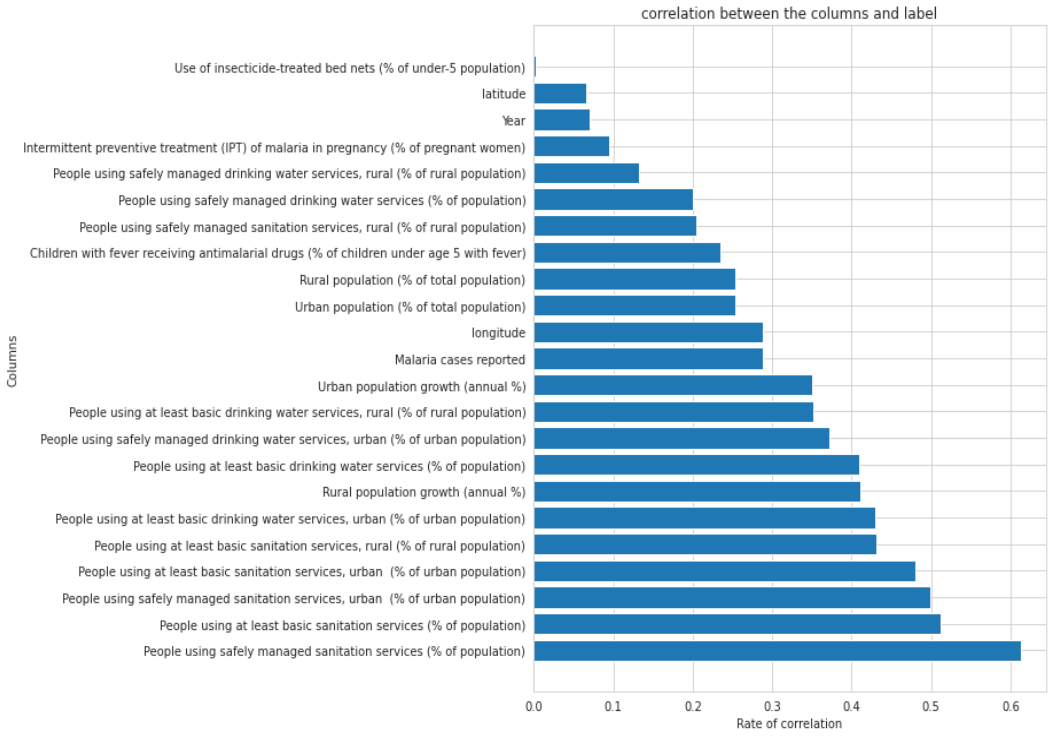
The graph below shows the trend of malaria cases from 2007 to 2017. It is evidently clear that the numbers have only been rising and would thus be a fair prediction to presume that if certain measures and strategies are not put in place, these numbers will only continue to increase and the number of deaths increases as a result.



2. Visualization on Correlation between the incidences of malaria and malaria cases reported

Graph Interpretation

From the below graph, we can see that the incidences of malaria have a strong positive correlation with people using safely managed sanitation and services. This means that this feature influences strongly the number of malaria incidences. On the other hand, we can see the use of insecticide does not strongly correlate with the label. A good reason for this could be the parasite mutation towards the insecticide as mentioned above from the research.



Observations/Results

The algorithm chosen for our model was linear regression because we wanted to predict the incidences of malaria cases, which is our target prediction value based on independent values that we used as the features. Our model had an accuracy of 0.940659526450512. From our model, we were able to derive predicted values based on our features and came up with a table to compare the two. To test for specific situations, we printed out our test data with the actual incidence at the end and the predicted at the beginning.

Recommendations/Solution

According to our problem value and the dataset provided, we decided to come up with a prediction model that predicts the incidences of Malaria based on the above features. The algorithm chosen was linear regression that gave us an accuracy of 94%. From our model, we came up with the predicted values of the incidences, which were higher than that of the actual value. Some of the ways we could reduce the number of malaria infection cases and possibly reduce the number of preventable deaths include:

- Clearing Stagnant water around places that humans live so as to disrupt mosquito breeding grounds
- Working with local Government communities and hospitals to provide mosquito nets for the community to act as barrier nets from vectors especially children who can't defend themselves.
- Encouraging the Government to partner with pharmaceutical companies to provide malaria drugs in Congo since it is the country with the largest number of malaria cases

- Educating the public on ways to mitigate the issue by encouraging the use of mosquito repellents and spraying insecticides in their homes so as to make them more informed and educated on their health choices.

Team Contribution

List	Name	Percentage(%)	Comment
1	Imali Luvandale	25	Worked on notebook implementation for highest cases occurred and the trends of malaria
2	Heather Mataruse	25	Worked on the statics of people affected over the years and the reasons behind
3	Ian Wanjohi	25	Worked on implementation of the prediction of the number of cases that might happen over the years
4	Lavina Murithi	25	Researched the malaria situation in Africa and problem value

Plagiarism score: 6%

References

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