

# Predict H1N1 and Seasonal Flu vaccines Uptake

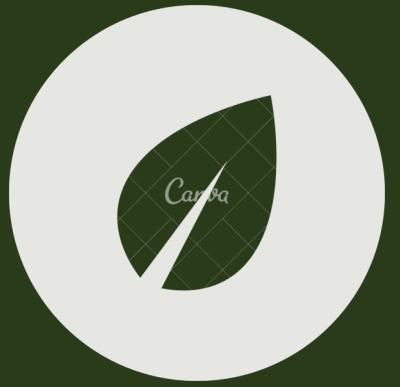


*Presented by Antony Kimanhi Mbindyo*

# INTRODUCTION



Immunization is a global health and development success story, saving millions of lives every year. Vaccines reduce the risks of getting a disease by working with your body's natural defenses to build protection.



# Problem Statement

Vaccines provide immunization for individuals, and enough immunization in a community can further reduce the spread of diseases through "herd immunity." Beginning in the spring of 2009, a pandemic caused by the H1N1 influenza virus, colloquially named "swine flu," swept across the world. Researchers estimate that in the first year, it was responsible for between 151,000 to 575,000 deaths globally. A vaccine for the H1N1 flu virus became publicly available in October 2009. In late 2009 and early 2010, the United States conducted the National 2009 H1N1 Flu Survey. This phone survey asked respondents whether they had received the H1N1 and seasonal flu vaccines, in conjunction with questions about themselves. These additional questions covered their social, economic, and demographic background, opinions on risks of illness and vaccine effectiveness, and behaviors towards mitigating transmission. A better understanding of how these characteristics are associated with personal vaccination patterns can provide guidance for future public health efforts.

## **MAIN OBJECTIVE**

- Predict how likely individuals are to receive their H1N1 and seasonal flu vaccines.

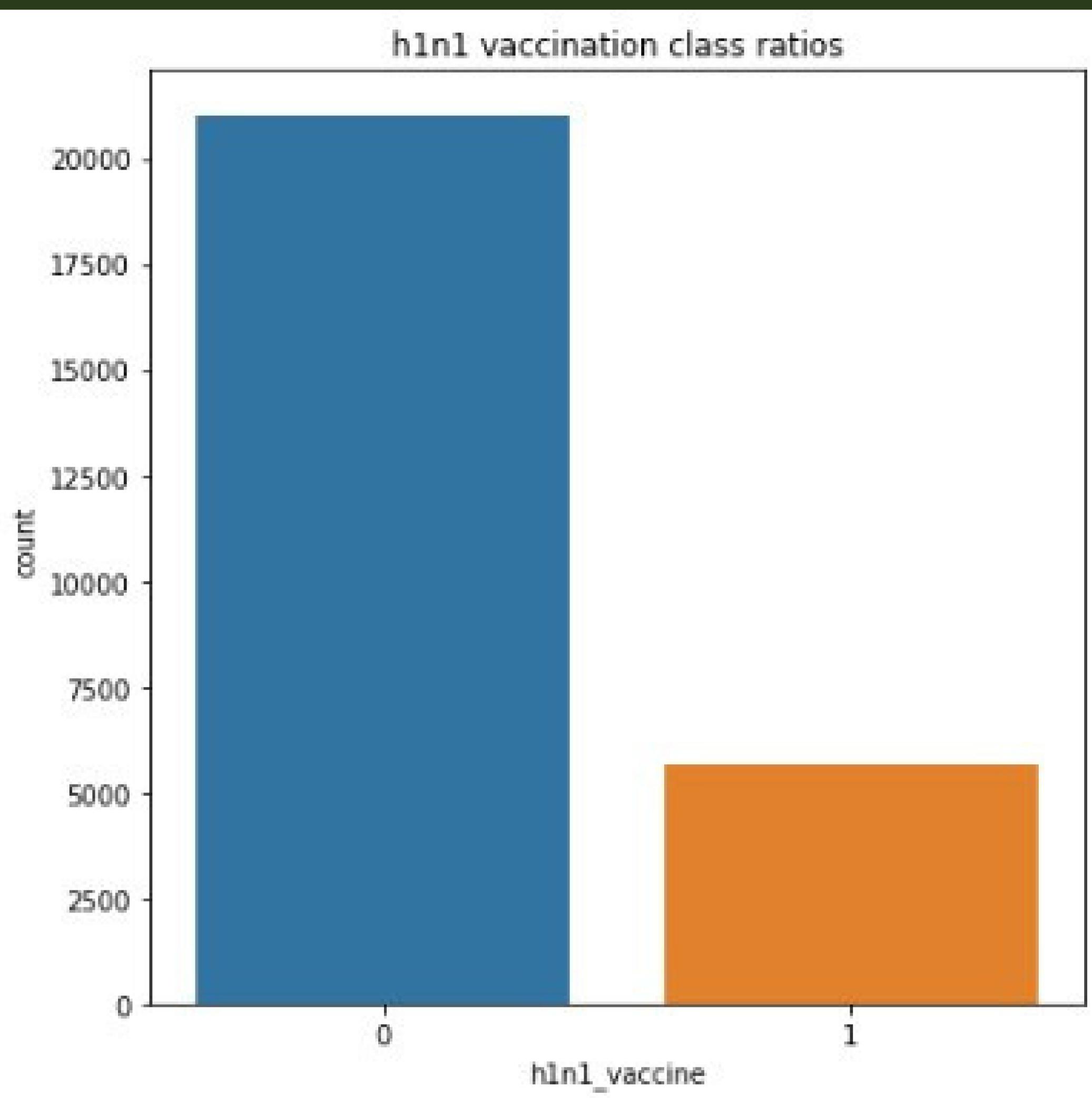
## **SPECIFIC OBJECTIVES**

- To find the best ROC AUC score in the Dataset
- To discover which model used can produce a high prediction score.

# Exploratory Data Analysis

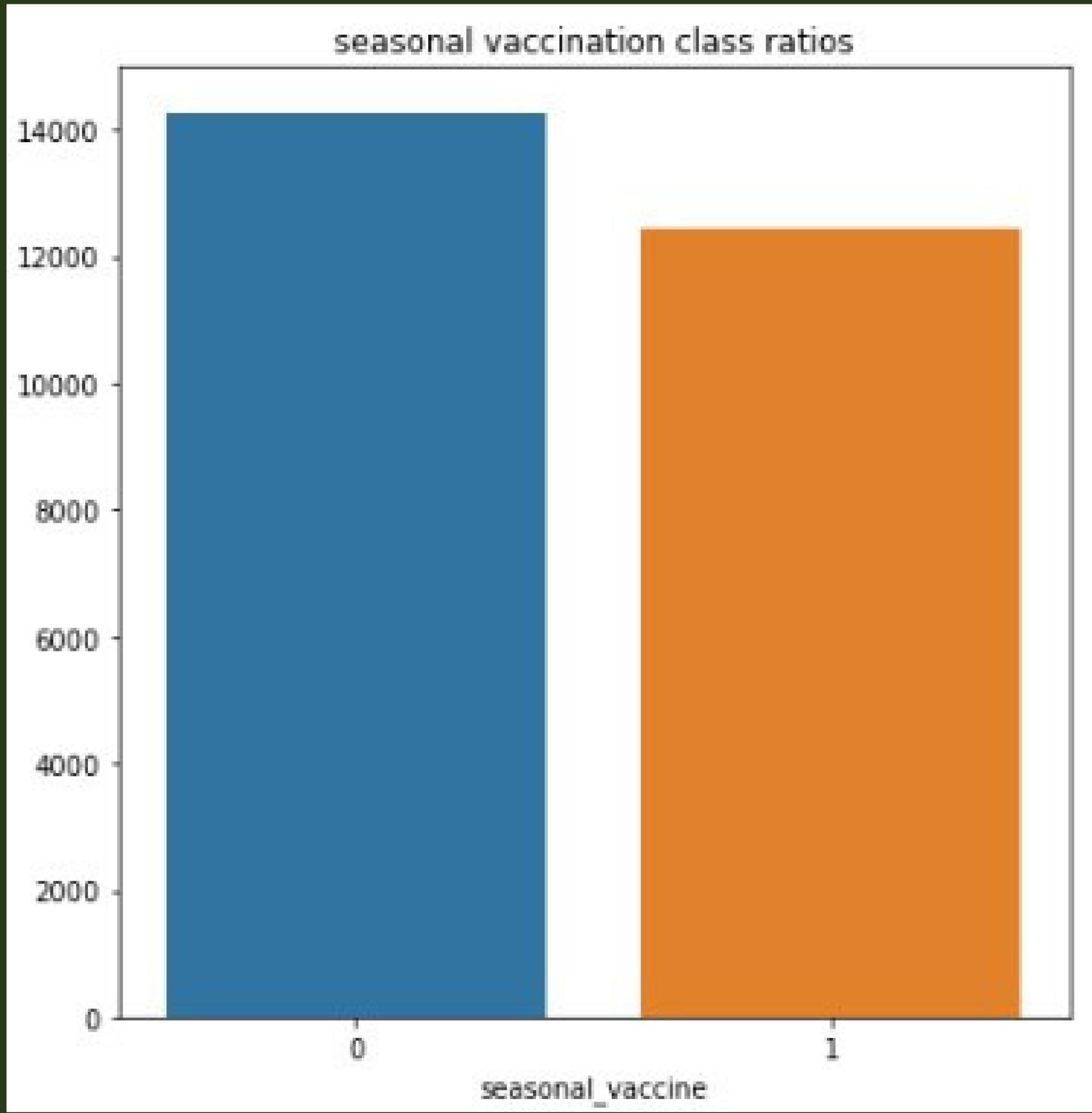


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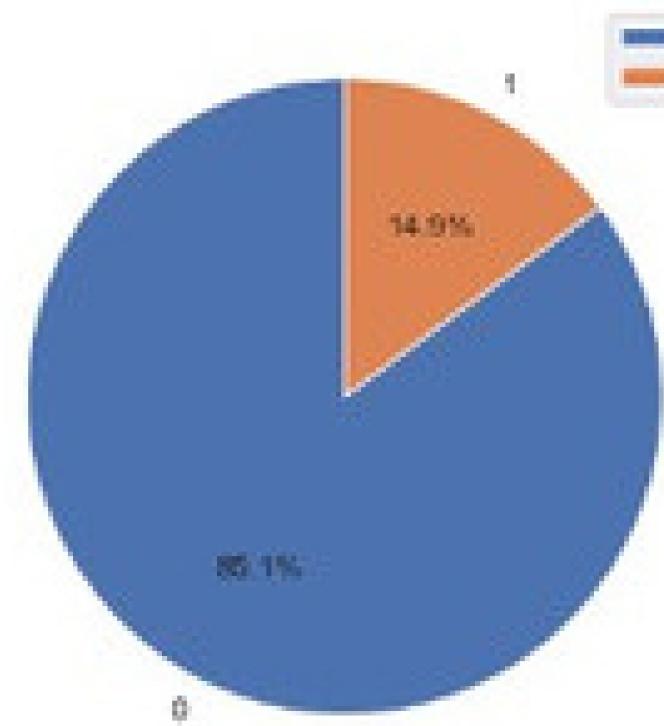
The h1n1 vaccine had a low uptake from the sampled population.

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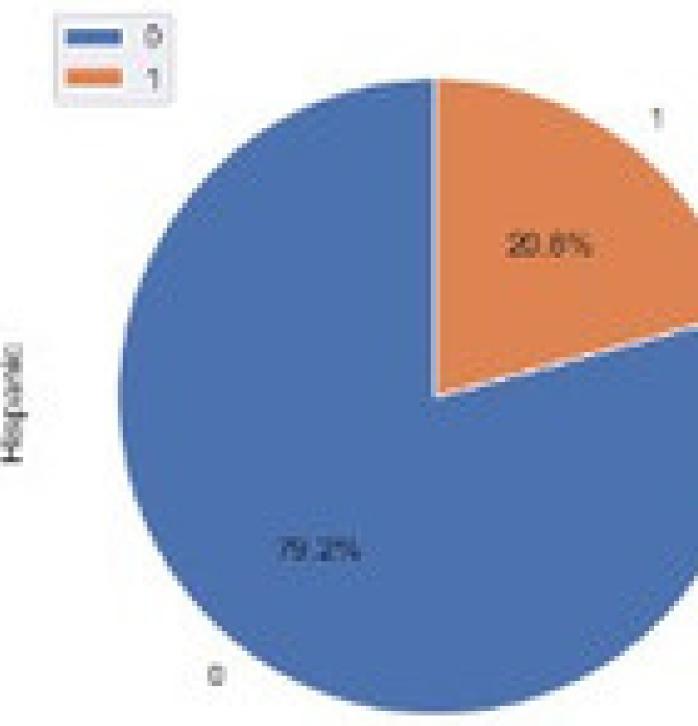


*On the Seasonal Vaccine we can see that in the comparison between those who didn't get vaccinated against those who were vaccinated, there was a small gap between them.*

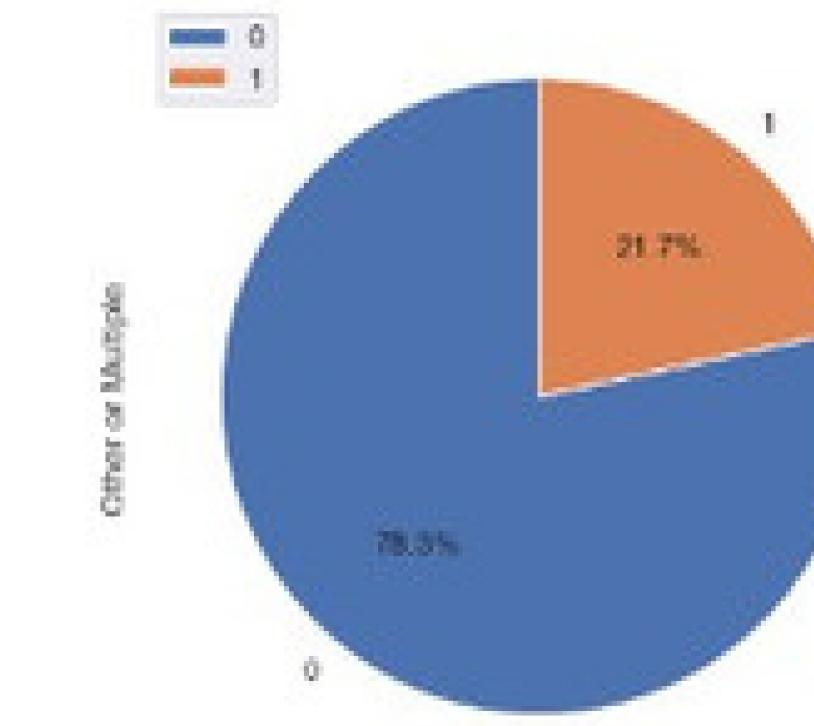
# Race Vs H1n1 Vaccine



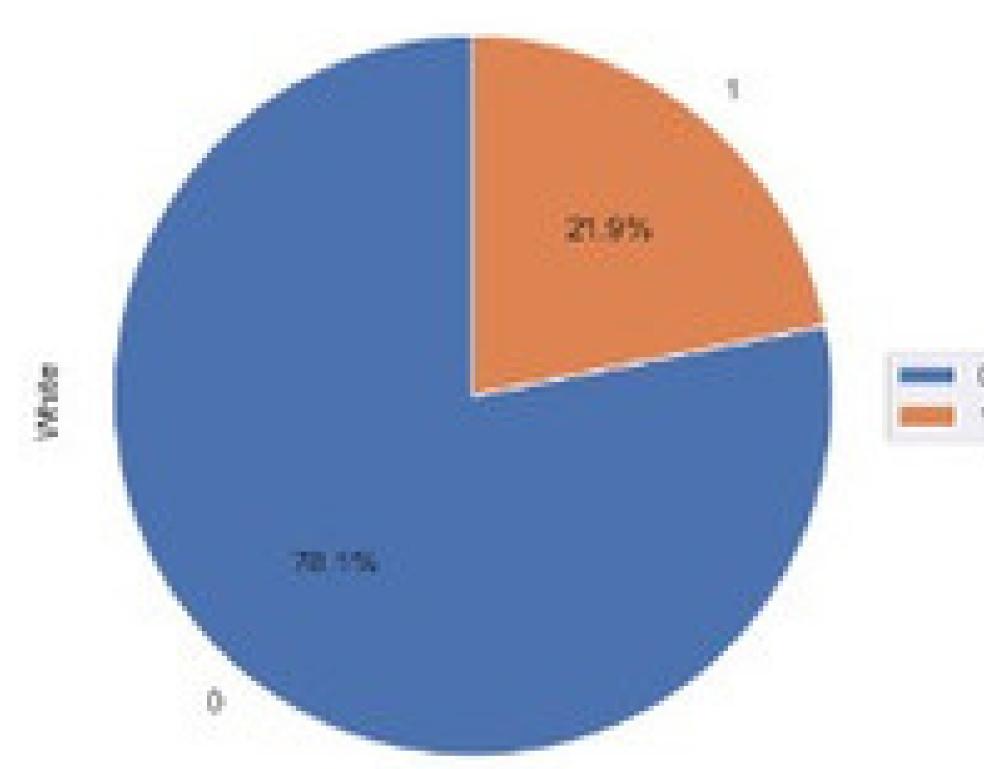
Black



Hispanic



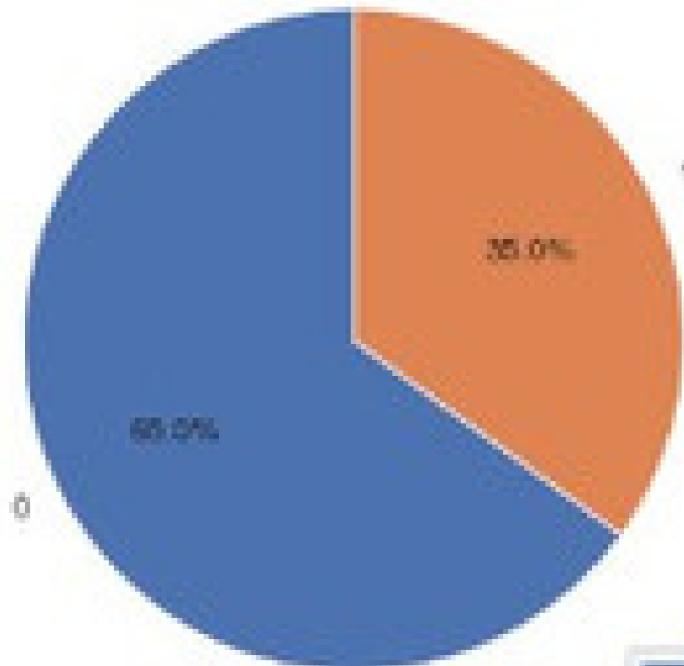
Other or Multiple



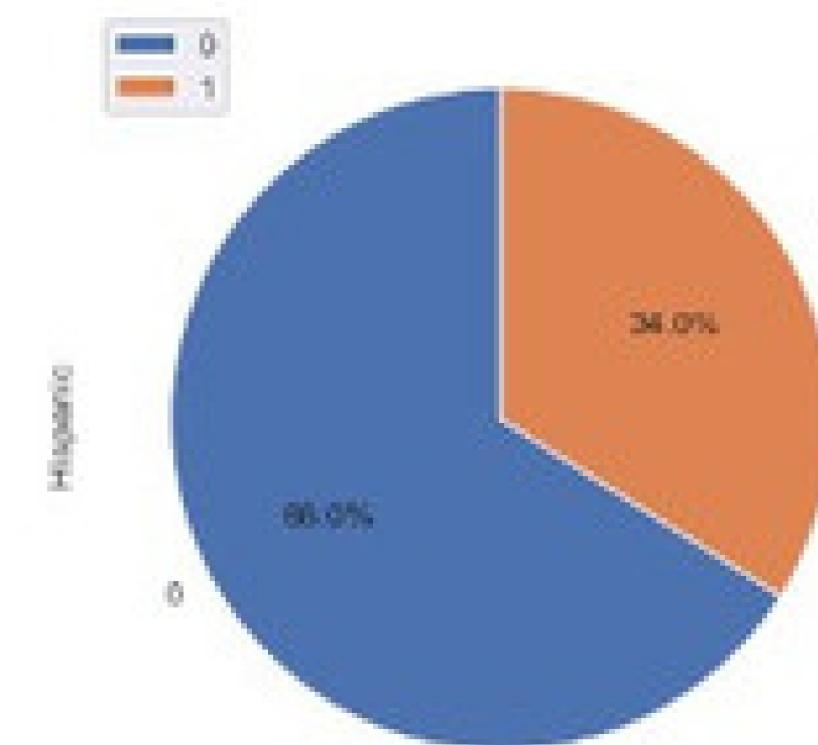
White

Whites had the largest of their population vaccinated i.e **21.9%** compared to the rest of the races in the sample population.

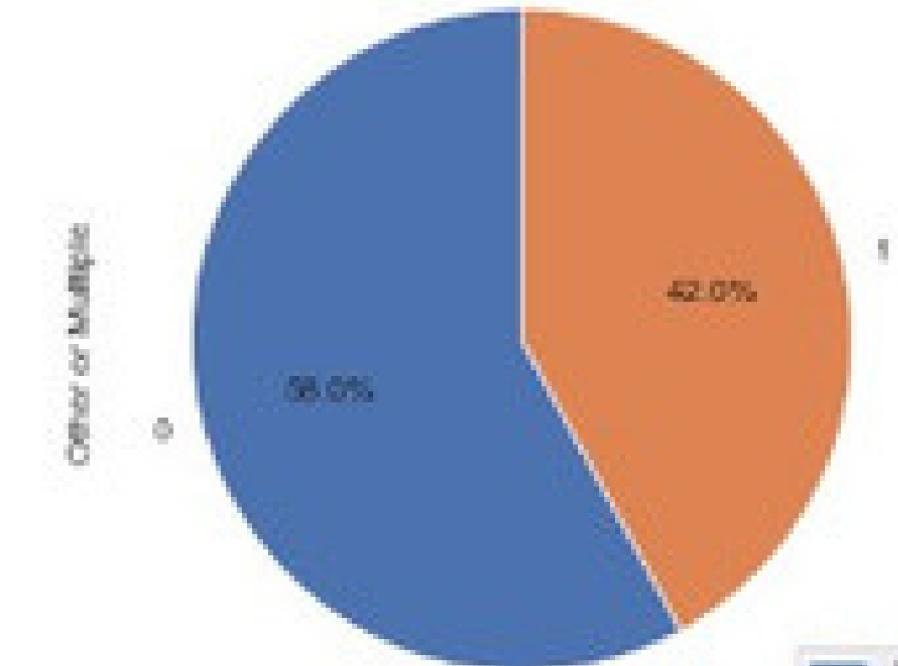
# Race Vs Seasonal Vaccine



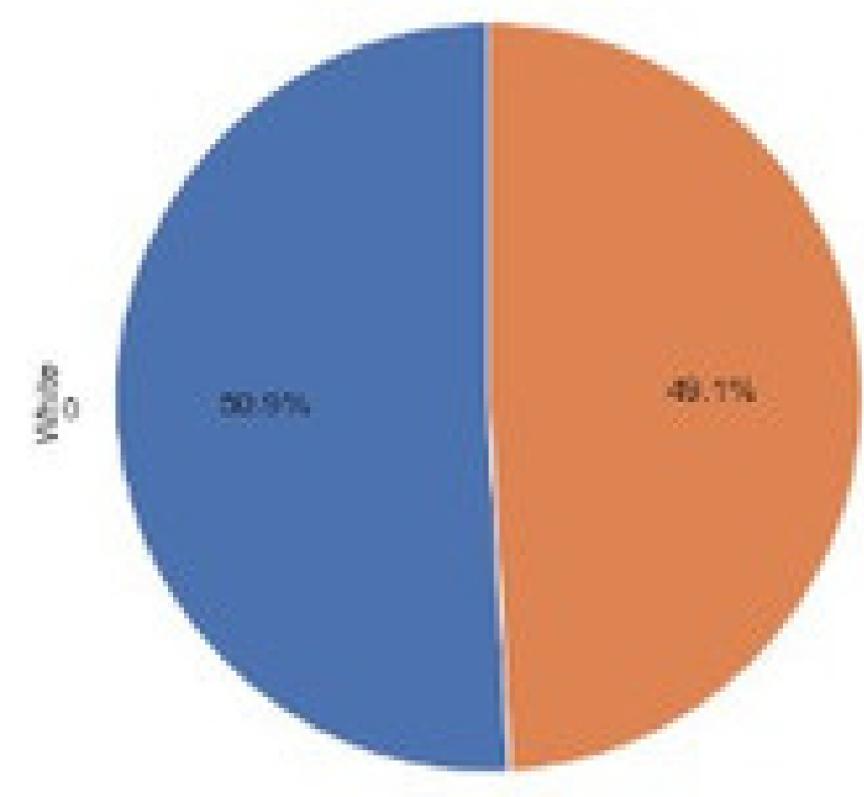
*Black*



*Hispanic*



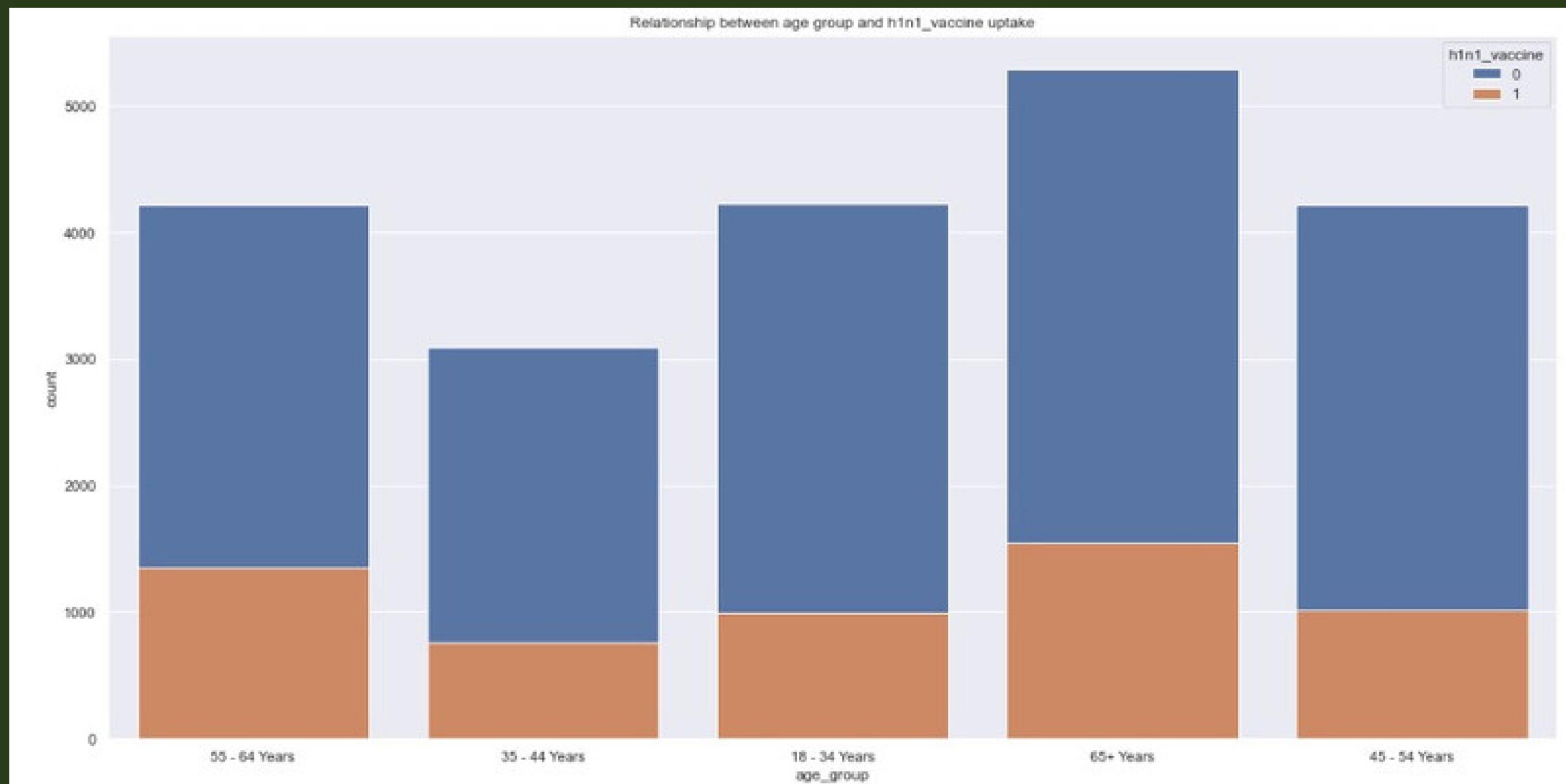
*Other or Multiple*



*White*

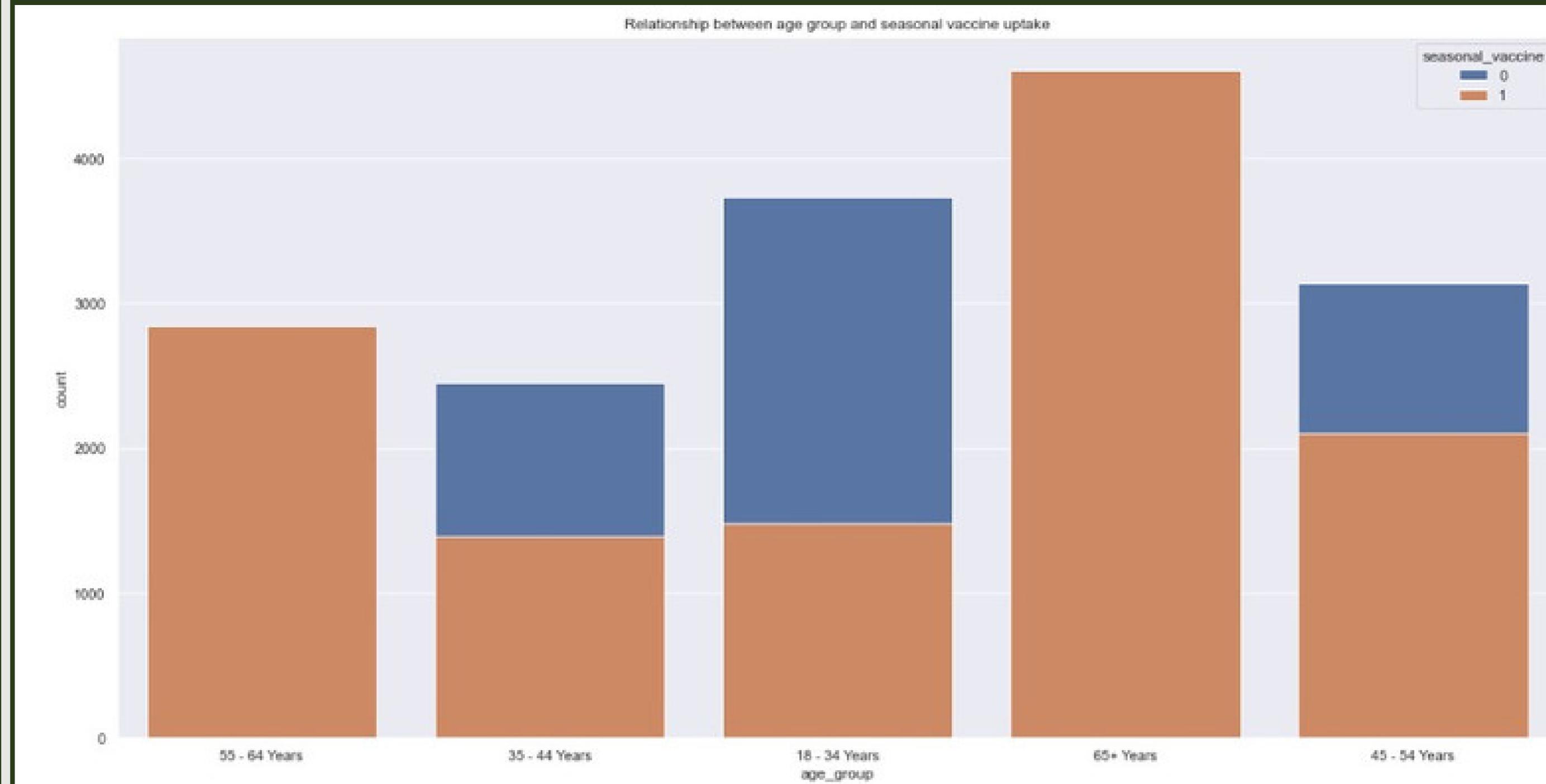
The Whites had a 49.1% of their population having been vaccinated compared to the rest of the races in the sample population.

# RELATIONSHIP BETWEEN AGE-GROUP AND H1N1 VACCINE UPTAKE



The age-group 35-44 years had the least number of people who had taken the H1n1 vaccine compared to the older population which had the highest vaccine uptake.

# RELATIONSHIP BETWEEN AGE-GROUP AND SEASONAL VACCINE UPTAKE



The older ages had a very high uptake of the seasonal vaccine in the sampled population. This is demonstrated by the ages above 55 years having all of them being vaccinated.

# MODELLING



# **MODELS USED!**

*Logistic  
Regression*

*Random Forest  
Classifier*

*Decision Tree  
Classifier*

*XGBoost*



This was the first model created produced a **ROC AUC** score of **0.827** on the H1n1 Vaccine and **0.846** on the Seasonal Vaccine.

# LOGISTIC REGRESSION

ROC AUC score - is a performance metric for binary classification problems which is used to measure the ability of a model to distinguish between negative and positive classes.

# DECISION TREE CLASIFIER

- This model produced a ROC AUC score of **0.682** on the H1n1 Vaccine and **0.751** on the Seasonal Vaccine.
- H1n1 Vaccine had a higher Precision, Recall, F1 and Accuracy scores compared to the Seasonal Vaccine.

# RANDOM FOREST CLASSIFIER

- This model produced a **ROC AUC** score of **0.674** on the H1n1 Vaccine and **0.764** on the Seasonal Vaccine.
- The accuracy score of the test data reduced from 0.80 to 0.77 when we used standardized data.

# XGBOOST

- This model's output on **ROC AUC** score of **0.826** on the H1n1 Vaccine and **0.846** on the Seasonal Vaccine.
- However, the Accuracy score reduced after tuning the model but not a big margin.



## CONCLUSION

- From the models created, the Seasonal Vaccine has a higher ROC AUC score compared to the h1n1 Vaccine.
- The performance of the predictive model was evaluated using several metrics where the best model produced had an average of 0.83 - 0.84 ROC AUC score i.e Logistic Regression and XGBoost models.
- According to the age- groups, the older the person is, the more they are likely to be vaccinated than the young population.
- Different races preferred to be vaccinated than the rest in the sample population i.e the Whites had most of their sampled population vaccinated.



## RECCOMENDATIONS

- Increase awareness and education to different races, so that they can see the benefit of being vaccinated in their respective races.
- The young should be vaccinated more than the old population. Partnering with the schools and governments can be considered therefore enabling the young population to be vaccinated at an early age as they say \*"Prevention is better than Cure".\*

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THANK  
YOU!

QUESTIONS?

