Supporting Public Health Through Data-Driven Insights on H1N1

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Introduction

Vaccination is one of the most effective public health interventions, providing individual protection against infectious diseases while contributing to community immunity through "herd immunity." Understanding vaccination behavior is critical for designing strategies to address vaccine hesitancy, improve uptake, and ensure equitable access

Goal: The project aims to develop a predictive model that can identify the key factors influencing H1N1 vaccine uptake, enabling organizations to design targeted interventions that increase vaccine adoption

The Importance of H1N1 Vaccine Uptake

- Economic Impact: Vaccination reduces the economic burden by lowering healthcare costs, absenteeism from work or school, and loss of productivity due to illness.

- Informed Health Strategies: Understanding vaccine uptake behaviors provides insights for designing effective campaigns, addressing vaccine hesitancy, and ensuring equitable access.

- Global Health Preparedness: Insights from H1N1 vaccine uptake can guide future strategies for other pandemics, improving readiness and response capabilities.

Data Overview

Key Highlights

- Dataset Size: 26,707 observations, 38 variables

Key Variables:

- Perceived risk of H1N1
- Doctor recommendations
- Behavioral factors
- Employment status
- Health indicators

KEY INSIGHTS FROM DATA EXPLORATION

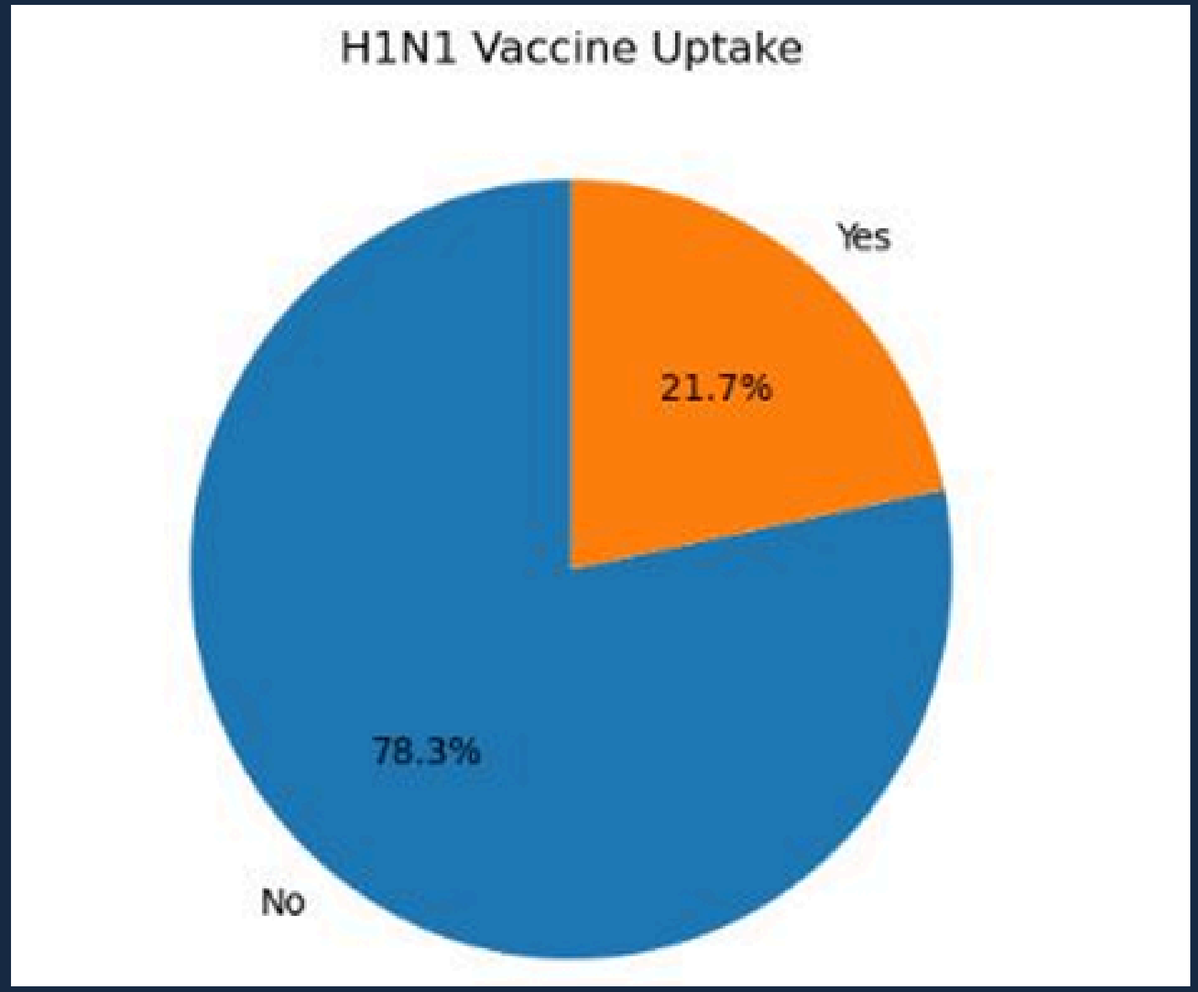
1. Class Imbalance
   - Majority of individuals in the dataset did not receive the vaccine.

2. Behavioral Correlations
   - Factors like attending large gatherings and spending time outside the home strongly correlate with vaccine uptake.

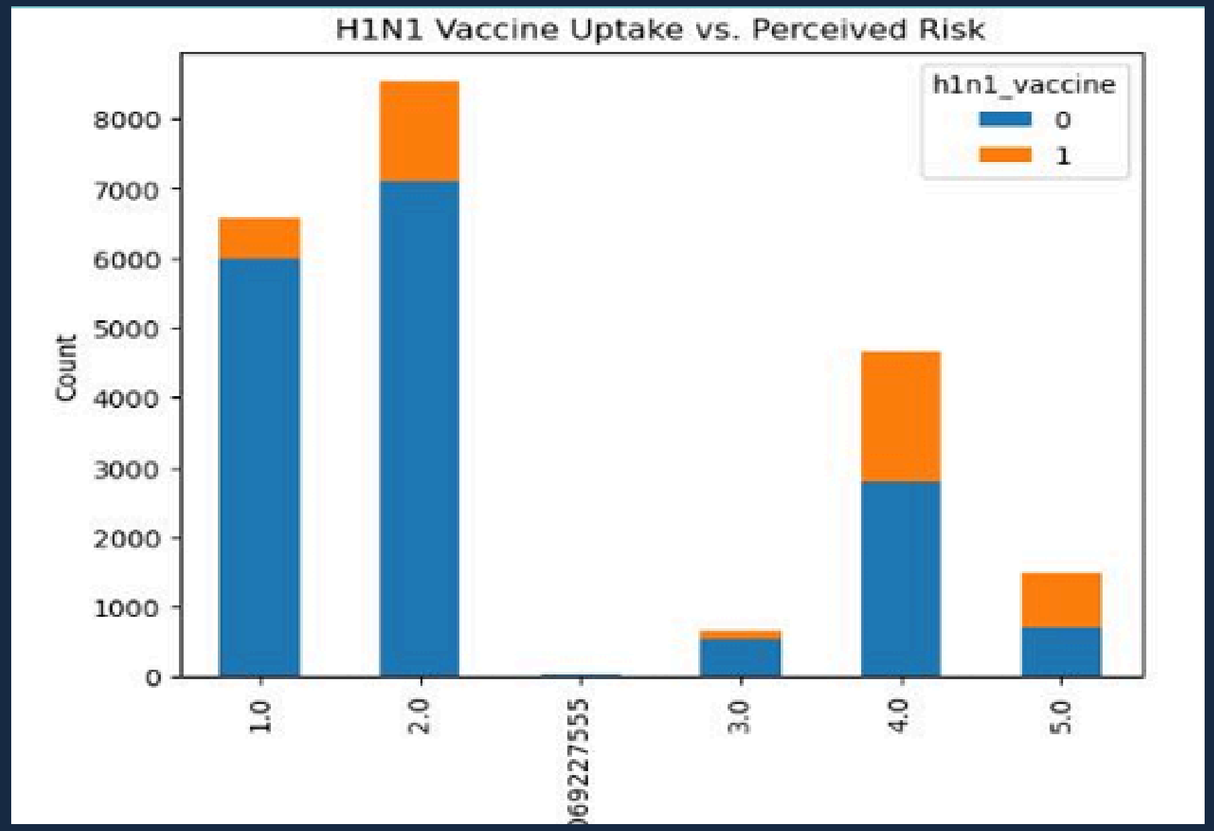
3. Perceived Risk & Doctor Influence
   - Higher perceived risk of H1N1 increases likelihood of vaccination.
   - Doctor’s recommendation plays a critical role in influencing vaccine uptake.

H1N1 Vaccine Uptake

- Target Variable: H1N1 Vaccine
- Class Imbalance: The majority class ("No") represents 78.3% of the observations.
- Implication: This imbalance requires special handling to prevent model bias towards the majority class.



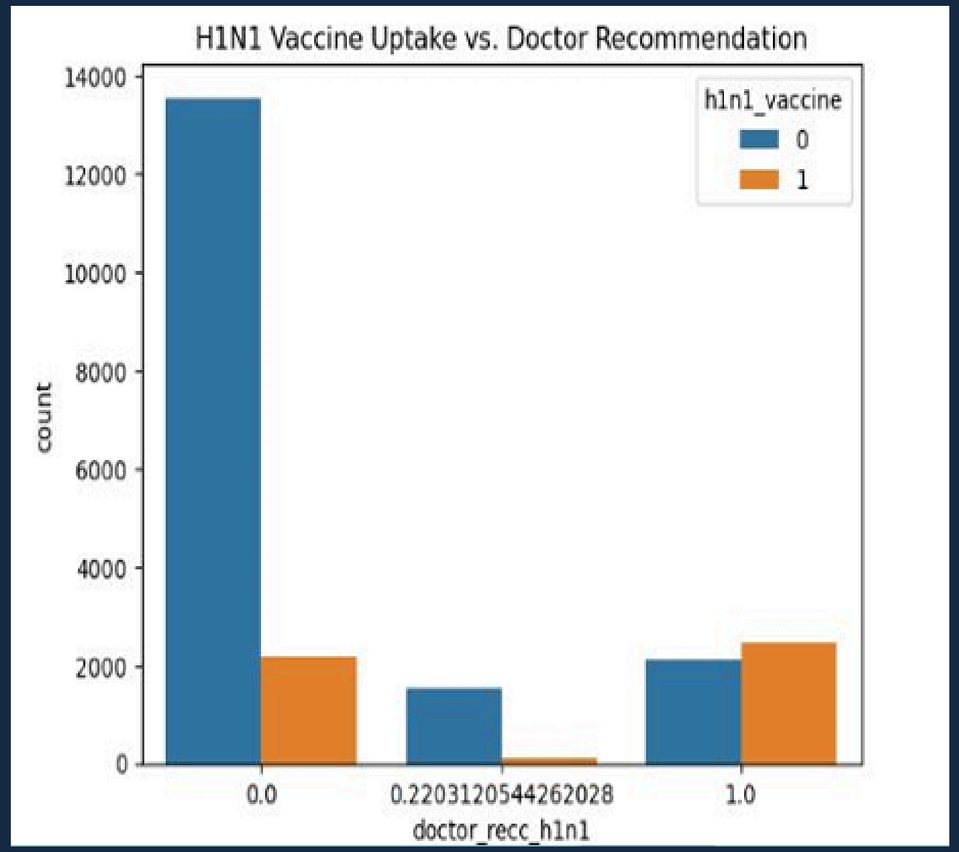
Vaccine Uptake vs. Perceived Risk



The bar chart demonstrates the relationship between perceived H1N1 risk and vaccine uptake.

It reveals that individuals with higher perceived risk are more likely to get vaccinated, while those with lower perceived risk (levels 1 and 2) show significantly lower vaccine uptake.

H1N1 Vaccine Uptake vs. Doctor Recommendation



The bar chart illustrates the impact of doctor recommendations on H1N1 vaccine uptake.

Individuals who received a doctor's recommendation (value 1) had a significantly higher vaccine uptake, while those who did not receive a recommendation (value 0) predominantly chose not to vaccinate.

Model Results

Best Model: Logistic Regression with a test accuracy of 87.22%, and balanced performance across both classes (diabetes and non-diabetes)

Logistic regression achieved 3,055 true negatives and 2,942 true positives, indicating good classification performance

Random Forest and Decision Tree showed good performance but had some issues like overfitting or lower accuracy

Conclusion

Key Indicators of Vaccine Uptake

- Perceived Risk: Higher perceived risk of H1N1 (levels 4 and 5) is linked to increased vaccine uptake.
- Doctor Recommendations: Individuals who received a doctor’s recommendation showed significantly higher vaccine uptake.
- Behavioral Characteristics: Factors like large gatherings and time spent outside the home strongly correlate with vaccine uptake.

Recommendations

- Increase Awareness of Perceived Risk: Public health campaigns should focus on raising awareness about the risk of H1N1 to motivate individuals to get vaccinated.

- Leverage Doctor Recommendations: Encourage doctors to recommend the vaccine to patients, which significantly increases uptake.

- Optimize Behavioral Factors: Incorporate behavioral data (e.g., large gatherings, time spent outside) into targeted interventions

THANK YOU!

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