A close-up, slightly blurred photograph of medical equipment. In the foreground, a white syringe with a needle is visible, with the text 'AFTER USE' printed on its side. Below the syringe, a blue and white striped bandage or label features the text 'H1N1'. In the background, a silver stethoscope is partially visible. The overall image has a blue and white color scheme with a soft focus.

# H1N1 Vaccine Uptake:

Learning from the Past to  
Inform the Future

Lou Hines  
6.22.2023

# Background Study:

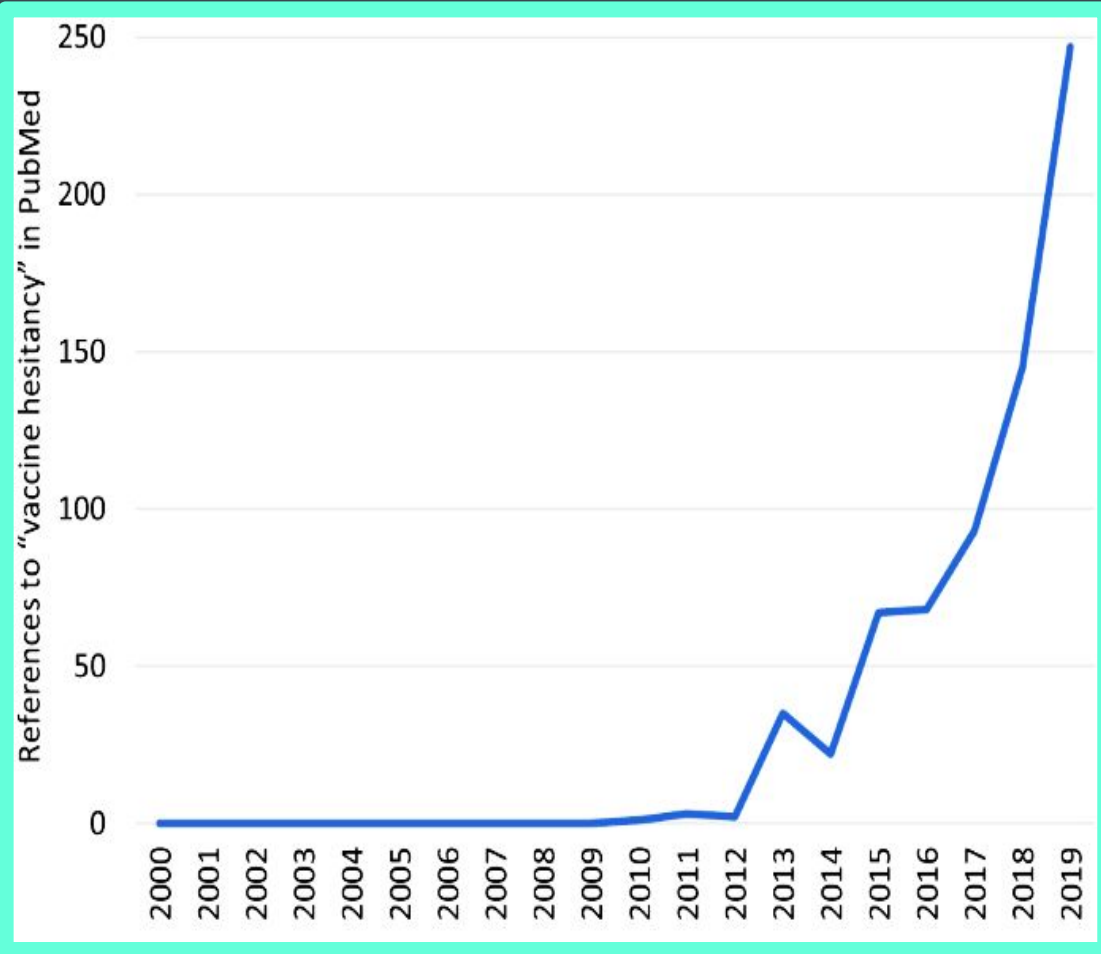
- Conducted 2009-2010 by the CDC
- Approximately 1.4 million participants
- Behavioral and opinion-based

Source:  
[https://www.cdc.gov/flu/fluview/cov\\_0910estimates.htm](https://www.cdc.gov/flu/fluview/cov_0910estimates.htm)

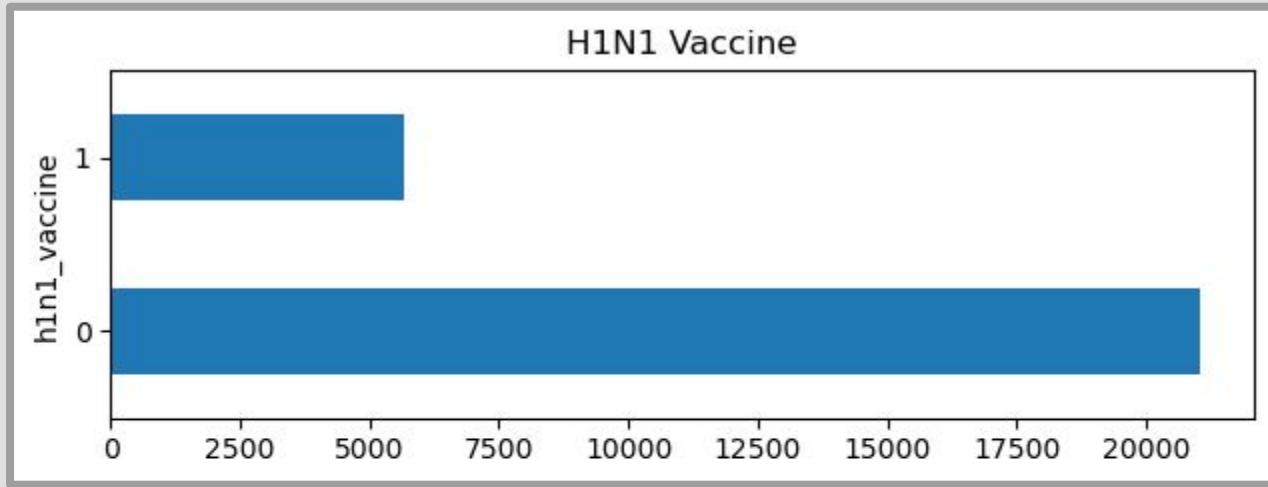


# A Brief History of Vaccine Hesitancy

Source: Kennedy, J. Vaccine Hesitancy: A Growing Concern. *Pediatr Drugs* 22, 105–111 (2020).  
<https://doi.org/10.1007/s40272-020-00385-4>



# The Data / Approach



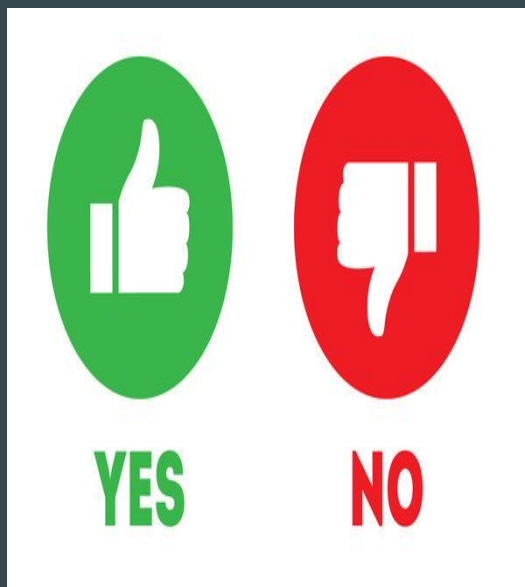
**Low Uptake = Imbalanced Data!**

# Modeling Considerations:

Imbalanced Data



Binary Classifications

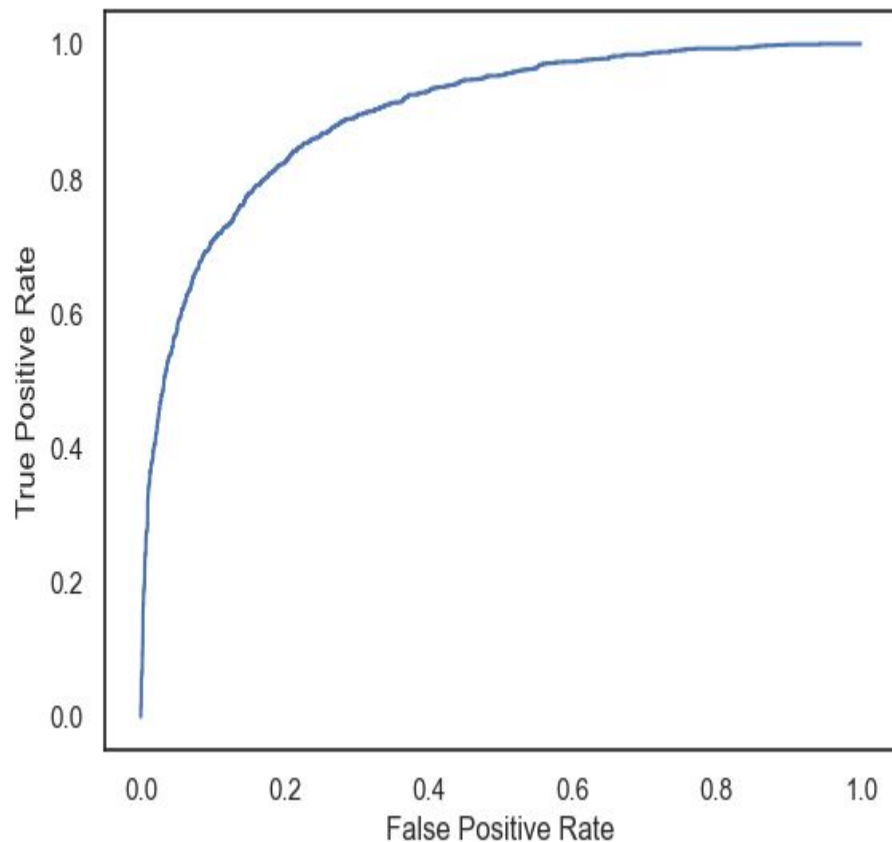


Missing Values



# Best Model:

Sci-Kit Learn's  
HistGradientBoostingClassifier  
with SMOTE re-sampling,  
tuned with GridSearchCV



# More Model Evaluation Metrics:

Training Scores:

Train Accuracy: 0.8848510912805074

Train Precision: 0.7691632533645407

Train Recall: 0.6602209944751382

Train F1-Score: 0.7105405405405407

\*\*\*\*\*

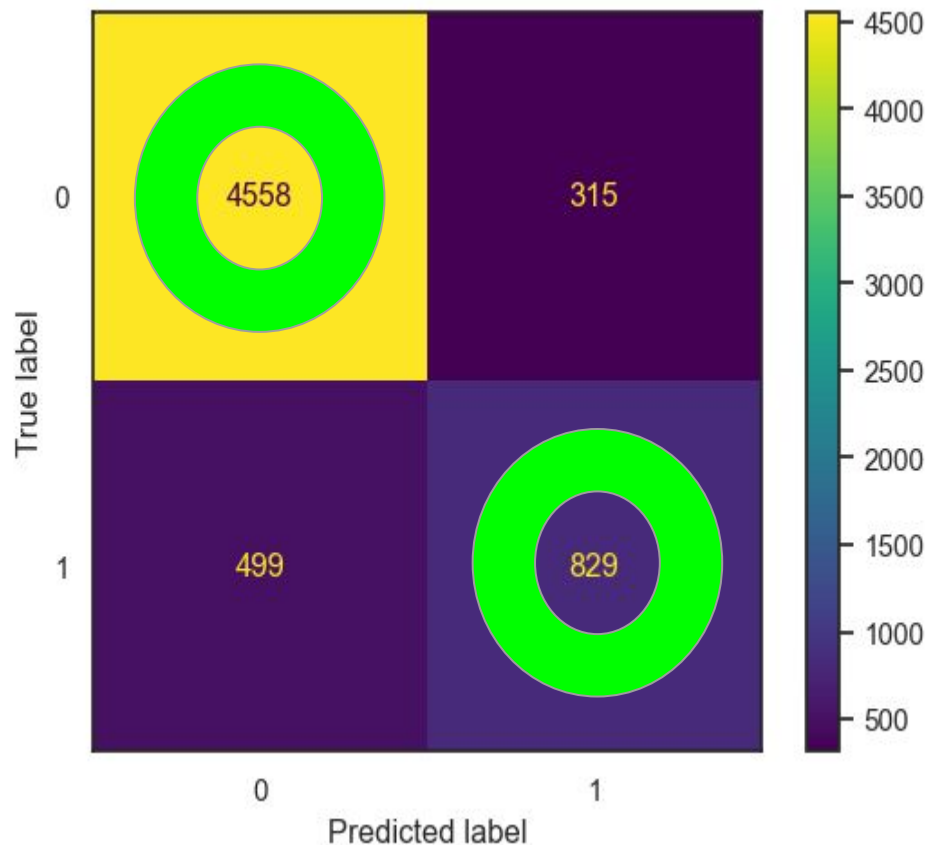
Testing Scores:

Test Accuracy: 0.8687308498629254

Test Precision: 0.7246503496503497

Test Recall: 0.6242469879518072

Test F1-Score: 0.6707119741100324





# Key Determinants of Uptake:

## Role of Doctors

- Doctors recommending the vaccine was one of the highest predictors of uptake across models

## Health Insurance Status

- Insured

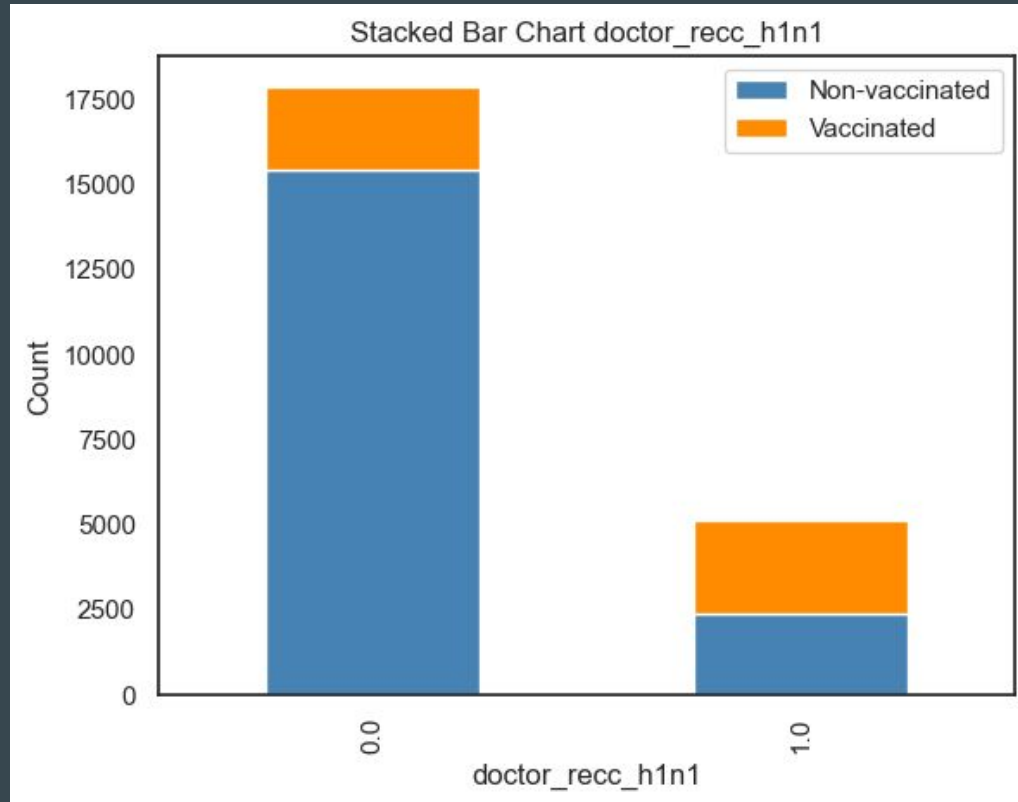
## Age

- Middle-aged and older adults

## Knowledge of H1N1 and Vaccine

- Those with concern about the virus and a favorable opinion of the vaccine

# Doctors Critical!



# Other Takeaways and Surprises:

## Gender

- Little role: women-identifying slightly more likely than men-identifying

## Chronic Illness

- Had no effect

## Labor Force Participation

- Being out of the labor force played little role

# Recommendations:

## Maximize Public Campaigns

Knowledge is key! Specifically target younger audiences with children who lack health insurance or who do not visit the doctor often. Also pay close attention to those with chronic health issues, regardless of age!

Hot tip: Make Tiktok your friend! Court Hank Green!

## Keep Doctors Near

Maintain close ties to primary caregivers; they are your most trusted allies against mis-info!

Identify key players in health networks and best ways to keep in touch with primary care providers.

## More Recommendations:



### Target sites of misinformation:

- Work within and across agencies and entities to stop the spread of vaccine mis-info:
- Consider lobbying, enhancing social media savvy and presence.

# Further Research:

Integrate this survey with more recent data, especially for underserved populations

Utilize other modelling techniques to extract more granular insights (ex: MultiOutputClassifier)

Combine classes to look for specific patterns in those who also did or did not receive the flu vaccine

Enhanced data cleaning

**Questions?**

# Contact Info



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