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' and some markings on its plunger. Below the syringe, a blue and white striped bandage or label is partially visible, featuring the text 'H1N1'. In the background, a silver stethoscope is resting on a surface. The overall image has a blue tint and is used as a background for the title.

H1N1 Vaccine Uptake:

Learning from the Past to
Inform the Future

Lou Hines
6.22.2023

Background Study:

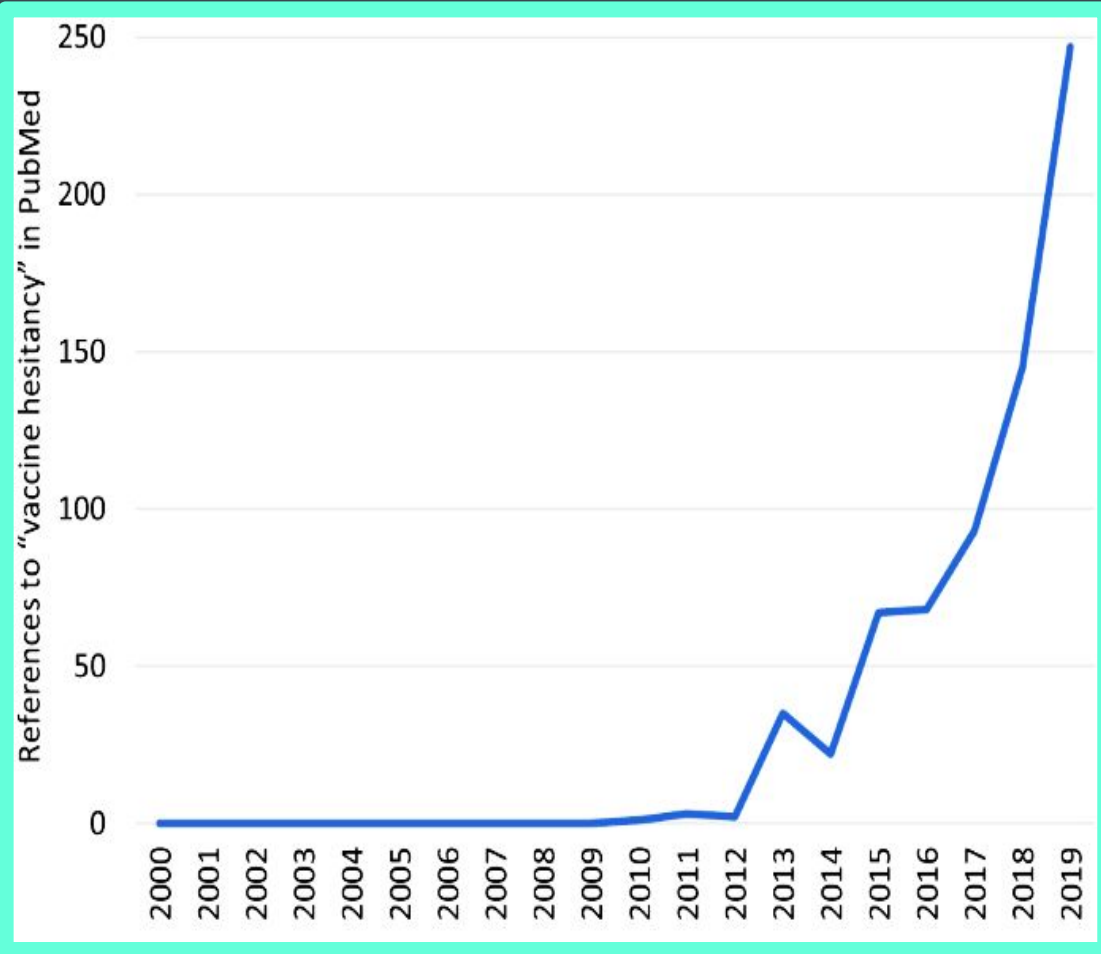
- Conducted 2009-2010 by the CDC
- Approximately 1.4 million participants
- Behavioral and opinion-based

Source:
https://www.cdc.gov/flu/fluview/cov_0910estimates.htm

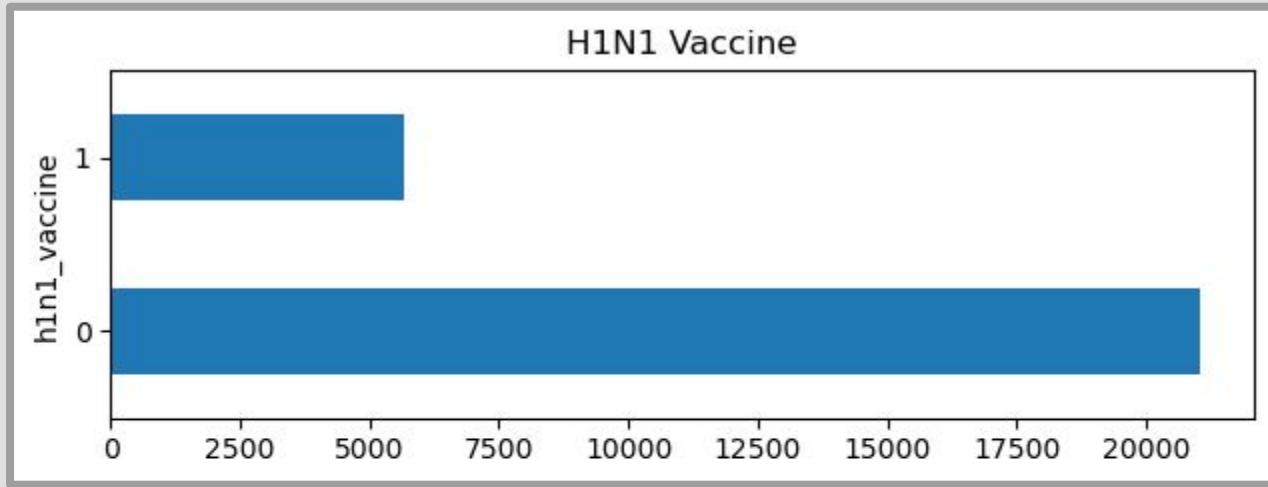


A Brief History of Vaccine Hesitancy

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



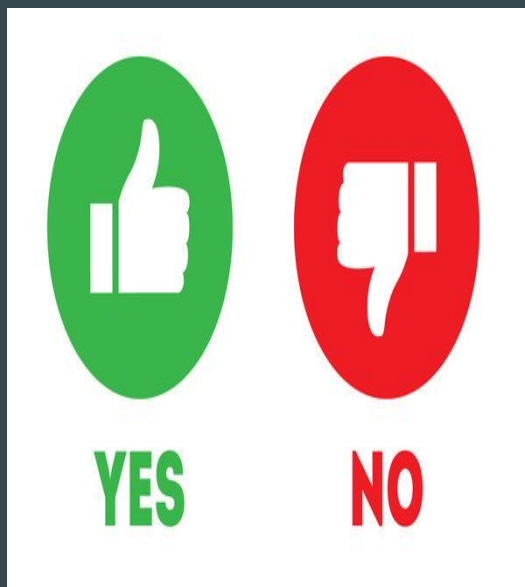
Low Uptake = Imbalanced Data!

Modeling Considerations:

Imbalanced Data



Binary Classifications



Missing Values

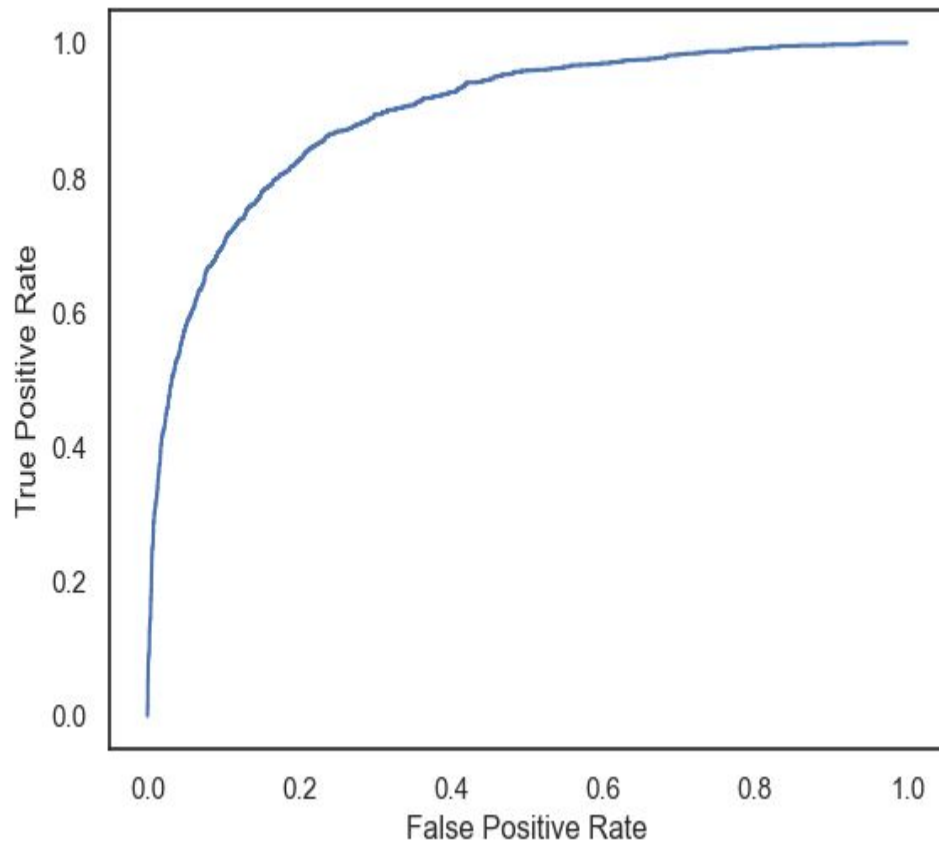


Best Model:

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

Cross-validation score: 0.8957821275594623

Test AUC score: 0.892988535302713



More Model Evaluation Metrics:

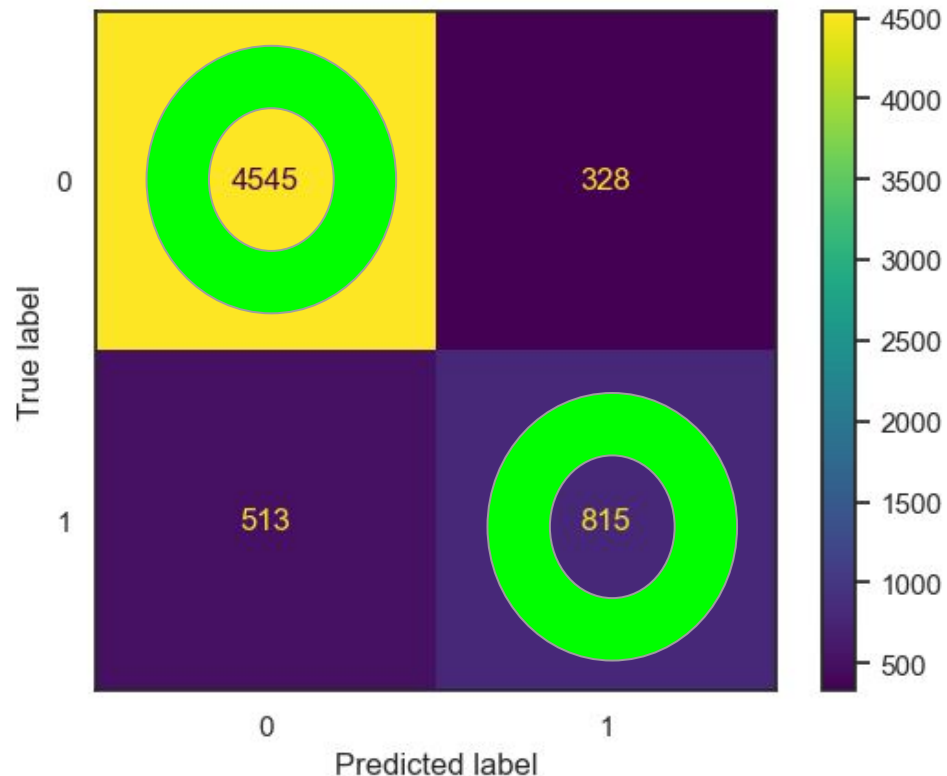
Testing Scores:

Test Accuracy: 0.8643767134333172

Test Precision: 0.7130358705161854

Test Recall: 0.6137048192771084

Test F1-Score: 0.65965196276811



Key Determinants of Uptake:

Role of Doctors

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

Health Insurance Status

- Insured

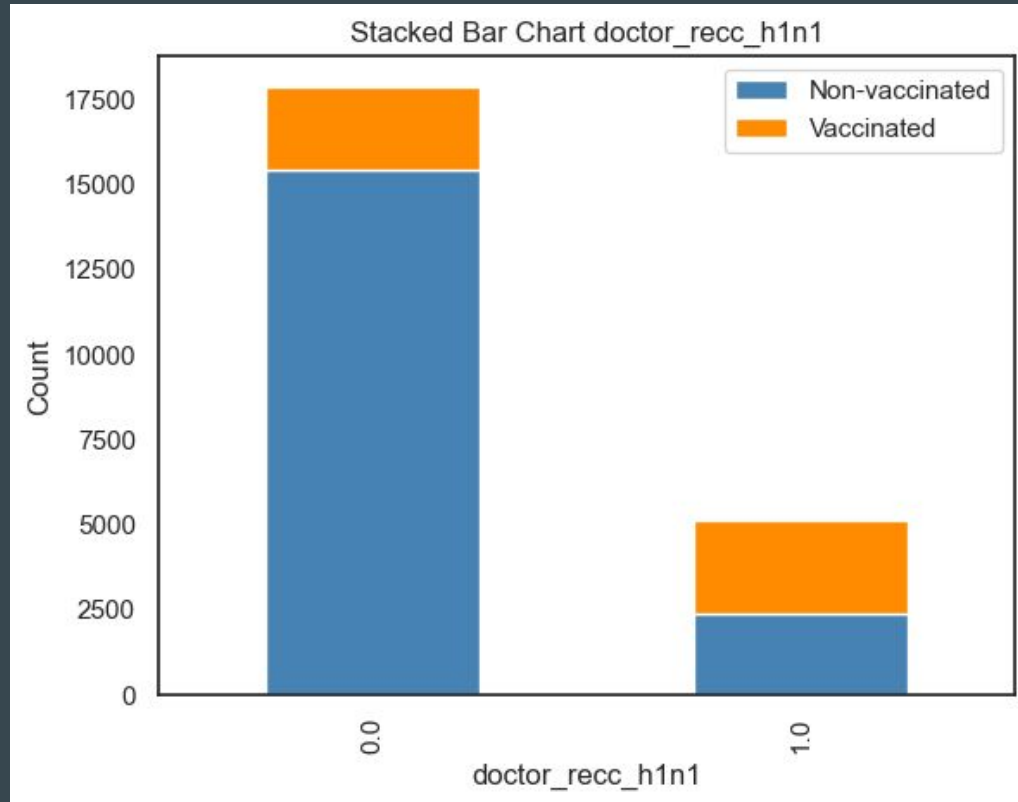
Age

- Middle-aged (45-54)

Knowledge of H1N1 and Vaccine

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

Doctors Critical!



Other Takeaways and Surprises:

Job Type*

- Aside from one industry, field of employment and particular job had little or negative impact

Chronic Illness

- Had little or negative effect

Labor Force Participation*

- Being in or out of the labor force played little or negative role

* Demographic data was often sparse, and collected at the end of the survey, when people are more likely to get off the phone.

Recommendations:

Maximize Public Campaigns

Knowledge is key! Specifically target younger audiences 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. Host events, produce hand-outs and other visual aides to help their patients understand vaccines.

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. Find trustworthy public figures you can engage with.

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, imputation, and feature engineering.

Questions?

Contact Info



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