Prediction Tool and Target Information for Moderna's Dual Purpose COVID-Flu Vaccine

Kevin Spring
28 October 2022

Presentation Outline

- Business Problem
- Data
- Model Results
- Prediction Tool
- Recommendations
- Next Steps

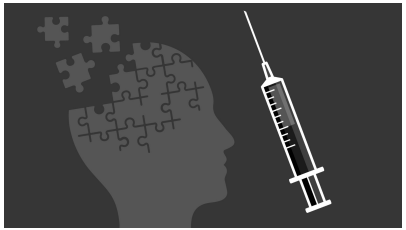
moderna

Business Problem

What factors lead to a person being vaccinated or unvaccinated?

Can we predict if someone will be vaccinated or not?

Combined Seasonal Flu & Covid vaccine



Only useful if people are vaccinated

Business Solution

ML model to predict who will be VACCINATED or UNVACCINATED

VACCINATED

- Offer to get vaccinated
- Follow-up reminder

UNVACCINATED

- Persuade based on the most important variables indicated by Machine Learning model

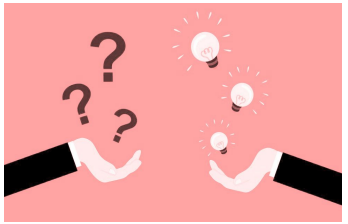
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

2009 CDC National Immunization Survey

- Seasonal Flu and H1N1 virus circulating
- Similar to current Flu / COVID environment

26,707 adult respondents

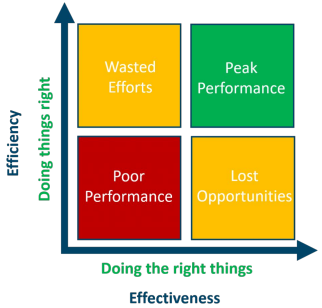
- Vaccination status
- Opinions of risk and effectiveness
- Demographics



- Yes / No
- Scale (1-5)
- Refuse or No Response

Results
Important variables for prediction

Access to healthcare



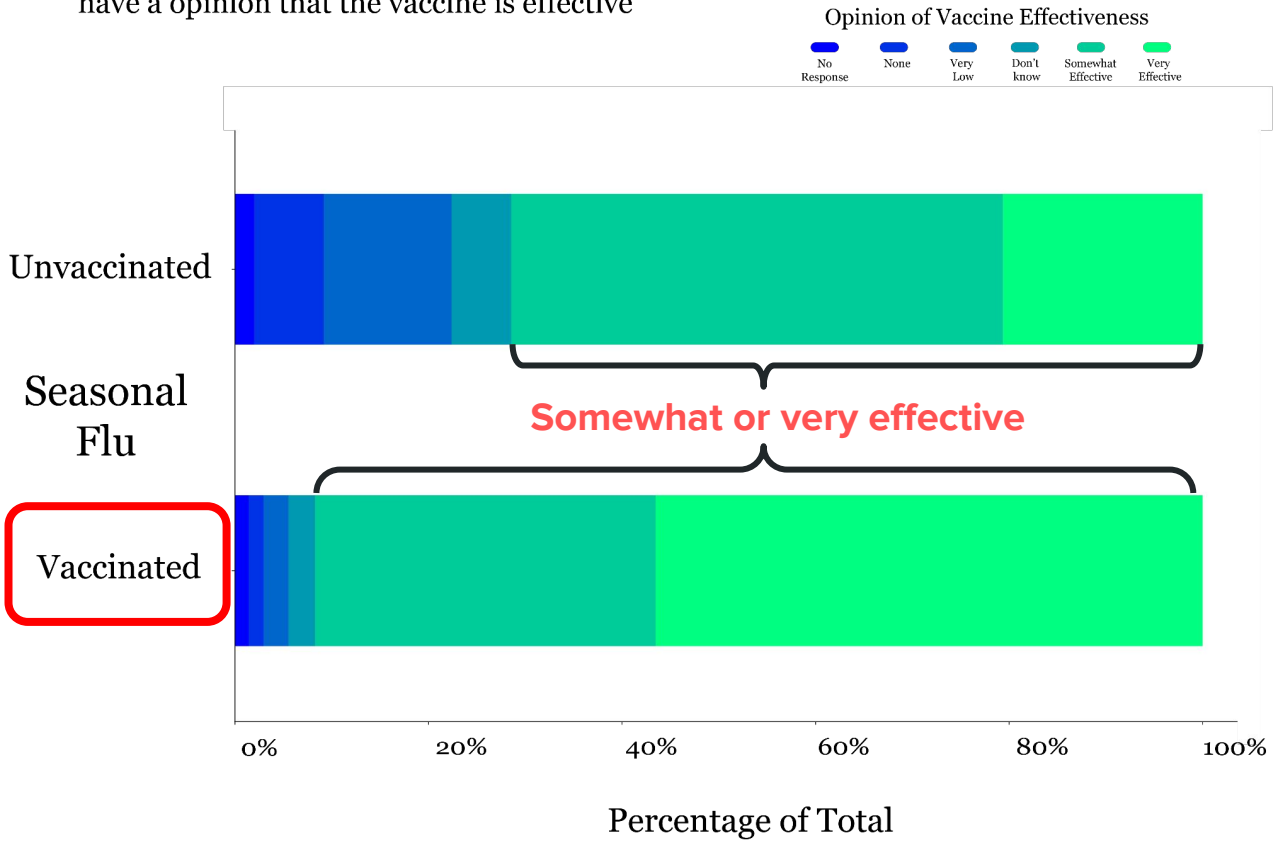
Opinion on vaccine effectiveness

Opinion on risk of infection

Age group

Vaccination Status and Opinion of Vaccine Effectiveness

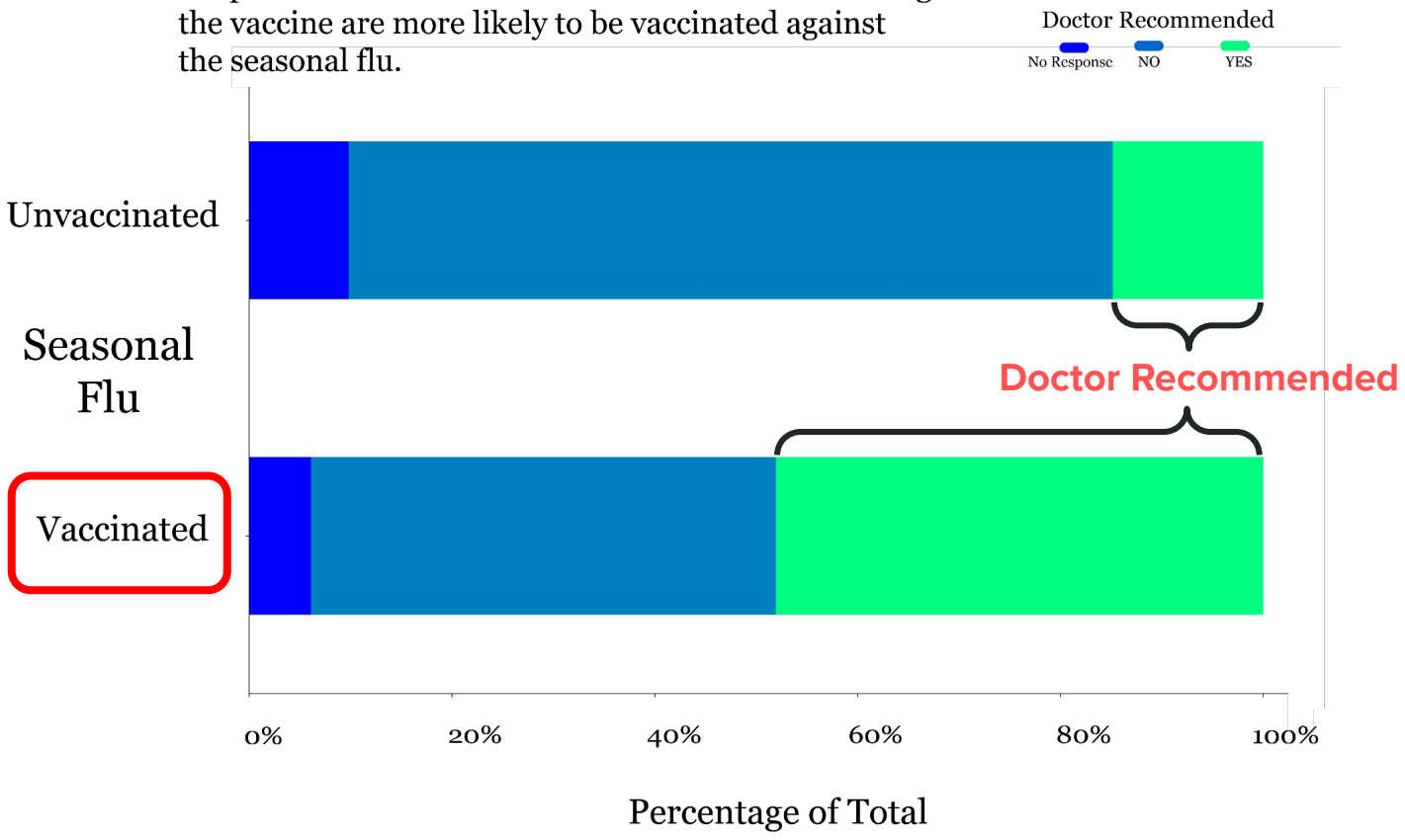
People that are vaccinated are more likely to have a opinion that the vaccine is effective



Source: CDC | Kevin Spring

Vaccination Status and Doctor Recommendation

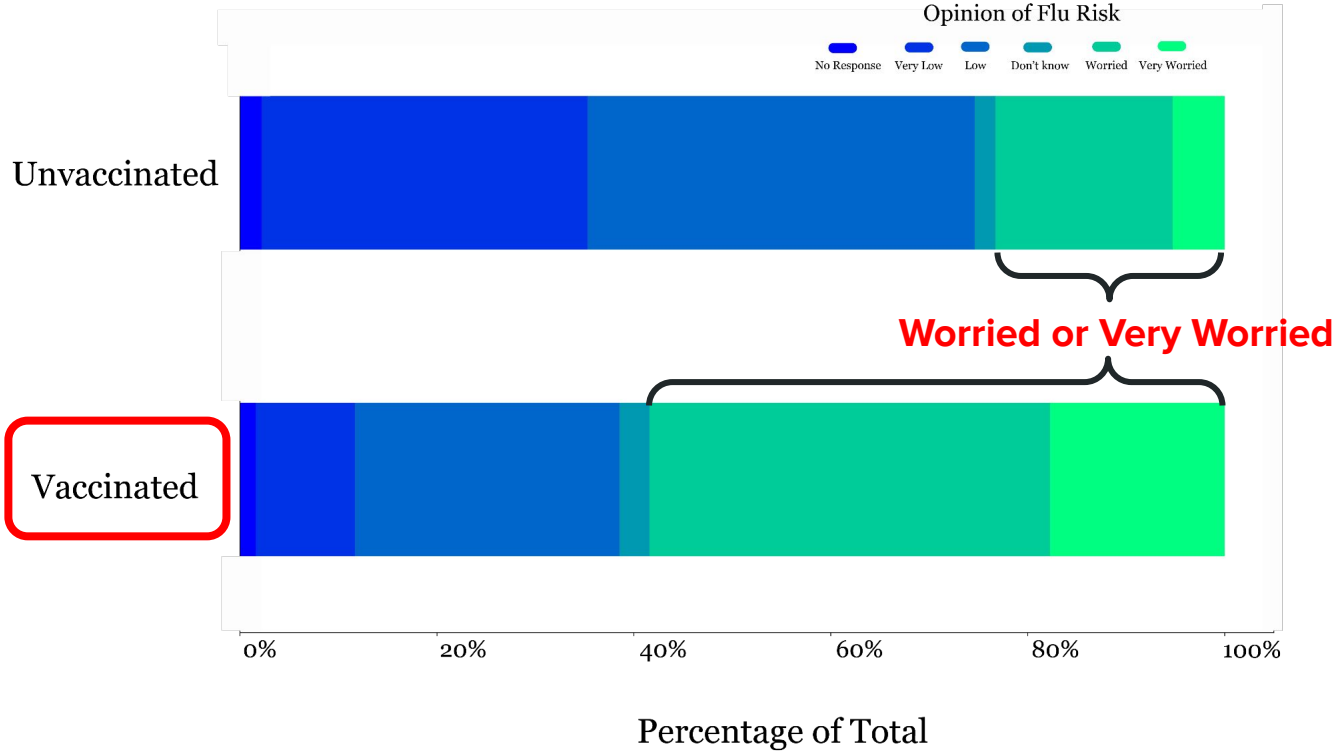
People that have a recommendation from a doctor to get the vaccine are more likely to be vaccinated against the seasonal flu.



Source: CDC | Kevin Spring

Opinion of Flu Risk and Vaccination Status

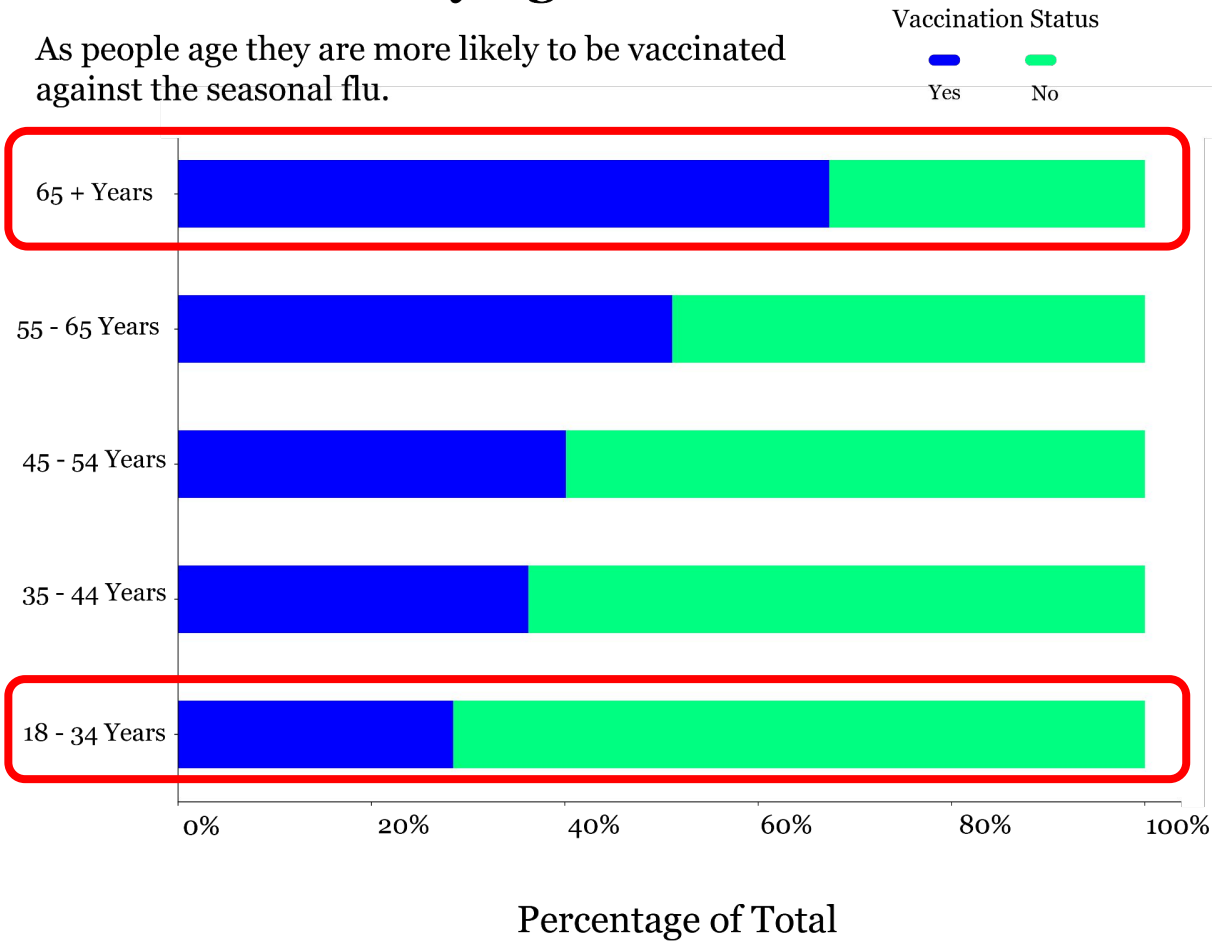
People that are vaccinated are more worried about the negative effects of the flu than unvaccinated people



Source: CDC | Kevin Spring

Vaccination Status by Age

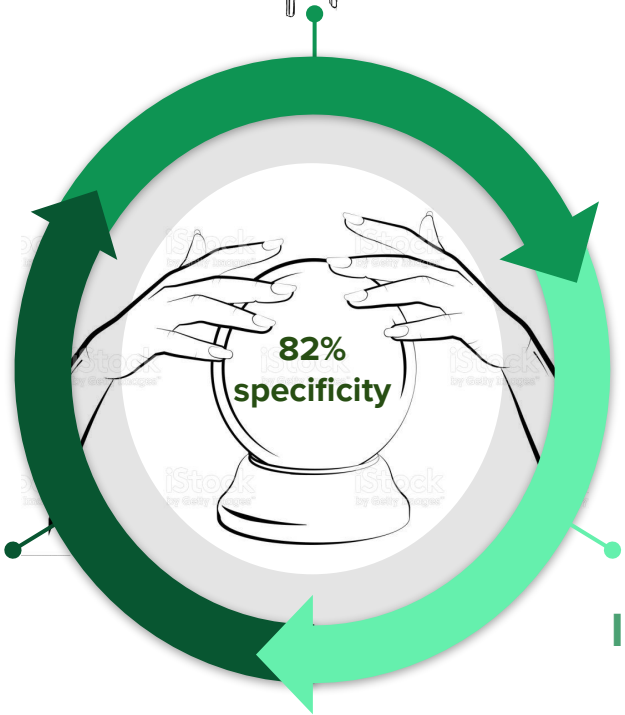
As people age they are more likely to be vaccinated against the seasonal flu.



Source: CDC | Kevin Spring

Prediction Tool

Vaccination survey



Provide relevant information

Input into model

Recommendations

Model Prediction

Vaccinated

Option to get the vaccine now

Unvaccinated

< 55 years old

Give information on effectiveness of vaccination

>= 55 years old

Give information based on risk of infection

Follow up on vaccination status

Next Steps

- Create persuasive information for healthcare workers to give their patients on the risk of the seasonal flu and COVID-19, and the effectiveness of Moderna's new Flu-COVID vaccination.
- Create a dashboard for healthcare workers to predict if a patient will get vaccinated or not along with the model's recommendations.

Thank You!

Email: kevinjspring@gmail.com
GitHub: @kjspring
LinkedIn: linkedin.com/in/kevin-spring-9947b0167/
Website: kjspring.github.io

Appendix

Important variables for prediction

Feature	Value	Importance
Opinion: Effectiveness of Seasonal Flu Vaccine	Very Effective (5)	24%
Opinion: Risk of Seasonal Flu Infection	Somewhat High (4)	12%
Doctor Recommend Seasonal Vaccine	Yes (1)	11%
Opinion: Risk of Seasonal Flu Infection	Very Low (1)	7%
Age Group	18-34 Years	6%
Age Group	65+ Years	6%

Examples of prediction outcomes

ID	9320 (TN)	14240 (TP)	9463 (FN)	12417 (FP)
Age	35-44 Years	65+ Years	55-64 Years	65+ Years
Gender	Female	Female	Male	Male
Children	2	0	0	0
Employed	No Response	Not Employed	Employed	Not Employed
Income	No Response	Below Poverty	> $75,000	<= $75,000
Flu Risk	Low (2)	Somewhat High (4)	High (2)	Low (2)
Effectiveness	Somewhat (4)	Very Effective (5)	Low (2)	Very Effective (5)
Dr. Recommendation	Not Received (0)	Received (1)	Not Received (0)	Not Received (0)
Predicted	Not Vaccinated (0)	Vaccinated (1)	Not Vaccinated (0)	Vaccinated (1)
Actual	Not Vaccinated (0)	Vaccinated (1)	Vaccinated (1)	Not Vaccinated (0)
Rate	**82% (TNR)**	**75% (TPR)**	**25% (FNR)**	**18% (FPR)**