# PREDICTING H1N1 VACCINE UPTAKE

Presentation by: Group 10 DSF-FT13-Hybrid

# The Bigger Picture

- Why does vaccine uptake matter so much?
- What have we learned from the “swine flu” pandemic in 2009 that led to over 150,000 deaths?
- Do opinions, behaviors, demographics and health concerns, affect vaccine uptake?
- How can healthcare professionals design more effective campaigns towards vaccine acceptance?

# What We Aimed To Discover

- **Predict Vaccine Uptake** → Build a machine learning model that can classify who is likely to receive the H1N1 vaccine.
- **Identify At-Risk Groups** → Detect populations with a high probability of remaining unvaccinated.
- **Uncover Key Drivers** → Highlight the main factors influencing vaccine acceptance and hesitancy.

# Let's Meet The Data

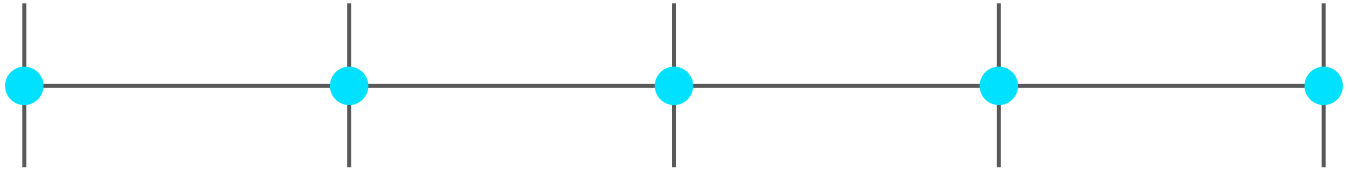
## Data Overview

- **Source:** 2009 H1N1 Flu Survey (CDC) – 26,707 U.S. respondents
- **Content:** Survey on attitudes, beliefs, and behaviors toward H1N1 & seasonal flu vaccines
- **Target:** Predict whether a person received the H1N1 vaccine

## Key Predictors

- **Opinions & Knowledge** → Concern, knowledge
- **Behaviors** → Mask use, handwashing
- **Demographics** → Age, income, race
- **External Influence** → Doctor recommendations, healthcare employment

# How We Cleaned The Mess



1

### Missing Data

Dropped columns with too many gaps, and filled the rest with common or average values.

2

### Feature Creation

Combined related columns into simpler scores (e.g., opinion score, prevention index).

3

### Column Cleanup

Removed IDs, duplicates, and less useful or redundant features.

4

### Data Split

Divided into training (80%) and testing (20%) while keeping class balance.

5

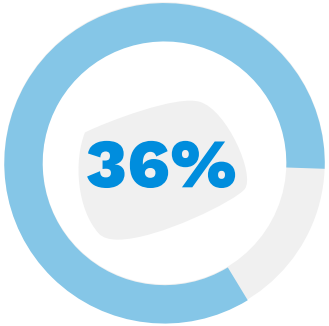
### Data Encoding

Converted categories into numeric form so models can understand them

# Dive Into The Dashboard

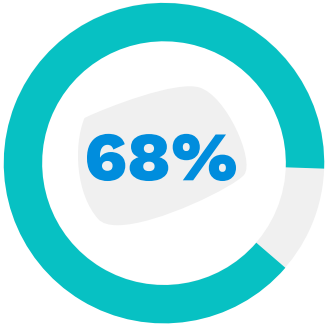
Link to Tableau

# Trials & Triumphs



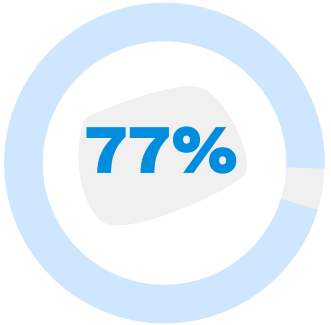

## Random Forest

Seemed powerful but underperformed, catching only 1 of 3 vaccinated people due to overfitting.




## Logistic Regression

This model was straightforward and easy to understand. It correctly identified 2 out of 3 people who were vaccinated, giving us a solid baseline




## Logistic Regression 2.0

After tweaking the model to be more sensitive, it now correctly identifies 3 out of 4 vaccinated people, showing a clear improvement and hitting a 77% success rate.

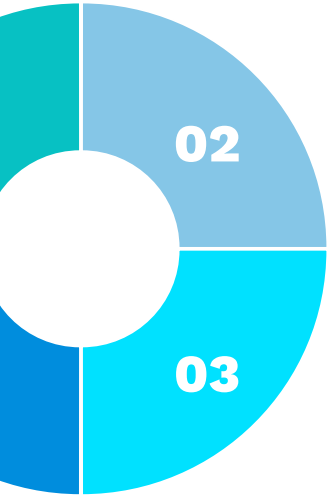
# What We Learned

## What Drives Vaccinations?

Doctor's advice matters, people believe vaccines work, healthcare workers are more likely to vaccinate, and feeling at risk motivates action.

## Public Health Impact

Better models lead to wider coverage and help target outreach to build trust, fight fear, and close access gaps.




## Why Do Some Say No?

Fear of side effects, lack of health insurance, and lower income or education prevent some people from vaccinating.

## Big Takeaway

Models reveal human behavior, not just numbers.

# Implications & Strategy

### 1. Focused Outreach

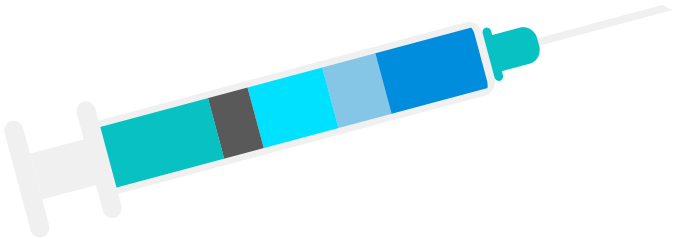
Target the top 77% most likely to vaccinate with personalized messaging for better impact.

### 2. Tailored Campaigns

Design campaigns by age, health condition, or education instead of one-size-fits-all approaches.

### 3. Efficient Resource Use

Deploy resources like mobile vaccination units to areas predicted to have lower uptake.



### 5. Predictive Intervention

Prioritize outreach for individuals unlikely to vaccinate and address misinformation strategically.

### 6. Key Limitation

The model may not generalize to other contexts, relies on specific features, and should support but not replace human judgment.

# Insights Into Action

## Explore & Enhance Models

Use advanced models like XGBoost and create new features for better predictions.

## Target Key Individuals

Focus on people with high opinion scores and strong doctor recommendations.

## Pilot Before Scaling

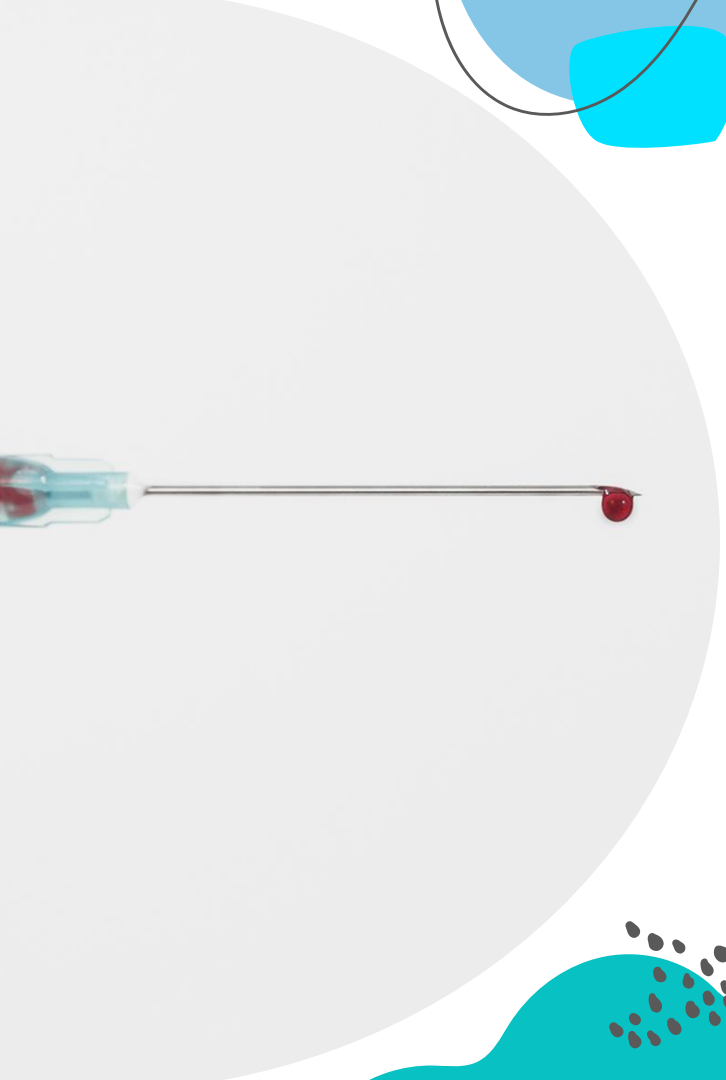
Test the model in a small region to validate its effectiveness.

## Improve Data Collection

Collect real-time vaccine attitude data to enhance model accuracy.

# The Conclusion

- Machine learning can predict vaccine uptake using health and behavioral data.
- Key drivers include doctor recommendations, risk perception, and knowledge.
- Insights guide targeted campaigns and better resource use. Models must be applied carefully and support, not replace, human judgment.



**“An ounce of prevention is worth a pound of cure”**

*-Benjamin Franklin*

# Q&A Session

# Thank You!

GitHub: