Diabetes Predictor

More than just being “healthier”

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The Problem

- **diabetes** ⇒ the pancreas does not produce enough insulin or the body cannot effectively use the insulin it produces (WHO)

- Individuals with diabetes at higher risk of other health problems
  - Heart attack, stroke, kidney failure (WHO)

- *What factors are the best indicators for when someone will be diagnosed with diabetes? Can knowing this be useful in preventing diabetes?*

Lifestyle Choices

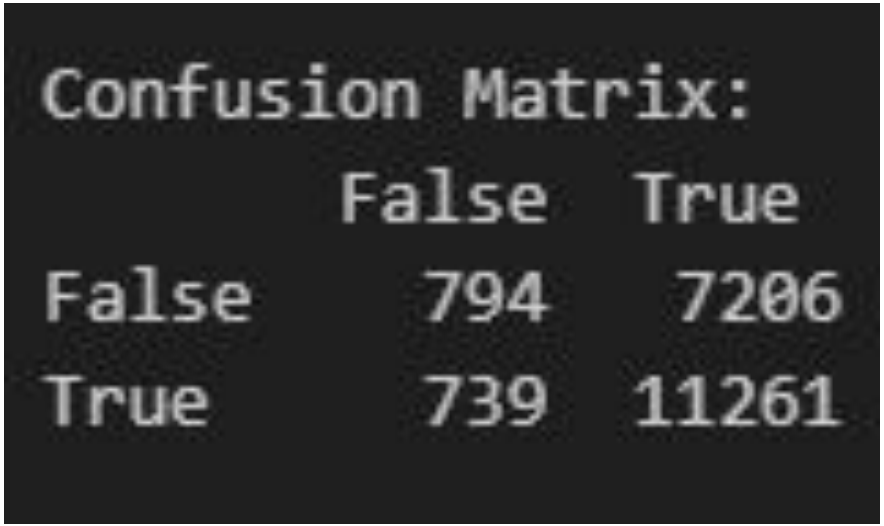
- Diabetes is heavily influenced by lifestyle choices (ADA)
  - Diet, regular exercise, sleep, BMI, etc.

- The logistic regression model trained on **the physical activity minutes per week, sleep hours per day,** and **BMI** → highest model recall (0.9384)
- Precision was pretty low compared to other models (0.6098)

Lifestyle Choices

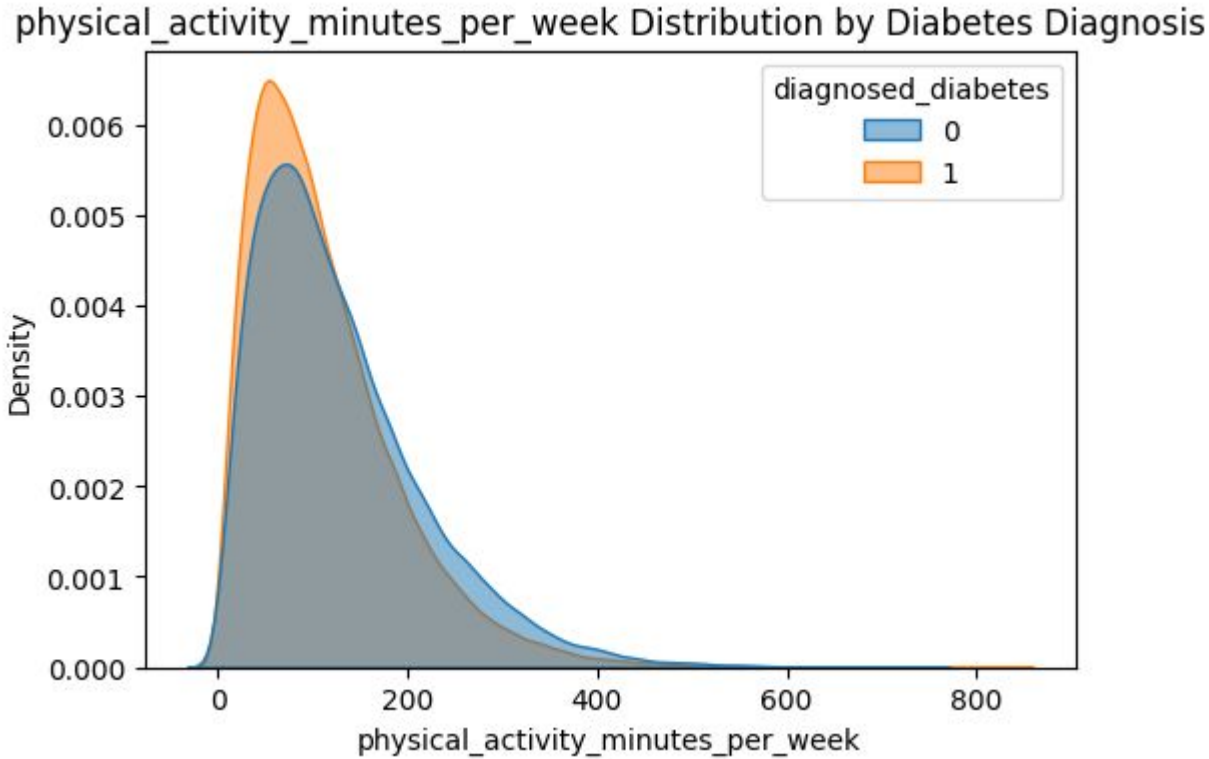
Resulting confusion matrix

- Basically predicting most people to have diabetes, which isn't valuable



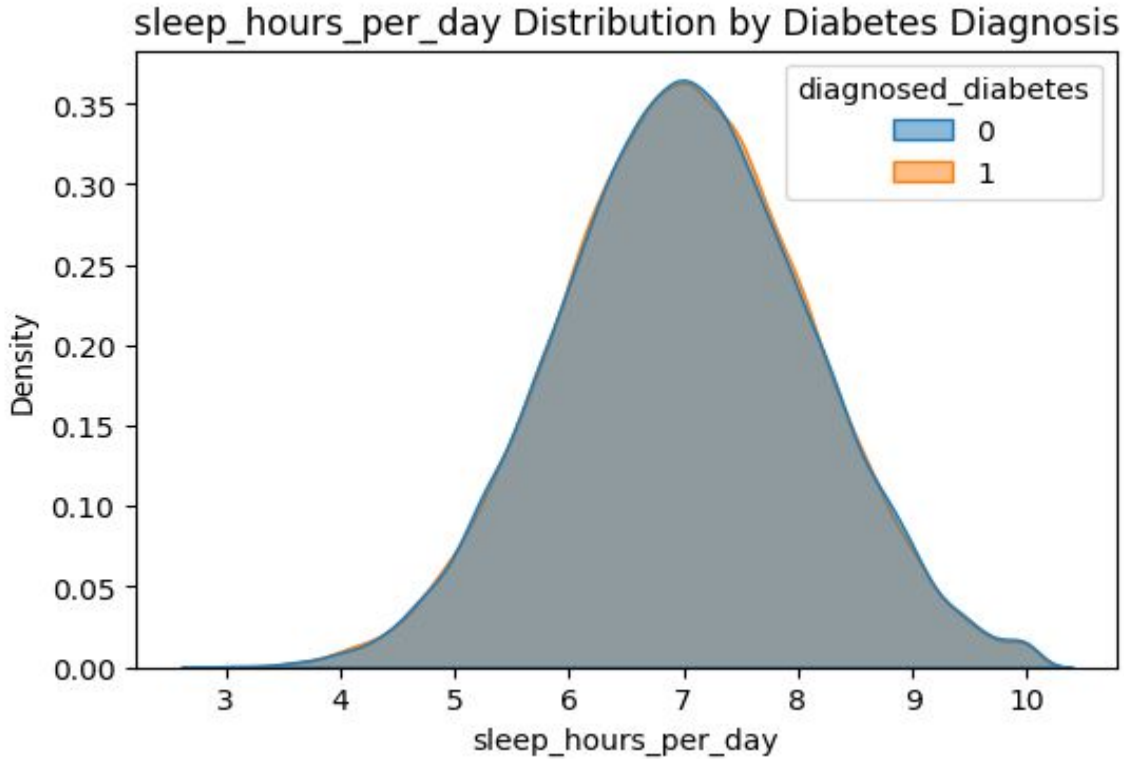
Physical Activity Minutes per Week

Very similar values regardless of whether individuals have been diagnosed with diabetes or not.



Sleep Hours per Day

Very similar values regardless of whether individuals have been diagnosed with diabetes or not.



Add Glucose Information

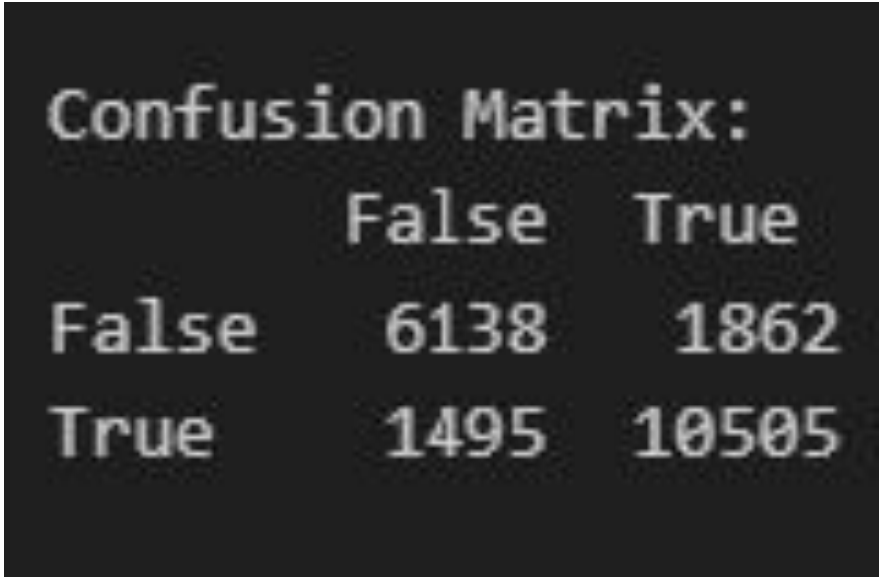
- Glucose (blood sugar) is the energy the body creates from food. (ADA)
- Insulin helps that glucose get to the cells of your body.

- The logistic regression model trained on **the physical activity minutes per week, BMI, glucose fasting levels,** and **glucose postprandial levels** → highest model recall (0.8754) with an acceptable precision (0.8494)

Add Glucose Information

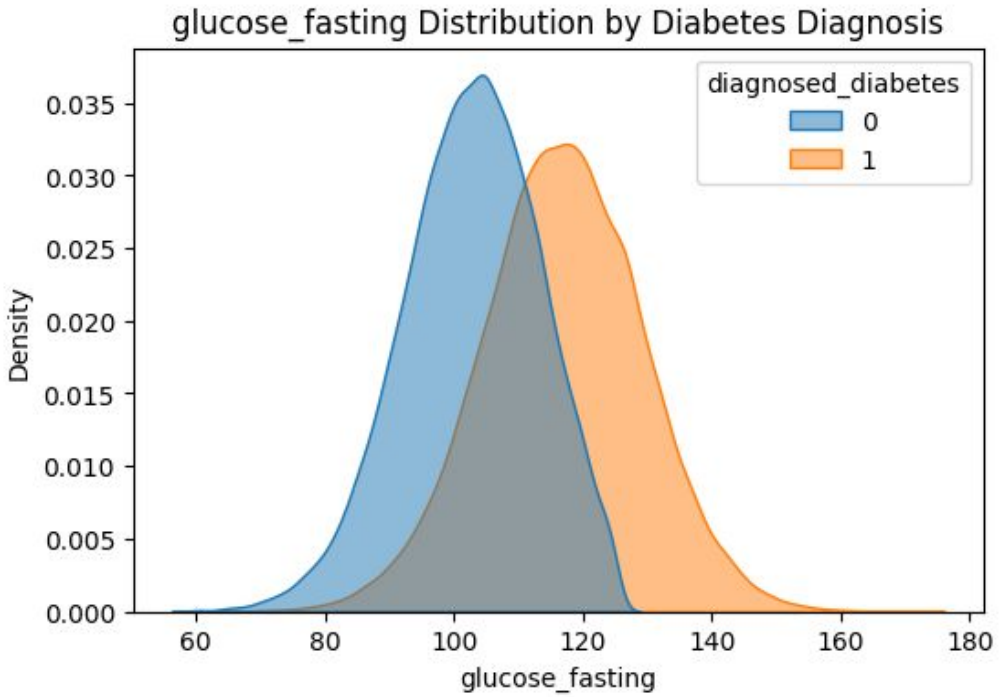
Resulting confusion matrix

- Much more acceptable values



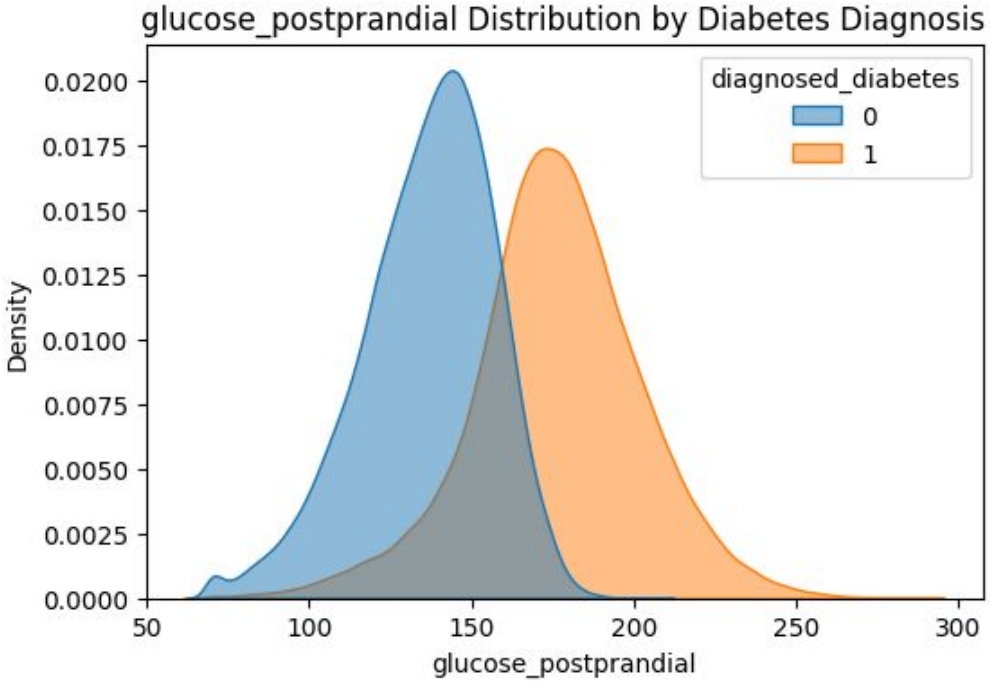
Glucose Fasting (mg/dL)

Well-defined bimodal distribution between the two groups.



Glucose Postprandial (mg/dL)

Well-defined bimodal distribution between the two groups.



Glucose Fasting

The amount of blood sugar in an individual’s system after going 8-12 hours without eating (ADA)

- This metric is often one of the primary metrics used in making diabetes diagnoses, along with other tests and pieces of information

Glucose Postprandial

How much blood sugar is in an individual’s system after eating or drinking something (ADA)

- Some diabetes diagnostic tests involve this metric by recording the glucose level before and after drinking a special sugary drink.

Takeaways

- Many individuals who had diabetes had similar sleep, diet, and activity metrics to those without diabetes.
    - Those metrics are important, but don’t always directly correlate with diabetes

- The main metric relate to glucose levels
    - Individual glucose levels can be improved with exercise and diet, but there are other factors at play

Why just following “healthy” diets doesn’t always work

- Individuals may have different glucose level reactions to the same foods, even if those foods are deemed “healthy” (CBS News article)
  - Ex: eating a tomato, a “healthy” food, may cause one person’s blood sugar to spike while it has little effect on another individual’s blood sugar

- Aside from being generally healthier in diet and routine, there are many different things that may spike blood sugar
  - Sunburns can increase blood sugar through stress on the body (CDC)
  - Dawn phenomenon: blood sugar is naturally higher in the morning for some individuals (CDC)

Sources

- Dataset name: **Diabetes Health Indicators Dataset** The data comes from Mohan Krishna Thalla on Kaggle @ https://www.kaggle.com/datasets/mohankrishnathalla/diabetes-health-indicators-dataset.

- “10 Surprising Things That Can Spike Your Blood Sugar.” Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, www.cdc.gov/diabetes/living-with/10-things-that-spike-blood-sugar.html. Accessed 3 Dec. 2025.
- “Blood Glucose and Insulin.” *Blood Glucose and Insulin | American Diabetes Association*, diabetes.org/about-diabetes/high-blood-sugar. Accessed 3 Dec. 2025.
- “Diabetes Diagnosis.” *Diabetes Diagnosis & Tests | ADA*, diabetes.org/about-diabetes/diagnosis. Accessed 3 Dec. 2025.
- “Diabetes.” World Health Organization, World Health Organization, www.who.int/health-topics/diabetes#tab=tab_1. Accessed 3 Dec. 2025.
- Vetter, Christina. “Postprandial Blood Sugar: Levels, Tests, and What They Mean.” *Postprandial Blood Sugar: Levels, Tests, and What They Mean*, ZOE, 17 Nov. 2025, zoe.com/learn/postprandial-blood-sugar?srsltid=AfmBOoqiuItcQX8O72aMBNC_Un_vyQrUOpLviHLKuB8HZfUgm2fGkwDJ.
- “‘Huge’ Differences Even Though People Ate the Same Foods.” *CBS News*, CBS Interactive, 19 Nov. 2015, www.cbsnews.com/news/huge-differences-even-when-people-ate-the-same-foods/.