# What is the meaning of logistic regression coefficients and can you provide an example of their interpretation?

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Logistic regression coefficients are numerical values that represent the relationship between a predictor variable and the outcome variable in a logistic regression model. They indicate the impact of a unit change in the predictor variable on the probability of the outcome variable occurring.

For example, in a logistic regression model predicting the likelihood of a person developing a certain disease based on their age, the coefficient for age may be 0.3. This means that for every one year increase in age, the probability of developing the disease increases by 0.3. Similarly, a coefficient of -0.2 for a categorical variable such as gender would indicate that being male decreases the probability of developing the disease by 0.2 compared to being female.

Interpreting logistic regression coefficients allows us to understand the direction and strength of the relationship between variables and the outcome, and can help identify important predictors in a model. These coefficients play a crucial role in determining the overall predictive power and accuracy of a logistic regression model.



## Interpret Logistic Regression Coefficients (With Example)

**Logistic regression is a method we can use to fit a regression model when the is binary.**

**When we fit a logistic regression model, the coefficients in the model output represent the average change in the log odds of the response variable associated with a one unit increase in the predictor variable.**

**$\beta$ = Average Change in Log Odds of Response Variable**

**Often we're more interested in understanding the average change in the odds of the response variable**

associated with a one unit increase in the predictor variable, which we can find by using the formula eβ.

eβ = Average Change in Odds of Response Variable

The following example shows how to interpret logistic regression coefficients in practice.

### Example: How to Interpret Logistic Regression Coefficients

Suppose we would like to fit a logistic regression model using gender and number of practice exams taken to predict whether or not a student will pass a final exam in some class.

Suppose we fit the model using statistical software (such as , , , or ) and receive the following output:

| | Coefficient Estimate | Standard Error | Z-Value | P-value |
|---|---|---|---|---|
| **Intercept** | -1.34 | 0.23 | 5.83 | <0.001 |
| **Gender (Male)** | -0.56 | 0.25 | 2.24 | 0.03 |
| **Practice Exams** | 1.13 | 0.43 | 2.63 | 0.01 |

### How to Interpret Gender (Binary Predictor Variable)

We can see that the coefficient estimate for gender is negative, which indicates that being male decreases the chances of passing the exam.

**We can also see that the p-value for gender is less than .05, which means it has a statistically significant effect on whether or not an individual passes the exam.**

**To understand exactly how being male affects whether or not an individual passes the exam, we can use the formula eβ.**

**e-0.56 = 0.57**

**We interpret this to mean that males have just 0.57 times the odds of females of passing the exam, *assuming the number of practice exams is held constant*.**

**We could also say that males have (1 - 0.57) 43% lower odds of passing the exam than females, again *assuming the number of practice exams is held constant*.**

### How to Interpret Practice Exams (Continuous Predictor Variable)

**We can see that the coefficient estimate for practice exams is positive, which indicates that each additional practice exam taken increases the chances of passing the final exam.**

**We can also see that the p-value for number of practice exams taken is less than .05, which means it has a statistically significant effect on whether or not an individual passes the final exam.**

**To quantify how each additional practice exam affects whether or not an individual passes the final exam, we can use the formula eβ.**

**e1.13 = 3.09**

**We interpret this to mean that each additional practice exam taken multiplies the odds of passing the final exam by 3.09, *assuming that gender is held constant*.**

**We could also say that each additional practice exam taken is associated with a (3.09 - 1) 209% increase in the odds of passing the final exam, again *assuming that gender is held constant.***

**Note: Refer to to learn how to interpret the intercept term in a logistic regression model.**

**The following tutorials provide additional information about logistic regression:**