

In the first part of the first question, you mention something about β being the probability of some binary representation. I am not sure exactly of the meaning, but I am guessing it is related to how it is a linear function that is associated with the Bernoulli variable. I think the textbook skips some steps in deriving the odds ratio and other formulas for logistic regression, so I am not too sure exactly how to interpret it. This is different though from what I wrote, but I like that you are discussing directly β . In my case, I focused more on $\hat{\beta}$ and so I failed to really go into detail about β itself. I notice also that you mention how the confidence interval comes from the Wald confidence interval.

In the second question, I think our results are the same. That is, we say that the odds ratio is dependent on $\beta_2 + \beta_{12}x_1$. You mention also that the interaction is related to multiple linear regression (MLR), which I think is important when thinking about how to analyze the problem. The reason to me is that in the textbook with MLR, they seem to want to analyze variables one at a time while keeping others constant. Using that same theme, we can do the same to get the result that we both ended up on. I tried to show more of the math steps that I think are taken in comparison to what the book is showing, so I tried to calculate directly $\hat{\eta}(x_2 + 1) - \hat{\eta}(x_2)$ to get the final result.