1 Logistic regression

Let the odds be denoted $odds(x) = \frac{P(lung\ cancer\ =\ yes|x)}{P(lung\ cancer\ =\ no|x)}$.

We want to find the increase in lung cancer for one unit increase in cigarettes, i.e. we want to find the following odds ratio:

$$\frac{odds(x + 1\ cigarettes)}{odds(x\ cigarettes)}$$

Start by looking at the log of the odds ratio and remember that $\beta = 0.02$

$$\begin{aligned}\log \frac{odds(x+1)}{odds(x)} &= \log odds(x+1) - \log odds(x) \\ &= (x+1)\beta + \beta_0 - (x\beta + \beta_0) \\ &= \beta \\ &= 0.02\end{aligned}$$

Transform back to find the odds ratio

$$\frac{odds(x+1)}{odds(x)} = \exp(0.02) \simeq 1.02$$