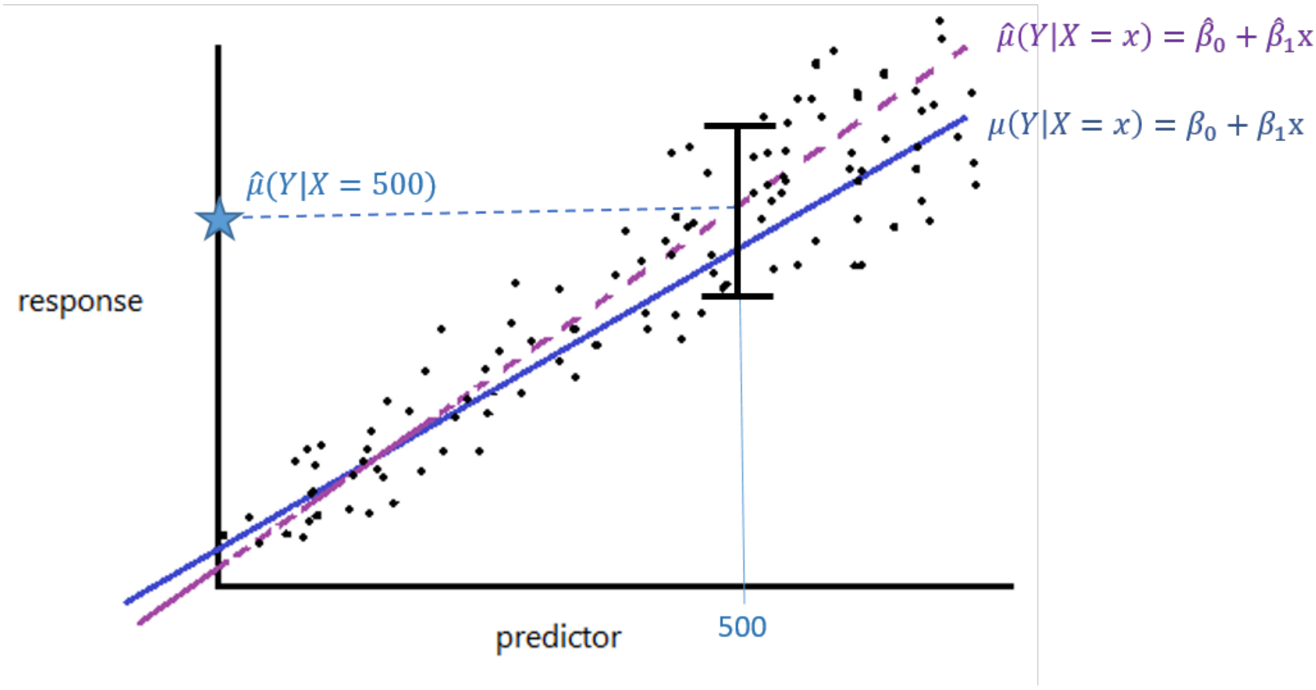

- $\hat{\mu}(Y|X=x) = \hat{\beta}_0 + \hat{\beta}_1 x$: estimated mean airtime as a function of distance
- $\mu(Y|X=x) = \beta_0 + \beta_1 x$: true mean airtime as a function of distance (unknown) in population of all flights
- $\hat{\beta}_0$ is our best estimate of the population intercept, β_0
- $\hat{\beta}_1$ is our best estimate of the population slope, β_1
- $\hat{\mu}(Y|X=x)$ is our best estimate of the population mean as a function of distance, $\mu(Y|X=x)$.
- To get the estimate of mean airtime for a particular distance, plug that into $\hat{\mu}(Y|X=x)$; e.g. $X = 500$ miles.
- Is just a point estimate enough? No. We can get a confidence interval for a particular distance:

$$(\hat{\mu}(Y|X=x) - t^* SE(\hat{\mu}), \hat{\mu}(Y|X=x) + t^* SE(\hat{\mu}))$$

For 95% of samples like this, the corresponding interval will contain the population mean at $x = 500$.

- $SE(\hat{\mu}) = \hat{\sigma}\sqrt{\frac{1}{n} + \frac{(x_0+\bar{x})^2}{(n-1)s_x^2}}$, where $\hat{\sigma} = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{y})^2}{n-2}}$ and $s_x^2 = \frac{1}{n-1}\sum_{i=1}^n (x_i - \bar{x})^2$.
- Note: $SE(\hat{\mu})$ smallest if x_0 (the value we are plugging in for x) is near $\bar{x}$
- Can use Scheffe or Bonferroni if want estimates at multiple x values