power



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σοα!	goal:		Decision	
keep α and β			fail to reject Ho	reject Ho
OW	Truth	Ho true	I — 🗙	Type I error, α
		Ha true	Type 2 error, β	$I - \beta$

- Type I error is rejecting H_0 when you shouldn't have, and the probability of doing so is α (significance level).
- Type 2 error is failing to reject H_0 when you should have, and the probability of doing so is β .
- Power of a test is the probability of correctly rejecting H_0 , and the probability of doing so is $I \beta$

Suppose a pharmaceutical company has developed a new drug for lowering blood pressure, and they are preparing a clinical trial to test the drug's effectiveness. They recruit people who are taking a particular standard blood pressure medication, and half of the subjects are given the new drug (treatment) and the other half continue to take their current medication through generic-looking pills to ensure blinding (control). What are the hypotheses for a two-sided hypothesis test in this context?

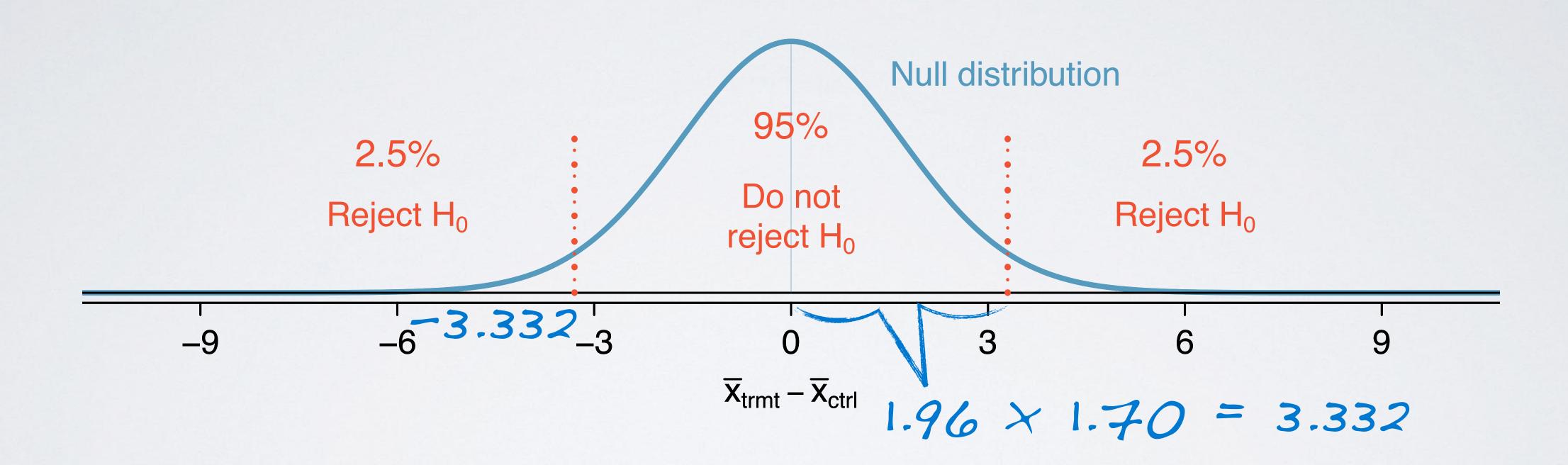
$$\mathcal{H}_{o}$$
: $\mu_{trmt} - \mu_{ctr/} = 0$

$$\mathcal{H}_{A}$$
: $\mu_{trmt} - \mu_{ctr/} \neq 0$

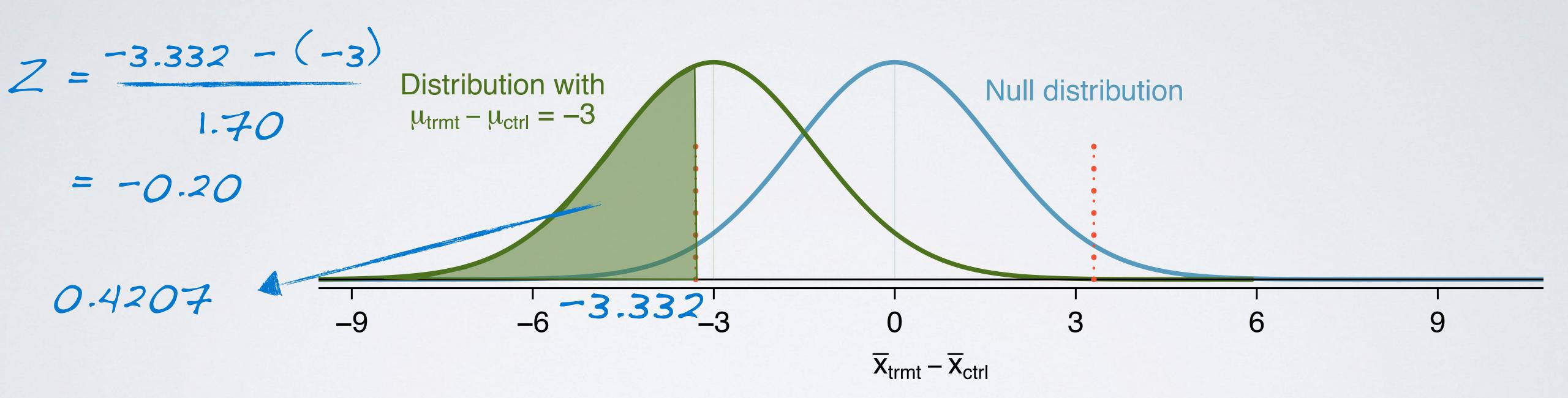
Suppose researchers would like to run the clinical trial on patients with systolic blood pressures between 140 and 180 mmHg. Suppose previously published studies suggest that the standard deviation of the patients' blood pressures will be about 12 mmHg and the distribution of patient blood pressures will be approximately symmetric. If we had 100 patients per group, what would be the approximate standard error for difference in sample means of the treatment and control groups?

$$SE = \frac{12^2}{100} + \frac{12^2}{100} = 1.70$$

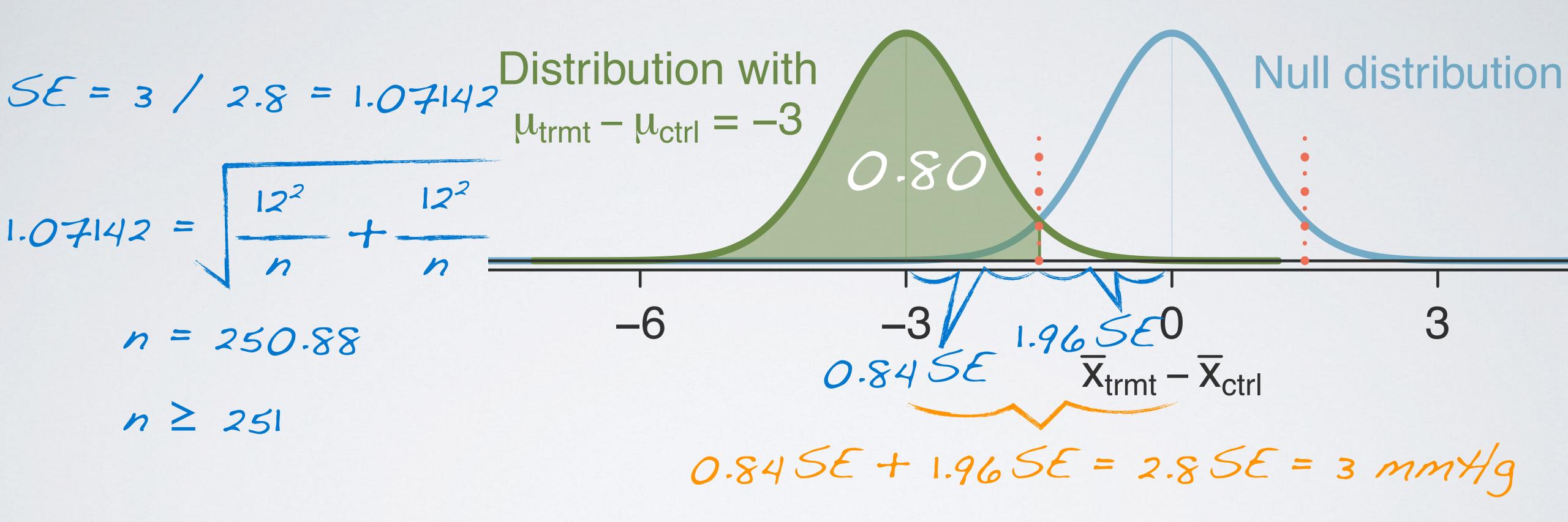
For what values of the difference between the observed averages of blood pressure in treatment and control groups (effect size) would we reject the null hypothesis at the 5% significance level?



Suppose that the company researchers care about finding any effect on blood pressure that is 3 mmHg or larger vs the standard medication. What is the power of the test that can detect this effect?



What sample size will lead to a power of 80% for this test?



summary

- calculate required sample size
 for a desired level of power
- calculate power for a range
 of sample sizes, and choose
 target power

