

We're trying to test whether a new, low-fat diet actually helps obese people lose weight. 100 randomly assigned obese people are assigned to group 1 and put on the low fat diet. Another 100 randomly assigned obese people are assigned to group 2 and put on a diet of approximately the same amount of food, but not as low in fat. After 4 months, the mean weight loss was 9.31 lbs. for group 1 ( $s=4.67$ ) and 7.40 lbs. ( $s=4.04$ ) for group 2.

低脂减肥组：

$$\bar{X}_1 = 9.31 \quad S_1 = 4.67$$

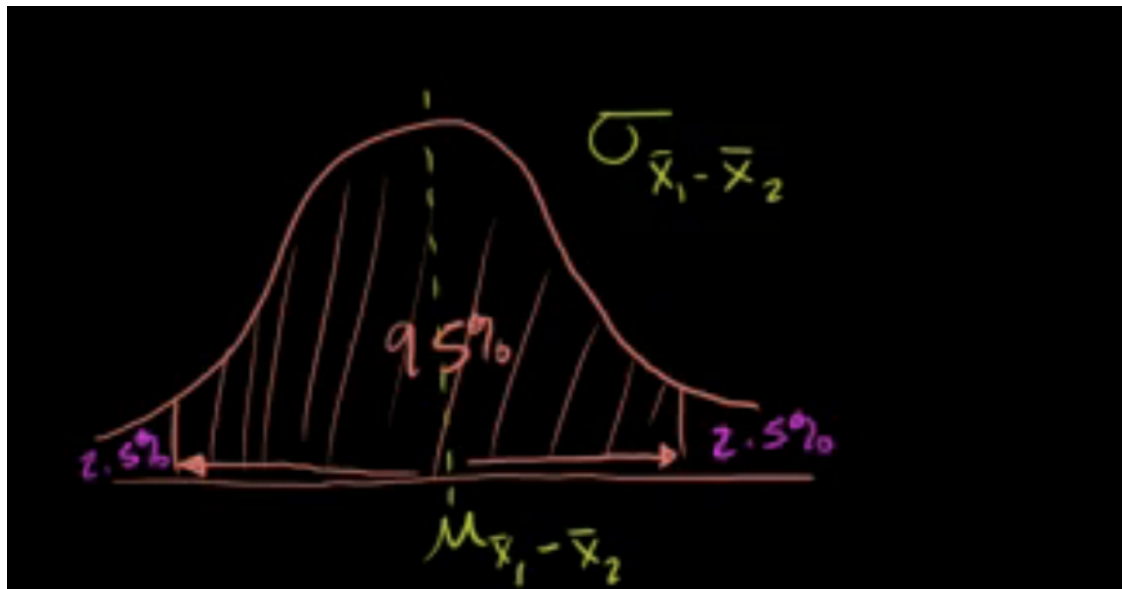
普通减肥组：

$$\bar{X}_2 = 7.40 \quad S_1 = 4.04$$

均值之差： $\bar{X}_1 - \bar{X}_2 = 9.31 - 7.40 = 1.91$ 。从这个结果看，每4个月低脂减肥组能比普通减肥组多减1.91磅。

接下来，我们要从统计学上得到这个数周围95%置信区间。如何构建一个这样的区间，让我们95%确信，均值之差落在这个区间内。

我们先构建均值之差的抽样分布：



我们先找95%的区间。因为z表格中给出的是累积概率，所以要查的是97.5%的概率，查表为：1.96。也就是 $\pm 1.96$ 个单位的标准差。

接下来求抽样分布的标准差：

$$\sigma_{\bar{z}} = \sqrt{\frac{\sigma_{\bar{x}_1}^2}{n} + \frac{\sigma_{\bar{x}_2}^2}{m}} = \sqrt{\frac{S_1^2}{n} + \frac{S_2^2}{m}} = \sqrt{\frac{4.67^2}{100} + \frac{4.04^2}{100}} = 0.617$$

所以，95%的置信区间为：

$$1.91 \pm 1.96 \times 0.617 = 1.91 \pm 1.21$$

均值之差的95%可信范围为：0.7~2.12。也就是说95%的概率低脂减肥者比普通减肥者在4个月减肥后，多减0.7到2.12磅。