Does Smoking Affect Skin?

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A medical researcher conjectures that smoking can result in the wrinkled skin around the eyes. The researcher recruited 150 smokers and 250 nonsmokers to take part in an observational study and found that 95 of the smokers and 105 of the nonsmokers were seen to have prominent wrinkles around the eyes (based on a standardized wrinkle score administered by a person who did not know if the subject smoked or not).

1. Are the conditions for a two-sample z-interval met in this problem?

> **Solution: Random Sampling:** We will assume that sampling within each population is done randomly.
>
> **Independence:** Here the samples of smokers and non-smokers are clearly less than 10% of their respective populations.
>
> **Normality:** We have $n_1\hat{p}_1 = 95$, $n_1(1-\hat{p}_1) = 55$, $n_2\hat{p}_2 = 105$, and $n_2(1-\hat{p}_2) = 145$ which all exceed 10. This means we can assume that the sampling distribution for $hatp_1 - \hat{p}_2$ is approximately normal.

2. Construct a 95% confidence interval for the difference in proportions between the smokers and non-smokers ($p_{\text{smoker}} - p_{\text{non-smoker}}$).

> **Solution:**
>
> $$\hat{p}_{\text{smoker}} - \hat{p}_{\text{non-smoker}} \pm z^\star \sigma_{\hat{p}_{\text{smoker}} - \hat{p}_{\text{non-smoker}}}$$
>
> $$0.21 \pm 2(0.05)$$
>
> Our confidence interval is $[0.11, 0.31]$.

3. Interpret the interval constructed in question 2.

> **Solution:** We are 95% confidence that the true difference in proportions between smokers and non-nonsmokers $p_{\text{smoker}} - p_{\text{non-smoker}}$) for having wrinkled skin around there eyes is captured on the interval from 0.11 to 0.31.

4. Would our confidence interval suggest that there is no difference in the proportions in the two populations?

> **Solution:** Here 0 is not captured within our two sample z-interval. This suggests that there likely is a difference between the two proportions based on our samples.