Example 7
Z-score -- Hypothesis testing
(More on this later)

Suppose a municipality wants to test the hypothesis that particular chemical in the water supply averages 20 ppm.

The hypothesis set would be:

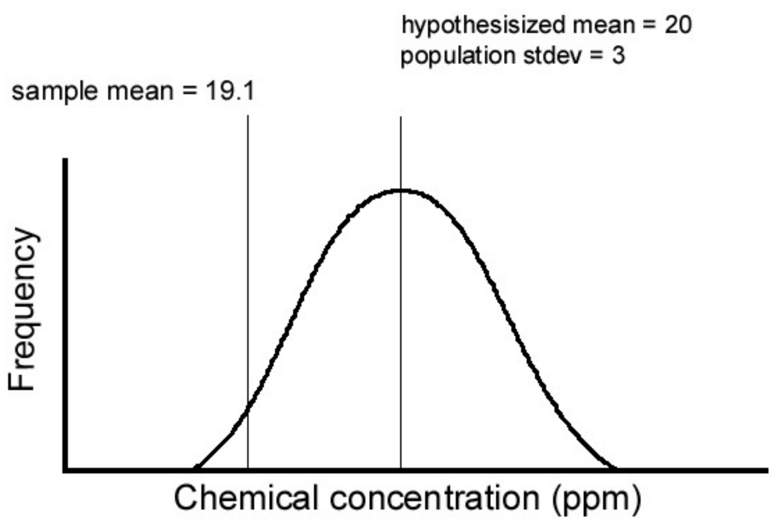
H_o: μ=20 ppm
H_A: $\mu \neq$20 ppm

Since we can not test all of the water in the city, we must test a sample of the water. The mean contamination would be used to decide on the credibility of the hypothesis that μ=20 ppm.

What if we obtained a sample mean of 19.1 ppm, would the hypothesis μ=20 ppm be credible.

If we know that the population is normally distributed, and n is sufficiently large (>30) then:

So if we take 100 water samples and obtain a mean mileage of 19.1 ppm with a standard deviation of 3 ppm.



$$z \cong \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$z \cong \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{19.1 - 20}{\frac{3}{\sqrt{100}}} = \frac{-0.9}{\frac{3}{10}} = \frac{-0.9}{0.3} = -3$$

Z= -3.00, p=0.4987 from Table A

Since we are interested in the proportion more extreme than this:

p = 0.500-0.4987 = 0.0013

So the probability that we get a sample mean of 19.1 ppm when the actual mean is 20 is p=0.0013.

Since $p<0.05$ we would reject the null hypothesis H_o: μ=20 ppm