Degrees of Freedom

- **Degrees of Freedom**

  Estimates of parameters can be based upon different amounts of information. The number of independent pieces of information that go into the estimate of a parameter is called the degrees of freedom (df). In general, the degrees of freedom of an estimate is equal to the number of independent scores that go into the estimate minus the number of parameters estimated as intermediate steps in the estimation of the parameter itself. For example, if the variance, σ^2, is to be estimated from a random sample of N independent scores, then the degrees of freedom is equal to the number of independent scores (N) minus the number of parameters estimated as intermediate steps and is therefore equal to N-1.

Quantifying Uncertainty

- **Standard deviation**: measures the variation of a variable in the sample.
  - Technically,

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

Example

Data: X = {6, 10, 5, 4, 9, 8}; N = 6

X	$X - \bar{X}$	$(X - \bar{X})^2$
6	-1	1
10	3	9
5	-2	4
4	-3	9
9	2	4
8	1	1
Total: 42	0	Total: 28

Mean:

$$\bar{X} = \frac{\sum X}{N} = \frac{42}{6} = 7$$

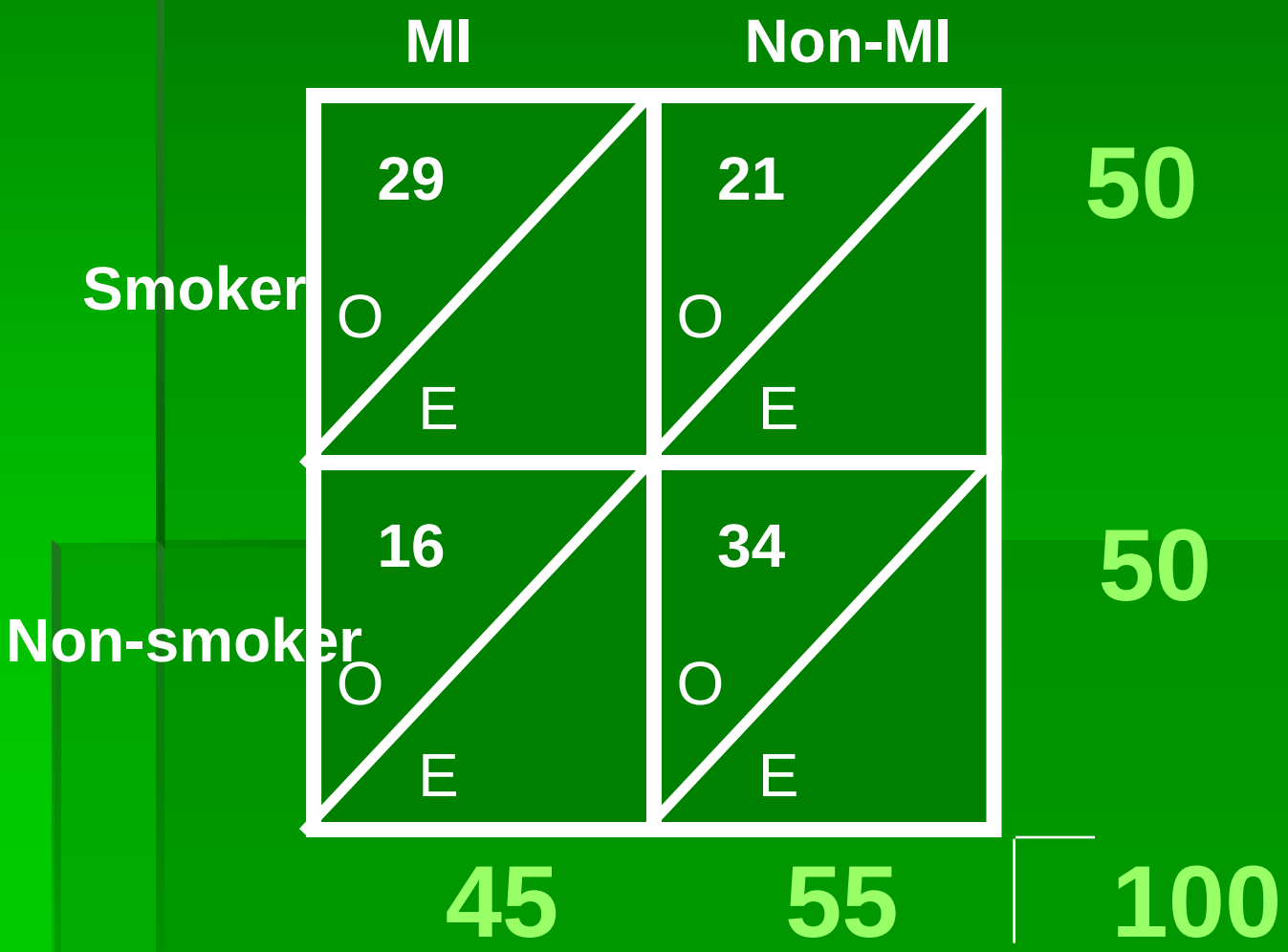
Variance:

$$s^2 = \frac{\sum (\bar{X} - X)^2}{N} = \frac{28}{6} = 4.67$$

Standard Deviation:

$$s = \sqrt{s^2} = \sqrt{4.67} = 2.16$$

Chi-Square



Test for Homogeneity (Similarity)

To test similarity between frequency distribution or group. It is used in assessing the similarity between non-responders and responders in any survey

Age (yrs)	Responders	Non-responders	Total
<20	76 (82)	20 (14)	96
20 – 29	288 (289)	50 (49)	338
30-39	312 (310)	51 (53)	363
40-49	187 (185)	30 (32)	217
>50	77 (73)	9 (13)	86
Total	940	160	1100