

Evolutionary Biology EEB 2245/ 2245 W
Spring 2011
Hardy-Weinberg Equilibrium Practice Problem Answer Key

First Biologist:

Lowland Population

$$\text{Freq A} = .64 + (.32/2) = 0.8$$

$$\text{Freq a} = (.32/2) + .04 = 0.2$$

Expected genotype frequencies

$$\text{Freq AA} = (0.8)^2 = 0.64$$

$$\text{Freq Aa} = 2(0.8)(0.2) = 0.32$$

$$\text{Freq aa} = (0.2)^2 = 0.04$$

The observed and expected genotype frequencies are consistent.

Second Biologist:

Mountain Top population

$$\text{Freq A} = .16 + (.48/2) = 0.4$$

$$\text{Freq a} = (.48/2) + 0.36 = 0.6$$

Expected genotype frequencies

$$\text{Freq AA} = (0.4)^2 = 0.16$$

$$\text{Freq Aa} = 2(0.4)(0.6) = 0.48$$

$$\text{Freq aa} = (0.6)^2 = 0.36$$

The observed and expected genotype frequencies are consistent.

Third Biologist:

Lowland and Mountain Top Populations

Observed genotype frequencies = average of the 2 populations

$$\text{Freq AA} = (0.64 + 0.16)/2 = 0.4$$

$$\text{Freq Aa} = (0.32 + 0.48)/2 = 0.4$$

$$\text{Freq aa} = (0.04 + 0.36)/2 = 0.2$$

Allele frequencies

$$\text{Freq A} = 0.4 + (0.4/2) = 0.6$$

$$\text{Freq a} = (0.4/2) + 0.2 = 0.4$$

Expected genotype frequencies

$$\text{Freq AA} = (0.6)^2 = 0.36$$

$$\text{Freq Aa} = 2(0.6)(0.4) = 0.48$$

$$\text{Freq aa} = (0.4)^2 = 0.16$$

AA and aa are overrepresented in the observed genotype frequencies, while Aa is underrepresented. The third biologist would conclude that this group is not in HW equilibrium. The assumption violated in this example is that mating is random, which is untrue because individuals within the lowland and mountain top populations do not mate at random between populations.