# Useful equations

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# The Hardy-Weinberg Equilibrium (HWE)

1. A SNP has the following observed genotype frequencies:

|  |  |  |
| --- | --- | --- |
| **AA** | **AT** | **TT** |
| 0.400 | 0.463 | 0.137 |

What are the allele frequencies under HWE?

1. In a population of 300 individuals, we observe the following distribution of the SNP above. What is the expected genotype distribution under HWE?

|  |  |  |  |
| --- | --- | --- | --- |
|  | AA | AT | TT |
| Observed distribution | 120 | 139 | 41 |
| Expected distribution |  |  |  |

1. Calculate the test statistic for the above SNP. Is there evidence that the SNP is in HWE?

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1. Is there statistical evidence that the marker is in HWE?

# Linkage Disequilibrium:

Consider two loci on the same chromosome: Locus 1 (alleles A and a) and locus 2 (alleles B and b). In 2000 chromosomes (1000 individuals), we observe the following number of individuals with the respective haplotypes:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | AB | Ab | aB | ab |
| Observed number | 450 | 50 | 100 | 400 |

1. What are the allele frequencies for each of the four alleles?

1. What are the expected haplotype frequencies if the two loci are in linkage equilibrium?
2. Calculate the LD coefficient (D) and the standardized LD coefficient (D’) for the alleles A and B. Are these alleles in LD?