Exercise 1 In Denmark, each year 6 children are born that are homozygotes for deleterious alleles at the phenylkenuria (PKU) locus (Følling's disease [ Named after Asbjørn Følling, a Norwegian that discovered PKU in 1934.]) These children are given a diet with a low concentration of phenyalanine to prevent them from developing a severe mental disease. In total, 60,000 children are born.

1. What is the frequency of the deleterious allele? (Assume that there are Hardy-Weinberg proportions.)
   * sqrt(6/60000) = 0.01
2. How many carriers (healthy heterozygotes) are born each year?
   * P = 1-0.01
   * 2pq = 2\* (1-0.01) \* 0.01 = 0.0198
   * 2pq \* N = 0.0198 \* 60000 = 1188
3. What is the fraction of affected children where both parents don’t have the disease?
   * Two heterozygotes need to produce a diseased homozygous child so:
   * (2pq)^2/4 = p^2\*q^2

Exercise 2 Silene nutans is a hermaphroditic plant that is self-compatible (It can fertilize itself.). In a study of this plant, genetic variation at two life stages was recorded in a population: seedlings and adult plants. In the table below the genotype distributions at an enzyme locus are given

11 12 22 Sum

Seedlings 79 43 21 143

Adults 70 60 13 143

Silene

1) Estimate the allele frequencies in the two groups.

Do the allele frequencies differ between the groups?

Do the genotype distributions differ from Hardy-Weinberg proportions?

Estimate the inbreeding coefficient F for both groups. [F = (HE – HO)/HE, where HE and HO are the expected and observed frequencies of heterozygotes.]

What could have caused the differences in HW proportions between the groups?

What is happening among the seedling stage and the adult life stage?