

Homework 1 (Due on Jan 24)

January 17, 2013

STA 5172

Applied problem

Download the dataset (fev.txt) concerning the relationship between respiratory function (measured by forced expiratory volume, FEV) and smoking. One primary question of interest is whether smokers suffer reduced pulmonary function (or higher FEV). The data used simply consider whether the child reports smoking cigarettes regularly (includes passive smoking from at least one of the parents). If the child smokes, then SMOKE is coded 1 and if the child does not smoke, then SMOKE is coded 0. The variables used in the dataset are

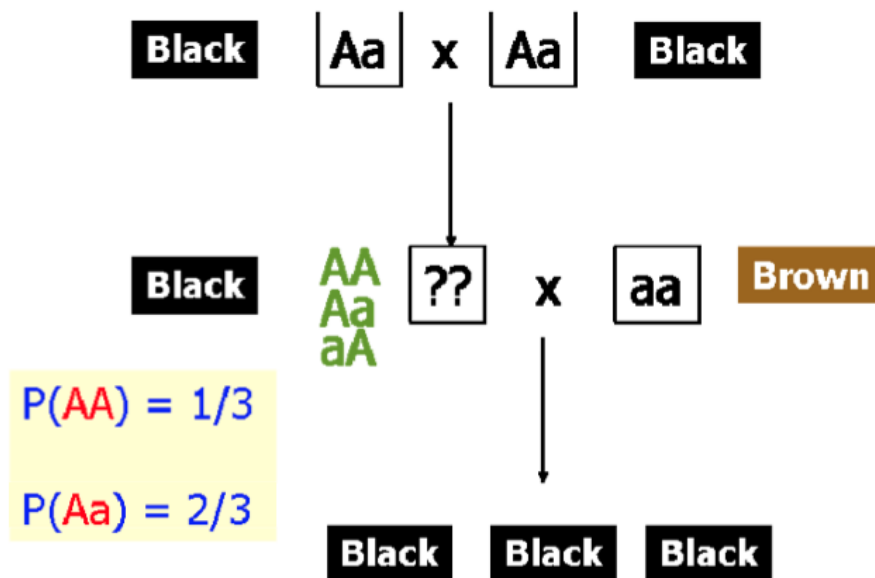
1. age (a) discrete, positive integer (years)
2. forced expiratory volume (fev) continuous measure (liters)
3. height (height) continuous measure (inches)
4. sex (sex) discrete, Female coded 0, Male coded 1
5. smoking habit (smoke) discrete, Nonsmoker is 0, Smoker is 1

Now answer the following questions:

1. Compute summary statistics (mean, median, mode, standard deviation, range, quartiles) of fev for males, females, smokers and non-smokers, smoking males, non-smoking males, smoking females and non-smoking females and tabulate them.
2. It is of clinical interest to know if the smokers have a higher FEV compared to non-smokers. Answer this question descriptively using either numeric or graphic methods.

Theoretical problem (Use Bayes' Theorem)

The colour of the skin of a mouse is determined by a single gene with two alleles (A,a). If a mouse receives the 'a' allele from both parents (then it is homozygous aa), its colour is brown, but if it receives an allele 'A' from one of the parents (in this case it can be either homozygous AA or heterozygous Aa, its colour is black. We are trying to know whether a black mouse, which is a offspring of heterozygous mates ($Aa \times Aa$), is homozygous (AA) or heterozygous (Aa) (Refer to the following figure).



In order to assess this, we mate this mouse with a brown (aa) mouse. If we obtain a brown offspring we will be sure it is heterozygous, but if we obtain black offspring there is still the doubt about whether our mouse is homozygous AA or heterozygous Aa. We perform the experiment and we get three offspring black. What is the probability for the black mouse is heterozygous, given this data?