# Probability

1. Patients diagnosed with a certain medical condition have a risk *p* of dying within one year of diagnosis: *p* is simply the average proportion of diagnosed patients who die within a year. Let *n* be the number of diagnosed patients, and *k* be the average number of these who die within a year.

a) Express *p* in terms of *k* and *n.*

b) Express *k* in terms of *p* and *n*.

c) Suppose that we define *w* =  . (In fact, defined this way w is called the *odds* of dying.) Using your answer in b) to substitute for *k*, express *w* in terms of *n* and *p*.

d) By factorising the denominator (bottom of fraction) in your answer to c), express *w* in terms of *p*.

e) If you’ve got this far, use your answer to d) to express *p*, the risk, in terms of *w*, the odds.

[Answer you should get for e): ]

2. In a maternity unit on average 20% of births are caesarian; suppose that a certain complication tends to occur on average in 10% of caesarian births, but only in 5% of otherwise normal births. Out of 100 births in this maternity unit, how many would you expect:

i) to have this complication following a caesarian?

ii) to have this complication regardless of the type of birth?

3. Suppose that proportion *p* of the adult population have a gene that makes them vulnerable to condition D. People with this gene have a chance *q* of developing the condition, whereas people without the gene have only chance *r* of developing D. Out of N people taken at random from the adult population, how many would you expect to develop the condition (in terms of N, *p*, *q* and *r*; hint: the proportion without the gene = 1 - *p*)?