Health Science Pathway

Data and Statistic Module, worked example 4 – probability

Questions

1. What is the probability of a child (in the USA) being diagnosed with leukaemia in any one year?

   Answer: 4.6 ÷ 100,000 = 0.000046 (4.6×10^{-5})

2. What is the probability of a child being diagnosed with Leukaemia in their 15 years (say) of childhood?

   Answer: 0.000046 × 15 = 0.00069

3. A recent paper in the British Medical Journal reported an Australian epidemiological study of childhood cancers and CT scanning that spanned 20 years from 1985 to 2005 (Mathews et al, 2013; doi: 10.1136/bmj.f2360).

   The cohort included 10 939 680 people. 680 211 (6.2%) of these received a CT scan and of these individuals, 3150 have been diagnosed with a cancer in the follow-up period. Of the 10 259 469 children who did **not** have a CT scan, 57 524 have been diagnosed with a cancer. Based on the incidence of cancer in the unexposed group, it is expected that 2542 cancers will occur in the 680 211 exposed children. However 3150 cancers were observed.

   What is the rate of cancer in his cohort of Australian children?
   Answer: total cancers = 3150 + 57524 = 60674

   Cancer rate = # of cancers ÷ # of people

   = 60674 ÷ 10 939 680 = 0.00555 (= 5.55×10^{-3})

4. What is the excess cancer risk in the cohort exposed to a CT scan?

   Answer:

   Expected # of cancers = 2542
   Observed # of cancers = 3150
   Excess cancer risk = observed ÷ expected
   = 3150 ÷ 2542
   = 1.24

Overall cancer incidence was 24% greater for exposed than for unexposed people (after accounting for age, sex, and year of birth)