

1. The Poisson distribution

- Limit of Binomial as n → ∞ and np stays fixed
 Useful whenever we can estimate expected
- number of rare events*X* has a *Poisson* distribution

 $P(X=x) = r^{x} e^{-r} / x!$



• In particular, the chance of no events (*x*=0) is e^{-r}





• So Probability(no winners) ~ $e^{-1/3} = 0.72$



Homicides: Metropolitan Police, April 2004 – March 2007

- On average: 160 per year, 13 per month, 3 per week, 0.44 per day
- Just knowing this overall rate means we can predict how often 'rare events' will happen









In London Homicides currently follow a stable 'random' pattern with average gap of 54 hours Over 3 years, expect one day with 4 independent homicides in London Just what was observed





