

Example: Cumulative Poisson Distribution

Given

1. The premium on medical malpractice insurance policies are increased whenever six or more (five or less) complaints have been filed with the State Medical Review Board during any policy renewal period.
2. The probability (likelihood or chance) is 1/1000 that medical professionals in general (on the average) cause one significant complaint (failure) per one foot of stitches administered to patients.
3. Your medical office consists of three doctors which can be viewed as a serial system (i.e., the office consists of “doctor A and doctor B and doctor C” and the logic “or” is not applicable). For simplicity, assume the administration of stitches is the primary service of your medical group (i.e., primary function of each serial element).
4. Each doctor in your office administers approximately 1000 feet of stitches during each medical malpractice insurance policy renewal period.

Question

In order not to be overly optimistic, you assume the skill level of the doctors in your office is average. What are the chances the premium for your office’s medical malpractice insurance policy will be increased when the policy renews?

Solution

1. When the complaint (failure) rate can be assumed to be constant, the cumulative Poisson distribution, a time-based probability formula, can be used. Go to the Tools section at <http://kscsma.ksc.nasa.gov/Reliability/Default.html> and download the Excel file for “Poisson” calculations.
2. Based on the first four conditions above, enter the values for the distribution’s input parameters by entering the following inputs:
 - $r = 5$
 - $\lambda = .001$ (or enter “=1/1000” instead of “.001”)
 - $N = 3$
 - $t = 1000$ (use cell E5).
3. Depress the “Enter” key to have Excel run the calculation.

Interpreting the Calculated Value

The result in cell F5 being [0.9160820580](#) means there is approximately a 91.6% chance that your medical office (i.e., system of three doctors in series) will experience five or less complaints during the policy period.

Answer

Since $1 - 0.916 = 0.084$, there is an 8.4% chance your medical office will experience more than five (six or more) Board filings. Thus with the assumed skill (performance) level, there is an 8.4% chance your premium will be increased when your policy renews.