

(4) **Hurricane insurance**

An insurance company needs to assess the risk associated with providing hurricane insurance. During 22 years from 1990 through 2011, Florida was hit by 27 major hurricanes (level 3 and above). The insurance company assumed Poisson distribution for modeling number of hurricanes.

(a) If hurricanes are independent and the mean has not changed, what is the probability of having a year in Florida with each of the following?

- (1) No hits.
- (2) Exactly one hit.
- (3) More than two hits.

(b) Use R to estimate the number of hurricane hits that will occur with the probability 99.5%.

Hint: One of the following R-commands: `dpois()`, `ppois()`, `qpois()`, `rpois()` is applicable.

a) X ... number of Hurricanes hitting Florida in a year

$$X \sim \mathcal{P}\left(\frac{27}{22}\right), \lambda := \frac{27}{22} \quad \forall k \in \mathbb{N}_0: p_X(k) = \mathbb{P}(X=k) = \frac{\lambda^k}{k!} e^{-\lambda}$$

$$(1) \mathbb{P}(X=0) = e^{-\lambda} \approx 0,29$$

$$(2) \mathbb{P}(X=1) = \lambda e^{-\lambda} \approx 0,36$$

$$(3) \mathbb{P}(X \geq 2) = 1 - \sum_{k=0}^2 \mathbb{P}(X=k) = 1 - \sum_{k=0}^2 \frac{\lambda^k}{k!} e^{-\lambda} \approx 0,13$$

$$b) \mathbb{P}(X \leq n) = \frac{995}{1000} = \frac{199}{200} \Leftarrow n \geq 5, \text{ mit } qpois\left(\frac{199}{200}, \lambda\right)$$