№6

$N=200$; $m_1=10$ $A_1$ – не болен

$\alpha=0{,}05$; $m_2=181$ $A_2$ – болен один раз

$n=2$ $m_3=9$ $A_3$ – болен два раза.

$H_0: P(m)=C_n^m p^m q^{n-m}=C_2^m p^m (1-p)^{2-m}$

$H_1: \overline{H_0}$

$P(A_1)=C_2^0\cdot p^0(1-p)^2=(1-p)^2=p_1$

$P(A_2)=C_2^1\cdot p(1-p)=2p(1-p)=p_2$

$P(A_3)=C_2^2\cdot p^2=p^2=p_3$

$L(\vec{\theta})=p_1^{10}\cdot p_2^{181}\cdot p_3^{9}=2^{181}\cdot p^{199}(1-p)^{201}$

$L\to max$:

$\ln L\to max$: $181\ln 2+199\ln p+201\ln(1-p)$

$$\frac{\partial \ln L}{\partial p}=\frac{199}{p}-\frac{201}{1-p}=0\Rightarrow p=\frac{199}{400}$$

$$\frac{\partial^2 \ln L}{\partial p^2}=-\frac{199}{p^2}-\frac{201}{(1-p)^2}<0\Rightarrow max$$

$N\geq 50$; $Np_i\geq 5$

$$\tilde{\Delta}=\sum_{i=1}^{3}\frac{(Np_i-m_i)^2}{Np_i}\approx 131{,}24$$

$$p\text{-value} = P(\Delta \geq \tilde{\Delta} | H_0) = \int_{131,24}^{\infty} p\chi^2(3-1-1)\,dx < 10^{-5} << 0,05$$

гипотеза $H_0$ отвергается