

## qPoisson

### Parametrisation

The Poisson distribution is

$$\text{Prob}(y) = \frac{\lambda^y}{y!} \exp(-\lambda)$$

for responses  $y = 0, 1, 2, \dots$ , where

$\lambda$ : the expected value.

### Link-function

The mean and variance of  $y$  are given as

$$\mu = \lambda \quad \text{and} \quad \sigma^2 = \lambda$$

and the mean is linked to the linear predictor by

$$\lambda(\eta) = E q_\alpha$$

where  $E > 0$  is a known constant (or  $\log(E)$  is an offset), and  $q_\alpha$  is the  $\alpha$  quantile of the continuous Poisson distribution.

### Hyperparameters

None.

### Specification

- family = `qpoisson`
- Required arguments:  $y$ ,  $E$  and  $\alpha$  (given as `control.family = list(quantile =  $\alpha$ )`).

### Hyperparameter specification and default values

**doc** The quantile Poisson likelihood

**hyper**

**survival** FALSE

**discrete** TRUE

**link** default log

**status** disabled

**pdf** `qpoisson`

## Example

In the following example we estimate the parameters in a simulated example with Poisson responses.

```
n = 300
intercept = 2
x = rnorm(n, sd = 0.2)
beta = 1
eta = intercept + beta * x
alpha = 0.9
y = numeric(n)
E = runif(n, min=1, max=10)
for(i in 1:n) {
  lambda = E[i] * INLA::inla.qcontpois(exp(eta[i]), alpha = alpha)
  y[i] = rpois(1, lambda)
}

r = inla(y ~ 1 + x,
        data = data.frame(y, x, E),
        family = "qpoisson",
        control.family = list(control.link=list(quantile = alpha)),
        E =E)
summary(r)
```

## Notes