Package ‘SurvGSD’

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Type Package

Title Group Sequential Design for a Clinical Trial with Censored Survival Data

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Description Sample size calculation utilizing the information fraction and the alpha spending function in a group sequential clinical trial with censored survival data from underlying generalized gamma survival distributions or log-logistic survival distributions.


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To find parameter of a uniform dropout censoring distribution under 
a generalized gamma survival distribution or a log-logistic survival 
distribution.

Description

A function finds parameter h of a uniform dropout censoring 
distribution U(0,h) with a generalized gamma survival distribution 
or a log-logistic survival distribution for a given dropout censoring 
probability.

Usage

Find.h(lfu, R, T, q, mu, sigma, eta, theta)

Arguments

lfu the dropout censoring probability.
R the recruitment duration.
T the study duration.
q, mu, sigma shape, location and scale parameters of an assumed generalized gamma distribution for the control arm. A character string q="LLG" indicates an assumed log-logistic survival distribution \( F_0(y;\xi,\zeta) = 1/(1 + (y/\xi)^{-\zeta}) \) for the control arm, where \( \xi = \mu \) and \( \zeta = \sigma \).
eta, theta parameters of the entry distribution with \( \eta \geq -\theta/R \) and \( \eta > 0 \) (\( \theta = 0 \) for the uniform dropout censoring).

Value

the parameter h of the uniform dropout censoring distribution U(0,h).

Examples

Find.h(lfu=0.15, R=2, T=3, q=1, mu=0.367, sigma=1, eta=1, theta=0)
Find.h(lfu=0.15, R=2, T=3, q="LLG", mu=1, sigma=1.75, eta=1, theta=0)

Information fractions under a generalized gamma survival distribu- 
tion or a log-logistic survival distribution.

Description

A function calculates information fractions with a generalized gamma survival distribution or a log-logistic survival distribution for a given dropout censoring probability.
Usage

General.tau(t, R, T, FUN.C, q, mu, sigma, rho, eta, theta)

Arguments

- **t**: the interim analysis time (vector).
- **R**: the recruitment duration.
- **T**: the study duration.
- **FUN.C**: the cumulative distribution function of dropout censoring. 
  - `FUN.C = function(y) punif(y,0,h)` for a uniform dropout censoring U(0,h);
  - `FUN.C = function(y) rep(0,length(y))` for assuming no dropout censoring.
- **q, mu, sigma**: shape, location and scale parameters of an assumed generalized gamma distribution for the control arm. A character string `q="LLG"` indicates an assumed log-logistic survival distribution 
  \[ F_0(y; \xi, \zeta) = \frac{1}{1 + (y/\xi)^{-\zeta}} \] for the control arm, where \( \xi = \mu \) and \( \zeta = \sigma \).
- **rho**: the power in the weight of the Harrington-Fleming statistic. \( \rho = 0 \) for the logrank test; \( \rho = 1 \) for the Wilcoxon test.
- **eta, theta**: parameters of the entry distribution with \( \eta \geq -\theta/R \) and \( \eta > 0 \) (\( \theta = 0 \) for the uniform dropout censoring).

Value

- **Info.fractions**: information fractions at times of all the interim analyses.
- **Event.prob**: the probability of events accumulated up to T.
- **Total.censor.prob**: the probability of censoring including the dropout and administrative censoring.

Examples

- `General.tau(t=c(1.5,2,2.5), R=2, T=3, FUN.C=function(y) punif(y,0,7.018), q=1, mu=0.367, sigma=1, rho=0, eta=1, theta=0)`
- `General.tau(t=c(1.5,2,2.5), R=2, T=3, FUN.C=function(y) punif(y,0,7.211), q="LLG", mu=1, sigma=1.75, rho=0, eta=1, theta=0)`

**SSize.FixAlter**

Maximum sample size for a group sequential test under a generalized gamma survival distribution or a log-logistic survival distribution.

Description

A function obtains maximum sample sizes and associated expected values for a group sequential design under a generalized gamma survival distribution or a log-logistic survival distribution for a given dropout censoring distribution.
Usage

SSize.FixAlter(t, R, T, FUN.C, para0, para1 = NULL, haz.r, rho = 0,
          eta = 1, theta = 0, px = 0.5, spf = 1, alpha = 0.05, power = 0.8)

Arguments

t the interim analysis time (vector).
R the recruitment duration.
T the study duration.
FUN.C the cumulative distribution function of dropout censoring.
FUN.C = function(y) punif(y,0,h) for a uniform dropout censoring U(0,h);
FUN.C = function(y) rep(0,length(y)) for assuming no dropout censoring.
para0 c(q0,mu0,sigma0), parameters of an assumed generalized gamma distribution
for the control arm. A character string q0="LLG" indicate an assumed log-
logistic survival distribution $F_0(y; \xi, \zeta) = 1/(1 + (y/\xi)^{-\zeta})$ for the control arm,
where $\xi = \mu_0$ and $\zeta = \sigma_0$.
para1 c(q1,mu1,sigma1), parameters of an assumed generalized gamma distribution
for the treatment arm. A character string q1="LLG" indicate an assumed log-
logistic survival distribution $F_1(y; \xi, \zeta) = 1/(1 + (y/\xi)^{-\zeta})$ for the treatment arm,
where $\xi = \mu_1$ and $\zeta = \sigma_1$.
haz.r the hazard ratio of the treatment arm to the control arm (numeric or function).
rho the power in the weight of the Harrington-Fleming statistic. $\rho = 0$ for the logrank test; $\rho = 1$ for the Wilcoxon test.
eta, theta parameters of the entry distribution with $\eta \geq -\theta/R$ and $\eta > 0$ ($\theta = 0$ for the Uniform dropout censoring).
px the proportion of patients assigned to the treatment arm. The default is px = 0.5
indicating 1:1 allocation.
spf 1 = O'Brien-Fleming-type; 2 = Pocock-type alpha-spending function. The de-
default is spf = 1.
alpha the type I error. The default is alpha = 0.05.
power A desired value of the power. The default is power = 0.8.

Value

MaxSize the maximum sample size.
ExpSize the expected sample size.
ExpEvent the expected number of events.
A.power actual achieved power.
Info.fractions information fractions at times of all the interim analyses.
boundary the monitoring boundary values of the standardized Harrington-Fleming statistic
at all the interim analyses.
SSize.FixAlter

References


Examples

# Assume an exponential (log-logistic) survival distribution
# with $q_0=\sigma_0=1$, $\mu_0=0.367$, $\xi_0=1$, $\zeta_0=1.75$ for the control arm,
# a uniform patient entry ($\eta_0=1$, $\theta_0=0$) and a uniform dropout censoring distribution $\text{Unif}(0, h)$
# having a 15% censoring probability ($\lfu=0.15$) for a study with $R=2$, $T=3$ and the interim
# analysis time at $t=1, 1.5, 2, 2.5$.

# To obtain the required $h$ for the uniform dropout censoring distribution.
find.h($\lfu=0.15$, $R=2$, $T=3$, $q=1$, $\mu=0.367$, $\sigma=1$, $\eta=1$, $\theta=0$) ## exponential
find.h($\lfu=0.15$, $R=2$, $T=3$, $q="llg"$, $\mu=1$, $\sigma=1.75$, $\eta=1$, $\theta=0$) ## log-logistic

# To obtain the maximum sample size for testing a treatment difference of a hazard ratio of 2/3
# with a type-I error of 0.05 and a power of 0.8.
SSize.FixAlter(t=c(1,1.5,2,2.5), $R=2$, $T=3$, FUN.C=function(y) punif(y,0,7.018),
para0=c(1,0.367,1), para1=NULL, haz.r=2/3, rho=0, eta=1, theta=0) # exponential
SSize.FixAlter(t=c(1,1.5,2,2.5), $R=2$, $T=3$, FUN.C=function(y) punif(y,0,7.211),
para0="llg",1.75), para1=NULL, haz.r=2/3, rho=0, eta=1, theta=0) # log-logistic

# To obtain the maximum sample size for testing $H_0:F_0=F_1$ with a type-I error of 0.05
# and a power of 0.8, where $F_1$ is an exponential (log-logistic) distribution
# with the parameter $\text{para}=c(1,0.772,1)$ ($\text{para}=c("LLG",1.5,1.75)$).
SSize.FixAlter(t=c(1,1.5,2,2.5), $R=2$, $T=3$, FUN.C=function(y) punif(y,0,7.018),
para0=c(1,0.367,1), para1=c(1,0.772,1), haz.r=0, eta=1, theta=0) # exponential
SSize.FixAlter(t=c(1,1.5,2,2.5), $R=2$, $T=3$, FUN.C=function(y) punif(y,0,7.211),
para0="llg",1.75), para1=llg,1.5,1.75), haz.r=0, eta=1, theta=0) # log-logistic
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