

Package ‘LARisk’

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Type Package

Title Estimation of Lifetime Attributable Risk of Cancer from
Radiation Exposure

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Description Compute lifetime attributable risk of
radiation-induced cancer reveals that it can be helpful with
enhancement of the flexibility in research with fast calculation
and various options. Important reference papers include
Berrington de Gonzalez et al. (2012) <doi:10.1088/0952-4746/32/3/205>,
National Research Council (2006, ISBN:978-0-309-09156-5).

License LGPL-3

Imports Rcpp (>= 1.0.0)

Suggests R.rsp

VignetteBuilder R.rsp

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LAR

Estimate LAR with Single ID

Description

LAR is used to estimate lifetime attributable radiation-related cancer risk for data with single ID.

Usage

```
LAR(
  data = data,
  weight_site = "no",
  weight_value = 0,
  current = as.numeric(substr(Sys.time(), 1, 4)),
  sim = 300,
  seed = 99,
  basepy = 1e+05,
  DDREF = TRUE,
  excel = FALSE,
  filename = NULL,
  ci = 0.9,
  changedata = FALSE,
  dbaseline = 0,
  dincidence = 0,
  rounddigit = 4
)
```

Arguments

data	data frame containing 'id', 'sex', 'birth', 'dosedist', 'dose1', 'dose2', 'dose3', 'site', 'exposure_rate'. See 'Details'.
weight_site	vector containing the name of cancer sites to give weights.
weight_value	numeric vector containing the value between 0 and 1 which is a weight on ERR model.
current	number of current year. default is year of the system time.
sim	number of iteration of simulation.
seed	number of seed.
basepy	number of base person year

DDREF	logical. Whether to apply the dose and dose-rate effectiveness factor.
excel	logical. Whether to extract the result as csv file.
filename	a string naming the file to save (.csv file).
ci	confidence level of the confidence interval.
changedata	logical, whether to change the data of lifetime table and incidence rate.
dbaseline	a path or data frame of the new lifetime table.
dincidence	a path or data frame of the new incidence rate table.
rounddigit	the number of decimal points to print.

Details

The data to be put in LAR should include some prerequisite information, which includes id, sex and birth of people(or person), distribution of dose, doses of exposed radiation, sites where exposed, and exposure rate. Also, the variable names should be written as expressed. The maximum age in LAR is set as 100 years old. If the data contains a birth year which makes attained age(= current - birth) over 100, the result has no useful value. For some variables, there is a fixed format. sex can have the component 'male' or 'female'. dosedist can have the component 'fixedvalue', 'normal', 'lognormal', 'triangular', 'logtriangular', 'uniform', 'loguniform'. site can have the component 'stomach', 'colon', 'liver', 'lung', 'breast', 'ovary', 'uterus', 'prostate', 'bladder', 'brain/cns', 'thyroid', 'remainder', 'oral', 'oesophagus', 'rectum', 'gallbladder', 'pancreas', 'kidney', 'leukemia'. exposure_rate can have the component 'acute' or 'chronic'.

Value

LAR

Cancer incidence probability per 100,000 persons to radiation exposure for their lifetime after exposed year.

LBR

Lifetime baseline risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after exposed year.

LFR

Lifetime fractional risk. Ratio LAR/LBR.

Future_LAR

LAR after current year.

BFR

Baseline future risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after current year.

TFR

Total future risk. Future LAR + BFR

References

Berrington de Gonzalez, A., Iulian Apostoaei, A., Veiga, L., Rajaraman, P., Thomas, B., Owen Hoffman, F., Gilbert, E. and Land, C. (2012). RadRAT: a radiation risk assessment tool for lifetime cancer risk projection. *Journal of Radiological Protection*, **32(3)**, pp.205-222.

National Research Council (NRC) and Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation (2005) *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* (Washington, DC: National Academy of Sciences)

Examples

```
data<-data.frame(id='a001', birth=1970, exposure=1980, dosedist='fixedvalue',
                 dose1=10, dose2=0, dose3=0, sex='male', site='colon',
                 exposure_rate='acute')
```

```
LAR(data)
```

LAR_batch

Estimate LAR with Multiple IDs

Description

LAR_batch is used to estimate lifetime attributable radiation-related cancer risk for data with Multiple IDs.

Usage

```
LAR_batch(
  data,
  excel = FALSE,
  filename = NULL,
  weight_site = "no",
  weight_value = 0,
  current = as.numeric(substr(Sys.time(), 1, 4)),
  sim = 300,
  seed = 99,
  basepy = 1e+05,
  DDREF = TRUE,
  ci = 0.9,
  changedata = FALSE,
  dbaseline = 0,
  dincidence = 0,
  rounddigit = 4
)
```

Arguments

data	data frame containing 'id', 'sex', 'birth', 'dosedist', 'dose1', 'dose2', 'dose3', 'site', 'exposure_rate'.
excel	logical. Whether to extract the result as csv file.
filename	a string naming the file to save (.csv file).
weight_site	vector containing the name of cancer sites to give weights.
weight_value	numeric vector containing the value between 0 and 1 which is a weight on ERR model.
current	number of current year. default is year of the system time.
sim	number of iteration of simulation.
seed	number of seed.
basepy	number of base person year
DDREF	logical. Whether to apply the dose and dose-rate effectiveness factor.
ci	confidence level of the confidence interval.
changedata	logical, whether to change the data of lifetime table and incidence rate.
dbaseline	a path or data frame of the new lifetime table.
dincidence	a path or data frame of the new incidence rate table.
rounddigit	the number of decimal points to print.

Details

Basically, the arguments of LAR_batch are same as LAR. But unlike LAR, LAR_batch can have multiple people's information.

Value

LAR_batch return a list of values for each IDs.

LAR

Cancer incidence probability per 100,000 persons to radiation exposure for their lifetime after exposed year.

LBR

Lifetime baseline risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after exposed year.

LFR

Lifetime fractional risk. Ratio LAR/LBR.

Future_LAR

LAR after current year.

BFR

Baseline future risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after current year.

TFR

Total future risk. Future LAR + BFR

LAR_batch return an list contains 'LAR' and 'Future_LAR' for each person.

References

Berrington de Gonzalez, A., Iulian Apostoaei, A., Veiga, L., Rajaraman, P., Thomas, B., Owen Hoffman, F., Gilbert, E. and Land, C. (2012). RadRAT: a radiation risk assessment tool for lifetime cancer risk projection. *Journal of Radiological Protection*, **32(3)**, pp.205-222.

National Research Council (NRC) and Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation (2005) *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* (Washington, DC: National Academy of Sciences)

Examples

```
data<-data.frame(id=c("a100","a101"), birth=rep(1970,2), exposure=c(1980,1990),
  dosedist=c("fixedvalue","fixedvalue"), dose1=c(10,20), dose2=c(0,0),
  dose3=c(0,0), sex=rep("male",2), site=c("colon","leukemia"),
  exposure_rate=rep("acute",2))
```

```
LAR_batch(data)
```

LAR_summary

Get a summary of LAR

Description

LAR_summary provides a summary of lifetime attributable radiation-related cancer risk.

Usage

```
LAR_summary(
  data,
  excel = FALSE,
  filename = NULL,
  weight_site = "no",
  weight_value = 0,
  current = as.numeric(substr(Sys.time(), 1, 4)),
  sim = 300,
  seed = 99,
  basepy = 1e+05,
  DDREF = TRUE,
  ci = 0.9,
  changedata = FALSE,
  dbaseline = 0,
  dincidence = 0,
  rounddigit = 4
)
```

Arguments

data	data frame containing 'id', 'sex', 'birth', 'dosedist', 'dose1', 'dose2', 'dose3', 'site', 'exposure_rate'.
excel	logical. Whether to extract the result as csv file.
filename	a string naming the file to save (.csv file).
weight_site	vector containing the name of cancer sites to give weights.
weight_value	numeric vector containing the value between 0 and 1 which is a weight on ERR model.
current	number of current year. default is year of the system time.
sim	number of iteration of simulation.
seed	number of seed.
basepy	number of base person year
DDREF	logical. Whether to apply the dose and dose-rate effectiveness factor.
ci	confidence level of the confidence interval.
changedata	logical, whether to change the data of lifetime table and incidence rate.
dbaseline	a path or data frame of the new lifetime table.
dincidence	a path or data frame of the new incidence rate table.
rounddigit	the number of decimal points to print.

Details

Basically, the arguments of LAR_batch are same as LAR.

Value

LAR_summary return a list of values. These values are a summary of LAR.

LAR

Cancer incidence probability per 100,000 persons to radiation exposure for their lifetime after exposed year.

LBR

Lifetime baseline risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after exposed year.

LFR

Lifetime fractional risk. Ratio LAR/LBR.

Future_LAR

LAR after current year.

BFR

Baseline future risk. Cumulative baseline probability of having cancer over the maximum lifetime without radiation exposure after current year.

TFR

Total future risk. Future LAR + BFR

References

Berrington de Gonzalez, A., Iulian Apostoaei, A., Veiga, L., Rajaraman, P., Thomas, B., Owen Hoffman, F., Gilbert, E. and Land, C. (2012). RadRAT: a radiation risk assessment tool for lifetime cancer risk projection. *Journal of Radiological Protection*, **32(3)**, pp.205-222.

National Research Council (NRC) and Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation (2005) *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* (Washington, DC: National Academy of Sciences)

Examples

```
data<-data.frame(id=c("a100", "a101"), birth=rep(1970,2), exposure=c(1980,1990),
  dosedist=c("fixedvalue", "fixedvalue"), dose1=c(10,20), dose2=c(0,0),
  dose3=c(0,0), sex=rep("male",2), site=c("colon", "leukemia"),
  exposure_rate=rep("acute",2))
```

```
LAR_summary(data)
```


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