

# Package ‘ciccr’

September 18, 2020

**Type** Package

**Title** Causal Inference in Case-Control Studies

**Version** 0.1.0

**Description** Estimation and inference methods for causal relative risk.  
Semiparametrically efficient estimation of the aggregated (log) odds ratio and a causal inference procedure for relative risk.  
For more details, see the paper by Jun and Lee (2020), “Causal Inference in Case-Control Studies,” <arXiv:2004.08318 [econ.EM]>.

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.1

**Imports** stats, MASS

**Suggests** knitr, rmarkdown, testthat

**VignetteBuilder** knitr

**Depends** R (>= 2.10)

**URL** <https://github.com/sokbae/ciccr/>

**BugReports** <https://github.com/sokbae/ciccr/issues>

**NeedsCompilation** no

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**Repository** CRAN

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ACS

ACS

**Description**

A case-control sample extracted from American Community Survey (ACS) 2018, restricted to white males residing in California with at least a bachelor's degree. The original ACS dataset is not from case-control sampling, but this case-control sample is obtained by the following procedure. The case sample is composed of 921 individuals whose income is top-coded. The control sample of equal size is randomly drawn without replacement from the pool of individuals whose income is not top-coded. Age is restricted to be between 25 and 70.

**Usage**

ACS

**Format**

A data frame with 1842 rows and 4 variables:

**age** age, in years

**ind** industry code, in four digits

**baplus** 1 if BA or higher; 0 otherwise

**topincome** 1 if income is top-coded; 0 otherwise

**Source**

<https://usa.ipums.org/usa/>

avg\_retro\_logit

*An Average of the Log Odds Ratio***Description**

Averages the log odds ratio using retrospective logistic regression.

**Usage**

```
avg_retro_logit(y, t, x, w = "control")
```

**Arguments**

y	n-dimensional vector of binary outcomes
t	n-dimensional vector of binary treatments
x	n by p matrix of covariates
w	'case' if the average is conditional on the case sample; 'control' if it is conditional on the control sample default w = 'control'

**Value**

An S3 object of type "ciccr". The object has the following elements.

est	a scalar estimate of the weighted average of the log odds ratio using retrospective logistic regression
se	standard error

**References**

Sung Jae Jun and Sokbae Lee. Causal Inference in Case-Control Studies. <https://arxiv.org/abs/2004.08318>.

**Examples**

```
# use the ACS dataset included in the package
y = ciccr::ACS$topincome
t = ciccr::ACS$baplust
x = ciccr::ACS$age
# use 'case' to condition on the distribution of covariates given y = 1
w = 'case'
results = avg_retro_logit(y, t, x, w)
```

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cicc

*Causal Inference for Relative Risk*


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**Description**

Provides an upper bound on the average of log relative risk.

**Usage**

```
cicc(y, t, x, p_upper = 1L, cov_prob = 0.95, length = 20L)
```

## Arguments

<code>y</code>	n-dimensional vector of binary outcomes
<code>t</code>	n-dimensional vector of binary treatments
<code>x</code>	n by p matrix of covariates
<code>p_upper</code>	a specified upper bound for the unknown true case probability (default = 1)
<code>cov_prob</code>	parameter for coverage probability of a confidence interval (default = 0.95)
<code>length</code>	specified length of a sequence from 0 to <code>p_upper</code> (default = 20)

## Value

An S3 object of type "ciccr". The object has the following elements:

<code>est</code>	(length)-dimensional vector of the upper bounds on the average of log relative risk
<code>se</code>	(length)-dimensional vector of pointwise standard errors
<code>ci</code>	(length)-dimensional vector of the upper ends of pointwise confidence interval
<code>pseq</code>	(length)-dimensional vector of a grid from 0 to <code>p_upper</code>

## References

Sung Jae Jun and Sokbae Lee. Causal Inference in Case-Control Studies. <https://arxiv.org/abs/2004.08318>.

## Examples

```
# use the ACS dataset included in the package.
y = ciccr::ACS$topincome
t = ciccr::ACS$baplust
x = ciccr::ACS$age
# The upper bound for Pr(y=1) is set as p_upper = 1 by default
# with the default coverage probability of 0.95.
ciccr(y, t, x)
# The upper bound for Pr(y=1) is set as p_upper = 0.2
# with the coverage probability of 0.99.
ciccr(y, t, x, 0.2, 0.99)
```

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ciccr

*ciccr: a package for causal inference in case-control studies*

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## Description

The ciccr package provides methods for causal inference in case-control studies.

**Functions**

The package includes the following:

- `cicc`: carries out causal inference on relative risk.
- `avg_retro_logit`: averages the log odds ratio using retrospective logistic regression.
- `ACS`: provides an illustrative case-control sample.

**References**

Sung Jae Jun and Sokbae Lee. Causal Inference in Case-Control Studies. <https://arxiv.org/abs/2004.08318>.

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