

# Package: tLagPropOdds (via r-universe)

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**Type** Package

**Title** Proportional Odds Model with Censored, Time-Lagged Categorical Outcome

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**Description** Implements a semiparametric estimator for the odds ratio model with censored, time-lagged, ordered categorical outcome in a randomized clinical trial that incorporates baseline and time-dependent information. Tsiatis, A. A. and Davidian, M. (2021) <[arXiv:2106.15559](https://arxiv.org/abs/2106.15559)>.

**License** GPL-2

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catProbs	<i>Estimation of the Probability of a Specific Categorical Outcome by Treatment</i>
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### Description

Inverse probability weighted complete case (IPWCC) and augmented inverse probability weighted complete case (AIPWCC) estimators for the probability of falling into a specific time-lagged ordered categorical outcome in a randomized clinical trial.

### Usage

```
catProbs(data, ..., ti = NULL, td = NULL)
```

### Arguments

data	A data.frame object. A data.frame containing all observed data. At a minimum, this data.frame must contain columns with headers "id", "U", "delta", "Cat" and "A". If the time-independent component of the estimator is to be included, data.frame must also contain the bases of $f(X)$ . If the time-dependent component is included, data.frame must also contain the bases of $h(X,L)$ as well as the time intervals with column headers {"tstart", "tstop"} or {"start", "stop"}. See Details for additional information.
...	Ignored. Included to require named inputs.
ti	A character or integer vector or NULL. The columns of data to be included in the time-independent component of the estimator, $f_m(X)$ $m = 0, \dots, M$ . If NULL, the time-independent component is excluded from the AIPWCC estimator. See Details for additional information.
td	A character or integer vector or NULL. The columns of data to be included in the time-dependent component of the estimator, $h_l(X,Lbar)$ , $l = 1, \dots, L$ . If NULL, the time-dependent component is excluded from the AIPWCC estimator. See Details for additional information.

### Details

At a minimum, the data provided for the analysis must contain the following information:

**id:** A unique participant identifier.

**U:** The time to ascertainment of category or censoring.

**delta:** The indicator of ascertainment of category (1 if U is the time to ascertainment; 0 otherwise).

**Cat:** The ordered outcome category. Data must be provided as a factor or an integer or be able to be converted to an integer without loss of information. If participant was censored ( $\text{delta} = 0$ ), Cat can take any integer-like value or NA.

**A:** The treatment received. Data must be provided as a factor or an integer or be able to be converted to an integer without loss of information.

With the exception of Cat, data must be complete.

If the time-independent component is to be included in the AIPWCC estimator, data must also include the time-independent basis functions  $f_m(X)$   $m = 0, \dots, M$ . If the intercept ( $f_0$ ) term is not provided, it will be added by the software.

If the time-dependent component is to be included in the AIPWCC estimator, the `data.frame` must be a time-dependent dataset as described by package `survival`. Specifically, the time-dependent data must be specified for intervals  $(\text{start}, \text{stop}]$ , and the data must include the following additional columns:

**tstart:** The lower boundary of the time interval to which the data pertain.

**tstop:** The upper boundary of the time interval to which the data pertain.

Note that column headers  $\{\text{"start"}, \text{"stop"}\}$  are also accepted.

The various combinations of inputs `ti` and `td` yield the following:

**ti = NULL, td = NULL** the IPWCC estimate is returned. (denoted as IPW in the simulations of the original manuscript.)

**ti != NULL, td != NULL** the IPWCC and the full AIPWCC estimates are returned. (denoted as AIPW2 in the simulations of the original manuscript.)

**ti = NULL, td != NULL** the IPWCC and the partial, time-independent AIPWCC estimates are returned. (denoted as AIPW1 in the simulations of the original manuscript.)

**ti = NULL, td != NULL** the IPWCC and the partial, time-dependent AIPWCC estimates are returned.

If a treatment subgroup has  $<5\%$  censoring, a message is generated and the treatment subgroup is removed from the time-dependent component of the AIPWCC estimator. If there is no censoring, the IPWCC estimator approaches the usual proportional odds estimator.

## Value

An S3 object of class `catProbsObj` containing a list. The elements of the list correspond to the selected AIPWCC and/or IPWCC estimators. For each estimator, a list of matrix objects is returned, one for each treatment, that contains the estimated probabilities, their asymptotic standard errors, and the 95% confidence intervals. The S3 object has an additional attributes, `"type"`, giving a verbose description of the components contained in the estimator.

## Examples

```
data(tLagData)

# full AIPWCC estimator
```

```

catProbs(data = tLagData, ti = "x", td = c("hospStatus", "daysOut"))

# partial, time-independent AIPWCC estimator
catProbs(data = tLagData, ti = "x")

# partial, time-dependent AIPWCC estimator
catProbs(data = tLagData, td = c("hospStatus", "daysOut"))

```

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print

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*Print Analysis Results*


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### Description

Prints the key results.

Prints the key results.

### Usage

```
## S3 method for class 'catProbsObj'
print(x, ...)
```

```
## S3 method for class 'tLagObj'
print(x, ...)
```

### Arguments

x	A tLagObj object. The value returned by tLagPropOdds().
...	Ignored.

### Examples

```

data(tLagData)

# full AIPWCC estimator
res <- catProbs(data = tLagData,
                ti = "x",
                td = c("hospStatus", "daysOut"))

print(x = res)

data(tLagData)

# full AIPWCC estimator
res <- tLagPropOdds(data = tLagData,
                   ti = "x",
                   td = c("hospStatus", "daysOut"))

print(x = res)

```

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 tLagData

*Toy Dataset For Illustration*


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### Description

These data are provided for the purposes of illustrating the use of the software. Though the data were generated under a scenario similar to a real-world COVID-19 therapeutics clinical trial, they should not be interpreted as representing true clinical trial data.

### Usage

```
data(tLagData)
```

### Format

tLagData is a time-dependent data.frame containing the following information for 602 participants ascertained at day 90 of a fictitious randomized clinical trial.

**id:** A unique participant identifier.

**A:** The treatment received, where  $A=\{0,1\}$ .

**Cat:** The ordered outcome category. There are 6 categories ascertained at day 90.

**1:** at home and off oxygen, number of days  $\geq 77$ ;

**2:** at home and off oxygen, number of days 49-76;

**3:** at home and off oxygen, number of days 1-48;

**4:** not hospitalized and either at home on oxygen or not home;

**5:** hospitalized for medical care or in hospice care; and

**6:** dead.

If participant is censored, Cat = NA.

**U:** The time at which the outcome category was determined or the censoring time. For Cat = 1-5, U is the interim analysis time (90 days). For Cat = 6, U is the time of death. For Cat = NA, U is the censoring time.

**delta:** The event indicator (1 if U is the time at which the outcome category was determined; 0 if censored).

**x:** A continuous baseline covariate.

**start:** The lower bound of the time interval to which the given covariate values pertain.

**stop:** The upper bound of the time interval to which the given covariate values pertain.

**hospStatus:** A time-dependent indicator of hospital status, where 1 indicates that the participant was not in the hospital during interval (start, stop]; 0 otherwise.

**daysOut:** The expected number of continuous days out of hospital at the time of the interim analysis (90 days).

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tLagPropOdds	<i>Estimation of the Odds Ratio in a Proportional Odds Model with Censored Time-lagged Outcome</i>
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## Description

Inverse probability weighted complete case (IPWCC) and augmented inverse probability weighted complete case (AIPWCC) estimators for the odds ratio in a proportional odds model with time-lagged ordered categorical outcome in a randomized clinical trial.

## Usage

```
tLagPropOdds(data, ..., ti = NULL, td = NULL, itmax = 500, tol = 1e-05)
```

## Arguments

data	A data.frame object. A data.frame containing all observed data. At a minimum, this data.frame must contain columns with headers "id", "U", "delta", "Cat" and "A". If the time-independent component of the estimator is to be included, data.frame must also contain the bases of $f(X)$ . If the time-dependent component is included, data.frame must also contain the bases of $h(X,L)$ as well as the time intervals with column headers {"tstart", "tstop"} or {"start", "stop"}. See Details for additional information.
...	Ignored. Included to require named inputs.
ti	A character or integer vector or NULL. The columns of data to be included in the time-independent component of the estimator, $f_m(X)$ $m = 0, \dots, M$ . If NULL, the time-independent component is excluded from the AIPWCC estimator. See Details for additional information.
td	A character or integer vector or NULL. The columns of data to be included in the time-dependent component of the estimator, $h_l(X,Lbar)$ , $l = 1, \dots, L$ . If NULL, the time-dependent component is excluded from the AIPWCC estimator. See Details for additional information.
itmax	An integer object. The maximum number of iterations for the Newton-Raphson algorithm used to estimate parameters alpha and beta.
tol	A numeric object. The value at which the Newton-Raphson is deemed to have converged.

## Details

At a minimum, the data provided for the analysis must contain the following information:

**id:** A unique participant identifier.

**U:** The time to ascertainment of category or censoring.

**delta:** The indicator of ascertainment of category (1 if U is the time to ascertainment; 0 otherwise).

**Cat:** The ordered outcome category. Data must be provided as a factor or an integer or be able to be converted to an integer without loss of information. If participant was censored ( $\delta = 0$ ), Cat can take any integer-like value or NA.

**A:** The treatment received. Data must be provided as a factor or an integer or be able to be converted to an integer without loss of information.

With the exception of Cat, data must be complete.

If the time-independent component is to be included in the AIPWCC estimator, data must also include the time-independent basis functions  $f_m(X)$   $m = 0, \dots, M$ . If the intercept ( $f_0$ ) term is not provided, it will be added by the software.

If the time-dependent component is to be included in the AIPWCC estimator, the data.frame must be a time-dependent dataset as described by package survival. Specifically, the time-dependent data must be specified for intervals (start,stop], and the data must include the following additional columns:

**tstart:** The lower boundary of the time interval to which the data pertain.

**tstop:** The upper boundary of the time interval to which the data pertain.

Note that column headers {"start", "stop"} are also accepted.

The various combinations of inputs ti and td yield the following:

**ti = NULL, td = NULL** the IPWCC estimate is returned. (denoted as IPW in the simulations of the original manuscript.)

**ti != NULL, td != NULL** the IPWCC and the full AIPWCC estimates are returned. (denoted as AIPW2 in the simulations of the original manuscript.)

**ti = NULL, td != NULL** the IPWCC and the partial, time-independent AIPWCC estimates are returned. (denoted as AIPW1 in the simulations of the original manuscript.)

**ti = NULL, td != NULL** the IPWCC and the partial, time-dependent AIPWCC estimates are returned. (not discussed in the simulations of the original manuscript.)

If a treatment subgroup has  $<5\%$  censoring, a message is generated and the treatment subgroup is removed from the time-dependent component of the AIPWCC estimator. If there is no censoring, the IPWCC estimator approaches the usual proportional odds estimator.

## Value

An S3 object of class tLagObj containing a list. The elements of the list correspond to the selected AIPWCC and/or IPWCC estimators. For each estimator, two matrix objects are returned: \$logOdds contains the estimated beta parameters, their standard errors estimated using the sandwich estimator, the 95% confidence intervals, and the p-values for the log odds ratio; \$odds contains the estimated odds ratio, their standard errors estimated using the delta method, and the 95% confidence intervals. The S3 object has an additional attribute, "type" giving a verbose description of the components contained in the estimator.

**Examples**

```
data(tLagData)

# full AIPWCC estimator
tLagPropOdds(data = tLagData, ti = "x", td = c("hospStatus", "daysOut"))

# partial, time-dependent AIPWCC estimator
tLagPropOdds(data = tLagData, td = c("hospStatus", "daysOut"))

# partial, time-independent AIPWCC estimator
tLagPropOdds(data = tLagData, ti = "x")
```



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