# Package 'healthcare.antitrust'

January 12, 2023

**Type** Package

**Title** Healthcare Antitrust Analysis

**Version** 0.1.3

**Description** Antitrust analysis of
healthcare markets. Contains functions to implement the
semiparametric estimation technique described in Raval, Rosenbaum,
and Tenn (2017) ``A Semiparametric Discrete Choice Model: An Application
to Hospital Mergers'' <doi:10.1111/ecin.12454>.

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**Encoding** UTF-8

**LazyData** true

**Depends** R (>= 2.10)

**Imports** methods, stats

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**RoxygenNote** 7.2.3

**URL** https://github.com/mpanhans/healthcare.antitrust

**NeedsCompilation** no

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**Repository** CRAN

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# R topics documented:

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| cell_defn | *Allocate Observations to Cells* |
|---|---|

---

### Description

Take a dataset of hospital discharges, and assigns them to cells that meet a minimum threshold cell size.

### Usage

```
cell_defn(data, min_size, layers, count = "count")
```

### Arguments

| | |
|---|---|
| data | Dataset of discharges. |
| min_size | Minimize cell size. |
| layers | A list of lists. Each layer is a list of the variables on which observations will be allocated to cells. The layers should be ordered in decreasing refinement, so that observations not assigned to a cell meeting the minimum size threshold can be assigned by a more coarse layer. |
| count | Name of variable which indicates the number of admissions represented by an observation. Default variable name is count. |

### Details

If the variable count is not available, the function will assume that each observation represents one admission, and a variable count will be created in the output data frame to indicate this.

When assigning observations to cells in a given layer, this function only assigns observations that have not been previously assigned in a finer layer. That is, the function assigns observations without replacement. Assignment with replacement is currently not supported.

For more details see the example vignette by typing: vignette("semipar_example", package = "healthcare.antitrust")

### Value

A list of data frames. The first component in the list, assigned, is the original data frame, with observations assigned to cells, and excluding observations that were not assigned. The assigned cells are designated by the variable cell, and the layer number in which the observation is assigned to the cell is given by the variable cell_type. The second component of the list, unassigned, is a data frame with the unassigned observations.

## Examples

```
data(discharge_data, package = "healthcare.antitrust")

list1 <- c("drg","age","zip5")
layers <- list(list1)
th <- 15
discharge_data$count <- 1

outList <- cell_defn(discharge_data,th,layers)
```

---

discharge_data            *A simulated dataset of hospital discharges*

---

### Description

A simulated dataset of hospital discharges containing patient characteristics.

### Usage

```
discharge_data
```

### Format

A data frame with 1,200 rows (one for each discharge) and 7 variables:

**drg**  diagnosis related group (drg) code for the admission

**age**  patient age

**zip5**  patient 5 digit zip code of residence

**hosp_id**  hospital identifier

**hospital**  hospital name

**sys_id**  system identifier

**system**  system name

### Source

Created as part of healthcare.antitrust package.

---

div_calc                                    *Diversion Ratio Calculator*

---

**Description**

Calculates hospital-level diversion ratios, once cells have been defined.

**Usage**

```
div_calc(
  data,
  cell = "cell",
  hosp_id = "hosp_id",
  hospital = "hospital",
  sys_id = "sys_id",
  party_ind = "party_ind",
  count = "count",
  dropDegenerateCell = TRUE
)
```

**Arguments**

| | |
|---|---|
| data | Dataset of hospital discharges, with required variables: `cell`, `hosp_id`, `hospital`, `sys_id`, `party_ind`, `count`. Use other function arguments to indicate alternative variable names to the default names. |
| cell | Name of variable specifying cell to which each observation has been allocated. Default variable name is `cell`. Can be created by `cell_defn` function. |
| hosp_id | Name of variable specifying (numeric) hospital identifier. Default variable name is `hosp_id`. |
| hospital | Name of variable specifying (string) hospital name. Default variable name is `hospital`. |
| sys_id | Name of variable specifying (numeric) system identifier. Default variable name is `sys_id`. |
| party_ind | Name of indicator variable for whether hospital is a merging party from which diversions should be calculated. Default variable name is `party_ind`. |
| count | Name of variable indicating the number of admissions represented by the observation. Set = 1 for every row if each observation represents one admission. |
| dropDegenerateCell | |
| | logical; specifies how to treat cells with a 100 percent within-system share. If TRUE, observations in degenerate, 100 percent share cells will be ignored in the diversion ratio calculation. If FALSE, any such individuals will be assigned to the outside option, but still included in the denominator, so that the inside-option diversion will total less than 100 percent. |

## Details

For system-to-system diversions, set `hosp_id` and `hospital` equal to corresponding system-level identifiers. Patients are not allowed to divert to within-system alternative hospitals.

For more details see the example vignette by typing: `vignette("semipar_example", package = "healthcare.antitrust")`

## Value

A list with two components. The first component, `hosp_level`, is a matrix giving hospital-level diversions from party hospitals to all other hospitals. The second object, `sys_level`, is a matrix that aggregates party hospitals to systems, thus giving diversions from party systems to all other hospitals.

## Examples

```
data(discharge_data, package = "healthcare.antitrust")

list1 <- c("drg","age","zip5")
layers <- list(list1)
th <- 15
discharge_data$count <- 1

outList <- cell_defn(discharge_data,th,layers)
D0 <- outList$assigned

D0$party_ind <- 0
D0$party_ind[D0$hosp_id==1] <- 1
D0$party_ind[D0$hosp_id==2] <- 1
D0$party_ind[D0$hosp_id==5] <- 1

out <- div_calc(D0)
```

---

   wtp_calc                     *Willingness-to-Pay Calculator*

---

## Description

This function calculates the system-level Willingness-To-Pay.

## Usage

```
wtp_calc(
  data,
  cell = "cell",
  sys_id = "sys_id",
  party_ind = "party_ind",
  count = "count",
```

```
  weight = "weight",
  dropDegenerateCell = TRUE
)
```

## Arguments

| | |
|---|---|
| data | Dataset of hospital discharges. Required variables: `cell`, `sys_id`, `party_ind`, `count`, and `weight`. Use other function arguments to indicate alternative variable names to the defaul names. |
| cell | Name of variable specifying cell to which each observation has been allocated. Default variable name is `cell`. Can be created by `cell_defn` function. |
| sys_id | Name of variable specifying (numeric) system identifier. Default variable name is `sys_id`. |
| party_ind | Name of indicator variable for whether hospital is a party from which diversions should be calculated. Default variable name is `party_ind`. |
| count | Name of variable indicating the number of admissions represented by the observation. Set = 1 for every row if each observation represents one admission. |
| weight | The designated weight of admission; =1 if observations should be equally weighted. |
| dropDegenerateCell | |
| | logical; specifies how to treat cells with a 100 percent within-system share. If TRUE, observations in degenerate, 100 percent share cells will be ignored in the WTP calculation. If FALSE, an adjustment is made where any cells with > 99 percent share at a single hospital have the share set to 99.0 percent. |

## Details

This function calculates the system-level WTP. For use in a WTP simulation exercise of the "WTP/Q Method" described in Brand and Balan (2018) doi: [10.2139/SSRN.3153109](https://doi.org/10.2139/SSRN.3153109). Hospital systems need to be numbered by sys_id, with a distinct sys_id for each independent hospital.

The `weight` input might for example be a DRG weight for each inpatient hospital admission.

For more details see the example vignette by typing: `vignette("semipar_example", package = "healthcare.antitrust")`

## Value

A data frame with the number of rows equal to the number of systems in the input data frame, and the following variables: `party` indicates whether the system includes party hospitals, `sys_id` is the system identifier, `WTP_s` is the system's WTP, `N_s` is the number of admission for the system, and `WTP_s_wt` is the weighted WTP for the system if the weight input is provided.

## Examples

```
data(discharge_data, package = "healthcare.antitrust")

list1 <- c("drg","age","zip5")
layers <- list(list1)
th <- 15
```

```
discharge_data$count <- 1

outList <- cell_defn(discharge_data,th,layers)
D0 <- outList$assigned

D0$party_ind <- 0
D0$party_ind[D0$hosp_id==1] <- 1
D0$party_ind[D0$hosp_id==2] <- 1
D0$party_ind[D0$hosp_id==5] <- 1

out <- wtp_calc(D0)
```

# Index