

## Help document for CEellipse

Here we provide the technical details and explanation for the example R programs using function CEellipse.

### Description of CEellipse

Draw a confidence ellipse for cost-effective data, using either person-level or summary cost-effectiveness data.

### Usage

```
CEellipse(cost=NULL, effect=NULL, treatment=NULL, dc=NULL,  
         se_dc=NULL, de=NULL, se_de=NULL, corr_dc_de=NULL, conf.level=0.95,  
         add=FALSE, printsum=TRUE, ce.point=TRUE, pch=16, n.point=100,  
         axis.lwd=1, axis.col="black", col="gray", xlim=NULL, ylim=NULL,  
         xlab = "Incremental Effect", ylab="Incremental Cost", ...)
```

### Arguments

cost	a vector for cost of individuals.
effect	a vector for effectiveness of individuals.
treatment	a vector for treatment indicator of individuals (1=considered treatment, 0=comparison).
dc	mean cost difference between considered treatment and comparison.
se_dc	standard error of the mean cost difference.
de	mean effect difference between considered treatment and comparison.
se_de	standard error of the mean effect difference.
corr_dc_de	correlation between the mean cost difference and mean effect difference.
conf.level	level of confidence ellipse. Defaults to 0.95.
add	logical. If TRUE, will add the ellipse to the existing plot, instead of creating a new plot. Defaults to FALSE. If TRUE, xlim, ylim, xlab, ylab, ce.point will not be used even provided.
printsum	logical. If TRUE and person-level data are provided, will print the obtained summary statistics. Defaults to TRUE.
ce.point	logical. If TRUE and add=FALSE, will add a point in the figure for the point estimates of cost difference and effect difference. Defaults to TRUE.

pch	a numeric value specifying the point. The 'points' help file contains examples of the possible marks. Defaults to 16.
n.point	number of points used to draw the ellipse. Defaults to 100.
axis.lwd	line width used to draw the axis crossing origin point. Defaults to 1.
axis.col	color used to draw the axis crossing origin point. Defaults to "black".
col	color used to draw the ellipse. Defaults to "gray".
xlim	a vector including 2 numeric values, specifying the limits of x-axis.
ylim	a vector including 2 numeric values, specifying the limits of y-axis.
xlab	label given to the x-axis. Defaults to "Incremental Effect".
ylab	label given to the y-axis. Defaults to "Incremental Cost".
...	other arguments that will be passed forward to the underlying plot.default method for drawing the ellipse.

### Value (Output saved in the result, in addition to the figure)

The saved result is a list. The following describes the components saved in the list.

ellipse	dataframe for the table of coordinates of the used points on the confidence ellipse (de_ell, dc_ell).
conf.level	level of confidence ellipse.
dc	mean cost difference between considered treatment and comparison.
se_dc	standard error of the mean cost difference.
de	mean effect difference between considered treatment and comparison.
se_de	standard error of the mean effect difference.
corr_dc_de	correlation between the mean cost difference and mean effect difference.
n	number of total individuals. Available only when person-level data are used.
n0	number of individuals in treatment group 0. Available only when person-level data are used.
n1	number of individuals in treatment group 1. Available only when person-level data are used.

## Examples

### Preparation.

```
# set the path to the folder with CEellipse.R (use "/" instead of "\" in path)
setwd("Your Path")

# load function for drawing a confidence ellipse
source("CEellipse.R")
```

### Use person-level cost-effectiveness data to draw a confidence ellipse.

```
## use a toy person-level data as an example
exampledata=data.frame(id=1:6,
  tx=c(0,0,0,1,1,1),
  cost=c(50,90,40,200,400,600),
  effect=c(4,5,1,5,2,4)
)
exampledata
```

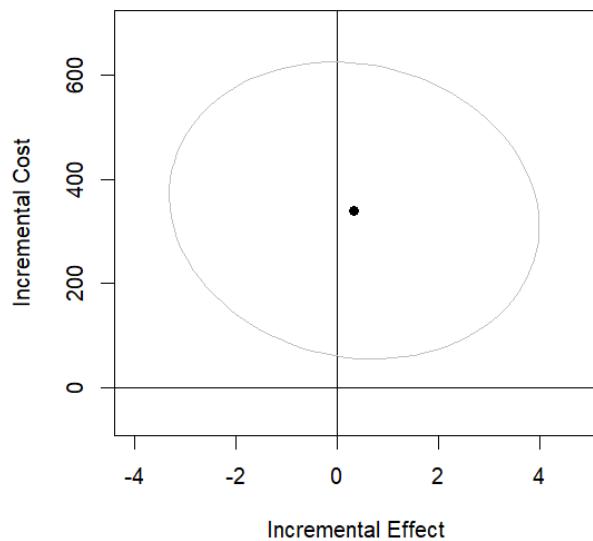
This shows the example data:

```
> exampledata
  id tx cost effect
1  1  0    50      4
2  2  0    90      5
3  3  0    40      1
4  4  1   200      5
5  5  1   400      2
6  6  1   600      4

##  draw a 95% confidence ellipse
CEellipse(cost=exampledata$cost, effect=exampledata$effect,
  treatment=exampledata$tx)
```

This prints out some summary statistics, along with a figure with the 95% confidence ellipse:

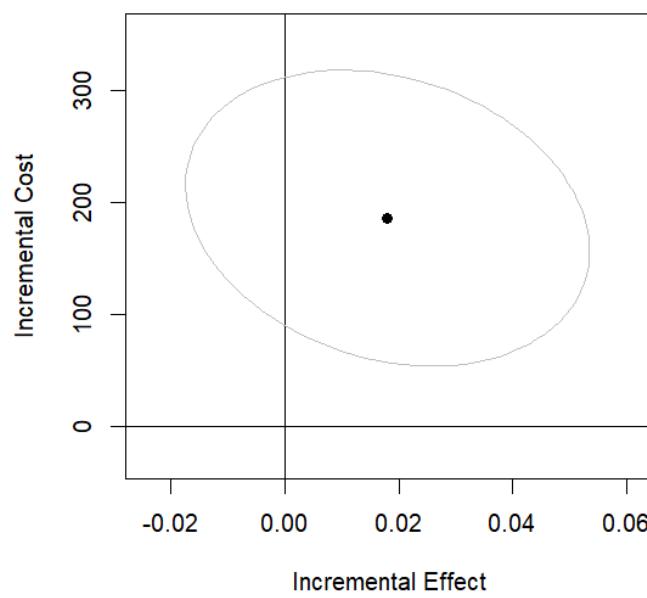
Person-level data are used.  
Summary Statistics:  
dc (mean cost difference): 340  
se\_dc (SE of mean cost difference): 116.476  
de (mean effect difference): 0.3333333  
se\_de (SE of mean effect difference): 1.490712  
corr\_dc\_de (corr(mean cost difference, mean effect difference)): -0.1055872



Use summary statistics from cost-effectiveness data to draw a confidence ellipse.

```
# use the summary statistics from Nixon et al. (2010)
CEellipse(dc=186, se_dc=sqrt(2920), de=0.018, se_de=sqrt(0.00021),
corr_dc_de=-0.222)
```

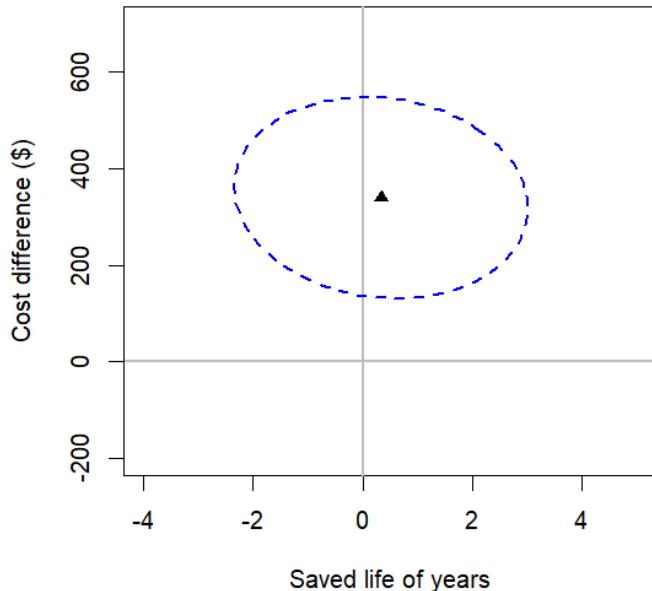
This creates a figure with the 95% confidence ellipse:



## Customize the figure.

```
## draw an 80% confidence ellipse and customize the axis and ellipse
CEellipse(cost=exampledatalist$cost, effect=exampledatalist$effect,
           treatment=exampledatalist$tx,
           conf.level=0.8,                      # confidence level
           xlim=c(-4,5), ylim=c(-200,700),      # limit of x- and y-axis
           xlab="Saved life of years", ylab="Cost difference ($)",    # labels
           lty=2, lwd=2, col="blue",             # type, width, color for ellipse
           axis.lwd=2, axis.col="gray",          # width and color for axis
           pch=17)                            # shape of point
)
```

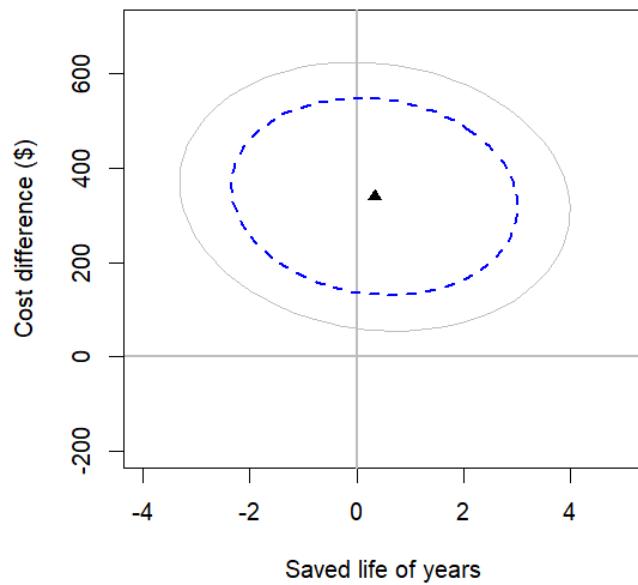
This creates a customized figure with the 80% confidence ellipse:



## Add the confidence ellipse to an existing plot, instead of creating a new one.

```
result <- CEellipse(cost=exampledatalist$cost, effect=exampledatalist$effect,
                      treatment=exampledatalist$tx, add=TRUE)
```

This adds a 95% confidence ellipse to the above figure. Meanwhile, it saves some results (e.g., summary statistics) into `result` for later use as needed.



```
# add a line for ICER using the saved summary statistics in result
lines(c(0,100),c(0,100*result$dc/result$de))
```

