```
> library(laeken)
Loading required package: boot
Loading required package: MASS
> data(eusilc)
> dim(eusilc)
[1] 14827    28
> summary(eusilc.spain)
     rb030         pb220a          py010n            py050n
py090n
 Min.   :    201      :  202   Min.   :     0   Min.   :-53040.0
Min.   :     0.0
 1st Qu.: 421903   EU :  461   1st Qu.:     0   1st Qu.:     0.0
1st Qu.:     0.0
 Median : 854202   LOC:26521   Median :     0   Median :     0.0
Median :     0.0
 Mean   : 852143   OTH: 1026   Mean   :  7217   Mean   :   742.8
Mean   :   684.8
 3rd Qu.:1283002               3rd Qu.: 12745   3rd Qu.:     0.0
3rd Qu.:     0.0
 Max.   :1706602               Max.   :247584   Max.   :158612.4
Max.   :189588.5

     py100n          py110n             py120n              py130n
py140n
 Min.   :    0   Min.   :    0.0   Min.   :    0.00   Min.   :    0
Min.   :    0.00
 1st Qu.:    0   1st Qu.:    0.0   1st Qu.:    0.00   1st Qu.:    0
1st Qu.:    0.00
 Median :    0   Median :    0.0   Median :    0.00   Median :    0
Median :    0.00
 Mean   : 2151   Mean   :  622.2   Mean   :   56.59   Mean   :  329
Mean   :   29.47
 3rd Qu.:    0   3rd Qu.:    0.0   3rd Qu.:    0.00   3rd Qu.:    0
3rd Qu.:    0.00
 Max.   :45556   Max.   :32213.5   Max.   :50000.00   Max.   :53374
Max.   :20001.00

      age            db030           rb050              rb090
hy040n
 Min.   :16.00   Min.   :    2   Min.   :   24.68   Min.   :1.000
Min.   :    0.0
 1st Qu.:34.00   1st Qu.: 4219   1st Qu.:  666.20   1st Qu.:1.000
1st Qu.:    0.0
 Median :48.00   Median : 8542   Median : 1140.62   Median :2.000
Median :    0.0
 Mean   :48.83   Mean   : 8521   Mean   : 1377.27   Mean   :1.519
Mean   :  467.4
 3rd Qu.:63.00   3rd Qu.:12830   3rd Qu.: 1758.68   3rd Qu.:2.000
3rd Qu.:    0.0
 Max.   :80.00   Max.   :17066   Max.   :21505.13   Max.   :2.000
Max.   :60000.0

     hy050n             hy070n             hy080n            hy090n
 Min.   :    0.00   Min.   :    0.00   Min.   :    0.0   Min.   :
```

```
0.0
 1st Qu.:    0.00   1st Qu.:    0.00   1st Qu.:    0.0   1st Qu.:
0.0
 Median :    0.00   Median :    0.00   Median :    0.0   Median :
21.6
 Mean   :   86.53   Mean   :   22.87   Mean   :  109.5   Mean   :
971.3
 3rd Qu.:    0.00   3rd Qu.:    0.00   3rd Qu.:    0.0   3rd Qu.:
518.2
 Max.   :51408.00   Max.   :10200.00   Max.   :42000.0   Max.   :
248914.9

     hy110n             hy130n            hy145n             hsize
eqSS
 Min.   :    0.00   Min.   :    0.0   Min.   :-22032.6   Min.   :
1.00   Min.   :1.00
 1st Qu.:    0.00   1st Qu.:    0.0   1st Qu.: -1016.7   1st Qu.:
2.00   1st Qu.:1.50
 Median :    0.00   Median :    0.0   Median :  -244.6   Median :
3.00   Median :2.00
 Mean   :   21.68   Mean   :  173.2   Mean   :  -406.5   Mean   :
3.11   Mean   :1.98
 3rd Qu.:    0.00   3rd Qu.:    0.0   3rd Qu.:     0.0   3rd Qu.:
4.00   3rd Qu.:2.50
 Max.   :12000.00   Max.   :24000.0   Max.   : 61360.7   Max.   :
11.00   Max.   :5.60

    eqIncome          db040           db090
 Min.   :-34027   ES61   : 3550   Min.   :   24.68
 1st Qu.:  9425   ES51   : 2943   1st Qu.:  666.20
 Median : 14259   ES30   : 2593   Median : 1140.62
 Mean   : 16569   ES52   : 2217   Mean   : 1377.27
 3rd Qu.: 20936   ES11   : 2077   3rd Qu.: 1758.68
 Max.   :196633   ES41   : 1953   Max.   :21505.13
                  (Other):12877
> eusilc.spain[1:5,]
  rb030 pb220a   py010n  py050n py090n py100n py110n py120n py130n
py140n age db030
1   201    LOC 12535.20    0.00      0    0.0    0.0      0      0
0  47     2
2   301    LOC 21325.10    0.00      0    0.0    0.0      0      0
0  41     3
3   401    LOC     0.00    0.00      0 7057.3  735.7      0      0
0  80     4
4   601    LOC 30930.03 2663.31      0    0.0    0.0      0      0
0  50     6
5   602    LOC  7940.62    0.00      0    0.0    0.0      0      0
0  47     6
      rb050 rb090 hy040n hy050n hy070n hy080n hy090n hy110n hy130n
hy145n hsize eqSS
1 1213.4150     2      0      0      0   3000    0.0      0      0
0.0     2  1.5
2 1239.8210     2      0      0      0  14400  621.9      0      0
-820.3     3  1.6
```

```
3  712.9236     2      0      0      0      0    0.0      0      0
0.0     1  1.0
4 2444.0060     1      0   1000      0      0  261.5      0      0
-2033.1     3  2.0
5 2444.0060     2      0   1000      0      0  261.5      0      0
-2033.1     3  2.0
  eqIncome db040     db090
1 10356.80  ES51 1213.4150
2 23229.56  ES30 1239.8210
3  7793.00  ES62  712.9236
4 22414.29  ES11 2444.0060
5 22414.29  ES11 2444.0060
> library(plyr)
Warning message:
package 'plyr' was built under R version 3.2.5
> count(eusilc.spain$rb030, 'eusilc.spain$db040')
   eusilc.spain.db040 freq
1                ES11 2077
2                ES12 1115
3                ES13  843
4                ES21 1466
5                ES22  801
6                ES23  926
7                ES24 1249
8                ES30 2593
9                ES41 1953
10               ES42 1588
11               ES43 1165
12               ES51 2943
13               ES52 2217
14               ES53  819
15               ES61 3550
16               ES62 1111
17               ES63  335
18               ES64  218
19               ES70 1241
> sum(eusilc.spain$rb050)
[1] 38852661
> tapply(eusilc.spain$rb050,eusilc.spain$db040,sum)
      ES11       ES12       ES13       ES21       ES22       ES23
ES24       ES30
2398229.80  932446.42  500965.85 1842311.43  526051.01  274187.91
1119612.78 5322761.60
      ES41       ES42       ES43       ES51       ES52       ES53
ES61       ES62
2149144.04 1734362.66  932154.21 6180503.30 4129532.45  903534.36
6857541.26 1179668.01
      ES63       ES64       ES70
  65668.06   60267.95 1743718.01
> eusilc2 <- eusilc.spain[!duplicated(eusilc.spain$db030),]
> count(eusilc2$rb030, 'eusilc2$db040')
   eusilc2.db040 freq
1           ES11  854
2           ES12  522
```

```
3           ES13  371
4           ES21  691
5           ES22  386
6           ES23  438
7           ES24  564
8           ES30 1188
9           ES41  893
10          ES42  712
11          ES43  508
12          ES51 1390
13          ES52 1022
14          ES53  380
15          ES61 1533
16          ES62  489
17          ES63  129
18          ES64   95
19          ES70  549
> sum(eusilc2$db090)
[1] 18034410
> tapply(eusilc2$db090,eusilc2$db040,sum)
      ES11       ES12       ES13       ES21       ES22       ES23
ES24       ES30
1057391.91  454029.25  235769.42  883757.16  247959.00  136636.91
534328.71 2475962.05
      ES41       ES42       ES43       ES51       ES52       ES53
ES61       ES62
1018300.74  788094.09  434913.21 2934342.53 1959124.84  423806.58
3093429.63  515330.00
      ES63       ES64       ES70
  25718.56   24017.44  791498.00
> ############ Estimation of Laeken indicators
>
>
> # We want to compute the at-risk-of-poverty rate and the relative
median at-risk-of-poverty gap as defined by Eurostat in the Laeken
indicators
>
> # The variable eqIncome contains for each individual the household
equivalized total net income, calculated as the household total net
income divided by the equivalised household size
> # the equivalence scale is the modified OECD scale
>
> # poverty threshold: is equal to the 60% of the national median
equivalised income
> arpt(eusilc.spain$eqIncome, weights = eusilc.spain$rb050)
[1] 8475.519
> weightedMedian(eusilc.spain$eqIncome, eusilc.spain$rb050)*0.6
[1] 8475.519
> arpr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
=eusicl.spain$db040)
Value:
[1] 20.42143

Threshold:
```

```
[1] 8475.519
> arpr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
=eusilc.spain$db040, breakdown = eusilc.spain$db040)
Value:
[1] 20.42143

Value by domain:
   stratum     value
1     ES11 17.903324
2     ES12 15.881427
3     ES13 18.315955
4     ES21 13.400384
5     ES22  6.220605
6     ES23 14.586851
7     ES24 12.813970
8     ES30 14.151479
9     ES41 16.041998
10    ES42 30.795457
11    ES43 30.498147
12    ES51 15.329552
13    ES52 24.446239
14    ES53 17.553270
15    ES61 27.576173
16    ES62 23.419107
17    ES63 28.952028
18    ES64  9.504047
19    ES70 33.146321

Threshold:
[1] 8475.519
> a <- arpr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusicl.spain$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=a, R=1000, bootType="naive",
ciType="perc")
Value:
[1] 20.42143

Variance:
[1] 0.08851678

Confidence interval:
   lower    upper
19.87072 21.09536

Threshold:
[1] 8475.519

> a.states <- arpr(eusilc.spain$eqIncome, weights = eusilc.spain
$rb050, design=eusilc.spain$db040, breakdown=eusilc.spain$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=a.states,
breakdown=eusilc.spain$db040, R=1000, bootType="naive",
ciType="perc")
```

```
Value:
[1] 20.42143

Variance:
[1] 0.08886496

Confidence interval:
   lower    upper
19.88005 21.01268

Value by domain:
   stratum     value
1     ES11 17.903324
2     ES12 15.881427
3     ES13 18.315955
4     ES21 13.400384
5     ES22  6.220605
6     ES23 14.586851
7     ES24 12.813970
8     ES30 14.151479
9     ES41 16.041998
10    ES42 30.795457
11    ES43 30.498147
12    ES51 15.329552
13    ES52 24.446239
14    ES53 17.553270
15    ES61 27.576173
16    ES62 23.419107
17    ES63 28.952028
18    ES64  9.504047
19    ES70 33.146321

Variance by domain:
   stratum       var
1     ES11 1.3706237
2     ES12 3.5664977
3     ES13 3.0086331
4     ES21 1.2825072
5     ES22 1.2068205
6     ES23 2.2818153
7     ES24 1.4243767
8     ES30 0.6992627
9     ES41 1.2578861
10    ES42 2.1777328
11    ES43 3.7933091
12    ES51 0.6542464
13    ES52 1.3023644
14    ES53 2.9714062
15    ES61 0.8535953
16    ES62 2.9413005
17    ES63 9.8280948
18    ES64 4.9601718
19    ES70 3.8627160
```

```
Confidence interval by domain:
   stratum     lower     upper
1     ES11 15.786627 20.235471
2     ES12 12.009665 19.579703
3     ES13 15.034375 22.053226
4     ES21 11.192863 15.648227
5     ES22  4.405788  8.639222
6     ES23 11.904171 17.887021
7     ES24 10.489860 15.068986
8     ES30 12.525594 15.898714
9     ES41 14.025117 18.650048
10    ES42 27.811331 33.551939
11    ES43 26.973679 34.868812
12    ES51 13.696882 16.957960
13    ES52 22.376189 26.931077
14    ES53 14.075255 20.891822
15    ES61 25.966259 29.636328
16    ES62 20.421010 27.203752
17    ES63 22.636647 35.563808
18    ES64  5.497133 14.349722
19    ES70 29.389662 37.083199

Threshold:
[1] 8475.519
> # RELATIVE MEDIAN AT-RISK-OF-POVERTY GAP
>
> # relative median at-risk-of-poverty gap: national level
> rmpg(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
=eusilc.spain$db040)
Value:
[1] 28.75758

Threshold:
[1] 8475.519
> rmpg(eusilc$eqIncome, weights = eusilc$rb050, design =eusilc
$db040, breakdown = eusilc$db040)
Value:
[1] 18.9286

Value by domain:
        stratum    value
1    Burgenland 12.32438
2     Carinthia 13.12787
3 Lower Austria 17.48023
4      Salzburg 28.89533
5        Styria 15.53486
6         Tyrol 19.58447
7 Upper Austria 19.47177
8        Vienna 23.35608
9    Vorarlberg 26.96706

Threshold:
[1] 10859.24
> rmpg(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
```

```
=eusilc.spain$db040, breakdown = eusilc.spain$db040)
Value:
[1] 28.75758

Value by domain:
   stratum    value
1     ES11 30.44320
2     ES12 14.24139
3     ES13 25.57848
4     ES21 43.36630
5     ES22 14.16608
6     ES23 36.95932
7     ES24 31.28232
8     ES30 30.34999
9     ES41 25.02255
10    ES42 25.92625
11    ES43 29.15744
12    ES51 30.56158
13    ES52 31.46544
14    ES53 29.60573
15    ES61 25.87884
16    ES62 23.68884
17    ES63 49.59693
18    ES64 26.68886
19    ES70 36.26034

Threshold:
[1] 8475.519
> # computing confidence intervals: national level
> pg <- rmpg(eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusicl.spain$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=pg, R=1000, bootType="naive",
ciType="perc")
Value:
[1] 28.75758

Variance:
[1] 0.7956333

Confidence interval:
   lower    upper
27.20004 30.70330

Threshold:
[1] 8475.519
> pg.states <- rmpg(eusilc$eqIncome, weights = eusilc$rb050,
design=eusilc$db040, breakdown=eusilc$db040)
> pg.states <- rmpg(eusilc.spain$eqIncome, weights = eusilc.spain
$rb050, design=eusilc.spain$db040, breakdown=eusilc.spain$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=pg.states,
breakdown=eusilc.spain$db040, R=1000, bootType="naive",
ciType="perc")
```

```
Value:
[1] 28.75758

Variance:
[1] 0.7689209

Confidence interval:
   lower    upper
27.13255 30.67832

Value by domain:
   stratum    value
1     ES11 30.44320
2     ES12 14.24139
3     ES13 25.57848
4     ES21 43.36630
5     ES22 14.16608
6     ES23 36.95932
7     ES24 31.28232
8     ES30 30.34999
9     ES41 25.02255
10    ES42 25.92625
11    ES43 29.15744
12    ES51 30.56158
13    ES52 31.46544
14    ES53 29.60573
15    ES61 25.87884
16    ES62 23.68884
17    ES63 49.59693
18    ES64 26.68886
19    ES70 36.26034

Variance by domain:
   stratum       var
1     ES11  2.521846
2     ES12 46.357536
3     ES13  5.250663
4     ES21 55.457288
5     ES22 44.758176
6     ES23  9.712559
7     ES24  8.249295
8     ES30  4.348261
9     ES41  6.693248
10    ES42  1.153753
11    ES43 17.441570
12    ES51  7.538676
13    ES52  3.535030
14    ES53 29.382883
15    ES61  3.274633
16    ES62  8.435206
17    ES63 16.695895
18    ES64 35.649635
19    ES70 14.108090
```

```
Confidence interval by domain:
   stratum     lower    upper
1     ES11 26.992766 33.12927
2     ES12 12.194257 39.70792
3     ES13 20.584559 32.49856
4     ES21 31.152245 53.74134
5     ES22  6.134071 36.05119
6     ES23 29.655286 41.34045
7     ES24 25.260513 37.75015
8     ES30 26.749556 34.91026
9     ES41 17.669436 27.96920
10    ES42 23.916897 28.31803
11    ES43 18.685413 35.43137
12    ES51 26.500615 36.53736
13    ES52 26.767733 34.30837
14    ES53 19.526926 47.39818
15    ES61 23.068111 30.45358
16    ES62 19.809237 31.11892
17    ES63 40.260369 51.14760
18    ES64 25.972396 40.97991
19    ES70 28.048808 44.18398

Threshold:
[1] 8475.519
> qsr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
=eusilc.spain$db040)
Value:
[1] 6.247873
> qsr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, , design
=eusilc.spain$db040, breakdown = eusilc.spain$db040)
Value:
[1] 6.247873

Value by domain:
   stratum     value
1     ES11  5.256725
2     ES12  5.183218
3     ES13  5.212008
4     ES21  6.252649
5     ES22  4.668066
6     ES23  5.078700
7     ES24  4.720277
8     ES30  6.035583
9     ES41  4.886432
10    ES42  6.452927
11    ES43  6.199717
12    ES51  5.890408
13    ES52  6.476175
14    ES53  5.881529
15    ES61  6.146460
16    ES62  4.808071
17    ES63 10.377006
18    ES64  4.545063
19    ES70  7.127279
```

```
> q<-qsr(eusilc.spain$eqIncome, weights = eusilc.spain$rb050, design
=eusilc.spain$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=q, R=1000, bootType="naive",
ciType="perc")
Value:
[1] 6.247873

Variance:
[1] 0.009320671

Confidence interval:
   lower    upper
6.061732 6.438389
> q.states <- qsr(eusilc.spain$eqIncome, weights = eusilc.spain
$rb050, , design =eusilc.spain$db040, breakdown = eusilc.spain
$db040)
> bootVar(inc=eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design =eusilc.spain$db040, indicator=q.states,
breakdown=eusilc.spain$db040, R=1000, bootType="naive",
ciType="perc")
Value:
[1] 6.247873

Variance:
[1] 0.009025976

Confidence interval:
   lower    upper
6.057406 6.436073

Value by domain:
   stratum     value
1     ES11  5.256725
2     ES12  5.183218
3     ES13  5.212008
4     ES21  6.252649
5     ES22  4.668066
6     ES23  5.078700
7     ES24  4.720277
8     ES30  6.035583
9     ES41  4.886432
10    ES42  6.452927
11    ES43  6.199717
12    ES51  5.890408
13    ES52  6.476175
14    ES53  5.881529
15    ES61  6.146460
16    ES62  4.808071
17    ES63 10.377006
18    ES64  4.545063
19    ES70  7.127279

Variance by domain:
```

```
   stratum        var
1     ES11 0.10603996
2     ES12 0.18801110
3     ES13 0.12312344
4     ES21 0.20380465
5     ES22 0.11124463
6     ES23 0.16383994
7     ES24 0.05493159
8     ES30 0.06336873
9     ES41 0.06792259
10    ES42 0.17202405
11    ES43 0.74894534
12    ES51 0.06059147
13    ES52 0.07302878
14    ES53 0.21348263
15    ES61 0.07184161
16    ES62 0.07735876
17    ES63 1.55384717
18    ES64 0.81880552
19    ES70 0.52174637

Confidence interval by domain:
   stratum    lower     upper
1     ES11 4.685388  5.964905
2     ES12 4.416304  6.109704
3     ES13 4.632048  6.016366
4     ES21 5.575825  7.325392
5     ES22 4.105242  5.424360
6     ES23 4.370526  5.929534
7     ES24 4.276477  5.202338
8     ES30 5.537662  6.549064
9     ES41 4.433533  5.446339
10    ES42 5.726283  7.395589
11    ES43 5.089090  8.428694
12    ES51 5.437531  6.372674
13    ES52 5.977007  7.004246
14    ES53 5.116377  6.921966
15    ES61 5.665906  6.722875
16    ES62 4.285207  5.395072
17    ES63 7.979611 12.952592
18    ES64 3.608943  7.091913
19    ES70 5.886788  8.622535
> gini(eusilc.spain$eqIncome, weights = eusilc.spain$rb050,
design=eusilc.spain$db040)
Value:
[1] 33.69247
>
```