

1. ALLONCO CANCER DATA

Asymptotic normal test results. BP ontology

2

d0 = 0.4444

```
2 > signifPvals_d0_0.4444$BP
$`level 3`
$`level 3`$sanger.atlas
$`level 3`$sanger.atlas$p.value
sanger.atlas
0.00826823
```

```
$`level 3`$sanger.atlas$enrichTab
          Enriched in atlas
Enriched in sanger TRUE FALSE
          TRUE    37      0
          FALSE   29    447
```

```
$`level 3`$sanger.miscellaneous
$`level 3`$sanger.miscellaneous$p.value
sanger.miscellaneous
0.001117645
```

```
$`level 3`$sanger.miscellaneous$enrichTab
          Enriched in miscellaneous
Enriched in sanger TRUE FALSE
          TRUE    28      9
          FALSE    8   468
```

```
$`level 3`$Vogelstein.atlas
$`level 3`$Vogelstein.atlas$p.value
Vogelstein.atlas
0.0004462332
```

```
$`level 3`$Vogelstein.atlas$enrichTab
          Enriched in atlas
Enriched in Vogelstein TRUE FALSE
          TRUE    40      1
          FALSE   26   446
```

```
$`level 3`$Vogelstein.miscellaneous
$`level 3`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
0.0002153174
```

```
$`level 3`$Vogelstein.miscellaneous$enrichTab
          Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
          TRUE    30     11
```

FALSE 6 466

3

```
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
6.317775e-51
```

3

```
$`level 3`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein TRUE FALSE
TRUE 37 4
FALSE 0 472
```

```
$`level 3`$waldman.atlas
$`level 3`$waldman.atlas$p.value
waldman.atlas
0.0004462332
```

```
$`level 3`$waldman.atlas$enrichTab
Enriched in atlas
Enriched in waldman TRUE FALSE
TRUE 44 9
FALSE 22 438
```

```
$`level 3`$waldman.miscellaneous
$`level 3`$waldman.miscellaneous$p.value
waldman.miscellaneous
3.383981e-07
```

```
$`level 3`$waldman.miscellaneous$enrichTab
Enriched in miscellaneous
Enriched in waldman TRUE FALSE
TRUE 36 17
FALSE 0 460
```

```
$`level 3`$waldman.sanger
$`level 3`$waldman.sanger$p.value
waldman.sanger
0.005478965
```

```
$`level 3`$waldman.sanger$enrichTab
Enriched in sanger
Enriched in waldman TRUE FALSE
TRUE 33 20
FALSE 4 456
```

```

$`level 3`$waldman.Vogelstein
$`level 3`$waldman.Vogelstein$p.value
4 waldman.Vogelstein
    0.001486348

$`level 3`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE      35      18
      FALSE      6     454

$`level 4`
$`level 4`$miscellaneous.atlas
$`level 4`$miscellaneous.atlas$p.value
miscellaneous.atlas
    0.009668647

$`level 4`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE      189      26
      FALSE     197    3355

$`level 4`$sanger.atlas
$`level 4`$sanger.atlas$p.value
sanger.atlas
    2.49828e-05

$`level 4`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger TRUE FALSE
      TRUE      202      25
      FALSE     184    3356

$`level 4`$sanger.miscellaneous
$`level 4`$sanger.miscellaneous$p.value
sanger.miscellaneous
    0.0001718543

$`level 4`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger TRUE FALSE
      TRUE      147      80
      FALSE      68    3472

```

```
$`level 4`$Vogelstein.atlas
$`level 4`$Vogelstein.atlas$p.value
Vogelstein.atlas
      8.133885e-09
```

```
$`level 4`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
      TRUE    221    39
      FALSE   165   3342
```

```
$`level 4`$Vogelstein.miscellaneous
$`level 4`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
      0.02022259
```

```
$`level 4`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
      TRUE    150   110
      FALSE    65  3442
```

```
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
      2.259924e-93
```

```
$`level 4`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE    214    46
      FALSE    13  3494
```

```
$`level 4`$waldman.atlas
$`level 4`$waldman.atlas$p.value
waldman.atlas
      7.236788e-14
```

```
$`level 4`$waldman.atlas$enrichTab
      Enriched in atlas
Enriched in waldman TRUE FALSE
      TRUE    248    67
      FALSE   138  3314
```

```
$`level 4`$waldman.miscellaneous
```

```
$`level 4`$waldman.miscellaneous$p.value
waldman.miscellaneous
      7.965405e-24
```

6

```
6 $`level 4`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman TRUE FALSE
      TRUE    203    112
      FALSE    12   3440
```

```
$`level 4`$waldman.sanger
$`level 4`$waldman.sanger$p.value
waldman.sanger
      0.0001408205
```

```
$`level 4`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman TRUE FALSE
      TRUE    178    137
      FALSE    49   3403
```

```
$`level 4`$waldman.Vogelstein
$`level 4`$waldman.Vogelstein$p.value
waldman.Vogelstein
      2.606523e-06
```

```
$`level 4`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE    193    122
      FALSE    67   3385
```

```
$`level 5`
$`level 5`$miscellaneous.atlas
$`level 5`$miscellaneous.atlas$p.value
miscellaneous.atlas
      1.003044e-05
```

```
$`level 5`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE    453    54
      FALSE   485   9296
```

```
$`level 5`$sanger.atlas
```

```
$`level 5`$sanger.atlas$p.value
sanger.atlas
4.731514e-12
```

7

```
$`level 5`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger TRUE FALSE
      TRUE   489    59
      FALSE  449   9291
```

7

```
$`level 5`$sanger.miscellaneous
$`level 5`$sanger.miscellaneous$p.value
sanger.miscellaneous
1.817452e-10
```

```
$`level 5`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger TRUE FALSE
      TRUE   352   196
      FALSE  155  9585
```

```
$`level 5`$Vogelstein.atlas
$`level 5`$Vogelstein.atlas$p.value
Vogelstein.atlas
1.428125e-20
```

```
$`level 5`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
      TRUE   529    78
      FALSE  409   9272
```

```
$`level 5`$Vogelstein.miscellaneous
$`level 5`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
1.025077e-08
```

```
$`level 5`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
      TRUE   365   242
      FALSE  142  9539
```

```
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
```

8 \$`level 5`\$Vogelstein.sanger\$enrichTab
 Enriched in sanger
 Enriched in Vogelstein TRUE FALSE
 TRUE 514 93
 FALSE 34 9647

\$`level 5`\$waldman.atlas
 \$`level 5`\$waldman.atlas\$p.value
 waldman.atlas
 3.774626e-44

\$`level 5`\$waldman.atlas\$enrichTab
 Enriched in atlas
 Enriched in waldman TRUE FALSE
 TRUE 616 139
 FALSE 322 9211

\$`level 5`\$waldman.miscellaneous
 \$`level 5`\$waldman.miscellaneous\$p.value
 waldman.miscellaneous
 4.226319e-42

\$`level 5`\$waldman.miscellaneous\$enrichTab
 Enriched in miscellaneous
 Enriched in waldman TRUE FALSE
 TRUE 470 285
 FALSE 37 9496

\$`level 5`\$waldman.sanger
 \$`level 5`\$waldman.sanger\$p.value
 waldman.sanger
 3.33945e-13

\$`level 5`\$waldman.sanger\$enrichTab
 Enriched in sanger
 Enriched in waldman TRUE FALSE
 TRUE 436 319
 FALSE 112 9421

\$`level 5`\$waldman.Vogelstein
 \$`level 5`\$waldman.Vogelstein\$p.value
 waldman.Vogelstein
 5.54536e-20


```
$`level 5`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE    470    285
      FALSE   137   9396
```

9

9

```
$`level 6`
$`level 6`$miscellaneous.atlas
$`level 6`$miscellaneous.atlas$p.value
miscellaneous.atlas
      0.003691337
```

```
$`level 6`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE    615    75
      FALSE   747 15244
```

```
$`level 6`$sanger.atlas
$`level 6`$sanger.atlas$p.value
sanger.atlas
6.974324e-11
```

```
$`level 6`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger TRUE FALSE
      TRUE    674    74
      FALSE   688 15245
```

```
$`level 6`$sanger.miscellaneous
$`level 6`$sanger.miscellaneous$p.value
sanger.miscellaneous
      1.503606e-07
```

```
$`level 6`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger TRUE FALSE
      TRUE    459    289
      FALSE   231 15702
```

```
$`level 6`$Vogelstein.atlas
$`level 6`$Vogelstein.atlas$p.value
Vogelstein.atlas
      8.607022e-23
```



```
Enriched in waldman  TRUE FALSE
                     TRUE   616   401
                     FALSE   74 15590
```

11

11

```
$`level 6`$waldman.sanger
$`level 6`$waldman.sanger$p.value
waldman.sanger
5.126769e-09
```

```
$`level 6`$waldman.sanger$enrichTab
                     Enriched in sanger
Enriched in waldman  TRUE FALSE
                     TRUE   563   454
                     FALSE  185 15479
```

```
$`level 6`$waldman.Vogelstein
$`level 6`$waldman.Vogelstein$p.value
waldman.Vogelstein
6.029807e-14
```

```
$`level 6`$waldman.Vogelstein$enrichTab
                     Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
                     TRUE   608   409
                     FALSE  231 15433
```

```
$`level 7`
$`level 7`$sanger.atlas
$`level 7`$sanger.atlas$p.value
sanger.atlas
2.171244e-09
```

```
$`level 7`$sanger.atlas$enrichTab
                     Enriched in atlas
Enriched in sanger  TRUE FALSE
                     TRUE   695   89
                     FALSE  722 17949
```

```
$`level 7`$sanger.miscellaneous
$`level 7`$sanger.miscellaneous$p.value
sanger.miscellaneous
0.0001856983
```

```
$`level 7`$sanger.miscellaneous$enrichTab
                     Enriched in miscellaneous
```

Enriched in sanger	TRUE	FALSE
	TRUE	452 332
	FALSE	226 18445

12

12

```
$`level 7`$Vogelstein.atlas
$`level 7`$Vogelstein.atlas$p.value
Vogelstein.atlas
2.716583e-24
```

```
$`level 7`$Vogelstein.atlas$enrichTab
Enriched in atlas
Enriched in Vogelstein TRUE FALSE
TRUE 776 115
FALSE 641 17923
```

```
$`level 7`$Vogelstein.miscellaneous
$`level 7`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
0.000672927
```

```
$`level 7`$Vogelstein.miscellaneous$enrichTab
Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
TRUE 480 411
FALSE 198 18366
```

```
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
0
```

```
$`level 7`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein TRUE FALSE
TRUE 739 152
FALSE 45 18519
```

```
$`level 7`$waldman.atlas
$`level 7`$waldman.atlas$p.value
waldman.atlas
2.306207e-24
```

```
$`level 7`$waldman.atlas$enrichTab
Enriched in atlas
Enriched in waldman TRUE FALSE
TRUE 815 201
```

```
$`level 7`$waldman.miscellaneous
$`level 7`$waldman.miscellaneous$p.value
waldman.miscellaneous
5.012923e-29
```

13

```
$`level 7`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
                TRUE   593   423
                FALSE   85 18354
```

```
$`level 7`$waldman.sanger
$`level 7`$waldman.sanger$p.value
waldman.sanger
7.765967e-07
```

```
$`level 7`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman  TRUE FALSE
                TRUE   564   452
                FALSE  220 18219
```

```
$`level 7`$waldman.Vogelstein
$`level 7`$waldman.Vogelstein$p.value
waldman.Vogelstein
1.334165e-10
```

```
$`level 7`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
                TRUE   612   404
                FALSE  279 18160
```

```
$`level 8`
$`level 8`$sanger.atlas
$`level 8`$sanger.atlas$p.value
sanger.atlas
1.895624e-11
```

```
$`level 8`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
                TRUE   629   90
```

```

14 $`level 8`$Vogelstein.atlas
$`level 8`$Vogelstein.atlas$p.value
Vogelstein.atlas
4.460406e-24

$`level 8`$Vogelstein.atlas$enrichTab
Enriched in atlas
Enriched in Vogelstein  TRUE FALSE
                        TRUE  694  118
                        FALSE 540 17650

$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.592e-304

$`level 8`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                        TRUE  675  137
                        FALSE  44 18146

$`level 8`$waldman.atlas
$`level 8`$waldman.atlas$p.value
waldman.atlas
6.001925e-15

$`level 8`$waldman.atlas$enrichTab
Enriched in atlas
Enriched in waldman  TRUE FALSE
                     TRUE  692  195
                     FALSE 542 17573

$`level 8`$waldman.miscellaneous
$`level 8`$waldman.miscellaneous$p.value
waldman.miscellaneous
2.922405e-19

$`level 8`$waldman.miscellaneous$enrichTab
Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
                     TRUE  502  385
                     FALSE  79 18036

```

```
$`level 8`$waldman.sanger
$`level 8`$waldman.sanger$p.value
waldman.sanger
0.002150401
```

15

```
$`level 8`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman  TRUE FALSE
      TRUE      488    399
      FALSE     231 17884
```

```
$`level 8`$waldman.Vogelstein
$`level 8`$waldman.Vogelstein$p.value
waldman.Vogelstein
1.441413e-05
```

```
$`level 8`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
      TRUE      528    359
      FALSE     284 17831
```

```
$`level 9`
$`level 9`$sanger.atlas
$`level 9`$sanger.atlas$p.value
sanger.atlas
7.942766e-09
```

```
$`level 9`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
      TRUE      485     75
      FALSE     462 15603
```

```
$`level 9`$Vogelstein.atlas
$`level 9`$Vogelstein.atlas$p.value
Vogelstein.atlas
2.011538e-17
```

```
$`level 9`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein  TRUE FALSE
      TRUE      535    105
      FALSE     412 15573
```

```

$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.763715e-238

$`level 9`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                        TRUE  529  111
                        FALSE  31 15954

$`level 9`$waldman.atlas
$`level 9`$waldman.atlas$p.value
waldman.atlas
1.094304e-08

$`level 9`$waldman.atlas$enrichTab
Enriched in atlas
Enriched in waldman  TRUE FALSE
                    TRUE  519  156
                    FALSE 428 15522

$`level 9`$waldman.miscellaneous
$`level 9`$waldman.miscellaneous$p.value
waldman.miscellaneous
1.26057e-13

$`level 9`$waldman.miscellaneous$enrichTab
Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
                    TRUE  380  295
                    FALSE  64 15886

$`level 9`$waldman.Vogelstein
$`level 9`$waldman.Vogelstein$p.value
waldman.Vogelstein
0.01984861

$`level 9`$waldman.Vogelstein$enrichTab
Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
                    TRUE  397  278
                    FALSE 243 15707

```



```

$`level 10`
$`level 10`$sanger.atlas
$`level 10`$sanger.atlas$p.value
sanger.atlas
4.930717e-06
17

$`level 10`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
      TRUE      328      54
      FALSE     310 12433

$`level 10`$Vogelstein.atlas
$`level 10`$Vogelstein.atlas$p.value
Vogelstein.atlas
5.243004e-11

$`level 10`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
      TRUE      360      77
      FALSE     278 12410

$`level 10`$Vogelstein.sanger
$`level 10`$Vogelstein.sanger$p.value
Vogelstein.sanger
9.549371e-163

$`level 10`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      361      76
      FALSE      21 12667

$`level 10`$waldman.atlas
$`level 10`$waldman.atlas$p.value
waldman.atlas
0.0001577348

$`level 10`$waldman.atlas$enrichTab
      Enriched in atlas
Enriched in waldman  TRUE FALSE
      TRUE      341     105
      FALSE     297 12382

$`level 10`$waldman.miscellaneous

```

```
$`level 10`$waldman.miscellaneous$p.value
waldman.miscellaneous
1.646044e-06
```

18

```
18 $`level 10`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
      TRUE      243    203
      FALSE      46 12633
```

```
*****
d0 = 0.2857
*****
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.606843e-18
```

```
$`level 3`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      37     4
      FALSE     0   472
```

```
$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
9.885878e-25
```

```
$`level 4`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      214    46
      FALSE      13 3494
```

```
$`level 5`
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
2.837001e-72
```

```
$`level 5`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
```

TRUE	514	93
FALSE	34	9647

19

19

```
$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger
6.093331e-71

$`level 6`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
TRUE      693    146
FALSE     55 15787
```

```
$`level 7`
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.244791e-89

$`level 7`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
TRUE      739    152
FALSE     45 18519
```

```
$`level 8`
$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
5.32969e-81

$`level 8`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
TRUE      675    137
FALSE     44 18146
```

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
```

Vogelstein.sanger
1.642817e-63

20

```
20 $`level 9`$Vogelstein.sanger$enrichTab
    Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                     TRUE   529   111
                     FALSE   31 15954
```

```
$`level 10`
$`level 10`$Vogelstein.sanger
$`level 10`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.792315e-43
```

```
$`level 10`$Vogelstein.sanger$enrichTab
    Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                     TRUE   361   76
                     FALSE   21 12667
```

Bootstrap test results. BP ontology

22

d0 = 0.4444

22 > # In BP ontology, all detected equivalencies seem very reliable:
> boot.signifPvals_d0_0.4444\$BP

\$`level 3`

\$`level 3`\$sanger.atlas

\$`level 3`\$sanger.atlas\$p.value

sanger.atlas

0.04479552

\$`level 3`\$sanger.atlas\$enrichTab

Enriched in atlas

Enriched in sanger TRUE FALSE

TRUE	37	0
------	----	---

FALSE	29	447
-------	----	-----

\$`level 3`\$sanger.atlas\$nboot

[1] 10000

\$`level 3`\$sanger.miscellaneous

\$`level 3`\$sanger.miscellaneous\$p.value

sanger.miscellaneous

0.03449655

\$`level 3`\$sanger.miscellaneous\$enrichTab

Enriched in miscellaneous

Enriched in sanger TRUE FALSE

TRUE	28	9
------	----	---

FALSE	8	468
-------	---	-----

\$`level 3`\$sanger.miscellaneous\$nboot

[1] 10000

\$`level 3`\$Vogelstein.atlas

\$`level 3`\$Vogelstein.atlas\$p.value

Vogelstein.atlas

0.0179982

\$`level 3`\$Vogelstein.atlas\$enrichTab

Enriched in atlas

Enriched in Vogelstein TRUE FALSE

TRUE	40	1
------	----	---

FALSE	26	446
-------	----	-----

\$`level 3`\$Vogelstein.atlas\$nboot

[1] 10000

```
$`level 3`$Vogelstein.miscellaneous
$`level 3`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
      0.0179982
```

23

```
$`level 3`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
      TRUE      30      11
      FALSE      6     466
```

```
$`level 3`$Vogelstein.miscellaneous$nboot
[1] 10000
```

```
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00213458
```

```
$`level 3`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      37      4
      FALSE      0     472
```

```
$`level 3`$Vogelstein.sanger$nboot
[1] 9837
```

```
$`level 3`$waldman.atlas
$`level 3`$waldman.atlas$p.value
waldman.atlas
      0.01329867
```

```
$`level 3`$waldman.atlas$enrichTab
      Enriched in atlas
Enriched in waldman TRUE FALSE
      TRUE      44      9
      FALSE     22     438
```

```
$`level 3`$waldman.atlas$nboot
[1] 10000
```

```
$`level 3`$waldman.miscellaneous
$`level 3`$waldman.miscellaneous$p.value
waldman.miscellaneous
      0.0059994
```

```

$`level 3`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman TRUE FALSE
24      TRUE      36      17
      FALSE      0     460

```

```

$`level 3`$waldman.miscellaneous$nboot
[1] 10000

```

```

$`level 3`$waldman.Vogelstein
$`level 3`$waldman.Vogelstein$p.value
waldman.Vogelstein
0.03359664

```

```

$`level 3`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE      35      18
      FALSE      6     454

```

```

$`level 3`$waldman.Vogelstein$nboot
[1] 10000

```

```

$`level 4`
$`level 4`$miscellaneous.atlas
$`level 4`$miscellaneous.atlas$p.value
miscellaneous.atlas
0.01689831

```

```

$`level 4`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE      189      26
      FALSE     197     3355

```

```

$`level 4`$miscellaneous.atlas$nboot
[1] 10000

```

```

$`level 4`$sanger.atlas
$`level 4`$sanger.atlas$p.value
sanger.atlas
0.00209979

```

```

$`level 4`$sanger.atlas$enrichTab
      Enriched in atlas

```



```
Enriched in sanger TRUE FALSE
      TRUE    202    25
      FALSE   184   3356
```

25

```
$`level 4`$sanger.atlas$nboot
[1] 10000
```

25

```
$`level 4`$sanger.miscellaneous
$`level 4`$sanger.miscellaneous$p.value
sanger.miscellaneous
      0.00209979
```

```
$`level 4`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger TRUE FALSE
      TRUE    147    80
      FALSE    68   3472
```

```
$`level 4`$sanger.miscellaneous$nboot
[1] 10000
```

```
$`level 4`$Vogelstein.atlas
$`level 4`$Vogelstein.atlas$p.value
Vogelstein.atlas
      0.00209979
```

```
$`level 4`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
      TRUE    221    39
      FALSE   165   3342
```

```
$`level 4`$Vogelstein.atlas$nboot
[1] 10000
```

```
$`level 4`$Vogelstein.miscellaneous
$`level 4`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
      0.03839616
```

```
$`level 4`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
      TRUE    150   110
      FALSE    65   3442
```

```
$`level 4`$Vogelstein.miscellaneous$nboot
```

```

26 $`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.00209979

$`level 4`$Vogelstein.sanger$enrichTab
                Enriched in sanger
Enriched in Vogelstein TRUE FALSE
                TRUE    214    46
                FALSE    13   3494

$`level 4`$Vogelstein.sanger$nboot
[1] 10000

$`level 4`$waldman.atlas
$`level 4`$waldman.atlas$p.value
waldman.atlas
    0.00209979

$`level 4`$waldman.atlas$enrichTab
                Enriched in atlas
Enriched in waldman TRUE FALSE
                TRUE    248    67
                FALSE   138   3314

$`level 4`$waldman.atlas$nboot
[1] 10000

$`level 4`$waldman.miscellaneous
$`level 4`$waldman.miscellaneous$p.value
waldman.miscellaneous
    0.00209979

$`level 4`$waldman.miscellaneous$enrichTab
                Enriched in miscellaneous
Enriched in waldman TRUE FALSE
                TRUE    203   112
                FALSE    12   3440

$`level 4`$waldman.miscellaneous$nboot
[1] 10000

$`level 4`$waldman.sanger
$`level 4`$waldman.sanger$p.value

```

waldman.sanger
0.00209979

27

```
$`level 4`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman TRUE FALSE
      TRUE   178   137
      FALSE   49  3403
```

27

```
$`level 4`$waldman.sanger$nboot
[1] 10000
```

```
$`level 4`$waldman.Vogelstein
$`level 4`$waldman.Vogelstein$p.value
waldman.Vogelstein
0.00209979
```

```
$`level 4`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE   193   122
      FALSE   67  3385
```

```
$`level 4`$waldman.Vogelstein$nboot
[1] 10000
```

```
$`level 5`
$`level 5`$miscellaneous.atlas
$`level 5`$miscellaneous.atlas$p.value
miscellaneous.atlas
0.00209979
```

```
$`level 5`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE   453    54
      FALSE  485  9296
```

```
$`level 5`$miscellaneous.atlas$nboot
[1] 10000
```

```
$`level 5`$sanger.atlas
$`level 5`$sanger.atlas$p.value
sanger.atlas
0.00209979
```

28

```

$`level 5`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger TRUE FALSE
      TRUE   489    59
      FALSE  449   9291

$`level 5`$sanger.atlas$nboot
[1] 10000

$`level 5`$sanger.miscellaneous
$`level 5`$sanger.miscellaneous$p.value
sanger.miscellaneous
      0.00209979

$`level 5`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger TRUE FALSE
      TRUE   352   196
      FALSE  155  9585

$`level 5`$sanger.miscellaneous$nboot
[1] 10000

$`level 5`$Vogelstein.atlas
$`level 5`$Vogelstein.atlas$p.value
Vogelstein.atlas
      0.00209979

$`level 5`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
      TRUE   529    78
      FALSE  409   9272

$`level 5`$Vogelstein.atlas$nboot
[1] 10000

$`level 5`$Vogelstein.miscellaneous
$`level 5`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
      0.00209979

$`level 5`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
      TRUE   365   242
      FALSE  142  9539

```

```
$`level 5`$Vogelstein.miscellaneous$nboot
[1] 10000
```

```
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.00209979
```

```
$`level 5`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE    514    93
      FALSE    34   9647
```

```
$`level 5`$Vogelstein.sanger$nboot
[1] 10000
```

```
$`level 5`$waldman.atlas
$`level 5`$waldman.atlas$p.value
waldman.atlas
0.00209979
```

```
$`level 5`$waldman.atlas$enrichTab
      Enriched in atlas
Enriched in waldman TRUE FALSE
      TRUE    616   139
      FALSE   322  9211
```

```
$`level 5`$waldman.atlas$nboot
[1] 10000
```

```
$`level 5`$waldman.miscellaneous
$`level 5`$waldman.miscellaneous$p.value
waldman.miscellaneous
0.00209979
```

```
$`level 5`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman TRUE FALSE
      TRUE    470   285
      FALSE    37  9496
```

```
$`level 5`$waldman.miscellaneous$nboot
[1] 10000
```

```

$`level 5`$waldman.sanger
$`level 5`$waldman.sanger$p.value
waldman.sanger
0.00209979
30

$`level 5`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman TRUE FALSE
      TRUE   436   319
      FALSE  112  9421

$`level 5`$waldman.sanger$nboot
[1] 10000

$`level 5`$waldman.Vogelstein
$`level 5`$waldman.Vogelstein$p.value
waldman.Vogelstein
0.00209979

$`level 5`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman TRUE FALSE
      TRUE   470   285
      FALSE  137  9396

$`level 5`$waldman.Vogelstein$nboot
[1] 10000

$`level 6`
$`level 6`$miscellaneous.atlas
$`level 6`$miscellaneous.atlas$p.value
miscellaneous.atlas
0.0059994

$`level 6`$miscellaneous.atlas$enrichTab
      Enriched in atlas
Enriched in miscellaneous TRUE FALSE
      TRUE   615   75
      FALSE  747 15244

$`level 6`$miscellaneous.atlas$nboot
[1] 10000

$`level 6`$sanger.atlas
$`level 6`$sanger.atlas$p.value
sanger.atlas

```

0.00209979

31

```
$`level 6`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
                  TRUE   674   74
                  FALSE  688 15245
```

31

```
$`level 6`$sanger.atlas$nboot
[1] 10000
```

```
$`level 6`$sanger.miscellaneous
$`level 6`$sanger.miscellaneous$p.value
sanger.miscellaneous
0.00209979
```

```
$`level 6`$sanger.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in sanger  TRUE FALSE
                  TRUE   459   289
                  FALSE  231 15702
```

```
$`level 6`$sanger.miscellaneous$nboot
[1] 10000
```

```
$`level 6`$Vogelstein.atlas
$`level 6`$Vogelstein.atlas$p.value
Vogelstein.atlas
0.00209979
```

```
$`level 6`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein TRUE FALSE
                  TRUE   739   100
                  FALSE  623 15219
```

```
$`level 6`$Vogelstein.atlas$nboot
[1] 10000
```

```
$`level 6`$Vogelstein.miscellaneous
$`level 6`$Vogelstein.miscellaneous$p.value
Vogelstein.miscellaneous
0.00209979
```

```
$`level 6`$Vogelstein.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in Vogelstein TRUE FALSE
```

TRUE	481	358
FALSE	209	15633

32

32 \$`level 6`\$Vogelstein.miscellaneous\$boot
[1] 10000

\$`level 6`\$Vogelstein.sanger
\$`level 6`\$Vogelstein.sanger\$p.value
Vogelstein.sanger
0.00209979

\$`level 6`\$Vogelstein.sanger\$enrichTab
Enriched in sanger
Enriched in Vogelstein TRUE FALSE
TRUE 693 146
FALSE 55 15787

\$`level 6`\$Vogelstein.sanger\$boot
[1] 10000

\$`level 6`\$waldman.atlas
\$`level 6`\$waldman.atlas\$p.value
waldman.atlas
0.00209979

\$`level 6`\$waldman.atlas\$enrichTab
Enriched in atlas
Enriched in waldman TRUE FALSE
TRUE 832 185
FALSE 530 15134

\$`level 6`\$waldman.atlas\$boot
[1] 10000

\$`level 6`\$waldman.miscellaneous
\$`level 6`\$waldman.miscellaneous\$p.value
waldman.miscellaneous
0.00209979

\$`level 6`\$waldman.miscellaneous\$enrichTab
Enriched in miscellaneous
Enriched in waldman TRUE FALSE
TRUE 616 401
FALSE 74 15590

\$`level 6`\$waldman.miscellaneous\$boot
[1] 10000


```
$`level 6`$waldman.sanger
$`level 6`$waldman.sanger$p.value
waldman.sanger
0.00209979
```

33

```
$`level 6`$waldman.sanger$enrichTab
      Enriched in sanger
Enriched in waldman  TRUE FALSE
      TRUE      563    454
      FALSE     185 15479
```

```
$`level 6`$waldman.sanger$nboot
[1] 10000
```

```
$`level 6`$waldman.Vogelstein
$`level 6`$waldman.Vogelstein$p.value
waldman.Vogelstein
0.00209979
```

```
$`level 6`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
      TRUE      608    409
      FALSE     231 15433
```

```
$`level 6`$waldman.Vogelstein$nboot
[1] 10000
```

```
$`level 7`
$`level 7`$sanger.atlas
$`level 7`$sanger.atlas$p.value
sanger.atlas
0.00209979
```

```
$`level 7`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
      TRUE      695    89
      FALSE     722 17949
```

```
$`level 7`$sanger.atlas$nboot
[1] 10000
```

```
$`level 7`$sanger.miscellaneous
```

```
$`level 7`$sanger.miscellaneous$p.value  
sanger.miscellaneous  
0.00209979
```

34

```
34 $`level 7`$sanger.miscellaneous$enrichTab  
      Enriched in miscellaneous  
Enriched in sanger  TRUE FALSE  
      TRUE      452   332  
      FALSE     226 18445
```

```
$`level 7`$sanger.miscellaneous$nboot  
[1] 10000
```

```
$`level 7`$Vogelstein.atlas  
$`level 7`$Vogelstein.atlas$p.value  
Vogelstein.atlas  
0.00209979
```

```
$`level 7`$Vogelstein.atlas$enrichTab  
      Enriched in atlas  
Enriched in Vogelstein  TRUE FALSE  
      TRUE      776   115  
      FALSE     641 17923
```

```
$`level 7`$Vogelstein.atlas$nboot  
[1] 10000
```

```
$`level 7`$Vogelstein.miscellaneous  
$`level 7`$Vogelstein.miscellaneous$p.value  
Vogelstein.miscellaneous  
0.00259974
```

```
$`level 7`$Vogelstein.miscellaneous$enrichTab  
      Enriched in miscellaneous  
Enriched in Vogelstein  TRUE FALSE  
      TRUE      480   411  
      FALSE     198 18366
```

```
$`level 7`$Vogelstein.miscellaneous$nboot  
[1] 10000
```

```
$`level 7`$Vogelstein.sanger  
$`level 7`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
0.00209979
```

```
$`level 7`$Vogelstein.sanger$enrichTab
```

```

                                Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                                TRUE   739   152
                                FALSE   45 18519
35
35

$`level 7`$Vogelstein.sanger$nboot
[1] 10000

$`level 7`$waldman.atlas
$`level 7`$waldman.atlas$p.value
waldman.atlas
0.00209979

$`level 7`$waldman.atlas$enrichTab
                                Enriched in atlas
Enriched in waldman  TRUE FALSE
                                TRUE   815   201
                                FALSE  602 17837

$`level 7`$waldman.atlas$nboot
[1] 10000

$`level 7`$waldman.miscellaneous
$`level 7`$waldman.miscellaneous$p.value
waldman.miscellaneous
0.00209979

$`level 7`$waldman.miscellaneous$enrichTab
                                Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
                                TRUE   593   423
                                FALSE   85 18354

$`level 7`$waldman.miscellaneous$nboot
[1] 10000

$`level 7`$waldman.sanger
$`level 7`$waldman.sanger$p.value
waldman.sanger
0.00209979

$`level 7`$waldman.sanger$enrichTab
                                Enriched in sanger
Enriched in waldman  TRUE FALSE
                                TRUE   564   452
                                FALSE  220 18219

```

```
$`level 7`$waldman.sanger$nboot  
[1] 10000
```

36

```
36 $`level 7`$waldman.Vogelstein  
$`level 7`$waldman.Vogelstein$p.value  
waldman.Vogelstein  
0.00209979  
  
$`level 7`$waldman.Vogelstein$enrichTab  
Enriched in Vogelstein  
Enriched in waldman TRUE FALSE  
TRUE 612 404  
FALSE 279 18160  
  
$`level 7`$waldman.Vogelstein$nboot  
[1] 10000
```

```
$`level 8`  
$`level 8`$sanger.atlas  
$`level 8`$sanger.atlas$p.value  
sanger.atlas  
0.00209979
```

```
$`level 8`$sanger.atlas$enrichTab  
Enriched in atlas  
Enriched in sanger TRUE FALSE  
TRUE 629 90  
FALSE 605 17678
```

```
$`level 8`$sanger.atlas$nboot  
[1] 10000
```

```
$`level 8`$Vogelstein.atlas  
$`level 8`$Vogelstein.atlas$p.value  
Vogelstein.atlas  
0.00209979
```

```
$`level 8`$Vogelstein.atlas$enrichTab  
Enriched in atlas  
Enriched in Vogelstein TRUE FALSE  
TRUE 694 118  
FALSE 540 17650
```

```
$`level 8`$Vogelstein.atlas$nboot  
[1] 10000
```

```
$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.00209979
```

37

```
$`level 8`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
TRUE      675    137
FALSE     44 18146
```

```
$`level 8`$Vogelstein.sanger$nboot
[1] 10000
```

```
$`level 8`$waldman.atlas
$`level 8`$waldman.atlas$p.value
waldman.atlas
0.00209979
```

```
$`level 8`$waldman.atlas$enrichTab
Enriched in atlas
Enriched in waldman  TRUE FALSE
TRUE      692    195
FALSE     542 17573
```

```
$`level 8`$waldman.atlas$nboot
[1] 10000
```

```
$`level 8`$waldman.miscellaneous
$`level 8`$waldman.miscellaneous$p.value
waldman.miscellaneous
0.00209979
```

```
$`level 8`$waldman.miscellaneous$enrichTab
Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
TRUE      502    385
FALSE     79 18036
```

```
$`level 8`$waldman.miscellaneous$nboot
[1] 10000
```

```
$`level 8`$waldman.sanger
$`level 8`$waldman.sanger$p.value
waldman.sanger
0.0119988
```

```

$`level 8`$waldman.sanger$enrichTab
      Enriched in sanger
38 Enriched in waldman  TRUE FALSE
      TRUE      488    399
      FALSE     231 17884

$`level 8`$waldman.sanger$nboot
[1] 10000

$`level 8`$waldman.Vogelstein
$`level 8`$waldman.Vogelstein$p.value
waldman.Vogelstein
      0.00209979

$`level 8`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
      TRUE      528    359
      FALSE     284 17831

$`level 8`$waldman.Vogelstein$nboot
[1] 10000

$`level 9`
$`level 9`$sanger.atlas
$`level 9`$sanger.atlas$p.value
sanger.atlas
      0.00209979

$`level 9`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
      TRUE      485     75
      FALSE     462 15603

$`level 9`$sanger.atlas$nboot
[1] 10000

$`level 9`$Vogelstein.atlas
$`level 9`$Vogelstein.atlas$p.value
Vogelstein.atlas
      0.00209979

$`level 9`$Vogelstein.atlas$enrichTab
      Enriched in atlas

```

```

Enriched in Vogelstein  TRUE FALSE
                        TRUE  535  105
                        FALSE 412 15573

```

39

```

$`level 9`$Vogelstein.atlas$nboot
[1] 10000

```

39

```

$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.00209979

```

```

$`level 9`$Vogelstein.sanger$enrichTab
                        Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
                        TRUE  529  111
                        FALSE  31 15954

```

```

$`level 9`$Vogelstein.sanger$nboot
[1] 10000

```

```

$`level 9`$waldman.atlas
$`level 9`$waldman.atlas$p.value
waldman.atlas
0.00209979

```

```

$`level 9`$waldman.atlas$enrichTab
                        Enriched in atlas
Enriched in waldman    TRUE FALSE
                        TRUE  519  156
                        FALSE 428 15522

```

```

$`level 9`$waldman.atlas$nboot
[1] 10000

```

```

$`level 9`$waldman.miscellaneous
$`level 9`$waldman.miscellaneous$p.value
waldman.miscellaneous
0.00209979

```

```

$`level 9`$waldman.miscellaneous$enrichTab
                        Enriched in miscellaneous
Enriched in waldman    TRUE FALSE
                        TRUE  380  295
                        FALSE  64 15886

```

```

$`level 9`$waldman.miscellaneous$nboot

```

[1] 10000

40

```
$`level 9`$waldman.Vogelstein
40 $`level 9`$waldman.Vogelstein$p.value
waldman.Vogelstein
      0.0319968

$`level 9`$waldman.Vogelstein$enrichTab
      Enriched in Vogelstein
Enriched in waldman  TRUE FALSE
      TRUE      397    278
      FALSE     243 15707

$`level 9`$waldman.Vogelstein$nboot
[1] 10000
```

```
$`level 10`
$`level 10`$sanger.atlas
$`level 10`$sanger.atlas$p.value
sanger.atlas
      0.00209979
```

```
$`level 10`$sanger.atlas$enrichTab
      Enriched in atlas
Enriched in sanger  TRUE FALSE
      TRUE      328    54
      FALSE     310 12433
```

```
$`level 10`$sanger.atlas$nboot
[1] 10000
```

```
$`level 10`$Vogelstein.atlas
$`level 10`$Vogelstein.atlas$p.value
Vogelstein.atlas
      0.00209979
```

```
$`level 10`$Vogelstein.atlas$enrichTab
      Enriched in atlas
Enriched in Vogelstein  TRUE FALSE
      TRUE      360    77
      FALSE     278 12410
```

```
$`level 10`$Vogelstein.atlas$nboot
[1] 10000
```



```
$`level 10`$Vogelstein.sanger
$`level 10`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.00209979
```

41

41

```
$`level 10`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
      TRUE      361      76
      FALSE      21 12667
```

```
$`level 10`$Vogelstein.sanger$nboot
[1] 10000
```

```
$`level 10`$waldman.atlas
$`level 10`$waldman.atlas$p.value
waldman.atlas
0.00209979
```

```
$`level 10`$waldman.atlas$enrichTab
      Enriched in atlas
Enriched in waldman  TRUE FALSE
      TRUE      341     105
      FALSE      297 12382
```

```
$`level 10`$waldman.atlas$nboot
[1] 10000
```

```
$`level 10`$waldman.miscellaneous
$`level 10`$waldman.miscellaneous$p.value
waldman.miscellaneous
0.00209979
```

```
$`level 10`$waldman.miscellaneous$enrichTab
      Enriched in miscellaneous
Enriched in waldman  TRUE FALSE
      TRUE      243     203
      FALSE      46 12633
```

```
$`level 10`$waldman.miscellaneous$nboot
[1] 10000
```

```

*****
d0 = 0.2857
*****
42 > boot.signifPvals_d0_0.2857$BP
$`level 3`
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.002138493

$`level 3`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      37      4
              FALSE      0     472

$`level 3`$Vogelstein.sanger$nboot
[1] 9819

$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00209979

$`level 4`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     214     46
              FALSE     13   3494

$`level 4`$Vogelstein.sanger$nboot
[1] 10000

$`level 5`
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00209979

$`level 5`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     514     93
              FALSE     34   9647

```

```
$`level 5`$Vogelstein.sanger$nboot  
[1] 10000
```

43

43

```
$`level 6`  
$`level 6`$Vogelstein.sanger  
$`level 6`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
0.00209979
```

```
$`level 6`$Vogelstein.sanger$enrichTab  
Enriched in sanger  
Enriched in Vogelstein TRUE FALSE  
TRUE 693 146  
FALSE 55 15787
```

```
$`level 6`$Vogelstein.sanger$nboot  
[1] 10000
```

```
$`level 7`  
$`level 7`$Vogelstein.sanger  
$`level 7`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
0.00209979
```

```
$`level 7`$Vogelstein.sanger$enrichTab  
Enriched in sanger  
Enriched in Vogelstein TRUE FALSE  
TRUE 739 152  
FALSE 45 18519
```

```
$`level 7`$Vogelstein.sanger$nboot  
[1] 10000
```

```
$`level 8`  
$`level 8`$Vogelstein.sanger  
$`level 8`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
0.00209979
```

```
$`level 8`$Vogelstein.sanger$enrichTab  
Enriched in sanger  
Enriched in Vogelstein TRUE FALSE  
TRUE 675 137  
FALSE 44 18146
```

```
$`level 8`$Vogelstein.sanger$nboot
[1] 10000
```

44

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00209979
```

```
$`level 9`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
              TRUE      529    111
              FALSE      31 15954
```

```
$`level 9`$Vogelstein.sanger$nboot
[1] 10000
```

```
$`level 10`
$`level 10`$Vogelstein.sanger
$`level 10`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00209979
```

```
$`level 10`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein  TRUE FALSE
              TRUE      361     76
              FALSE      21 12667
```

```
$`level 10`$Vogelstein.sanger$nboot
[1] 10000
```

Asymptotic normal test results. CC ontology

```

*****
d0 = 0.4444
*****
46 > signifPvals_d0_0.4444$CC
$`level 3`
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
      3.195304e-05

$`level 3`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      9      0
              FALSE     2    779

$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
      3.343399e-13

$`level 4`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     17      1
              FALSE     2   1417

$`level 5`
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
      2.867313e-07

$`level 5`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     13      0
              FALSE     3   2163

$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger

```

2.89865e-25

47

```
$`level 6`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      13      1
      FALSE      0 2250
```

47

```
$`level 7`
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
5.170968e-10
```

```
$`level 7`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      15      2
      FALSE      1 2008
```

```
$`level 8`
$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.009967e-29
```

```
$`level 8`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      20      1
      FALSE      1 1755
```

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
3.195304e-05
```

```
$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      9      0
      FALSE      2 1328
```

```

$`level 10`
named list()

*****
d0 = 0.2857
*****
> signifPvals_d0_0.2857$CC
$`level 3`
named list()

$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.0002009146

$`level 4`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE    17      1
              FALSE     2   1417

$`level 5`
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.03119347

$`level 5`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     13      0
              FALSE     3   2163

$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger
    9.988948e-10

$`level 6`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE     13      1

```


FALSE 0 2250

49

49

```
$`level 7`  
$`level 7`$Vogelstein.sanger  
$`level 7`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
0.003069937  
  
$`level 7`$Vogelstein.sanger$enrichTab  
Enriched in sanger  
Enriched in Vogelstein TRUE FALSE  
TRUE 15 2  
FALSE 1 2008
```

```
$`level 8`  
$`level 8`$Vogelstein.sanger  
$`level 8`$Vogelstein.sanger$p.value  
Vogelstein.sanger  
4.866382e-11  
  
$`level 8`$Vogelstein.sanger$enrichTab  
Enriched in sanger  
Enriched in Vogelstein TRUE FALSE  
TRUE 20 1  
FALSE 1 1755
```

```
$`level 9`  
named list()
```

```
$`level 10`  
named list()
```

Bootstrap test results. CC ontology

51

d0 = 0.4444

> boot.signifPvals_d0_0.4444\$CC\$`level 3`

51

\$`level 3`\$Vogelstein.sanger

\$`level 3`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

0.00242915

\$`level 3`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	9	0
------	---	---

FALSE	2	779
-------	---	-----

\$`level 3`\$Vogelstein.sanger\$nboot

[1] 8644

\$`level 4`

\$`level 4`\$Vogelstein.sanger

\$`level 4`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

0.002209596

\$`level 4`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	17	1
------	----	---

FALSE	2	1417
-------	---	------

\$`level 4`\$Vogelstein.sanger\$nboot

[1] 9503

\$`level 5`

\$`level 5`\$Vogelstein.sanger

\$`level 5`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

0.002208202

\$`level 5`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	13	0
------	----	---

FALSE	3	2163
-------	---	------

\$`level 5`\$Vogelstein.sanger\$nboot

```

52 $`level 6`
    $`level 6`$Vogelstein.sanger
    $`level 6`$Vogelstein.sanger$p.value
    Vogelstein.sanger
        0.003331747

    $`level 6`$Vogelstein.sanger$enrichTab
                                Enriched in sanger
    Enriched in Vogelstein TRUE FALSE
                        TRUE    13    1
                        FALSE    0 2250

    $`level 6`$Vogelstein.sanger$nboot
    [1] 6302


    $`level 7`
    $`level 7`$Vogelstein.sanger
    $`level 7`$Vogelstein.sanger$p.value
    Vogelstein.sanger
        0.002212856

    $`level 7`$Vogelstein.sanger$enrichTab
                                Enriched in sanger
    Enriched in Vogelstein TRUE FALSE
                        TRUE    15    2
                        FALSE    1 2008

    $`level 7`$Vogelstein.sanger$nboot
    [1] 9489


    $`level 8`
    $`level 8`$Vogelstein.sanger
    $`level 8`$Vogelstein.sanger$p.value
    Vogelstein.sanger
        0.002437043

    $`level 8`$Vogelstein.sanger$enrichTab
                                Enriched in sanger
    Enriched in Vogelstein TRUE FALSE
                        TRUE    20    1
                        FALSE    1 1755

```

```
$`level 8`$Vogelstein.sanger$boot
[1] 8616
```

53

53

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.00242915

$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      9      0
      FALSE     2 1328
```

```
$`level 9`$Vogelstein.sanger$boot
[1] 8644
```

```
$`level 10`
named list()
```

```
*****
d0 = 0.2857
*****
> boot.signifPvals_d0_0.2857$CC
$`level 3`
$`level 3`$Vogelstein.sanger
$`level 3`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.01452115
```

```
$`level 3`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      9      0
      FALSE     2  779
```

```
$`level 3`$Vogelstein.sanger$boot
[1] 8676
```

```
$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
```

```
Vogelstein.sanger
0.004420122
```

54

```
54 $`level 4`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      17      1
      FALSE      2 1417
```

```
$`level 4`$Vogelstein.sanger$nboot
[1] 9501
```

```
$`level 5`
named list()
```

```
$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.003277154
```

```
$`level 6`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      13      1
      FALSE      0 2250
```

```
$`level 6`$Vogelstein.sanger$nboot
[1] 6407
```

```
$`level 7`
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.0154428
```

```
$`level 7`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      15      2
      FALSE      1 2008
```

```
$`level 7`$Vogelstein.sanger$nboot
[1] 9518
```

```
$`level 8`
$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.002435912
```

55

```
$`level 8`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      20      1
      FALSE      1 1755
```

```
$`level 8`$Vogelstein.sanger$nboot
[1] 8620
```

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.03631543
```

```
$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE       9      0
      FALSE      2 1328
```

```
$`level 9`$Vogelstein.sanger$nboot
[1] 8673
```

```
$`level 10`
named list()
```

Asymptotic normal test results. MF ontology

57

d0 = 0.4444

> signifPvals_d0_0.4444\$MF

57

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$Vogelstein.sanger

\$`level 4`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

5.147625e-20

\$`level 4`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	24	4
------	----	---

FALSE	0	860
-------	---	-----

\$`level 5`

\$`level 5`\$Vogelstein.sanger

\$`level 5`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

6.154731e-14

\$`level 5`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	30	6
------	----	---

FALSE	2	2022
-------	---	------

\$`level 6`

\$`level 6`\$Vogelstein.sanger

\$`level 6`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

7.923295e-19

\$`level 6`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	20	2
------	----	---

FALSE	1	5370
-------	---	------

\$`level 7`

```

$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
58      9.521725e-24

$`level 7`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      18      1
      FALSE      1 2696

$`level 8`
$`level 8`$Vogelstein.sanger
$`level 8`$Vogelstein.sanger$p.value
Vogelstein.sanger
      0.02524444

$`level 8`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      8      0
      FALSE      3 1687

$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
      1.887799e-14

$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE     10      0
      FALSE      1  878

$`level 10`
named list()

```

59

d0 = 0.2857

> signifPvals_d0_0.2857\$MF

59

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$Vogelstein.sanger

\$`level 4`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

9.410644e-07

\$`level 4`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	24	4
------	----	---

FALSE	0	860
-------	---	-----

\$`level 5`

\$`level 5`\$Vogelstein.sanger

\$`level 5`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

0.0006242553

\$`level 5`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	30	6
------	----	---

FALSE	2	2022
-------	---	------

\$`level 6`

\$`level 6`\$Vogelstein.sanger

\$`level 6`\$Vogelstein.sanger\$p.value

Vogelstein.sanger

1.545194e-06

\$`level 6`\$Vogelstein.sanger\$enrichTab

Enriched in sanger

Enriched in Vogelstein TRUE FALSE

TRUE	20	2
------	----	---

FALSE	1	5370
-------	---	------

\$`level 7`

```

$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.027692e-08
60

$`level 7`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      18      1
      FALSE      1 2696

$`level 8`
named list()

$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
1.908352e-05

$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      10      0
      FALSE      1  878

$`level 10`
named list()

```

Bootstrap test results. MF ontology

```
*****
d0 = 0.4444
*****
```

62

```
62 > boot.signifPvals_d0_0.4444$MF
$`level 3`
named list()

$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.002137405

$`level 4`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      24      4
              FALSE      0    860

$`level 4`$Vogelstein.sanger$nboot
[1] 9824

$`level 5`
$`level 5`$Vogelstein.sanger
$`level 5`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.00419958

$`level 5`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      30      6
              FALSE      2   2022

$`level 5`$Vogelstein.sanger$nboot
[1] 10000

$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger
    0.002210526

$`level 6`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
```

TRUE	20	2
FALSE	1	5370

63

```
$`level 6`$Vogelstein.sanger$nboot
[1] 9499
```

63

```
$`level 7`
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.002428026
```

```
$`level 7`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein TRUE FALSE
TRUE 18 1
FALSE 1 2696
```

```
$`level 7`$Vogelstein.sanger$nboot
[1] 8648
```

```
$`level 8`
named list()
```

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.003321734
```

```
$`level 9`$Vogelstein.sanger$enrichTab
Enriched in sanger
Enriched in Vogelstein TRUE FALSE
TRUE 10 0
FALSE 1 878
```

```
$`level 9`$Vogelstein.sanger$nboot
[1] 6321
```

```
$`level 10`
named list()
```

```
*****
d0 = 0.2857
*****
```

64

```
64 > boot.signifPvals_d0_0.2857$MF
$`level 3`
named list()

$`level 4`
$`level 4`$Vogelstein.sanger
$`level 4`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.004277857

$`level 4`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      24      4
              FALSE      0    860

$`level 4`$Vogelstein.sanger$nboot
[1] 9817

$`level 5`
named list()

$`level 6`
$`level 6`$Vogelstein.sanger
$`level 6`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.002202643

$`level 6`$Vogelstein.sanger$enrichTab
              Enriched in sanger
Enriched in Vogelstein TRUE FALSE
              TRUE      20      2
              FALSE      1   5370

$`level 6`$Vogelstein.sanger$nboot
[1] 9533

$`level 7`
$`level 7`$Vogelstein.sanger
$`level 7`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.002429712
```



```
$`level 7`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      18      1
      FALSE     1 2696
```

65

65

```
$`level 7`$Vogelstein.sanger$nboot
[1] 8642
```

```
$`level 8`
named list()
```

```
$`level 9`
$`level 9`$Vogelstein.sanger
$`level 9`$Vogelstein.sanger$p.value
Vogelstein.sanger
0.003288958
```

```
$`level 9`$Vogelstein.sanger$enrichTab
      Enriched in sanger
Enriched in Vogelstein TRUE FALSE
      TRUE      10      0
      FALSE     1 878
```

```
$`level 9`$Vogelstein.sanger$nboot
[1] 6384
```

```
$`level 10`
named list()
```

2. KIDNEY REJECTION PBTs DATA

Asymptotic normal test results. BP ontology

67

d0 = 0.4444

signifPvals_d0_0.4444\$BP

67

\$`level 3`

\$`level 3`\$Rej_RATs.ABMR_RATs

\$`level 3`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.002424904

\$`level 3`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs TRUE FALSE

TRUE 10 3

FALSE 0 500

\$`level 4`

\$`level 4`\$Rej_RATs.ABMR_RATs

\$`level 4`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

1.090178e-22

\$`level 4`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs TRUE FALSE

TRUE 76 16

FALSE 11 3664

\$`level 4`\$Rej_RATs.GRIT3

\$`level 4`\$Rej_RATs.GRIT3\$p.value

Rej_RATs.GRIT3

1.9986e-05

\$`level 4`\$Rej_RATs.GRIT3\$enrichTab

Enriched in GRIT3

Enriched in Rej_RATs TRUE FALSE

TRUE 61 31

FALSE 10 3665

\$`level 5`

\$`level 5`\$GRIT3.GRIT2

\$`level 5`\$GRIT3.GRIT2\$p.value

GRIT3.GRIT2

0.004705732

```

$`level 5`$GRIT3.GRIT2$enrichTab
                                Enriched in GRIT2
Enriched in GRIT3  TRUE FALSE
68                TRUE    82   46
                   FALSE   28 10132

$`level 5`$LT3.LT1
$`level 5`$LT3.LT1$p.value
    LT3.LT1
0.001115614

$`level 5`$LT3.LT1$enrichTab
                                Enriched in LT1
Enriched in LT3  TRUE FALSE
                  TRUE    17    0
                  FALSE    7 10264

$`level 5`$Rej_RATs.ABMR_RATs
$`level 5`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
6.881163e-38

$`level 5`$Rej_RATs.ABMR_RATs$enrichTab
                                Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
                      TRUE   143   21
                      FALSE   34 10090

$`level 5`$Rej_RATs.GRIT3
$`level 5`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.0004962529

$`level 5`$Rej_RATs.GRIT3$enrichTab
                                Enriched in GRIT3
Enriched in Rej_RATs  TRUE FALSE
                      TRUE   101   63
                      FALSE   27 10097

$`level 6`
$`level 6`$LT3.LT1
$`level 6`$LT3.LT1$p.value
    LT3.LT1
2.461102e-07

```

```
$`level 6`$LT3.LT1$enrichTab
      Enriched in LT1
Enriched in LT3  TRUE FALSE
      TRUE      20      1
      FALSE     5 16655
```

69

69

```
$`level 6`$Rej_RATs.ABMR_RATs
$`level 6`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
      4.614298e-27
```

```
$`level 6`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      191      50
      FALSE     55 16385
```

```
$`level 6`$Rej_RATs.GRIT3
$`level 6`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
      8.085234e-06
```

```
$`level 6`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs  TRUE FALSE
      TRUE      145      96
      FALSE     34 16406
```

```
$`level 7`
$`level 7`$LT3.LT1
$`level 7`$LT3.LT1$p.value
      LT3.LT1
      0.000523515
```

```
$`level 7`$LT3.LT1$enrichTab
      Enriched in LT1
Enriched in LT3  TRUE FALSE
      TRUE      19      1
      FALSE     7 19428
```

```
$`level 7`$Rej_RATs.ABMR_RATs
$`level 7`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
      4.118312e-18
```

```

$`level 7`$Rej_RATs.ABMR_RATs$enrichTab
              Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
              TRUE      186    66
70                   FALSE    56 19147

```

```

$`level 7`$Rej_RATs.GRIT3
$`level 7`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.01326505

```

```

$`level 7`$Rej_RATs.GRIT3$enrichTab
              Enriched in GRIT3
Enriched in Rej_RATs  TRUE FALSE
              TRUE      139   113
                   FALSE    35 19168

```

```

$`level 8`
$`level 8`$LT3.LT1
$`level 8`$LT3.LT1$p.value
LT3.LT1
8.86918e-05

```

```

$`level 8`$LT3.LT1$enrichTab
              Enriched in LT1
Enriched in LT3  TRUE FALSE
              TRUE      17    0
                   FALSE    6 18979

```

```

$`level 8`$Rej_RATs.ABMR_RATs
$`level 8`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
8.066099e-11

```

```

$`level 8`$Rej_RATs.ABMR_RATs$enrichTab
              Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
              TRUE      150    62
                   FALSE    49 18741

```

```

$`level 9`
$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs

```

3.042761e-05

71

```
$`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      98    49
      FALSE     31 16447
```

71

```
$`level 10`
$`level 10`$LT3.LT1
$`level 10`$LT3.LT1$p.value
      LT3.LT1
0.002330402
```

```
$`level 10`$LT3.LT1$enrichTab
      Enriched in LT1
Enriched in LT3  TRUE FALSE
      TRUE      8     0
      FALSE     2 13115
```

```
$`level 10`$Rej_RATs.ABMR_RATs
$`level 10`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
0.002996326
```

```
$`level 10`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      59    34
      FALSE     13 13019
```

72

d0 = 0.2857

72 **signifPvals_d0_0.2857\$BP**

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$Rej_RATs.ABMR_RATs

\$`level 4`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.0001183324

\$`level 4`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs FALSE TRUE

FALSE 3664 11

TRUE 16 76

\$`level 5`

\$`level 5`\$Rej_RATs.ABMR_RATs

\$`level 5`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

3.072385e-07

\$`level 5`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs FALSE TRUE

FALSE 10090 34

TRUE 21 143

\$`level 6`

\$`level 6`\$Rej_RATs.ABMR_RATs

\$`level 6`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.02931452

\$`level 6`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs FALSE TRUE

FALSE 16385 55

TRUE 50 191

\$`level 7`

named list()	73
\$`level 8` named list()	73
\$`level 9` named list()	
\$`level 10` named list()	

Bootstrap test results. BP ontology

75

d0 = 0.4444

> boot.signifPvals_d0_0.4444\$BP

75

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$Rej_RATs.ABMR_RATs

\$`level 4`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.00909909

\$`level 4`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs TRUE FALSE

TRUE 76 16

FALSE 11 3664

\$`level 4`\$Rej_RATs.ABMR_RATs\$nboot

[1] 10000

\$`level 4`\$Rej_RATs.GRIT3

\$`level 4`\$Rej_RATs.GRIT3\$p.value

Rej_RATs.GRIT3

0.0179982

\$`level 4`\$Rej_RATs.GRIT3\$enrichTab

Enriched in GRIT3

Enriched in Rej_RATs TRUE FALSE

TRUE 61 31

FALSE 10 3665

\$`level 4`\$Rej_RATs.GRIT3\$nboot

[1] 10000

\$`level 5`

\$`level 5`\$GRIT3.GRIT2

\$`level 5`\$GRIT3.GRIT2\$p.value

GRIT3.GRIT2

0.01779822

\$`level 5`\$GRIT3.GRIT2\$enrichTab

Enriched in GRIT2

Enriched in GRIT3 TRUE FALSE

TRUE 82 46

FALSE 28 10132

```
$`level 5`$GRIT3.GRIT2$nboot
[1] 10000
```

76

```
$`level 5`$Rej_RATs.ABMR_RATs
$`level 5`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
0.00909909
```

```
$`level 5`$Rej_RATs.ABMR_RATs$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 143 21
FALSE 34 10090
```

```
$`level 5`$Rej_RATs.ABMR_RATs$nboot
[1] 10000
```

```
$`level 5`$Rej_RATs.GRIT3
$`level 5`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.00909909
```

```
$`level 5`$Rej_RATs.GRIT3$enrichTab
Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
TRUE 101 63
FALSE 27 10097
```

```
$`level 5`$Rej_RATs.GRIT3$nboot
[1] 10000
```

```
$`level 6`
$`level 6`$Rej_RATs.ABMR_RATs
$`level 6`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
0.00909909
```

```
$`level 6`$Rej_RATs.ABMR_RATs$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 191 50
FALSE 55 16385
```

```
$`level 6`$Rej_RATs.ABMR_RATs$nboot
[1] 10000
```

```
$`level 6`$Rej_RATs.GRIT3
$`level 6`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.00909909
```

77

```
$`level 6`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs  TRUE FALSE
      TRUE      145    96
      FALSE     34 16406
```

```
$`level 6`$Rej_RATs.GRIT3$nboot
[1] 10000
```

```
$`level 7`
$`level 7`$Rej_RATs.ABMR_RATs
$`level 7`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
0.00909909
```

```
$`level 7`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      186    66
      FALSE     56 19147
```

```
$`level 7`$Rej_RATs.ABMR_RATs$nboot
[1] 10000
```

```
$`level 7`$Rej_RATs.GRIT3
$`level 7`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.0359964
```

```
$`level 7`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs  TRUE FALSE
      TRUE      139   113
      FALSE     35 19168
```

```
$`level 7`$Rej_RATs.GRIT3$nboot
[1] 10000
```

```

$`level 8`
$`level 8`$Rej_RATs.ABMR_RATs
$`level 8`$Rej_RATs.ABMR_RATs$p.value
78 Rej_RATs.ABMR_RATs
    0.00909909

$`level 8`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      150     62
      FALSE     49 18741

$`level 8`$Rej_RATs.ABMR_RATs$nboot
[1] 10000

$`level 9`
$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.00909909

$`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      98     49
      FALSE     31 16447

$`level 9`$Rej_RATs.ABMR_RATs$nboot
[1] 10000

$`level 10`
$`level 10`$LT3.LT1
$`level 10`$LT3.LT1$p.value
    LT3.LT1
0.01054828

$`level 10`$LT3.LT1$enrichTab
      Enriched in LT1
Enriched in LT3  TRUE FALSE
      TRUE       8      0
      FALSE      2 13115

$`level 10`$LT3.LT1$nboot
[1] 8626

```

```

$`level 10`$Rej_RATs.ABMR_RATs
$`level 10`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.0359964
79

$`level 10`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs  TRUE FALSE
      TRUE      59      34
      FALSE     13 13019

$`level 10`$Rej_RATs.ABMR_RATs$nboot
[1] 10000
79

```

```

*****
d0 = 0.2857
*****
80 > boot.signifPvals_d0_0.2857$BP
$`level 3`
named list()

$`level 4`
$`level 4`$Rej_RATs.ABMR_RATs
$`level 4`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
      0.03639636

$`level 4`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      76      16
      FALSE     11    3664

$`level 4`$Rej_RATs.ABMR_RATs$nboot
[1] 10000

$`level 5`
$`level 5`$Rej_RATs.ABMR_RATs
$`level 5`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
      0.00909909

$`level 5`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE     143     21
      FALSE     34 10090

$`level 5`$Rej_RATs.ABMR_RATs$nboot
[1] 10000

$`level 6`
named list()

$`level 7`
named list()

$`level 8`
named list()

```


\$`level 9` named list()	81
\$`level 10` named list()	81

Asymptotic normal test results. CC ontology

83

d0 = 0.4444

signifPvals_d0_0.4444\$CC

83

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$LT3.LT1

\$`level 4`\$LT3.LT1\$p.value

LT3.LT1

2.713986e-08

\$`level 4`\$LT3.LT1\$enrichTab

Enriched in LT1

Enriched in LT3 TRUE FALSE

TRUE	8	0
------	---	---

FALSE	1	1428
-------	---	------

\$`level 5`

\$`level 5`\$LT3.LT1

\$`level 5`\$LT3.LT1\$p.value

LT3.LT1

0.0002466792

\$`level 5`\$LT3.LT1\$enrichTab

Enriched in LT1

Enriched in LT3 TRUE FALSE

TRUE	11	1
------	----	---

FALSE	2	2165
-------	---	------

\$`level 5`\$Rej_RATs.GRIT3

\$`level 5`\$Rej_RATs.GRIT3\$p.value

Rej_RATs.GRIT3

1.157676e-08

\$`level 5`\$Rej_RATs.GRIT3\$enrichTab

Enriched in GRIT3

Enriched in Rej_RATs TRUE FALSE

TRUE	17	1
------	----	---

FALSE	3	2158
-------	---	------

\$`level 6`

\$`level 6`\$GRIT3.ABMR_RATs

\$`level 6`\$GRIT3.ABMR_RATs\$p.value

GRIT3.ABMR_RATs
3.333228e-23

84

```
84 $`level 6`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      26      4
      FALSE      0 2234
```

```
$`level 6`$Rej_RATs.ABMR_RATs
$`level 6`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
4.034811e-16
```

```
$`level 6`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      25      4
      FALSE      1 2234
```

```
$`level 6`$Rej_RATs.GRIT3
$`level 6`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
3.665783e-38
```

```
$`level 6`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      28      1
      FALSE      2 2233
```

```
$`level 7`
$`level 7`$GRIT3.ABMR_RATs
$`level 7`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
2.82732e-27
```

```
$`level 7`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      24      3
      FALSE      0 1999
```

```
$`level 7`$Rej_RATs.ABMR_RATs
$`level 7`$Rej_RATs.ABMR_RATs$p.value
```

Rej_RATs.ABMR_RATs
1.324968e-17

85

\$`level 7`\$Rej_RATs.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 23 3
FALSE 1 1999

85

\$`level 7`\$Rej_RATs.GRIT3
\$`level 7`\$Rej_RATs.GRIT3\$p.value
Rej_RATs.GRIT3
6.213858e-107

\$`level 7`\$Rej_RATs.GRIT3\$enrichTab
Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
TRUE 26 0
FALSE 1 1999

\$`level 8`
\$`level 8`\$GRIT3.ABMR_RATs
\$`level 8`\$GRIT3.ABMR_RATs\$p.value
GRIT3.ABMR_RATs
1.925034e-68

\$`level 8`\$GRIT3.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
TRUE 21 1
FALSE 0 1755

\$`level 8`\$Rej_RATs.ABMR_RATs
\$`level 8`\$Rej_RATs.ABMR_RATs\$p.value
Rej_RATs.ABMR_RATs
1.925034e-68

\$`level 8`\$Rej_RATs.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 21 1
FALSE 0 1755

\$`level 9`

```

$`level 9`$GRIT3.ABMR_RATs
$`level 9`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
1.882757e-49
86

$`level 9`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      18      1
      FALSE      0 1320

$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
2.179661e-20

$`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      17      1
      FALSE      1 1320

$`level 9`$Rej_RATs.GRIT3
$`level 9`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
1.882757e-49

$`level 9`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      18      0
      FALSE      1 1320

$`level 10`
named list()

```

87

d0 = 0.2857

signifPvals_d0_0.2857\$CC

87

\$`level 3`

named list()

\$`level 4`

\$`level 4`\$LT3.LT1

\$`level 4`\$LT3.LT1\$p.value

LT3.LT1

0.0122681

\$`level 4`\$LT3.LT1\$enrichTab

Enriched in LT1

Enriched in LT3 TRUE FALSE

TRUE	8	0
------	---	---

FALSE	1	1428
-------	---	------

\$`level 5`

\$`level 5`\$Rej_RATs.GRIT3

\$`level 5`\$Rej_RATs.GRIT3\$p.value

Rej_RATs.GRIT3

0.03487338

\$`level 5`\$Rej_RATs.GRIT3\$enrichTab

Enriched in GRIT3

Enriched in Rej_RATs TRUE FALSE

TRUE	17	1
------	----	---

FALSE	3	2158
-------	---	------

\$`level 6`

\$`level 6`\$GRIT3.ABMR_RATs

\$`level 6`\$GRIT3.ABMR_RATs\$p.value

GRIT3.ABMR_RATs

1.500177e-07

\$`level 6`\$GRIT3.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in GRIT3 TRUE FALSE

TRUE	26	4
------	----	---

FALSE	0	2234
-------	---	------

\$`level 6`\$Rej_RATs.ABMR_RATs

\$`level 6`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs
9.960349e-05

88

88 \$`level 6`\$Rej_RATs.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 25 4
FALSE 1 2234

\$`level 6`\$Rej_RATs.GRIT3
\$`level 6`\$Rej_RATs.GRIT3\$p.value
Rej_RATs.GRIT3
1.483371e-13

\$`level 6`\$Rej_RATs.GRIT3\$enrichTab
Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
TRUE 28 1
FALSE 2 2233

\$`level 7`
\$`level 7`\$GRIT3.ABMR_RATs
\$`level 7`\$GRIT3.ABMR_RATs\$p.value
GRIT3.ABMR_RATs
2.30632e-09

\$`level 7`\$GRIT3.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
TRUE 24 3
FALSE 0 1999

\$`level 7`\$Rej_RATs.ABMR_RATs
\$`level 7`\$Rej_RATs.ABMR_RATs\$p.value
Rej_RATs.ABMR_RATs
1.837061e-05

\$`level 7`\$Rej_RATs.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 23 3
FALSE 1 1999

\$`level 7`\$Rej_RATs.GRIT3
\$`level 7`\$Rej_RATs.GRIT3\$p.value

Rej_RATs.GRIT3
3.760055e-42

89

\$`level 7`\$Rej_RATs.GRIT3\$enrichTab
Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
TRUE 26 0
FALSE 1 1999

89

\$`level 8`
\$`level 8`\$GRIT3.ABMR_RATs
\$`level 8`\$GRIT3.ABMR_RATs\$p.value
GRIT3.ABMR_RATs
1.256929e-26

\$`level 8`\$GRIT3.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
TRUE 21 1
FALSE 0 1755

\$`level 8`\$Rej_RATs.ABMR_RATs
\$`level 8`\$Rej_RATs.ABMR_RATs\$p.value
Rej_RATs.ABMR_RATs
1.256929e-26

\$`level 8`\$Rej_RATs.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
TRUE 21 1
FALSE 0 1755

\$`level 9`
\$`level 9`\$GRIT3.ABMR_RATs
\$`level 9`\$GRIT3.ABMR_RATs\$p.value
GRIT3.ABMR_RATs
5.316038e-19

\$`level 9`\$GRIT3.ABMR_RATs\$enrichTab
Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
TRUE 18 1
FALSE 0 1320

```

$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
4.985064e-07
90

$`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      17      1
      FALSE      1 1320

$`level 9`$Rej_RATs.GRIT3
$`level 9`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
5.316038e-19

$`level 9`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      18      0
      FALSE      1 1320

$`level 10`
named list()

```

Bootstrap test results. CC ontology

```
*****
```

92

```
d0 = 0.4444
```

```
*****
```

```
92 > boot.signifPvals_d0_0.4444$CC
```

```
$`level 3`
```

```
named list()
```

```
$`level 4`
```

```
$`level 4`$LT3.LT1
```

```
$`level 4`$LT3.LT1$p.value
```

```
LT3.LT1
```

```
0.01443299
```

```
$`level 4`$LT3.LT1$enrichTab
```

```
Enriched in LT1
```

```
Enriched in LT3 TRUE FALSE
```

```
TRUE      8      0
```

```
FALSE     1 1428
```

```
$`level 4`$LT3.LT1$nboot
```

```
[1] 6304
```

```
$`level 5`
```

```
$`level 5`$LT3.LT1
```

```
$`level 5`$LT3.LT1$p.value
```

```
LT3.LT1
```

```
0.01900137
```

```
$`level 5`$LT3.LT1$enrichTab
```

```
Enriched in LT1
```

```
Enriched in LT3 TRUE FALSE
```

```
TRUE     11      1
```

```
FALSE     2 2165
```

```
$`level 5`$LT3.LT1$nboot
```

```
[1] 9472
```

```
$`level 5`$Rej_RATs.GRIT3
```

```
$`level 5`$Rej_RATs.GRIT3$p.value
```

```
Rej_RATs.GRIT3
```

```
0.009280033
```

```
$`level 5`$Rej_RATs.GRIT3$enrichTab
```

```
Enriched in GRIT3
```

```
Enriched in Rej_RATs TRUE FALSE
```

```
TRUE     17      1
```

```
FALSE     3 2158
```

```
$`level 5`$Rej_RATs.GRIT3$nboot
[1] 9805
```

```
$`level 6`
$`level 6`$GRIT3.ABMR_RATs
$`level 6`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.009162304

$`level 6`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      26      4
      FALSE      0 2234
```

```
$`level 6`$GRIT3.ABMR_RATs$nboot
[1] 9827
```

```
$`level 6`$Rej_RATs.ABMR_RATs
$`level 6`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.009162304
```

```
$`level 6`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      25      4
      FALSE      1 2234
```

```
$`level 6`$Rej_RATs.ABMR_RATs$nboot
[1] 9931
```

```
$`level 6`$Rej_RATs.GRIT3
$`level 6`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
    0.009394131
```

```
$`level 6`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      28      1
      FALSE      2 2233
```

```
$`level 6`$Rej_RATs.GRIT3$nboot
[1] 9473
```

```

94 $`level 7`
$`level 7`$GRIT3.ABMR_RATs
$`level 7`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.009473684

$`level 7`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE     24     3
      FALSE     0 1999

$`level 7`$GRIT3.ABMR_RATs$nboot
[1] 9499

$`level 7`$Rej_RATs.ABMR_RATs
$`level 7`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.009245149

$`level 7`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE     23     3
      FALSE     1 1999

$`level 7`$Rej_RATs.ABMR_RATs$nboot
[1] 9842

$`level 7`$Rej_RATs.GRIT3
$`level 7`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
    0.01408228

$`level 7`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE     26     0
      FALSE     1 1999

$`level 7`$Rej_RATs.GRIT3$nboot
[1] 6319

```

```

$`level 8`
$`level 8`$GRIT3.ABMR_RATs
$`level 8`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.01440101

$`level 8`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      21      1
      FALSE      0 1755

$`level 8`$GRIT3.ABMR_RATs$nboot
[1] 6285

$`level 8`$Rej_RATs.ABMR_RATs
$`level 8`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.01440101

$`level 8`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      21      1
      FALSE      0 1755

$`level 8`$Rej_RATs.ABMR_RATs$nboot
[1] 6318

$`level 9`
$`level 9`$GRIT3.ABMR_RATs
$`level 9`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.01422407

$`level 9`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      18      1
      FALSE      0 1320

$`level 9`$GRIT3.ABMR_RATs$nboot
[1] 6256

$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value

```

```
Rej_RATs.ABMR_RATs
0.01051658
```

96

```
96 $`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      17      1
      FALSE     1 1320
```

```
$`level 9`$Rej_RATs.ABMR_RATs$nboot
[1] 8652
```

```
$`level 9`$Rej_RATs.GRIT3
$`level 9`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.01413317
```

```
$`level 9`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      18      0
      FALSE     1 1320
```

```
$`level 9`$Rej_RATs.GRIT3$nboot
[1] 6367
```

```
$`level 10`
$`level 10`$IRITD5.IRITD3
$`level 10`$IRITD5.IRITD3$p.value
IRITD5.IRITD3
0.01469164
```

```
$`level 10`$IRITD5.IRITD3$enrichTab
      Enriched in IRITD3
Enriched in IRITD5 TRUE FALSE
      TRUE      4      1
      FALSE     0 850
```

```
$`level 10`$IRITD5.IRITD3$nboot
[1] 6193
```

```
*****
d0 = 0.2857
*****
> boot.signifPvals_d0_0.2857$CC
$`level 3`
named list()
```



```
$`level 4`
$`level 4`$LT3.LT1
$`level 4`$LT3.LT1$p.value
  LT3.LT1
0.01440101
```

97

```
$`level 4`$LT3.LT1$enrichTab
      Enriched in LT1
Enriched in LT3 TRUE FALSE
      TRUE      8      0
      FALSE     1 1428
```

```
$`level 4`$LT3.LT1$nboot
[1] 6318
```

```
$`level 5`
named list()
```

```
$`level 6`
$`level 6`$GRIT3.ABMR_RATs
$`level 6`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
0.009262087
```

```
$`level 6`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      26      4
      FALSE     0 2234
```

```
$`level 6`$GRIT3.ABMR_RATs$nboot
[1] 9824
```

```
$`level 6`$Rej_RATs.GRIT3
$`level 6`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.009489667
```

```
$`level 6`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      28      1
      FALSE     2 2233
```

```
$`level 6`$Rej_RATs.GRIT3$nboot
[1] 9483
```

```

98 $`level 7`
$`level 7`$GRIT3.ABMR_RATs
$`level 7`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.009590052

$`level 7`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE     24     3
      FALSE     0 1999

$`level 7`$GRIT3.ABMR_RATs$nboot
[1] 9488

$`level 7`$Rej_RATs.ABMR_RATs
$`level 7`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.01814475

$`level 7`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE     23     3
      FALSE     1 1999

$`level 7`$Rej_RATs.ABMR_RATs$nboot
[1] 9809

$`level 7`$Rej_RATs.GRIT3
$`level 7`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
    0.01422925

$`level 7`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE     26     0
      FALSE     1 1999

$`level 7`$Rej_RATs.GRIT3$nboot
[1] 6324

```

```

$`level 8`
$`level 8`$GRIT3.ABMR_RATs
$`level 8`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.01437826

$`level 8`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      21      1
      FALSE     0 1755

$`level 8`$GRIT3.ABMR_RATs$nboot
[1] 6265

$`level 8`$Rej_RATs.ABMR_RATs
$`level 8`$Rej_RATs.ABMR_RATs$p.value
Rej_RATs.ABMR_RATs
    0.01437826

$`level 8`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      21      1
      FALSE     0 1755

$`level 8`$Rej_RATs.ABMR_RATs$nboot
[1] 6328

$`level 9`
$`level 9`$GRIT3.ABMR_RATs
$`level 9`$GRIT3.ABMR_RATs$p.value
GRIT3.ABMR_RATs
    0.0142218

$`level 9`$GRIT3.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in GRIT3 TRUE FALSE
      TRUE      18      1
      FALSE     0 1320

$`level 9`$GRIT3.ABMR_RATs$nboot
[1] 6257

$`level 9`$Rej_RATs.ABMR_RATs
$`level 9`$Rej_RATs.ABMR_RATs$p.value

```

```
Rej_RATs.ABMR_RATs
0.01045977
```

100

```
100 $`level 9`$Rej_RATs.ABMR_RATs$enrichTab
      Enriched in ABMR_RATs
Enriched in Rej_RATs TRUE FALSE
      TRUE      17      1
      FALSE     1 1320
```

```
$`level 9`$Rej_RATs.ABMR_RATs$nboot
[1] 8699
```

```
$`level 9`$Rej_RATs.GRIT3
$`level 9`$Rej_RATs.GRIT3$p.value
Rej_RATs.GRIT3
0.01407349
```

```
$`level 9`$Rej_RATs.GRIT3$enrichTab
      Enriched in GRIT3
Enriched in Rej_RATs TRUE FALSE
      TRUE      18      0
      FALSE     1 1320
```

```
$`level 9`$Rej_RATs.GRIT3$nboot
[1] 6394
```

```
$`level 10`
named list()
```

Asymptotic normal test results. MF ontology

102

d0 = 0.4444

102 **signifPvals_d0_0.4444\$MF**

\$`level 3`

named list()

\$`level 4`

named list()

\$`level 5`

\$`level 5`\$Rej_RATs.ABMR_RATs

\$`level 5`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.02702655

\$`level 5`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs TRUE FALSE

TRUE	7	2
------	---	---

FALSE	0	2051
-------	---	------

\$`level 6`

named list()

\$`level 7`

named list()

\$`level 8`

named list()

\$`level 9`

named list()

\$`level 10`

named list()

103

d0 = 0.2857

signifPvals_d0_0.2857\$MF

103

\$`level 3`

named list()

\$`level 4`

named list()

\$`level 5`

named list()

\$`level 6`

named list()

\$`level 7`

named list()

\$`level 8`

named list()

\$`level 9`

named list()

\$`level 10`

named list()

Bootstrap test results. MF ontology

105

d0 = 0.4444

> boot.signifPvals_d0_0.4444\$MF

105

\$`level 3`

named list()

\$`level 4`

named list()

\$`level 5`

\$`level 5`\$Rej_RATs.ABMR_RATs

\$`level 5`\$Rej_RATs.ABMR_RATs\$p.value

Rej_RATs.ABMR_RATs

0.02100404

\$`level 5`\$Rej_RATs.ABMR_RATs\$enrichTab

Enriched in ABMR_RATs

Enriched in Rej_RATs TRUE FALSE

TRUE 7 2

FALSE 0 2051

\$`level 5`\$Rej_RATs.ABMR_RATs\$nboot

[1] 8664

\$`level 6`

named list()

\$`level 7`

named list()

\$`level 8`

named list()

\$`level 9`

named list()

\$`level 10`

named list()

```
*****  
d0 = 0.2857  
*****
```

106

```
106 > boot.signifPvals_d0_0.2857$MF  
$`level 3`  
named list()  
  
$`level 4`  
named list()  
  
$`level 5`  
named list()  
  
$`level 6`  
named list()  
  
$`level 7`  
named list()  
  
$`level 8`  
named list()  
  
$`level 9`  
named list()  
  
$`level 10`  
named list()
```