```
$Single.Stage.Equal.Alpha.Allocation.Design
$Single.Stage.Equal.Alpha.Allocation.Design$design.parameters
$Single.Stage.Equal.Alpha.Allocation.Design$design.parameters$cumulative.sample.sizes.and.c
alendar.time.per.stage
  Stage  C1  C2  A1  A2 Analysis.Time.In.Years
1     1 347 705 347 705                     10


$Single.Stage.Equal.Alpha.Allocation.Design$design.parameters$alpha.allocation
  Stage Subpop.1 Subpop.2
1     1    0.025    0.025


$Single.Stage.Equal.Alpha.Allocation.Design$design.parameters$futility.boundaries
  Stage Subpop.1 Subpop.2
1     1       NA       NA



$Single.Stage.Equal.Alpha.Allocation.Design$design.performance
$Single.Stage.Equal.Alpha.Allocation.Design$design.performance$Power
  Scenario Power.HO1 Power.HO2 Prob.Reject.All.False.Null.Hypotheses
1        1    0.8729    0.9885                                0.8661
2        2    0.8075        NA                                0.8075
3        3    0.8040        NA                                0.8040
4        4        NA        NA                                    NA

$Single.Stage.Equal.Alpha.Allocation.Design$design.performance$Type.1.Error
  Scenario Type.I.Error.HO1 Type.I.Error.HO2 Familywise.Type.I.Error
1        1               NA               NA                      NA
2        2               NA           0.0449                  0.0449
3        3               NA           0.0000                  0.0000
4        4           0.0298           0.0256                  0.0523

$Single.Stage.Equal.Alpha.Allocation.Design$design.performance$Expected.Sample.Size
                          Scenario expected.sample.size
1                                1                 2104
2                                2                 2104
3                                3                 2104
4                                4                 2104
5 Weighted.Combination.Over.Scenarios                 2104

$Single.Stage.Equal.Alpha.Allocation.Design$design.performance$Expected.Duration
                          Scenario expected.duration
1                                1                10
2                                2                10
3                                3                10
4                                4                10
5 Weighted.Combination.Over.Scenarios                10

$Single.Stage.Equal.Alpha.Allocation.Design$design.performance$Distribution.of.sample.size.
and.duration.per.scenario
  scenario C1 C2 A1 A2 sample.size duration person.time frequency proportion
1        1  1  1  1  1        2104       10          40     10000          1
2        2  1  1  1  1        2104       10          40     10000          1
3        3  1  1  1  1        2104       10          40     10000          1
4        4  1  1  1  1        2104       10          40     10000          1
```

```
$Single.Stage.Optimized.Alpha.Allocation.Design
$Single.Stage.Optimized.Alpha.Allocation.Design$design.parameters
$Single.Stage.Optimized.Alpha.Allocation.Design$design.parameters$cumulative.sample.sizes.a
nd.calendar.time.per.stage
  Stage  C1  C2  A1  A2 Analysis.Time.In.Years
1     1 326 662 326 662                     10


$Single.Stage.Optimized.Alpha.Allocation.Design$design.parameters$alpha.allocation
  Stage Subpop.1 Subpop.2
1     1   0.0277   0.0223


$Single.Stage.Optimized.Alpha.Allocation.Design$design.parameters$futility.boundaries
  Stage Subpop.1 Subpop.2
1     1       NA       NA



$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance
$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance$Power
  Scenario Power.HO1 Power.HO2 Prob.Reject.All.False.Null.Hypotheses
1        1    0.8634    0.9827                                0.8529
2        2    0.8065        NA                                0.8065
3        3    0.8013        NA                                0.8013
4        4        NA        NA                                    NA

$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance$Type.1.Error
  Scenario Type.I.Error.HO1 Type.I.Error.HO2 Familywise.Type.I.Error
1        1               NA               NA                      NA
2        2               NA           0.0457                  0.0457
3        3               NA           0.0000                  0.0000
4        4           0.0261           0.0204                  0.0456

$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance$Expected.Sample.Size
                          Scenario expected.sample.size
1                                1                 1976
2                                2                 1976
3                                3                 1976
4                                4                 1976
5 Weighted.Combination.Over.Scenarios                 1976

$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance$Expected.Duration
                          Scenario expected.duration
1                                1                10
2                                2                10
3                                3                10
4                                4                10
5 Weighted.Combination.Over.Scenarios                10

$Single.Stage.Optimized.Alpha.Allocation.Design$design.performance$Distribution.of.sample.s
ize.and.duration.per.scenario
  scenario C1 C2 A1 A2 sample.size duration person.time frequency proportion
1        1  1  1  1  1        1976       10          40     10000          1
2        2  1  1  1  1        1976       10          40     10000          1
3        3  1  1  1  1        1976       10          40     10000          1
4        4  1  1  1  1        1976       10          40     10000          1
```

```
$Two.Stage.Group.Sequential.Design
$Two.Stage.Group.Sequential.Design$design.parameters
$Two.Stage.Group.Sequential.Design$design.parameters$cumulative.sample.sizes.and.calendar.t
ime.per.stage
  Stage  C1  C2  A1  A2 Analysis.Time.In.Years
1     1 357 725 357 725               4.922939
2     2 357 725 357 725              10.000000

$Two.Stage.Group.Sequential.Design$design.parameters$alpha.allocation
  Stage Subpop.1 Subpop.2
1     1   0.0155   0.0073
2     2   0.0127   0.0145

$Two.Stage.Group.Sequential.Design$design.parameters$futility.boundaries
  Stage Subpop.1 Subpop.2
1     1  -3.6057  -3.0735
2     2       NA       NA


$Two.Stage.Group.Sequential.Design$design.performance
$Two.Stage.Group.Sequential.Design$design.performance$Power
  Scenario Power.HO1 Power.HO2 Prob.Reject.All.False.Null.Hypotheses
1        1    0.8828    0.9882                                0.8758
2        2    0.7983        NA                                0.7983
3        3    0.7897        NA                                0.7897
4        4        NA        NA                                    NA

$Two.Stage.Group.Sequential.Design$design.performance$Type.1.Error
  Scenario Type.I.Error.HO1 Type.I.Error.HO2 Familywise.Type.I.Error
1        1               NA               NA                      NA
2        2               NA           0.0457                  0.0457
3        3               NA           0.0000                  0.0000
4        4            0.031           0.0233                  0.0518

$Two.Stage.Group.Sequential.Design$design.performance$Expected.Sample.Size
                               Scenario expected.sample.size
1                                     1                 2164
2                                     2                 2164
3                                     3                 2164
4                                     4                 2164
5 Weighted.Combination.Over.Scenarios                  2164

$Two.Stage.Group.Sequential.Design$design.performance$Expected.Duration
                               Scenario expected.duration
1                                     1              8.37
2                                     2              9.98
3                                     3              7.66
4                                     4             10.00
5 Weighted.Combination.Over.Scenarios               9.00

$Two.Stage.Group.Sequential.Design$design.performance$Distribution.of.sample.size.and.durat
ion.per.scenario
  scenario C1 C2 A1 A2 sample.size  duration person.time frequency proportion
1        1  1  1  1  1        2164  4.922939    19.69176      3208     0.3208
```

2	1	1	2	1	2	2164	10.000000	29.84588	NA	NA
3	1	2	1	2	1	2164	10.000000	29.84588	NA	NA
4	1	2	2	2	2	2164	10.000000	40.00000	6792	0.6792
5	2	1	1	1	1	2164	4.922939	19.69176	43	0.0043
6	2	1	2	1	2	2164	10.000000	29.84588	NA	NA
7	2	2	1	2	1	2164	10.000000	29.84588	NA	NA
8	2	2	2	2	2	2164	10.000000	40.00000	9957	0.9957
9	3	1	1	1	1	2164	4.922939	19.69176	4612	0.4612
10	3	1	2	1	2	2164	10.000000	29.84588	NA	NA
11	3	2	1	2	1	2164	10.000000	29.84588	NA	NA
12	3	2	2	2	2	2164	10.000000	40.00000	5388	0.5388
13	4	1	1	1	1	2164	4.922939	19.69176	7	0.0007
14	4	1	2	1	2	2164	10.000000	29.84588	NA	NA
15	4	2	1	2	1	2164	10.000000	29.84588	NA	NA
16	4	2	2	2	2	2164	10.000000	40.00000	9993	0.9993

```
$Two.Stage.Equal.Alpha.Allocation.Design
$Two.Stage.Equal.Alpha.Allocation.Design$design.parameters
$Two.Stage.Equal.Alpha.Allocation.Design$design.parameters$cumulative.sample.sizes.and.cale
ndar.time.per.stage
  Stage  C1  C2  A1  A2 Analysis.Time.In.Years
1     1 368 748 368 748                      5
2     2 368 748 368 748                     10


$Two.Stage.Equal.Alpha.Allocation.Design$design.parameters$alpha.allocation
  Stage Subpop.1 Subpop.2
1     1   0.0125   0.0125
2     2   0.0125   0.0125


$Two.Stage.Equal.Alpha.Allocation.Design$design.parameters$futility.boundaries
  Stage Subpop.1 Subpop.2
1     1       -3       -3
2     2       NA       NA



$Two.Stage.Equal.Alpha.Allocation.Design$design.performance
$Two.Stage.Equal.Alpha.Allocation.Design$design.performance$Power
  Scenario Power.HO1 Power.HO2 Prob.Reject.All.False.Null.Hypotheses
1        1    0.8858    0.9897                                0.8804
2        2    0.8021        NA                                0.8021
3        3    0.7999        NA                                0.7999
4        4        NA        NA                                    NA


$Two.Stage.Equal.Alpha.Allocation.Design$design.performance$Type.1.Error
  Scenario Type.I.Error.HO1 Type.I.Error.HO2 Familywise.Type.I.Error
1        1              NA               NA                      NA
2        2              NA           0.0448                  0.0448
3        3              NA           0.0000                  0.0000
4        4           0.026           0.0251                  0.0495


$Two.Stage.Equal.Alpha.Allocation.Design$design.performance$Expected.Sample.Size
                          Scenario expected.sample.size
1                                1                 2232
2                                2                 2232
```

```
3                                                   3               2232
4                                                   4               2232
5 Weighted.Combination.Over.Scenarios                               2232


$Two.Stage.Equal.Alpha.Allocation.Design$design.performance$Expected.Duration
                              Scenario expected.duration
1                                     1               8.23
2                                     2               9.97
3                                     3               7.83
4                                     4              10.00
5 Weighted.Combination.Over.Scenarios                9.01
```

$Two.Stage.Equal.Alpha.Allocation.Design$design.performance$Distribution.of.sample.size.and
.duration.per.scenario

scenario	C1	C2	A1	A2	sample.size	duration	person.time	frequency	proportion
1	1	1	1	1	2232	5	20	3541	0.3541
2	1	1	2	1	2	2232	10	30	976	0.0976
3	1	2	1	2	1	2232	10	30	4222	0.4222
4	1	2	2	2	2	2232	10	40	1261	0.1261
5	2	1	1	1	1	2232	5	20	53	0.0053
6	2	1	2	1	2	2232	10	30	4357	0.4357
7	2	2	1	2	1	2232	10	30	79	0.0079
8	2	2	2	2	2	2232	10	40	5511	0.5511
9	3	1	1	1	1	2232	5	20	4342	0.4342
10	3	1	2	1	2	2232	10	30	27	0.0027
11	3	2	1	2	1	2232	10	30	5589	0.5589
12	3	2	2	2	2	2232	10	40	42	0.0042
13	4	1	1	1	1	2232	5	20	3	0.0003
14	4	1	2	1	2	2232	10	30	149	0.0149
15	4	2	1	2	1	2232	10	30	146	0.0146
16	4	2	2	2	2	2232	10	40	9702	0.9702

```
$Two.Stage.Optimized.Alpha.Allocation.Design
$Two.Stage.Optimized.Alpha.Allocation.Design$design.parameters
$Two.Stage.Optimized.Alpha.Allocation.Design$design.parameters$cumulative.sample.sizes.and.
calendar.time.per.stage
  Stage  C1   C2   A1   A2 Analysis.Time.In.Years
1     1 447  909  447  909               3.956868
2     2 447  909  447  909               9.497218


$Two.Stage.Optimized.Alpha.Allocation.Design$design.parameters$alpha.allocation
  Stage Subpop.1 Subpop.2
1     1   0.0124   0.0151
2     2   0.0080   0.0146


$Two.Stage.Optimized.Alpha.Allocation.Design$design.parameters$futility.boundaries
  Stage Subpop.1 Subpop.2
1     1  -3.1686  -4.2525
2     2       NA       NA


$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance
$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance$Power
  Scenario Power.HO1 Power.HO2 Prob.Reject.All.False.Null.Hypotheses
```

1	1	0.9168	0.9972		0.9147
2	2	0.8070	NA		0.8070
3	3	0.8055	NA		0.8055
4	4	NA	NA		NA

$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance$Type.1.Error

	Scenario	Type.I.Error.HO1	Type.I.Error.HO2	Familywise.Type.I.Error
1	1	NA	NA	NA
2	2	NA	0.0439	0.0439
3	3	NA	0.0000	0.0000
4	4	0.0224	0.0325	0.0528

$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance$Expected.Sample.Size

	Scenario	expected.sample.size
1	1	2712
2	2	2712
3	3	2712
4	4	2712
5	Weighted.Combination.Over.Scenarios	2712

$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance$Expected.Duration

	Scenario	expected.duration
1	1	7.98
2	2	9.47
3	3	7.79
4	4	9.50
5	Weighted.Combination.Over.Scenarios	8.68

$Two.Stage.Optimized.Alpha.Allocation.Design$design.performance$Distribution.of.sample.size
.and.duration.per.scenario

	scenario	C1	C2	A1	A2	sample.size	duration	person.time	frequency	proportion
1	1	1	1	1	1	2712	3.956868	15.82747	2730	0.2730
2	1	1	2	1	2	2712	9.497218	26.90817	1055	0.1055
3	1	2	1	2	1	2712	9.497218	26.90817	4560	0.4560
4	1	2	2	2	2	2712	9.497218	37.98887	1655	0.1655
5	2	1	1	1	1	2712	3.956868	15.82747	53	0.0053
6	2	1	2	1	2	2712	9.497218	26.90817	3729	0.3729
7	2	2	1	2	1	2712	9.497218	26.90817	89	0.0089
8	2	2	2	2	2	2712	9.497218	37.98887	6129	0.6129
9	3	1	1	1	1	2712	3.956868	15.82747	3081	0.3081
10	3	1	2	1	2	2712	9.497218	26.90817	764	0.0764
11	3	2	1	2	1	2712	9.497218	26.90817	4937	0.4937
12	3	2	2	2	2	2712	9.497218	37.98887	1218	0.1218
13	4	1	1	1	1	2712	3.956868	15.82747	2	0.0002
14	4	1	2	1	2	2712	9.497218	26.90817	137	0.0137
15	4	2	1	2	1	2712	9.497218	26.90817	165	0.0165
16	4	2	2	2	2	2712	9.497218	37.98887	9696	0.9696

Minimum power difference (obtained - desired) for each Design

Design	Scenario	Minimum difference in power (obtained - desired)
Single.Stage.Equal.Alpha.Allocation.Design	3	0.0040
Single.Stage.Optimized.Alpha.Allocation.Design	3	0.0013
Two.Stage.Group.Sequential.Design	3	-0.0103
Two.Stage.Equal.Alpha.Allocation.Design	3	-0.0001
Two.Stage.Optimized.Alpha.Allocation.Design	3	0.0055