Extra Module

Automation

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Report generation

Now we are going to combine some "programming" with making automated tables/reports.

In the 'Reports.zip' folder on the webpage, there are 36 tables, one table per month, of new individuals joining a study. We are going to practice flexibly reading in many similarly-formatted tables at once.

Report generation

Suppose you have many files of the same general format in one or more folders across your computer (or a server somewhere). We can use apply statements and for loops to automate the process of handling many datasets identically.

```
> files = list.files("Reports", full.names = T)
> length(files)
```

```
[1] 36
```

```
> head(files)
```

```
[1] "Reports/April_2009_Report.txt"  "Reports/April_2010_Report.txt"
[3] "Reports/April_2011_Report.txt"  "Reports/August_2009_Report.txt"
[5] "Reports/August_2010_Report.txt" "Reports/August_2011_Report.txt"
```

Report generation

Now it's going to be useful to name the character vector `files` :

```
> name = sapply(strsplit(files, "/"), function(x) x[2])
> name = sapply(strsplit(name, "\\."), function(x) x[1])
> head(name)
```

```
[1] "April_2009_Report"  "April_2010_Report"  "April_2011_Report"
[4] "August_2009_Report" "August_2010_Report" "August_2011_Report"
```

```
> names(files) = name
> head(files)
```

```
               April_2009_Report                April_2010_Report 
 "Reports/April_2009_Report.txt"  "Reports/April_2010_Report.txt" 
               April_2011_Report               August_2009_Report 
 "Reports/April_2011_Report.txt" "Reports/August_2009_Report.txt" 
              August_2010_Report               August_2011_Report 
"Reports/August_2010_Report.txt" "Reports/August_2011_Report.txt" 
```

Report generation

For this example, it's probably easier to use lapply, which performs a function on each element of a list or vector, and returns a list.

```
> fileList = lapply(files, read.delim, header = T, as.is = T)
> head(names(fileList))
```

```
[1] "April_2009_Report"  "April_2010_Report"  "April_2011_Report"
[4] "August_2009_Report" "August_2010_Report" "August_2011_Report"
```

```
> head(fileList[[1]])
```

```
    id    sex   treat   age bgDrugs height weight block recruitDate   bmi
1 1072 Female Control 51.00  asprin  63.84  131.3     d          21 22.64
2 1073 Female Control 54.81 tylenol  66.10  117.2     b           1 18.85
3 1074 Female    Case 43.54  asprin  64.39  145.0     a          28 24.59
4 1075   Male    Case 52.52    none  70.36  170.0     b           8 24.13
5 1076   Male    Case 43.12   advil  68.38  180.1     a          18 27.08
6 1077   Male    Case 37.54  asprin  70.16  172.5     b          24 24.63
```

```
> fileList = lapply(files, read.delim, header = T, as.is = T)
> head(names(fileList))
```

```
[1] "April_2009_Report"  "April_2010_Report"  "April_2011_Report" 
[4] "August_2009_Report" "August_2010_Report" "August_2011_Report"
```

```
> lapply(fileList, head, 2)
```

```
$April_2009_Report
    id    sex   treat   age bgDrugs height weight block recruitDate   bmi
1 1072 Female Control 51.00  asprin  63.84  131.3     d          21 22.64
2 1073 Female Control 54.81 tylenol  66.10  117.2     b           1 18.85

$April_2010_Report
    id    sex treat   age bgDrugs height weight block recruitDate   bmi
1 4337 Female  Case 46.91    none  64.95  140.6     f          25 23.43
2 4338 Female  Case 47.95    none  66.47  143.3     f          14 22.81

$April_2011_Report
    id  sex   treat   age bgDrugs height weight block recruitDate   bmi
1 7780 Male    Case 53.93  asprin  70.12  175.0     f          29 25.02
2 7781 Male Control 62.77 tylenol  71.02  153.1     b          29 21.34

$August_2009_Report
    id  sex   treat   age bgDrugs height weight block recruitDate   bmi
1 2051 Male Control 56.76 tylenol  70.47  168.0     f           2 23.78
2 2052 Male    Case 50.14  asprin  69.56  172.3     c           1 25.04

$August_2010_Report
    id    sex   treat   age bgDrugs height weight block recruitDate   bmi
1 5481   Male Control 40.97  asprin  71.15  168.0     b           7 23.34
2 5482 Female Control 41.10    none  65.78  137.1     c          23 22.27
```

Report generation

Now we have 36 tables in a list. We can order that list chronologically, instead of alphabetically.

```
> month = sapply(strsplit(name, "_"), function(x) x[1])
> month = factor(month, levels = c("January", "February", "March", "April", "May",
+     "June", "July", "August", "September", "October", "November", "December"))
> year = as.integer(sapply(strsplit(name, "_"), function(x) x[2]))
> fileList = fileList[order(year, month)]
> names(fileList)
```

```
 [1] "January_2009_Report"   "February_2009_Report"
 [3] "March_2009_Report"     "April_2009_Report"
 [5] "May_2009_Report"       "June_2009_Report"
 [7] "July_2009_Report"      "August_2009_Report"
 [9] "September_2009_Report" "October_2009_Report"
[11] "November_2009_Report"  "December_2009_Report"
[13] "January_2010_Report"   "February_2010_Report"
[15] "March_2010_Report"     "April_2010_Report"
[17] "May_2010_Report"       "June_2010_Report"
[19] "July_2010_Report"      "August_2010_Report"
[21] "September_2010_Report" "October_2010_Report"
[23] "November_2010_Report"  "December_2010_Report"
[25] "January_2011_Report"   "February_2011_Report"
[27] "March_2011_Report"     "April_2011_Report"
[29] "May_2011_Report"       "June_2011_Report"
[31] "July_2011_Report"      "August_2011_Report"
[33] "September_2011_Report" "October_2011_Report"
[35] "November_2011_Report"  "December_2011_Report"
```

Report generation

How many entries are in each list? How many overall entries are there?

For this, sapply is very useful, because it is applied to a list, but tries to return a matrix.

```
> sapply(fileList, nrow)[1:10]  # number of entries
```

```
  January_2009_Report  February_2009_Report     March_2009_Report
                  328                   359                   384
    April_2009_Report       May_2009_Report      June_2009_Report
                  287                   226                   264
     July_2009_Report    August_2009_Report September_2009_Report
                  202                   353                   225
  October_2009_Report
                  341
```

```
> sum(sapply(fileList, nrow))  # all reports
```

```
[1] 10438
```

Report generation

We can also tabulate variables across reports.

```
> sapply(fileList, function(x) table(x$sex))
```

```
       January_2009_Report February_2009_Report March_2009_Report
Female                 152                  189               197
Male                   176                  170               187
       April_2009_Report May_2009_Report June_2009_Report July_2009_Report
Female               152             110              132              119
Male                 135             116              132               83
       August_2009_Report September_2009_Report October_2009_Report
Female                167                   117                 151
Male                  186                   108                 190
       November_2009_Report December_2009_Report January_2010_Report
Female                  124                  158                 152
Male                    108                  117                 161
       February_2010_Report March_2010_Report April_2010_Report
Female                  150               101               168
Male                    177               119               156
       May_2010_Report June_2010_Report July_2010_Report
Female             118              185              134
Male               106              165              112
       August_2010_Report September_2010_Report October_2010_Report
Female                156                   149                 137
Male                  213                   131                 152
       November_2010_Report December_2010_Report January_2011_Report
Female                  140                  141                 115
Male                    145                  136                 105
       February_2011_Report March_2011_Report April_2011_Report
Female                  179               123               175
Male                    179                98               184
```

```
> sapply(fileList, function(x) table(x$treat))
```

```
        January_2009_Report February_2009_Report March_2009_Report
Case                    176                  184               178
Control                 152                  175               206
        April_2009_Report May_2009_Report June_2009_Report
Case                  154             104              133
Control               133             122              131
        July_2009_Report August_2009_Report September_2009_Report
Case                  91                176                   113
Control              111                177                   112
        October_2009_Report November_2009_Report December_2009_Report
Case                    166                  115                  141
Control                 175                  117                  134
        January_2010_Report February_2010_Report March_2010_Report
Case                    142                  161               122
Control                 171                  166                98
        April_2010_Report May_2010_Report June_2010_Report
Case                  161             108              188
Control               163             116              162
        July_2010_Report August_2010_Report September_2010_Report
Case                 131                179                   147
Control              115                190                   133
        October_2010_Report November_2010_Report December_2010_Report
Case                    160                  138                  128
Control                 129                  147                  149
        January_2011_Report February_2011_Report March_2011_Report
Case                    121                  161               112
Control                  99                  197               109
        April_2011_Report May_2011_Report June_2011_Report
Case                  173              98              186
Control               186             107              175
        July_2011_Report August_2011_Report September_2011_Report
Case                 126                150                   141
```

```
> sapply(fileList, function(x) table(x$bgDrugs))
```

```
        January_2009_Report February_2009_Report March_2009_Report
advil                    62                   84                83
asprin                  107                   95                88
none                     82                   85               105
tylenol                  77                   95               108
        April_2009_Report May_2009_Report June_2009_Report
advil                  74              45               50
asprin                 60              62               77
none                   81              55               64
tylenol                72              64               73
        July_2009_Report August_2009_Report September_2009_Report
advil                 57                 87                    52
asprin                50                 82                    65
none                  45                 86                    61
tylenol               50                 98                    47
        October_2009_Report November_2009_Report December_2009_Report
advil                   107                   51                   53
asprin                   78                   70                   66
none                     79                   49                   78
tylenol                  77                   62                   78
        January_2010_Report February_2010_Report March_2010_Report
advil                    88                   81                66
asprin                   82                   76                51
none                     67                   92                51
tylenol                  76                   78                52
        April_2010_Report May_2010_Report June_2010_Report
advil                  81              52               87
asprin                 74              63               96
none                   77              47               93
tylenol                92              62               74
        July_2010_Report August_2010_Report September_2010_Report
advil                 62                 89                    76
```

```
> sapply(fileList, function(x) table(x$block))
```

```
  January_2009_Report February_2009_Report March_2009_Report
a                  52                   45                75
b                  64                   82                59
c                  64                   66                60
d                  43                   64                65
e                  56                   46                71
f                  49                   56                54
  April_2009_Report May_2009_Report June_2009_Report July_2009_Report
a                40              33               59               38
b                45              39               48               25
c                44              35               41               35
d                52              36               32               27
e                56              46               40               33
f                50              37               44               44
  August_2009_Report September_2009_Report October_2009_Report
a                 71                    40                  67
b                 49                    36                  51
c                 57                    39                  71
d                 55                    44                  47
e                 56                    35                  54
f                 65                    31                  51
  November_2009_Report December_2009_Report January_2010_Report
a                   39                   41                  37
b                   42                   52                  55
c                   46                   46                  60
d                   37                   39                  49
e                   44                   53                  67
f                   24                   44                  45
  February_2010_Report March_2010_Report April_2010_Report May_2010_Report
a                   56                29                53              36
b                   56                41                58              33
c                   57                38                50              40
```

```
> sapply(fileList, function(x) quantile(x$age))
```

```
     January_2009_Report February_2009_Report March_2009_Report
0%                 24.51                24.48             23.29
25%                44.61                44.88             44.81
50%                50.16                50.60             50.51
75%                55.17                56.30             56.85
100%               67.49                75.50             82.73
     April_2009_Report May_2009_Report June_2009_Report July_2009_Report
0%               27.41           30.84            28.93            27.37
25%              43.99           44.27            44.16            44.65
50%              49.66           50.13            50.03            49.94
75%              55.03           55.88            55.41            54.80
100%             71.70           72.81            70.36            73.26
     August_2009_Report September_2009_Report October_2009_Report
0%                23.16                 32.96               21.76
25%               44.60                 44.89               44.80
50%               49.48                 49.66               49.85
75%               54.59                 55.50               55.41
100%              73.93                 67.81               73.14
     November_2009_Report December_2009_Report January_2010_Report
0%                  26.84                28.18               25.64
25%                 43.04                44.09               44.69
50%                 49.49                49.89               50.46
75%                 54.47                54.75               54.57
100%                72.64                68.19               72.46
     February_2010_Report March_2010_Report April_2010_Report
0%                  26.39             19.84             18.34
25%                 44.16             44.73             43.54
50%                 49.83             49.46             48.90
75%                 55.57             55.01             54.99
100%                69.39             71.69             75.65
     May_2010_Report June_2010_Report July_2010_Report August_2010_Report
0%             25.25            26.65            27.56              22.14
```

```
> sapply(fileList, function(x) quantile(x$height))
```

```
     January_2009_Report February_2009_Report March_2009_Report
0%                 62.76                62.47             62.09
25%                65.05                65.09             65.07
50%                68.41                66.55             67.13
75%                70.13                70.07             70.12
100%               73.53                72.54             72.73
     April_2009_Report May_2009_Report June_2009_Report July_2009_Report
0%               61.91           63.02            62.90            61.77
25%              64.88           64.92            65.01            64.73
50%              66.67           68.01            67.73            66.06
75%              69.97           70.09            70.07            69.85
100%             72.86           73.01            74.01            72.91
     August_2009_Report September_2009_Report October_2009_Report
0%                62.32                 62.75               62.00
25%               65.20                 64.94               65.03
50%               68.29                 66.60               68.77
75%               70.01                 69.73               70.05
100%              72.56                 72.30               72.52
     November_2009_Report December_2009_Report January_2010_Report
0%                  62.15                62.77               62.27
25%                 64.82                64.78               64.91
50%                 66.46                66.04               68.21
75%                 69.92                69.89               70.15
100%                72.04                72.31               72.88
     February_2010_Report March_2010_Report April_2010_Report
0%                  61.61             62.53             62.59
25%                 65.09             64.87             64.97
50%                 68.59             68.56             66.97
75%                 70.08             70.25             69.80
100%                72.21             73.16             72.25
     May_2010_Report June_2010_Report July_2010_Report August_2010_Report
0%             62.91            61.76            61.19              62.13
```

```
> sapply(fileList, function(x) quantile(x$bmi))
```

```
     January_2009_Report February_2009_Report March_2009_Report
0%                 18.34                18.51             18.12
25%                22.72                22.63             22.53
50%                23.96                23.77             23.79
75%                25.04                25.12             25.08
100%               28.11                29.09             29.43
     April_2009_Report May_2009_Report June_2009_Report July_2009_Report
0%               18.71           17.94            19.05            17.74
25%              22.41           22.75            22.78            22.45
50%              23.72           24.03            23.85            23.67
75%              24.99           24.99            24.97            25.10
100%             30.42           28.86            28.52            28.58
     August_2009_Report September_2009_Report October_2009_Report
0%                17.42                 18.09               17.98
25%               22.71                 22.69               22.91
50%               23.85                 23.85               23.99
75%               25.16                 24.99               25.24
100%              29.33                 28.83               28.88
     November_2009_Report December_2009_Report January_2010_Report
0%                  18.33                19.66               18.58
25%                 22.59                22.65               22.73
50%                 24.01                23.87               23.83
75%                 25.29                24.89               25.01
100%                28.74                29.25               30.32
     February_2010_Report March_2010_Report April_2010_Report
0%                  18.85             19.04             18.77
25%                 22.64             22.52             22.56
50%                 23.82             23.68             23.92
75%                 25.06             25.09             25.08
100%                29.31             28.86             29.37
     May_2010_Report June_2010_Report July_2010_Report August_2010_Report
0%             18.07            18.84            18.52              17.99
```

"Table 1"

We can now use R to make a "table 1" containing each report. Let's use the first report as an example.

```
> y = fileList[[1]]
> y[1:5, ]
```

```
  id    sex   treat   age bgDrugs height weight block recruitDate   bmi
1  1   Male Control 52.68    none  70.24  173.4     f          25 24.70
2  2 Female Control 47.10    none  63.84  139.9     f          24 24.13
3  3   Male Control 62.84  asprin  69.47  174.5     c           8 25.42
4  4 Female Control 49.51 tylenol  65.39  132.3     b          24 21.75
5  5   Male Control 54.42   advil  70.87  161.8     d           7 22.64
```

```
> cIndexes = split(1:nrow(y), y$treat)  # splits 1st vector by levels of the 2nd
> lapply(cIndexes, head)  # indices for each outcome
```

```
$Case
[1]  6  9 13 14 15 19

$Control
[1] 1 2 3 4 5 7
```

We can use sapply() again here.

```
> mCont = sapply(cIndexes, function(x) colMeans(y[x, c("age", "weight", "height",
+     "bmi")]))
> mCont  # mean of continuous variables by outcome
```

```
         Case Control
age     49.45   50.34
weight 153.94  158.45
height  67.32   68.17
bmi     23.83   23.91
```

```
> sdCont = sapply(cIndexes, function(x) apply(y[x, c("age", "weight", "height",
+     "bmi")], 2, sd))
> sdCont  # sd of continuous variables by outcome
```

```
         Case Control
age     7.912   8.067
weight 17.854  17.833
height  2.793   2.587
bmi     1.820   1.711
```

Note that we now have the mean and sd for the continuous traits. Now we need to do some formatting, basically putting the SDs in parentheses.

```
> mat1 = matrix(paste(signif(mCont, 4), " (SD=", signif(sdCont, 2), ")", sep = ""),
+     nc = 2)
> dimnames(mat1) = dimnames(mCont)  # copies row and column names
> mat1
```

```
       Case             Control
age    "49.45 (SD=7.9)" "50.34 (SD=8.1)"
weight "153.9 (SD=18)"  "158.4 (SD=18)" 
height "67.32 (SD=2.8)" "68.17 (SD=2.6)"
bmi    "23.83 (SD=1.8)" "23.91 (SD=1.7)"
```

Now we can tabulate the binary sex variable.

```
> sex = sapply(cIndexes, function(x) table(y$sex[x]))
> sex
```

```
       Case Control
Female   93      59
Male     83      93
```

```
> sexF = signif(prop.table(sex, 2), 3)
> sexF
```

```
        Case Control
Female 0.528   0.388
Male   0.472   0.612
```

And we can add the row to our existing 'table 1'

```
> mat1 = rbind(mat1, sexF[1, ])
> rownames(mat1)[nrow(mat1)] = "Sex (Female)"
> mat1
```

```
             Case                Control
age          "49.45 (SD=7.9)" "50.34 (SD=8.1)"
weight       "153.9 (SD=18)"  "158.4 (SD=18)"
height       "67.32 (SD=2.8)" "68.17 (SD=2.6)"
bmi          "23.83 (SD=1.8)" "23.91 (SD=1.7)"
Sex (Female) "0.528"          "0.388"
```

Now we add the p-values. For continuous variables we will use a t-test and for sex we will use a chi-sqaured test.

```
> pv = apply(y[, c("age", "weight", "height", "bmi")], 2, function(x) t.test(x ~
+     y$treat)$p.value)
> pv
```

```
    age  weight  height     bmi 
0.31571 0.02324 0.00436 0.69091 
```

```
> pv = paste("p=", signif(pv, 3), sep = "")
> pv
```

```
[1] "p=0.316"   "p=0.0232"  "p=0.00436" "p=0.691"  
```

```
> sexp = chisq.test(table(y$sex, y$treat))$p.value
> sexp = paste("p=", signif(sexp, 3), sep = "")
> sexp
```

```
[1] "p=0.0151"
```

And now we bind the p-values as a column to the current 'table 1'

```
> pv = c(pv, sexp)
> mat1 = cbind(mat1, pv)
> colnames(mat1)[ncol(mat1)] = "p-value"
> mat1
```

```
             Case                Control             p-value
age          "49.45 (SD=7.9)"  "50.34 (SD=8.1)"  "p=0.316"
weight       "153.9 (SD=18)"   "158.4 (SD=18)"   "p=0.0232"
height       "67.32 (SD=2.8)"  "68.17 (SD=2.6)"  "p=0.00436"
bmi          "23.83 (SD=1.8)"  "23.91 (SD=1.7)"  "p=0.691"
Sex (Female) "0.528"           "0.388"           "p=0.0151"
```

Lastly, we will add the total N as the last row

```
> mat1 = rbind(mat1, c(sapply(cIndexes, length), nrow(y)))
> rownames(mat1)[nrow(mat1)] = "Number"
> mat1
```

```
             Case             Control          p-value    
age          "49.45 (SD=7.9)" "50.34 (SD=8.1)" "p=0.316"  
weight       "153.9 (SD=18)"  "158.4 (SD=18)"  "p=0.0232" 
height       "67.32 (SD=2.8)" "68.17 (SD=2.6)" "p=0.00436"
bmi          "23.83 (SD=1.8)" "23.91 (SD=1.7)" "p=0.691"  
Sex (Female) "0.528"          "0.388"          "p=0.0151" 
Number       "176"            "152"            "328"      
```

Ta-da!

But that's not the best part. We can now do this to every element of the fileList list, using two different ways. The first way is to build a 'for' loop.

```
tableList=fileList # copy format/structure/names
for(i in seq(along=fileList)) {
  y = fileList[[i]]
  < copy all of the table making coding inside here, that starts with 'y' >
  tableList[[i]] = mat1
}
```

This would essentially make tableList a list of tables, one per report.

```
> # or we can write this as a general function
> makeTable1 = function(y) {
+     cIndexes = split(1:nrow(y), y$treat)
+     mCont = sapply(cIndexes, function(x) colMeans(y[x, c("age", "weight", "height",
+         "bmi")]))
+     sdCont = sapply(cIndexes, function(x) apply(y[x, c("age", "weight", "height",
+         "bmi")], 2, sd))
+     mat1 = matrix(paste(signif(mCont, 4), " (SD=", signif(sdCont, 2), ")", sep = ""),
+         nc = 2)
+     dimnames(mat1) = dimnames(mCont)
+     sex = sapply(cIndexes, function(x) table(y$sex[x]))
+     sexF = signif(prop.table(sex, 2), 3)
+     apply(sexF, 2, function(x) paste(x[1], "M/", x[2], "F", sep = ""))
+     mat1 = rbind(mat1, sexF[1, ])
+     rownames(mat1)[nrow(mat1)] = "Sex (Female)"
+     pv = apply(y[, c("age", "weight", "height", "bmi")], 2, function(x) t.test(x ~
+         y$treat)$p.value)
+     pv = paste("p=", signif(pv, 3), sep = "")
+     sexp = chisq.test(table(y$sex, y$treat))$p.value
+     sexp = paste("p=", signif(sexp, 3), sep = "")
+     pv = c(pv, sexp)
+     mat1 = cbind(mat1, pv)
+     colnames(mat1)[ncol(mat1)] = "p-value"
+     mat1 = rbind(mat1, c(sapply(cIndexes, length), nrow(y)))
+     rownames(mat1)[nrow(mat1)] = "Number"
+     return(mat1)
+ }
```

With our general function, it's really easy to lapply this to our list of reports.

```
> tabList = lapply(fileList, makeTable1)
> lapply(tabList, head, 2)
```

```
$January_2009_Report
       Case             Control          p-value
age    "49.45 (SD=7.9)" "50.34 (SD=8.1)" "p=0.316"
weight "153.9 (SD=18)"  "158.4 (SD=18)"  "p=0.0232"

$February_2009_Report
       Case             Control          p-value
age    "50.68 (SD=8.5)" "50.37 (SD=7.5)" "p=0.71"
weight "154.7 (SD=19)"  "154.7 (SD=18)"  "p=0.997"

$March_2009_Report
       Case            Control          p-value
age    "50.2 (SD=8.6)" "50.53 (SD=8.4)" "p=0.698"
weight "155.8 (SD=18)" "154 (SD=18)"    "p=0.306"

$April_2009_Report
       Case             Control          p-value
age    "49.58 (SD=8.1)" "49.59 (SD=7.6)" "p=0.989"
weight "154.2 (SD=18)"  "152.7 (SD=18)"  "p=0.491"

$May_2009_Report
       Case             Control         p-value
age    "48.93 (SD=8.5)" "51.22 (SD=8)"  "p=0.0398"
weight "157.6 (SD=17)"  "153.3 (SD=20)" "p=0.0818"

$June_2009_Report
       Case             Control         p-value
age    "50.05 (SD=8.2)" "49.53 (SD=8)"  "p=0.603"
weight "155.1 (SD=17)"  "155.8 (SD=18)" "p=0.768"
```

Now we can write out each 'Table 1' to a new file. Create a new folder in your current working directory called 'Tables'.

```
> for (i in seq(along = tabList)) {
+     fn = paste("Tables/", names(tabList)[i], "_table1.txt", sep = "")
+     write.table(tabList[[i]], fn, quote = F, sep = "\t")
+ }
```

So we now have 36 tab-delimited tables written to our Tables/ directory

Ta-da!

'Table 1'

We can also make one big data frame, combining each report. The do.call() function is very useful here, which 'constructs and executes a function call from a name or a function and a list of arguments to be passed to it'.

While the definition is a little confusing, you can see how it works in practice. This will row bind all of the list elements together into 1 data frame.

```
> bigTab = do.call("rbind", fileList)
> dim(bigTab)
```

```
[1] 10438    10
```

```
> class(bigTab)
```

```
[1] "data.frame"
```

Note that 'rbind' will only work here if EVERY element of fileList has the same number of columns and likely the same column names.

```
> bigTab[1:10, ]
```

```
                       id    sex   treat   age bgDrugs height weight block
January_2009_Report.1   1   Male Control 52.68    none  70.24  173.4     f
January_2009_Report.2   2 Female Control 47.10    none  63.84  139.9     f
January_2009_Report.3   3   Male Control 62.84  asprin  69.47  174.5     c
January_2009_Report.4   4 Female Control 49.51 tylenol  65.39  132.3     b
January_2009_Report.5   5   Male Control 54.42   advil  70.87  161.8     d
January_2009_Report.6   6 Female    Case 46.02  asprin  63.94  150.5     c
January_2009_Report.7   7 Female Control 60.98 tylenol  65.68  133.5     b
January_2009_Report.8   8   Male Control 45.93    none  69.39  183.9     a
January_2009_Report.9   9 Female    Case 50.37   advil  64.80  144.5     c
January_2009_Report.10 10   Male Control 50.08 tylenol  70.68  169.2     b
                       recruitDate   bmi
January_2009_Report.1           25 24.70
January_2009_Report.2           24 24.13
January_2009_Report.3            8 25.42
January_2009_Report.4           24 21.75
January_2009_Report.5            7 22.64
January_2009_Report.6            5 25.88
January_2009_Report.7            8 21.75
January_2009_Report.8           13 26.84
January_2009_Report.9           13 24.19
January_2009_Report.10           9 23.81
```

'Table 1'

And now we can use our custom function on the full data frame.

```
> makeTable1(bigTab)
```

```
             Case             Control          p-value  
age          "49.85 (SD=8.2)" "50.07 (SD=8)"   "p=0.169"
weight       "155 (SD=18)"    "154.7 (SD=18)"  "p=0.409"
height       "67.5 (SD=2.7)"  "67.49 (SD=2.7)" "p=0.87" 
bmi          "23.85 (SD=1.8)" "23.82 (SD=1.8)" "p=0.3"  
Sex (Female) "0.502"          "0.504"          "p=0.921"
Number       "5234"           "5204"           "10438"  
```

Data Formatting

Let's fix up the row names from our big table.

```
> ss = function(x, pattern, slot = 1, ...) sapply(strsplit(x, pattern, ...), function(y) y[slot])
> month = ss(rownames(bigTab), "_", 1)
> year = as.integer(ss(rownames(bigTab), "_", 2))
> rownames(bigTab) = NULL
> head(bigTab)
```

```
  id    sex   treat   age bgDrugs height weight block recruitDate   bmi
1  1   Male Control 52.68    none  70.24  173.4     f          25 24.70
2  2 Female Control 47.10    none  63.84  139.9     f          24 24.13
3  3   Male Control 62.84  asprin  69.47  174.5     c           8 25.42
4  4 Female Control 49.51 tylenol  65.39  132.3     b          24 21.75
5  5   Male Control 54.42   advil  70.87  161.8     d           7 22.64
6  6 Female    Case 46.02  asprin  63.94  150.5     c           5 25.88
```

```
> head(month)
```

```
[1] "January" "January" "January" "January" "January" "January"
```

Data Formatting

We can clean up the date as well, and coerce it to the 'Date' class. See more information about formatting here: http://www.statmethods.net/input/dates.html

```
> date = paste(month, " ", bigTab$recruitDate, ", ", year, sep = "")
> bigTab$Date = as.Date(date, format = "%B %d, %Y")
> bigTab = bigTab[, names(bigTab) != "recruitDate"]
> head(bigTab)
```

```
  id    sex   treat   age bgDrugs height weight block   bmi       Date
1  1   Male Control 52.68    none  70.24  173.4     f 24.70 2009-01-25
2  2 Female Control 47.10    none  63.84  139.9     f 24.13 2009-01-24
3  3   Male Control 62.84  asprin  69.47  174.5     c 25.42 2009-01-08
4  4 Female Control 49.51 tylenol  65.39  132.3     b 21.75 2009-01-24
5  5   Male Control 54.42   advil  70.87  161.8     d 22.64 2009-01-07
6  6 Female    Case 46.02  asprin  63.94  150.5     c 25.88 2009-01-05
```

Data Formatting

And we can order by date.

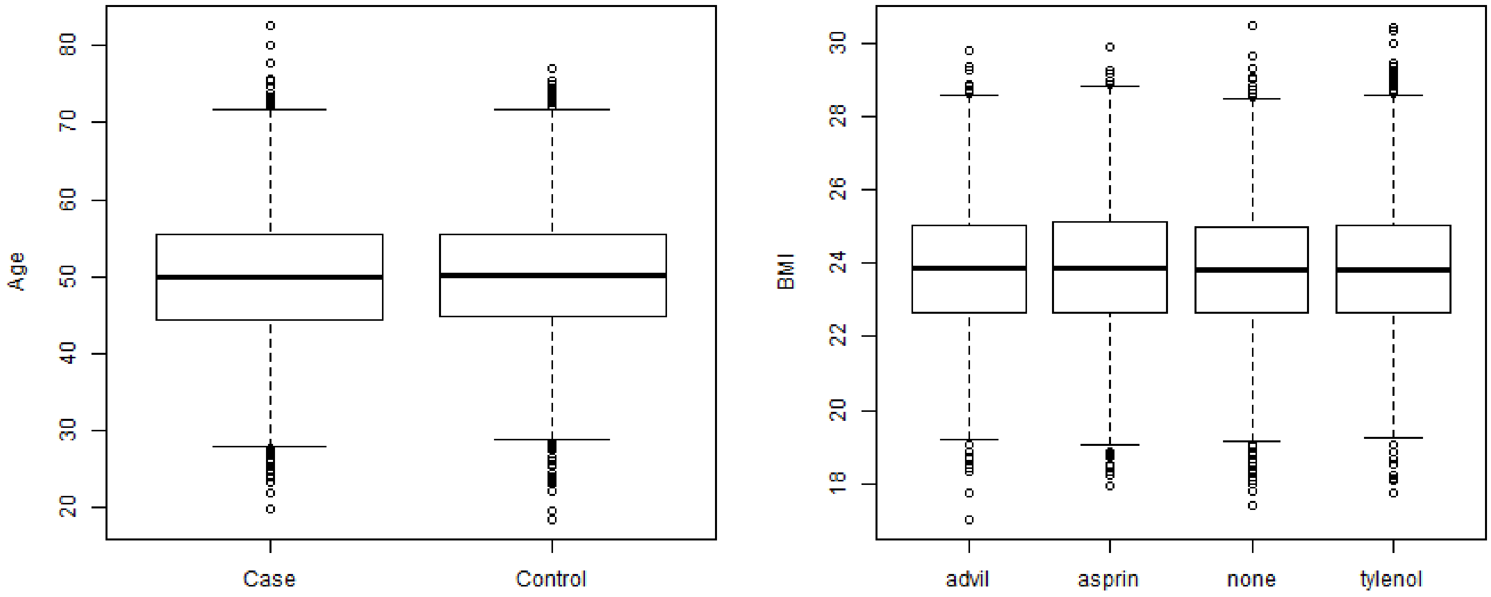
```
> bigTabDate = bigTab[order(bigTab$Date), ]
> head(bigTabDate)
```

```
     id    sex   treat   age bgDrugs height weight block   bmi       Date
29   29   Male    Case 54.56 tylenol  70.94  164.4     b 22.97 2009-01-01
56   56 Female    Case 53.97 tylenol  64.58  147.7     b 24.91 2009-01-01
68   68 Female    Case 51.81   advil  63.58  137.8     c 23.97 2009-01-01
70   70   Male Control 43.70   advil  69.00  169.0     c 24.95 2009-01-01
82   82 Female Control 53.88    none  66.01  136.6     b 22.04 2009-01-01
134 134   Male    Case 57.16    none  71.16  170.2     c 23.63 2009-01-01
```

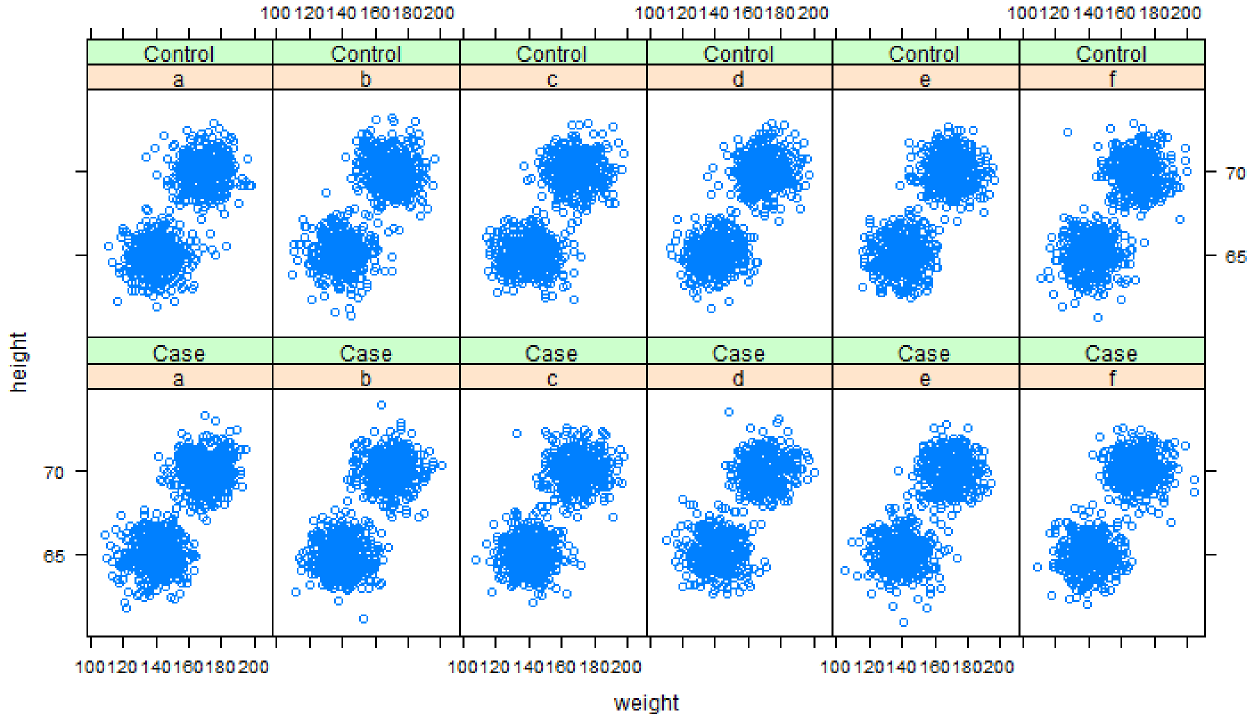
Data Exploration

Now we explore this data frame.

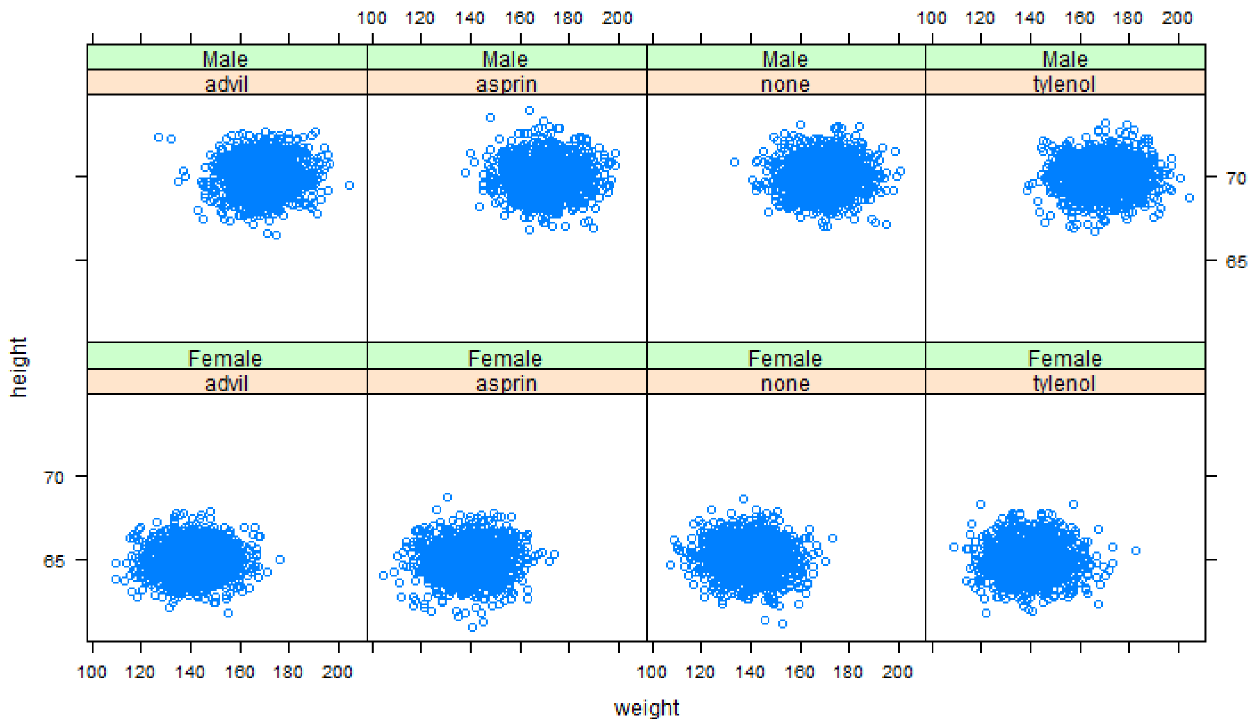
```
> par(mfrow = c(1, 2))
> boxplot(age ~ treat, data = bigTab, ylab = "Age")
> boxplot(bmi ~ bgDrugs, data = bigTab, ylab = "BMI")
```



```
> par(mfrow = c(1, 1))
> library(lattice)
> xyplot(height ~ weight | block * treat, data = bigTab)
```



```
> par(mfrow = c(1, 1))
> library(lattice)
> xyplot(height ~ weight | bgDrugs * sex, data = bigTab)
```


Male
advil
Male
asprin
Male
none
Male
tylenol
height
Female
advil
Female
asprin
Female
none
Female
tylenol
weight