MPS814 - Tópicos Especiais em Epidemiologia

R para epidemiologia

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compareGroups

O pacote compareGroups

- O pacote compareGroups permite aos usuários **criar tabelas** dispondo resultados de análises univariadas, **estratitificadas** ou não **por variáveis categóricas de agrupamentos**.
- As tabelas podem facilmente ser **exportadas para CSV, LaTeX, HTML, PDF, Word ou Excel**.
- Este pacote pode ser usado a partir do R, de uma interface gráfica (consulte o help), ou ainda, de uma interface web (http://www.comparegroups.eu/).
- Nesta aula, veremos uma breve revisão do uso do pacote compareGroups.
  - Para mais detalhes das funcionalidades do pacote, veja a vinheta no help do pacote.
- Primeiro instale e carregue o pacote:

```
install.packages("compareGroups")
```

```
library(compareGroups)
```

Classes e metódos

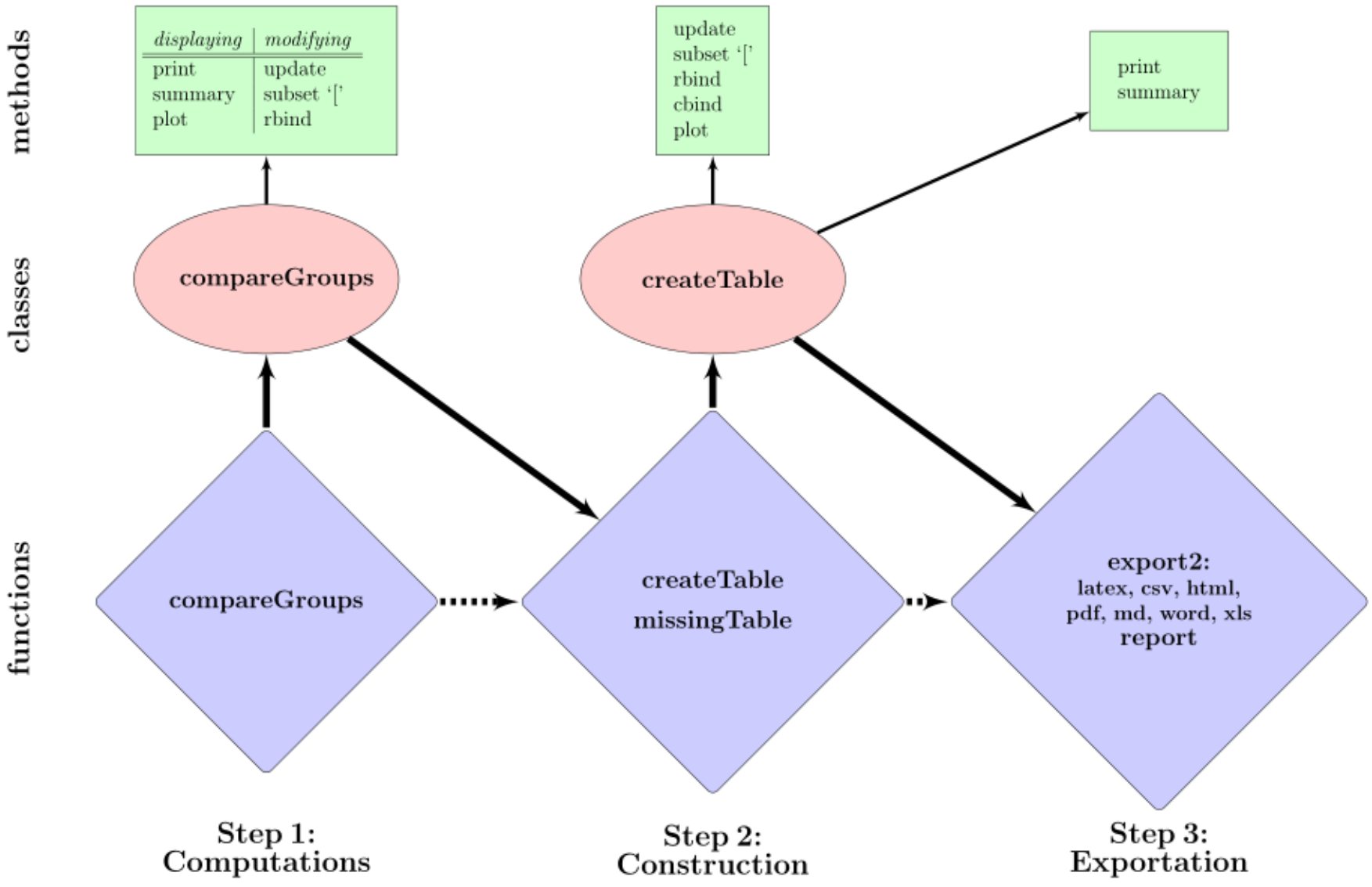
O pacote `compareGroups` possui **três funções principais**:

- `compareGroups()` cria um objeto da classe `compareGroups`. Este objeto pode ser:
  - impresso (`print()`)
  - resumido (`summary()`)
  - plotado (`plot()`)
  - atualizado (`update()`)
- `createTable()` cria um objeto da classe `createTable`. Este objeto pode ser:
  - impresso (`print()`)
  - resumido (`summary()`)

Classes e metódos

- `export2csv()`, `export2html()`, `export2latex()`, `export2pdf()`, `export2md()`, `export2word()` e `export2xls()` irão exportar os resultados para CSV, HTML, LaTeX, PDF, Markdown, Word ou Excel, respectivamente.

Classes e metódos



Exemplo

```
data(predimed)
```

```
?predimed
```

	Name	Label	Codes
group	group	Intervention group	Control; MDN; MDV
sex	sex	Sex	Male; Female
age	age	Age	
smoke	smoke	Smoking	Never; Current; Former
bmi	bmi	Body mass index	
waist	waist	Waist circumference	
wth	wth	Waist-to-height ratio	
htn	htn	Hypertension	No; Yes
diab	diab	Type-2 diabetes	No; Yes
hyperchol	hyperchol	Dyslipidemia	No; Yes
famhist	famhist	Family history of premature CHD	No; Yes
hormo	hormo	Hormone-replacement therapy	No; Yes
p14	p14	MeDiet Adherence score	
toevent	toevent	follow-up to main event (years)	
event.varlabel	event	AMI, stroke, or CV Death	No; Yes

Variáveis tempo até o evento

- **Veja a vinheta do pacote!**

```
predimed$tmain <- with(predimed,
                       Surv(toevent, event == 'Yes'))
label(predimed$tmain) <- "AMI, stroke, or CV Death"
```

A função `compareGroups()`

- Esta é a principal função do pacote.
  - Ela realiza todos os cálculos.
  - **É necessário armazenar os resultados em um objeto**.
  - Posteriormente, aplicando a função `createTable()` a este objeto, **tabelas de resultados de análises serão criadas**.
- Por exemplo, para realizar uma análise univariada com os dados de *predimed* entre grupos (variável `group`) e **todas as demais variáveis**, utiliza-se a seguinte fórmula:

```
compareGroups(group ~ . , data = predimed)
```

- Note que o `.` no argumento `formula` especifica a inclusão de todas as variáveis do dataframe na fórmula.
- Para remover as variáveis *toevent* e *event* da análise utilizamos o `-`:

```
compareGroups(group ~ . - toevent - event, data = predimed)
```

A função `compareGroups()`

- Para selecionar variáveis específicas utilizamos o +:

```
res <- compareGroups(group ~ age + sex + smoke + waist + hormo,
                     data = predimed)
res
```

```
##
##
## -------- Summary of results by groups of 'Intervention group'---------
##
##
##   var                          N    p.value  method            selection
## 1 Age                          6324 0.003**  continuous normal ALL
## 2 Sex                          6324 <0.001** categorical       ALL
## 3 Smoking                      6324 0.444    categorical       ALL
## 4 Waist circumference          6324 0.045**  continuous normal ALL
## 5 Hormone-replacement therapy 5661 0.850    categorical       ALL
## -----
## Signif. codes:  0 '**' 0.05 '*' 0.1 ' ' 1
```

Subconjuntos

- É possível criarmos tabelas apenas para um subconjunto dos dados através do argumento `subset`:

```
compareGroups(group ~ age + smoke + waist + hormo,
              data = predimed,
              subset = sex == 'Female')
```

```
##
##
## -------- Summary of results by groups of 'Intervention group'---------
##
##
##   var                          N    p.value method
## 1 Age                          3645 0.056*  continuous normal
## 2 Smoking                      3645 0.907   categorical
## 3 Waist circumference          3645 0.016** continuous normal
## 4 Hormone-replacement therapy 3459 0.898   categorical
##   selection
## 1 sex == "Female"
## 2 sex == "Female"
## 3 sex == "Female"
## 4 sex == "Female"
## -----
## Signif. codes:  0 '**' 0.05 '*' 0.1 ' ' 1
```

Métodos para variáveis contínuas

- Por *default*, **variáveis contínuas** serão analisadas como normais **(normalmente distribuídas)**.
  - Quando uma tabela é construída, variáveis contínuas **serão descritas** por **média** e **desvio padrão**.
  - Para mudar esta opção, use o argumento `method`:

```
compareGroups(group ~ age + smoke + waist + hormo,
              data = predimed,
              method = c(waist = 2))
```

```
## Warning in cor.test.default(x, as.integer(y), method = "spearman"): Cannot
## compute exact p-value with ties
```

Métodos para variáveis contínuas

```
##
##
## -------- Summary of results by groups of 'Intervention group'---------
##
##
##   var                          N    p.value method                selection
## 1 Age                          6324 0.003** continuous normal     ALL
## 2 Smoking                      6324 0.444   categorical           ALL
## 3 Waist circumference          6324 0.085*  continuous non-normal ALL
## 4 Hormone-replacement therapy 5661 0.850   categorical           ALL
## -----
## Signif. codes:  0 '**' 0.05 '*' 0.1 ' ' 1
```

Métodos para variáveis contínuas

- Valores possíveis para o argumento `method` são:
  - `1`: força a análise **como normal**
  - `2`: força a análise **como contínua não-normal**
  - `3`: força a análise **como categórica**
  - `NA`: realiza um **teste de Shapiro-Wilks** para decidir entre normal e não-normal (por *default* o teste utiliza o nível de significância de 0,05)

Métodos para variáveis contínuas

- Mudando o nível de significância do teste de Shapiro-Wilks:

```
compareGroups(group ~ age + smoke + waist + hormo,
              data = predimed,
              method = c(waist = NA),
              alpha = 0.01)
```

```
## Warning in cor.test.default(x, as.integer(y), method = "spearman"): Cannot
## compute exact p-value with ties
```

```
##
##
## -------- Summary of results by groups of 'Intervention group'---------
##
##
##   var                          N    p.value method                selection
## 1 Age                          6324 0.003** continuous normal     ALL
## 2 Smoking                      6324 0.444   categorical           ALL
## 3 Waist circumference          6324 0.085*  continuous non-normal ALL
## 4 Hormone-replacement therapy 5661 0.850   categorical           ALL
## -----
## Signif. codes:  0 '**' 0.05 '*' 0.1 ' ' 1
```

A função `createTable()`

- A função `createTable()` aplicada a um objeto da classe `compareGroups` **retorna tabelas com estatísticas descritivas** que podem ser **dispostas na tela** (console) ou **exportadas** para CSV, LaTeX, HTML, Word ou Excel.

```
res <- compareGroups(group ~ age + sex + smoke + waist + hormo,
                     data = predimed, method = c(waist = NA),
                     selec = list(hormo = sex == "Female"))
restab <- createTable(res)
print(restab, which.table = 'descr')
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________
##                                Control          MDN            MDV       p.overall
##                                 N=2042         N=2100         N=2182
## ----------------------------------------------------------------------------
## Age                          67.3 (6.28)    66.7 (6.02)    67.0 (6.21)     0.003
## Sex:                                                                      <0.001
##     Male                     812 (39.8%)    968 (46.1%)    899 (41.2%)
##     Female                   1230 (60.2%)   1132 (53.9%)   1283 (58.8%)
## Smoking:                                                                   0.444
##     Never                    1282 (62.8%)   1259 (60.0%)   1351 (61.9%)
##     Current                  270 (13.2%)    296 (14.1%)    292 (13.4%)
##     Former                   490 (24.0%)    545 (26.0%)    539 (24.7%)
## Waist circumference         101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085
## Hormone-replacement therapy:                                               0.898
##     No                       1143 (97.4%)   1036 (97.2%)   1183 (97.0%)
##     Yes                       31 (2.64%)     30 (2.81%)     36 (2.95%)
## ----------------------------------------------------------------------------
```

A função `createTable()`

- Note que a função `print()` aplicada ao objeto `restab` (da classe `createTable`) **imprime** a tabela de estatísticas descritivas quando o argumento `which.table` é especificado como `descr`.
  - Quando o mesmo argumento é especificado como `avail` os métodos e seleções utilizados para a construção da tabela são descritos.

```
print(restab, which.table = 'avail')
```

```
##
##
##
## ---Available data----
##
## ------------------------------------------------------------------------------------
##                             [ALL] Control MDN  MDV         method              select
## ------------------------------------------------------------------------------------
## Age                         6324   2042   2100 2182   continuous-normal         ALL
## Sex                         6324   2042   2100 2182      categorical            ALL
## Smoking                     6324   2042   2100 2182      categorical            ALL
## Waist circumference         6324   2042   2100 2182 continuous-non-normal       ALL
## Hormone-replacement therapy 3459   1174   1066 1219      categorical      sex == "Female"
## ------------------------------------------------------------------------------------
```

“Escondendo” categorias

```
restab2 <- createTable(res, hide = c(sex = "Male"))
print(restab2)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________
##                                 Control          MDN            MDV       p.overall
##                                  N=2042         N=2100         N=2182
## ----------------------------------------------------------------------------
## Age                            67.3 (6.28)    66.7 (6.02)    67.0 (6.21)     0.003
## Sex: Female                    1230 (60.2%)   1132 (53.9%)   1283 (58.8%)   <0.001
## Smoking:                                                                     0.444
##     Never                      1282 (62.8%)   1259 (60.0%)   1351 (61.9%)
##     Current                    270 (13.2%)    296 (14.1%)    292 (13.4%)
##     Former                     490 (24.0%)    545 (26.0%)    539 (24.7%)
## Waist circumference           101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085
## Hormone-replacement therapy:                                                 0.898
##     No                         1143 (97.4%)   1036 (97.2%)   1183 (97.0%)
##     Yes                         31 (2.64%)     30 (2.81%)     36 (2.95%)
## ----------------------------------------------------------------------------
```

"Escondendo" categorias `no`

```
restab3 <- createTable(res, hide.no = "no",
                       hide = c(sex = "Male"))
print(restab3)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ------------------------------------------------------------------------------
##                                 Control          MDN             MDV       p.overall
##                                  N=2042         N=2100          N=2182
## ------------------------------------------------------------------------------
## Age                            67.3 (6.28)    66.7 (6.02)     67.0 (6.21)     0.003
## Sex: Female                    1230 (60.2%)   1132 (53.9%)    1283 (58.8%)   <0.001
## Smoking:                                                                      0.444
##     Never                      1282 (62.8%)   1259 (60.0%)    1351 (61.9%)
##     Current                    270 (13.2%)    296 (14.1%)     292 (13.4%)
##     Former                     490 (24.0%)    545 (26.0%)     539 (24.7%)
## Waist circumference           101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085
## Hormone-replacement therapy    31 (2.64%)     30 (2.81%)      36 (2.95%)     0.898
## ------------------------------------------------------------------------------
```

Especificando o número de dígitos

```
restab4 <- createTable(res, digits = c(age = 2, sex = 3),
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab4)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________
##                                Control          MDN            MDV       p.overall
##                                 N=2042         N=2100         N=2182
## ____________________________________________________________________________
## Age                           67.34 (6.28)   66.68 (6.02)   67.02 (6.21)    0.003
## Sex: Female                  1230 (60.235%) 1132 (53.905%) 1283 (58.799%)  <0.001
## Smoking:                                                                    0.444
##     Never                     1282 (62.8%)   1259 (60.0%)   1351 (61.9%)
##     Current                   270 (13.2%)    296 (14.1%)    292 (13.4%)
##     Former                    490 (24.0%)    545 (26.0%)    539 (24.7%)
## Waist circumference          101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085
## Hormone-replacement therapy   31 (2.64%)     30 (2.81%)     36 (2.95%)     0.898
## ____________________________________________________________________________
```

Apresentando o tamanho de amostra

```
restab5 <- createTable(res, show.n = TRUE,
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab5)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________________
##                                Control          MDN             MDV       p.overall  N
##                                 N=2042         N=2100          N=2182
## ____________________________________________________________________________________
## Age                          67.3 (6.28)    66.7 (6.02)     67.0 (6.21)      0.003   6324
## Sex: Female                  1230 (60.2%)   1132 (53.9%)    1283 (58.8%)    <0.001   6324
## Smoking:                                                                     0.444   6324
##     Never                    1282 (62.8%)   1259 (60.0%)    1351 (61.9%)
##     Current                  270 (13.2%)    296 (14.1%)     292 (13.4%)
##     Former                   490 (24.0%)    545 (26.0%)     539 (24.7%)
## Waist circumference         101 [94.0;108] 100 [93.0;107] 100 [93.0;107]    0.085   6324
## Hormone-replacement therapy   31 (2.64%)     30 (2.81%)      36 (2.95%)      0.898   3459
## ____________________________________________________________________________________
```

Descritivas sem estratificação

```
restab6 <- createTable(res, show.all = TRUE,
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab6)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________________________
##                                 [ALL]          Control          MDN             MDV        p.overall
##                                N=6324          N=2042          N=2100          N=2182
## --------------------------------------------------------------------------------------------
## Age                          67.0 (6.17)     67.3 (6.28)     66.7 (6.02)     67.0 (6.21)      0.003
## Sex: Female                  3645 (57.6%)    1230 (60.2%)    1132 (53.9%)    1283 (58.8%)    <0.001
## Smoking:                                                                                      0.444
##     Never                    3892 (61.5%)    1282 (62.8%)    1259 (60.0%)    1351 (61.9%)
##     Current                  858 (13.6%)     270 (13.2%)     296 (14.1%)     292 (13.4%)
##     Former                   1574 (24.9%)    490 (24.0%)     545 (26.0%)     539 (24.7%)
## Waist circumference         100 [93.0;107] 101 [94.0;108] 100 [93.0;107] 100 [93.0;107]    0.085
## Hormone-replacement therapy   97 (2.80%)      31 (2.64%)      30 (2.81%)      36 (2.95%)      0.898
## --------------------------------------------------------------------------------------------
```

Teste de tendência

```
restab7 <- createTable(res, show.p.trend = TRUE,
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab7)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________________
##                                Control          MDN             MDV       p.overall p.trend
##                                 N=2042          N=2100          N=2182
## ____________________________________________________________________________________
## Age                          67.3 (6.28)     66.7 (6.02)     67.0 (6.21)     0.003    0.101
## Sex: Female                  1230 (60.2%)    1132 (53.9%)    1283 (58.8%)   <0.001    0.388
## Smoking:                                                                     0.444    0.573
##     Never                    1282 (62.8%)    1259 (60.0%)    1351 (61.9%)
##     Current                  270 (13.2%)     296 (14.1%)     292 (13.4%)
##     Former                   490 (24.0%)     545 (26.0%)     539 (24.7%)
## Waist circumference         101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085    0.040
## Hormone-replacement therapy   31 (2.64%)      30 (2.81%)      36 (2.95%)     0.898    0.643
## ____________________________________________________________________________________
```

Comparações múltiplas

```
restab8 <- createTable(res, show.p.mul = TRUE,
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab8)
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________________________________
##                                Control          MDN             MDV       p.overall p.Control vs MDN p.Contro
##                                 N=2042          N=2100          N=2182
## ----------------------------------------------------------------------------------------------------
## Age                          67.3 (6.28)     66.7 (6.02)     67.0 (6.21)     0.003         0.002             0.2
## Sex: Female                  1230 (60.2%)    1132 (53.9%)    1283 (58.8%)   <0.001         <0.001            0.3
## Smoking:                                                                     0.444         0.518             0.8
##     Never                    1282 (62.8%)    1259 (60.0%)    1351 (61.9%)
##     Current                  270 (13.2%)     296 (14.1%)     292 (13.4%)
##     Former                   490 (24.0%)     545 (26.0%)     539 (24.7%)
## Waist circumference         101 [94.0;108] 100 [93.0;107] 100 [93.0;107]   0.085         0.126             0.1
## Hormone-replacement therapy   31 (2.64%)      30 (2.81%)      36 (2.95%)     0.898         0.942             0.9
## ____________________________________________________________________________________________________
```

Alterando os nomes das colunas

```
restab9 <- createTable(res, show.all = TRUE,
                       hide.no = "no",
                       hide = c(sex = "Male"))
print(restab9, header.labels = c(p.overall = "p-valor", all = "Total"))
```

```
##
## --------Summary descriptives table by 'Intervention group'---------
##
## ____________________________________________________________________________________
##                                Total         Control          MDN            MDV       p-valor
##                                N=6324         N=2042         N=2100         N=2182
## ____________________________________________________________________________________
## Age                          67.0 (6.17)    67.3 (6.28)    66.7 (6.02)    67.0 (6.21)    0.003
## Sex: Female                  3645 (57.6%)   1230 (60.2%)   1132 (53.9%)   1283 (58.8%)  <0.001
## Smoking:                                                                                  0.444
##     Never                    3892 (61.5%)   1282 (62.8%)   1259 (60.0%)   1351 (61.9%)
##     Current                  858 (13.6%)    270 (13.2%)    296 (14.1%)    292 (13.4%)
##     Former                   1574 (24.9%)   490 (24.0%)    545 (26.0%)    539 (24.7%)
## Waist circumference         100 [93.0;107] 101 [94.0;108] 100 [93.0;107] 100 [93.0;107]  0.085
## Hormone-replacement therapy   97 (2.80%)     31 (2.64%)     30 (2.81%)     36 (2.95%)    0.898
## ____________________________________________________________________________________
```

Exportando tabelas

- As tabelas podem ser exportadas para os formatos CSV, HTML, LaTeX, PDF, Markdown, Word ou Excel:

- `export2csv(restab, file='table1.csv')` exporta para o formato CSV
- `export2html(restab, file='table1.html')` exporta para o formato HTML
- `export2latex(restab, file='table1.tex')` exporta para o formato LaTeX
- `export2pdf(restab, file='table1.pdf')` exporta para o formato PDF
- `export2md(restab, file='table1.md')` para ser incluído dentro de documentos Markdown em chunks do `R`
- `export2word(restab, file='table1.docx')` exporta para o formato Word
- `export2xls(restab, file='table1.xlsx')` exporta para o formato Excel

Exportando tabelas

```
export2md(restab9, caption = "Características dos grupos do estudo",
          header.labels = c(p.overall = "p-valor", all = "Total"))
```

Table 2: Características dos grupos do estudo

Var	Total N=6324	Control N=2042	MDN N=2100	MDV N=2182	p-valor
Age	67.0 (6.17)	67.3 (6.28)	66.7 (6.02)	67.0 (6.21)	0.003
Sex: Female	3645 (57.6%)	1230 (60.2%)	1132 (53.9%)	1283 (58.8%)	<0.001
Smoking:					0.444
Never	3892 (61.5%)	1282 (62.8%)	1259 (60.0%)	1351 (61.9%)	
Current	858 (13.6%)	270 (13.2%)	296 (14.1%)	292 (13.4%)	
Former	1574 (24.9%)	490 (24.0%)	545 (26.0%)	539 (24.7%)	
Waist circumference	100 [93.0;107]	101 [94.0;108]	100 [93.0;107]	100 [93.0;107]	0.085
Hormone-replacement therapy	97 (2.80%)	31 (2.64%)	30 (2.81%)	36 (2.95%)	0.898

Tabela de dados ausentes (?!)

```
data(regicor)
res <- compareGroups(year ~ . - id, regicor)
restab <- createTable(res, show.n = TRUE,
                      hide.no = "no",
                      hide = c(sex = "Male"))
print(restab, header.labels = c(p.overall = "p-valor", all = "Total"))
```

```
##
## --------Summary descriptives table by 'Recruitment year'---------
##
## ____________________________________________________________________________________________
##                                                1995          2000          2005      p-valor  N
##                                                N=431         N=786         N=1077
## ____________________________________________________________________________________________
## Age                                          54.1 (11.7)   54.3 (11.2)   55.3 (10.6)   0.078   2294
## Sex: Female                                  225 (52.2%)   396 (50.4%)   572 (53.1%)   0.506   2294
## Smoking status:                                                                        <0.001   2233
##     Never smoker                             234 (56.4%)   414 (54.6%)   553 (52.2%)
##     Current or former < 1y                   109 (26.3%)   267 (35.2%)   217 (20.5%)
##     Former >= 1y                             72 (17.3%)    77 (10.2%)    290 (27.4%)
## Systolic blood pressure                      133 (19.2)    133 (21.3)    129 (19.8)    <0.001   2280
## Diastolic blood pressure                     77.0 (10.5)   80.8 (10.3)   79.9 (10.6)   <0.001   2280
## History of hypertension                      111 (25.8%)   233 (29.6%)   379 (35.5%)   <0.001   2286
## Hypertension treatment                       71 (16.5%)    127 (16.2%)   230 (22.2%)   0.002    2251
## Total cholesterol                            225 (43.1)    224 (44.4)    213 (45.9)    <0.001   2193
## HDL cholesterol                              51.9 (14.5)   52.3 (15.6)   53.2 (14.2)   0.208    2225
## Triglycerides                                114 (74.4)    114 (70.7)    117 (76.0)    0.582    2231
## LDL cholesterol                              152 (38.4)    149 (38.6)    136 (39.7)    <0.001   2126
```

Tabela de dados ausentes (?!)

```
## History of hyperchol.                                 97 (22.5%)  256 (33.2%) 356 (33.2%) <0.001  2273
## Cholesterol treatment                                 28 (6.50%)  68 (8.80%)  132 (12.8%) <0.001  2239
## Height (cm)                                           163 (9.21)  162 (9.39)  163 (9.05)   0.003  2259
## Weight (Kg)                                           72.3 (12.6) 73.8 (14.0) 73.6 (13.9)  0.150  2259
## Body mass index                                       27.0 (4.15) 28.1 (4.62) 27.6 (4.63) <0.001  2259
## Physical activity (Kcal/week)                          491 (419)   422 (377)   351 (378)  <0.001  2206
## Physical component                                    49.3 (8.08) 49.0 (9.63) 50.1 (8.91)  0.032  2054
## Mental component                                      49.2 (11.3) 48.9 (11.0) 46.9 (10.8) <0.001  2054
## Cardiovascular event                                  10 (2.51%)  35 (4.72%)  47 (4.59%)   0.161  2163
## Days to cardiovascular event or end of follow-up      1784 (1101) 1686 (1080) 1793 (1072)  0.099  2163
## Overall death                                         18 (4.65%)  81 (11.0%)  74 (7.23%)  <0.001  2148
## Days to overall death or end of follow-up             1713 (1042) 1674 (1050) 1758 (1055)  0.252  2148
## ------------------------------------------------------------------------------------------------------
```

```
missingTable(res)
```

```
## Warning in cor(as.integer(x), as.integer(y)): o desvio padrão é zero

## Warning in cor(as.integer(x), as.integer(y)): o desvio padrão é zero
```

Tabela de dados ausentes (?!)

```
##
## --------Missingness table by 'Recruitment year'---------
##
## ------------------------------------------------------------------------------------
##                                                    1995       2000        2005    p.overall
##                                                   N=431      N=786       N=1077
## ------------------------------------------------------------------------------------
## Age                                              0 (0.00%)   0 (0.00%)  0 (0.00%)      .
## Sex                                              0 (0.00%)   0 (0.00%)  0 (0.00%)      .
## Smoking status                                  16 (3.71%) 28 (3.56%)  17 (1.58%)   0.010
## Systolic blood pressure                          3 (0.70%)  11 (1.40%)  0 (0.00%)   <0.001
## Diastolic blood pressure                         3 (0.70%)  11 (1.40%)  0 (0.00%)   <0.001
## History of hypertension                          0 (0.00%)   0 (0.00%)  8 (0.74%)    0.015
## Hypertension treatment                           0 (0.00%)   0 (0.00%)  43 (3.99%)  <0.001
## Total cholesterol                               28 (6.50%) 71 (9.03%)  2 (0.19%)   <0.001
## HDL cholesterol                                 30 (6.96%) 38 (4.83%)  1 (0.09%)   <0.001
## Triglycerides                                   28 (6.50%) 34 (4.33%)  1 (0.09%)   <0.001
## LDL cholesterol                                 43 (9.98%) 98 (12.5%)  27 (2.51%)  <0.001
## History of hyperchol.                            0 (0.00%)  15 (1.91%)  6 (0.56%)    0.001
## Cholesterol treatment                            0 (0.00%)  13 (1.65%)  42 (3.90%)  <0.001
## Height (cm)                                      8 (1.86%)  15 (1.91%)  12 (1.11%)   0.318
## Weight (Kg)                                      8 (1.86%)  15 (1.91%)  12 (1.11%)   0.318
## Body mass index                                  8 (1.86%)  15 (1.91%)  12 (1.11%)   0.318
## Physical activity (Kcal/week)                   64 (14.8%) 22 (2.80%)  2 (0.19%)   <0.001
## Physical component                              34 (7.89%) 123 (15.6%) 83 (7.71%)  <0.001
## Mental component                                34 (7.89%) 123 (15.6%) 83 (7.71%)  <0.001
## Cardiovascular event                            33 (7.66%) 45 (5.73%)  53 (4.92%)   0.118
## Days to cardiovascular event or end of follow-up 33 (7.66%) 45 (5.73%)  53 (4.92%)   0.118
## Overall death                                   44 (10.2%) 48 (6.11%)  54 (5.01%)   0.001
## Days to overall death or end of follow-up       44 (10.2%) 48 (6.11%)  54 (5.01%)   0.001
## ------------------------------------------------------------------------------------
```

Sua vez!

1. Repita os exemplos encontrados na vinheta do pacote `compareGroups` com o banco de dados *evans.dta*.