Data Frame basics

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## Objectives

After completing this unit, programmers should be able to:

* 1. identify two differences between a data frame and a tibble
  2. know how to examine the structure of a data frame or tibble
  3. View or print to contents of a tibble
  4. describe rules for constructing tidy data

## Data Frame or Tibble?

#### In R, a data frame is a multicolumn list of information. This forms the heart of R data analysis. A tibble, found in the ‘tidyverse’ package is an ‘opinionated’ data frame object that has improvements over legacy data.frame objects in terms of subsetting and printing. It also enforces column (or variable) typing, so there is no coercion of variables from one type to the next, seen in older forms of the data frame in R.

#### A tibble incorporates the notion of ‘Tidy’ data:

* + Each variable must have its own column.
  + Each observation must have its own row.
  + Each value must have its own cell.)

see also: <https://r4ds.had.co.nz/tibbles.html>

# Getting Information on a Dataset

There are a number of functions for listing the contents of an object or dataset.

## Examine the structure of a data frame or tibble

## Introduce the tibble object  
library(tidyverse)

## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --

## v ggplot2 3.3.3 v purrr 0.3.4  
## v tibble 3.1.0 v dplyr 1.0.5  
## v tidyr 1.1.3 v stringr 1.4.0  
## v readr 1.4.0 v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse\_conflicts() --  
## x dplyr::filter() masks stats::filter()  
## x dplyr::lag() masks stats::lag()

# Most R packages use regular data frames. as\_tibble() will convert a data frame to a tibble.  
# Class tells us a bit about the data structure:  
# IRIS is one of R Studio's built in data frames  
class(iris)

## [1] "data.frame"

iris\_tbl<-as\_tibble(iris)   
class(iris\_tbl)

## [1] "tbl\_df" "tbl" "data.frame"

# In addition to the class() function, you can get more about the DF using the str() function  
str(iris)

## 'data.frame': 150 obs. of 5 variables:  
## $ Sepal.Length: num 5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...  
## $ Sepal.Width : num 3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...  
## $ Petal.Length: num 1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...  
## $ Petal.Width : num 0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...  
## $ Species : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 1 ...

str(iris\_tbl)

## tibble [150 x 5] (S3: tbl\_df/tbl/data.frame)  
## $ Sepal.Length: num [1:150] 5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...  
## $ Sepal.Width : num [1:150] 3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...  
## $ Petal.Length: num [1:150] 1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...  
## $ Petal.Width : num [1:150] 0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...  
## $ Species : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 1 ...

# list objects in the working environment  
ls()

## [1] "iris\_tbl"

## Viewing contents of data frames or tibbles

library(tidyverse)  
  
#read in the sample data  
library(haven)  
library(here)

## Warning: package 'here' was built under R version 4.0.5

## here() starts at C:/Users/thomasb/Documents/R/training

#Note that the HAVEN package reads in data as a tibble:  
  
ae\_xpt<-read\_xpt(here("data/sas","ae.xpt"))  
  
# lots of variables(35) in this one!  
str(ae\_xpt)

## tibble [1,191 x 35] (S3: tbl\_df/tbl/data.frame)  
## $ STUDYID : chr [1:1191] "CDISCPILOT01" "CDISCPILOT01" "CDISCPILOT01" "CDISCPILOT01" ...  
## ..- attr(\*, "label")= chr "Study Identifier"  
## $ DOMAIN : chr [1:1191] "AE" "AE" "AE" "AE" ...  
## ..- attr(\*, "label")= chr "Domain Abbreviation"  
## $ USUBJID : chr [1:1191] "01-701-1015" "01-701-1015" "01-701-1015" "01-701-1023" ...  
## ..- attr(\*, "label")= chr "Unique Subject Identifier"  
## $ AESEQ : num [1:1191] 1 2 3 3 1 2 4 1 2 1 ...  
## ..- attr(\*, "label")= chr "Sequence Number"  
## $ AESPID : chr [1:1191] "E07" "E08" "E06" "E10" ...  
## ..- attr(\*, "label")= chr "Sponsor-Defined Identifier"  
## $ AETERM : chr [1:1191] "APPLICATION SITE ERYTHEMA" "APPLICATION SITE PRURITUS" "DIARRHOEA" "ATRIOVENTRICULAR BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Reported Term for the Adverse Event"  
## $ AELLT : chr [1:1191] "APPLICATION SITE REDNESS" "APPLICATION SITE ITCHING" "DIARRHEA" "AV BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Lowest Level Term"  
## $ AELLTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Lowest Level Term Code"  
## $ AEDECOD : chr [1:1191] "APPLICATION SITE ERYTHEMA" "APPLICATION SITE PRURITUS" "DIARRHOEA" "ATRIOVENTRICULAR BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Dictionary-Derived Term"  
## $ AEPTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Preferred Term Code"  
## $ AEHLT : chr [1:1191] "HLT\_0617" "HLT\_0317" "HLT\_0148" "HLT\_0415" ...  
## ..- attr(\*, "label")= chr "High Level Term"  
## $ AEHLTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "High Level Term Code"  
## $ AEHLGT : chr [1:1191] "HLGT\_0152" "HLGT\_0338" "HLGT\_0588" "HLGT\_0086" ...  
## ..- attr(\*, "label")= chr "High Level Group Term"  
## $ AEHLGTCD: num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "High Level Group Term Code"  
## $ AEBODSYS: chr [1:1191] "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GASTROINTESTINAL DISORDERS" "CARDIAC DISORDERS" ...  
## ..- attr(\*, "label")= chr "Body System or Organ Class"  
## $ AEBDSYCD: num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Body System or Organ Class Code"  
## $ AESOC : chr [1:1191] "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GASTROINTESTINAL DISORDERS" "CARDIAC DISORDERS" ...  
## ..- attr(\*, "label")= chr "Primary System Organ Class"  
## $ AESOCCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Primary System Organ Class Code"  
## $ AESEV : chr [1:1191] "MILD" "MILD" "MILD" "MILD" ...  
## ..- attr(\*, "label")= chr "Severity/Intensity"  
## $ AESER : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Serious Event"  
## $ AEACN : chr [1:1191] "" "" "" "" ...  
## ..- attr(\*, "label")= chr "Action Taken with Study Treatment"  
## $ AEREL : chr [1:1191] "PROBABLE" "PROBABLE" "REMOTE" "POSSIBLE" ...  
## ..- attr(\*, "label")= chr "Causality"  
## $ AEOUT : chr [1:1191] "NOT RECOVERED/NOT RESOLVED" "NOT RECOVERED/NOT RESOLVED" "RECOVERED/RESOLVED" "NOT RECOVERED/NOT RESOLVED" ...  
## ..- attr(\*, "label")= chr "Outcome of Adverse Event"  
## $ AESCAN : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Involves Cancer"  
## $ AESCONG : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Congenital Anomaly or Birth Defect"  
## $ AESDISAB: chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Persist or Signif Disability/Incapacity"  
## $ AESDTH : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Results in Death"  
## $ AESHOSP : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Requires or Prolongs Hospitalization"  
## $ AESLIFE : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Is Life Threatening"  
## $ AESOD : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Occurred with Overdose"  
## $ AEDTC : chr [1:1191] "2014-01-16" "2014-01-16" "2014-01-16" "2012-08-27" ...  
## ..- attr(\*, "label")= chr "Date/Time of Collection"  
## $ AESTDTC : chr [1:1191] "2014-01-03" "2014-01-03" "2014-01-09" "2012-08-26" ...  
## ..- attr(\*, "label")= chr "Start Date/Time of Adverse Event"  
## $ AEENDTC : chr [1:1191] "" "" "2014-01-11" "" ...  
## ..- attr(\*, "label")= chr "End Date/Time of Adverse Event"  
## $ AESTDY : num [1:1191] 2 2 8 22 3 3 3 3 21 58 ...  
## ..- attr(\*, "label")= chr "Study Day of Start of Adverse Event"  
## $ AEENDY : num [1:1191] NA NA 10 NA 26 NA 26 NA NA NA ...  
## ..- attr(\*, "label")= chr "Study Day of End of Adverse Event"

## View functions like a SAS viewer, at least for navigation  
## type at the R Studio console: View(ae\_xpt, "AE in a View window")  
  
## Or use the print() function( type ?print() at the R studio console)  
# or use the head() function  
head(ae\_xpt)

## # A tibble: 6 x 35  
## STUDYID DOMAIN USUBJID AESEQ AESPID AETERM AELLT AELLTCD AEDECOD AEPTCD AEHLT  
## <chr> <chr> <chr> <dbl> <chr> <chr> <chr> <dbl> <chr> <dbl> <chr>  
## 1 CDISCPI~ AE 01-701~ 1 E07 APPLI~ APPL~ NA APPLIC~ NA HLT\_~  
## 2 CDISCPI~ AE 01-701~ 2 E08 APPLI~ APPL~ NA APPLIC~ NA HLT\_~  
## 3 CDISCPI~ AE 01-701~ 3 E06 DIARR~ DIAR~ NA DIARRH~ NA HLT\_~  
## 4 CDISCPI~ AE 01-701~ 3 E10 ATRIO~ AV B~ NA ATRIOV~ NA HLT\_~  
## 5 CDISCPI~ AE 01-701~ 1 E08 ERYTH~ ERYT~ NA ERYTHE~ NA HLT\_~  
## 6 CDISCPI~ AE 01-701~ 2 E09 ERYTH~ LOCA~ NA ERYTHE~ NA HLT\_~  
## # ... with 24 more variables: AEHLTCD <dbl>, AEHLGT <chr>, AEHLGTCD <dbl>,  
## # AEBODSYS <chr>, AEBDSYCD <dbl>, AESOC <chr>, AESOCCD <dbl>, AESEV <chr>,  
## # AESER <chr>, AEACN <chr>, AEREL <chr>, AEOUT <chr>, AESCAN <chr>,  
## # AESCONG <chr>, AESDISAB <chr>, AESDTH <chr>, AESHOSP <chr>, AESLIFE <chr>,  
## # AESOD <chr>, AEDTC <chr>, AESTDTC <chr>, AEENDTC <chr>, AESTDY <dbl>,  
## # AEENDY <dbl>

## rename the data frame as ae\_xpt  
  
# list the variables in ae\_xpt  
names(ae\_xpt)

## [1] "STUDYID" "DOMAIN" "USUBJID" "AESEQ" "AESPID" "AETERM"   
## [7] "AELLT" "AELLTCD" "AEDECOD" "AEPTCD" "AEHLT" "AEHLTCD"   
## [13] "AEHLGT" "AEHLGTCD" "AEBODSYS" "AEBDSYCD" "AESOC" "AESOCCD"   
## [19] "AESEV" "AESER" "AEACN" "AEREL" "AEOUT" "AESCAN"   
## [25] "AESCONG" "AESDISAB" "AESDTH" "AESHOSP" "AESLIFE" "AESOD"   
## [31] "AEDTC" "AESTDTC" "AEENDTC" "AESTDY" "AEENDY"

# dimensions of an object  
dim(ae\_xpt)

## [1] 1191 35

# list the structure of ae\_xpt  
str(ae\_xpt)

## tibble [1,191 x 35] (S3: tbl\_df/tbl/data.frame)  
## $ STUDYID : chr [1:1191] "CDISCPILOT01" "CDISCPILOT01" "CDISCPILOT01" "CDISCPILOT01" ...  
## ..- attr(\*, "label")= chr "Study Identifier"  
## $ DOMAIN : chr [1:1191] "AE" "AE" "AE" "AE" ...  
## ..- attr(\*, "label")= chr "Domain Abbreviation"  
## $ USUBJID : chr [1:1191] "01-701-1015" "01-701-1015" "01-701-1015" "01-701-1023" ...  
## ..- attr(\*, "label")= chr "Unique Subject Identifier"  
## $ AESEQ : num [1:1191] 1 2 3 3 1 2 4 1 2 1 ...  
## ..- attr(\*, "label")= chr "Sequence Number"  
## $ AESPID : chr [1:1191] "E07" "E08" "E06" "E10" ...  
## ..- attr(\*, "label")= chr "Sponsor-Defined Identifier"  
## $ AETERM : chr [1:1191] "APPLICATION SITE ERYTHEMA" "APPLICATION SITE PRURITUS" "DIARRHOEA" "ATRIOVENTRICULAR BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Reported Term for the Adverse Event"  
## $ AELLT : chr [1:1191] "APPLICATION SITE REDNESS" "APPLICATION SITE ITCHING" "DIARRHEA" "AV BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Lowest Level Term"  
## $ AELLTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Lowest Level Term Code"  
## $ AEDECOD : chr [1:1191] "APPLICATION SITE ERYTHEMA" "APPLICATION SITE PRURITUS" "DIARRHOEA" "ATRIOVENTRICULAR BLOCK SECOND DEGREE" ...  
## ..- attr(\*, "label")= chr "Dictionary-Derived Term"  
## $ AEPTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Preferred Term Code"  
## $ AEHLT : chr [1:1191] "HLT\_0617" "HLT\_0317" "HLT\_0148" "HLT\_0415" ...  
## ..- attr(\*, "label")= chr "High Level Term"  
## $ AEHLTCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "High Level Term Code"  
## $ AEHLGT : chr [1:1191] "HLGT\_0152" "HLGT\_0338" "HLGT\_0588" "HLGT\_0086" ...  
## ..- attr(\*, "label")= chr "High Level Group Term"  
## $ AEHLGTCD: num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "High Level Group Term Code"  
## $ AEBODSYS: chr [1:1191] "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GASTROINTESTINAL DISORDERS" "CARDIAC DISORDERS" ...  
## ..- attr(\*, "label")= chr "Body System or Organ Class"  
## $ AEBDSYCD: num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Body System or Organ Class Code"  
## $ AESOC : chr [1:1191] "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GENERAL DISORDERS AND ADMINISTRATION SITE CONDITIONS" "GASTROINTESTINAL DISORDERS" "CARDIAC DISORDERS" ...  
## ..- attr(\*, "label")= chr "Primary System Organ Class"  
## $ AESOCCD : num [1:1191] NA NA NA NA NA NA NA NA NA NA ...  
## ..- attr(\*, "label")= chr "Primary System Organ Class Code"  
## $ AESEV : chr [1:1191] "MILD" "MILD" "MILD" "MILD" ...  
## ..- attr(\*, "label")= chr "Severity/Intensity"  
## $ AESER : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Serious Event"  
## $ AEACN : chr [1:1191] "" "" "" "" ...  
## ..- attr(\*, "label")= chr "Action Taken with Study Treatment"  
## $ AEREL : chr [1:1191] "PROBABLE" "PROBABLE" "REMOTE" "POSSIBLE" ...  
## ..- attr(\*, "label")= chr "Causality"  
## $ AEOUT : chr [1:1191] "NOT RECOVERED/NOT RESOLVED" "NOT RECOVERED/NOT RESOLVED" "RECOVERED/RESOLVED" "NOT RECOVERED/NOT RESOLVED" ...  
## ..- attr(\*, "label")= chr "Outcome of Adverse Event"  
## $ AESCAN : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Involves Cancer"  
## $ AESCONG : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Congenital Anomaly or Birth Defect"  
## $ AESDISAB: chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Persist or Signif Disability/Incapacity"  
## $ AESDTH : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Results in Death"  
## $ AESHOSP : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Requires or Prolongs Hospitalization"  
## $ AESLIFE : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Is Life Threatening"  
## $ AESOD : chr [1:1191] "N" "N" "N" "N" ...  
## ..- attr(\*, "label")= chr "Occurred with Overdose"  
## $ AEDTC : chr [1:1191] "2014-01-16" "2014-01-16" "2014-01-16" "2012-08-27" ...  
## ..- attr(\*, "label")= chr "Date/Time of Collection"  
## $ AESTDTC : chr [1:1191] "2014-01-03" "2014-01-03" "2014-01-09" "2012-08-26" ...  
## ..- attr(\*, "label")= chr "Start Date/Time of Adverse Event"  
## $ AEENDTC : chr [1:1191] "" "" "2014-01-11" "" ...  
## ..- attr(\*, "label")= chr "End Date/Time of Adverse Event"  
## $ AESTDY : num [1:1191] 2 2 8 22 3 3 3 3 21 58 ...  
## ..- attr(\*, "label")= chr "Study Day of Start of Adverse Event"  
## $ AEENDY : num [1:1191] NA NA 10 NA 26 NA 26 NA NA NA ...  
## ..- attr(\*, "label")= chr "Study Day of End of Adverse Event"

# class of an object (numeric, matrix, data frame, etc)  
class(ae\_xpt)

## [1] "tbl\_df" "tbl" "data.frame"

# print ae\_xpt variable Values   
  
ae\_xpt%>% select(AEDECOD,AETERM)

## # A tibble: 1,191 x 2  
## AEDECOD AETERM   
## <chr> <chr>   
## 1 APPLICATION SITE ERYTHEMA APPLICATION SITE ERYTHEMA   
## 2 APPLICATION SITE PRURITUS APPLICATION SITE PRURITUS   
## 3 DIARRHOEA DIARRHOEA   
## 4 ATRIOVENTRICULAR BLOCK SECOND DEGREE ATRIOVENTRICULAR BLOCK SECOND DEGREE  
## 5 ERYTHEMA ERYTHEMA   
## 6 ERYTHEMA ERYTHEMA   
## 7 ERYTHEMA ERYTHEMA   
## 8 APPLICATION SITE ERYTHEMA APPLICATION SITE ERYTHEMA   
## 9 APPLICATION SITE PRURITUS APPLICATION SITE PRURITUS   
## 10 APPLICATION SITE PRURITUS APPLICATION SITE PRURITUS   
## # ... with 1,181 more rows

# print first 6 rows and 22 columns of ae\_xpt  
head(ae\_xpt, c(6L, 22L))

## # A tibble: 6 x 22  
## STUDYID DOMAIN USUBJID AESEQ AESPID AETERM AELLT AELLTCD AEDECOD AEPTCD AEHLT  
## <chr> <chr> <chr> <dbl> <chr> <chr> <chr> <dbl> <chr> <dbl> <chr>  
## 1 CDISCPI~ AE 01-701~ 1 E07 APPLI~ APPL~ NA APPLIC~ NA HLT\_~  
## 2 CDISCPI~ AE 01-701~ 2 E08 APPLI~ APPL~ NA APPLIC~ NA HLT\_~  
## 3 CDISCPI~ AE 01-701~ 3 E06 DIARR~ DIAR~ NA DIARRH~ NA HLT\_~  
## 4 CDISCPI~ AE 01-701~ 3 E10 ATRIO~ AV B~ NA ATRIOV~ NA HLT\_~  
## 5 CDISCPI~ AE 01-701~ 1 E08 ERYTH~ ERYT~ NA ERYTHE~ NA HLT\_~  
## 6 CDISCPI~ AE 01-701~ 2 E09 ERYTH~ LOCA~ NA ERYTHE~ NA HLT\_~  
## # ... with 11 more variables: AEHLTCD <dbl>, AEHLGT <chr>, AEHLGTCD <dbl>,  
## # AEBODSYS <chr>, AEBDSYCD <dbl>, AESOC <chr>, AESOCCD <dbl>, AESEV <chr>,  
## # AESER <chr>, AEACN <chr>, AEREL <chr>

# print last 5 rows of ae\_xpt  
tail(ae\_xpt, n=5)

## # A tibble: 5 x 35  
## STUDYID DOMAIN USUBJID AESEQ AESPID AETERM AELLT AELLTCD AEDECOD AEPTCD AEHLT  
## <chr> <chr> <chr> <dbl> <chr> <chr> <chr> <dbl> <chr> <dbl> <chr>  
## 1 CDISCPI~ AE 01-718~ 4 E06 NAUSEA NAUS~ NA NAUSEA NA HLT\_~  
## 2 CDISCPI~ AE 01-718~ 6 E09 NAUSEA NAUS~ NA NAUSEA NA HLT\_~  
## 3 CDISCPI~ AE 01-718~ 8 E12 NAUSEA NAUS~ NA NAUSEA NA HLT\_~  
## 4 CDISCPI~ AE 01-718~ 14 E15 NAUSEA NAUS~ NA NAUSEA NA HLT\_~  
## 5 CDISCPI~ AE 01-718~ 16 E15 NAUSEA NAUS~ NA NAUSEA NA HLT\_~  
## # ... with 24 more variables: AEHLTCD <dbl>, AEHLGT <chr>, AEHLGTCD <dbl>,  
## # AEBODSYS <chr>, AEBDSYCD <dbl>, AESOC <chr>, AESOCCD <dbl>, AESEV <chr>,  
## # AESER <chr>, AEACN <chr>, AEREL <chr>, AEOUT <chr>, AESCAN <chr>,  
## # AESCONG <chr>, AESDISAB <chr>, AESDTH <chr>, AESHOSP <chr>, AESLIFE <chr>,  
## # AESOD <chr>, AEDTC <chr>, AESTDTC <chr>, AEENDTC <chr>, AESTDY <dbl>,  
## # AEENDY <dbl>

# list objects in the working environment. Should be two tibbles...  
ls()

## [1] "ae\_xpt" "iris\_tbl"