03 - Manipulation et données Tidy

PRO1036 - Analyse de données scientifiques en R

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Tidy data

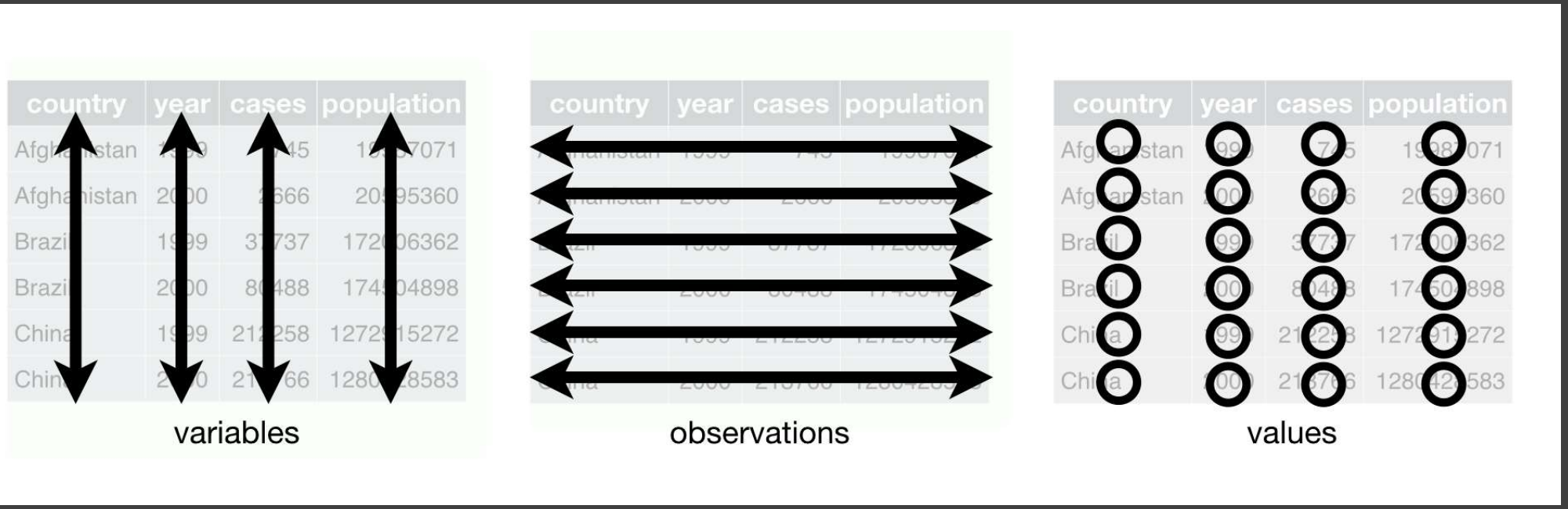
Tidy data

> *Happy families are all alike; every unhappy family is unhappy in its own way. – Leo Tolstoy*

Qu’est ce que des données Tidy ?

- Chaque variable est une colonne
- Chaque observation est une ligne
- Chaque valeur est une cellule

Tidy data



(Wickham et al., 2023, chap. 5)

Exemples

En quoi ces données ne sont pas tidy ?

Airplanes on Hand in the AAF, By Major Type:
Jul 1939 to Aug 1945

End of Month	Total	Very Heavy Bombers	Heavy Bombers	Medium Bombers	Light Bombers	Fighters	Recon-naissance	Transports	Trainers	Communi-cations
1939										
Jul	2,402	-	16	400	276	494	356	118	735	7
Aug	2,440	-	18	414	276	492	359	129	745	7
[Germany invades Poland, 1 Sep 1939]										
Sep	2,473	-	22	428	278	489	359	136	754	7
Oct	2,507	-	27	446	277	490	365	137	758	7
Nov	2,536	-	32	458	275	498	375	136	755	7
Dec	2,546	-	39	464	274	492	378	131	761	7
1940										
Jan	2,588	-	45	466	271	464	409	128	798	7
Feb	2,658	-	49	470	271	458	415	128	860	7
Mar	2,709	-	54	468	267	453	415	125	920	7
Apr	2,806	-	54	468	263	451	416	125	1,022	7
May	2,906	-	54	470	259	459	410	124	1,123	7
Jun	2,966	-	54	478	166	477	414	127	1,243	7
[France surrenders to Germany, 25 Jun 1940] [Battle of Britain begins, 10 July 1940]										
Jul	3,102	-	56	483	161	500	410	128	1,357	7
Aug	3,295	-	65	485	158	539	407	128	1,506	7

Source: Army Air Forces Statistical Digest, WWII

En quoi ces données ne sont pas tidy ?

	A	AA	AB	AC	AD	AE	AF	AG	AH
1	Estimated HIV Prevalence% - (Ages 15-49)	2004	2005	2006	2007	2008	2009	2010	2011
2	Abkhazia								
3	Afghanistan						0.06	0.06	0.06
4	Akrotiri and Dhekelia								
5	Albania								
6	Algeria	0.1	0.1	0.1	0.1	0.1			
7	American Samoa								
8	Andorra								
9	Angola	1.9	1.9	1.9	1.9	2	2.1	2.1	2.1
10	Anguilla								
11	Antigua and Barbuda								
12	Argentina	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4
13	Armenia	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
14	Aruba								
15	Australia	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
16	Austria	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
17	Azerbaijan	0.06	0.06	0.06	0.1	0.1	0.1	0.1	0.1
18	Bahamas	3	3	3	3.1	3.1	2.9	2.8	2.8

Source: Gapminder, Estimated HIV prevalence among 15-49 year olds

En quoi ces données ne sont pas tidy ?

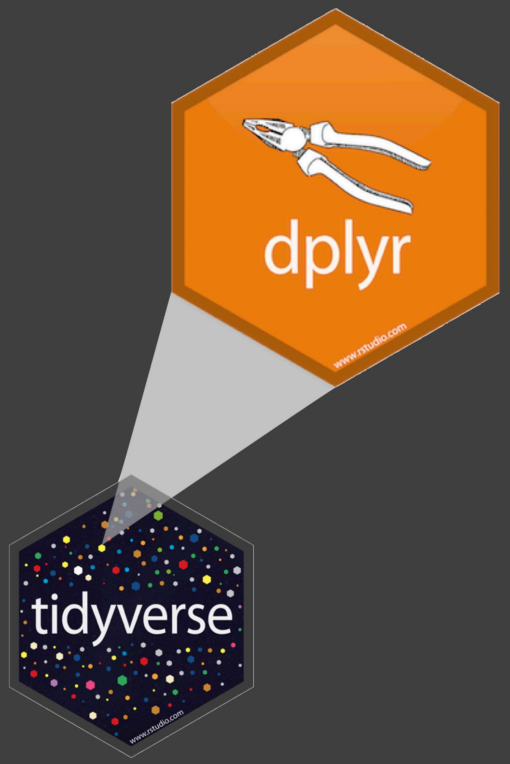
Subject	United States			
	Estimate	Margin of Error	Percent	Percent Margin of Error
EMPLOYMENT STATUS				
Population 16 years and over	255,797,692	+/-17,051	255,797,692	(X)
In labor force	162,184,325	+/-135,158	63.4%	+/-0.1
Civilian labor force	161,159,470	+/-127,501	63.0%	+/-0.1
Employed	150,599,165	+/-138,066	58.9%	+/-0.1
Unemployed	10,560,305	+/-27,385	4.1%	+/-0.1
Armed Forces	1,024,855	+/-10,363	0.4%	+/-0.1
Not in labor force	93,613,367	+/-126,007	36.6%	+/-0.1
Civilian labor force	161,159,470	+/-127,501	161,159,470	(X)
Unemployment Rate	(X)	(X)	6.6%	+/-0.1
Females 16 years and over	131,092,196	+/-11,187	131,092,196	(X)
In labor force	76,493,327	+/-75,824	58.4%	+/-0.1
Civilian labor force	76,350,498	+/-75,238	58.2%	+/-0.1
Employed	71,451,559	+/-79,007	54.5%	+/-0.1
Own children of the householder under 6 years	22,939,897	+/-14,240	22,939,897	(X)
All parents in family in labor force	14,957,537	+/-36,506	65.2%	+/-0.1
Own children of the householder 6 to 17 years	47,007,147	+/-19,644	47,007,147	(X)
All parents in family in labor force	33,238,793	+/-49,036	70.7%	+/-0.1

Source: US Census Fact Finder, General Economic Characteristics, ACS 2017

Grammaire

La grammaire de la manipulation de données

Basé sur des fonctions qui correspondent à des verbes permettant de manipuler des dataframes.



- `select`: Sélectionner une colonne
- `arrange`: Ordonner les lignes
- `slice`: Sélectionner des lignes (par les index)
- `filter`: Sélectionner des lignes selon des critères
- `distinct`: Filtrer les lignes uniques
- `mutate`: Ajout de nouvelles variables
- `summarise`: Réduire variables en valeurs
- `group_by`: Regrouper des observations selon une variable
- …

Pipes

Pipe

Élément très important dans la syntaxe de la manipulation de données

En programmation, un `pipe` permet de passer de l'information d'un processus à un autre.

Imaginons le processus suivant: Trouver les clés, démarrer la voiture, conduire au travail et se garer.

```
park(drive(start_car(find(keys)), to = "work"))
```

```
keys %>%
  find() %>%
  start_car() %>%
  drive(to = "work") %>%
  park()
```

Dataset

Data: Réservations d'hôtels

Données de deux hôtels, un en ville et un en campagne

Chaque ligne représente une réservation

Dataset créé pour prédire les chances qu'une réservation soit annulée (Antonio et al., 2019)

```
1 hotels <- read_csv("data/hotels.csv")
```

Les variables

```
1 names(hotels)
```

```
 [1] "hotel"                          "is_canceled"
 [3] "lead_time"                      "arrival_date_year"
 [5] "arrival_date_month"             "arrival_date_week_number"
 [7] "arrival_date_day_of_month"      "stays_in_weekend_nights"
 [9] "stays_in_week_nights"           "adults"
[11] "children"                       "babies"
[13] "meal"                           "country"
[15] "market_segment"                 "distribution_channel"
[17] "is_repeated_guest"              "previous_cancellations"
[19] "previous_bookings_not_canceled" "reserved_room_type"
[21] "assigned_room_type"             "booking_changes"
[23] "deposit_type"                   "agent"
[25] "company"                        "days_in_waiting_list"
[27] "customer_type"                  "adr"
[29] "required_car_parking_spaces"    "total_of_special_requests"
[31] "reservation_status"             "reservation_status_date"
```

Glimpse

```
1 glimpse(hotels)
```

```
Rows: 119,390
Columns: 32
$ hotel                         <chr> "Resort Hotel", "Resort Hotel", "Resort…
$ is_canceled                   <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, …
$ lead_time                     <dbl> 342, 737, 7, 13, 14, 14, 0, 9, 85, 75, …
$ arrival_date_year             <dbl> 2015, 2015, 2015, 2015, 2015, 2015, 201…
$ arrival_date_month            <chr> "July", "July", "July", "July", "July",…
$ arrival_date_week_number      <dbl> 27, 27, 27, 27, 27, 27, 27, 27, 27, 27,…
$ arrival_date_day_of_month     <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, …
$ stays_in_weekend_nights       <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ stays_in_week_nights          <dbl> 0, 0, 1, 1, 2, 2, 2, 2, 3, 3, 4, 4, 4, …
$ adults                        <dbl> 2, 2, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, …
$ children                      <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ babies                        <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ meal                          <chr> "BB", "BB", "BB", "BB", "BB", "BB", "BB…
$ country                       <chr> "PRT", "PRT", "GBR", "GBR", "GBR", "GBR…
$ market_segment                <chr> "Direct", "Direct", "Direct", "Corporat…
$ distribution_channel          <chr> "Direct", "Direct", "Direct", "Corporat…
$ is_repeated_guest             <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ previous_cancellations        <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ previous_bookings_not_canceled <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, …
$ reserved_room_type            <chr> "C", "C", "A", "A", "A", "A", "C", "C",…
$ assigned_room_type            <chr> "C", "C", "C", "A", "A", "A", "C", "C",…
```

Select

Sélection d'une variable

Nous allons sélectionner la variable `lead_time`, qui représente le temps entre la date de réservation et la date d'arrivée

```
1 select(hotels, lead_time)
```

```
# A tibble: 119,390 × 1
   lead_time
       <dbl>
 1       342
 2       737
 3         7
 4        13
 5        14
 6        14
 7         0
 8         9
 9        85
10        75
# ℹ 119,380 more rows
```

Équivalent:

```
1 hotels %>%
2   select(lead_time)
```

Sélection de plusieurs variables

Nous allons maintenant ajouter la variable `hotel` qui indique s'il s'agit d'un hotel de ville ou un resort

```
1 hotels %>%
2   select(hotel, lead_time)
```

```
# A tibble: 119,390 × 2
   hotel        lead_time
   <chr>            <dbl>
 1 Resort Hotel       342
 2 Resort Hotel       737
 3 Resort Hotel         7
 4 Resort Hotel        13
 5 Resort Hotel        14
 6 Resort Hotel        14
 7 Resort Hotel         0
 8 Resort Hotel         9
 9 Resort Hotel        85
10 Resort Hotel        75
# ℹ 119,380 more rows
```

Exclusion de variables

```
1 hotels %>%
2   select(hotel, lead_time, agent) %>%
3   select(-agent)
```

```
# A tibble: 119,390 × 2
   hotel        lead_time
   <chr>            <dbl>
 1 Resort Hotel       342
 2 Resort Hotel       737
 3 Resort Hotel         7
 4 Resort Hotel        13
 5 Resort Hotel        14
 6 Resort Hotel        14
 7 Resort Hotel         0
 8 Resort Hotel         9
 9 Resort Hotel        85
10 Resort Hotel        75
# ℹ 119,380 more rows
```

Sélection d'une plage de variables

```
1 hotels %>%
2   select(hotel:arrival_date_month)
```

```
# A tibble: 119,390 × 5
   hotel        is_canceled lead_time arrival_date_year arrival_date_month
   <chr>              <dbl>     <dbl>              <dbl> <chr>
 1 Resort Hotel           0       342               2015 July
 2 Resort Hotel           0       737               2015 July
 3 Resort Hotel           0         7               2015 July
 4 Resort Hotel           0        13               2015 July
 5 Resort Hotel           0        14               2015 July
 6 Resort Hotel           0        14               2015 July
 7 Resort Hotel           0         0               2015 July
 8 Resort Hotel           0         9               2015 July
 9 Resort Hotel           1        85               2015 July
10 Resort Hotel           1        75               2015 July
# ℹ 119,380 more rows
```

Sélection de variables selon une condition

```r
hotels %>%
  select(starts_with("arrival"))
```

```
# A tibble: 119,390 × 4
   arrival_date_year arrival_date_month arrival_date_week_number
               <dbl> <chr>                                  <dbl>
 1              2015 July                                      27
 2              2015 July                                      27
 3              2015 July                                      27
 4              2015 July                                      27
 5              2015 July                                      27
 6              2015 July                                      27
 7              2015 July                                      27
 8              2015 July                                      27
 9              2015 July                                      27
10              2015 July                                      27
# ℹ 119,380 more rows
# ℹ 1 more variable: arrival_date_day_of_month <dbl>
```

Sélection de variables selon une condition

```r
hotels %>%
  select(ends_with("type"))
```

```
# A tibble: 119,390 × 4
   reserved_room_type assigned_room_type deposit_type customer_type
   <chr>              <chr>              <chr>        <chr>
 1 C                  C                  No Deposit   Transient
 2 C                  C                  No Deposit   Transient
 3 A                  C                  No Deposit   Transient
 4 A                  A                  No Deposit   Transient
 5 A                  A                  No Deposit   Transient
 6 A                  A                  No Deposit   Transient
 7 C                  C                  No Deposit   Transient
 8 C                  C                  No Deposit   Transient
 9 A                  A                  No Deposit   Transient
10 D                  D                  No Deposit   Transient
# ℹ 119,380 more rows
```

Autres conditions

- `starts_with()`: Commence par un préfix
- `ends_with()`: Termine par un suffix
- `contains()`: Contient une certaine chaine de caractères
- `num_range()`: Match un certain range de nombres
- `one_of()`: Match les variables font parties d'une liste
- `everything()`: Match les variable qui contiennet tous les éléments de la liste
- `last_col()`: Sélectionne la dernière variable (possibilité d'indiquer un offset)
- `matches()`: Match une expression régulière

Arrange

Ordonner les lignes

Par défaut, les lignes sont arrangées en ordre croissant. Il est possible de préciser l'ordre décroissant avec `desc()`

```
1 hotels %>%
2   select(adults, children, babies) %>%
3   arrange(babies)
```

```
# A tibble: 119,390 × 3
   adults children babies
    <dbl>    <dbl>  <dbl>
 1      2        0      0
 2      2        0      0
 3      1        0      0
 4      1        0      0
 5      2        0      0
 6      2        0      0
 7      2        0      0
 8      2        0      0
 9      2        0      0
10      2        0      0
# ℹ 119,380 more rows
```

```
1 hotels %>%
2   select(adults, children, babies) %>%
3   arrange(desc(babies))
```

```
# A tibble: 119,390 × 3
   adults children babies
    <dbl>    <dbl>  <dbl>
 1      2        0     10
 2      1        0      9
 3      2        0      2
 4      2        0      2
 5      2        0      2
 6      2        0      2
 7      2        0      2
 8      2        0      2
 9      2        0      2
10      2        0      2
# ℹ 119,380 more rows
```

Slice

Sélection de lignes

La sélection se base sur le numéro de ligne

```
1 # first five
2 hotels %>%
3   slice(1:5)
```

```
# A tibble: 5 × 32
  hotel        is_canceled lead_time arrival_date_year arrival_date_month
  <chr>              <dbl>     <dbl>             <dbl> <chr>
1 Resort Hotel           0       342              2015 July
2 Resort Hotel           0       737              2015 July
3 Resort Hotel           0         7              2015 July
4 Resort Hotel           0        13              2015 July
5 Resort Hotel           0        14              2015 July
# ℹ 27 more variables: arrival_date_week_number <dbl>,
#   arrival_date_day_of_month <dbl>, stays_in_weekend_nights <dbl>,
#   stays_in_week_nights <dbl>, adults <dbl>, children <dbl>, babies <dbl>,
#   meal <chr>, country <chr>, market_segment <chr>,
#   distribution_channel <chr>, is_repeated_guest <dbl>,
#   previous_cancellations <dbl>, previous_bookings_not_canceled <dbl>,
#   reserved_room_type <chr>, assigned_room_type <chr>, …
```

filter

Sélection de lignes

La sélection se base sur des conditions

```r
hotels %>%
  filter(hotel == "City Hotel")
```

```
# A tibble: 79,330 × 32
   hotel      is_canceled lead_time arrival_date_year arrival_date_month
   <chr>            <dbl>     <dbl>             <dbl> <chr>
 1 City Hotel           0         6              2015 July
 2 City Hotel           1        88              2015 July
 3 City Hotel           1        65              2015 July
 4 City Hotel           1        92              2015 July
 5 City Hotel           1       100              2015 July
 6 City Hotel           1        79              2015 July
 7 City Hotel           0         3              2015 July
 8 City Hotel           1        63              2015 July
 9 City Hotel           1        62              2015 July
10 City Hotel           1        62              2015 July
# ℹ 79,320 more rows
# ℹ 27 more variables: arrival_date_week_number <dbl>,
#   arrival_date_day_of_month <dbl>, stays_in_weekend_nights <dbl>,
#   stays_in_week_nights <dbl>, adults <dbl>, children <dbl>, babies <dbl>,
#   meal <chr>, country <chr>, market_segment <chr>,
#   distribution_channel <chr>, is_repeated_guest <dbl>,
#   previous_cancellations <dbl>, previous_bookings_not_canceled <dbl>, …
```

Conditions multiples

On veut les réservations sans adultes ET plus qu'un enfant.

```
 1 hotels %>%
 2   filter(
 3     adults == 0,
 4     children >= 1
 5     ) %>%
 6   select(adults, babies, children)
```

```
# A tibble: 223 × 3
   adults babies children
    <dbl>  <dbl>    <dbl>
 1      0      0        3
 2      0      0        2
 3      0      0        2
 4      0      0        2
 5      0      0        2
 6      0      0        3
 7      0      1        2
 8      0      0        2
 9      0      0        2
10      0      0        2
# ℹ 213 more rows
```

Conditions multiples

On veut les réservations sans adultes ET, plus qu'un enfant OU plus qu'un bébé.

```
hotels %>%
  filter(
    adults == 0,
    children >= 1 | babies >= 1 # le | veut dire "ou"
    ) %>%
  select(adults, babies, children)
```

```
# A tibble: 223 × 3
   adults babies children
    <dbl>  <dbl>    <dbl>
 1      0      0        3
 2      0      0        2
 3      0      0        2
 4      0      0        2
 5      0      0        2
 6      0      0        3
 7      0      1        2
 8      0      0        2
 9      0      0        2
10      0      0        2
# ℹ 213 more rows
```

Les opérations logiques

Opérateur	Définition	Opérateur	Définition
`<`	plus petit que	`x | y`	`x` OU `y`
`<=`	plus petit ou égal	`is.na(x)`	test si `x` est `NA`
`>`	plus grand que	`!is.na(x)`	test si `x` est différent de `NA`
`>=`	plus grand ou égal	`x %in% y`	test si `x` est dans `y`
`==`	égal à	`!(x %in% y)`	test si `x` n'est pas dans `y`
`!=`	différent de	`!x`	non `x`
`x & y`	`x` ET `y`		

`distinct` et `count`

Ne garder que les lignes uniques

```
1 hotels %>%
2   distinct(market_segment) %>%
3   arrange(market_segment)
```

```
# A tibble: 8 × 1
  market_segment
  <chr>
1 Aviation
2 Complementary
3 Corporate
4 Direct
5 Groups
6 Offline TA/TO
7 Online TA
8 Undefined
```

```
1 hotels %>%
2   distinct(hotel, market_segment) %>%
3   arrange(hotel, market_segment)
```

```
# A tibble: 14 × 2
   hotel        market_segment
   <chr>        <chr>
 1 City Hotel   Aviation
 2 City Hotel   Complementary
 3 City Hotel   Corporate
 4 City Hotel   Direct
 5 City Hotel   Groups
 6 City Hotel   Offline TA/TO
 7 City Hotel   Online TA
 8 City Hotel   Undefined
 9 Resort Hotel Complementary
10 Resort Hotel Corporate
11 Resort Hotel Direct
12 Resort Hotel Groups
13 Resort Hotel Offline TA/TO
14 Resort Hotel Online TA
```

Compter le nombre de lignes

Par défaut, le résultat est trié par ordre alphabétique :

```
  1 hotels %>%
  2   count(market_segment)
```

```
# A tibble: 8 × 2
  market_segment     n
  <chr>          <int>
1 Aviation         237
2 Complementary    743
3 Corporate       5295
4 Direct         12606
5 Groups         19811
6 Offline TA/TO  24219
7 Online TA      56477
8 Undefined          2
```

En triant par fréquence d'apparition :

```
  1 hotels %>%
  2   count(market_segment, sort=TRUE)
```

```
# A tibble: 8 × 2
  market_segment     n
  <chr>          <int>
1 Online TA      56477
2 Offline TA/TO  24219
3 Groups         19811
4 Direct         12606
5 Corporate       5295
6 Complementary    743
7 Aviation         237
8 Undefined          2
```

count puis arrange

```
hotels %>%
  count(market_segment) %>%
  arrange(n)
```

```
# A tibble: 8 × 2
  market_segment     n
  <chr>          <int>
1 Undefined          2
2 Aviation         237
3 Complementary    743
4 Corporate       5295
5 Direct         12606
6 Groups         19811
7 Offline TA/TO  24219
8 Online TA      56477
```

```
# Même chose que sort=TRUE
hotels %>%
  count(market_segment) %>%
  arrange(desc(n))
```

```
# A tibble: 8 × 2
  market_segment     n
  <chr>          <int>
1 Online TA      56477
2 Offline TA/TO  24219
3 Groups         19811
4 Direct         12606
5 Corporate       5295
6 Complementary    743
7 Aviation         237
8 Undefined          2
```

Compter sur plusieurs variables

Attention à l'ordre…

```
1 hotels %>%
2   count(hotel, market_segment)
```

```
# A tibble: 14 × 3
   hotel        market_segment     n
   <chr>        <chr>          <int>
 1 City Hotel   Aviation         237
 2 City Hotel   Complementary    542
 3 City Hotel   Corporate       2986
 4 City Hotel   Direct          6093
 5 City Hotel   Groups         13975
 6 City Hotel   Offline TA/TO  16747
 7 City Hotel   Online TA      38748
 8 City Hotel   Undefined          2
 9 Resort Hotel Complementary    201
10 Resort Hotel Corporate       2309
11 Resort Hotel Direct          6513
12 Resort Hotel Groups          5836
13 Resort Hotel Offline TA/TO   7472
14 Resort Hotel Online TA      17729
```

```
1 hotels %>%
2   count(market_segment, hotel)
```

```
# A tibble: 14 × 3
   market_segment hotel            n
   <chr>          <chr>        <int>
 1 Aviation       City Hotel     237
 2 Complementary  City Hotel     542
 3 Complementary  Resort Hotel   201
 4 Corporate      City Hotel    2986
 5 Corporate      Resort Hotel  2309
 6 Direct         City Hotel    6093
 7 Direct         Resort Hotel  6513
 8 Groups         City Hotel   13975
 9 Groups         Resort Hotel  5836
10 Offline TA/TO  City Hotel   16747
11 Offline TA/TO  Resort Hotel  7472
12 Online TA      City Hotel   38748
13 Online TA      Resort Hotel 17729
14 Undefined      City Hotel       2
```

mutate

Ajout de nouvelles variables

```r
hotels %>%
  mutate(little_ones = children + babies) %>%
  select(children, babies, little_ones) %>%
  arrange(desc(little_ones))
```

```
# A tibble: 119,390 × 3
   children babies little_ones
      <dbl>  <dbl>       <dbl>
 1       10      0          10
 2        0     10          10
 3        0      9           9
 4        2      1           3
 5        2      1           3
 6        2      1           3
 7        3      0           3
 8        2      1           3
 9        2      1           3
10        3      0           3
# ℹ 119,380 more rows
```

Combinaison des verbes

```
hotels %>%
  mutate(
    little_ones = children + babies) %>%
  count(hotel, little_ones)
```

```
# A tibble: 12 × 3
   hotel        little_ones     n
   <chr>              <dbl> <int>
 1 City Hotel             0 73923
 2 City Hotel             1  3263
 3 City Hotel             2  2056
 4 City Hotel             3    82
 5 City Hotel             9     1
 6 City Hotel            10     1
 7 City Hotel            NA     4
 8 Resort Hotel           0 36131
 9 Resort Hotel           1  2183
10 Resort Hotel           2  1716
11 Resort Hotel           3    29
12 Resort Hotel          10     1
```

```
hotels %>%
  mutate(
    little_ones = children + babies) %>%
  count(hotel, little_ones) %>%
  mutate(prop = n / sum(n))
```

```
# A tibble: 12 × 4
   hotel        little_ones     n        prop
   <chr>              <dbl> <int>       <dbl>
 1 City Hotel             0 73923 0.619
 2 City Hotel             1  3263 0.0273
 3 City Hotel             2  2056 0.0172
 4 City Hotel             3    82 0.000687
 5 City Hotel             9     1 0.00000838
 6 City Hotel            10     1 0.00000838
 7 City Hotel            NA     4 0.0000335
 8 Resort Hotel           0 36131 0.303
 9 Resort Hotel           1  2183 0.0183
10 Resort Hotel           2  1716 0.0144
11 Resort Hotel           3    29 0.000243
12 Resort Hotel          10     1 0.00000838
```

`summarize` et `group by`

summarize

Permet de faire des calculs sur des variables

```
1  # Moyenne du taux de réservation journalier
2  hotels %>%
3    summarise(mean_adr = mean(adr))
```

```
# A tibble: 1 × 1
  mean_adr
     <dbl>
1     102.
```

`summarize()` change complètement le dataframe, transforme les lignes en une unique statistique et enlève les colonnes inutiles

Attention à la notation

Nous pouvons être fainéant et laisser `summarize()` créer le nom des colonnes mais ce n'est pas très *propre*.

❌

```
  1  hotels %>%
  2    summarise(mean(adr))
```

```
# A tibble: 1 × 1
  `mean(adr)`
        <dbl>
1        102.
```

✅

```
  1  hotels %>%
  2    summarise(mean_adr = mean(adr))
```

```
# A tibble: 1 × 1
  mean_adr
     <dbl>
1     102.
```

group_by

Permet de regrouper des lignes selon une variable et de faire des opérations sur chaque groupe

```
  1 hotels %>%
  2   group_by(hotel) %>%
  3   summarise(mean_adr = mean(adr))
```

```
# A tibble: 2 × 2
  hotel        mean_adr
  <chr>           <dbl>
1 City Hotel      105.
2 Resort Hotel     95.0
```

Exemple: calcul de fréquences

Les deux blocs de code suivants donnent le résultat ! `count()` est en faite un `group_by()` suivi d'un `summarize()`.

```
1 hotels %>%
2   group_by(hotel) %>%
3   summarise(n = n())
```

```
# A tibble: 2 × 2
  hotel            n
  <chr>        <int>
1 City Hotel   79330
2 Resort Hotel 40060
```

```
1 hotels %>%
2   count(hotel)
```

```
# A tibble: 2 × 2
  hotel            n
  <chr>        <int>
1 City Hotel   79330
2 Resort Hotel 40060
```

Statistiques multiples

Il est possible de calculer plusieurs statistiques d'un coup.

```
hotels %>%
  summarise(
    min_adr = min(adr),
    mean_adr = mean(adr),
    median_adr = median(adr),
    max_adr = max(adr)
    )
```

```
# A tibble: 1 × 4
  min_adr mean_adr median_adr max_adr
    <dbl>    <dbl>      <dbl>   <dbl>
1   -6.38     102.       94.6    5400
```

Tidying data

Ce qu'on a...

```
# A tibble: 2 × 4
  customer_id item_1 item_2       item_3
        <dbl> <chr>  <chr>        <chr>
1           1 bread  milk         banana
2           2 milk   toilet paper <NA>
```

Ce qu'on veut…

```
# A tibble: 6 × 3
  customer_id item_no item
        <dbl> <chr>   <chr>
1           1 item_1  bread
2           1 item_2  milk
3           1 item_3  banana
4           2 item_1  milk
5           2 item_2  toilet paper
6           2 item_3  <NA>
```

Pour Tidyer: Tidyr

Tidyr permet de transformer les données pour les Tidy :

- Faire pivoter les données
- Séparer ou combiner des colonnes
- Imbriquer/Désimbriquer des colonnes
- Préciser commenter traiter les NA

Pivoter les données


PIVOT!!!

Wide vs Long

Forme large :

id	bp1	bp2
A	100	120
B	140	115
C	120	125

Forme longue :

id	measurement	value
A	bp1	100
A	bp2	120
B	bp1	140
B	bp2	115
C	bp1	120
C	bp2	125

Source: (Wickham et al., 2023, chap. 5)

Wide vs Long

Wide

Plus de colonnes

```
# A tibble: 2 × 4
  customer_id item_1 item_2       item_3
        <dbl> <chr>  <chr>        <chr>
1           1 bread  milk         banana
2           2 milk   toilet paper <NA>
```

Long

Plus de lignes

```
# A tibble: 6 × 3
  customer_id item_no item
        <dbl> <chr>   <chr>
1           1 item_1  bread
2           1 item_2  milk
3           1 item_3  banana
4           2 item_1  milk
5           2 item_2  toilet paper
6           2 item_3  <NA>
```

pivot_longer()

- `data` : Comme d'habitude
- `cols` : Colonne à pivoter
- `names_to` : Nom de la colonne où les variables vont être envoyées
- `values_to` : Nom de la colonne où les valeurs vont être envoyées

```
pivot_longer(
  data,
  cols,
  names_to = "name",
  values_to = "value"
  )
```

Customer \(\rightarrow\) purchases

```r
purchases <- customers %>%
  pivot_longer(
    cols = item_1:item_3,   # variables item_1 à item_3
    names_to = "item_no",   # Noms des colonnes -> dans une nouvelle colonne item_no
    values_to = "item"      # valeurs pour chaque colonne -> dans une nouvelle colonne item
    )

purchases
```

```
# A tibble: 6 × 3
  customer_id item_no item
        <dbl> <chr>   <chr>
1           1 item_1  bread
2           1 item_2  milk
3           1 item_3  banana
4           2 item_1  milk
5           2 item_2  toilet paper
6           2 item_3  <NA>
```

pivot_wider()

- `data` : Comme d'habitude
- `names_from` : Colonne contenant les noms de colonnes
- `values_from` : Colonne contenant les valeurs

```
purchases %>%
  pivot_wider(
    names_from = item_no,
    values_from = item
  )
```

```
# A tibble: 2 × 4
  customer_id item_1 item_2       item_3
        <dbl> <chr>  <chr>        <chr>
1           1 bread  milk         banana
2           2 milk   toilet paper <NA>
```

Références

Antonio, N., de Almeida, A. and Nunes, L. (2019). Hotel booking demand datasets. *Data in Brief*, *22*, 41–49. https://doi.org/10.1016/j.dib.2018.11.126

Wickham, H., Çetinkaya-Rundel, M. and Grolemund, G. (2023). *R for Data Science* (2nd ed.). O'Reilly Media, Inc.