Socio-Informatics 348

Data Tidying

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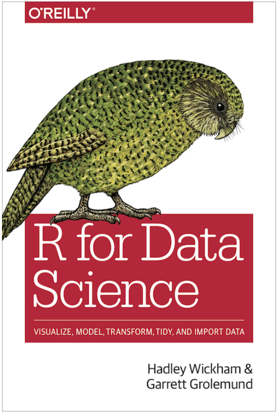
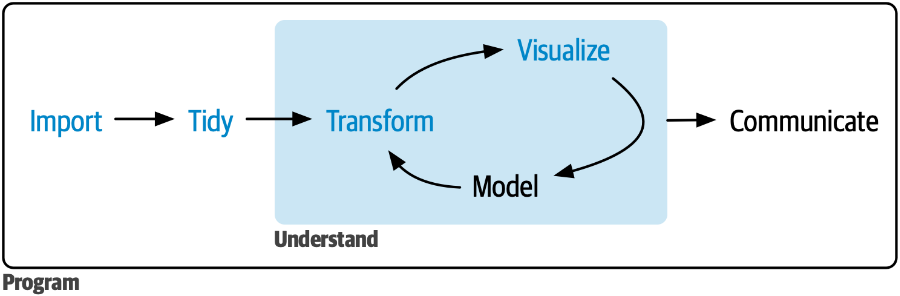
Today's Reading



R for Data Science, Wholegame, Data Tidying

Let's refer back to the 'wholegame'

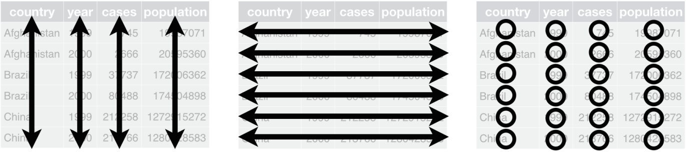
From *R for Data Science*, Introduction:



Data Structure

Rules

- Each variable is a column.
- Each observation is a row, represents a single unit at a point in time.
- Each cell is a single value.



country	year	cases	population
Afghanistan	1999	745	19987071
Afghanistan	2000	2666	20595360
Brazil	1999	37737	172006362
Brazil	2000	80488	174504898
China	1999	212258	1272915272
China	2000	213766	1280428583

variables observations values

Advantages

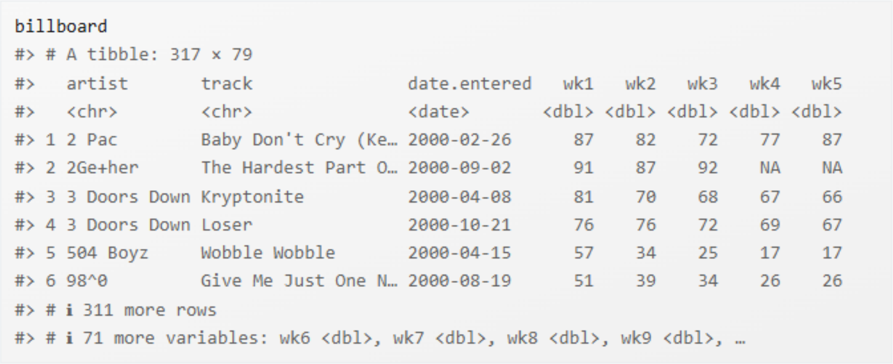
- R's vectorized nature
- Consistency makes it easier to learn and use

Real-world data is messy

- Not often in tidy format
- Often compiled for a specific purpose, not for your research

Lengthening Data

In some cases, there may be extra data captured in column headings

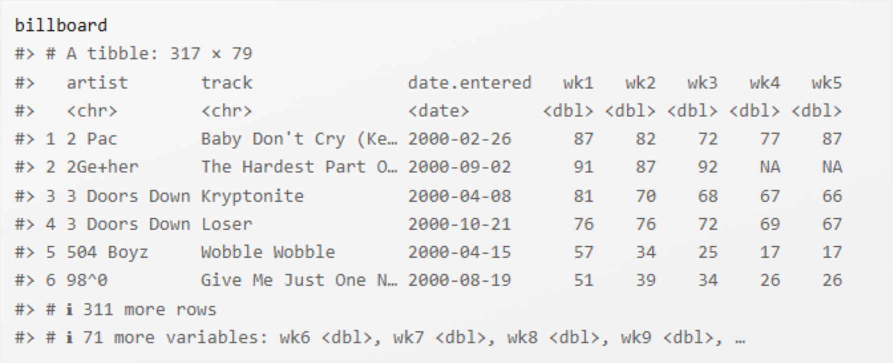


```
billboard
#> # A tibble: 317 × 79
#>   artist       track                   date.entered   wk1   wk2   wk3   wk4   wk5
#>   <chr>        <chr>                   <date>       <dbl> <dbl> <dbl> <dbl> <dbl>
#> 1 2 Pac        Baby Don't Cry (Ke… 2000-02-26      87    82    72    77    87
#> 2 2Ge+her      The Hardest Part O… 2000-09-02      91    87    92    NA    NA
#> 3 3 Doors Down Kryptonite              2000-04-08      81    70    68    67    66
#> 4 3 Doors Down Loser                   2000-10-21      76    76    72    69    67
#> 5 504 Boyz     Wobble Wobble           2000-04-15      57    34    25    17    17
#> 6 98^0         Give Me Just One N… 2000-08-19      51    39    34    26    26
#> # ℹ 311 more rows
#> # ℹ 71 more variables: wk6 <dbl>, wk7 <dbl>, wk8 <dbl>, wk9 <dbl>, …
```

Lengthening Data

Here, we have time information in the column headings, which is not ideal

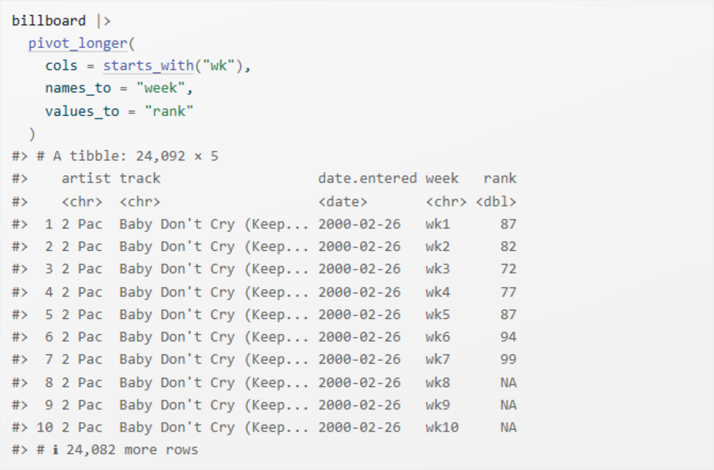
- We would prefer to have a single column for 'week'
- Think of how that might help with visualising or transorming the data



```
billboard
#> # A tibble: 317 × 79
#>   artist       track               date.entered   wk1   wk2   wk3   wk4   wk5
#>   <chr>        <chr>               <date>       <dbl> <dbl> <dbl> <dbl> <dbl>
#> 1 2 Pac        Baby Don't Cry (Ke… 2000-02-26      87    82    72    77    87
#> 2 2Ge+her      The Hardest Part O… 2000-09-02      91    87    92    NA    NA
#> 3 3 Doors Down Kryptonite          2000-04-08      81    70    68    67    66
#> 4 3 Doors Down Loser               2000-10-21      76    76    72    69    67
#> 5 504 Boyz     Wobble Wobble       2000-04-15      57    34    25    17    17
#> 6 98^0         Give Me Just One N… 2000-08-19      51    39    34    26    26
#> # ℹ 311 more rows
#> # ℹ 71 more variables: wk6 <dbl>, wk7 <dbl>, wk8 <dbl>, wk9 <dbl>, …
```

Lengthening Data

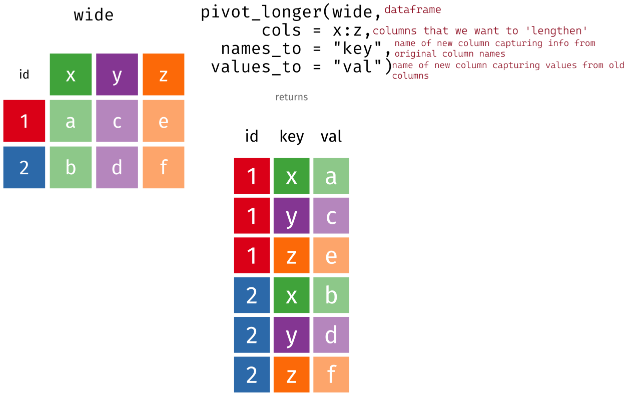
pivot_longer



```
billboard |>
  pivot_longer(
    cols = starts_with("wk"),
    names_to = "week",
    values_to = "rank"
  )
#> # A tibble: 24,092 × 5
#>    artist track                   date.entered week   rank
#>    <chr>  <chr>                   <date>       <chr> <dbl>
#>  1 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk1      87
#>  2 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk2      82
#>  3 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk3      72
#>  4 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk4      77
#>  5 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk5      87
#>  6 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk6      94
#>  7 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk7      99
#>  8 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk8      NA
#>  9 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk9      NA
#> 10 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk10     NA
#> # ℹ 24,082 more rows
```

Lengthening Data

pivot_longer



wide

id	x	y	z
1	a	c	e
2	b	d	f

```
pivot_longer(wide, dataframe
       cols = x:z, columns that we want to 'lengthen'
  names_to = "key", name of new column capturing info from
                    original column names
 values_to = "val") name of new column capturing values from old
                    columns
```

returns

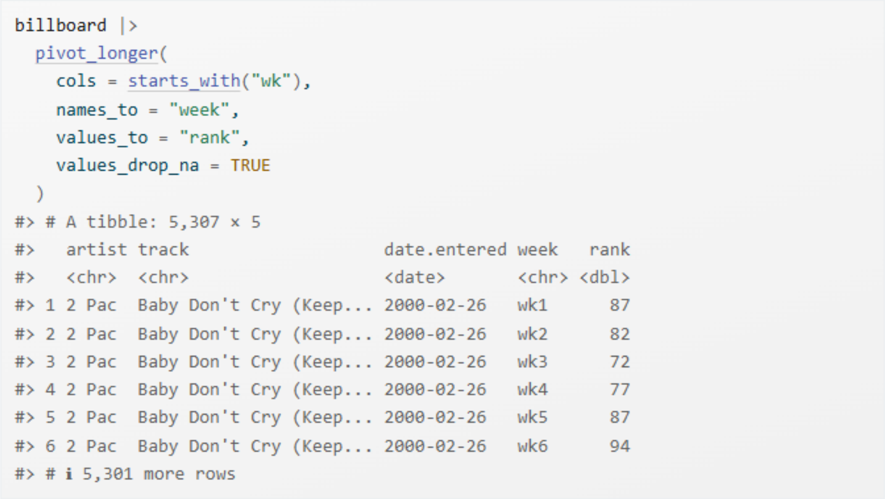
id	key	val
1	x	a
1	y	c
1	z	e
2	x	b
2	y	d
2	z	f

Adapted from Visuals by Garrick Aden-Buie

- Think of how you would plot this new data

Lengthening Data

pivot_longer



```
billboard |>
  pivot_longer(
    cols = starts_with("wk"),
    names_to = "week",
    values_to = "rank",
    values_drop_na = TRUE
  )
#> # A tibble: 5,307 × 5
#>   artist track                   date.entered week   rank
#>   <chr>  <chr>                   <date>       <chr> <dbl>
#> 1 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk1      87
#> 2 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk2      82
#> 3 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk3      72
#> 4 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk4      77
#> 5 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk5      87
#> 6 2 Pac  Baby Don't Cry (Keep... 2000-02-26   wk6      94
#> # ℹ 5,301 more rows
```

Lengthening Data

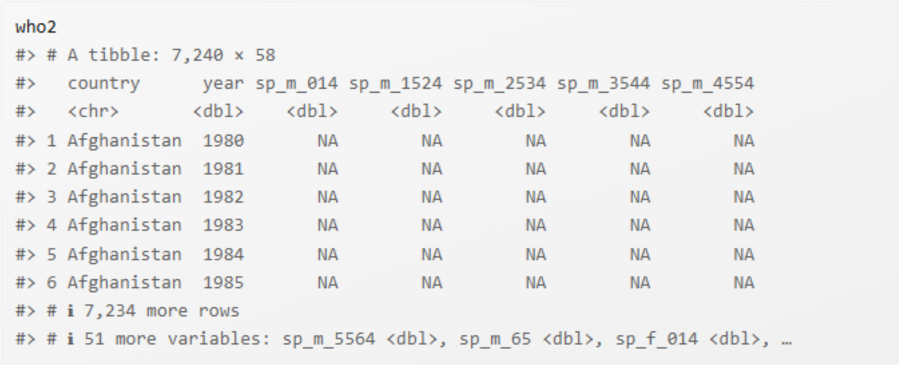
pivot_longer

- Each column is a variable
- Each cell is a single value
- But now we have multiple rows for each 'unit' or 'object'
- Each row is still a single observation in time

Lengthening Data

Multiple variables in a single column name?

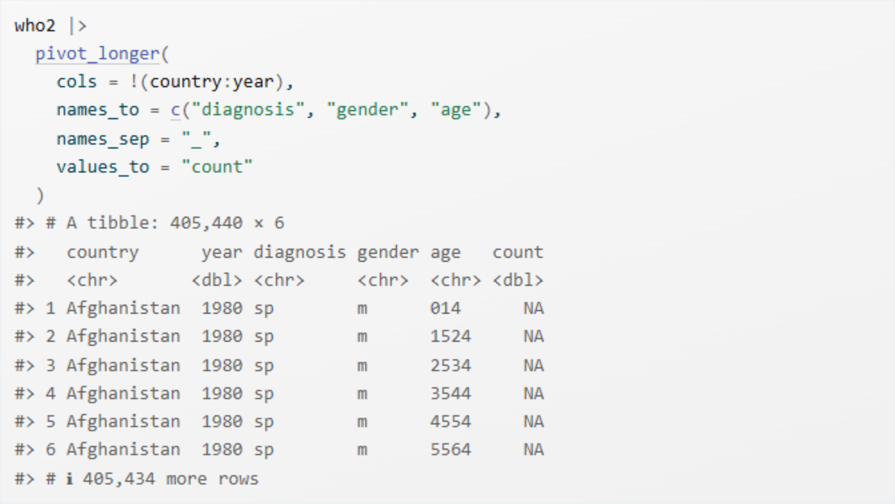
- Collected by the World Health Organisation
- Records information about tuberculosis diagnoses



```
who2
#> # A tibble: 7,240 × 58
#>   country      year sp_m_014 sp_m_1524 sp_m_2534 sp_m_3544 sp_m_4554
#>   <chr>       <dbl>    <dbl>     <dbl>     <dbl>     <dbl>     <dbl>
#> 1 Afghanistan  1980       NA        NA        NA        NA        NA
#> 2 Afghanistan  1981       NA        NA        NA        NA        NA
#> 3 Afghanistan  1982       NA        NA        NA        NA        NA
#> 4 Afghanistan  1983       NA        NA        NA        NA        NA
#> 5 Afghanistan  1984       NA        NA        NA        NA        NA
#> 6 Afghanistan  1985       NA        NA        NA        NA        NA
#> # ℹ 7,234 more rows
#> # ℹ 51 more variables: sp_m_5564 <dbl>, sp_m_65 <dbl>, sp_f_014 <dbl>, …
```

Lengthening Data

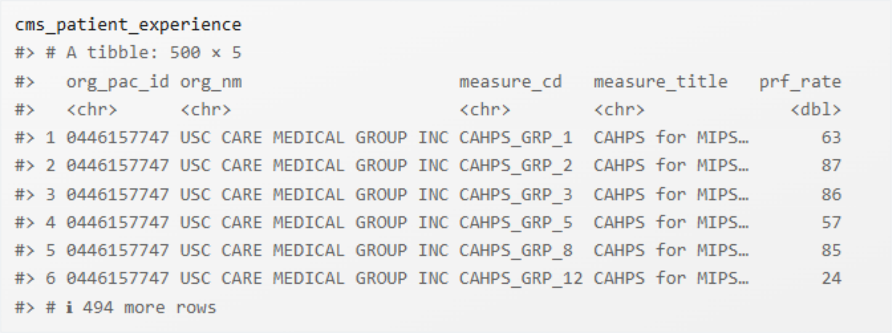
Multiple variables in a single column name?



```
who2 |>
  pivot_longer(
    cols = !(country:year),
    names_to = c("diagnosis", "gender", "age"),
    names_sep = "_",
    values_to = "count"
  )
#> # A tibble: 405,440 × 6
#>   country      year diagnosis gender age   count
#>   <chr>       <dbl> <chr>     <chr>  <chr> <dbl>
#> 1 Afghanistan  1980 sp        m      014      NA
#> 2 Afghanistan  1980 sp        m      1524     NA
#> 3 Afghanistan  1980 sp        m      2534     NA
#> 4 Afghanistan  1980 sp        m      3544     NA
#> 5 Afghanistan  1980 sp        m      4554     NA
#> 6 Afghanistan  1980 sp        m      5564     NA
#> # ℹ 405,434 more rows
```

Widening Data

- Needing to widen data is less common
- `cms_patient_experience` from the Centers of Medicare and Medicaid services
- Data about patient experiences



```
cms_patient_experience
#> # A tibble: 500 × 5
#>   org_pac_id org_nm                     measure_cd   measure_title   prf_rate
#>   <chr>      <chr>                      <chr>        <chr>              <dbl>
#> 1 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_1  CAHPS for MIPS…       63
#> 2 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_2  CAHPS for MIPS…       87
#> 3 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_3  CAHPS for MIPS…       86
#> 4 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_5  CAHPS for MIPS…       57
#> 5 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_8  CAHPS for MIPS…       85
#> 6 0446157747 USC CARE MEDICAL GROUP INC CAHPS_GRP_12 CAHPS for MIPS…       24
#> # ℹ 494 more rows
```

Widening Data

```
long
```

id	key	val
1	x	a
2	x	b
1	y	c
2	y	d
1	z	e
2	z	f

```
pivot_wider(long,
  names_from = key,
 values_from = val)
```

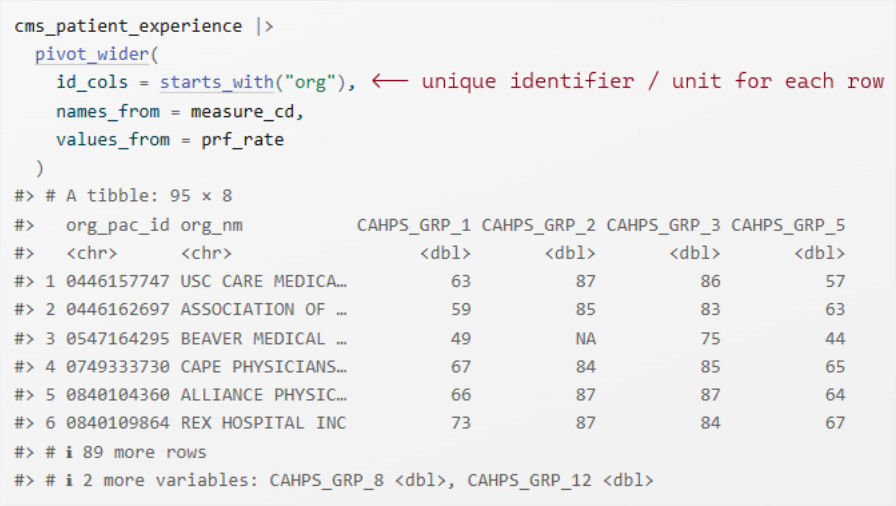
returns

id	x	y	z
1	a	c	e
2	b	d	f

Adapted from Visuals by Garrick Aden-Buie

Widening Data

pivot_wider



```
cms_patient_experience |>
  pivot_wider(
    id_cols = starts_with("org"), ⟵ unique identifier / unit for each row
    names_from = measure_cd,
    values_from = prf_rate
  )
#> # A tibble: 95 × 8
#>   org_pac_id org_nm           CAHPS_GRP_1 CAHPS_GRP_2 CAHPS_GRP_3 CAHPS_GRP_5
#>   <chr>      <chr>                  <dbl>       <dbl>       <dbl>       <dbl>
#> 1 0446157747 USC CARE MEDICA…          63          87          86          57
#> 2 0446162697 ASSOCIATION OF …          59          85          83          63
#> 3 0547164295 BEAVER MEDICAL …          49          NA          75          44
#> 4 0749333730 CAPE PHYSICIANS…          67          84          85          65
#> 5 0840104360 ALLIANCE PHYSIC…          66          87          87          64
#> 6 0840109864 REX HOSPITAL INC          73          87          84          67
#> # ℹ 89 more rows
#> # ℹ 2 more variables: CAHPS_GRP_8 <dbl>, CAHPS_GRP_12 <dbl>
```