PSYC 259: Principles of Data Science

Week 4: Part 1

Tidy Data

Why do data need to be wrangled and tidied?

- Data files are often created without the foresight of how they might be used by computers
  - Instead, they are made to look nice for humans
- We need to tidy data to make it convenient for programming
  - Format is dictated by analyses
  - You may need multiple formats

Tidy data (Wickham, 2014)

- Each variable is a column
  - Variable: “All values that measure the same underlying attribute”
- Each observation is a row
  - Observation: Unit for which all variables were measured (person, session, trial, etc.)
- Each type of observational unit is a table
  - e.g., participant questionnaire vs trial-by-trial data

Common types of "un-tidy" data: Column names are values

```
relig_income
#> # A tibble: 18 x 11
#>    religion `<$10k` `$10-20k` `$20-30k` `$30-40k` `$40-50k` `$50-75k` `$75-100k`
#>    <chr>      <dbl>     <dbl>     <dbl>     <dbl>     <dbl>     <dbl>      <dbl>
#>  1 Agnostic      27        34        60        81        76       137        122
#>  2 Atheist       12        27        37        52        35        70         73
#>  3 Buddhist      27        21        30        34        33        58         62
#>  4 Catholic     418       617       732       670       638      1116        949
```

But what’s the problem?

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```

- Income level can’t be made a factor to use in a model
- Challenging to summarize, each income level needs to be treated as a separate variable
- Need to use *different verbs* to subset observations (*filter* for religion, *select* for income)

Solution: pivot_longer() turns columns into rows

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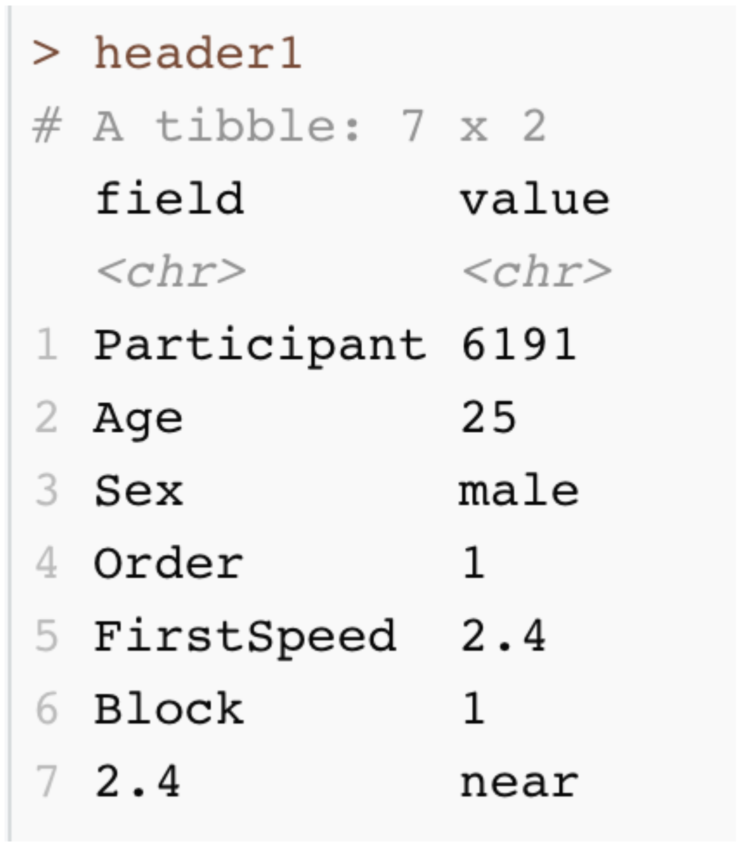
#>  3 Buddhist      27        21        30        34        33        58         62
#>  4 Catholic     418       617       732       670       638      1116        949
```

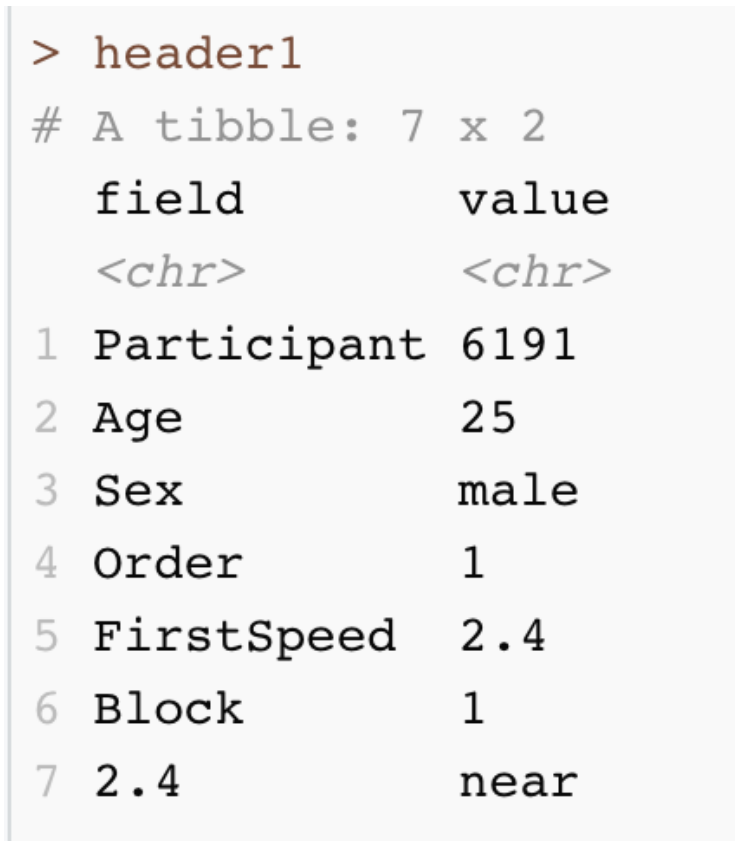
```
relig_income %>%
  pivot_longer(!religion, names_to = "income", values_to = "count")
#> # A tibble: 180 x 3
#>    religion income             count
#>    <chr>    <chr>              <dbl>
#>  1 Agnostic <$10k                 27
#>  2 Agnostic $10-20k               34
#>  3 Agnostic $20-30k               60
#>  4 Agnostic $30-40k               81
#>  5 Agnostic $40-50k               76
```

Common types of “un-tidy” data: Multiple variables in one column



```
> header1
# A tibble: 7 x 2
  field       value
  <chr>       <chr>
1 Participant 6191
2 Age         25
3 Sex         male
4 Order       1
5 FirstSpeed  2.4
6 Block       1
7 2.4         near
```

But what's the problem?



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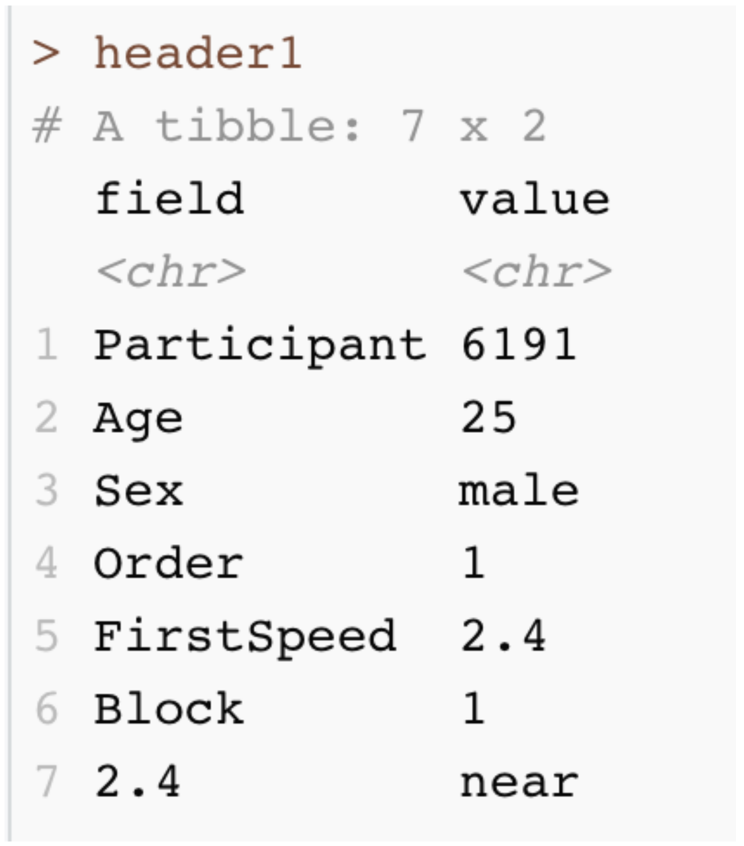

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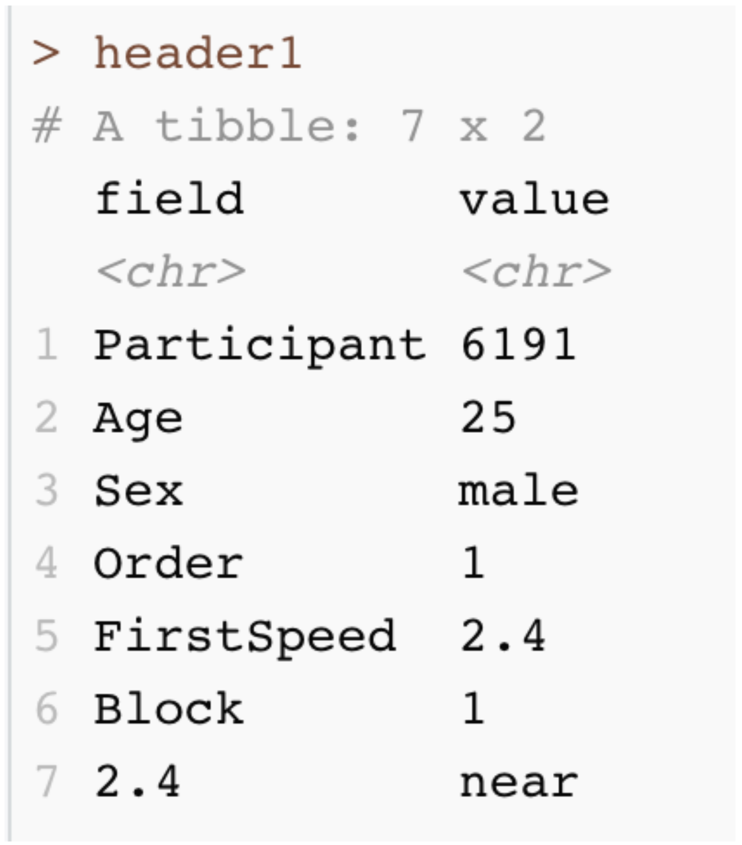
```

- Mixing types in the same column
- No meaningful summary of “value”
- Impossible to use values in a model (i.e., outcome ~ order*sex*block)

Solution: pivot_wider() turns rows into columns



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  field       value
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2 Age         25
3 Sex         male
4 Order       1
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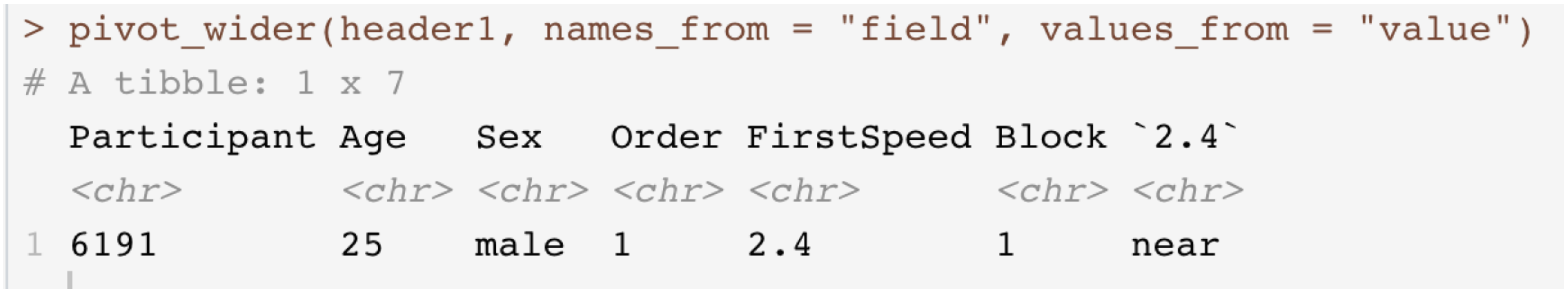
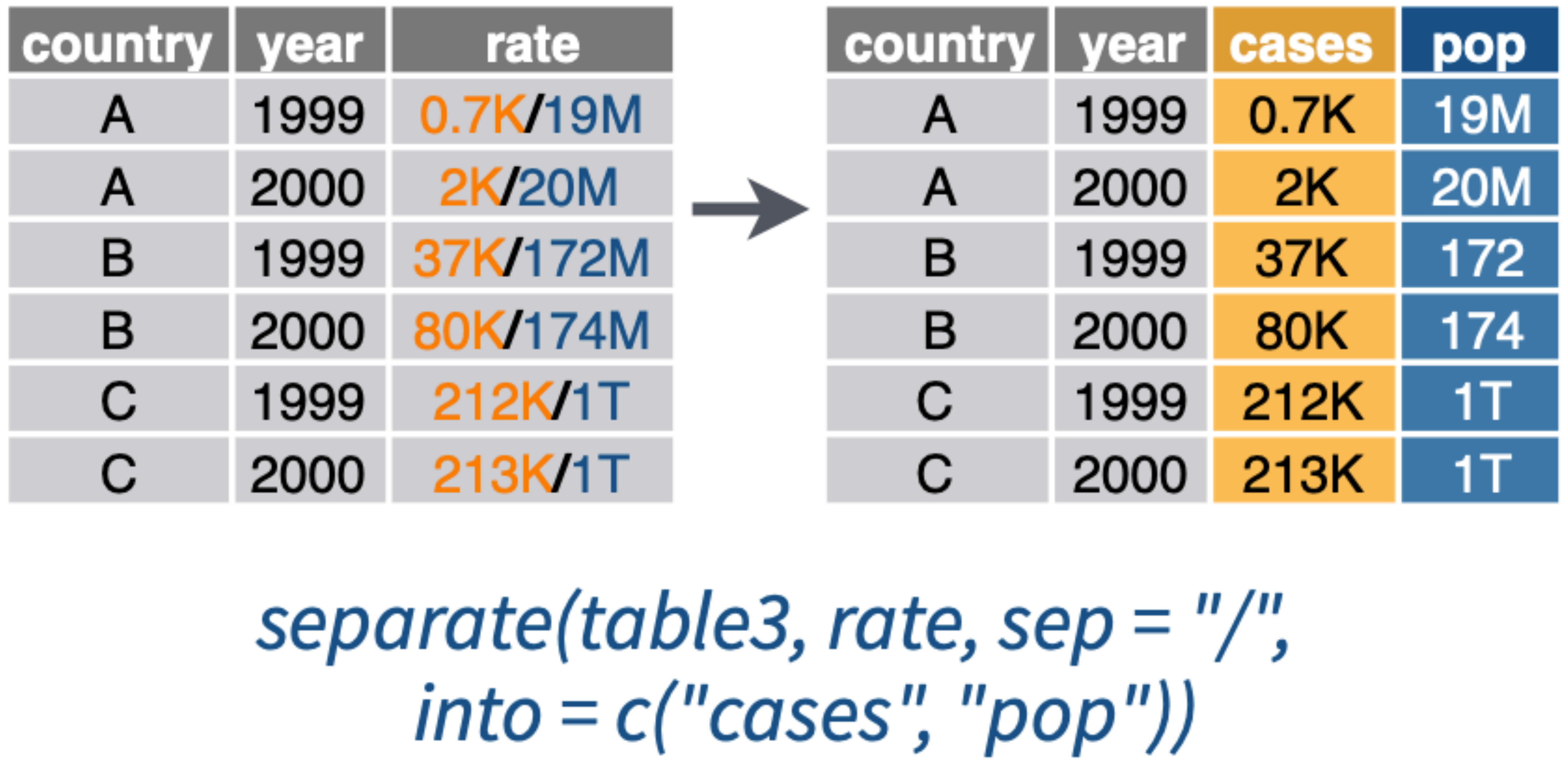


```
> pivot_wider(header1, names_from = "field", values_from = "value")
# A tibble: 1 x 7
  Participant Age   Sex   Order FirstSpeed Block `2.4`
  <chr>       <chr> <chr> <chr> <chr>      <chr> <chr>
1 6191        25    male  1     2.4        1     near
```

Common types of “un-tidy” data: Variables glued into one column



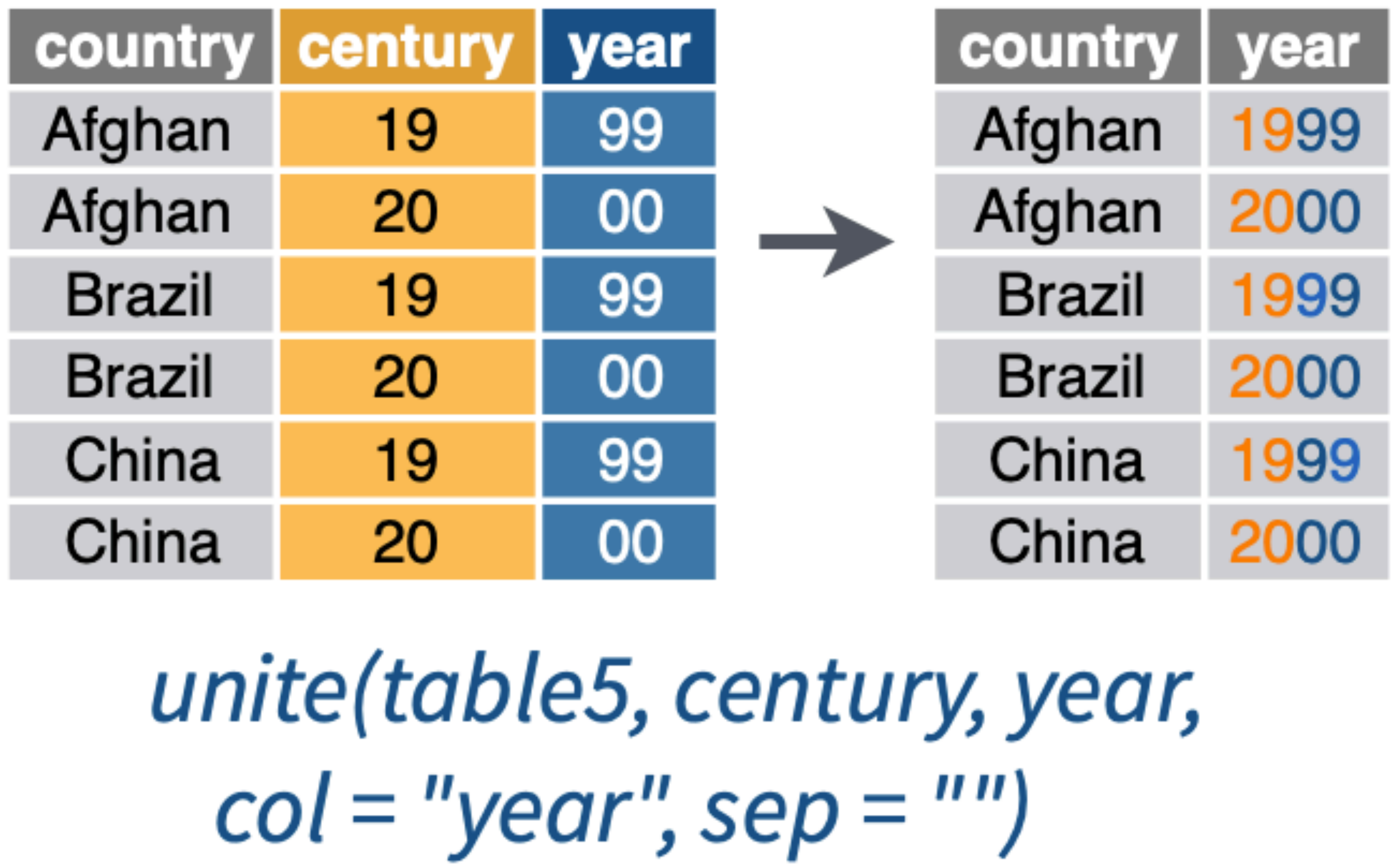
country	year	rate
A	1999	0.7K/19M
A	2000	2K/20M
B	1999	37K/172M
B	2000	80K/174M
C	1999	212K/1T
C	2000	213K/1T

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172
B	2000	80K	174
C	1999	212K	1T
C	2000	213K	1T

```
separate(table3, rate, sep = "/",
    into = c("cases", "pop"))
```

- Solution: use separate()

Common types of "un-tidy" data: Variables split across columns



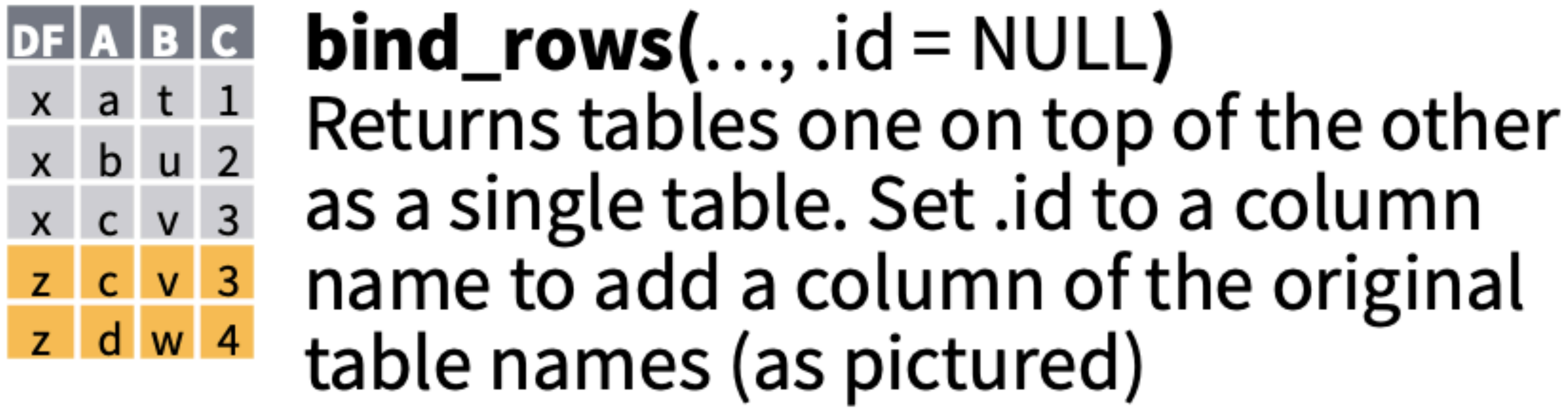
country	century	year
Afghan	19	99
Afghan	20	00
Brazil	19	99
Brazil	20	00
China	19	99
China	20	00

country	year
Afghan	1999
Afghan	2000
Brazil	1999
Brazil	2000
China	1999
China	2000

```
unite(table5, century, year,
  col = "year", sep = "")
```

- Solution: use unite()

Common types of “un-tidy” data: Observations split across tables

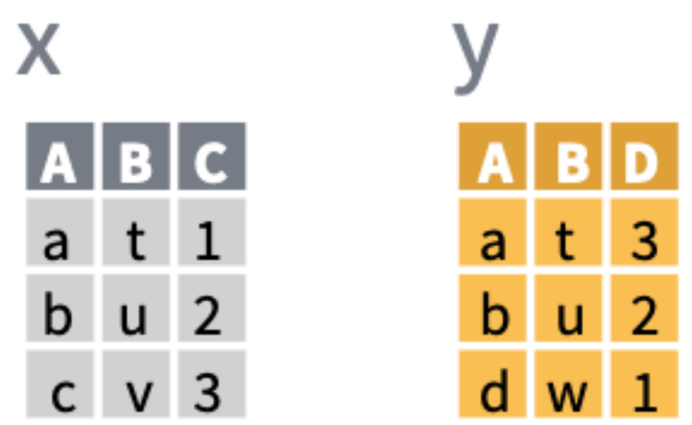


DF	A	B	C
x	a	t	1
x	b	u	2
x	c	v	3
z	c	v	3
z	d	w	4

bind_rows(…, .id = NULL**)**
Returns tables one on top of the other as a single table. Set .id to a column name to add a column of the original table names (as pictured)

- Solution: use bind_rows()
- Solution: use vroom() if data are split across files

Common types of “un-tidy” data: Variables split across tables

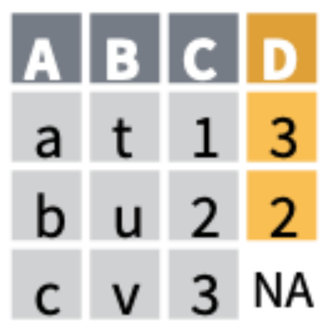


x

A	B	C
a	t	1
b	u	2
c	v	3

y

A	B	D
a	t	3
b	u	2
d	w	1



A	B	C	D
a	t	1	3
b	u	2	2
c	v	3	NA

left_join(x, y, by = NULL, copy=FALSE, suffix=c(“.x”,“.y”),...**)**
Join matching values from y to x.

- Solution: use left_join() or other joins
- Why not bind_cols?