

When pivot-wider goes wrong

# Packages

The inevitable:

```
library(tidyverse)
```

## Some long data that should be wide

```
# A tibble: 6 x 3
  obs time      y
  <dbl> <chr> <dbl>
1     1 pre    19
2     2 post   18
3     3 pre    17
4     4 post   16
5     5 pre    15
6     6 post   14
```

- ▶ Six observations of variable `y`, but three measured before some treatment and three measured after.
- ▶ Really matched pairs, so want column of `y`-values for `pre` and for `post`.
- ▶ `pivot_wider`.

## What happens here?

```
d %>% pivot_wider(names_from = time, values_from = y)
```

```
# A tibble: 6 x 3
  obs   pre post
  <dbl> <dbl> <dbl>
1     1    19  NA
2     2   NA  18
3     3    17  NA
4     4   NA  16
5     5    15  NA
6     6   NA  14
```

- ▶ Should be *three* pre values and *three* post. Why did this happen?
- ▶ `pivot_wider` needs to know which *row* to put each observation in.
- ▶ Uses combo of columns *not* named in `pivot_wider`, here `obs` (only).

## The problem

```
d %>% pivot_wider(names_from = time, values_from = y)
```

```
# A tibble: 6 x 3
```

|   | obs   | pre   | post  |
|---|-------|-------|-------|
|   | <dbl> | <dbl> | <dbl> |
| 1 | 1     | 19    | NA    |
| 2 | 2     | NA    | 18    |
| 3 | 3     | 17    | NA    |
| 4 | 4     | NA    | 16    |
| 5 | 5     | 15    | NA    |
| 6 | 6     | NA    | 14    |

- ▶ There are 6 different obs values, so 6 different rows.
- ▶ No data for obs 2 and pre, so that cell missing (NA).
- ▶ Not enough data (6 obs) to fill 12 ( $= 2 \times 6$ ) cells.
- ▶ obs needs to say which subject provided which 2 observations.

## Fixing it up

```
# A tibble: 6 x 3
  subject time      y
  <dbl> <chr> <dbl>
1     1 pre     19
2     1 post    18
3     2 pre     17
4     2 post    16
5     3 pre     15
6     3 post    14
```

- ▶ column `subject` shows which subject provided each pre and post.
- ▶ when we do `pivot_wider`, now only 3 rows, one per subject.

## Coming out right

```
d2 %>% pivot_wider(names_from = time, values_from = y)
```

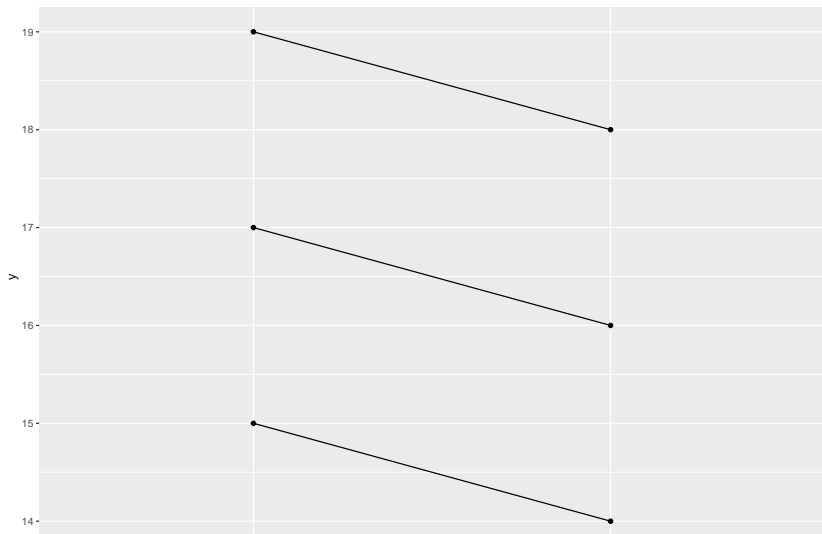
```
# A tibble: 3 x 3
```

```
  subject  pre  post  
  <dbl> <dbl> <dbl>  
1       1   19   18  
2       2   17   16  
3       3   15   14
```

- ▶ row each observation goes to determined by other column subject, and now a pre and post for each subject.
- ▶ right layout for matched pairs  $t$  or to make differences for sign test or normal quantile plot.
- ▶ “spaghetti plot” needs data longer, as d2.

## Spaghetti plot

```
d2 %>% mutate(time = fct_inorder(time)) %>%  
  ggplot(aes(x = time, y = y, group = subject)) +  
    geom_point() + geom_line()
```





## Another example

- ▶ Two independent samples this time

```
# A tibble: 8 x 2
  group      y
  <chr>    <dbl>
1 control     8
2 control    11
3 control    13
4 control    14
5 treatment  12
6 treatment  15
7 treatment  16
8 treatment  17
```

- ▶ These should be arranged like this
- ▶ but what if we make them wider?

## Wider

```
d3 %>% pivot_wider(names_from = group, values_from = y)
```

```
# A tibble: 1 x 2  
  control treatment  
  <list>   <list>  
1 <dbl [4]> <dbl [4]>
```

- ▶ row determined by what not used for `pivot_wider`: nothing!
- ▶ everything smooshed into *one* row!
- ▶ this time, too *much* data for the layout.
- ▶ Four data values squeezed into each of the two cells: “list-columns”.

## Get the data out

- ▶ To expand list-columns out into the data values they contain, can use `unnest`:

```
d3 %>% pivot_wider(names_from = group, values_from = y) %>%  
  unnest(c(control, treatment))
```

```
# A tibble: 4 x 2  
  control treatment  
  <dbl>    <dbl>  
1      8         12  
2     11         15  
3     13         16  
4     14         17
```

- ▶ in this case, wrong layout, because data values not paired.

## A proper use of list-columns

```
d3 %>% nest_by(group) %>%  
  summarize(n = nrow(data),  
            mean_y = mean(data$y),  
            sd_y = sd(data$y))
```

```
# A tibble: 2 x 4  
# Groups:   group [2]  
  group      n mean_y sd_y  
  <chr> <int> <dbl> <dbl>  
1 control     4  11.5  2.65  
2 treatment   4   15   2.16
```

- ▶ another way to do `group_by` and `summarize` to find stats by group.
- ▶ run this one piece at a time to see what it does.