# When pivot-wider goes wrong

# Some long data that should be wide

| obs | time | y |
|---|---|---|
| 1 | pre | 19 |
| 2 | post | 18 |
| 3 | pre | 17 |
| 4 | post | 16 |
| 5 | pre | 15 |
| 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)
```

| obs | pre | post |
|---|---|---|
| 1 | 19 | NA |
| 2 | NA | 18 |
| 3 | 17 | NA |
| 4 | NA | 16 |
| 5 | 15 | NA |
| 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)
```

| obs | pre | post |
|---|---|---|
| 1 | 19 | NA |
| 2 | NA | 18 |
| 3 | 17 | NA |
| 4 | NA | 16 |
| 5 | 15 | NA |
| 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

| subject | time | y |
|---|---|---|
| 1 | pre | 19 |
| 1 | post | 18 |
| 2 | pre | 17 |
| 2 | post | 16 |
| 3 | pre | 15 |
| 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)
```

| subject | pre | post |
|---|---|---|
| 1 | 19 | 18 |
| 2 | 17 | 16 |
| 3 | 15 | 14 |

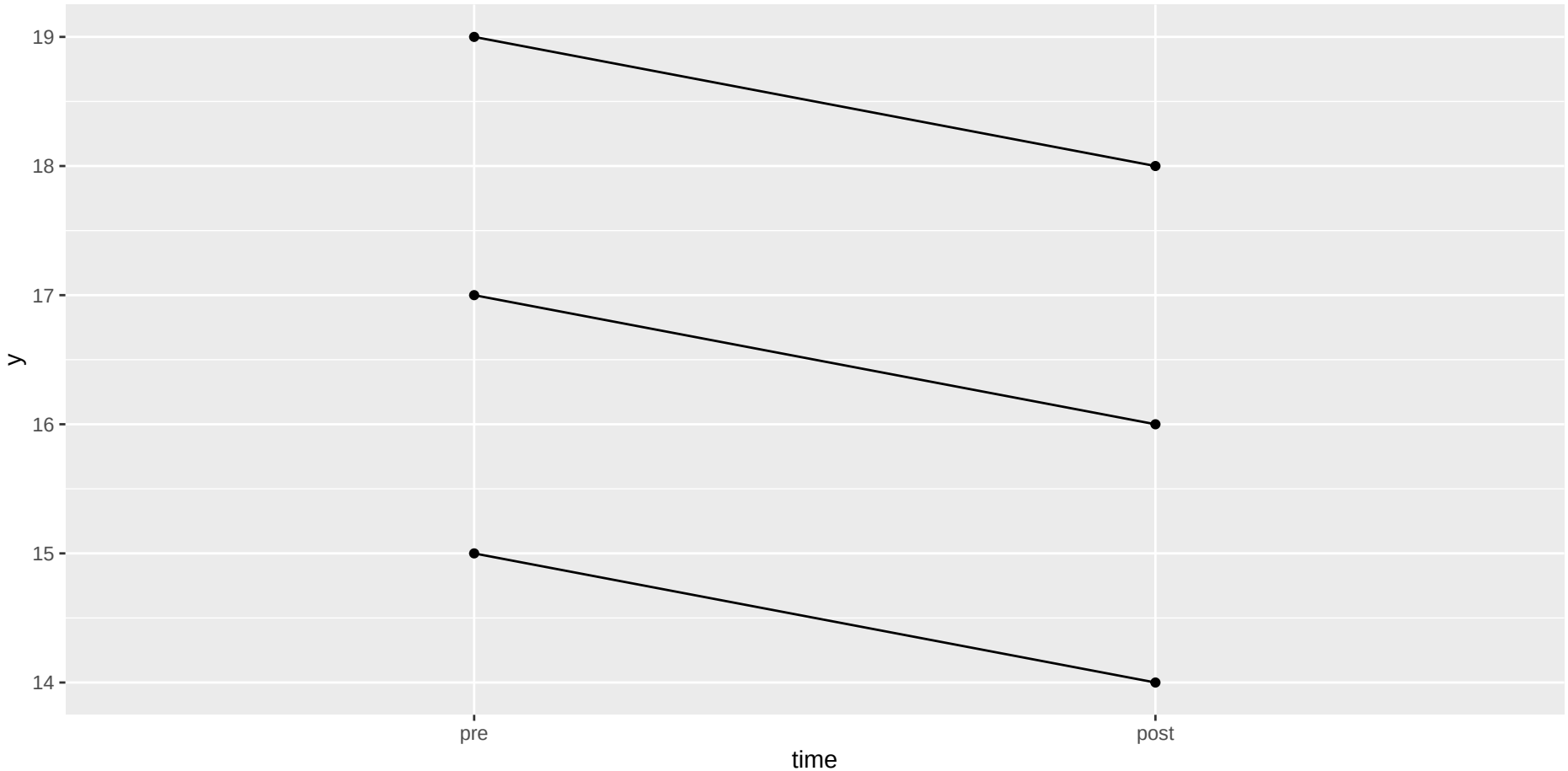
- row each observation goes to determined by other column `subject`, and now a `pre` and `post` for each `subject`.
- right layout for matched pairs $t$ or to make differences for sign test or normal quantile plot.
- "spaghetti plot" needs data longer, as `d2`.

# Spaghetti plot

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

# The spaghetti plot

```
g
```




- each subject's y decreases over time, with subject 1 highest overall.

# Another example

- Two independent samples this time

| group | y |
|---|---|
| control | 8 |
| control | 11 |
| control | 13 |
| control | 14 |
| treatment | 12 |
| treatment | 15 |
| treatment | 16 |
| 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)
```

```
## Warning: Values are not uniquely identified; output will co
cols.
## * Use `values_fn = list` to suppress this warning.
## * Use `values_fn = length` to identify where the duplicates
## * Use `values_fn = {summary_fun}` to summarise duplicates
```

| control | treatment |
|---|---|
| 8, 11, 13, 14 | 12, 15, 16, 17 |

- 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))
```

```
## Warning: Values are not uniquely identified; output will co
cols.
## * Use `values_fn = list` to suppress this warning.
## * Use `values_fn = length` to identify where the duplicates
## * Use `values_fn = {summary_fun}` to summarise duplicates
```

| control | treatment |
|---|---|
| 8 | 12 |
| 11 | 15 |
| 13 | 16 |
| 14 | 17 |

# A proper use of list-columns

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

```
## `summarise()` regrouping output by 'group' (override with `
```

| group | n | mean_y | sd_y |
|---|---|---|---|
| control | 4 | 11.5 | 2.645751 |
| treatment | 4 | 15.0 | 2.160247 |

- 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.