

# Introduction to relational plots and subplots

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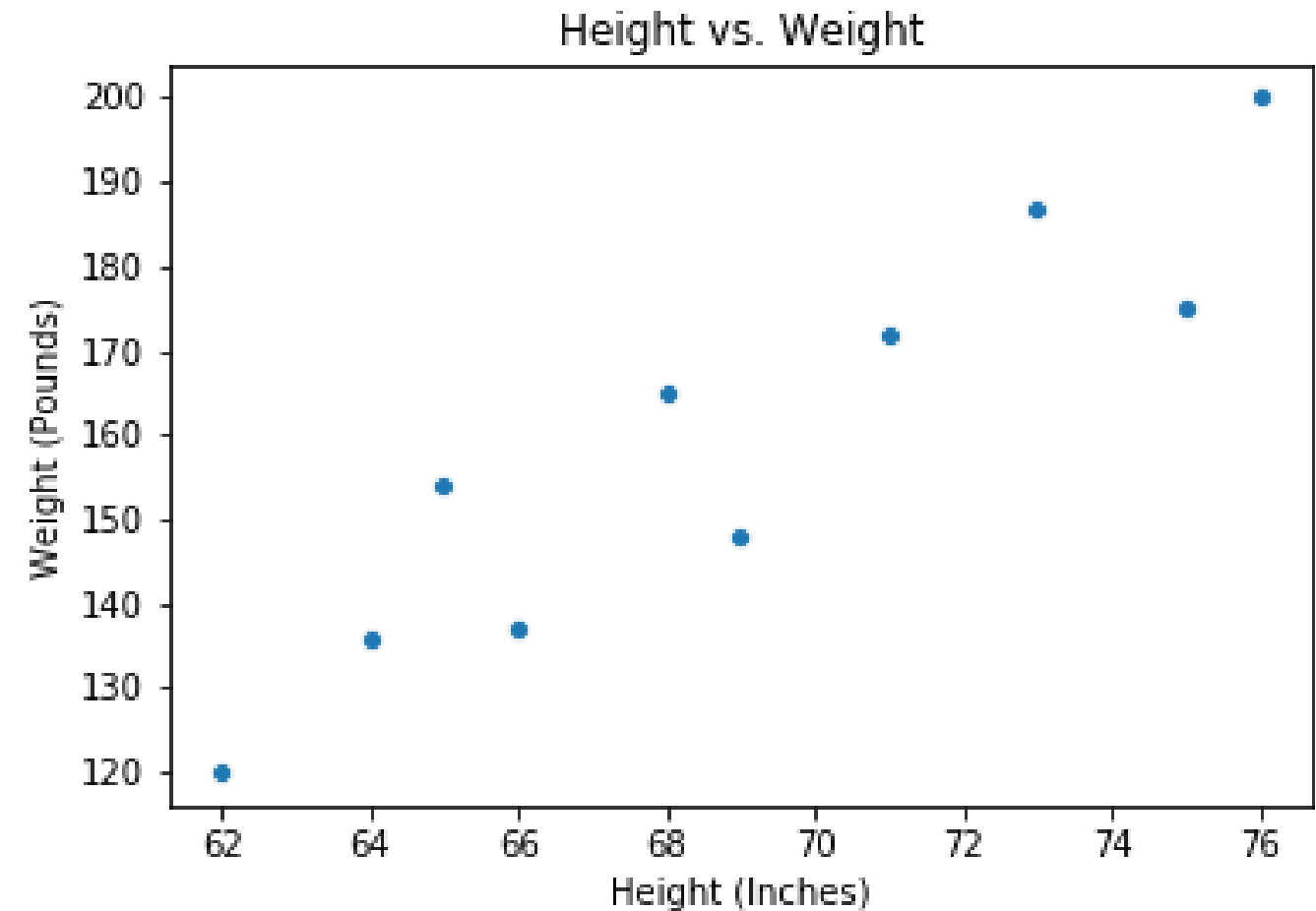


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# Questions about quantitative variables

## Relational plots

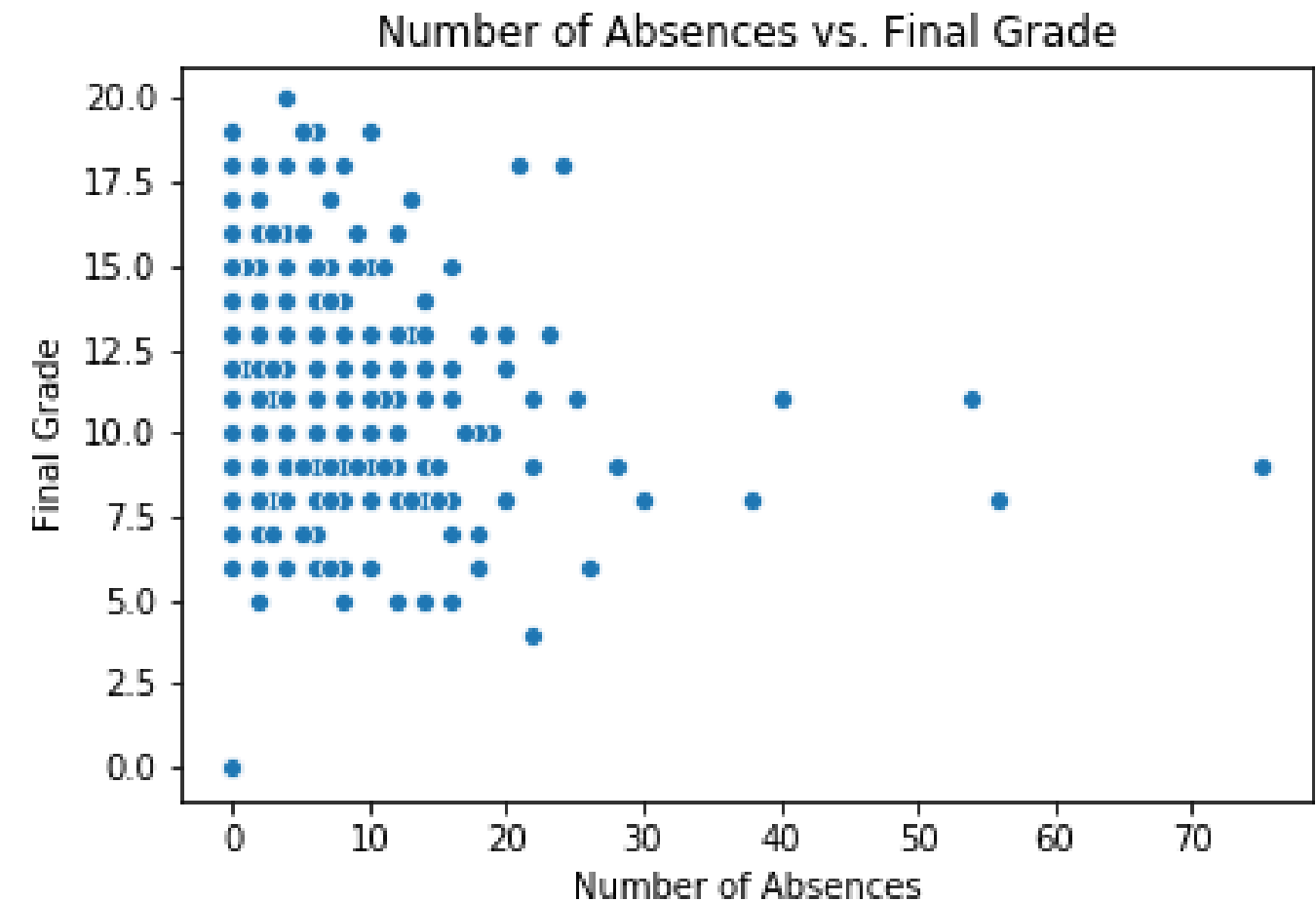
- Height vs. weight



# Questions about quantitative variables

## Relational plots

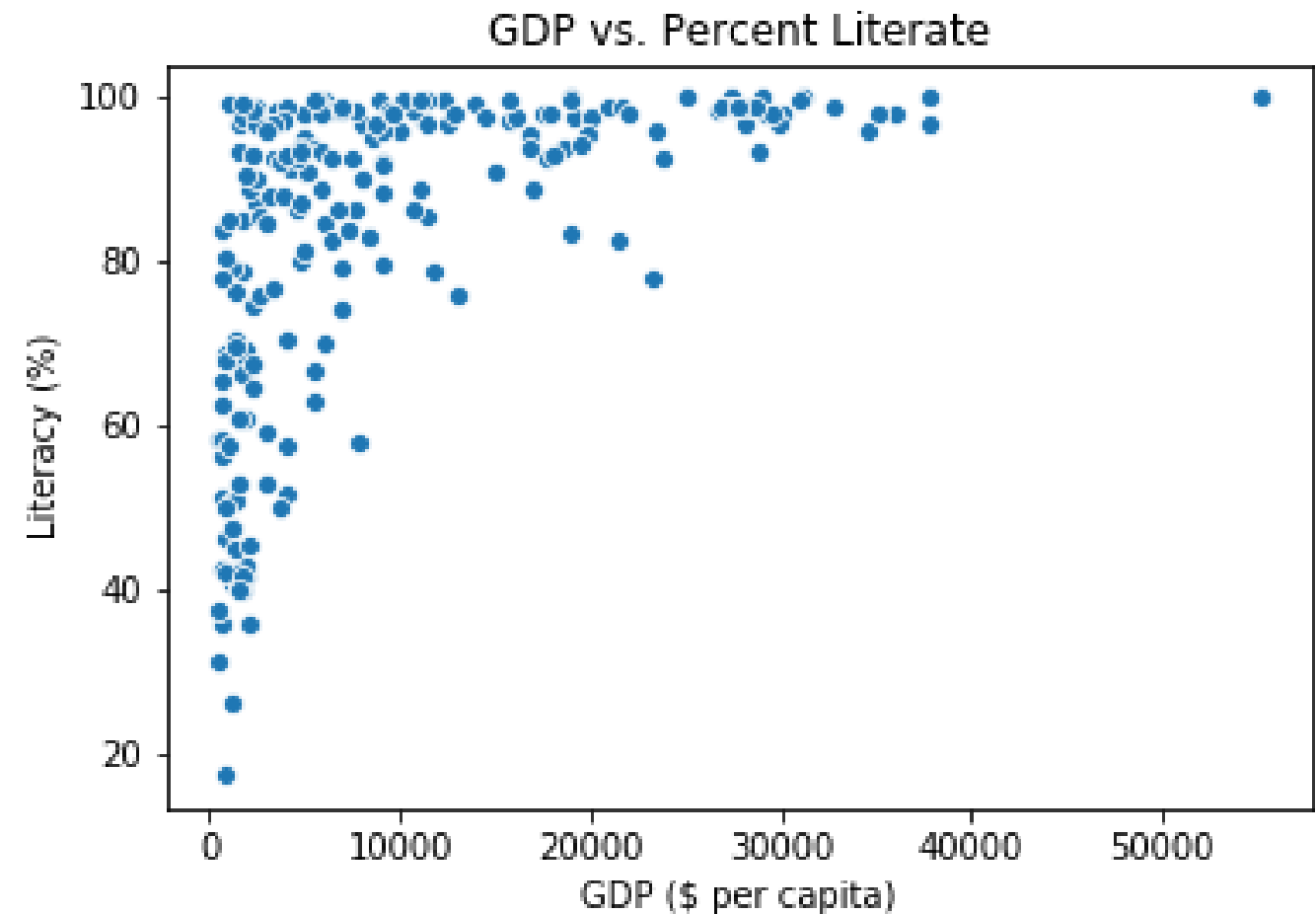
- Height vs. weight
- Number of school absences vs. final grade

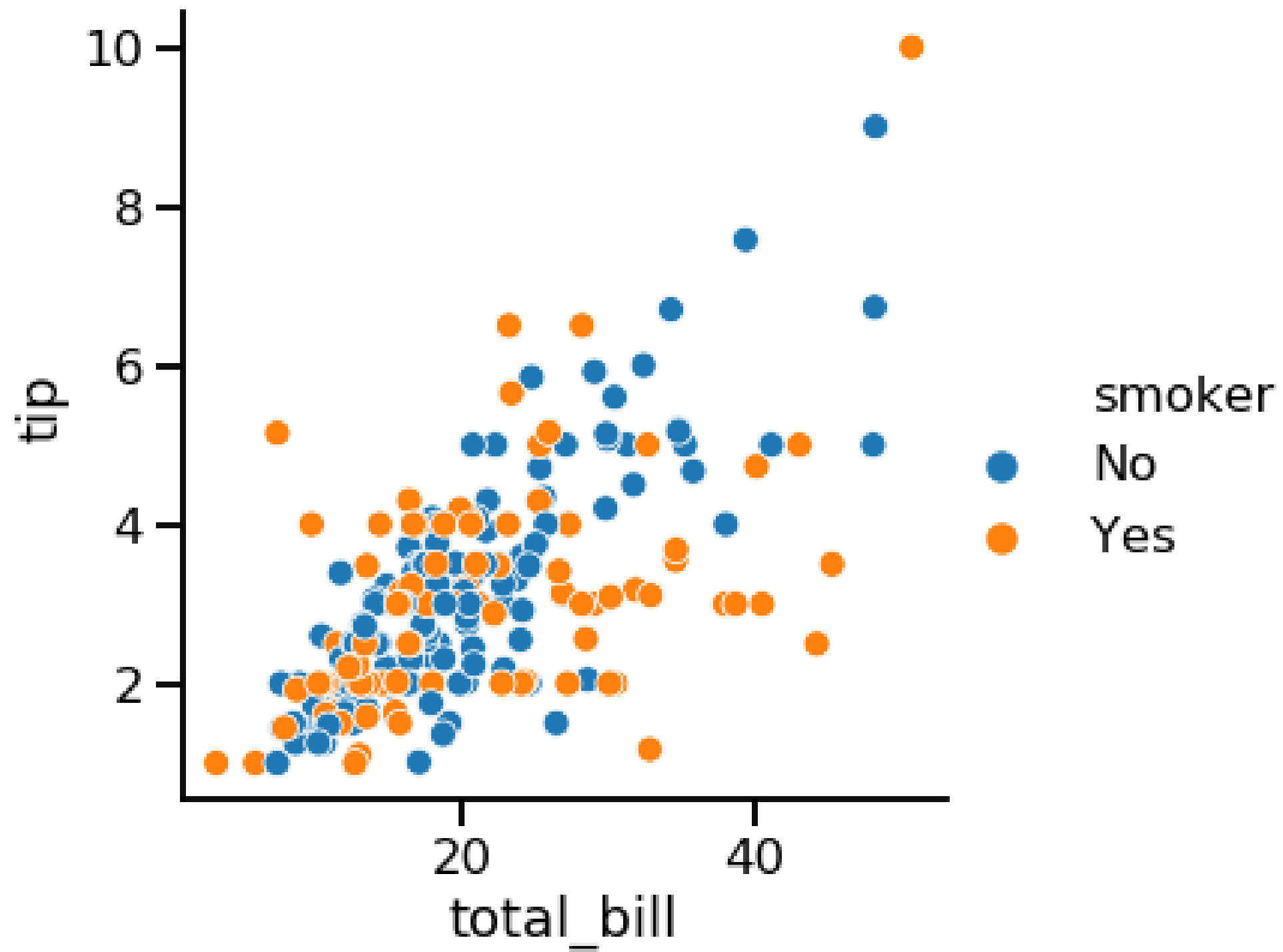


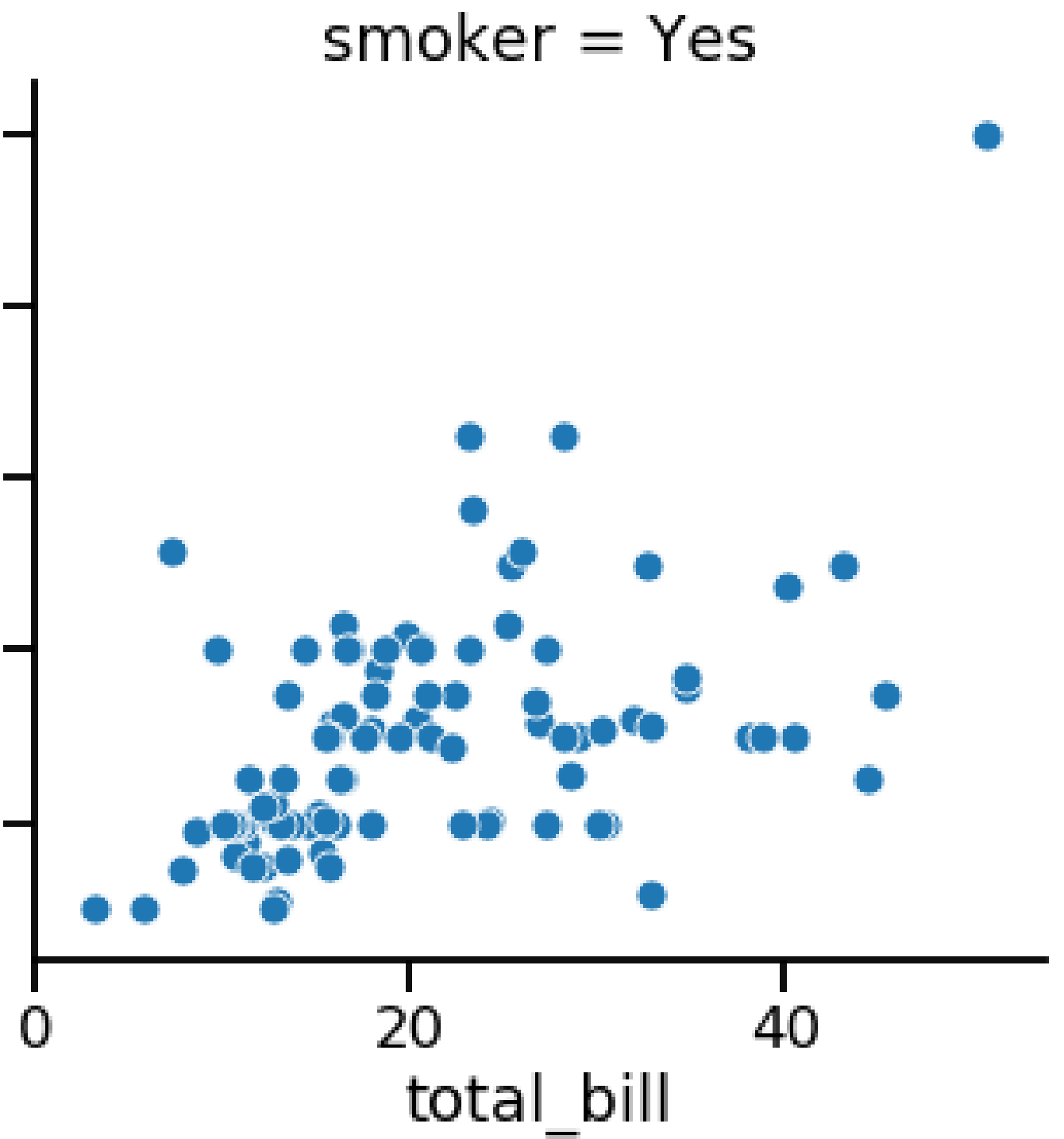
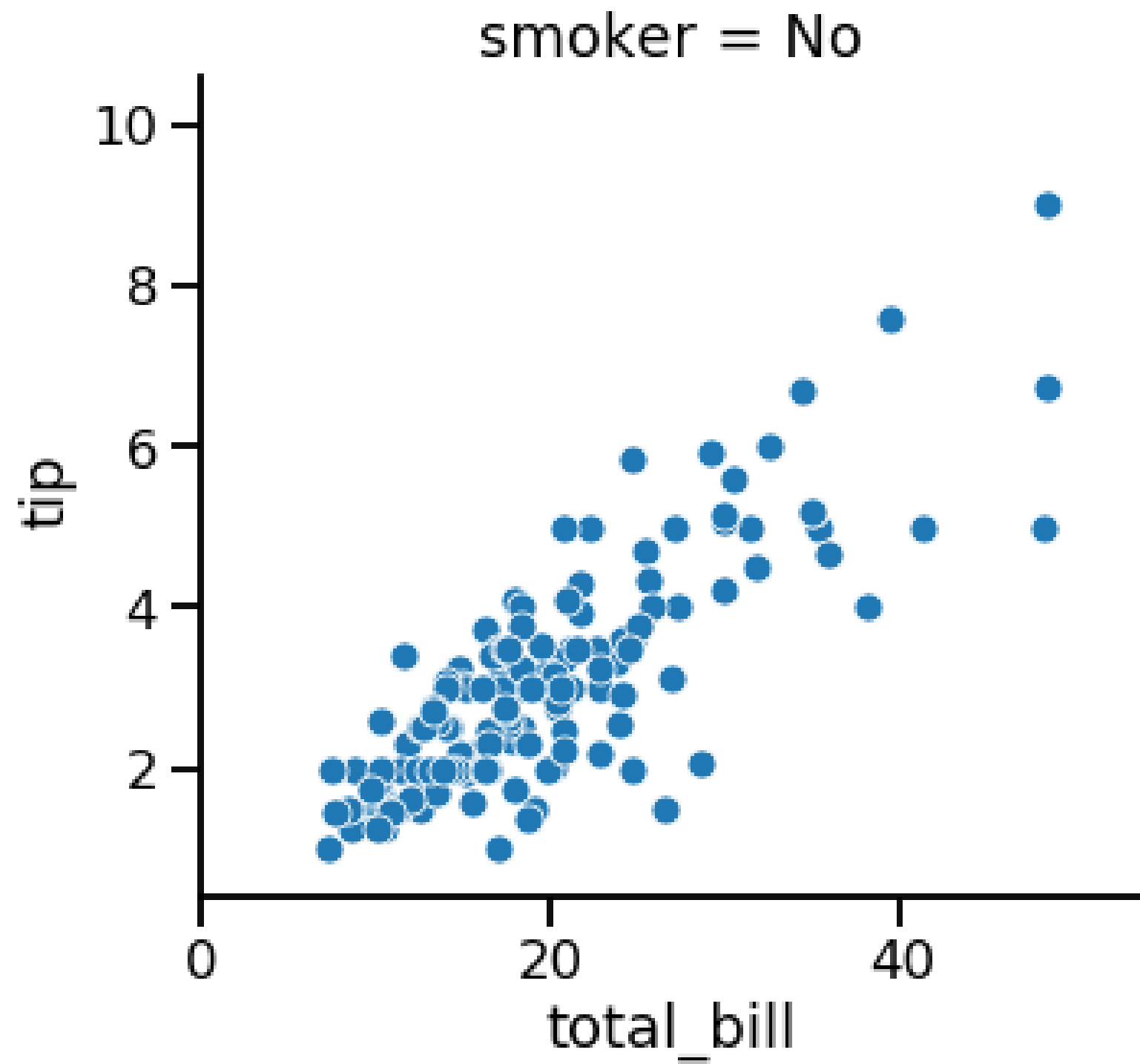
# Questions about quantitative variables

## Relational plots

- Height vs. weight
- Number of school absences vs. final grade
- GDP vs. percent literate







# Introducing relplot()

- Create "relational plots": scatter plots or line plots

Why use `relplot()` instead of `scatterplot()` ?

- `relplot()` lets you create subplots in a single figure

# scatterplot() vs. relplot()

Using `scatterplot()`

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.scatterplot(x="total_bill",
                y="tip",
                data=tips)

plt.show()
```

Using `relplot()`

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter")

plt.show()
```

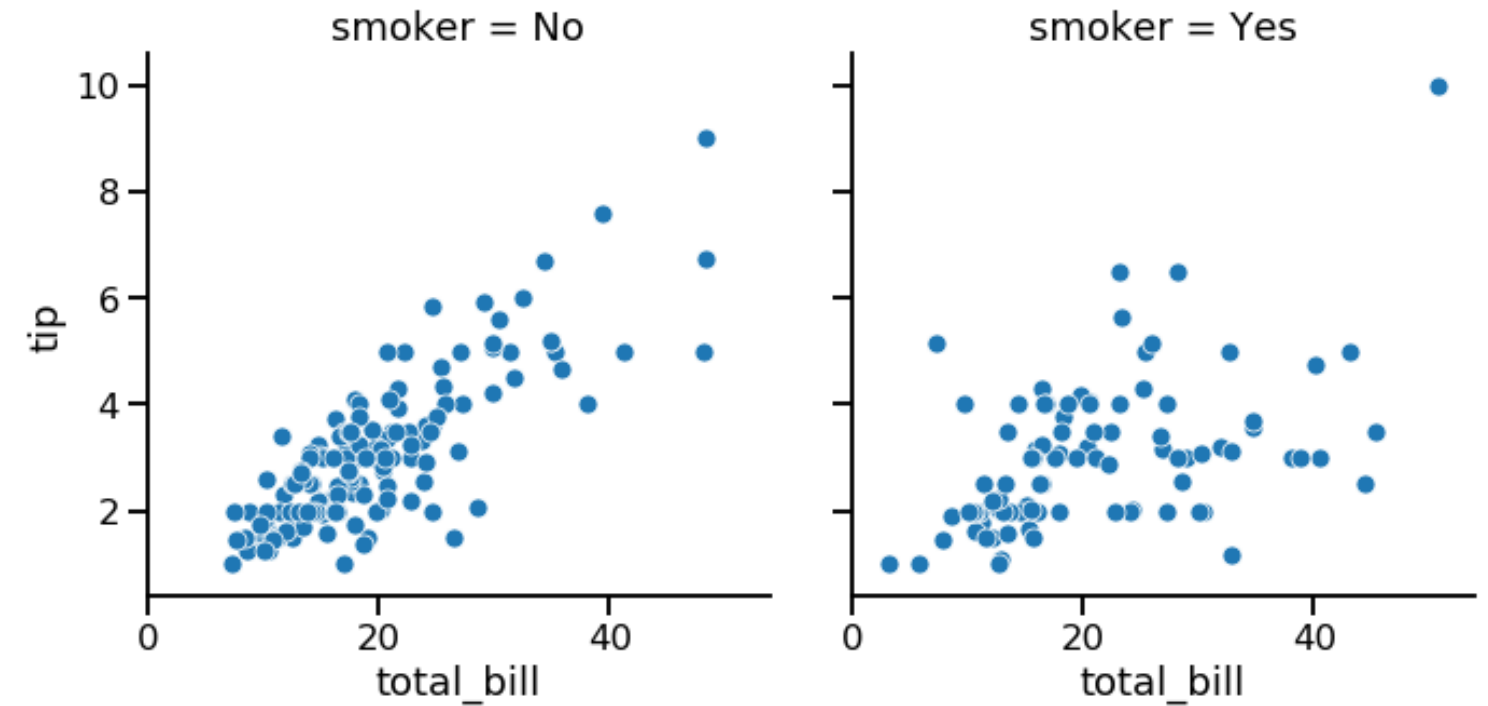


# Subplots in columns

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            col="smoker")

plt.show()
```

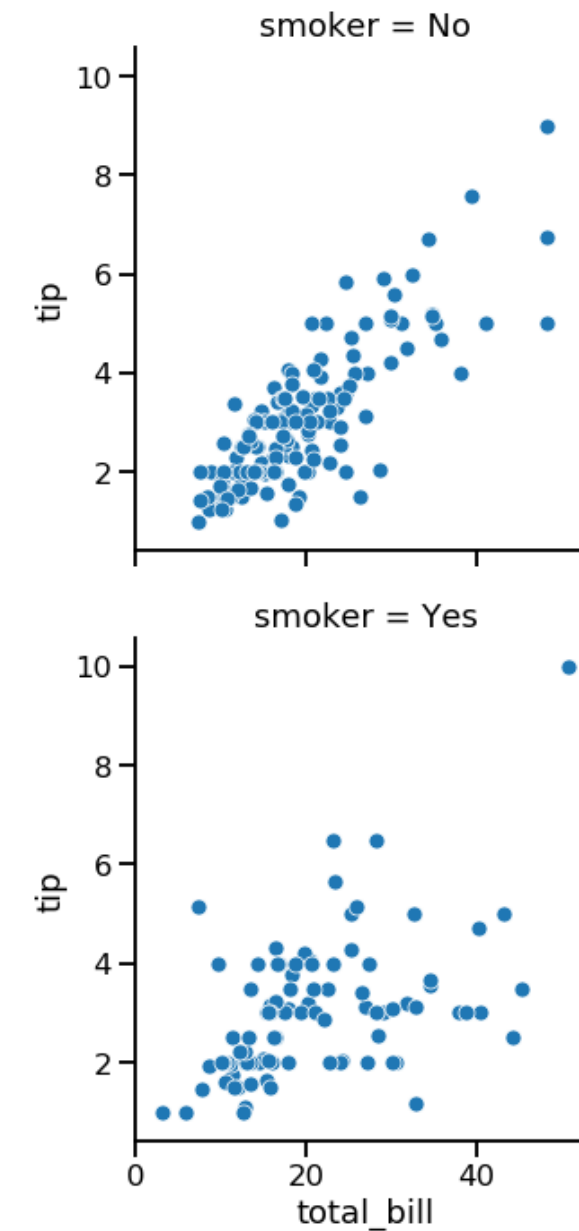


# Subplots in rows

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            row="smoker")

plt.show()
```

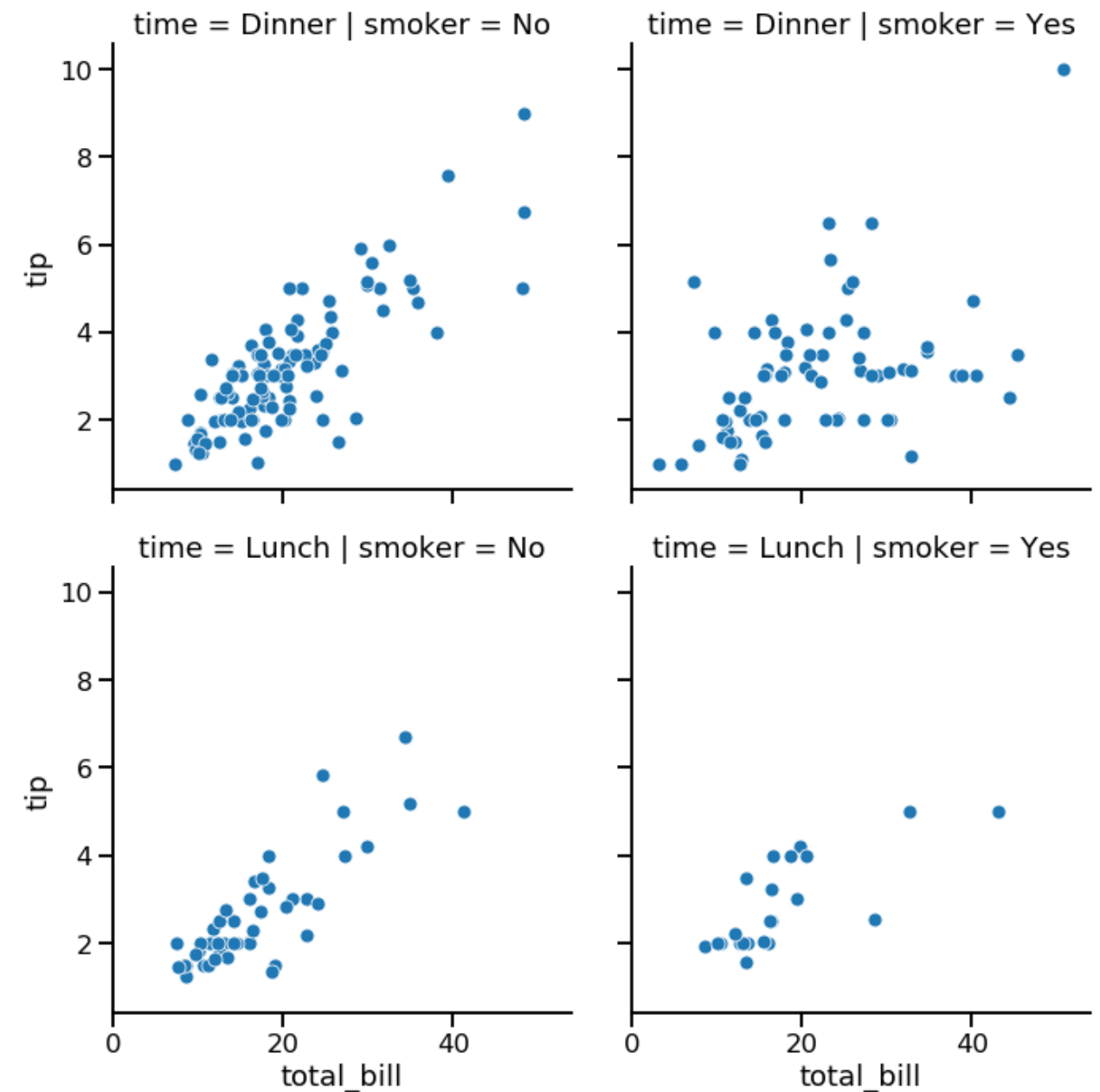


# Subplots in rows and columns

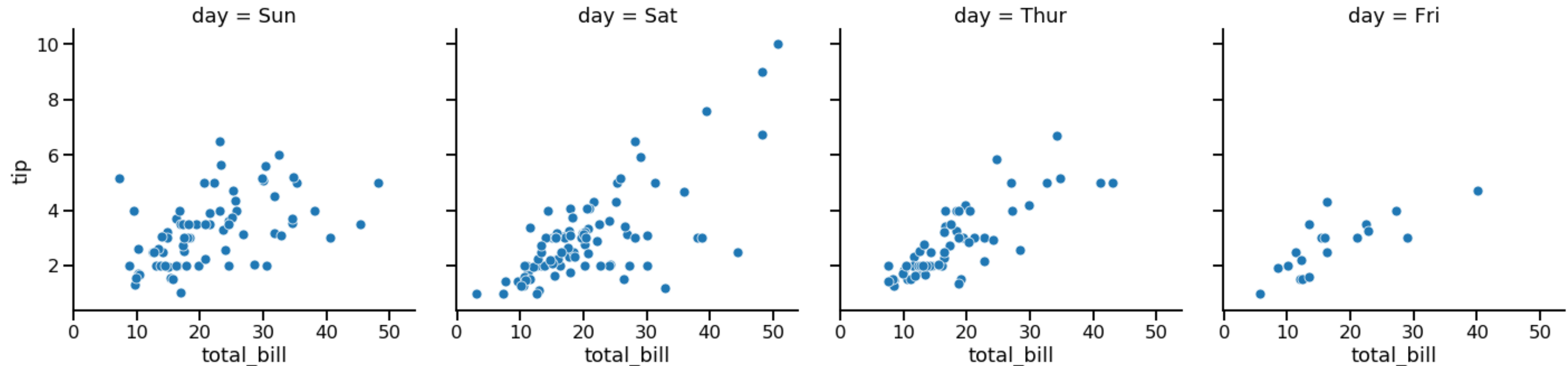
```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            col="smoker",
            row="time")

plt.show()
```



# Subgroups for days of the week

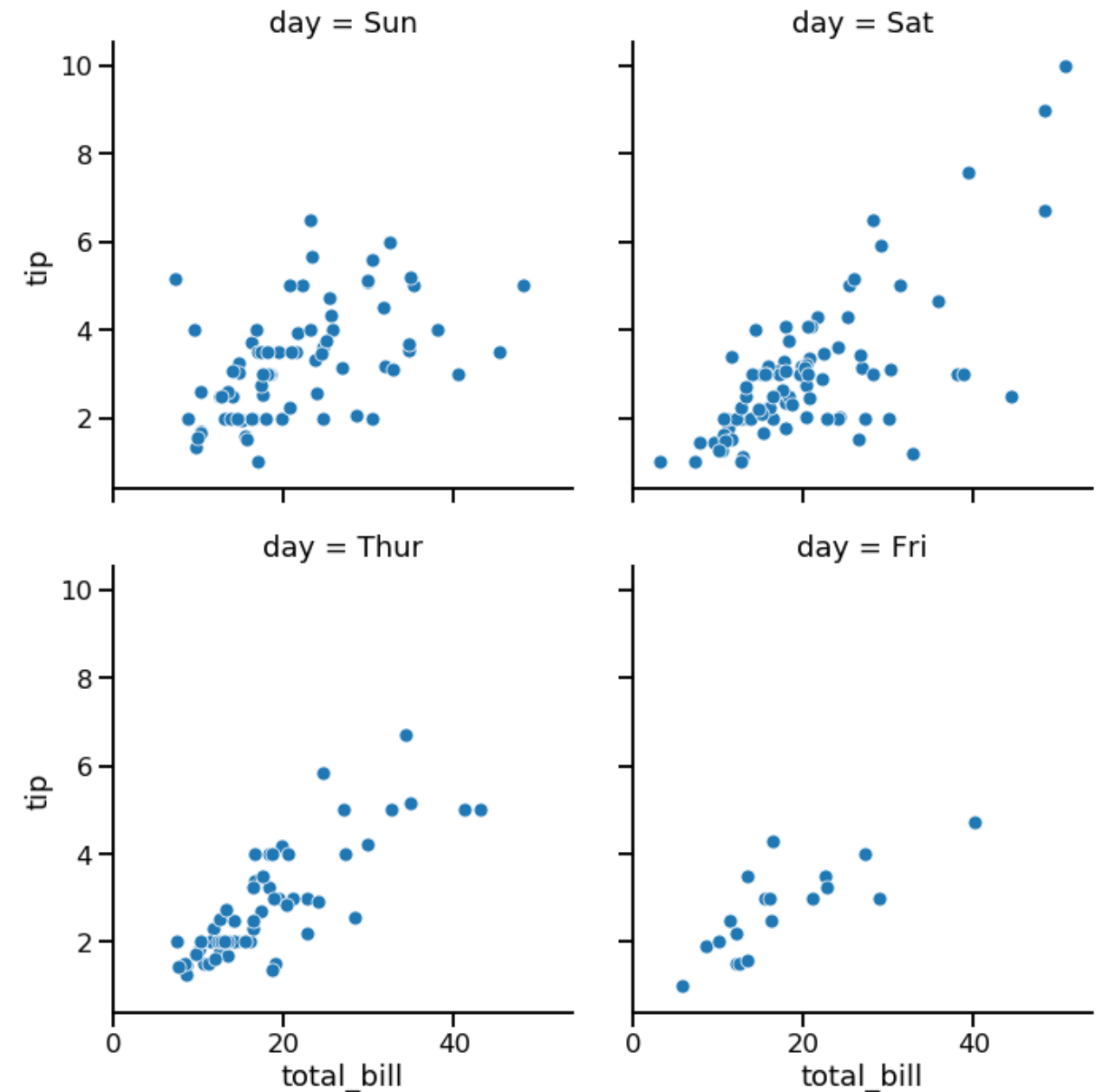


# Wrapping columns

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            col="day",
            col_wrap=2)

plt.show()
```

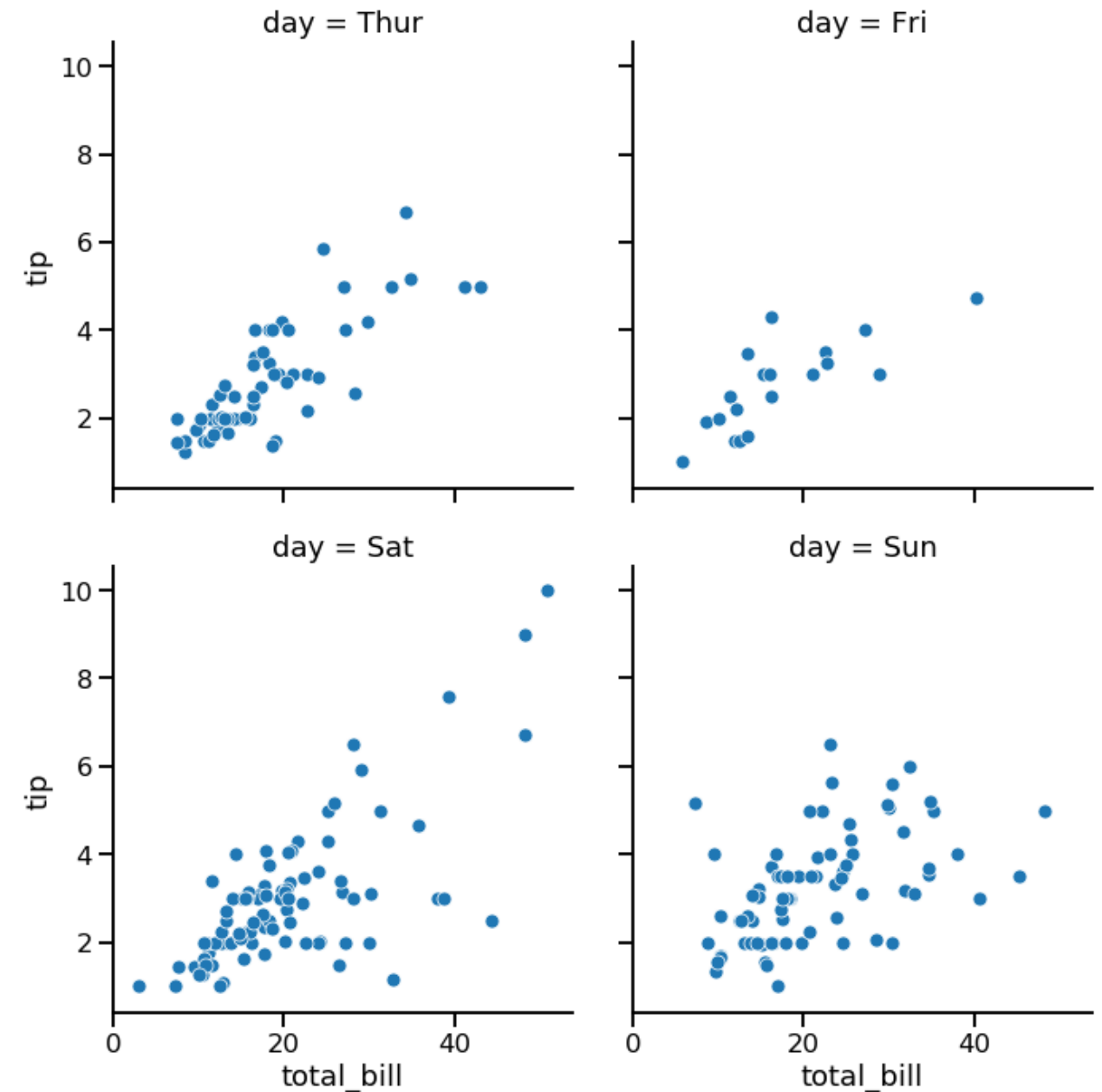


# Ordering columns

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            col="day",
            col_wrap=2,
            col_order=["Thur",
                      "Fri",
                      "Sat",
                      "Sun"])

plt.show()
```



# Let's practice!

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# Customizing scatter plots

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# Scatter plot overview

Show relationship between two quantitative variables

We've seen:

- Subplots ( `col` and `row` )
- Subgroups with color ( `hue` )

New Customizations:

- Subgroups with point size and style
- Changing point transparency

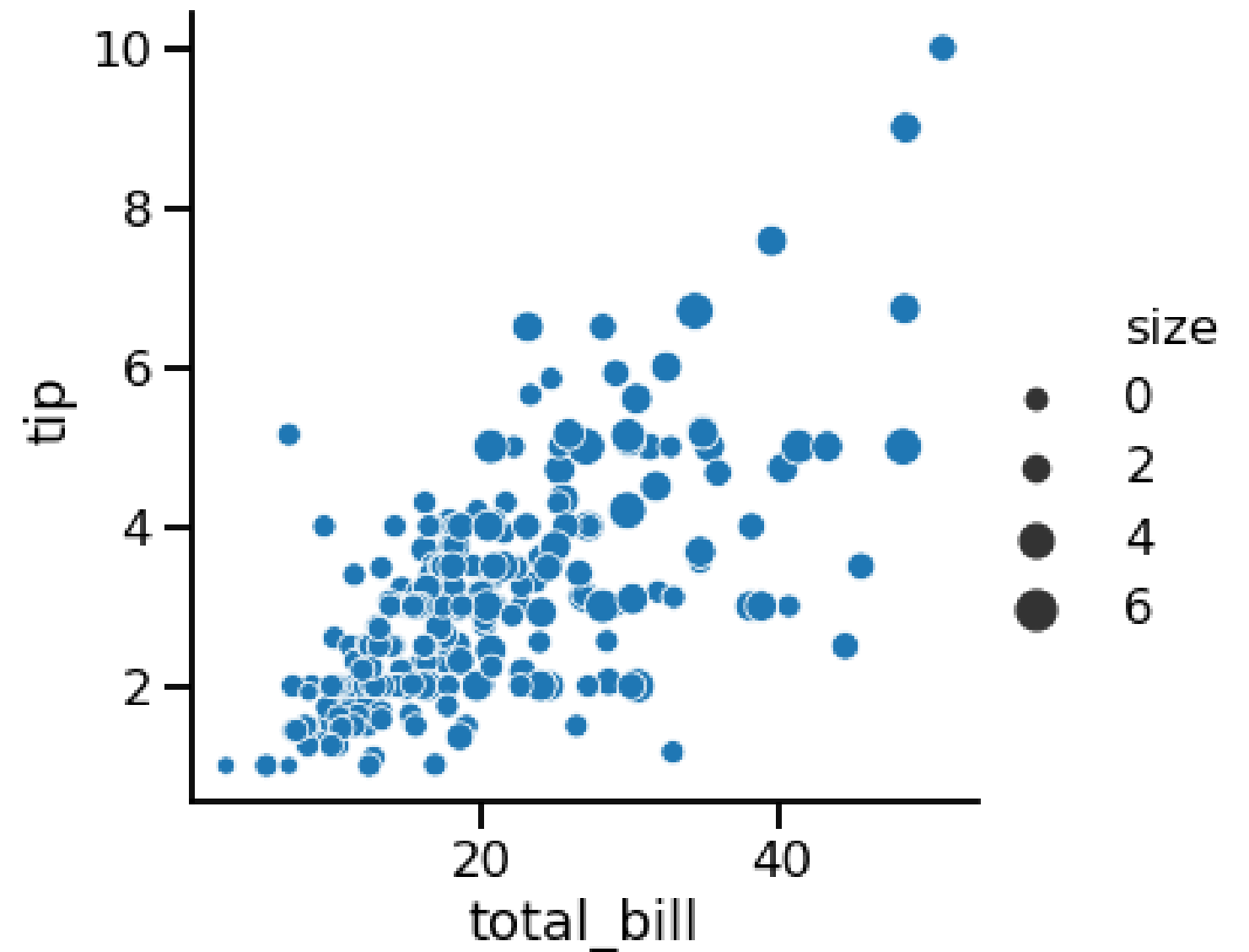
Use with both `scatterplot()` and `relplot()`

# Subgroups with point size

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            size="size")

plt.show()
```

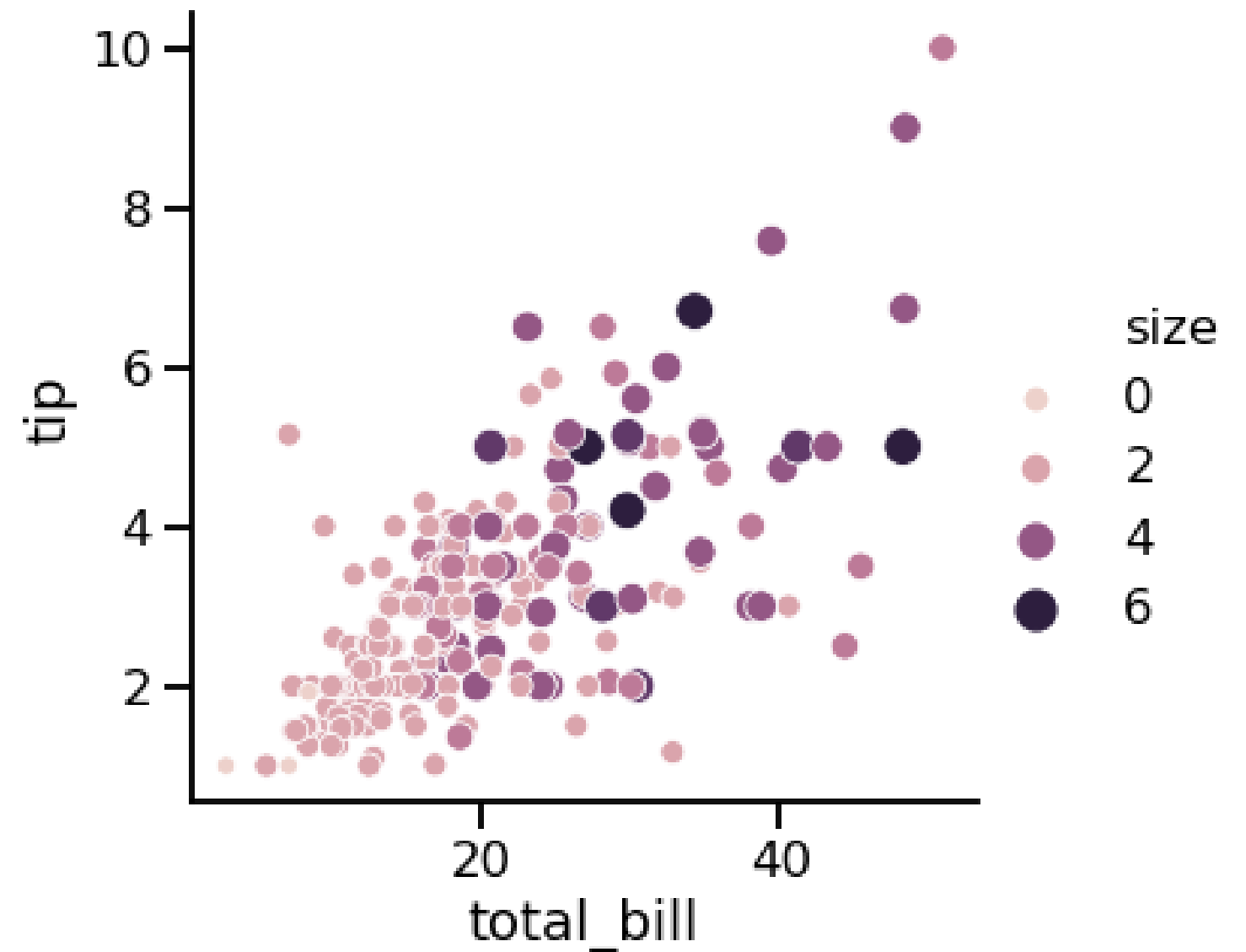


# Point size and hue

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            size="size",
            hue="size")

plt.show()
```

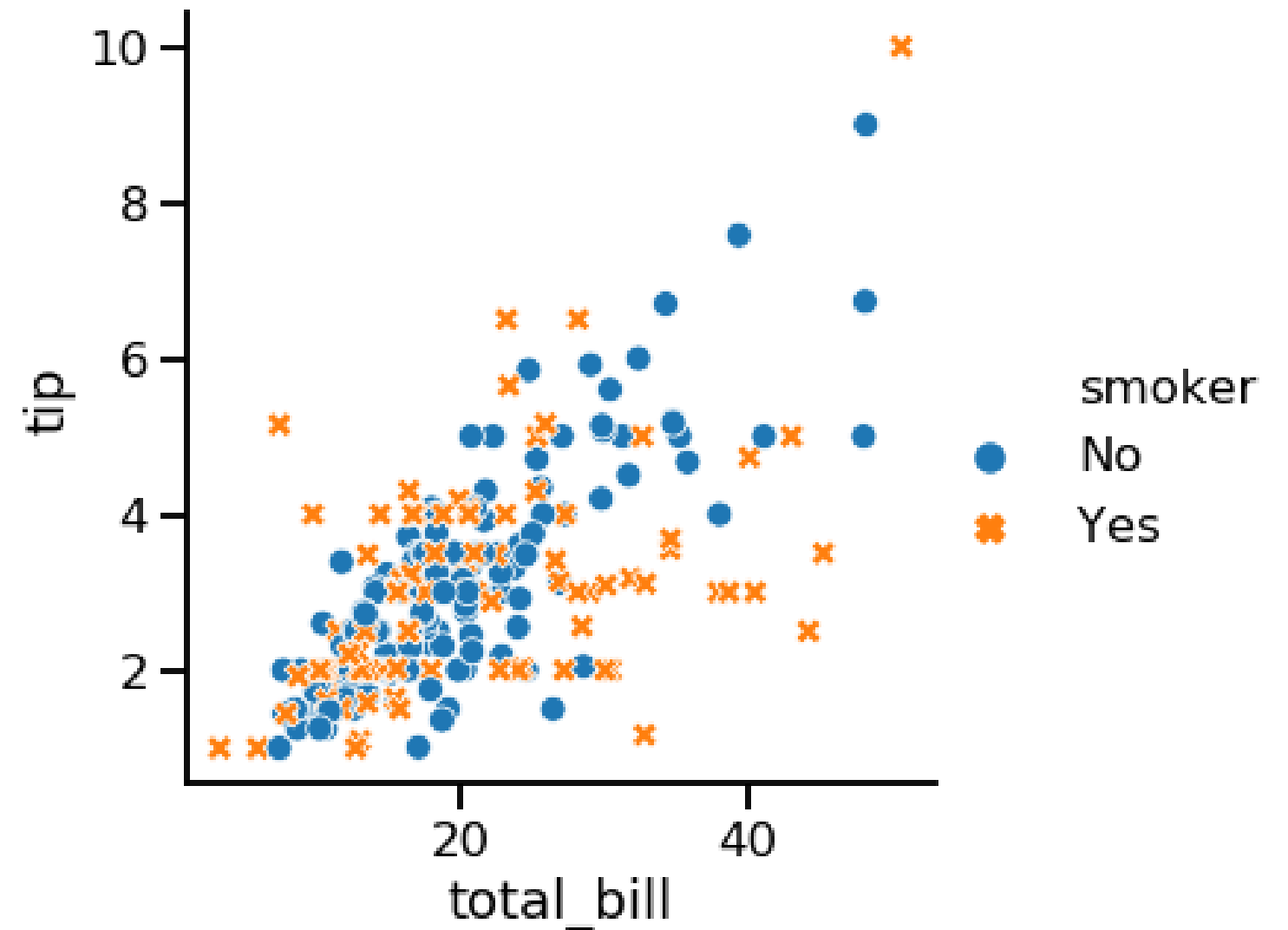


# Subgroups with point style

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            hue="smoker",
            style="smoker")

plt.show()
```

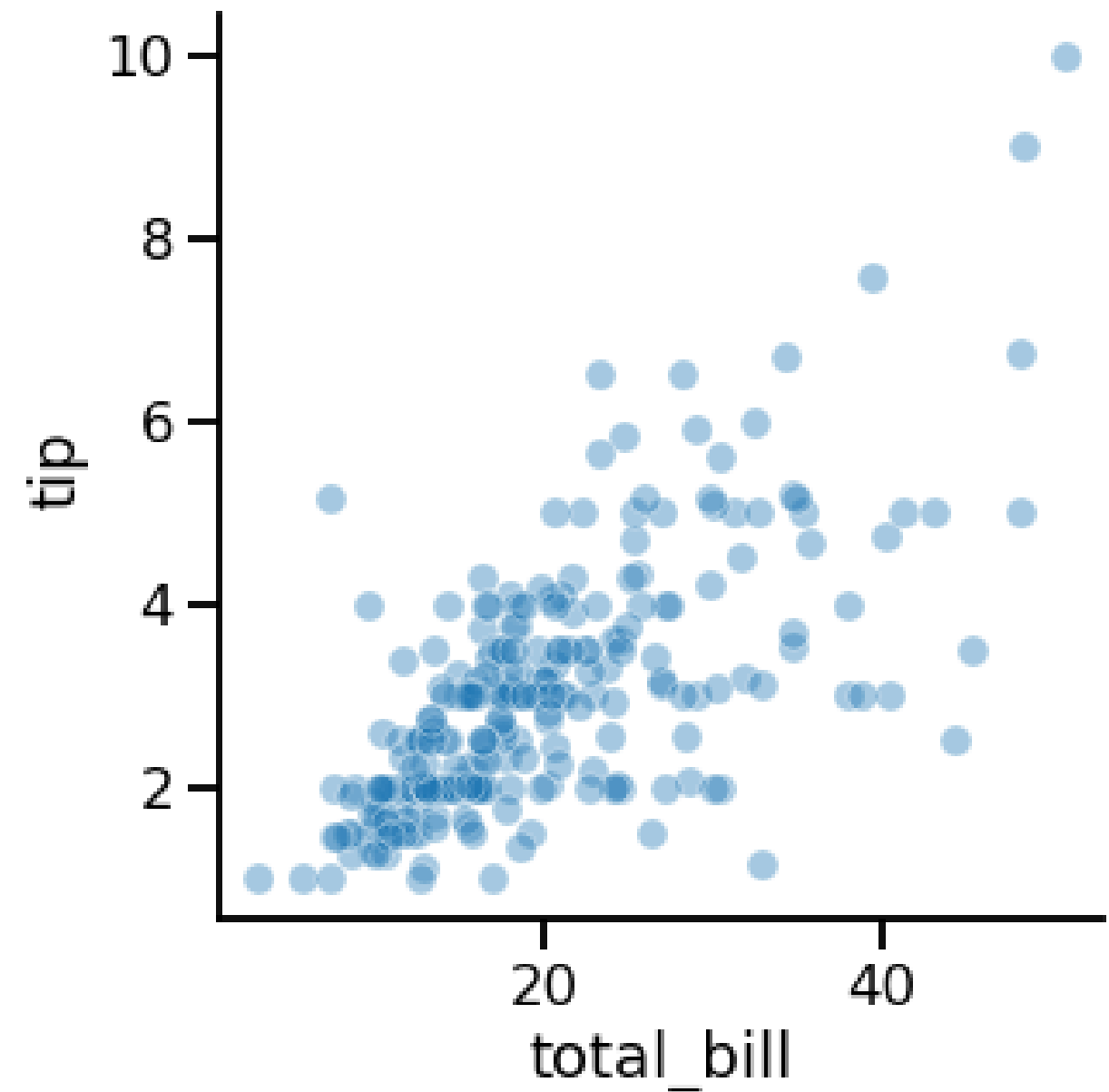


# Changing point transparency

```
import seaborn as sns
import matplotlib.pyplot as plt

# Set alpha to be between 0 and 1
sns.relplot(x="total_bill",
            y="tip",
            data=tips,
            kind="scatter",
            alpha=0.4)

plt.show()
```



# Let's practice!

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# Introduction to line plots

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# What are line plots?

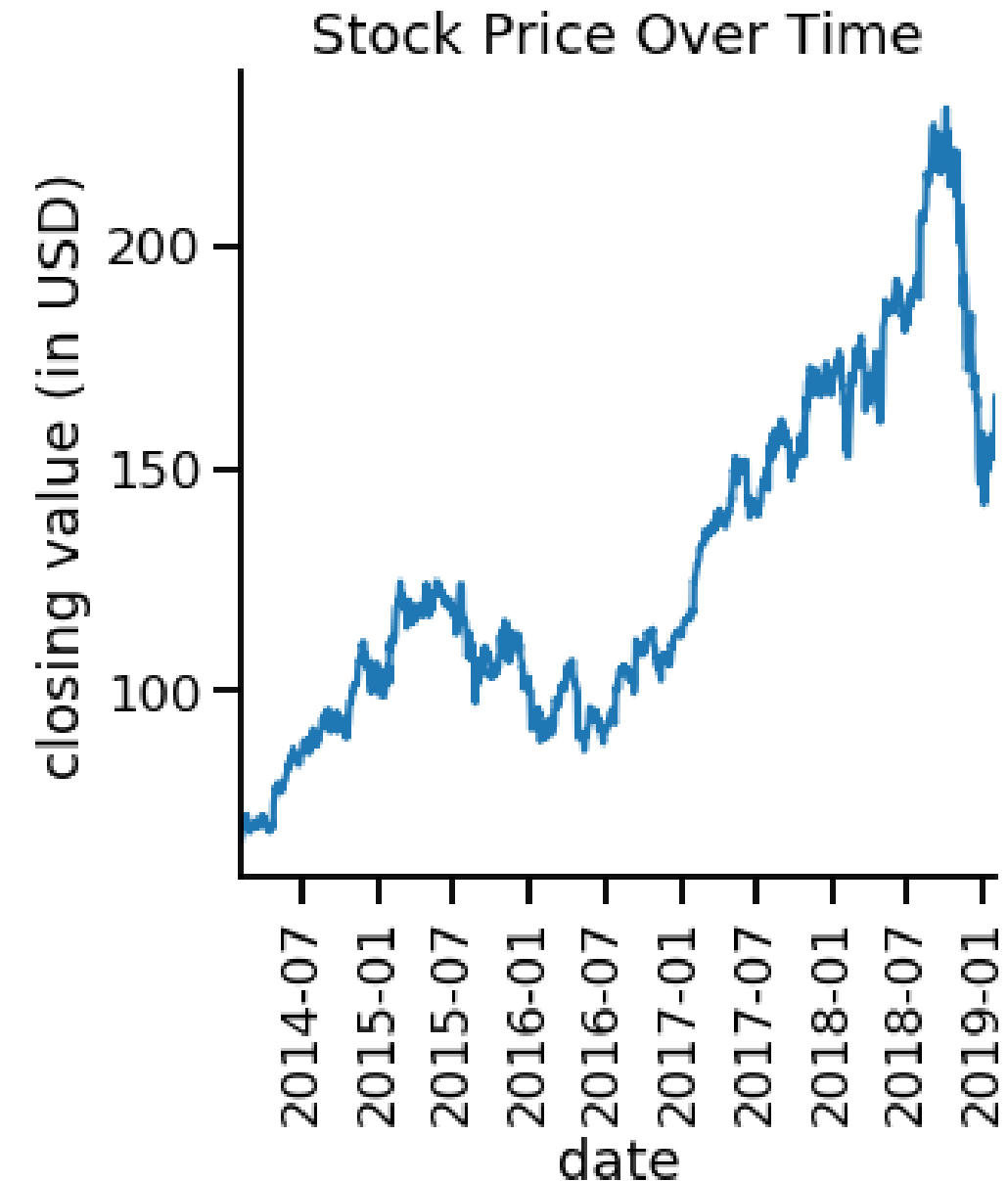
Two types of relational plots: scatter plots and line plots

## Scatter plots

- Each plot point is an independent observation

## Line plots

- Each plot point represents the same "thing", typically tracked over time





# Air pollution data

- Collection stations throughout city
- Air samples of nitrogen dioxide levels

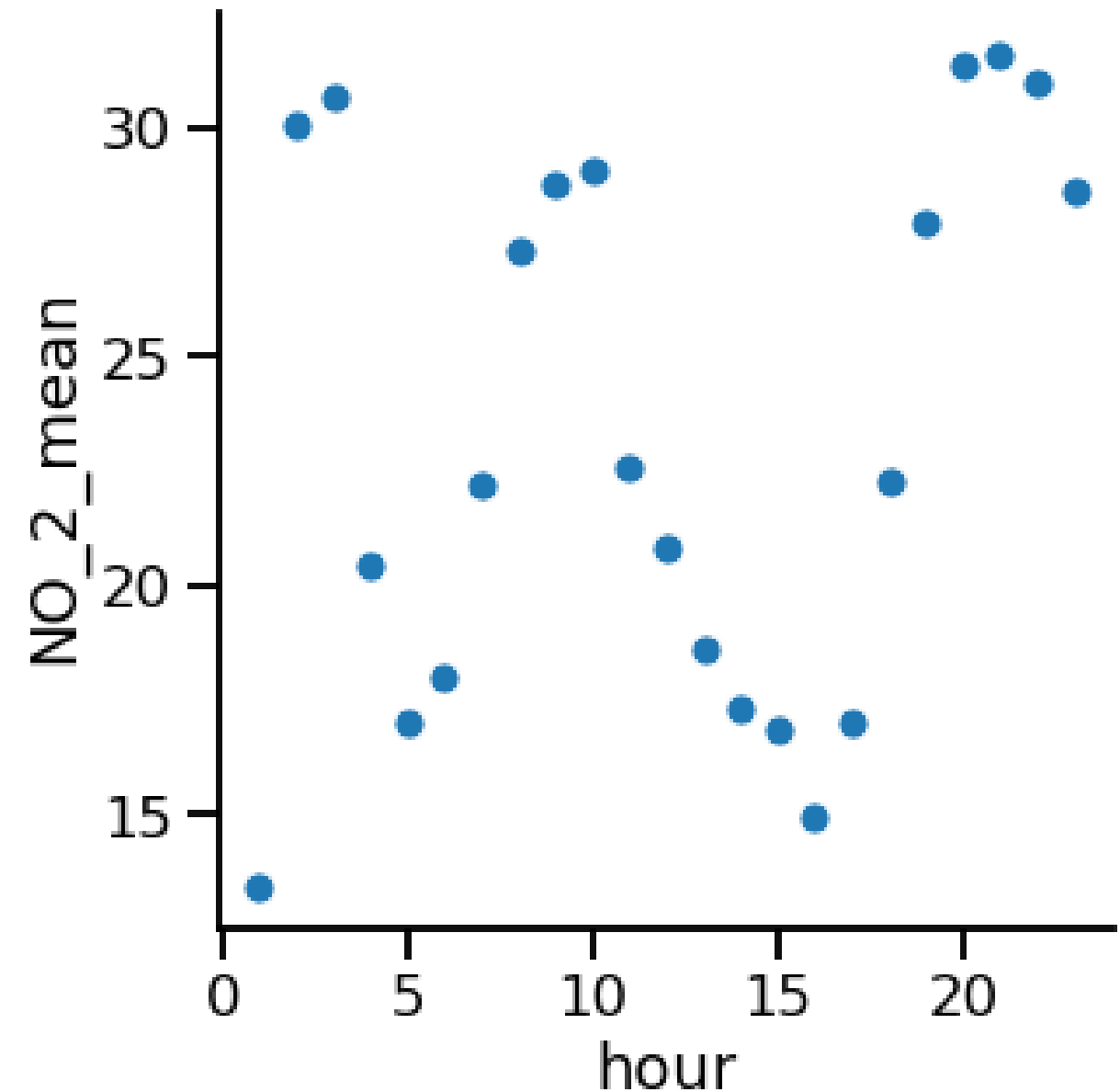
| hour |   | NO_2_mean |
|------|---|-----------|
| 0    | 1 | 13.375000 |
| 1    | 2 | 30.041667 |
| 2    | 3 | 30.666667 |
| 3    | 4 | 20.416667 |
| 4    | 5 | 16.958333 |

# Scatter plot

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2_mean",
            data=air_df_mean,
            kind="scatter")

plt.show()
```

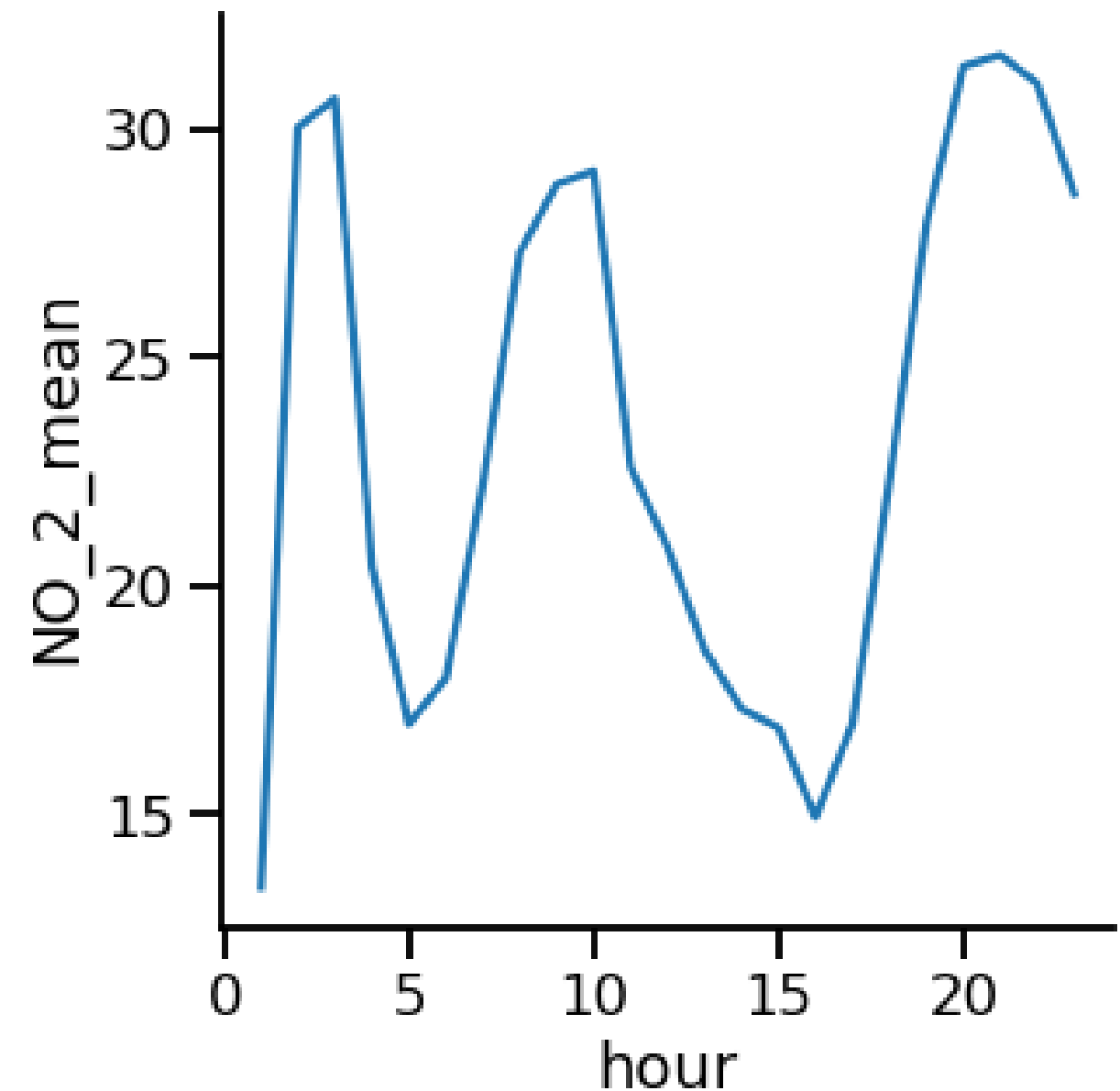


# Line plot

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2_mean",
            data=air_df_mean,
            kind="line")

plt.show()
```



# Subgroups by location

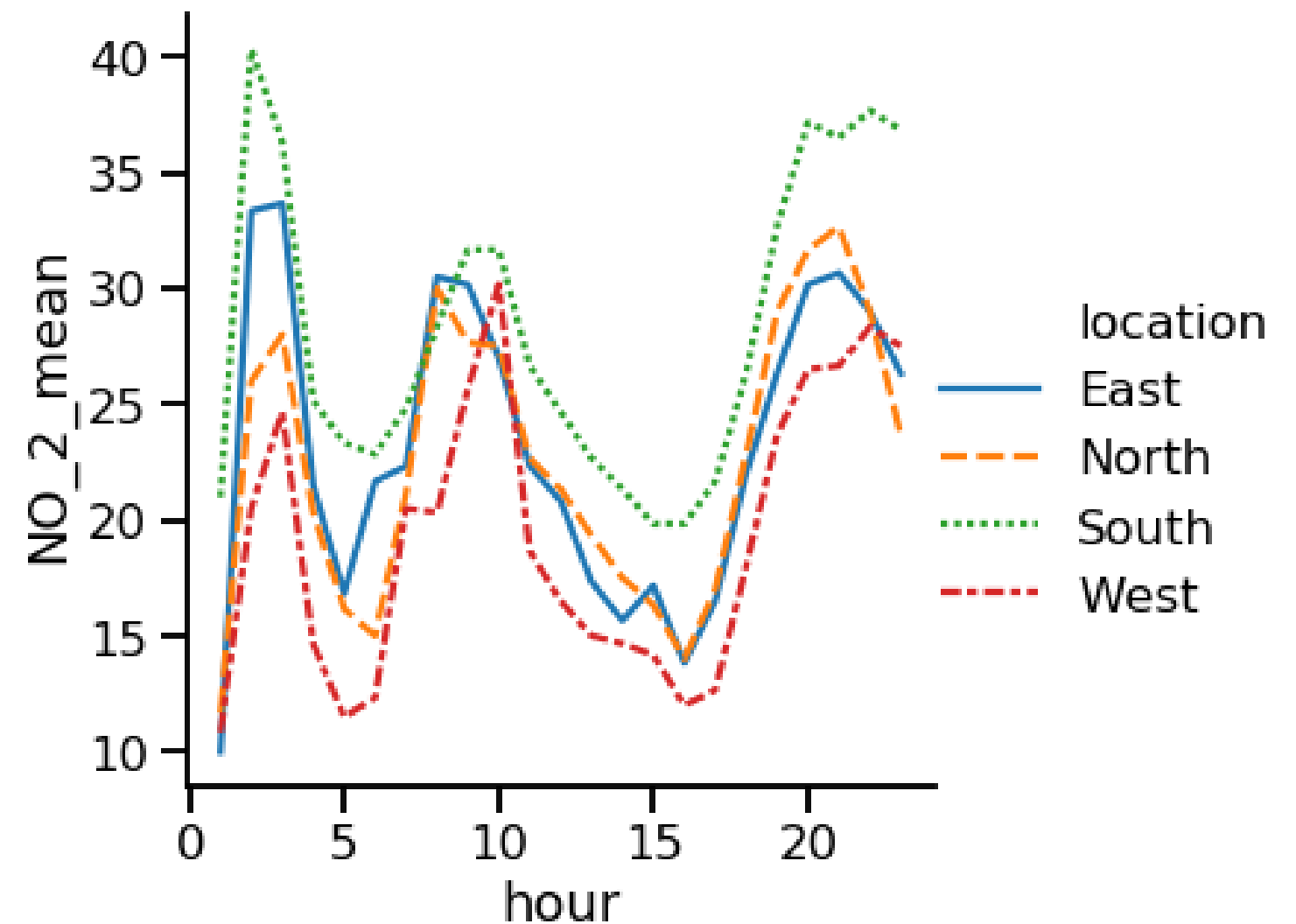
|   | hour | location | NO_2_mean |
|---|------|----------|-----------|
| 0 | 1    | East     | 10.000000 |
| 1 | 1    | North    | 11.666667 |
| 2 | 1    | South    | 21.000000 |
| 3 | 1    | West     | 10.833333 |
| 4 | 2    | East     | 33.333333 |

# Subgroups by location

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2_mean",
            data=air_df_loc_mean,
            kind="line",
            style="location",
            hue="location")

plt.show()
```

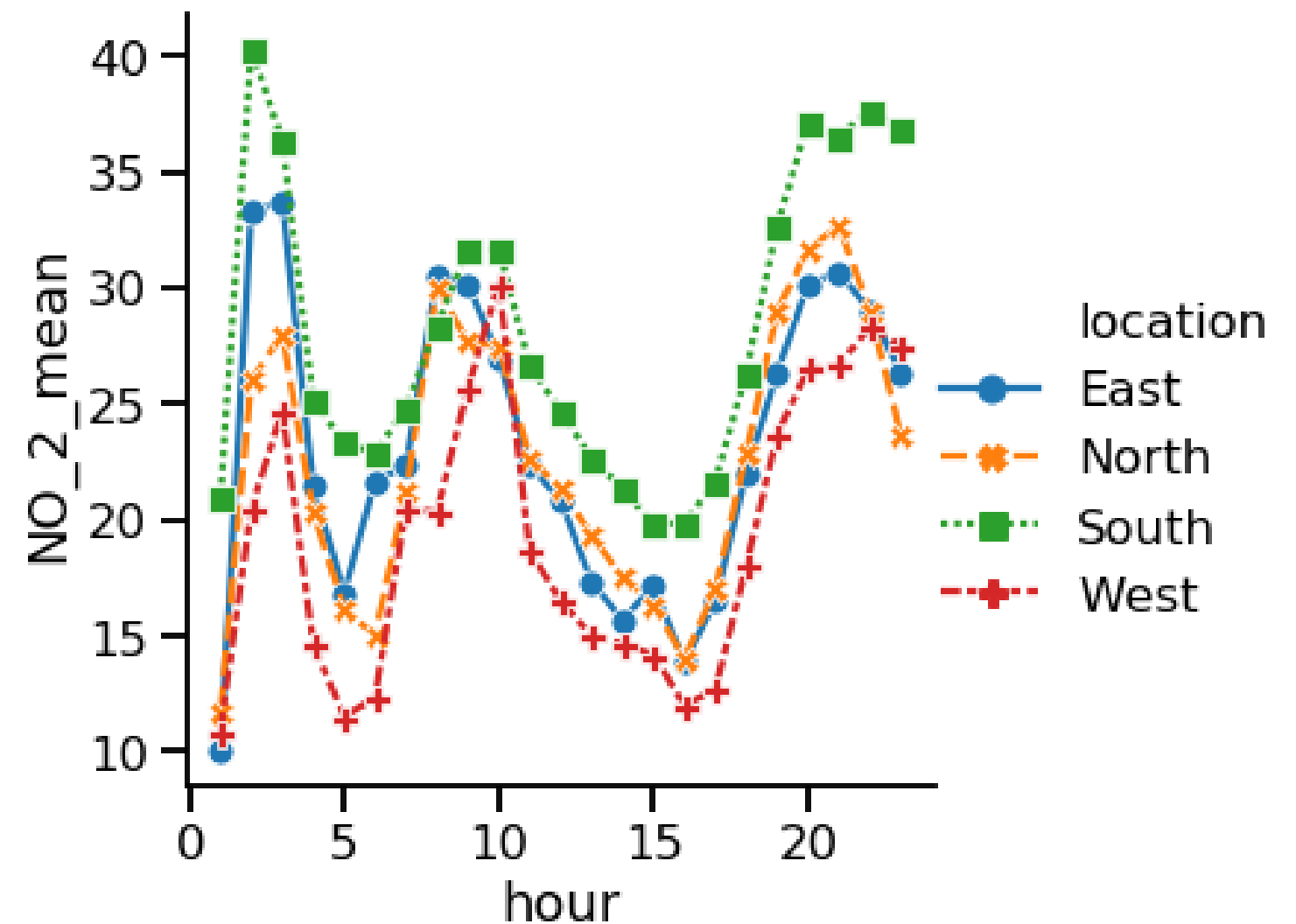


# Adding markers

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2_mean",
            data=air_df_loc_mean,
            kind="line",
            style="location",
            hue="location",
            markers=True)

plt.show()
```

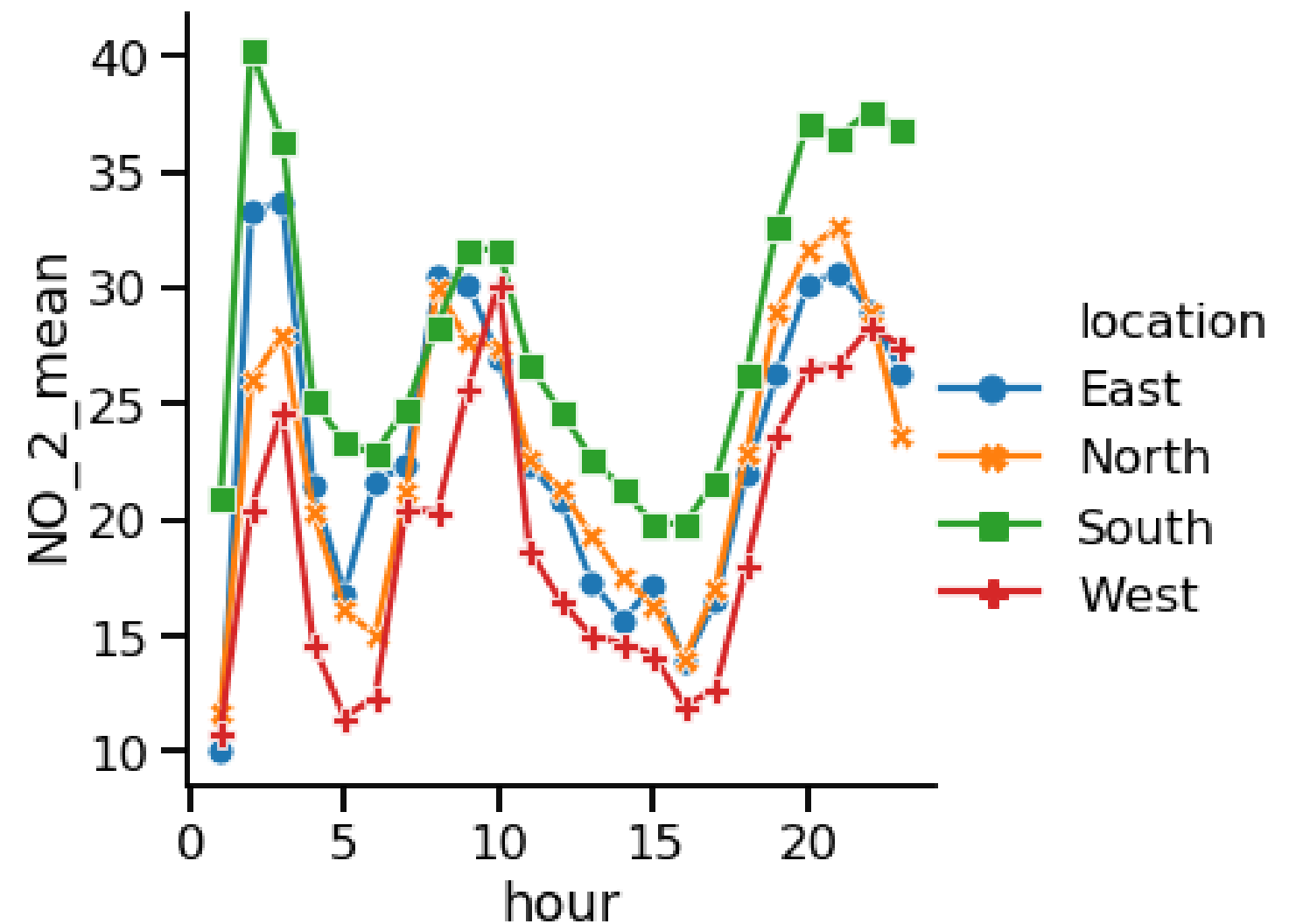


# Turning off line style

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2_mean",
            data=air_df_loc_mean,
            kind="line",
            style="location",
            hue="location",
            markers=True,
            dashes=False)

plt.show()
```



# Multiple observations per x-value

|   | hour | NO_2 | station  | location |
|---|------|------|----------|----------|
| 0 | 1    | 15.0 | 28079004 | South    |
| 1 | 1    | 33.0 | 28079008 | South    |
| 2 | 1    | 11.0 | 28079011 | South    |
| 3 | 1    | 12.0 | 28079016 | South    |
| 4 | 1    | 23.0 | 28079017 | South    |



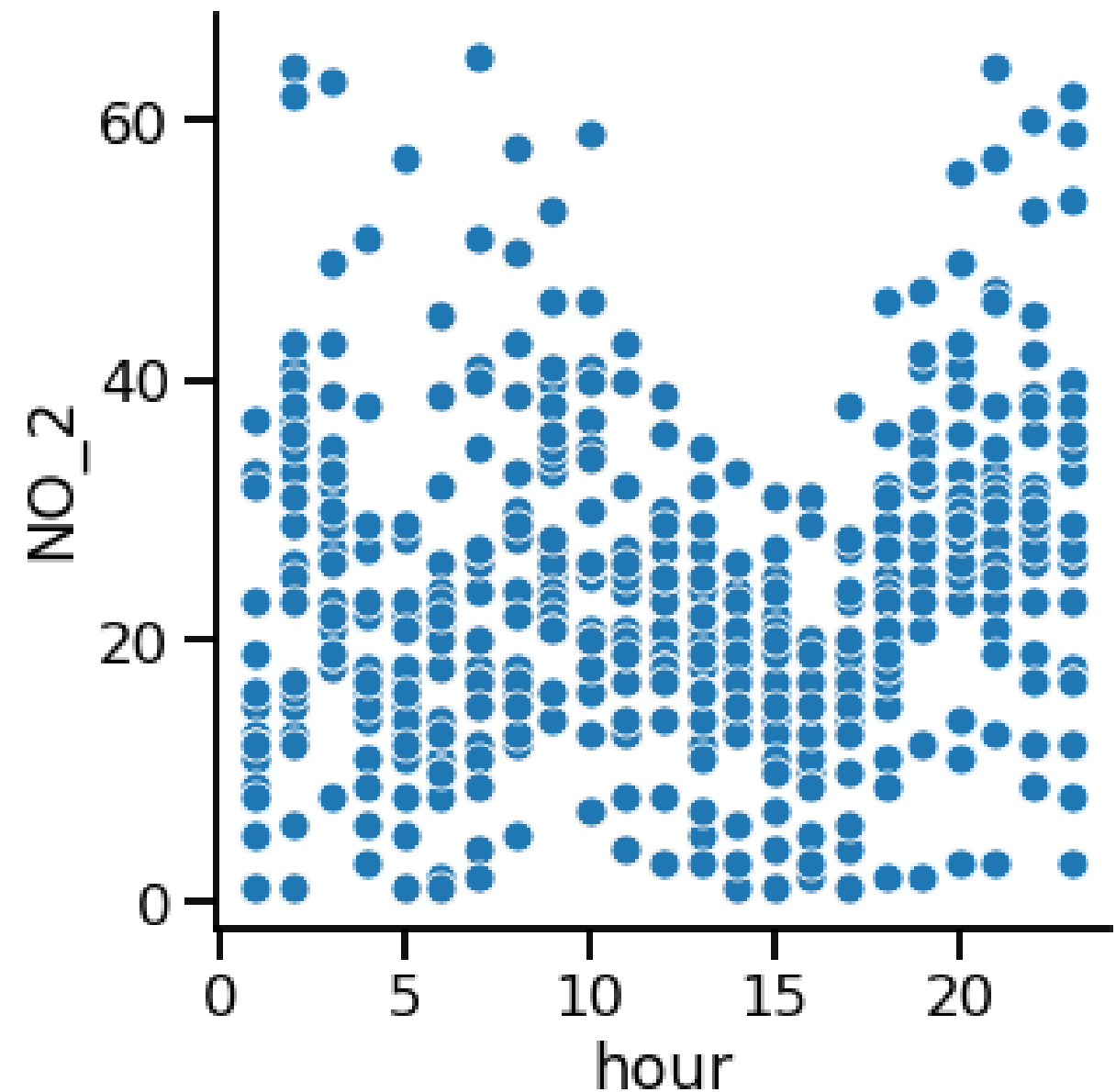
# Multiple observations per x-value

## Scatter plot

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2",
            data=air_df,
            kind="scatter")

plt.show()
```



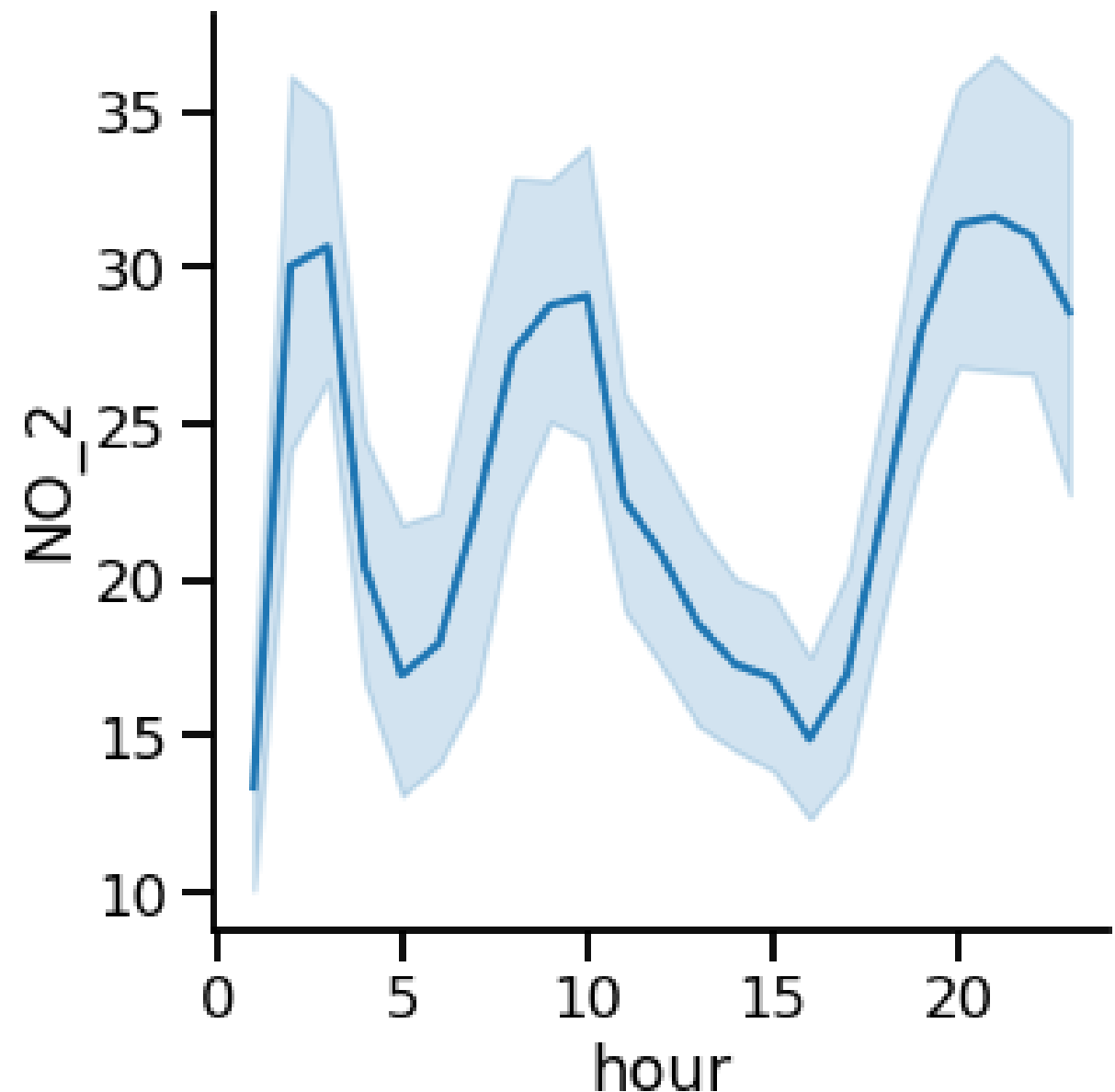
# Multiple observations per x-value

## Line plot

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2",
            data=air_df,
            kind="line")

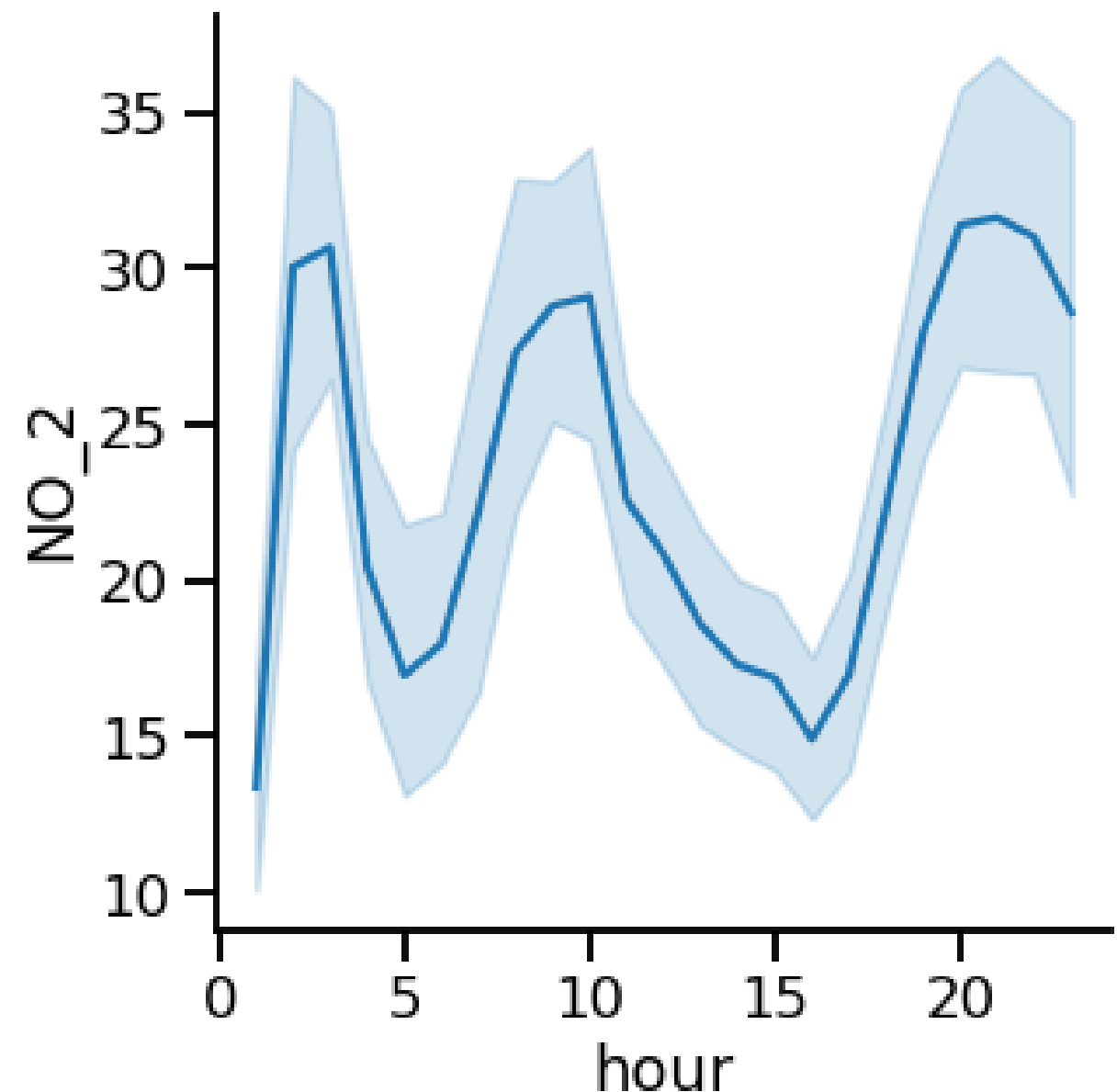
plt.show()
```



# Multiple observations per x-value

Shaded region is the confidence interval

- Assumes dataset is a random sample
- 95% confident that the mean is within this interval
- Indicates uncertainty in our estimate

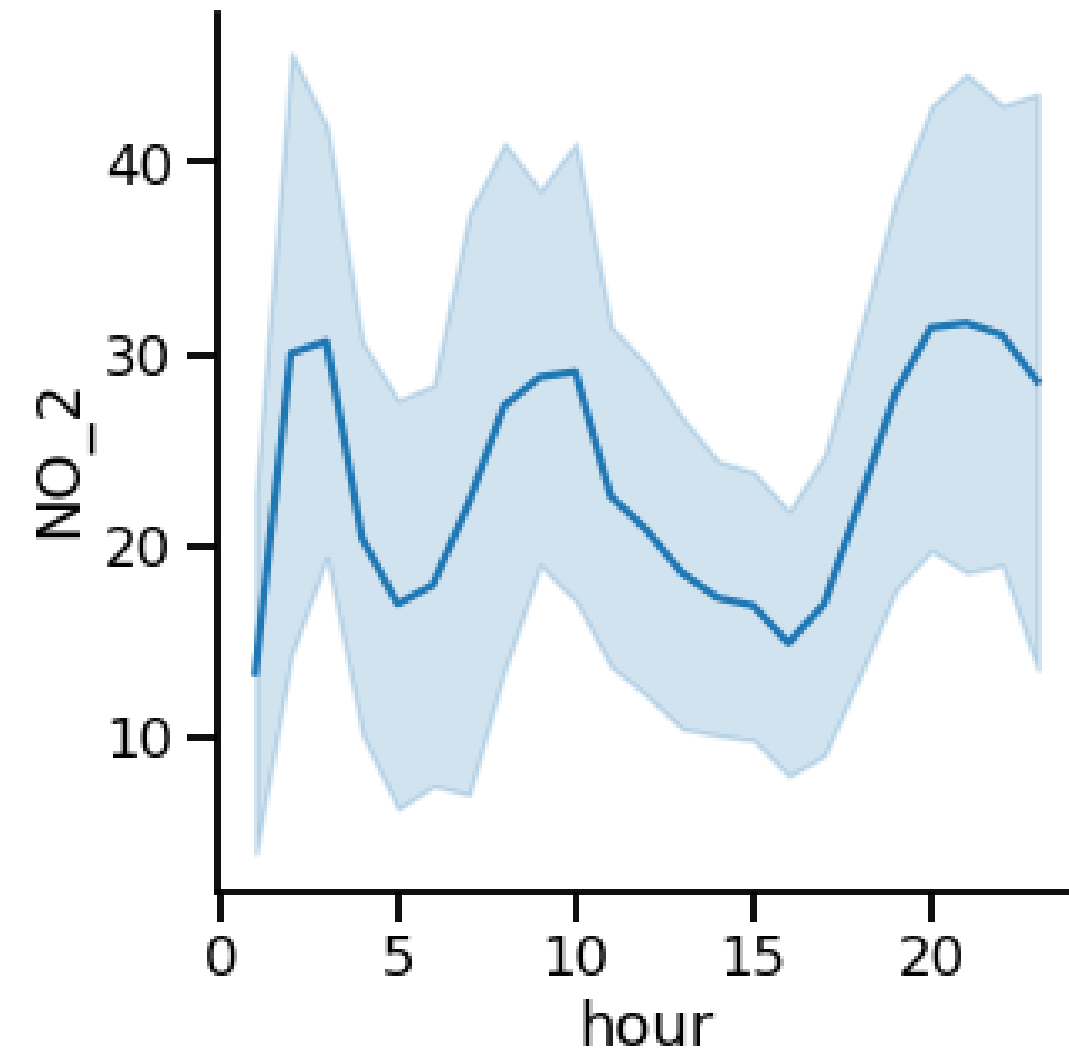


# Replacing confidence interval with standard deviation

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2",
            data=air_df,
            kind="line",
            ci="sd")

plt.show()
```

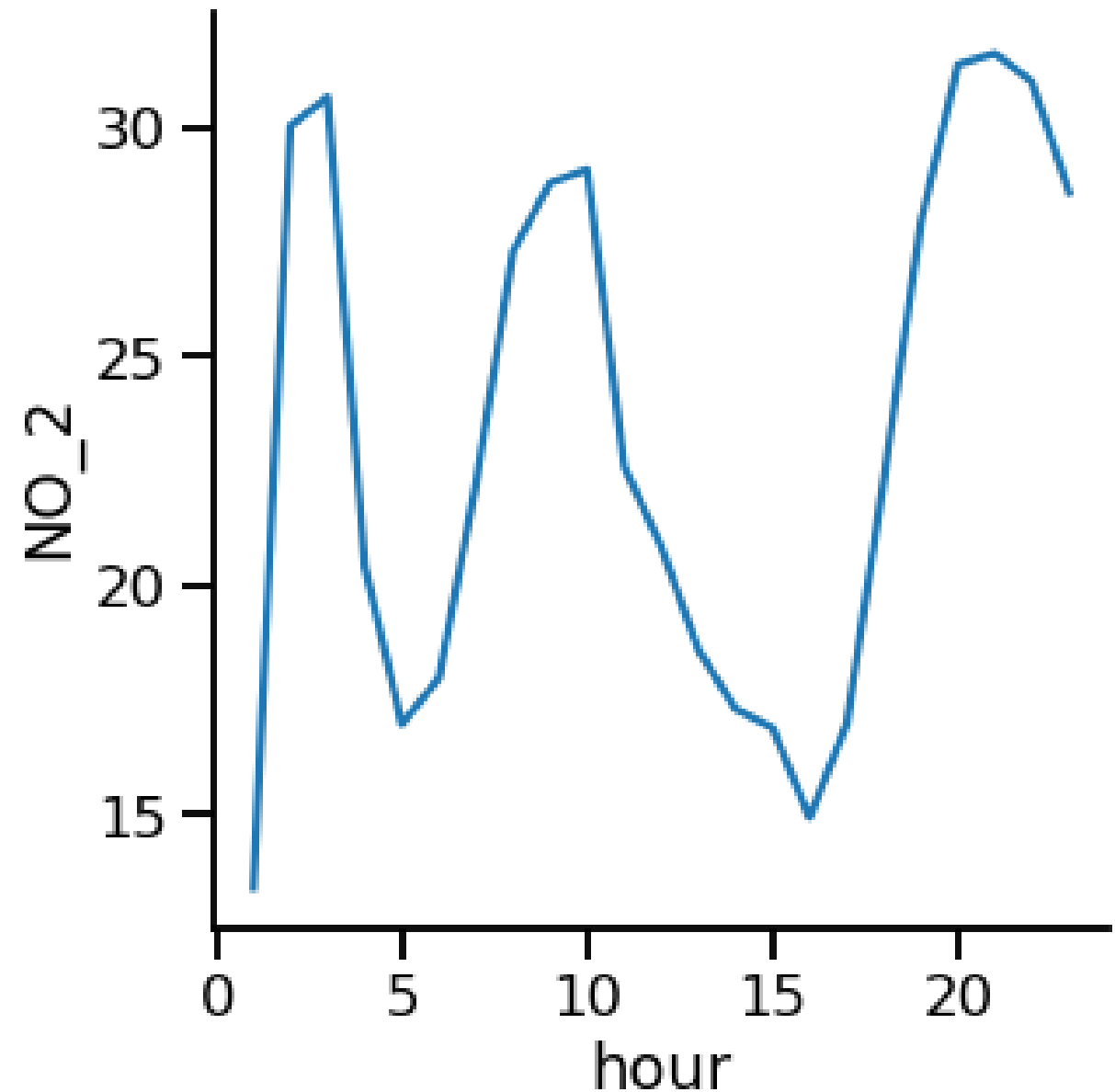


# Turning off confidence interval

```
import matplotlib.pyplot as plt
import seaborn as sns

sns.relplot(x="hour", y="NO_2",
            data=air_df,
            kind="line",
            ci=None)

plt.show()
```



# Let's practice!

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