

# Maps with ggplot2 and sf

Data Visualization for Social Good

CorrelAid Switzerland

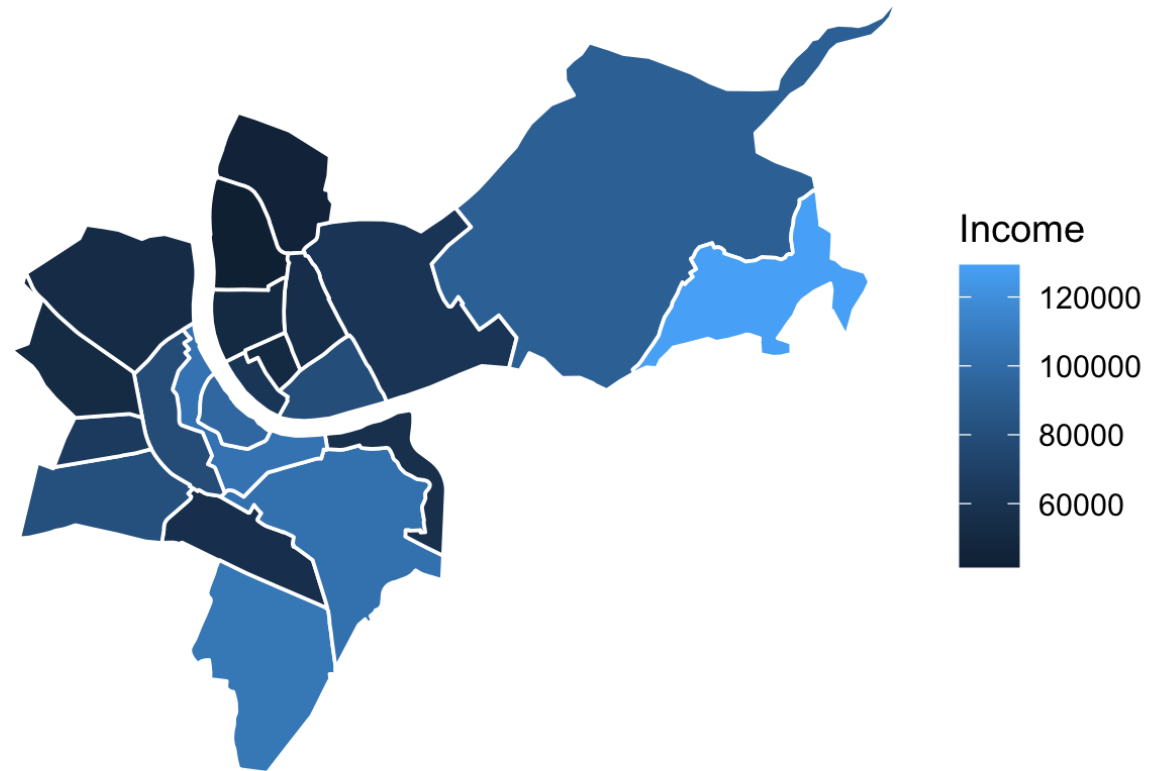


February 2021

# Maps with ggplot/sf

- 1 Maps require geometric shapes stored in **shapefiles**.
- 2 The **simple features** (sf) framework makes processing and visualizing maps with the tidyverse easy.

Inequality in Basel  
Average income in Basel's quarters in 2017



Source: Open Data Basel Stadt

# Shapefiles

- 1 Geospatial vector data format for **geographic information system** (GIS) software.
- 2 Necessary files:
  - .shp | actual shapefile
  - .shx | shape index format
  - .dbf | attribute format
- 3 Optional files:
  - .prj | projection description
  - .cpg | code page specification



quarters.cpg



quarters.dbf



quarters.prj



quarters.shp



quarters.shx

# sf

```
read_sf('1_Data/quarters')
```

Simple feature collection with 21 features and 5 fields

geometry type: POLYGON

dimension: XY

bbox: xmin: 2609000 ymin: 1263000 xmax: 2619000 ymax: 1272000

projected CRS: CH1903+ / LV95

# A tibble: 21 x 6

	OBJID	OBJECTID	TXT	ZTXT	TYPE	geometry
	<chr>	<dbl>	<chr>	<chr>	<chr>	<POLYGON [m]>
1	17136	1 7	07	Bruderholz	((2612556 1264548, 2612561 1264514, 2612565 1264482, 261...	
2	17139	2 6	06	Gundeldingen	((2610887 1266551, 2610896 1266546, 2610918 1266533, 261...	
3	17142	3 5	05	St. Alban	((2612942 1267023, 2613000 1267019, 2613027 1267020, 261...	
4	17145	4 4	04	Breite	((2613684 1266891, 2613686 1266889, 2613689 1266887, 261...	
5	17148	5 8	08	Bachletten	((2610561 1266791, 2610571 1266781, 2610595 1266757, 261...	
6	17151	6 2	02	Vorstädte	((2610928 1268323, 2610934 1268293, 2610947 1268297, 261...	
7	17154	7 1	01	Altstadt Gr...	((2611366 1267578, 2611375 1267568, 2611376 1267569, 261...	
8	17157	8 3	03	Am Ring	((2610705 1267923, 2610680 1267844, 2610647 1267740, 261...	
9	17160	9 9	09	Gotthelf	((2609245 1266802, 2609236 1266801, 2609366 1267143, 260...	
10	17163	10 10	10	Iselin	((2610234 1267656, 2610284 1267389, 2610234 1267403, 261...	

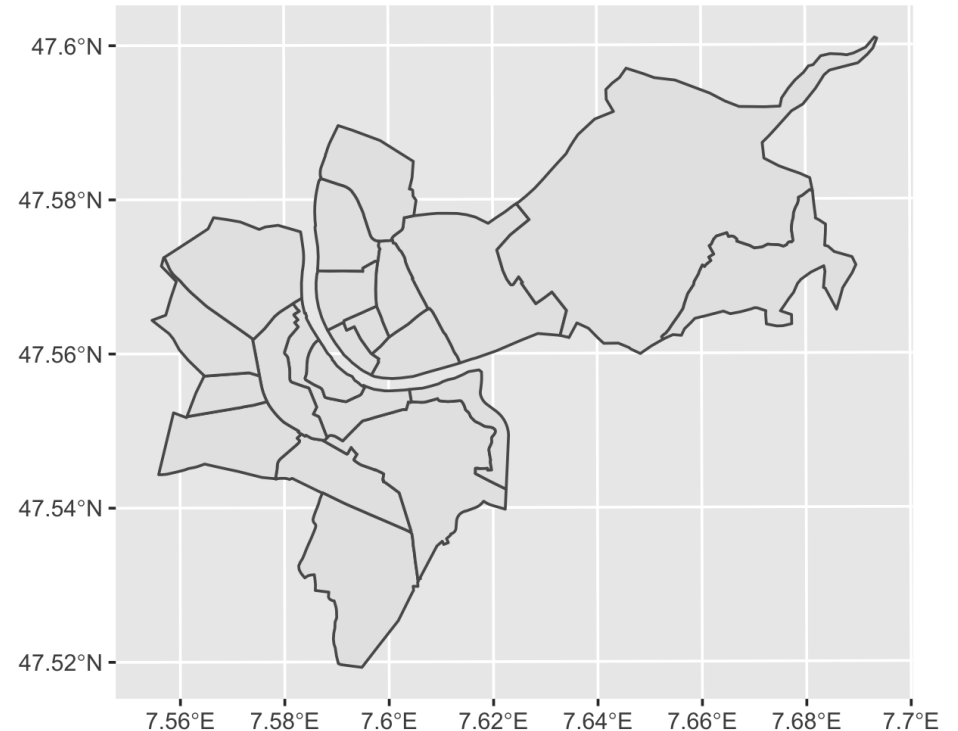
# ... with 11 more rows

# geom\_sf

- 1 Since `read_sf` creates a tibble, it can be plugged **straight into ggplot**.
- 2 The dedicated geom `geom_sf` plots the geometric polygons.

```
# read shapefiles
quarters_map <- read_sf('1_Data/quarters')

# plot quarters
quarters_map %>%
  ggplot() +
  geom_sf()
```



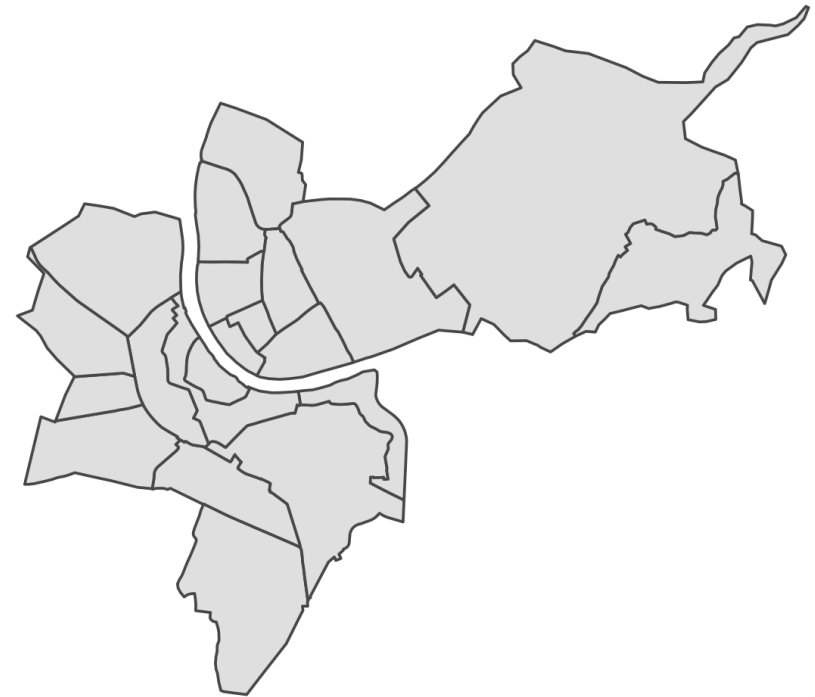
# geom\_sf

- 1 Since `read_sf` creates a tibble, it can be plugged **straight into ggplot**.
- 2 The dedicated geom `geom_sf` plots the geometric polygons.

```
# read shapefiles
quarters_map <- read_sf('1_Data/quarters')

# plot quarters
quarters_map %>%
  ggplot() +
  geom_sf() +

# remove background
theme_void()
```

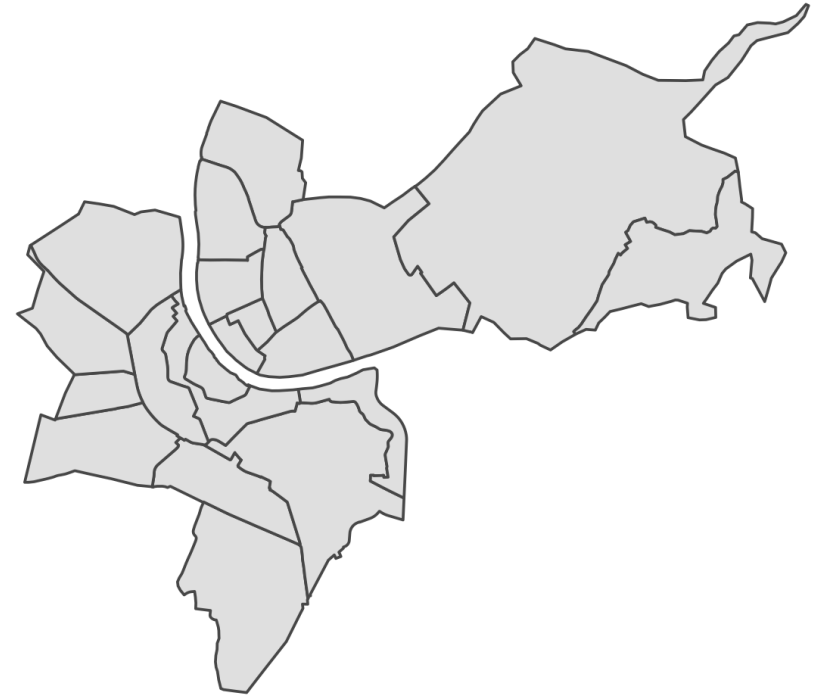


# Wrangling

- 1 Since `read_sf` creates a tibble, one can easily **join additional data**.

```
# join basel tax data
quarters_map <- quarters_map %>%
  left_join(filter(basel, year == 2017),
            by = c("TYPE" = "quarter"))

# plot quarters
quarters_map %>%
  ggplot() +
  geom_sf() +
  theme_void()
```



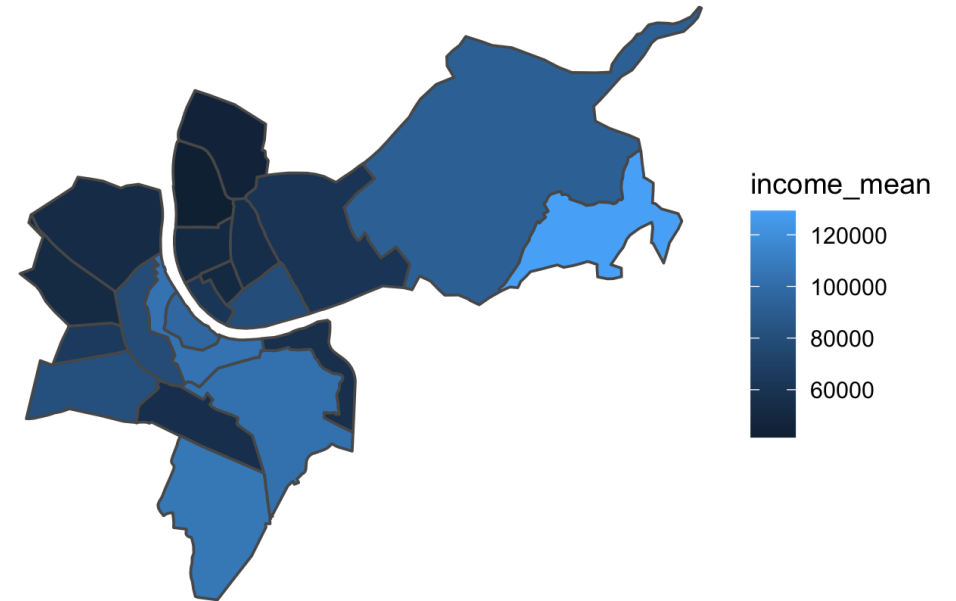
# Add color

- 1 Colors are set using `aes()` just like in a regular `ggplot`.

```
# join basel tax data
quarters_map <- quarters_map %>%
  left_join(filter(basel, year == 2017),
            by = c("TYPE" = "quarter"))

# plot quarters
quarters_map %>%
  ggplot() +

  # fill color by income
  geom_sf(aes(fill = income_mean)) +
  theme_void()
```





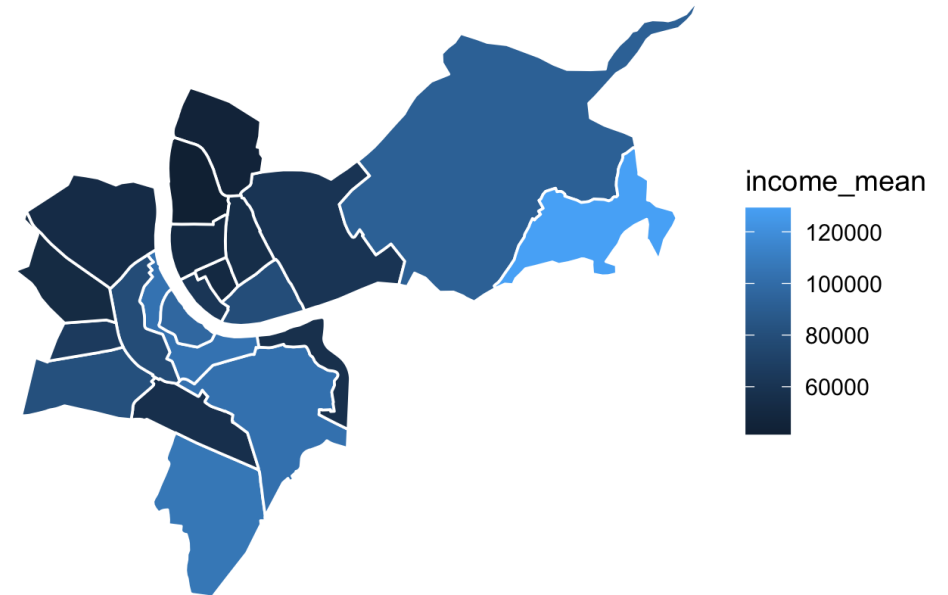
# Styling

- 1 Styling can be adjusted just like in any other ggplot.

```
# join basel tax data
quarters_map <- quarters_map %>%
  left_join(filter(basel, year == 2017),
            by = c("TYPE" = "quarter"))

# plot quarters
quarters_map %>%
  ggplot() +

  # add white outlines
  geom_sf(aes(fill = income_mean),
          col = "white") +
  theme_void()
```



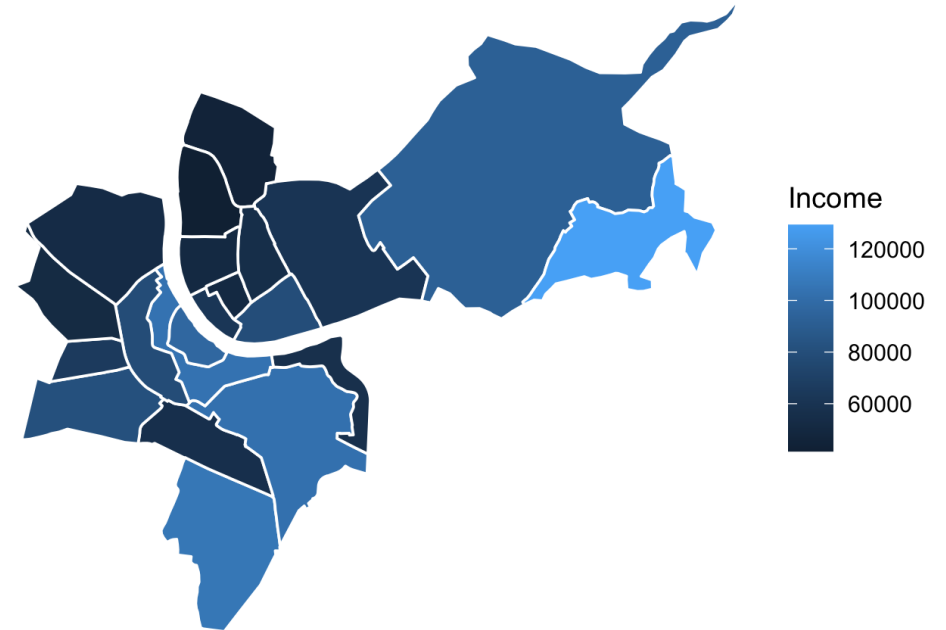
# Styling

- 1 Styling can be adjusted just like in any other ggplot.

```
# join basel tax data
quarters_map <- quarters_map %>%
  left_join(filter(basel, year == 2017),
            by = c("TYPE" = "quarter"))

# plot quarters
quarters_map %>%
  ggplot() +
  geom_sf(aes(fill = income_mean),
          col = "white") +
  theme_void() +

# change legend title
scale_fill_continuous(name = 'Income')
```



# Styling

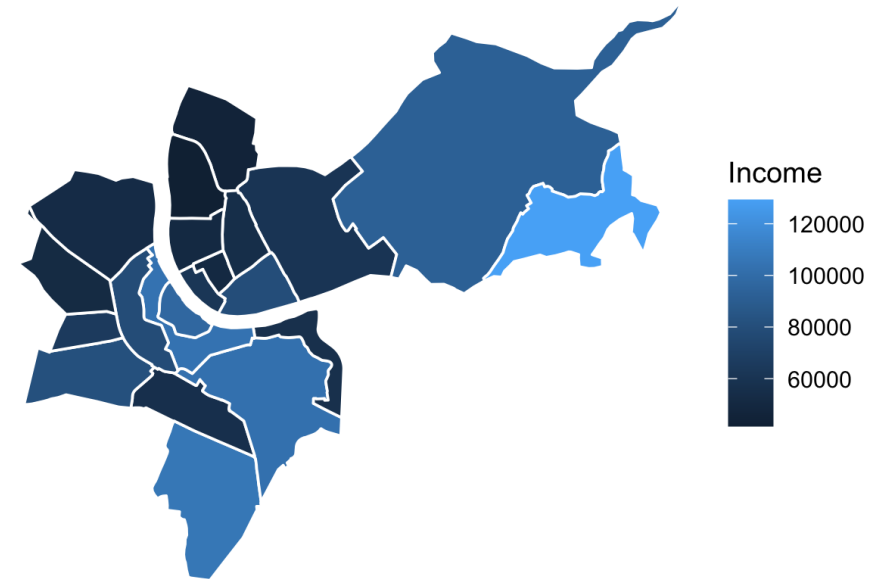
- 1 Styling can be adjusted just like in any other ggplot.

```
# join basel tax data
quarters_map <- quarters_map %>%
  left_join(filter(basel, year == 2017),
            by = c("TYPE" = "quarter"))

# plot quarters
quarters_map %>%
  ggplot() +
  geom_sf(aes(fill = income_mean),
          col = "white") +
  theme_void() +
  scale_fill_continuous(name = 'Income') +

# add annotation
labs(title = "Inequality in Basel",
     subtitle = "Average income in Basel...",
     caption = "Source: Open Data Basel...")
```

Inequality in Basel  
Average income in Basel's quarters in 2017



Source: Open Data Basel Stadt

# Schedule