Data transformation with dplyr

Research Beyond the Lab: Open Science and Research Methods for a Global Engineer

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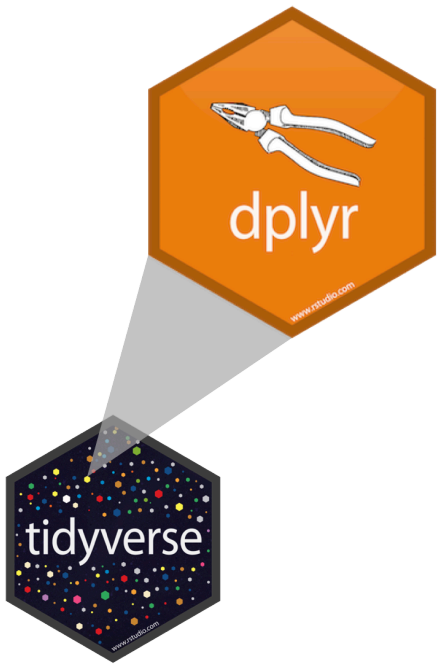
Learning Objectives (for this week)

1. Learners can apply ten functions from the dplyr R Package to generate a subset of data for use in a table or plot.

Data wrangling with dplyr

A grammar of data wrangling...

... based on the concepts of functions as verbs that manipulate data frames



- `select`: pick columns by name
- `arrange`: reorder rows
- `filter`: pick rows matching criteria
- `relocate`: changes the order of the columns
- `mutate`: add new variables
- `summarise`: reduce variables to values
- `group_by`: for grouped operations
- ... (many more)

dplyr rules

Rules of `dplyr` functions:

- First argument is always a data frame
- Subsequent arguments say what to do with that data frame
- Always return a data frame
- Don’t modify in place

Functions & Arguments

```
1 library(dplyr)
2
3 filter(.data = gapminder,
4        year == 2007)
```

- Function: `filter()`
- Argument: `.data =`
- Arguments following: `year == 2007` What to do with the data

Objects

```
1 library(dplyr)
2
3 gapminder_2007 <- filter(.data = gapminder,
4                          year == 2007)
```

- Function: `filter()`
- Argument: `.data =`
- Arguments following: `year == 2007` What to do with the data
- Data (Object): `gapminder_2007`

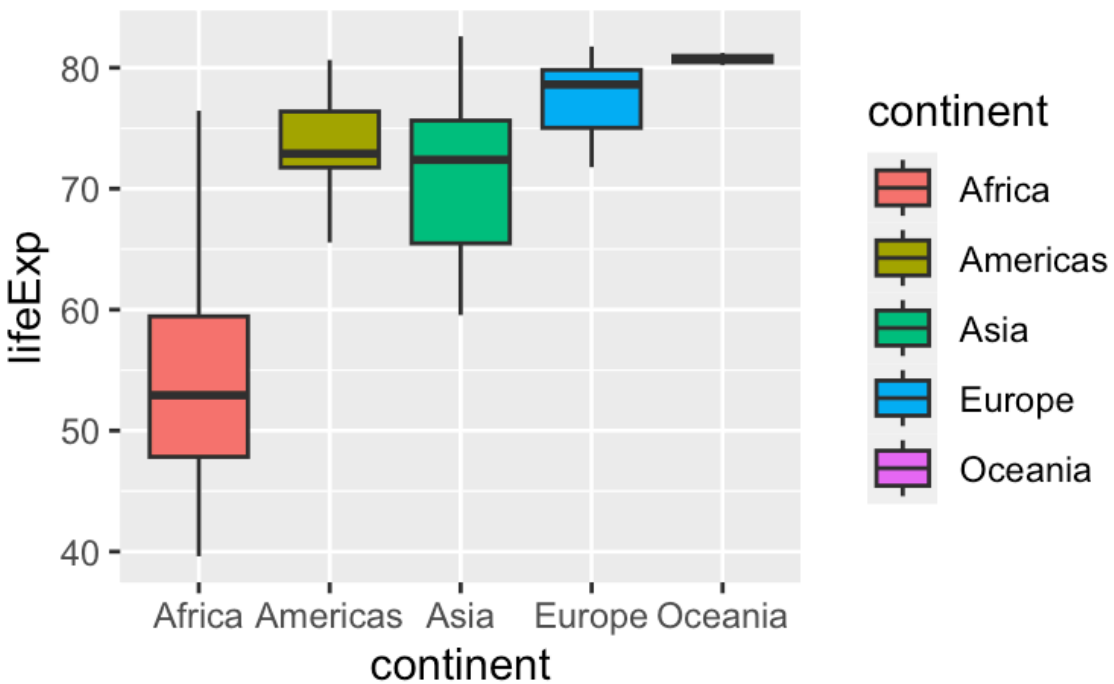
Operators

```
1 library(dplyr)
2
3 gapminder_2007 <- gapminder |>
4   filter(year == 2007)
```

- Function: `filter()`
- Argument: `.data =`
- Arguments following: `year == 2007` What to do with the data
- Data (Object): `gapminder_2007`
- Assignment operator: `<-`
- Pipe operator: `|>`

Plot

```
1  library(dplyr)
2
3  gapminder_2007 <- gapminder |>
4    filter(year == 2007)
5
6  ggplot(data = gapminder_2007,
7         mapping = aes(x = continent,
8                       y = lifeExp,
9                       fill = continent)) +
10   geom_boxplot(outlier.shape = NA)
```



Our turn: SDG 6.2.1

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Data

```
1 head(sanitation)
```

name	iso3	year	region_sdg	varname_short	varname_long	residence	percent
Afghanistan	AFG	2000	Central and Southern Asia	san_bas	basic sanitation services	national	21.9
Afghanistan	AFG	2000	Central and Southern Asia	san_bas	basic sanitation services	rural	19.3
Afghanistan	AFG	2000	Central and Southern Asia	san_bas	basic sanitation services	urban	30.9
Afghanistan	AFG	2000	Central and Southern Asia	san_lim	limited sanitation services	national	5.6
Afghanistan	AFG	2000	Central and Southern Asia	san_lim	limited sanitation services	rural	3.1
Afghanistan	AFG	2000	Central and Southern Asia	san_lim	limited sanitation services	urban	14.5

```
1 ncol(sanitation)
```

```
[1] 8
```

```
1 nrow(sanitation)
```

```
[1] 73710
```

Data

```
1 sanitation |>
2   count(varname_short, varname_long)
```

varname_short	varname_long	n
san_bas	basic sanitation services	14742
san_lim	limited sanitation services	14742
san_od	no sanitation facilities	14742
san_sm	safely managed sanitation services	14742
san_unimp	unimproved sanitation facilities	14742

Our turn: md-03-exercises

1. Open posit.cloud in your browser.
2. Open the `rbtl-fs24 workspace` for the course.
3. Click `Start` next to `md-03-exercises`.
4. In the File Manager in the bottom right window, locate the `md-03a-data-transformation.qmd` file and click on it to open it in the top left window.

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15:00

Take a break

Please get up and move! Let your emails rest in peace.

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10:00

Your turn: md-03b-your-turn-filter.qmd

1. Open posit.cloud in your browser.
2. Open the rbtl-fs24 workspace for the course.
3. In the File Manager in the bottom right window, locate the `md-03b-your-turn-filter.qmd` file and click on it to open it in the top left window.
4. Follow instructions in the file

R Terminology

```r
library(dplyr)

sanitation_national_2020_sm <- sanitation |>
  filter(residence == "national",
         year == 2020,
         varname_short == "san_sm")
```

- Function: `filter()`
- Arguments following: `residence == "national", etc.`
  What to do with the data
- Data (Object): `sanitation_national_2020_sm`
- Assignment operator: `<-`
- Pipe operator: `|>`

Task 1.2

1. Use the `filter()` function to create a subset from the `sanitation` data containing urban and rural estimates for Nigeria.
2. Store the result as a new object in your environment with the name `sanitation_nigeria_urban_rural`

```
1 sanitation_nigeria_urban_rural <- sanitation |>
2   filter(name == "Nigeria", residence != "national")
```

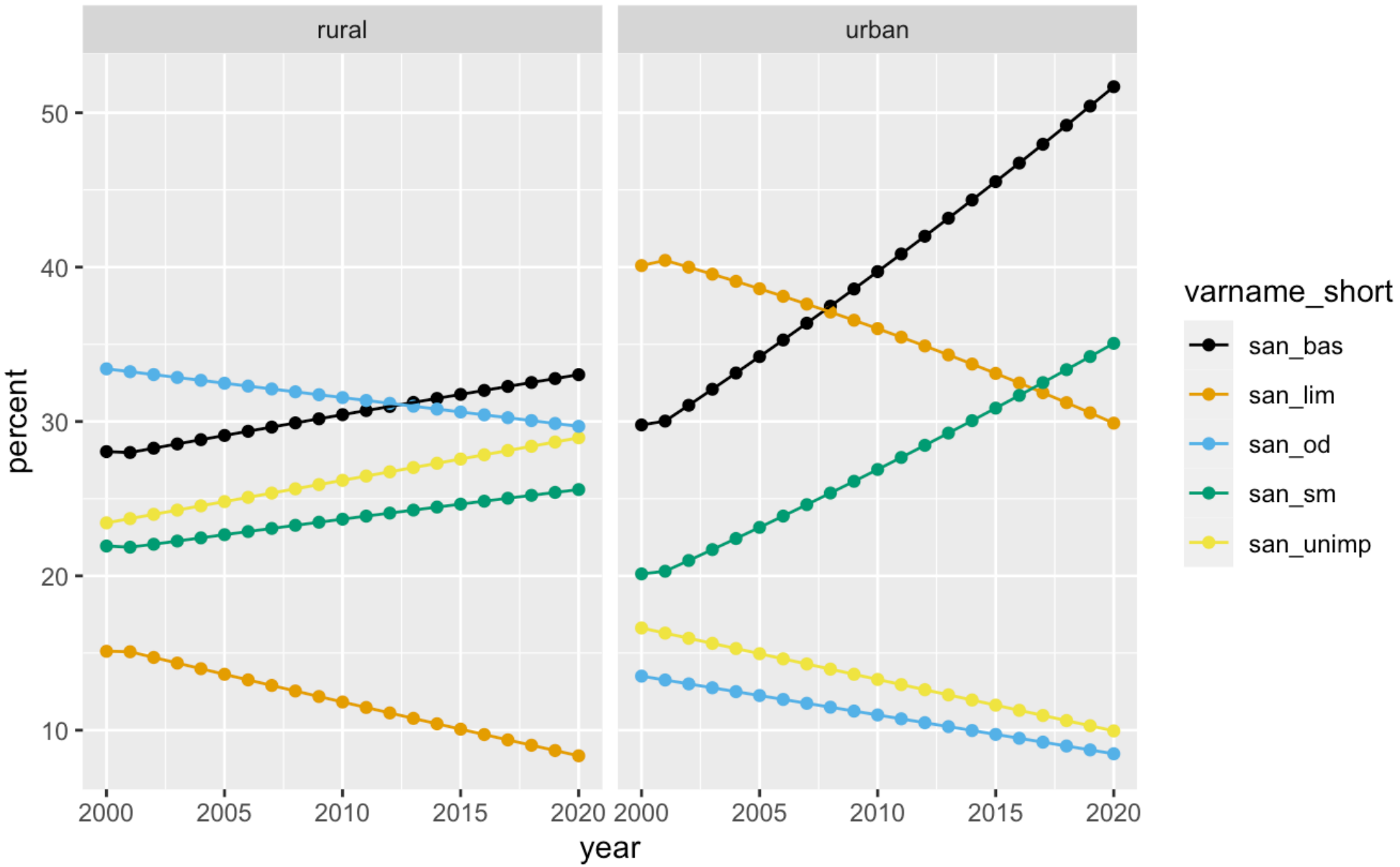
Task 1.3 - Connected scatterplot

👍 Great for timeseries data 📅

1. Use the `ggplot()` function to create a connected scatterplot with `geom_point()` and `geom_line()` for the data you created in Task 1.2.
2. Use the `aes()` function to map the year variable to the x-axis, the `percent` variable to the y-axis, and the `varname_short` variable to color and group aesthetic.
3. Use `facet_wrap()` to create a separate plot urban and rural populations.
4. Change the colors using `scale_color_colorblind()`.

```
ggplot(data = sanitation_nigeria_urban_rural,
       mapping = aes(x = year,
                     y = percent,
                     group = varname_short,
                     color = varname_short)) +
  geom_point() +
  geom_line() +
  facet_wrap(~residence) +
  scale_color_colorblind()
```

Task 1.3 - Connected scatterplot



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Our turn: back to md-03a-data-transformation.qmd

1. Open posit.cloud in your browser.
2. Open the `rbtl-fs24 workspace` for the course.
3. Click `Start` next to `md-03-exercises`.
4. In the File Manager in the bottom right window, locate the `md-03a-data-transformation.qmd` file and click on it to open it in the top left window.

Take a break

Please get up and move! Let your emails rest in peace.

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15:00

Your turn: md-03c-your-turn-summarise.qmd

1. Open posit.cloud in your browser.
2. Open the rbtl-fs24 workspace for the course.
3. In the File Manager in the bottom right window, locate the `md-03c-your-turn-summarise.qmd` file and click on it to open it in the top left window.
4. Follow instructions in the file

Homework assignments module 3

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Module 3 documentation

rbtl-fs24.github.io/website/modules/md-03.html

Module 3

Data transformation with dplyr

Learning Objectives

1. Learners can apply ten functions from the dplyr R Package to generate a subset of data for use in a table or plot.

Slides

- In preparation

Readings

1. Read R for Data Science - Section 3 - Data transformation

Assignments

Homework due date

- Homework assignment due: Wednesday, March 13th
- Correction & feedback phase up to: Tuesday, March 19th

Wrap-up

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Thanks! 🌻

Slides created via revealjs and Quarto: https://quarto.org/docs/presentations/revealjs/ Access slides as PDF on GitHub