Assessment 08 - Exploring the gapminder dataset

Alessandro Corradini - Harvard Data Science Professional

Life expectancy vs fertility - part 1

The Gapminder Foundation (www.gapminder.org) is a non-profit organization based in Sweden that promotes global development through the use of statistics that can help reduce misconceptions about global development.

Instructions

- Using ggplot and the points layer, create a scatter plot of life expectancy versus fertility for the African continent in 2012.
- Remember that you can use the R console to explore the gapminder dataset to figure out the names of the columns in the dataframe.
- In this exercise we provide parts of code to get you going. You need to fill out what is missing. But note that going forward, in the next exercises, you will be required to write most of the code.

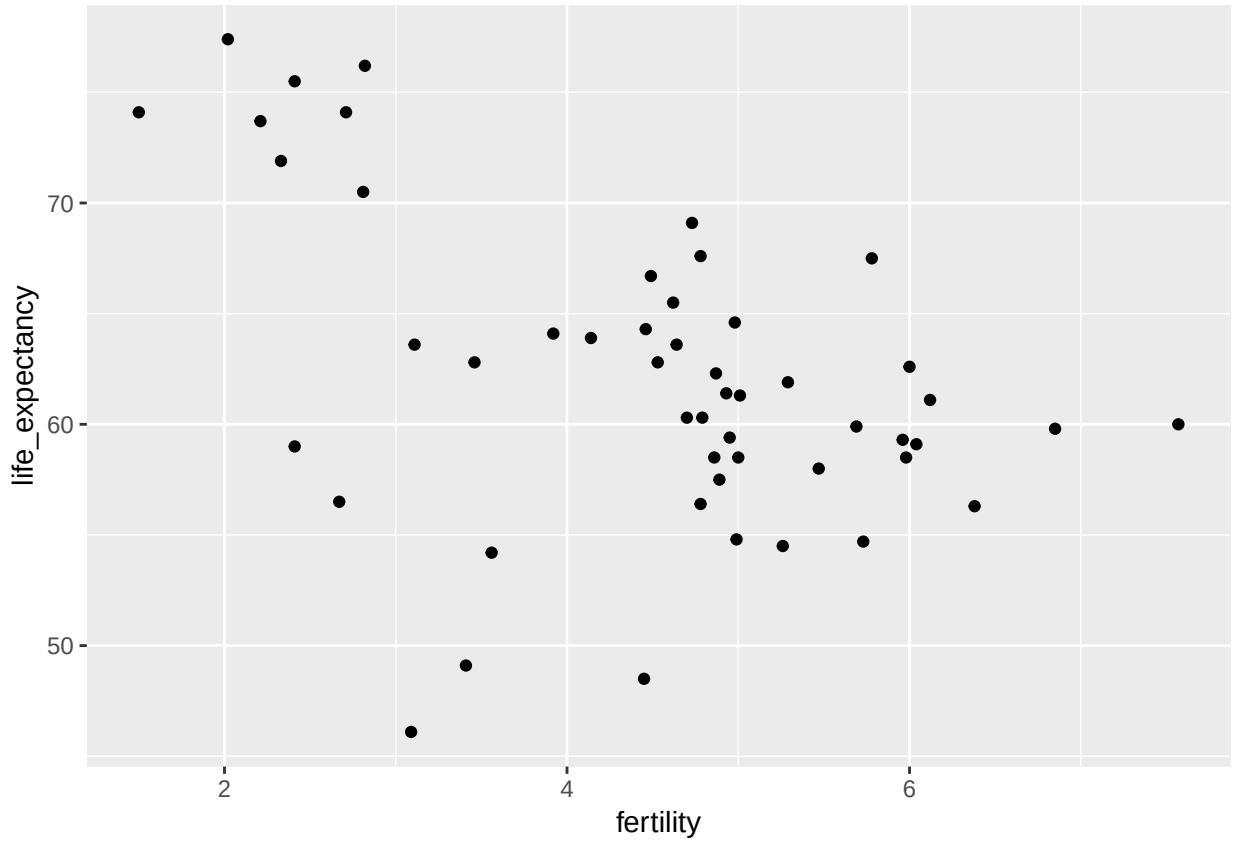
```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(dslabs)
data(gapminder)
gapminder %>% filter(continent=="Africa" & year == 2012) %>%
  ggplot(aes(fertility, life_expectancy)) +
  geom_point()
```



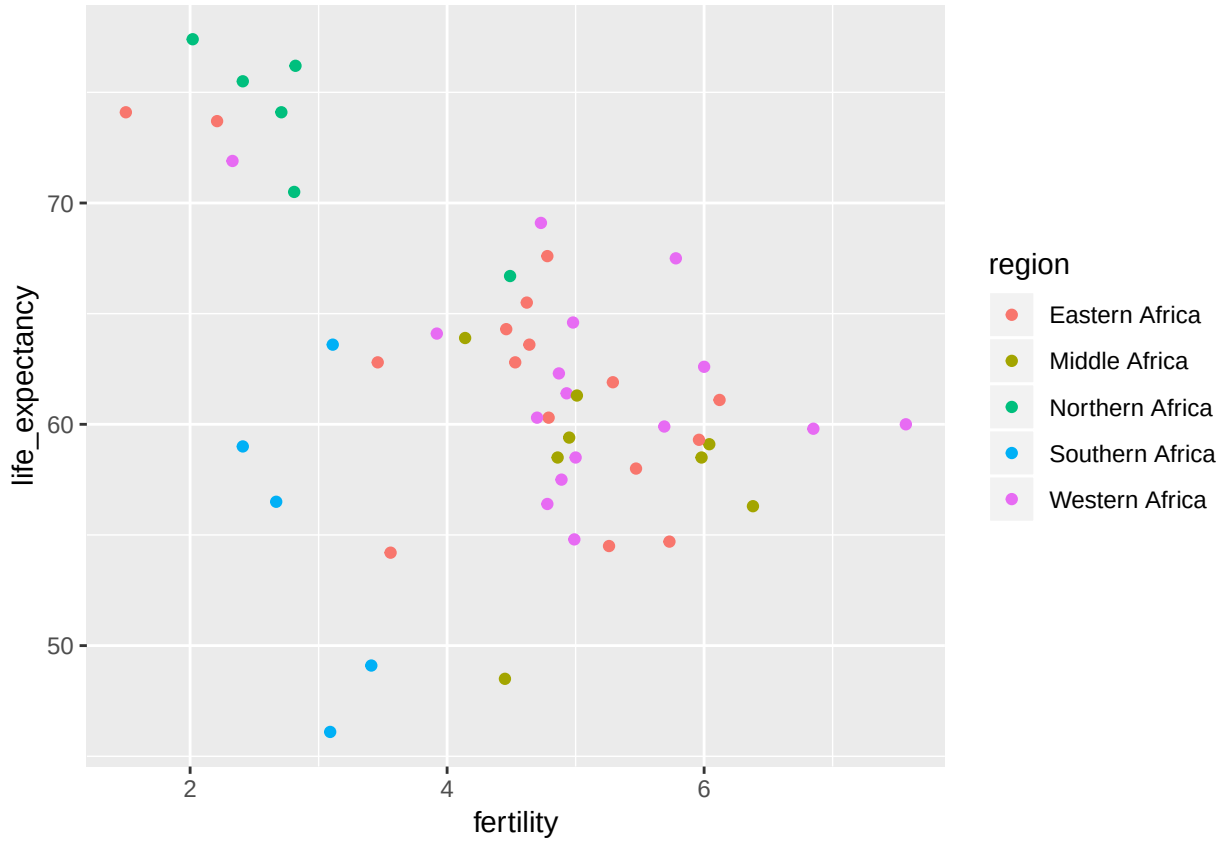
Life expectancy vs fertility - part 2 - coloring your plot

Note that there is quite a bit of variability in life expectancy and fertility with some African countries having very high life expectancies. There also appear to be three clusters in the plot.

Instructions

- Remake the plot from the previous exercises but this time use color to dinstinguish the different regions of Africa to see if this explains the clusters. Remember that you can explore the gapminder data to see how the regions of Africa are labeled in the dataframe!

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)
gapminder %>% filter(continent=="Africa" & year == 2012) %>%
  ggplot(aes(fertility, life_expectancy,color=region)) +
  geom_point()
```



Life expectancy vs fertility - part 3 - selecting country and region

While many of the countries in the high life expectancy/low fertility cluster are from Northern Africa, three countries are not.

Instructions - Create a table showing the country and region for the African countries (use `select`) that in 2012 had fertility rates of 3 or less and life expectancies of at least 70. - Assign your result to a data frame called `df`.

```
library(dplyr)
library(dslabs)
data(gapminder)
df <- gapminder %>%
  filter(continent=="Africa" & year == 2012 & fertility <=3 & life_expectancy>=70) %>%
  select(country, region)
```

Life expectancy and the Vietnam War - part 1

The Vietnam War lasted from 1955 to 1975. Do the data support war having a negative effect on life expectancy? We will create a time series plot that covers the period from 1960 to 2010 of life expectancy for Vietnam and the United States, using color to distinguish the two countries. In this start we start the analysis by generating a table.

Instructions

- Use `filter` to create a table with data for the years from 1960 to 2010 in Vietnam and the United States.
- Save the table in an object called `tab`.

```
library(dplyr)
library(dslabs)
data(gapminder)
years <- 1960:2010
countries <- c("United States", "Vietnam")
tab <- gapminder %>% filter(year %in% years & country %in% countries)
```

Life expectancy and the Vietnam War - part 2

Now that you have created the data table in Exercise 4, it is time to plot the data for the two countries.

Instructions

- Use `geom_line` to plot life expectancy vs year for Vietnam and the United States. The data table is stored in `tab`.
- Use color to distinguish the two countries.

```
p <- tab %>% ggplot(aes(year, life_expectancy, color=country)) + geom_line()
```

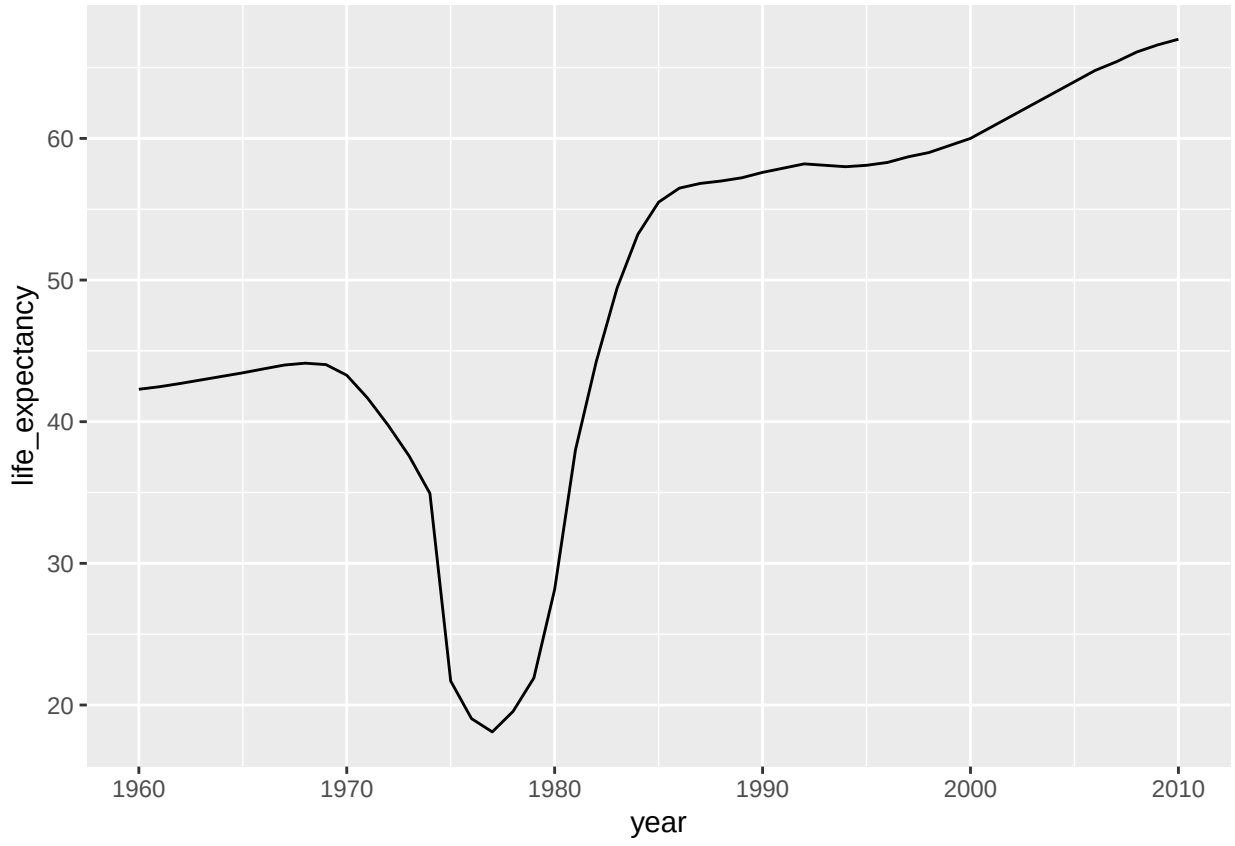
Life expectancy in Cambodia

Cambodia was also involved in this conflict and, after the war, Pol Pot and his communist Khmer Rouge took control and ruled Cambodia from 1975 to 1979. He is considered one of the most brutal dictators in history. Do the data support this claim?

Instructions

- Use a single line of code to create a time series plot from 1960 to 2010 of life expectancy vs year for Cambodia.

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)
gapminder %>% filter(year >= 1960 & year <= 2010 & country == "Cambodia") %>%
  ggplot(aes(year, life_expectancy)) + geom_line()
```



Dollars per day - part 1

Now we are going to calculate and plot dollars per day for African countries in 2010 using GDP data.

In the first part of this analysis, we will create the dollars per day variable.

Instructions

- Use `mutate` to create a `dollars_per_day` variable, which is defined as gdp/population/365.
- Create the `dollars_per_day` variable for African countries for the year 2010.
- Remove any `NA` values.
- Save the mutated dataset as `daydollars`.

```
library(dplyr)
library(dslabs)
data(gapminder)
daydollars <- gapminder %>% mutate(dollars_per_day = gdp/population/365) %>% filter(continent == "Africa
```

Dollars per day - part 2

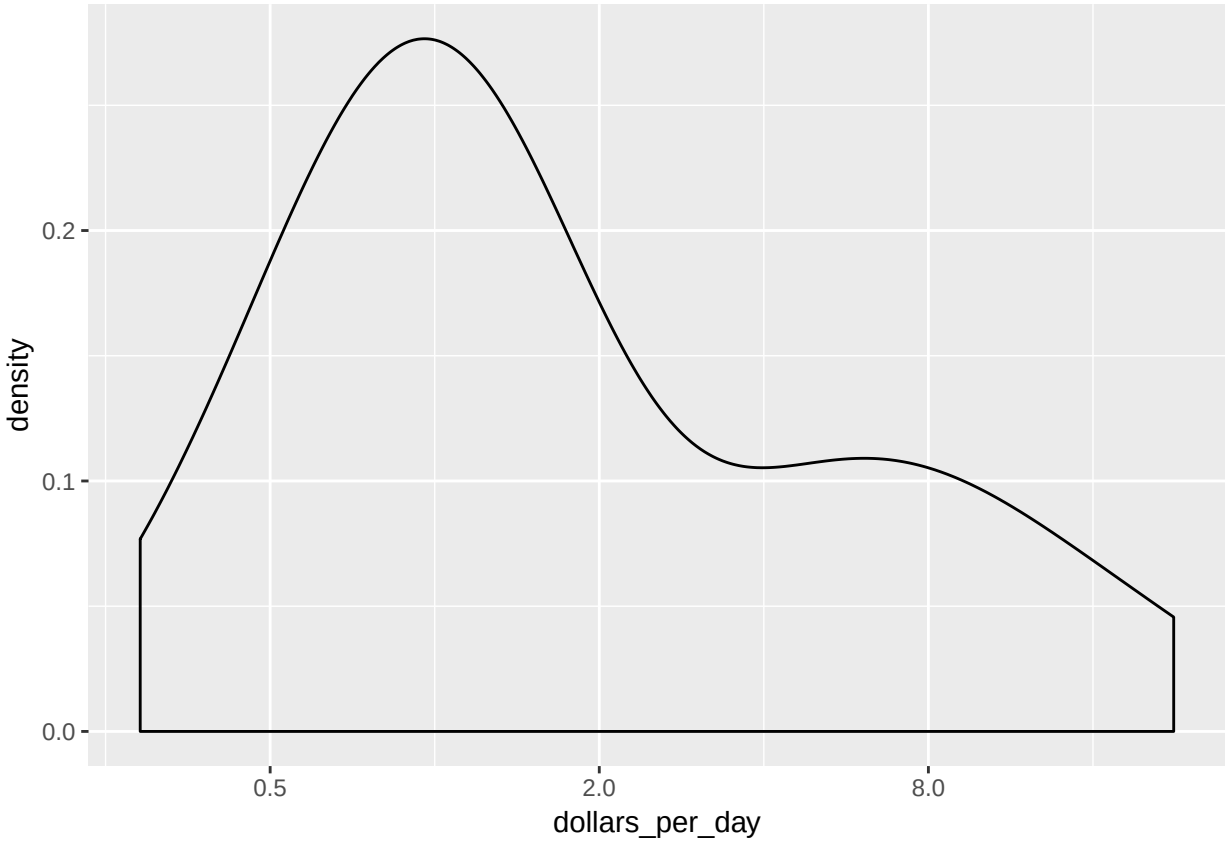
Now we are going to calculate and plot dollars per day for African countries in 2010 using GDP data.

In the second part of this analysis, we will plot the smooth density plot using a log (base 2) x axis.

Instructions

- The dataset including the `dollars_per_day` variable is preloaded as `daydollars`.
- Create a smooth density plot of dollars per day from `daydollars`.
- Use a log (base 2) scale for the x axis.

```
daydollars %>% ggplot(aes(dollars_per_day)) + geom_density() + scale_x_continuous(trans = "log2")
```



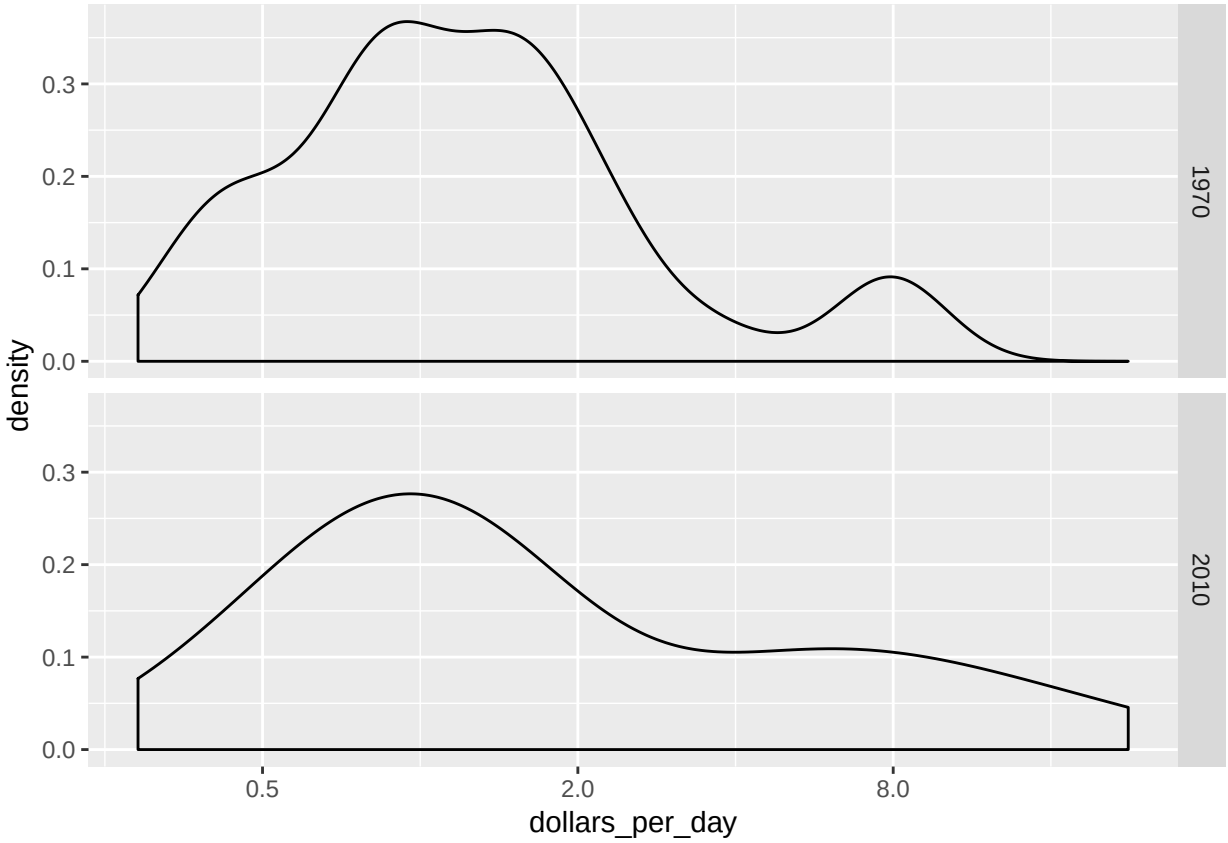
Dollars per day - part 3 - multiple density plots

Now we are going to combine the plotting tools we have used in the past two exercises to create density plots for multiple years.

Instructions

- Create the `dollars_per_day` variable as in Exercise 7, but for African countries in the years 1970 and 2010 this time.
- Make sure you remove any `NA` values.
- Create a smooth density plot of dollars per day for 1970 and 2010 using a log (base 2) scale for the x axis.
- Use `facet_grid` to show a different density plot for 1970 and 2010.

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)
gapminder %>%
  mutate(dollars_per_day = gdp/population/365) %>%
  filter(continent == "Africa" & year %in% c(1970,2010) & !is.na(dollars_per_day)) %>%
  ggplot(aes(dollars_per_day)) +
  geom_density() +
  scale_x_continuous(trans = "log2") +
  facet_grid(year ~ .)
```



Dollars per day - part 4 - stacked histograms

Now we are going to edit the code from Exercise 9 to show stacked histograms of each region in Africa.

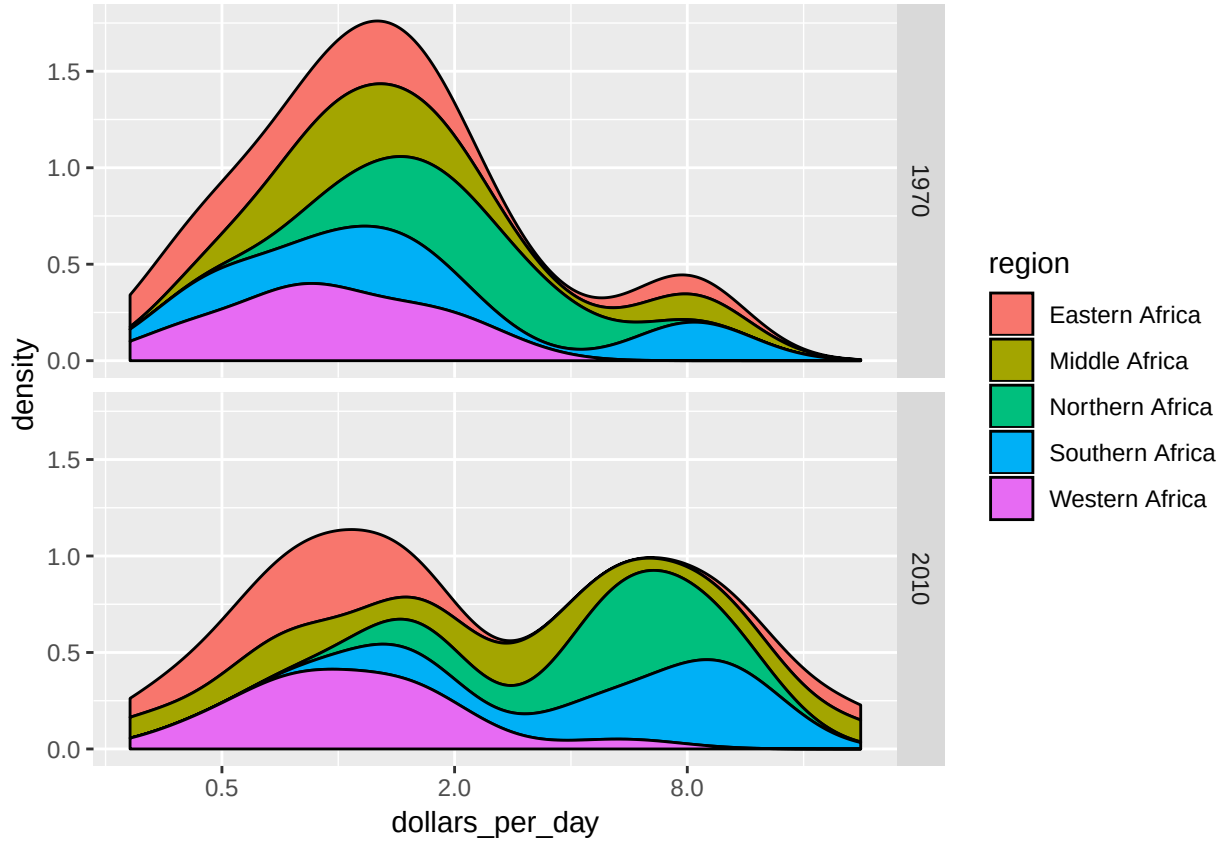
Instructions

- Much of the code will be the same as in Exercise 9:
- Create the `dollars_per_day` variable as in Exercise 7, but for African countries in the years 1970 and 2010 this time.
- Make sure you remove any `NA` values.
- Create a smooth density plot of dollars per day for 1970 and 2010 using a log (base 2) scale for the x axis.
- Use `facet_grid` to show a different density plot for 1970 and 2010.
- Make sure the densities are smooth by using `bw = 0.5`.
- Use the `fill` and `position` arguments where appropriate to create the stacked histograms of each region.

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)

gapminder %>%
  mutate(dollars_per_day = gdp/population/365) %>%
  filter(continent == "Africa" & year %in% c(1970,2010) & !is.na(dollars_per_day)) %>%
  ggplot(aes(dollars_per_day, fill = region)) +
  geom_density(bw=0.5, position = "stack") +
```

```
  scale_x_continuous(trans = "log2") +
  facet_grid(year ~ .)
```



Infant mortality scatter plot - part 1

We are going to continue looking at patterns in the gapminder dataset by plotting infant mortality rates versus dollars per day for African countries.

Instructions

- Generate `dollars_per_day` using `mutate` and `filter` for the year 2010 for African countries.
- Remember to remove `NA` values.
- Store the mutated dataset in `gapminder_Africa_2010`.
- Make a scatter plot of `infant_mortaility` versus `dollars_per_day` for countries in the African continent.
- Use color to denote the different regions of Africa.

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)

gapminder_Africa_2010 <- gapminder %>%
mutate(dollars_per_day = gdp/population/365) %>%
filter(continent == "Africa" & year %in% 2010 & !is.na(dollars_per_day)) %>% ggplot(aes(y=infant_mortali
geom_point()
```

Infant mortality scatter plot - part 2 - logarithmic axis

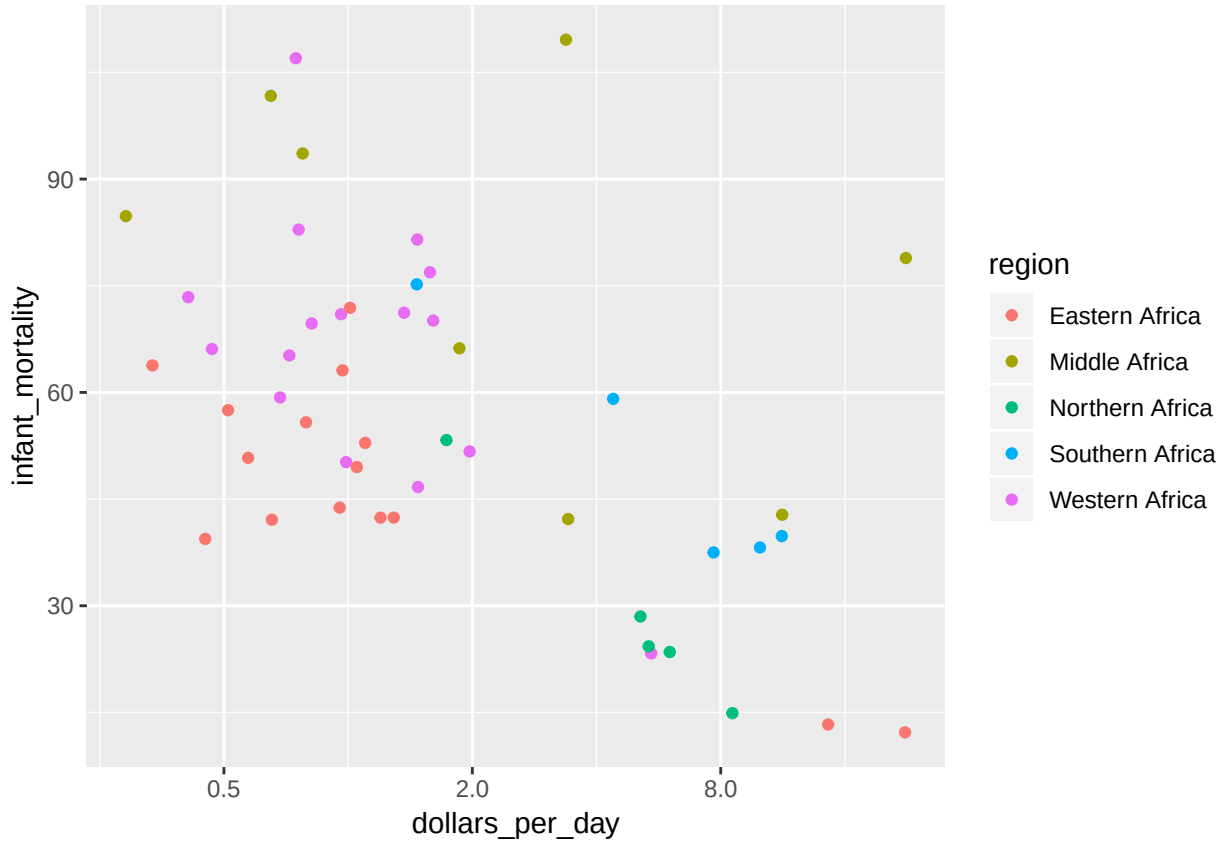
Now we are going to transform the x axis of the plot from the previous exercise.

Instructions

- The mutated dataset is preloaded as `gapminder_Africa_2010`.
- As in the previous exercise, make a scatter plot of `infant_mortaility` versus `dollars_per_day` for countries in the African continent.
- As in the previous exercise, use color to denote the different regions of Africa.
- Transform the x axis to be in the log (base 2) scale.

```
gapminder_Africa_2010 <- gapminder_Africa_2010$data
```

```
gapminder_Africa_2010 %>% ggplot(aes(y=infant_mortality, x=dollars_per_day, color=region)) +
geom_point() + scale_x_continuous(trans = "log2")
```



Infant mortality scatter plot - part 3 - adding labels

Note that there is a large variation in infant mortality and dollars per day among African countries.

As an example, one country has infant mortality rates of less than 20 per 1000 and dollars per day of 16, while another country has infant mortality rates over 10% and dollars per day of about 1.

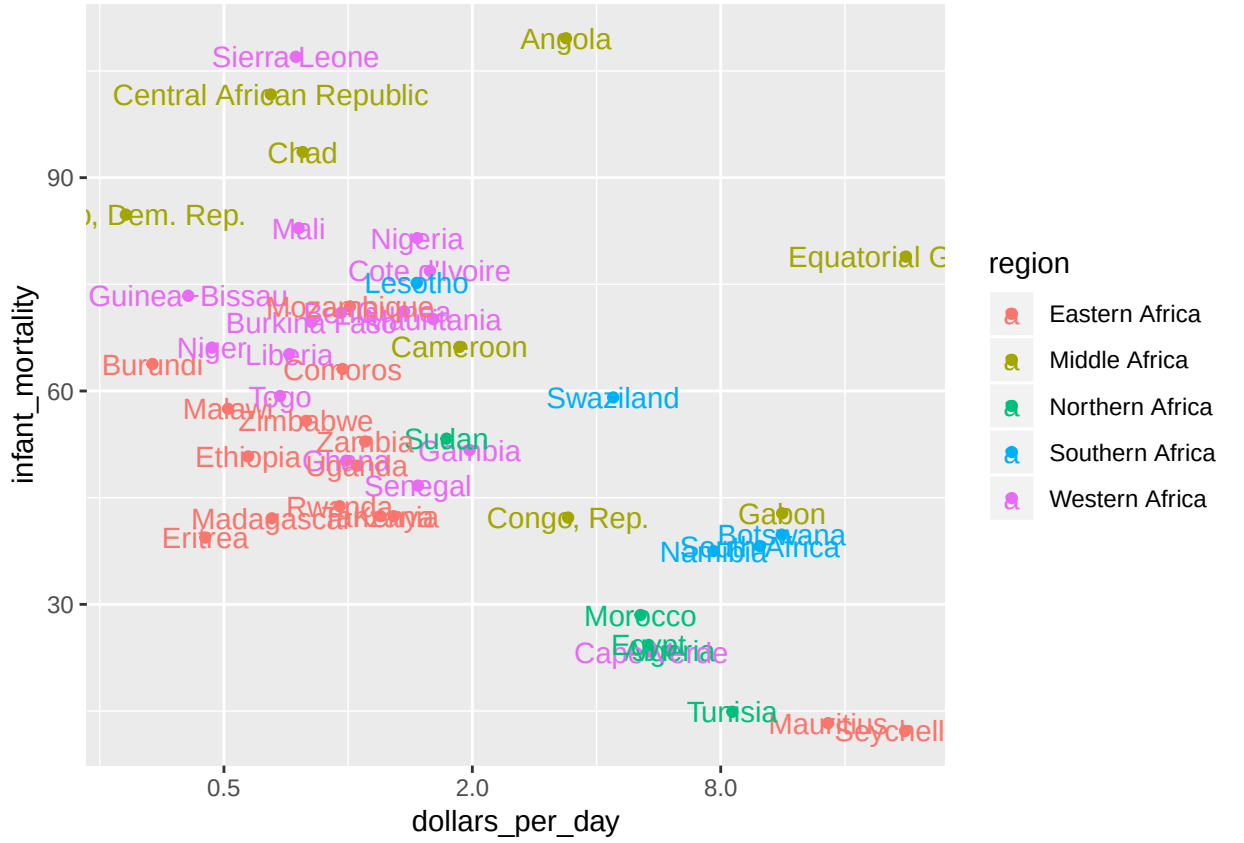
In this exercise, we will remake the plot from Exercise 12 with country names instead of points so we can identify which countries are which.

Instructions

- The mutated dataset is preloaded as `gapminder_Africa_2010`.

- As in the previous exercise, make a scatter plot of `infant_mortality` versus `dollars_per_day` for countries in the African continent.
- As in the previous exercise, use color to denote the different regions of Africa.
- As in the previous exercise, transform the x axis to be in the log (base 2) scale.
- Add a layer to display country names instead of points.

```
gapminder_Africa_2010 %>%
ggplot(aes(y=infant_mortality, x=dollars_per_day, color=region, label=country)) +
geom_point() +
scale_x_continuous(trans = "log2") +
geom_text()
```



Infant mortality scatter plot - part 4 - comparison of scatter plots

Now we are going to look at changes in the infant mortality and dollars per day patterns African countries between 1970 and 2010.

Instructions

- Generate `dollars_per_day` using `mutate` and `filter` for the years 1970 and 2010 for African countries. Remember to remove NA values.
- As in the previous exercise, make a scatter plot of `infant_mortality` versus `dollars_per_day` for countries in the African continent.
- As in the previous exercise, use color to denote the different regions of Africa.
- As in the previous exercise, transform the x axis to be in the log (base 2) scale.
- As in the previous exercise, add a layer to display country names instead of points.
- Use `facet_grid` to show different plots for 1970 and 2010.

```
library(dplyr)
library(ggplot2)
library(dslabs)
data(gapminder)
gapminder %>%
  mutate(dollars_per_day = gdp/population/365) %>%
  filter(continent == "Africa" & year %in% c(1970, 2010) & !is.na(dollars_per_day) & !is.na(infant_morta
  ggplot(aes(dollars_per_day, infant_mortality, color = region, label = country)) +
  geom_text() +
  scale_x_continuous(trans = "log2") +
  facet_grid(year~.)
```