Visualizing Amounts

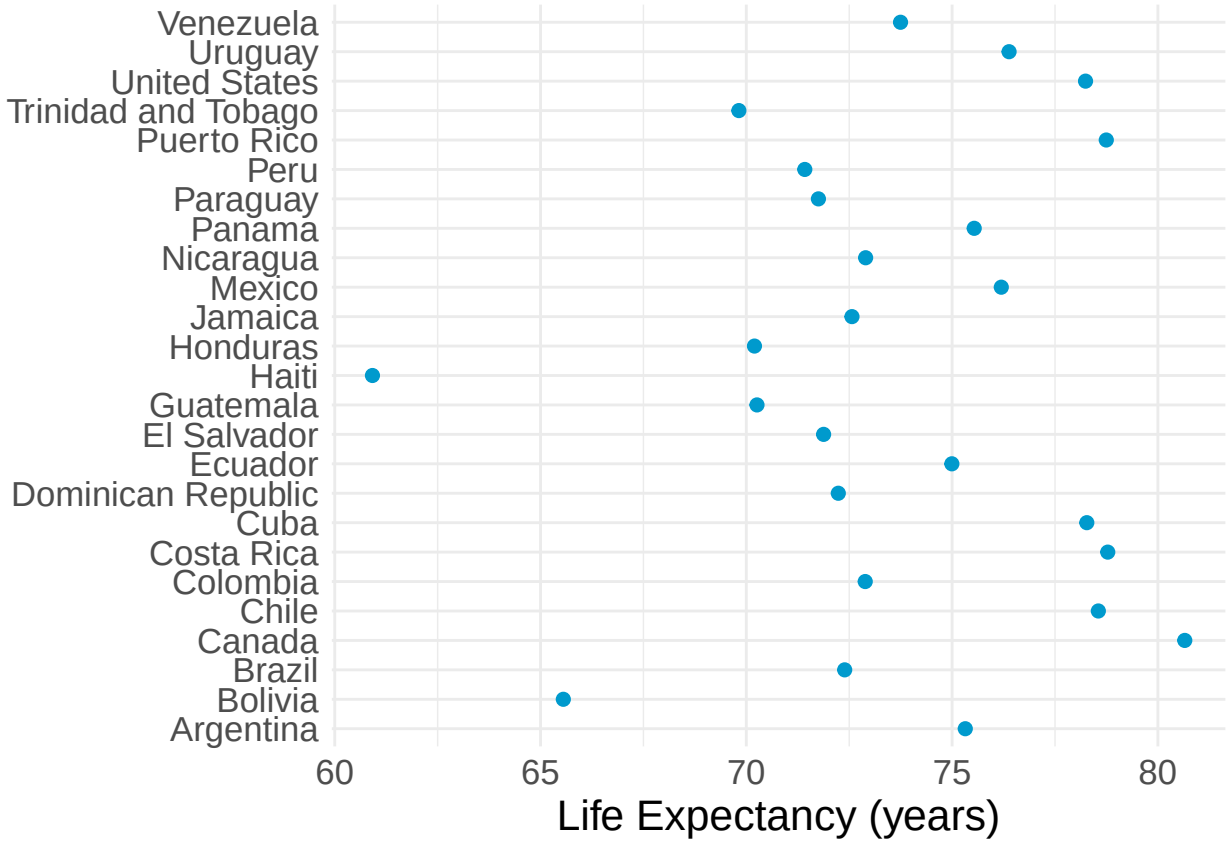
2024-02-14

1. Dot plots

One of the simplest visualizations of a single numerical variable with a modest number of observations and labels for the observations is a dot plot, or Cleveland dot plot:

```
# Filtering data
le_am_2007 <- filter(gapminder,
                     year == 2007,
                     continent == "Americas")
# Setting up the theme
thm <- theme_minimal() +
  theme(text = element_text(size = 16))

# Visualize
ggplot(le_am_2007, aes(x = lifeExp,
                       y = country)) +
  geom_point(color = "deepskyblue3", size = 2) +
  labs(x = "Life Expectancy (years)",
       y = NULL) +
  thm # Apply the theme
```

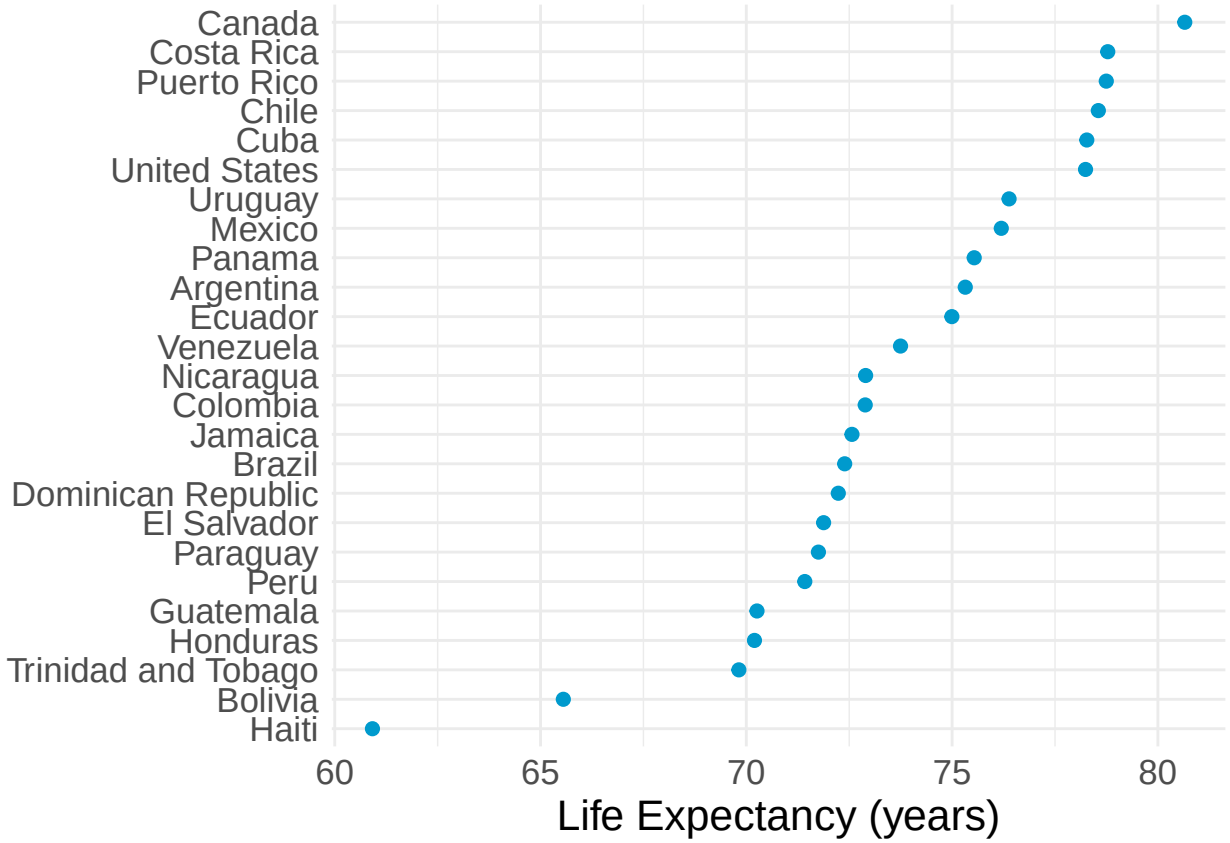


This visualization:

- Shows the overall distribution of the data
- Makes it easy to locate the life expectancy of a particular country.

```
ggplot(le_am_2007, aes(x = lifeExp,
                       y = reorder(country, lifeExp))) +
  geom_point(color = "deepskyblue3",
             size = 2) +
  labs(x = "Life Expectancy (years)",
       y = NULL) +
  thm
```

Unless there is a natural order to the categories (e.g. months of the year or days of the week) it is usually better to `reorder` to make the plot increasing or decreasing:



- Locating a particular country is a little more difficult.
- But the shape of the distribution is more apparent.
- Approximate median and quartiles can be read off easily.

Dot plot uses: Dot plots are particularly appropriate for `interval` data.

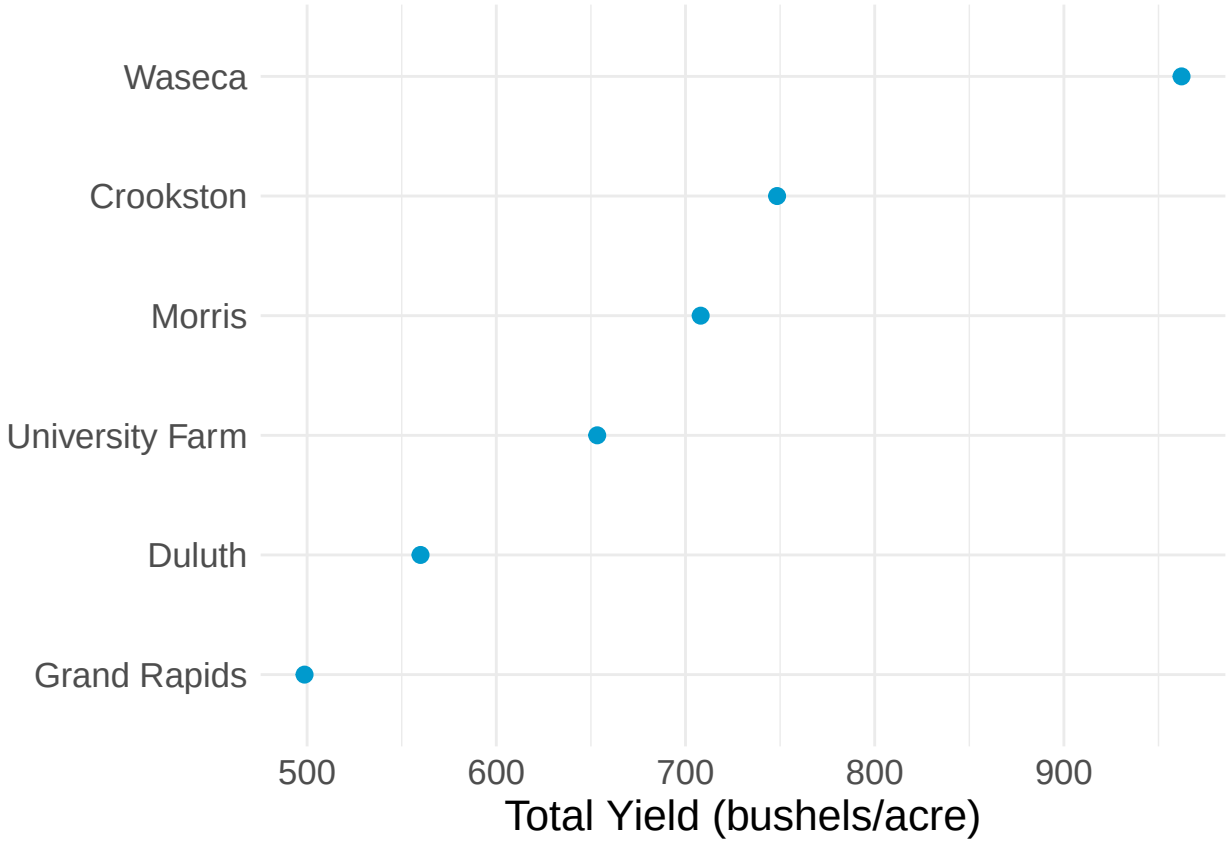
- They often do not show the origin;
- They focus the viewer's attention on differences.

Dot plots are often very useful for **group summaries** like *totals* or *averages*.

For the barley data, total yield within each site, adding up across all varieties and both years, can be computed as:

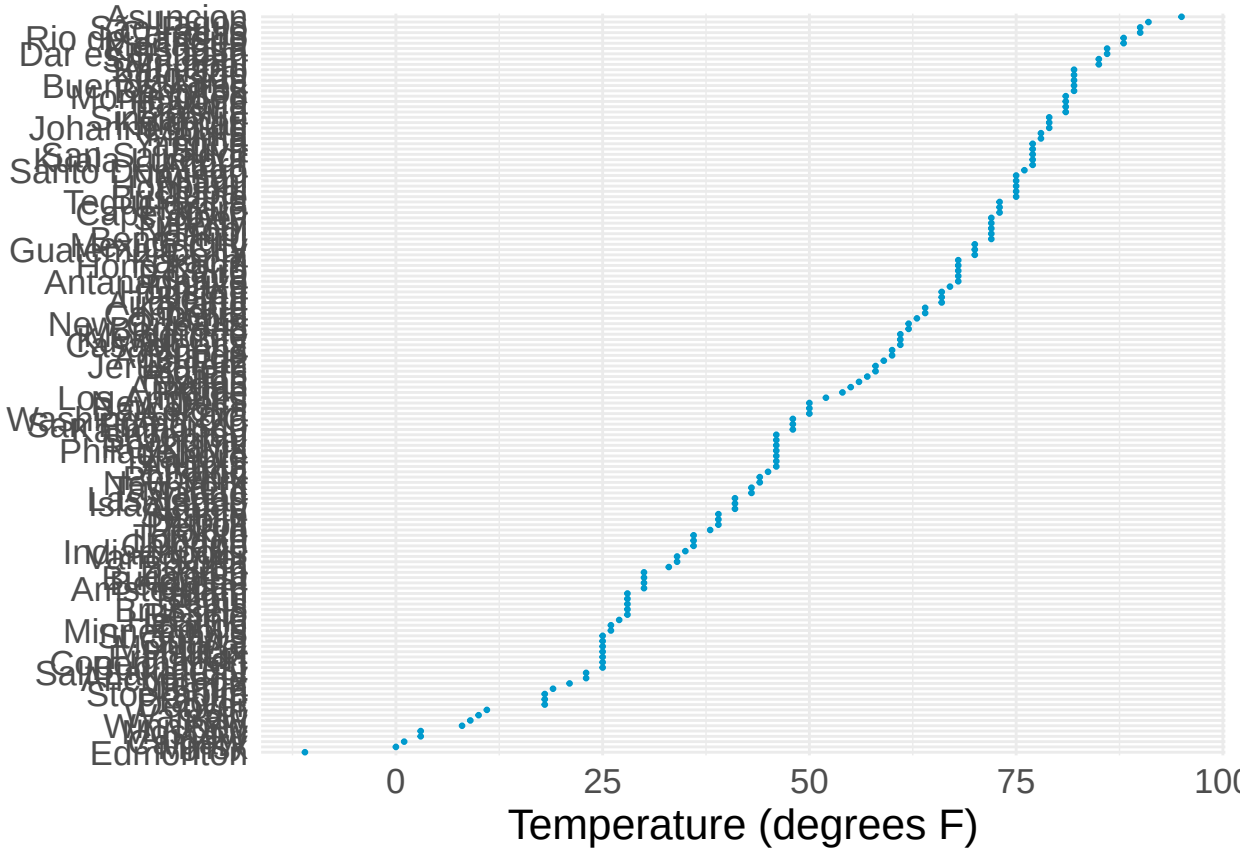
```
b_tot_site <- group_by(barley, site) |>
  summarize(yield = sum(yield))

ggplot(b_tot_site, aes(x = yield,
                       y = site)) +
  geom_point(color = "deepskyblue3",
             size = 2.5) +
  labs(x = "Total Yield (bushels/acre)",
       y = NULL) +
  thm
```



Larger Data Sets For larger data sets, like the `citytemps` data with 140 observations, over-plotting of labels becomes a problem:

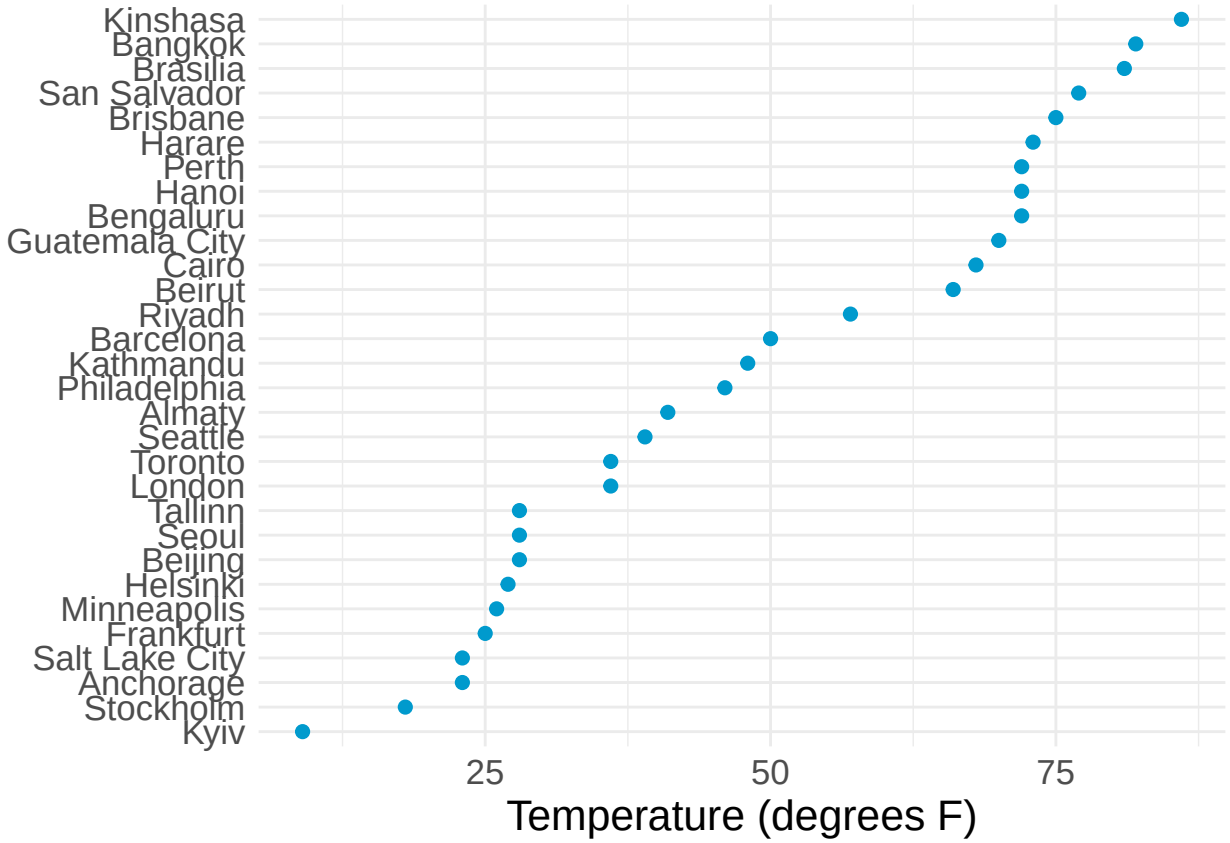
```
citytemps <- read.table("http://www.stat.uiowa.edu/~luke/data/citytemps.dat", header = TRUE)
ggplot(citytemps, aes(x = temp,
                      y = reorder(city, temp))) +
  geom_point(color = "deepskyblue3",
             size = 0.5) +
  labs(x = "Temperature (degrees F)",
       y = NULL) +
  thm
```



Reducing to 30 or 40, e.g. by taking a sample or a meaningful subset, can help:

```
ct1 <- filter(citytemps, temp < 32) |> sample_n(10)
ct2 <- filter(citytemps, temp >= 32) |> sample_n(20)
ctsamp <- bind_rows(ct1, ct2)

ggplot(ctsamp, aes(x = temp,
                   y = reorder(city, temp))) +
  geom_point(color = "deepskyblue3",
             size = 2) +
  labs(x = "Temperature (degrees F)",
       y = NULL) +
  thm
```

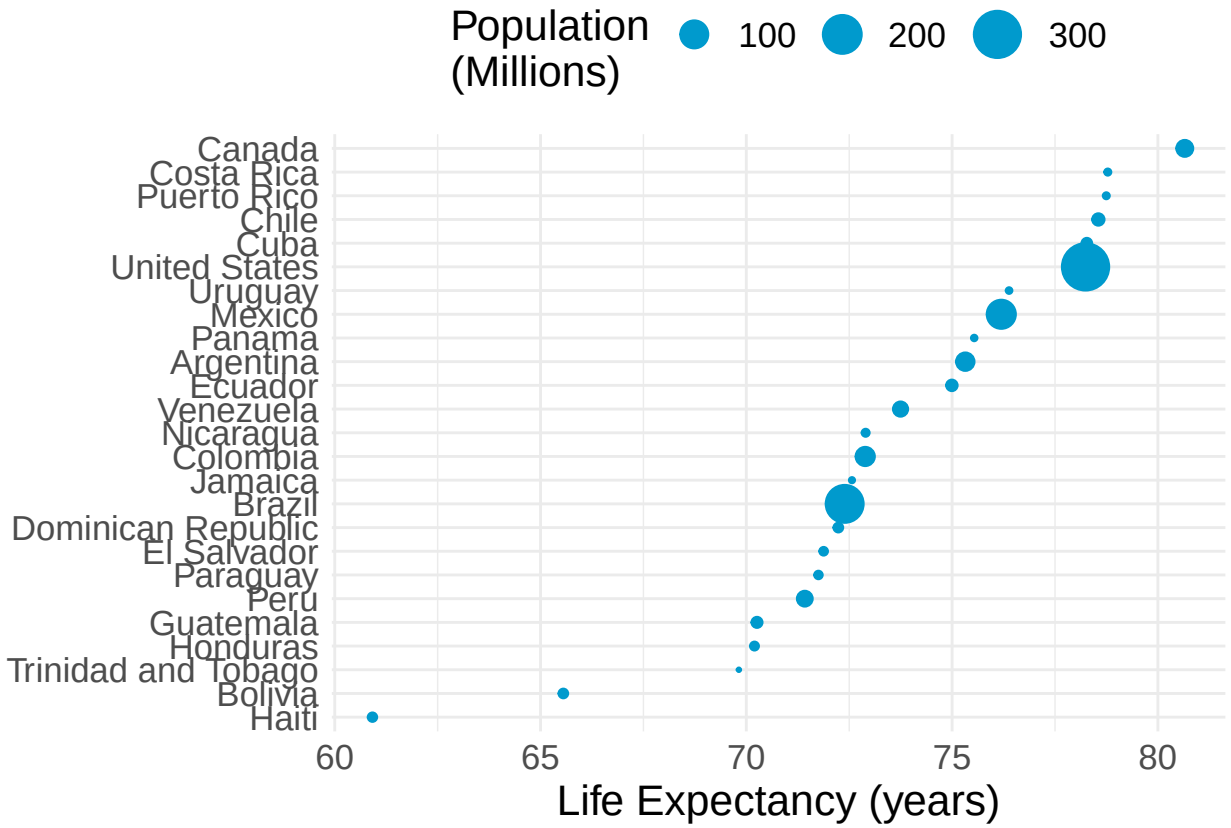


Some Variations The size of the dots can be used to encode an additional numeric variable.

This view uses area to encode population size:

This is sometimes called a *bubble chart*.

```
ggplot(le_am_2007, aes(x = lifeExp,
                       y = reorder(country, lifeExp),
                       size = pop / 1000000)) +
  geom_point(color = "deepskyblue3") +
  labs(x = "Life Expectancy (years)",
       y = NULL) +
  scale_size_area("Population\n(Millions)",
                  max_size = 8) +
  thm + theme(legend.position = "top")
```


Population (Millions)
100
200
300
Canada
Costa Rica
Puerto Rico
Chile
Cuba
United States
Uruguay
Mexico
Panama
Argentina
Ecuador
Venezuela
Nicaragua
Colombia
Jamaica
Brazil
Dominican Republic
El Salvador
Paraguay
Peru
Guatemala
Honduras
Trinidad and Tobago
Bolivia
Haiti
60
65
70
75
80
Life Expectancy (years)