

**Dr. Mindaugas Šarpis**

# **Lessons on Data Analysis from CERN**

## **Lecture 5**

### **Data Visualization**

# Data Visualization

- One of the key components of data analysis
  - Interpreting Results
  - Reporting Findings
- Choosing appropriate method of visualization and representation is crucial



Arc Diagram



Area Graph



Bar Chart



Box & Whisker Plot



Brainstorm



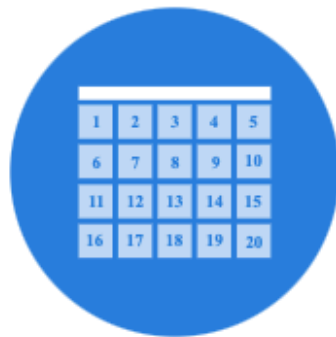
Bubble Chart



Bubble Map



Bullet Graph



Calendar



Candlestick Chart



Chord Diagram



Choropleth Map



Circle Packing



Connection Map



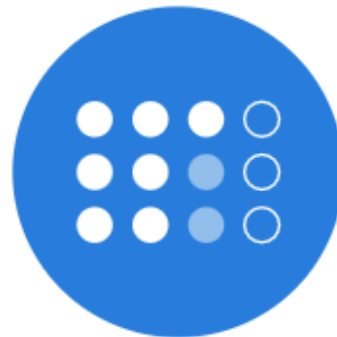
Density Plot



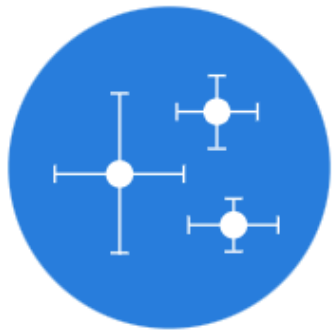
Donut Chart



Dot Map



Dot Matrix Chart



Error Bars



Flow Chart



Flow Map



Gantt Chart



Heatmap



Histogram

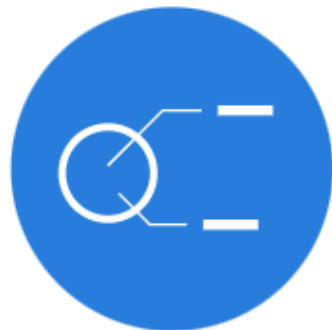


Illustration Diagram



Kagi Chart



Line Graph



Marimekko Chart



Multi-set Bar Chart



Network Diagram



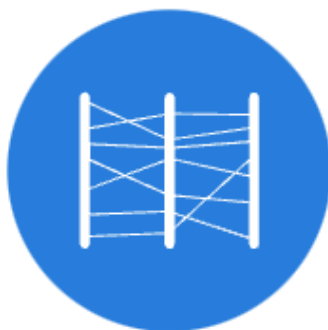
Nightingale Rose  
Chart



Non-ribbon Chord  
Diagram



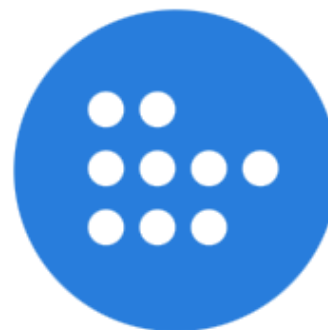
Open-high-low-  
close Chart



Parallel  
Coordinates Plot



Parallel Sets



Pictogram Chart



Pie Chart



Point & Figure  
Chart



Population Pyramid



Proportional Area  
Chart



Radar Chart



Radial Bar Chart



Radial Column  
Chart



Sankey Diagram



Scatterplot



Span Chart



Spiral Plot



Stacked Area  
Graph



Stacked Bar Graph



Stem & Leaf Plot



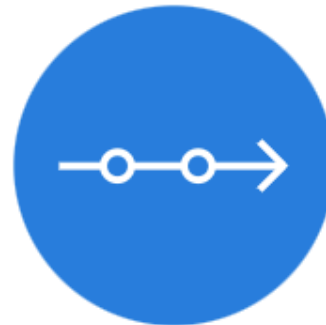
Stream Graph



Sunburst Diagram



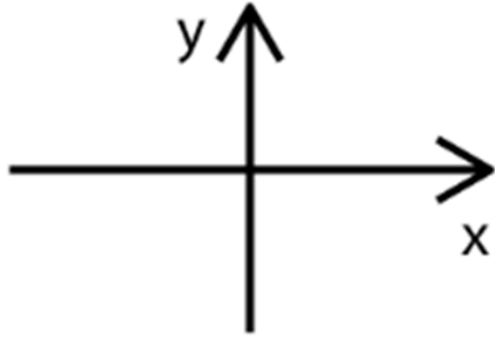
Tally Chart



Timeline

# Aesthetics of Data Visualization

position



shape



size



color



line width



line type



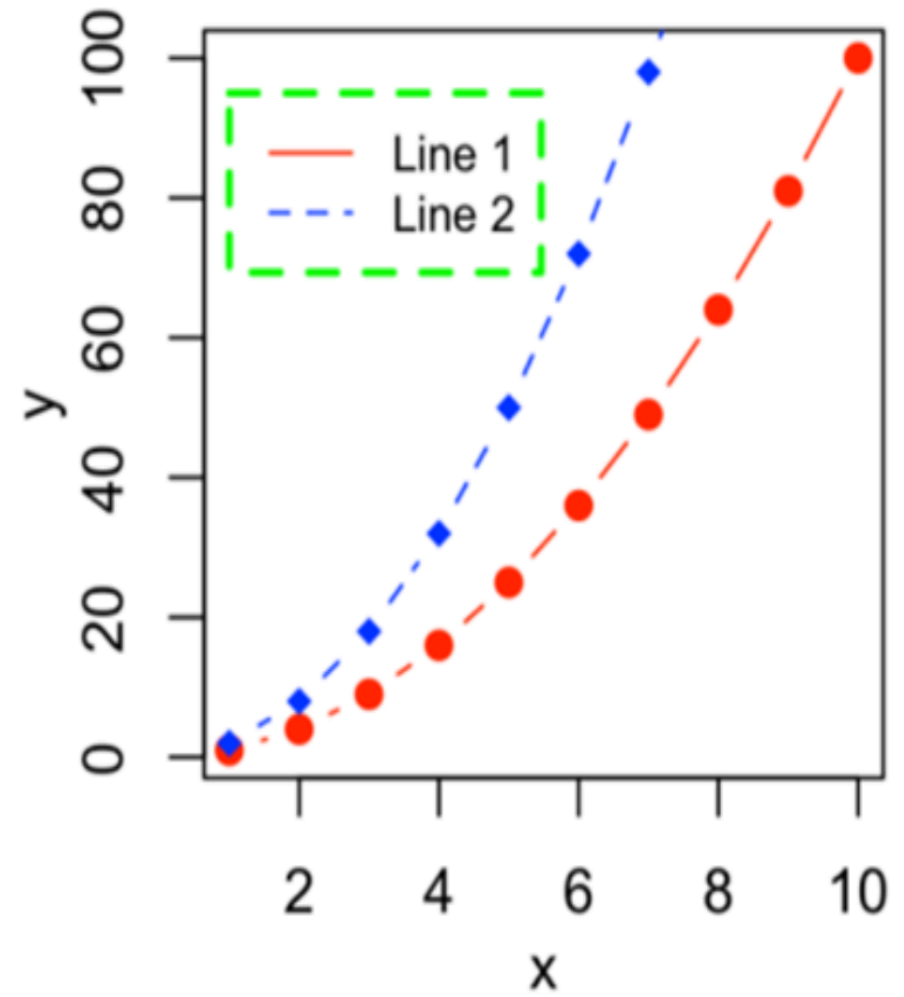
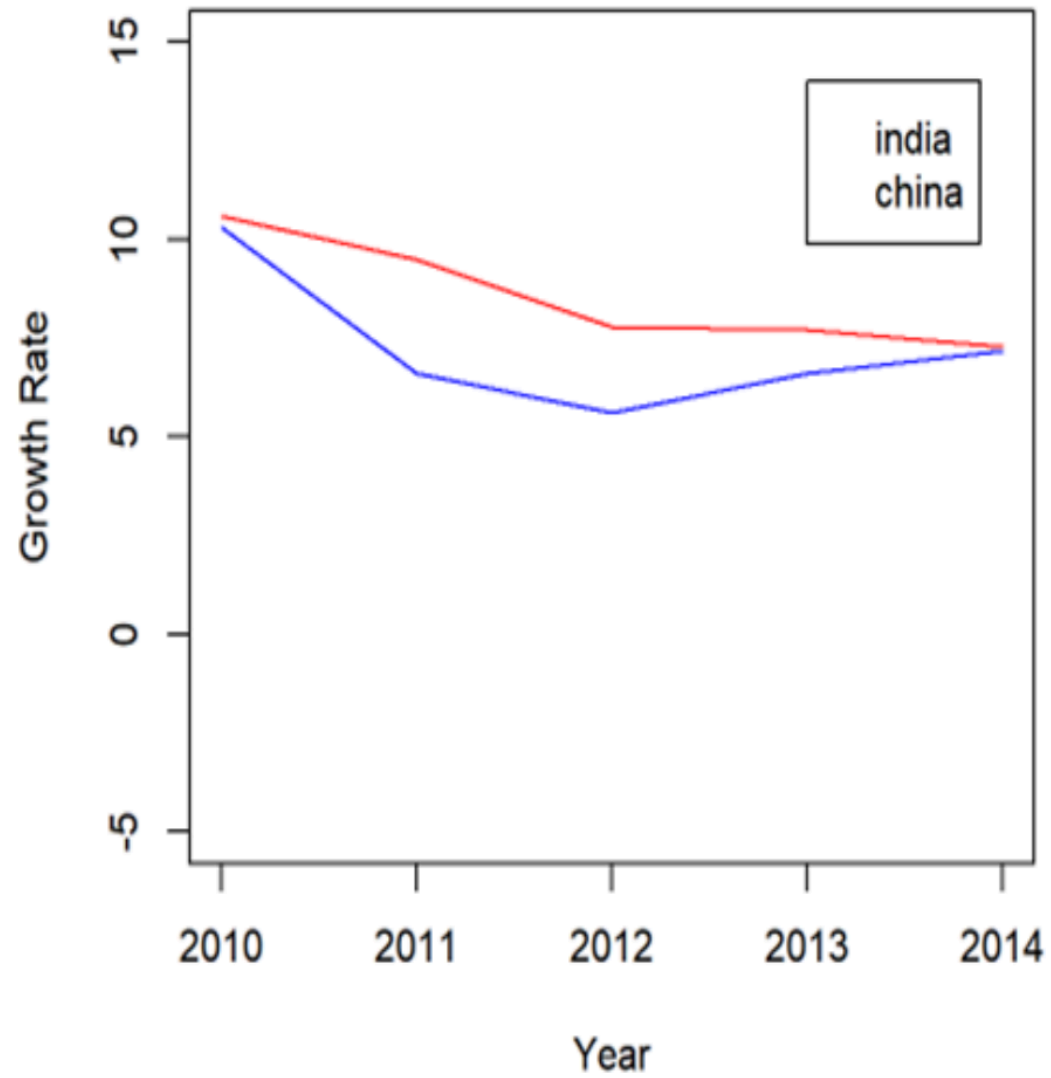
# Continuous and Discrete Data

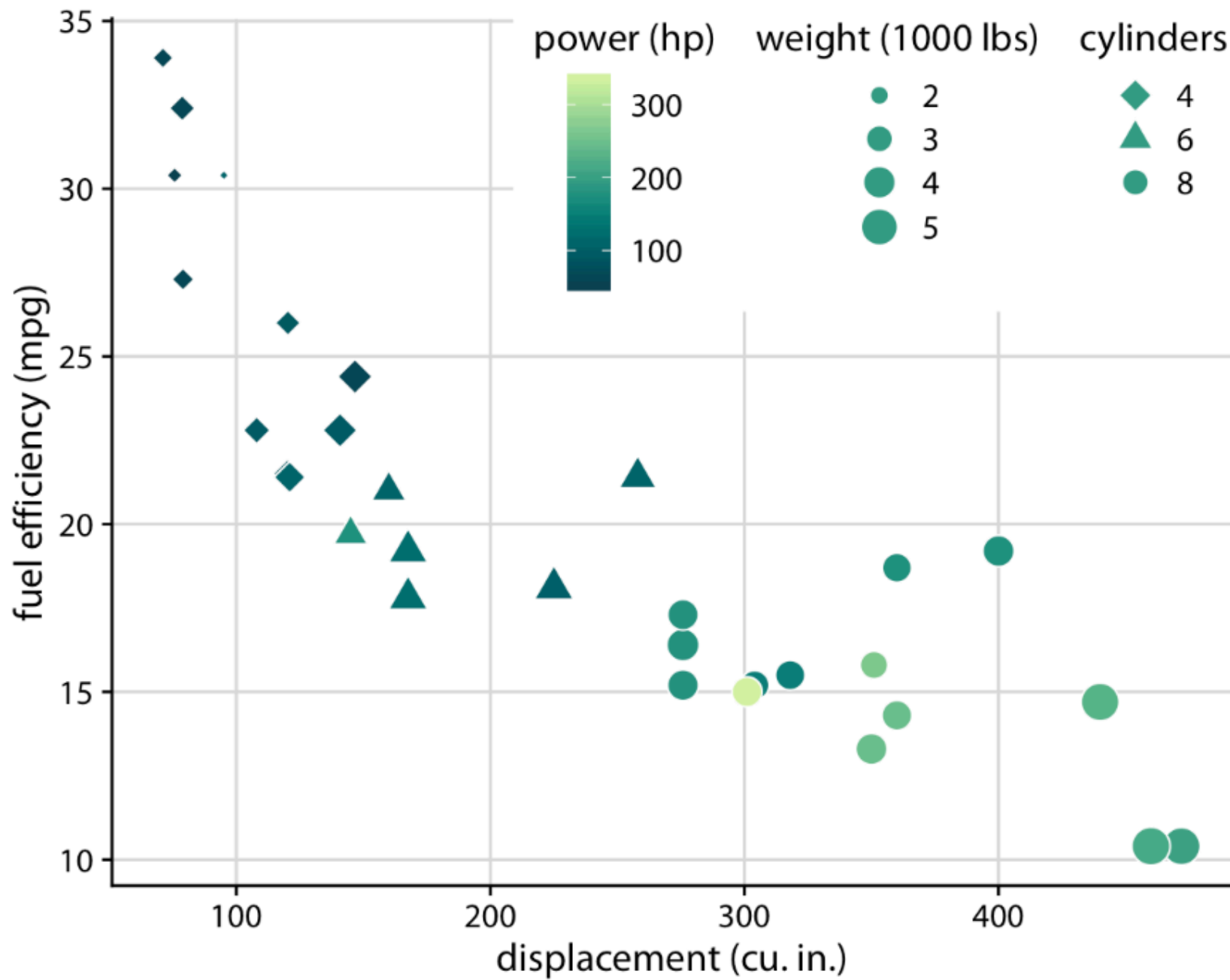
- Quantitative / Numerical Data
- Qualitative / Categorical Data
- Date and Time
- Text

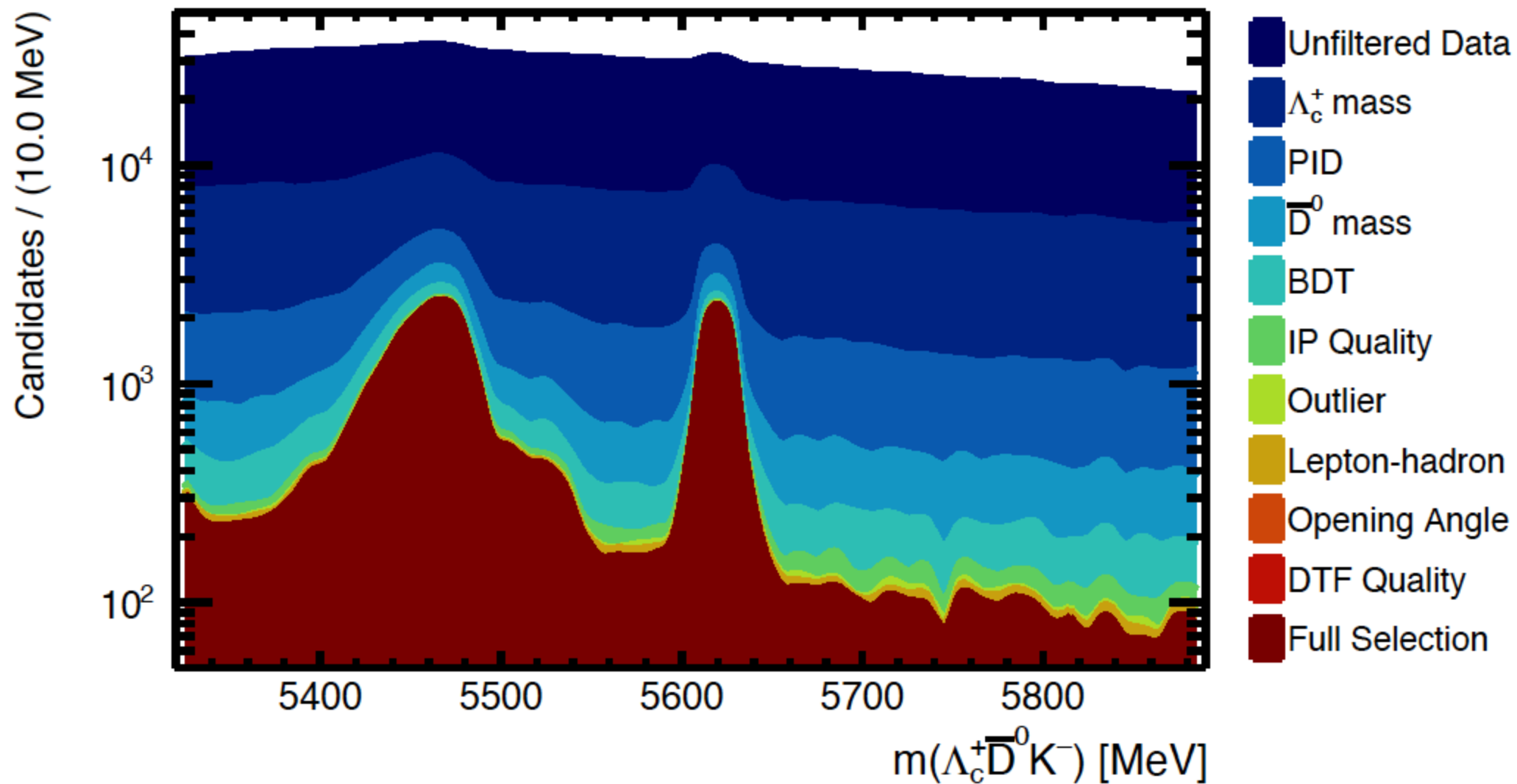
# Legend



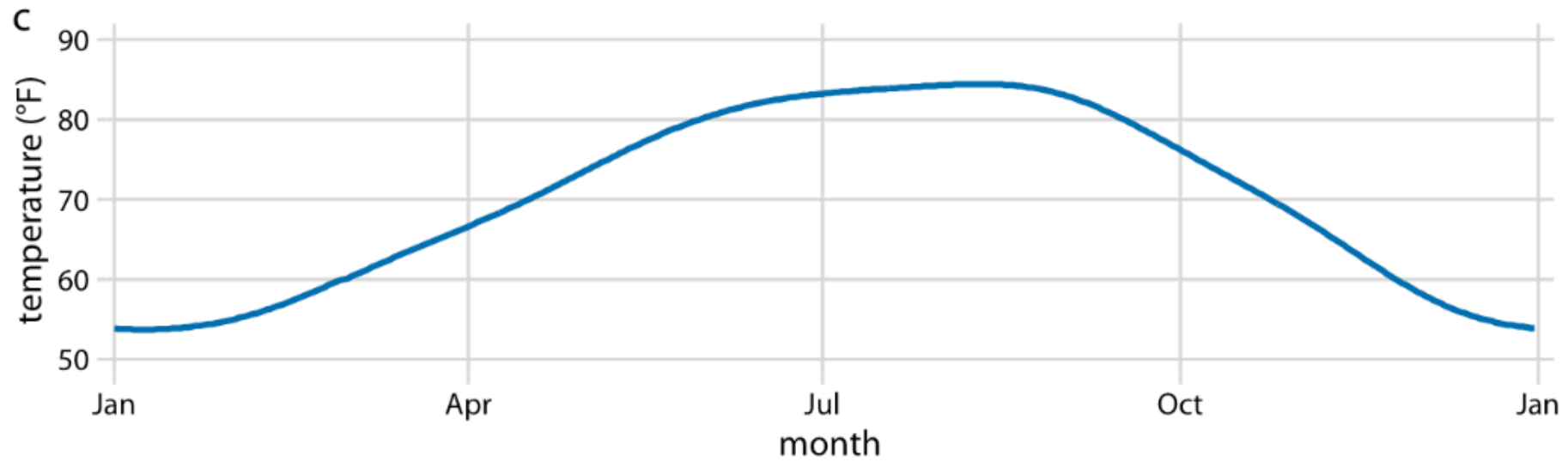
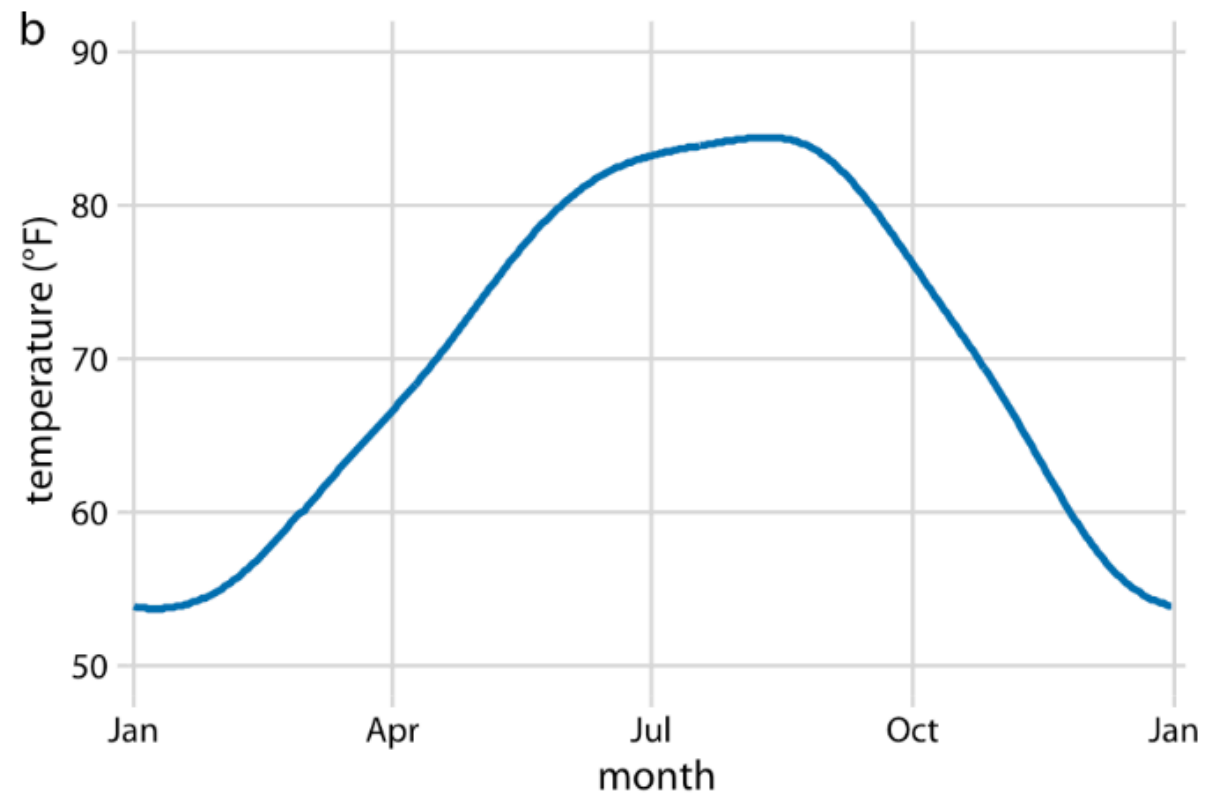
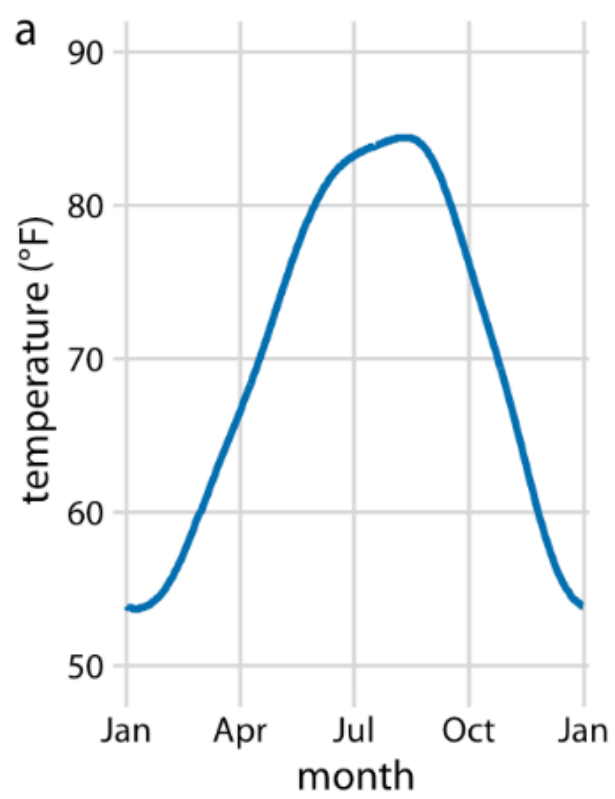
## BRICS: Growth Rate



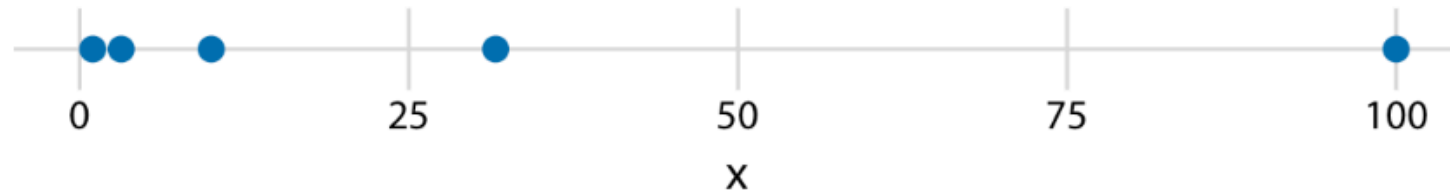




## Axis and overall Scale



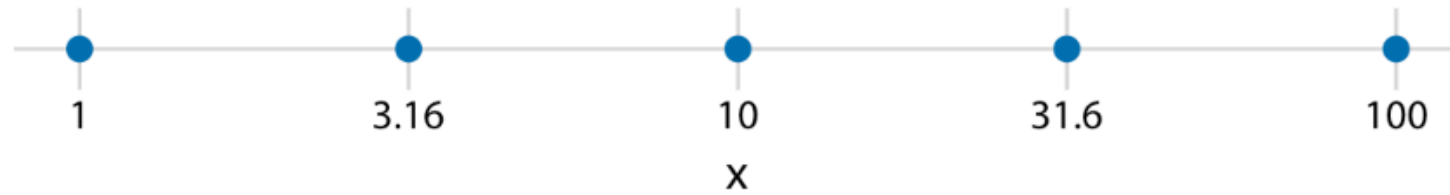
original data, linear scale



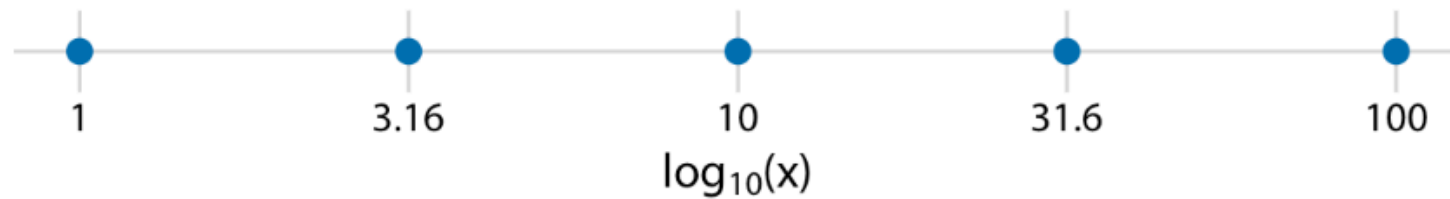
log-transformed data, linear scale



original data, logarithmic scale



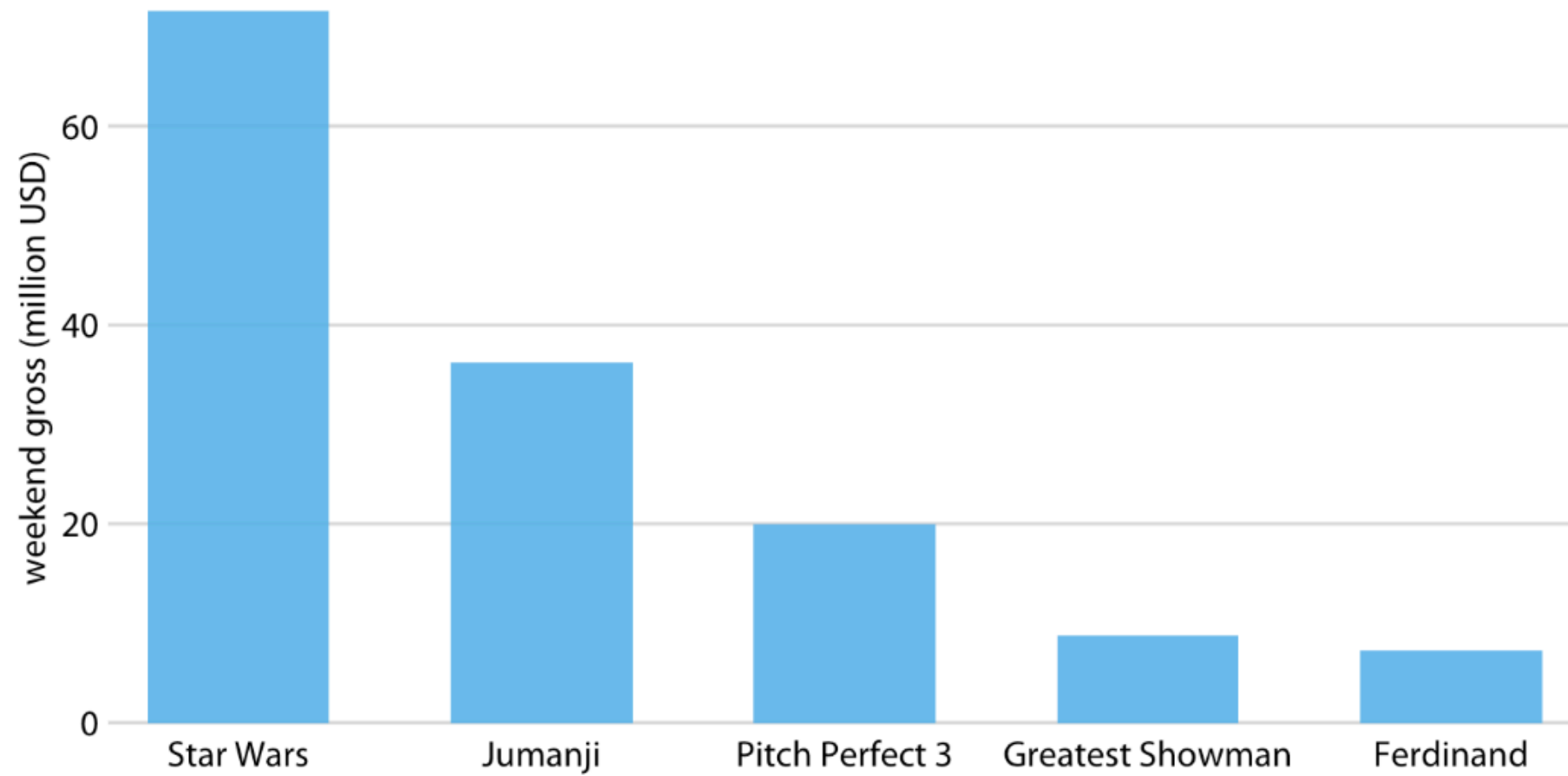
logarithmic scale with incorrect axis title



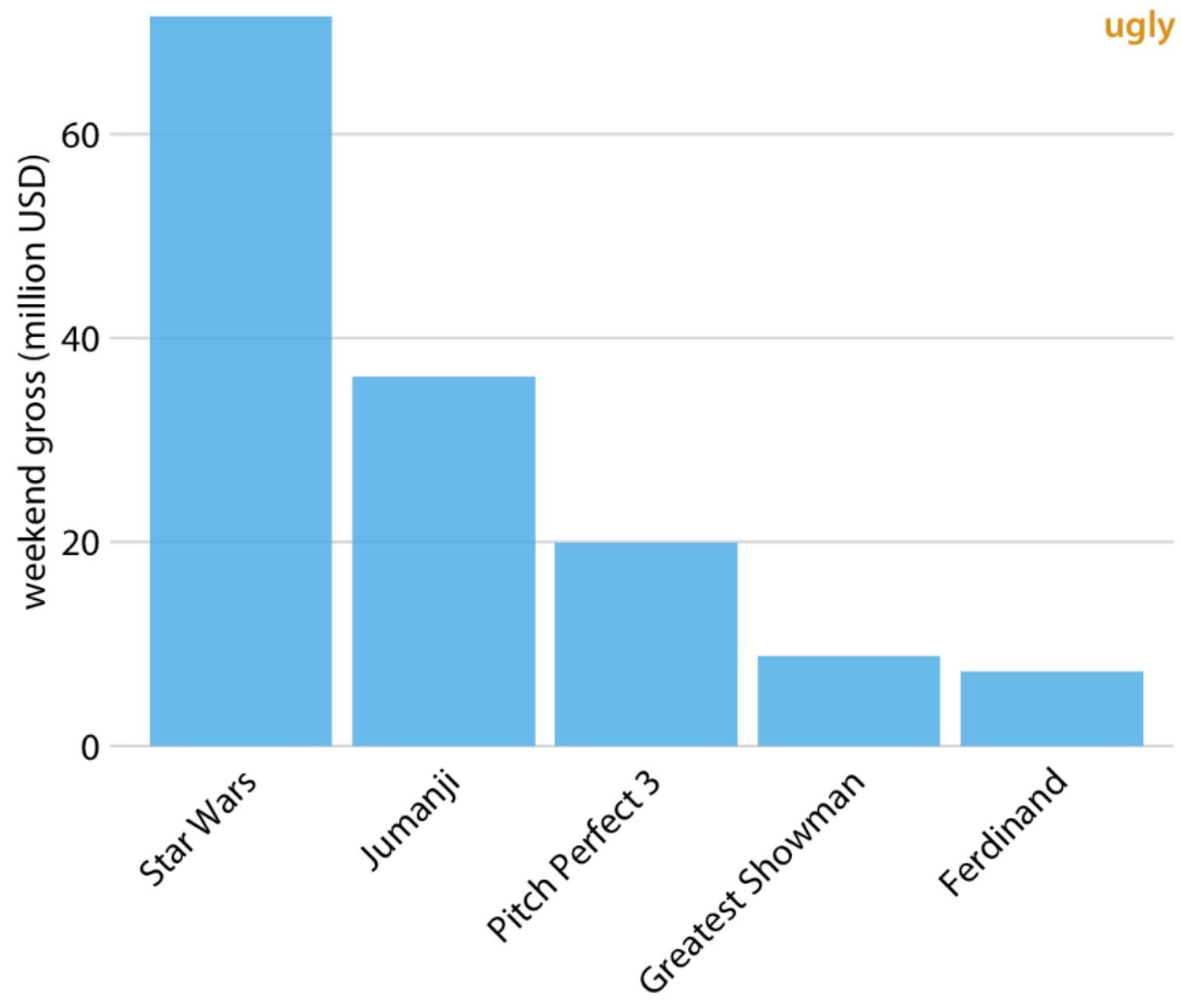
wrong

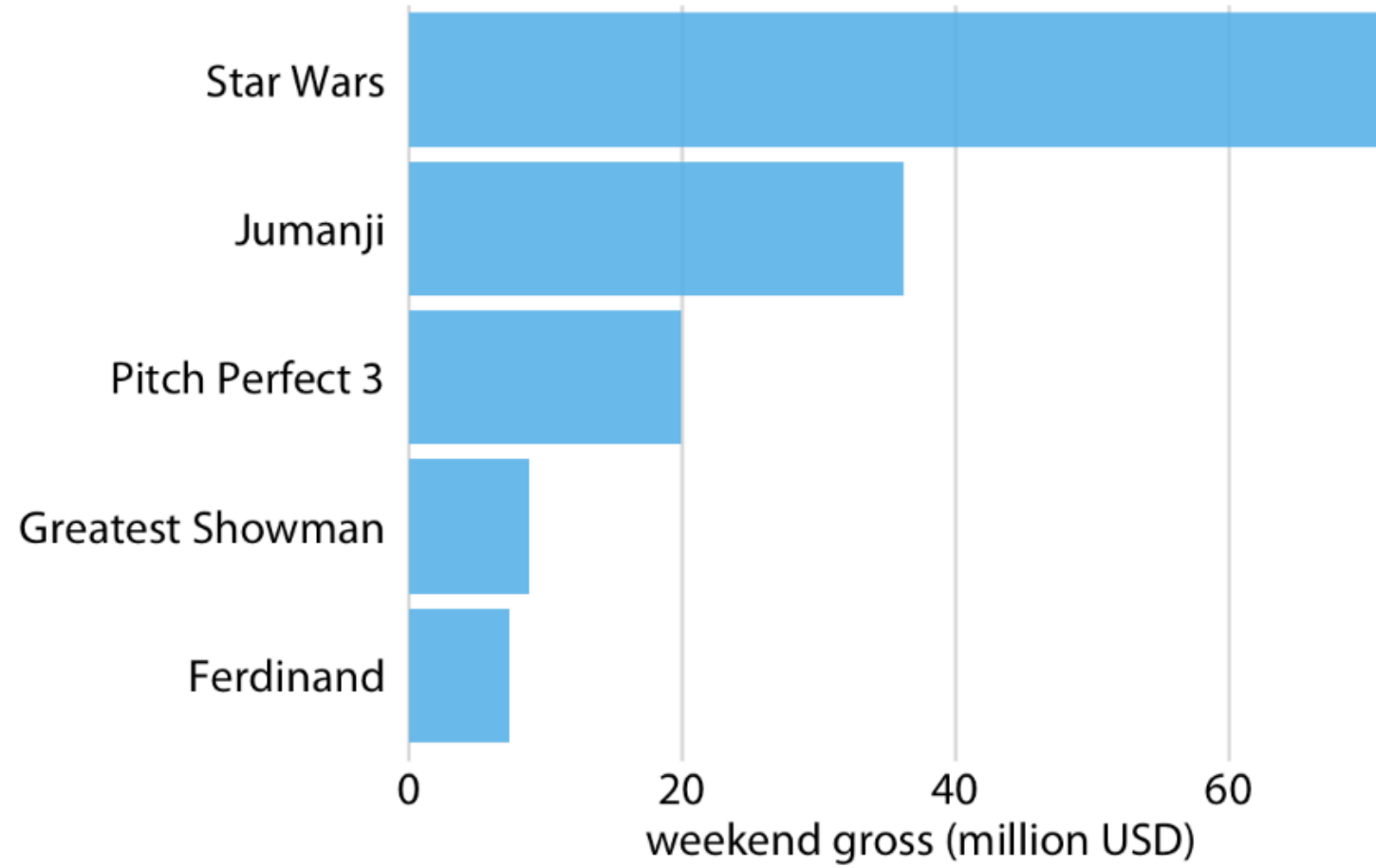
# Visualizing **Amounts**

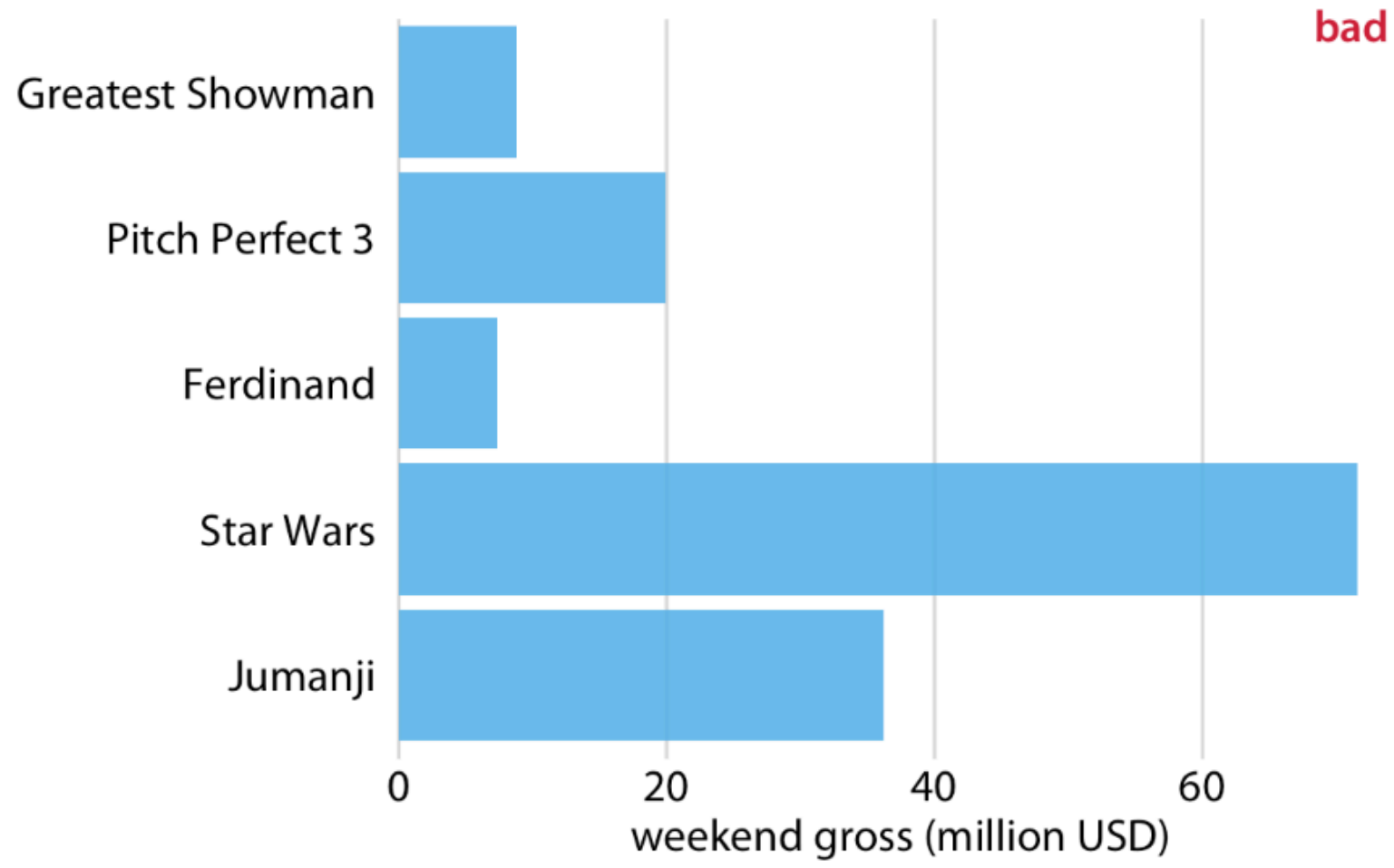
- **Bar Charts**
- **Grouped Bar Charts**
- **Stacked Bar Charts**
- **Heat Maps**

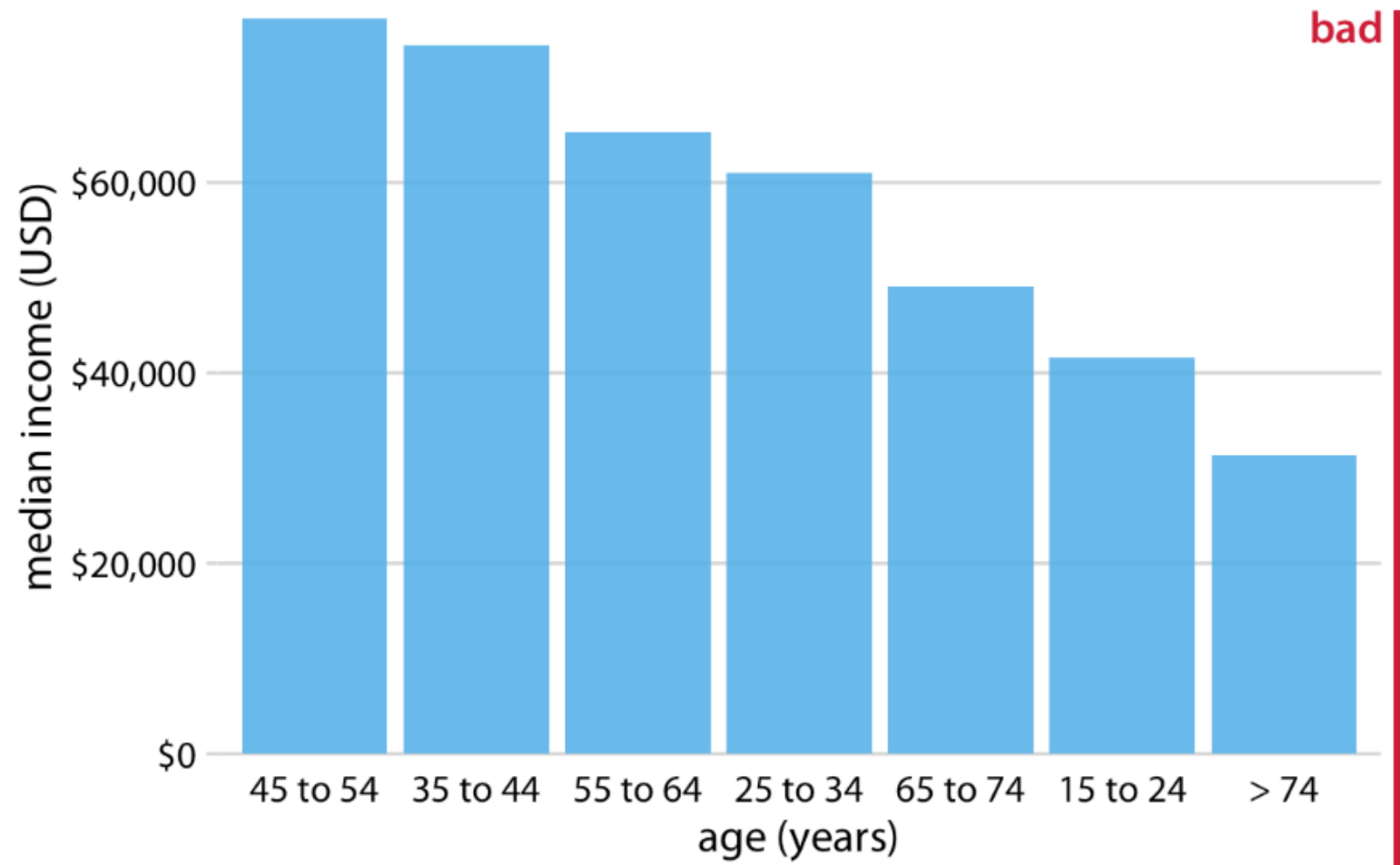


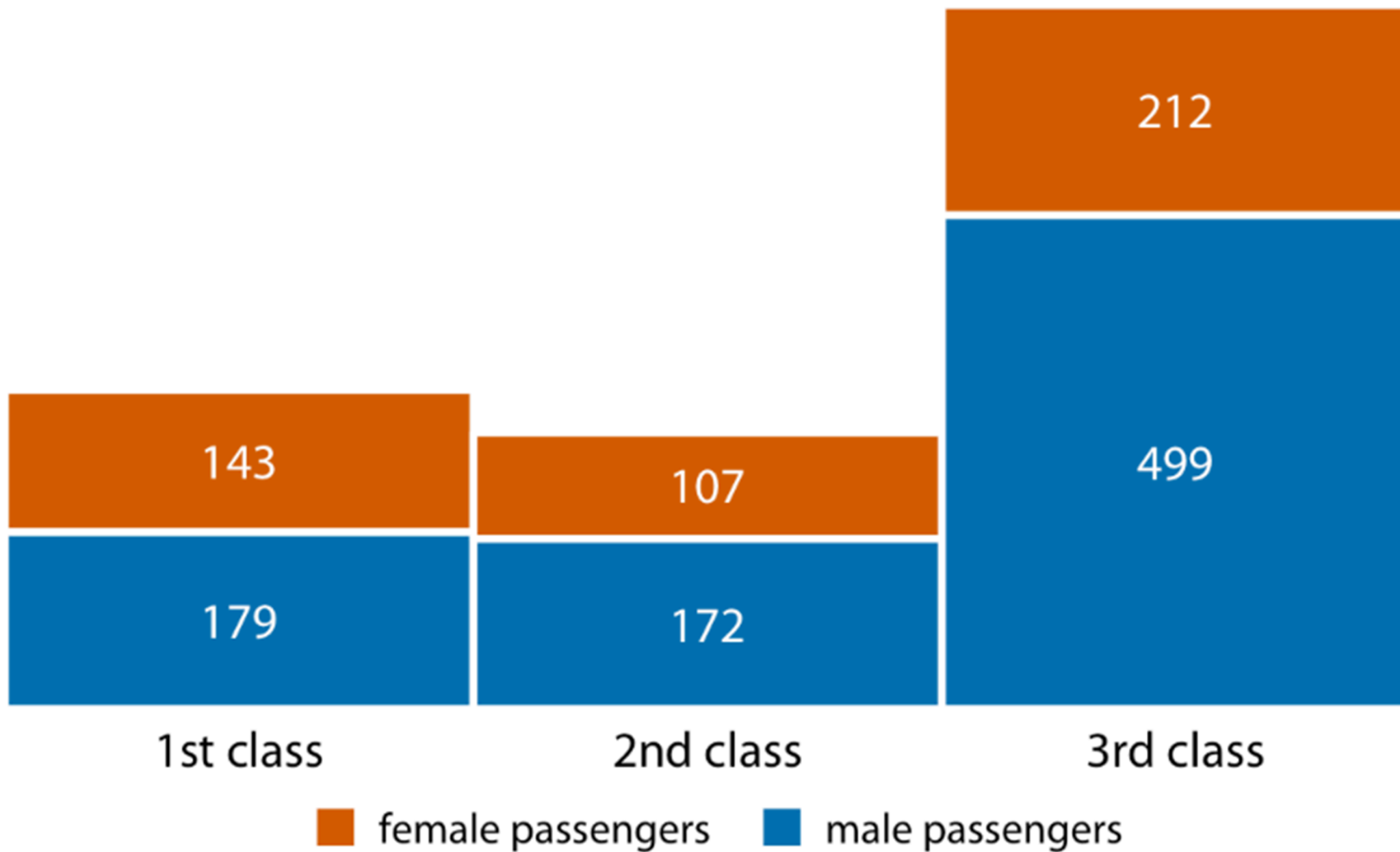


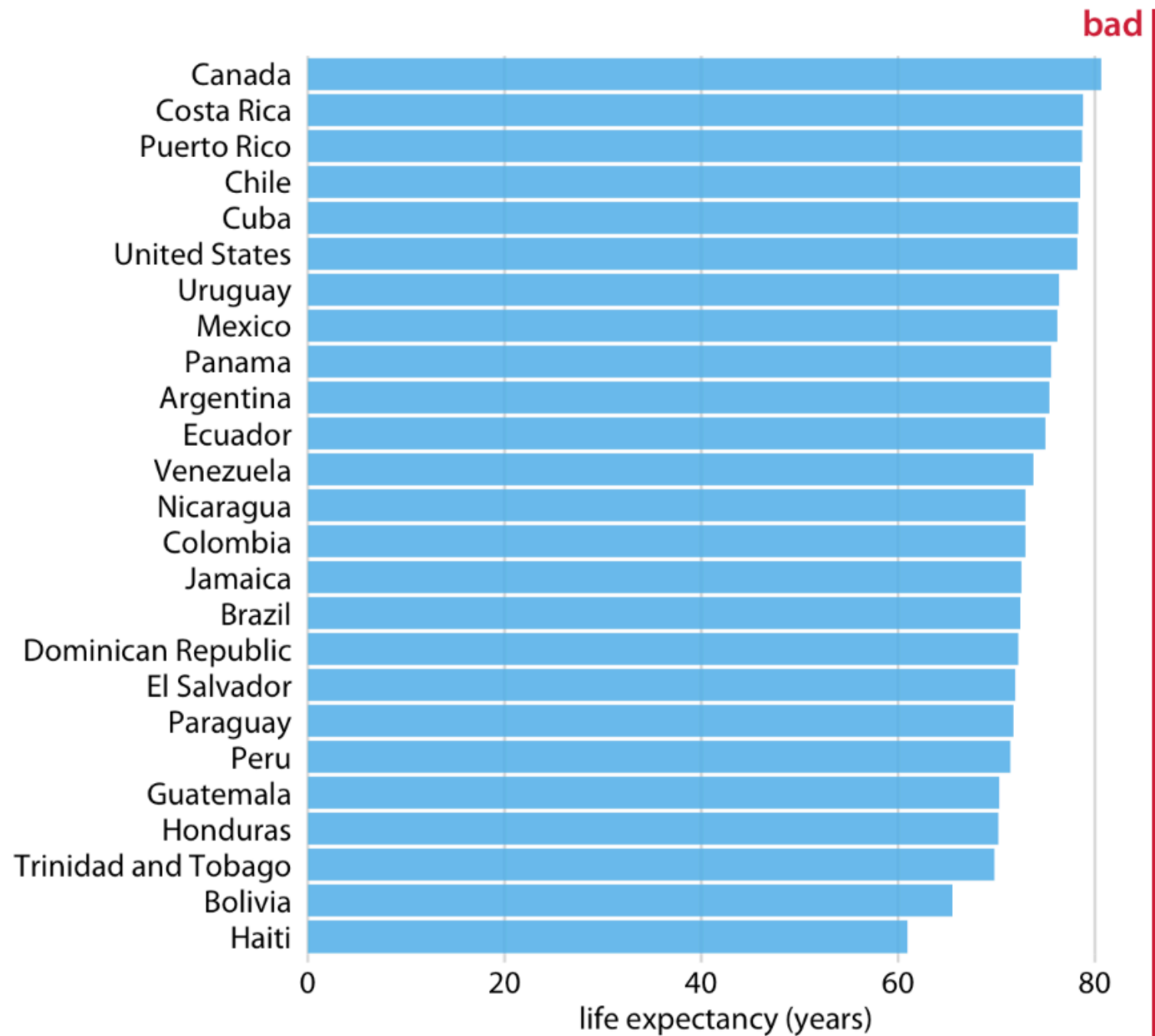


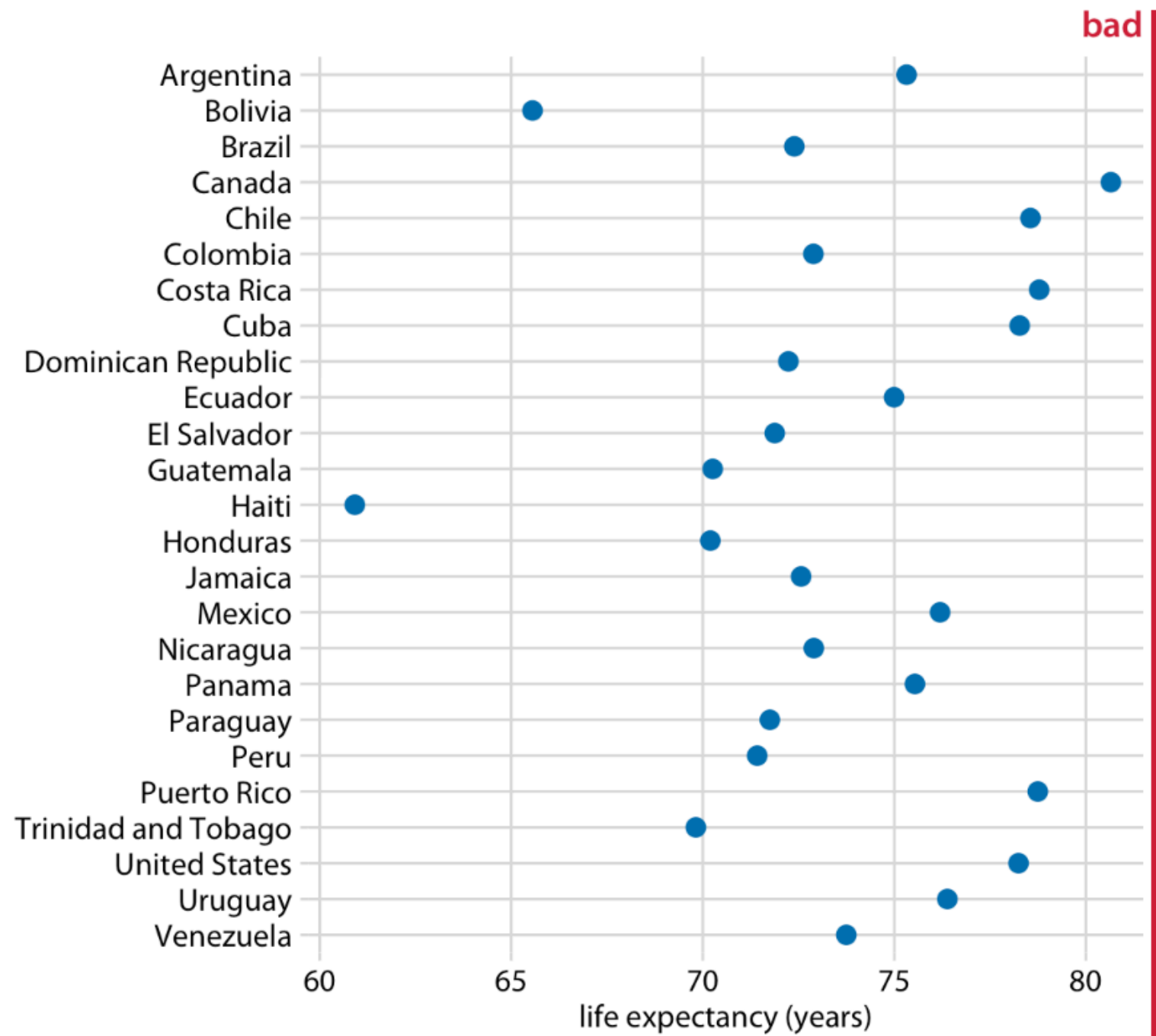


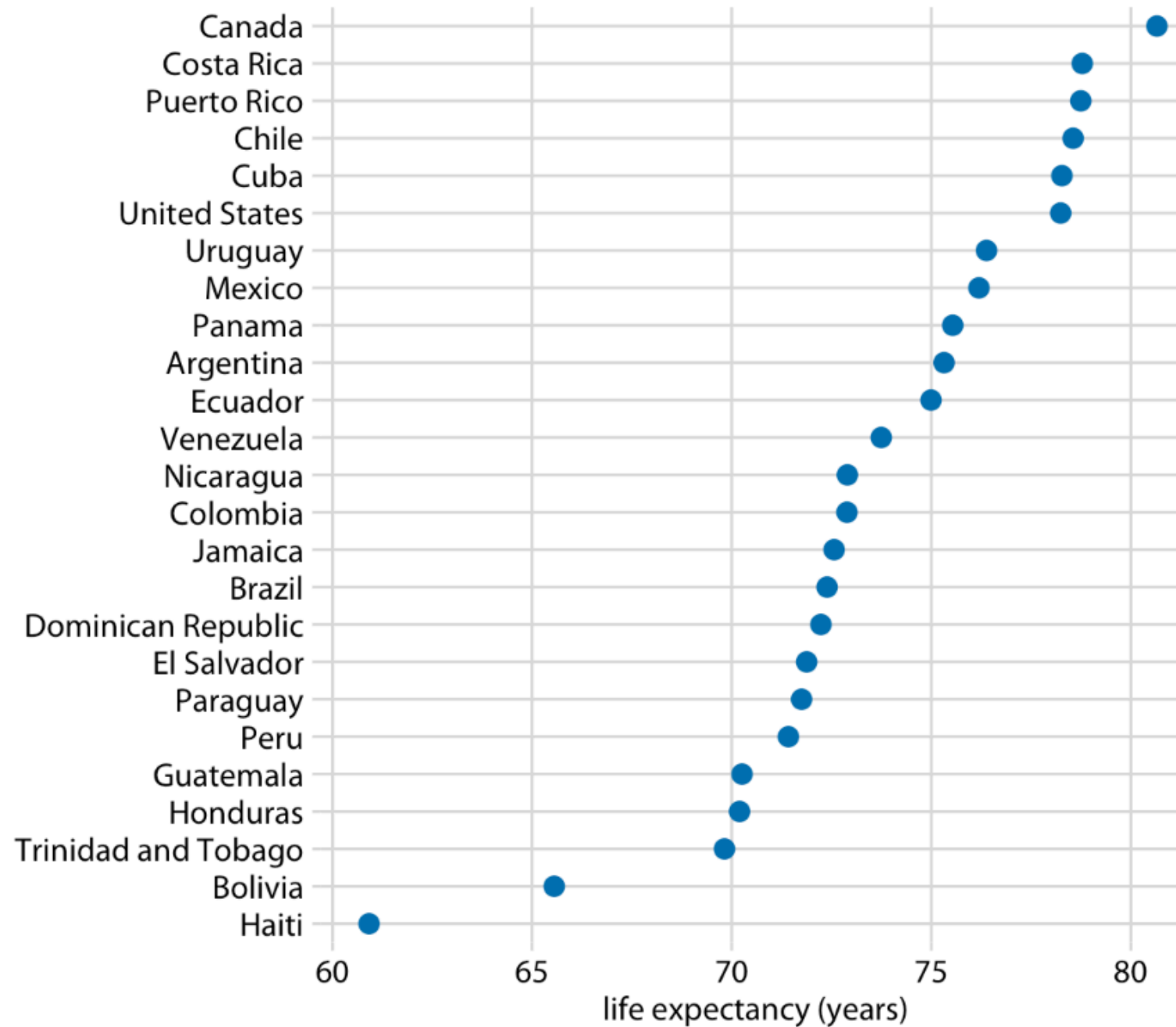




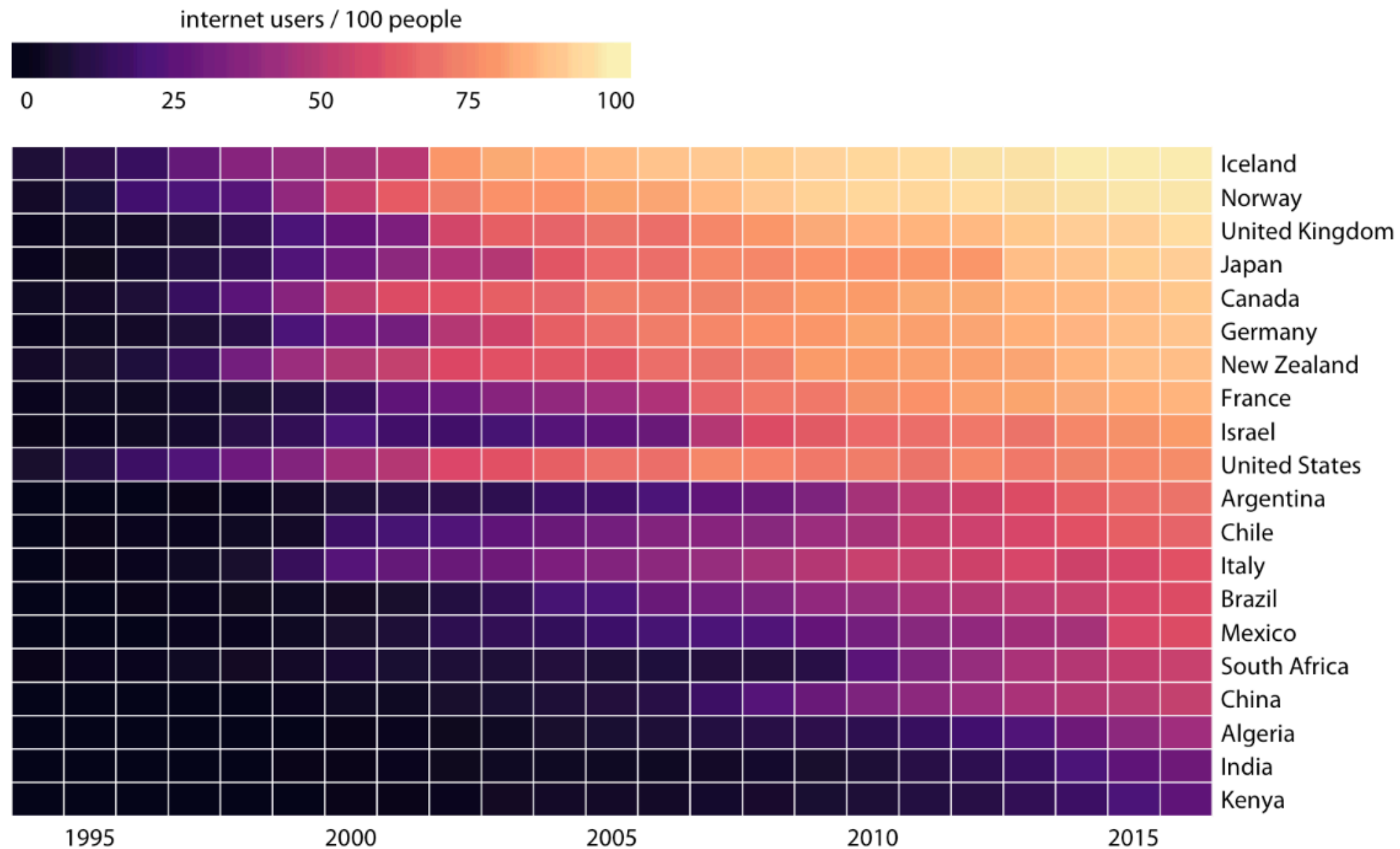




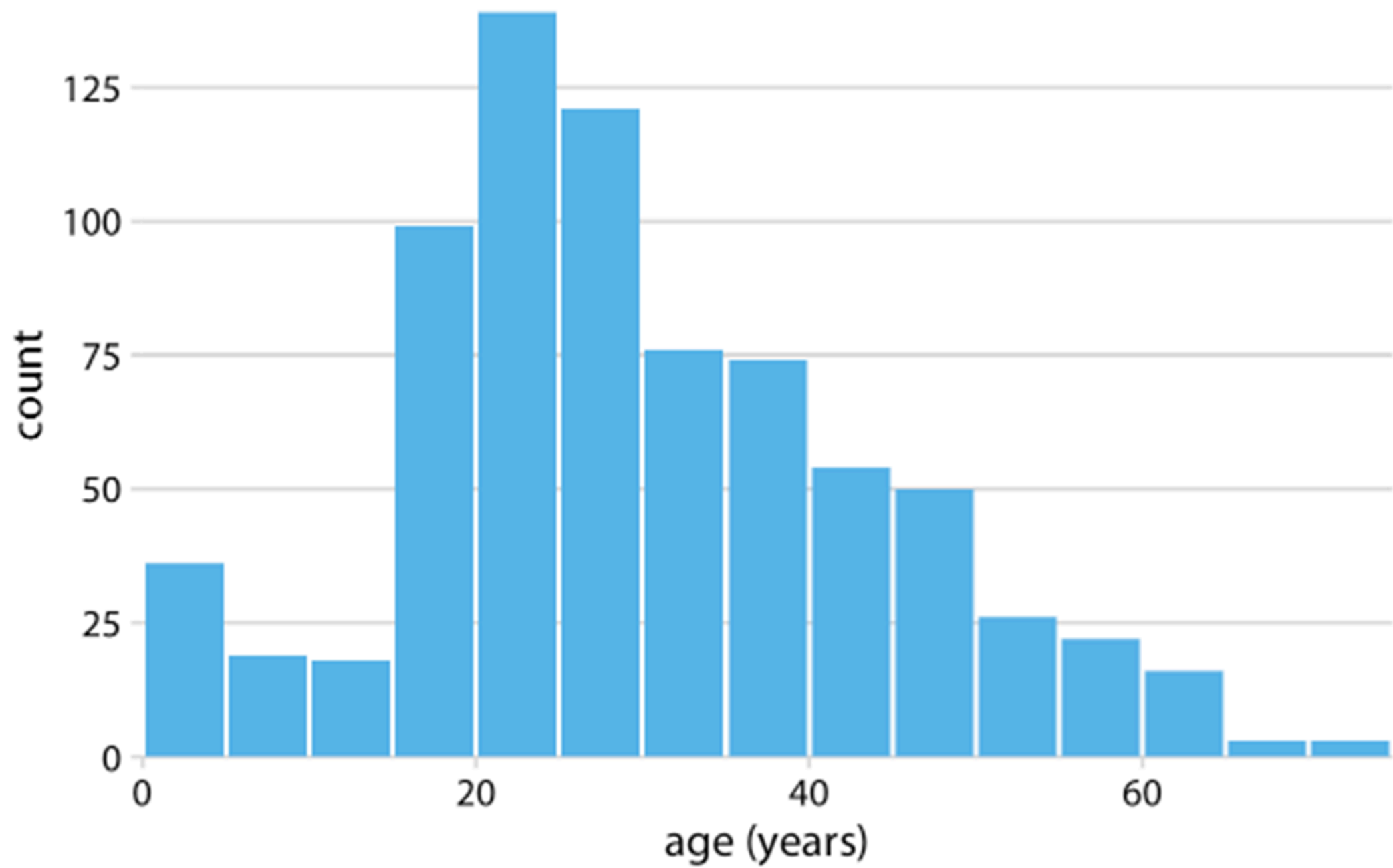


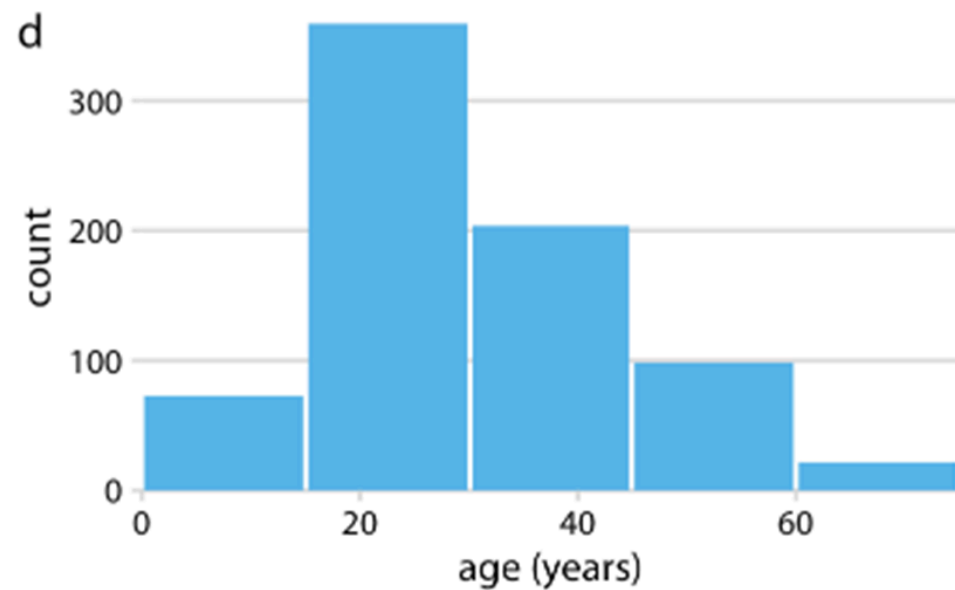
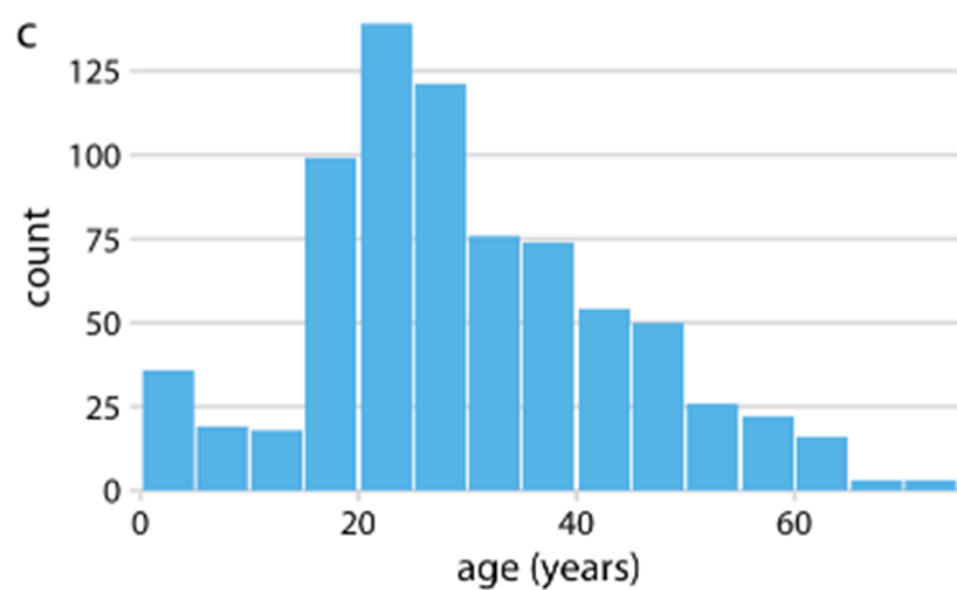
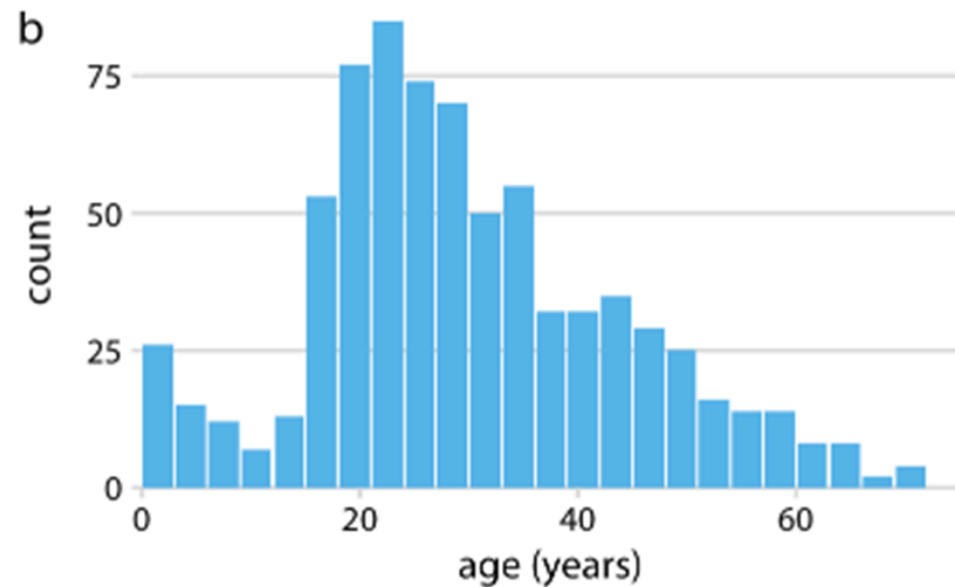
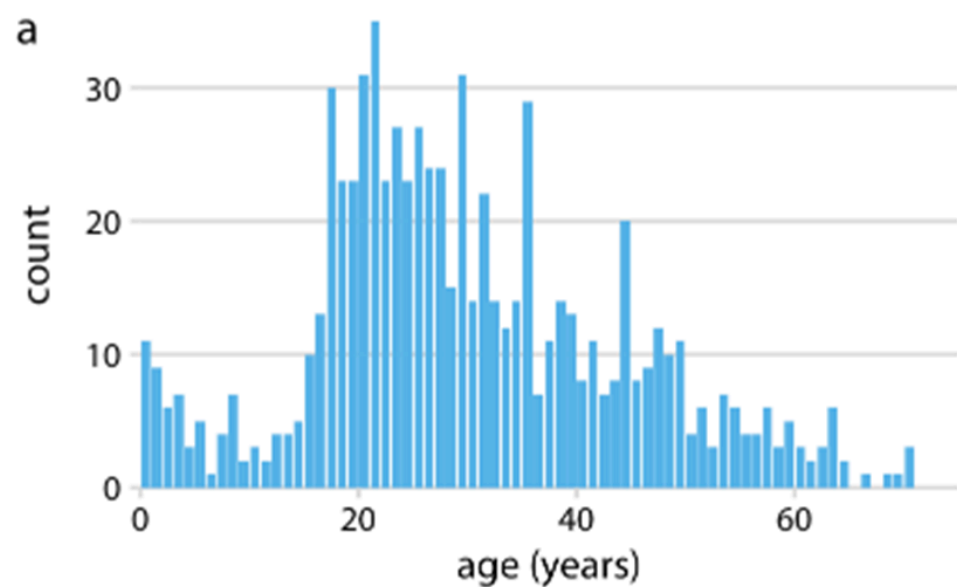


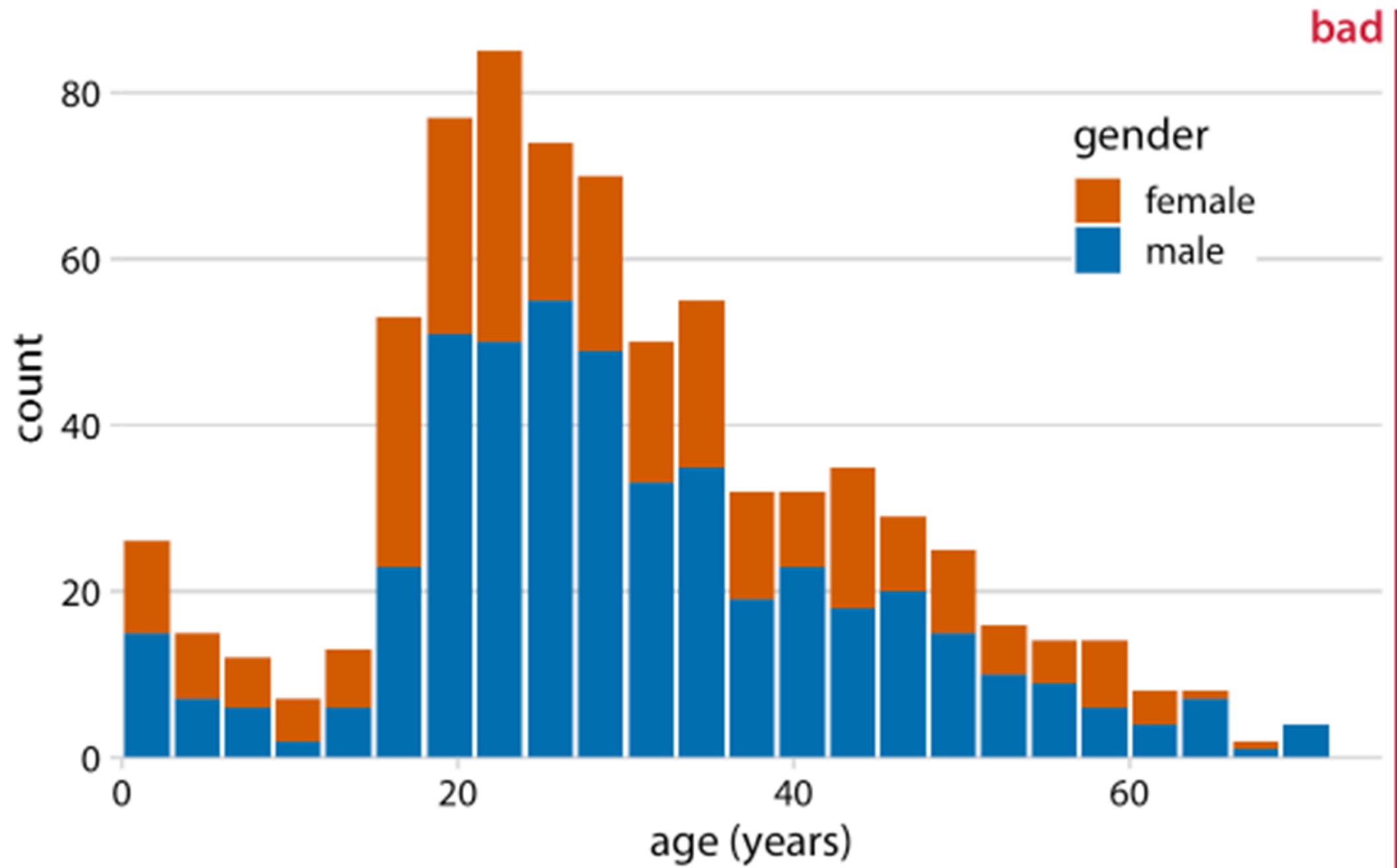




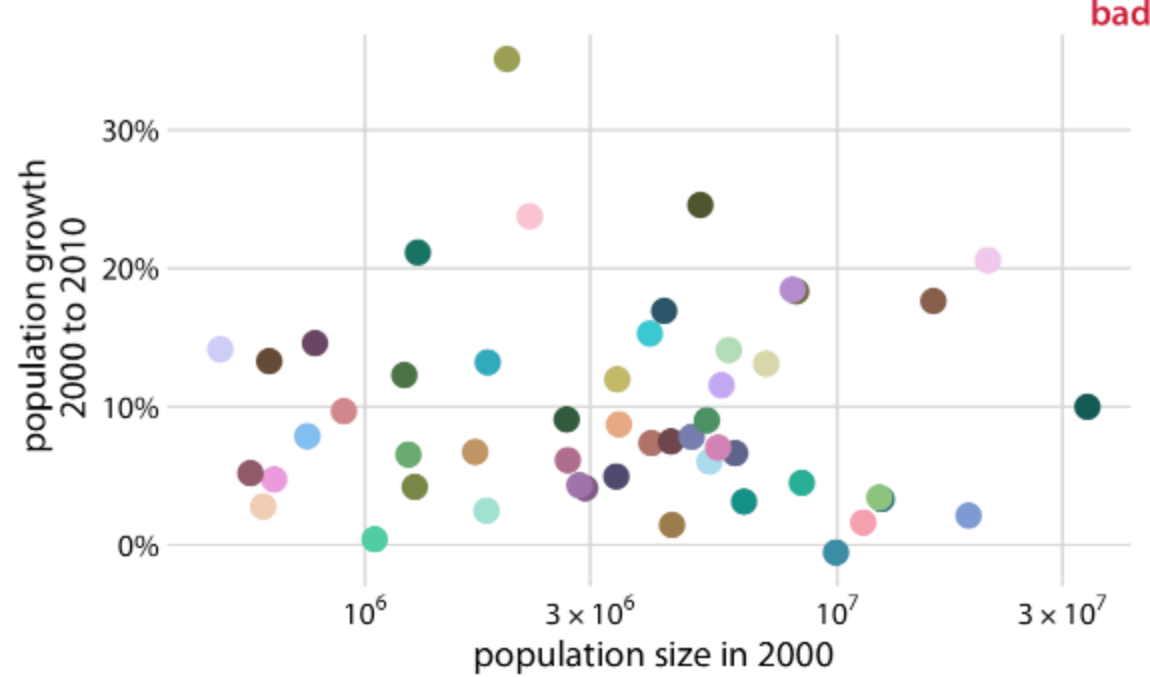
# Histograms







# Color

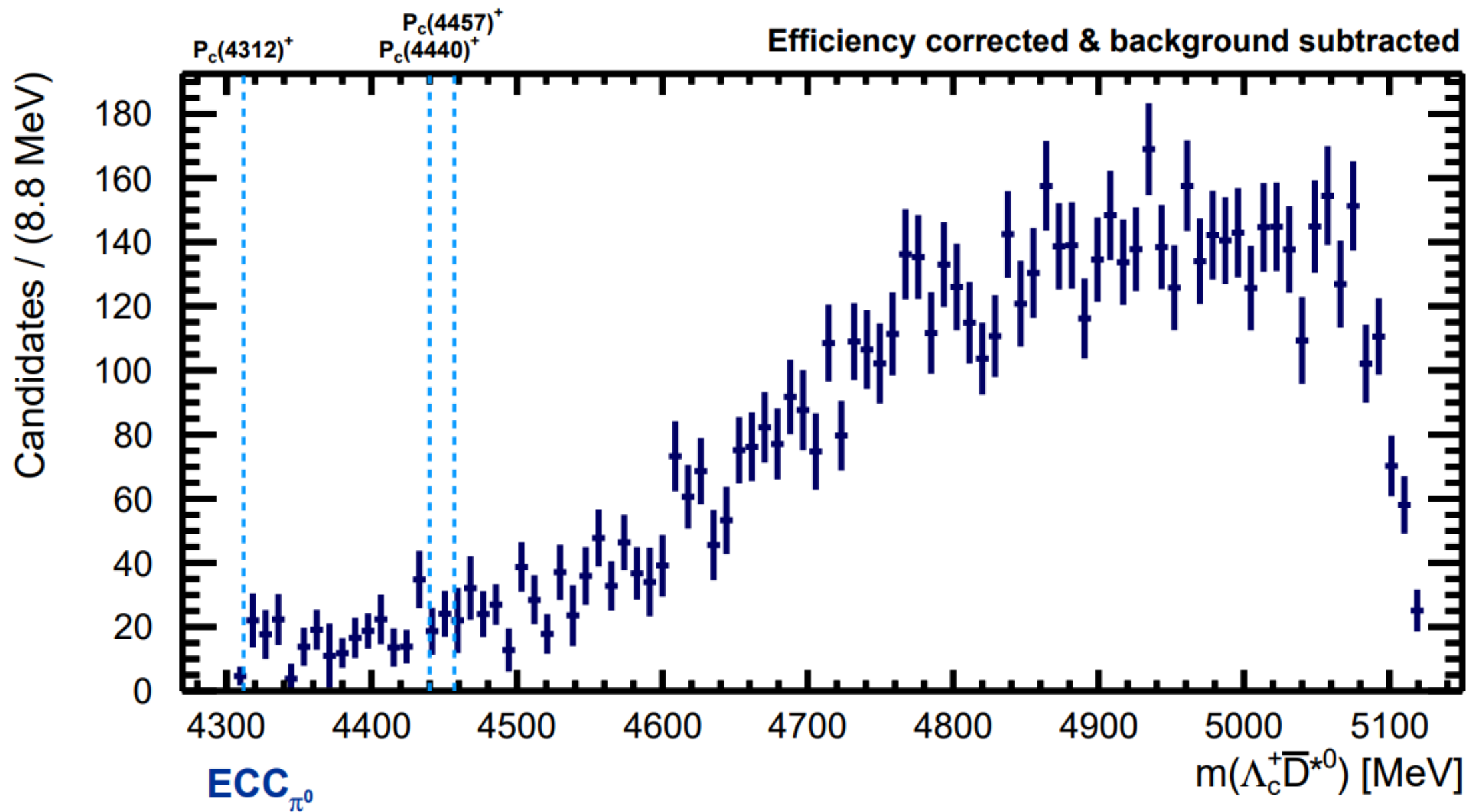


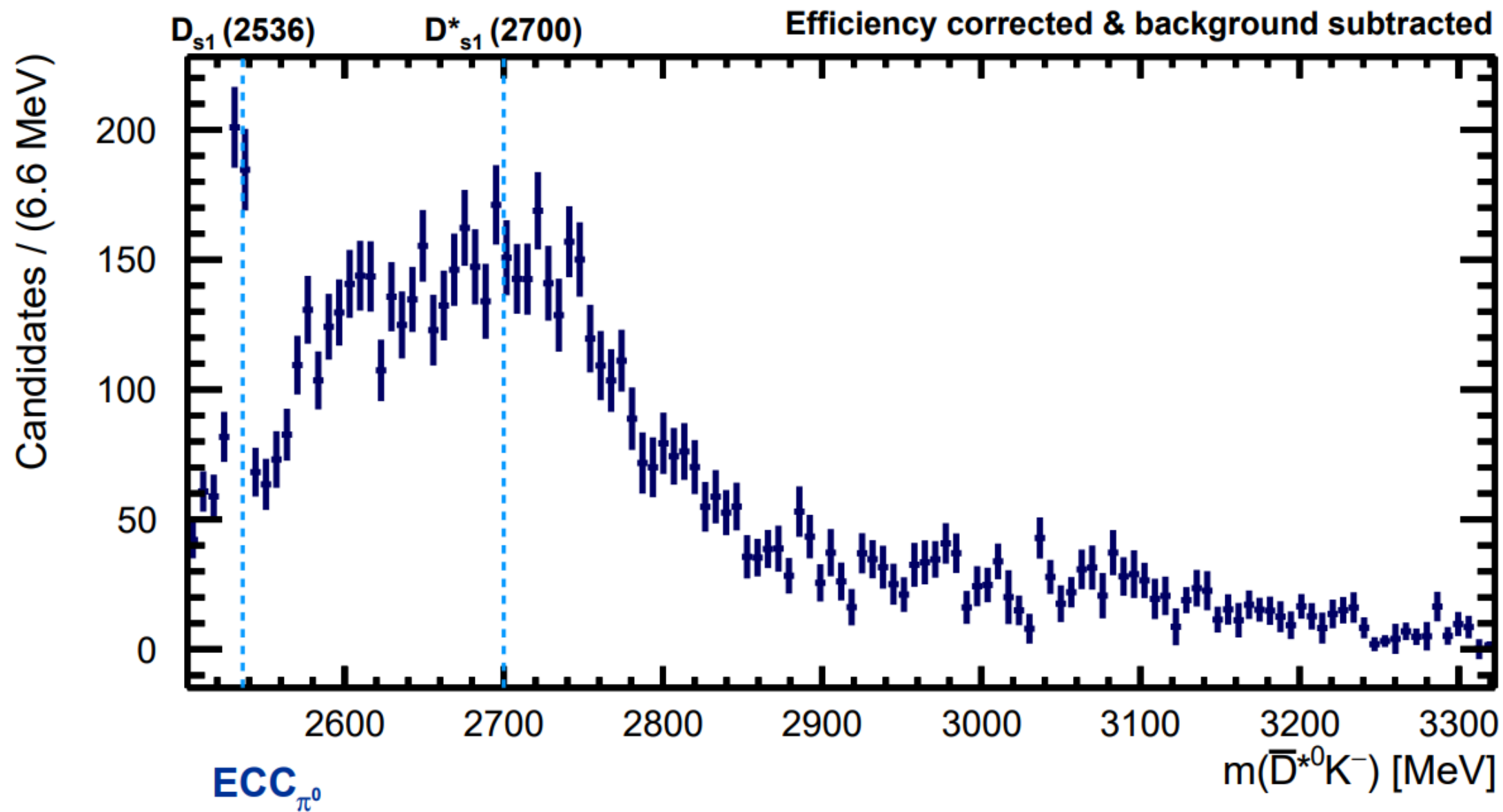
state

- |                      |                |                |
|----------------------|----------------|----------------|
| Alabama              | Kentucky       | North Dakota   |
| Alaska               | Louisiana      | Ohio           |
| Arizona              | Maine          | Oklahoma       |
| Arkansas             | Maryland       | Oregon         |
| California           | Massachusetts  | Pennsylvania   |
| Colorado             | Michigan       | Rhode Island   |
| Connecticut          | Minnesota      | South Carolina |
| Delaware             | Mississippi    | South Dakota   |
| District of Columbia | Missouri       | Tennessee      |
| Florida              | Montana        | Texas          |
| Georgia              | Nebraska       | Utah           |
| Hawaii               | Nevada         | Vermont        |
| Idaho                | New Hampshire  | Virginia       |
| Illinois             | New Jersey     | Washington     |
| Indiana              | New Mexico     | West Virginia  |
| Iowa                 | New York       | Wisconsin      |
| Kansas               | North Carolina | Wyoming        |

# Error Bars







# Anatomy of a Plot

