Grammar of Graphics intro

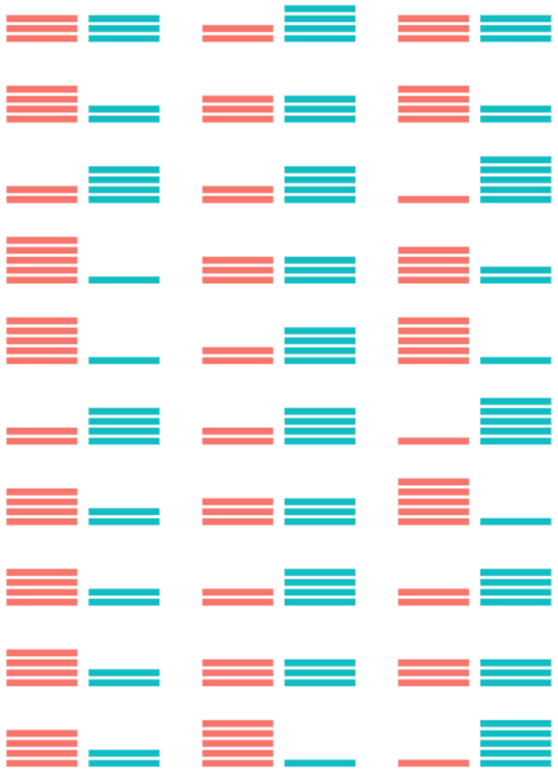
VISUALIZATION BEST PRACTICES IN R

Nick Strayer
Instructor

What is this course?

What you will learn

How to make better visualizations by thinking deeply about the data at hand.



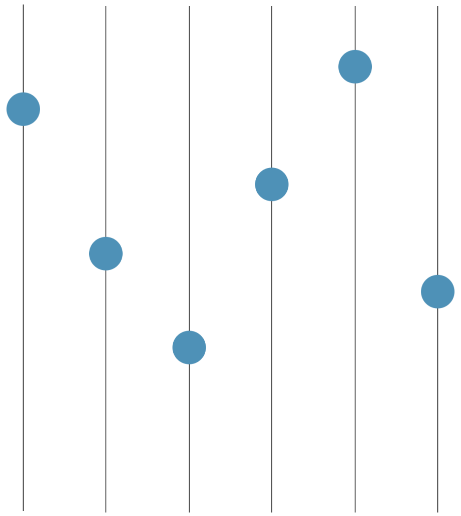
How you will learn it

- Overviews of different data types
- Standard visualizations
- Alternatives

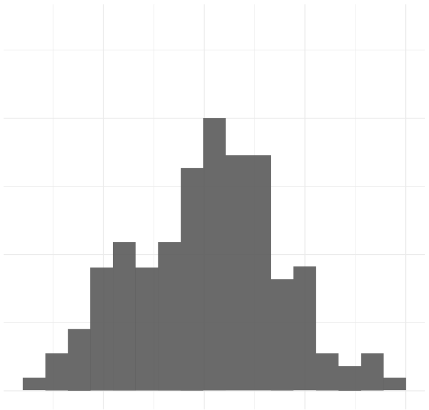
Course layout

Chapter 1: Proportions of a whole

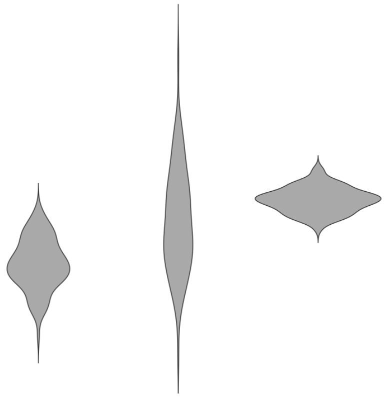
Chapter 2: Point data



Chapter 3: Single distributions



Chapter 4: Multiple(or conditional) distributions



Warning!

- Topics here are not as cut and dry as other programming topics
- Every rule will have exceptions
- An emphasis on thinking through each problem is given to help you deal with these cases when you get to them

Tools used

- R
- The 'Tidyverse'
- Ggplot2

Data used

- Comes from the World Health Organization (WHO)

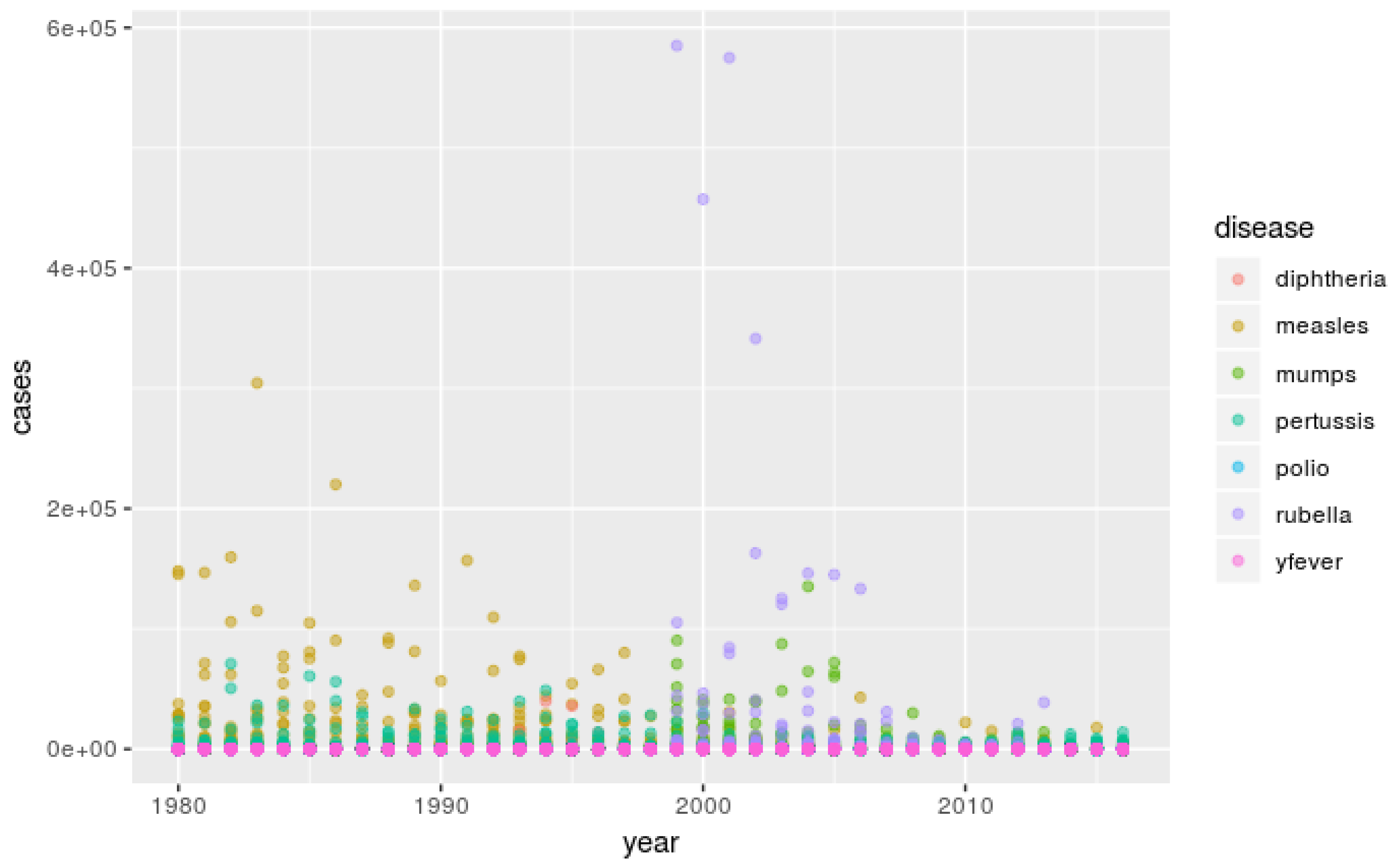
```
who_disease
```

```
# A tibble: 43,262 x 6
   region countryCode country             disease  year  cases
   <chr>  <chr>       <chr>               <chr>   <int>  <dbl>
 1 EMR    AFG         Afghanistan         measles  2016 638
 2 EUR    ALB         Albania             measles  2016  17.0
 3 AFR    DZA         Algeria             measles  2016  41.0
 4 EUR    AND         Andorra             measles  2016   0
 5 AFR    AGO         Angola              measles  2016  53.0
 6 AMR    ATG         Antigua and Barbuda measles  2016   0
 7 AMR    ARG         Argentina           measles  2016   0
 8 EUR    ARM         Armenia             measles  2016   2.00
# ... with 43,254 more rows
```

WHO disease data

```r
# Filter to AMR region
amr_region <- who_disease %>%
  filter(region == 'AMR')

# Map x to year and y to cases, color by disease
ggplot(amr_region, aes(x = year, y = cases, color = disease)) +
  geom_point(alpha = 0.5)
```


6e+05
4e+05
2e+05
0e+00
cases
1980
1990
2000
2010
year
disease
diphtheria
measles
mumps
pertussis
polio
rubella
yfever

Let's practice!

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The pie chart and its friends

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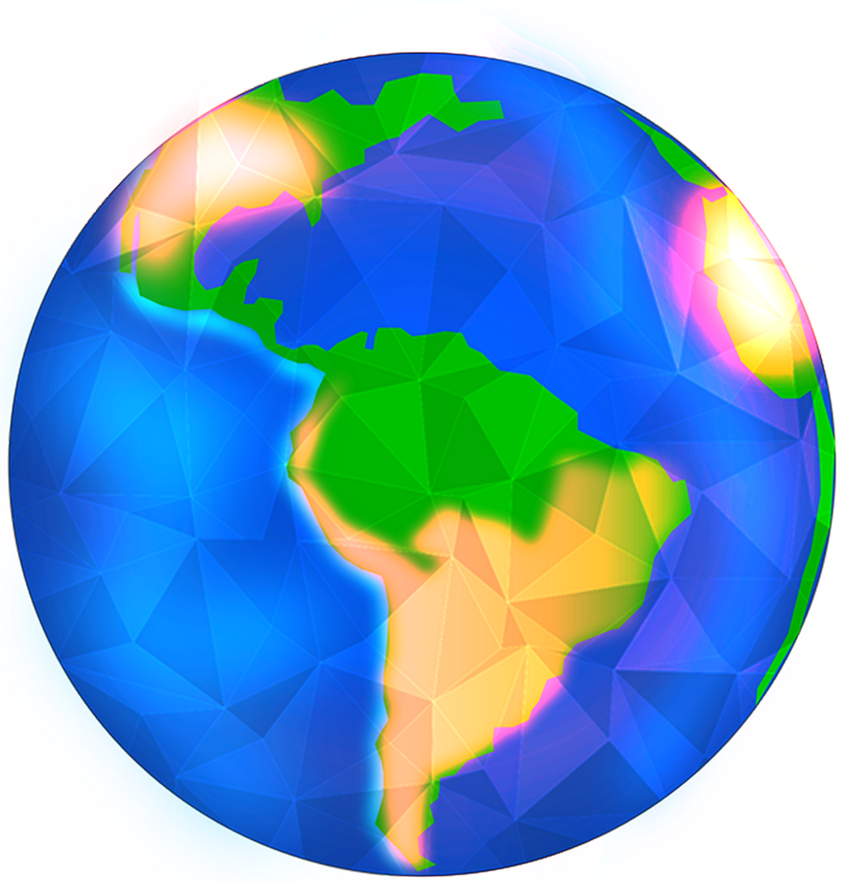
What is a proportion?

- Parts making up a whole
- Often used to understand population

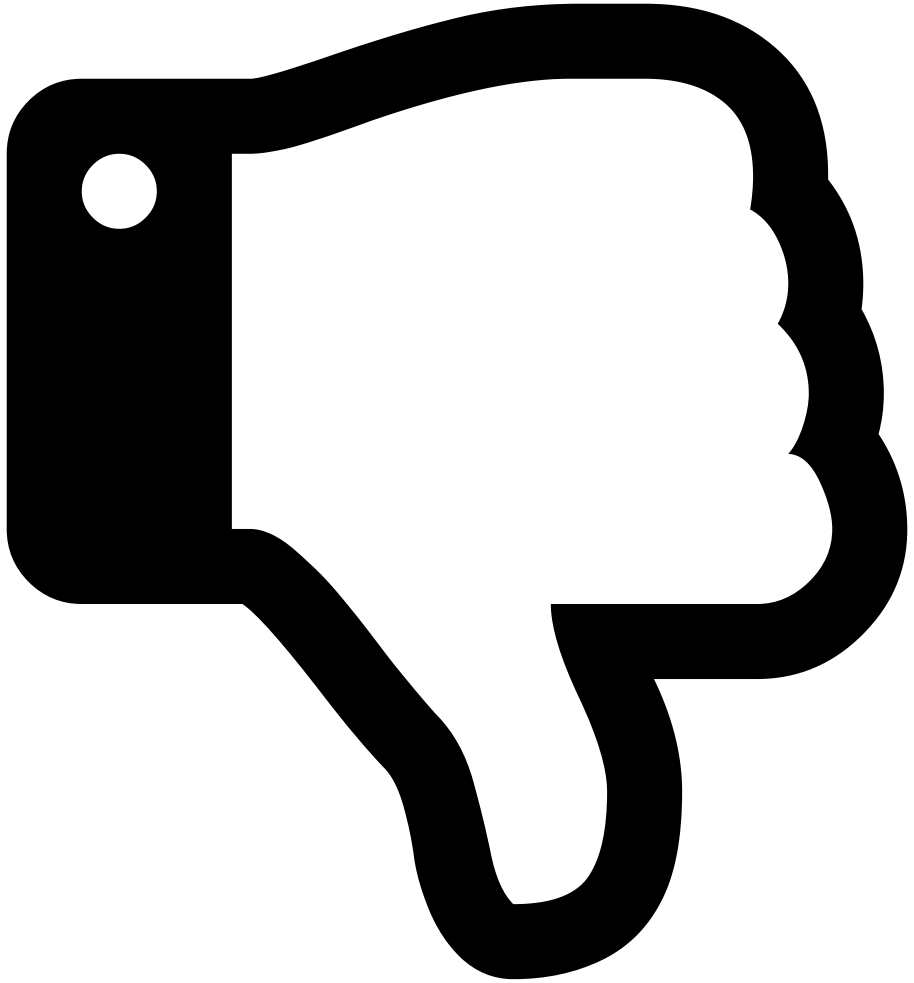


The pie chart

- Often the first technique people learn
- Also, the first technique people learn to dislike
- Dislike is not *entirely* warranted

A sour pie

- Pie charts are not very precise
  - Data encoded in angles
- Doesn't handle lots of classes well
  - After three slices it becomes hard to compare

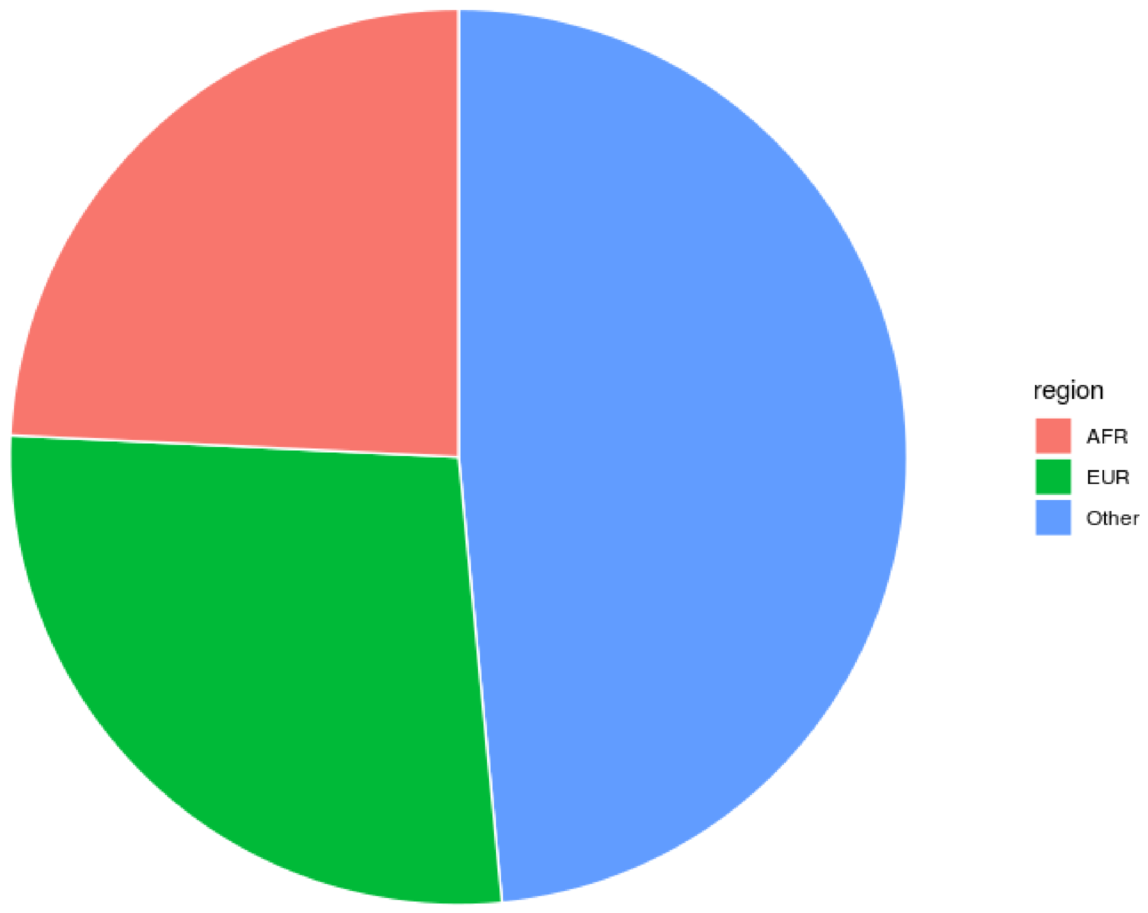


A sweet pie

- Intuitive and compact

```
who_disease %>%
  mutate(
    region = ifelse(
      region %in% c('EUR', 'AFR'),
      region, 'Other')
  ) %>%
  ggplot(aes(x = 1, fill = region)) +
    geom_bar(color = 'white') +
    coord_polar(theta = "y") +
    theme_void()
```

Proportion of observations by region.



The waffle chart

- More precise than pie charts
- Encode data in area, not angles

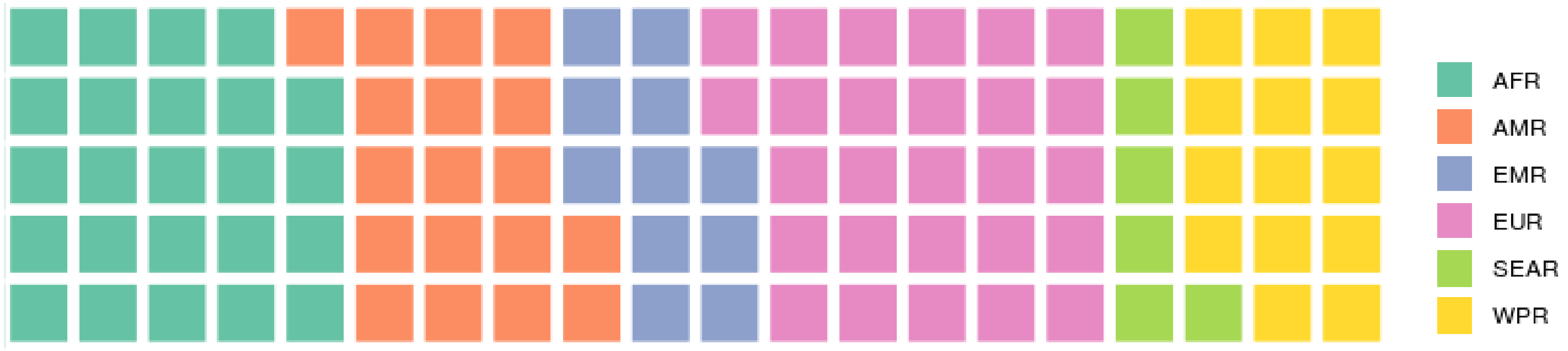
```
obs_by_region <- who_disease %>%
  group_by(region) %>% summarise(num_obs = n()) %>%
  mutate(percent = round(num_obs/sum(num_obs)*100))

# Array of rounded percentages
percent_by_region <- obs_by_region$percent
names(percent_by_region) <- obs_by_region$region

# Send array of percentages to waffle plot function
waffle::waffle(percent_by_region, rows = 5)
```

The waffle chart

Proportion of observations by region.



Let's practice!

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Comparing multiple populations

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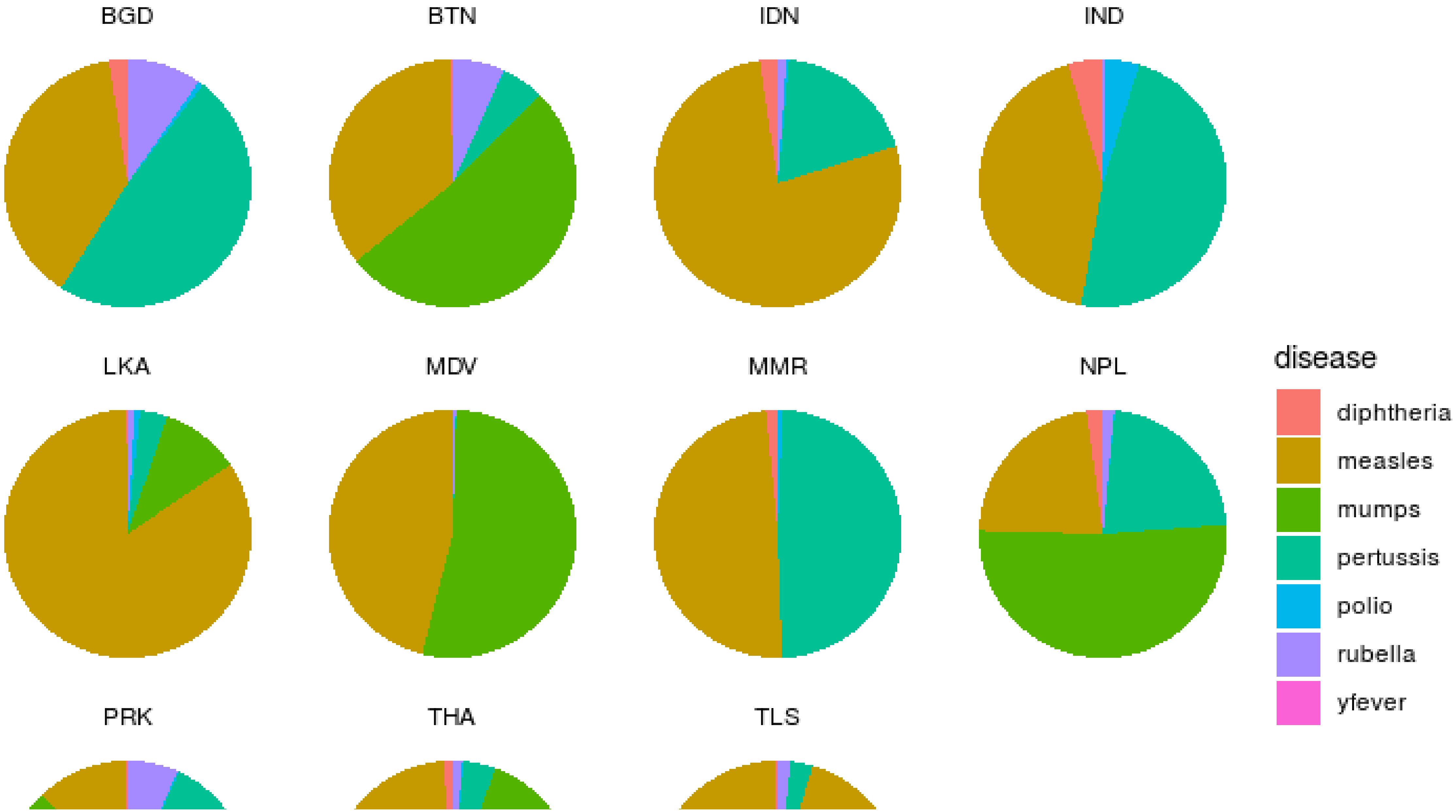
Why not use faceting?

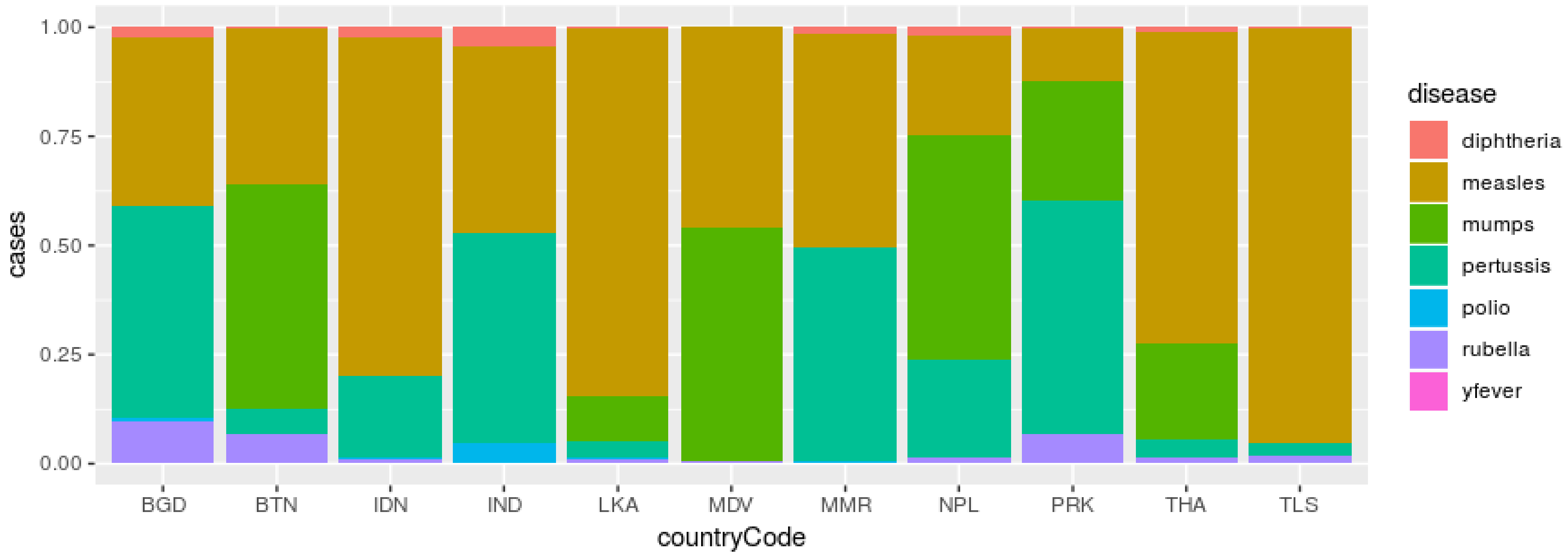
- Almost impossible to compare



The stacked bar chart

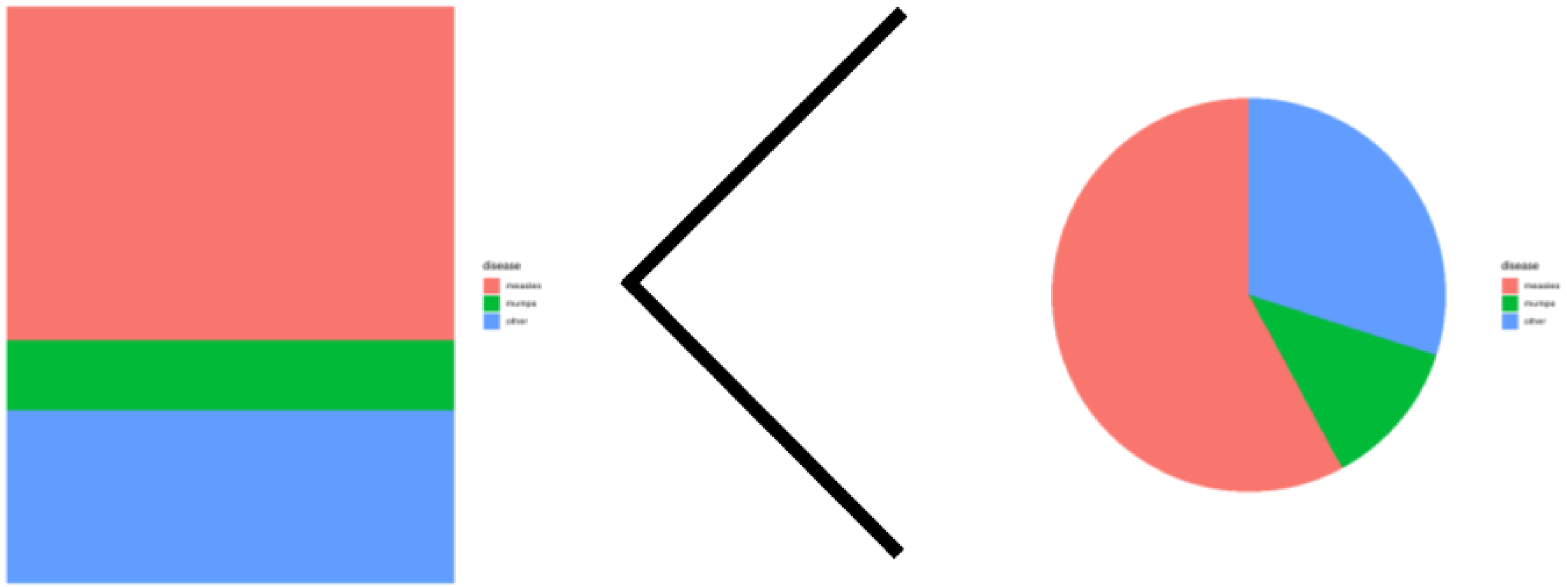
- Allow each population to share the same y-axis
- Enables easier comparisons based on vertical position/size

```
who_disease %>%
  filter(region == 'SEAR') %>%
  ggplot(aes(x = countryCode, y = cases, fill = disease)) +
    geom_col(position = 'fill')
```



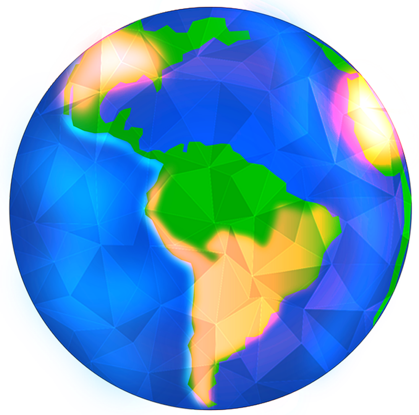
Caveats

- Worse in isolation than pie or waffle charts
- Accuracy degrades rapidly after 3 classes

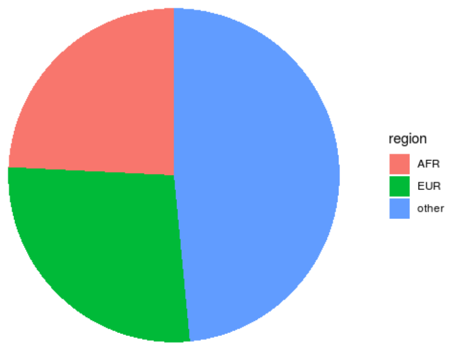


Chapter recap

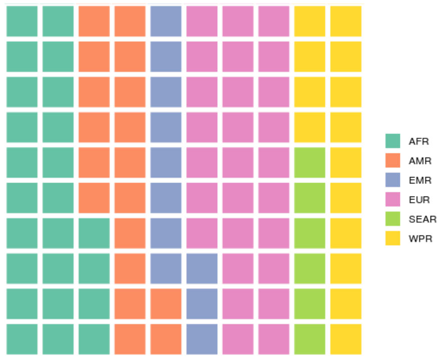
Proportions:



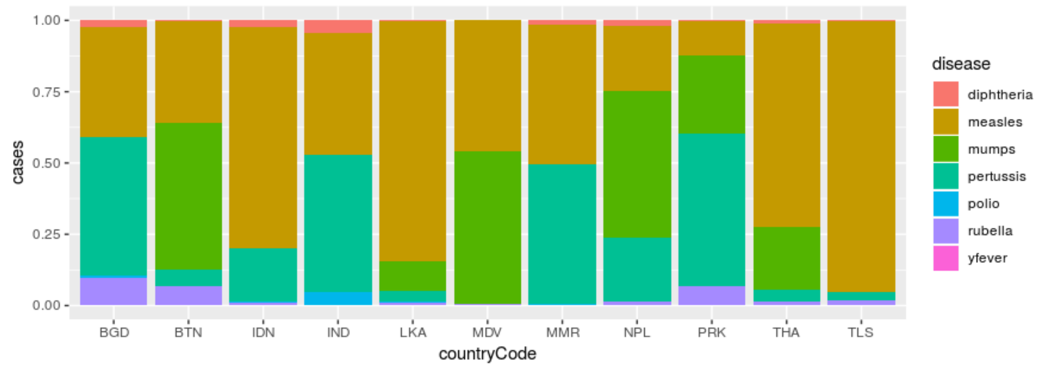
Pie charts:



Waffle charts:



Stacked bars:



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