Visualizing Temporal Data

Riccardo Pucella

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Temporal data

Definition: data index by time

- show the evolution of various measures over time
- (if not, then can treat time like any other measure)

Why?

- reveal patterns
- tell a *story*

Line Charts

Knee-jerk go-to visualization

- X axis: time (independent axis)
- Y axis: dependent measure(s)

Highly granular data:

- plot individual points, let curve emerge
- otherwise interpolate the curve
  - straight lines
  - smooth curve (differentiable)

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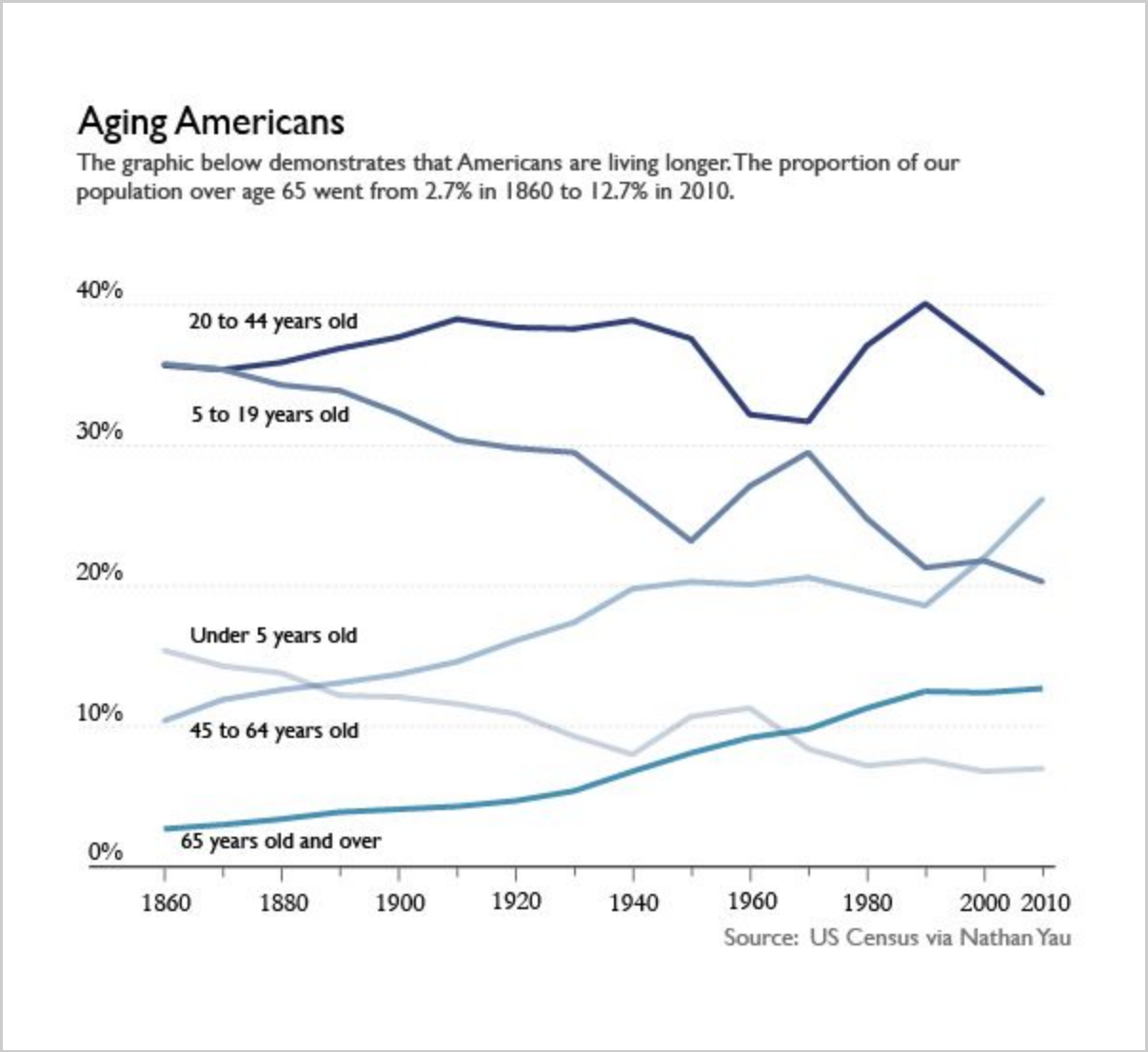
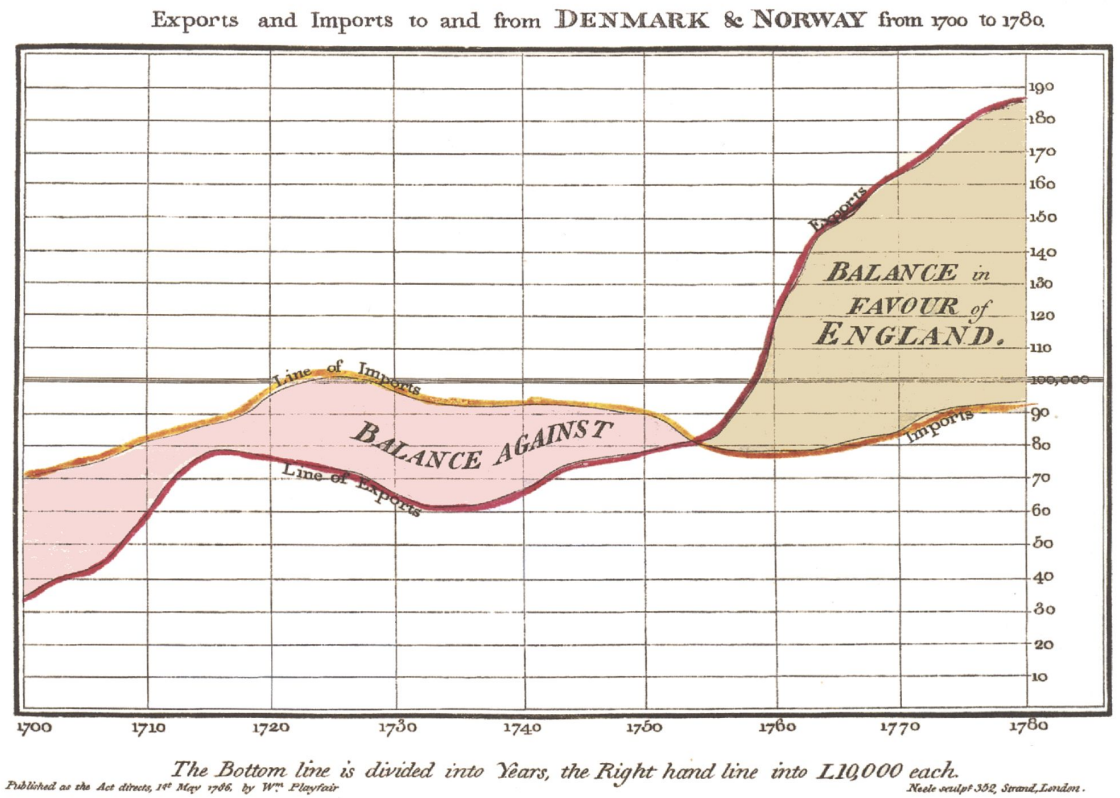

Aging Americans
The graphic below demonstrates that Americans are living longer. The proportion of our population over age 65 went from 2.7% in 1860 to 12.7% in 2010.
40%
30%
20%
10%
0%
20 to 44 years old
5 to 19 years old
Under 5 years old
45 to 64 years old
65 years old and over
1860
1880
1900
1920
1940
1960
1980
2000
2010
Source: US Census via Nathan Yau

Line Charts

Differences between lines may have significance if one is above the other



Stacked Area Charts

Like line charts, but show cumulative totals for each category

- part-of-whole information about categories
- can see the evolution of ratios
- but harder to see absolute values

Y axis:

- Percentage (total normalized to 100%)
- Absolute values

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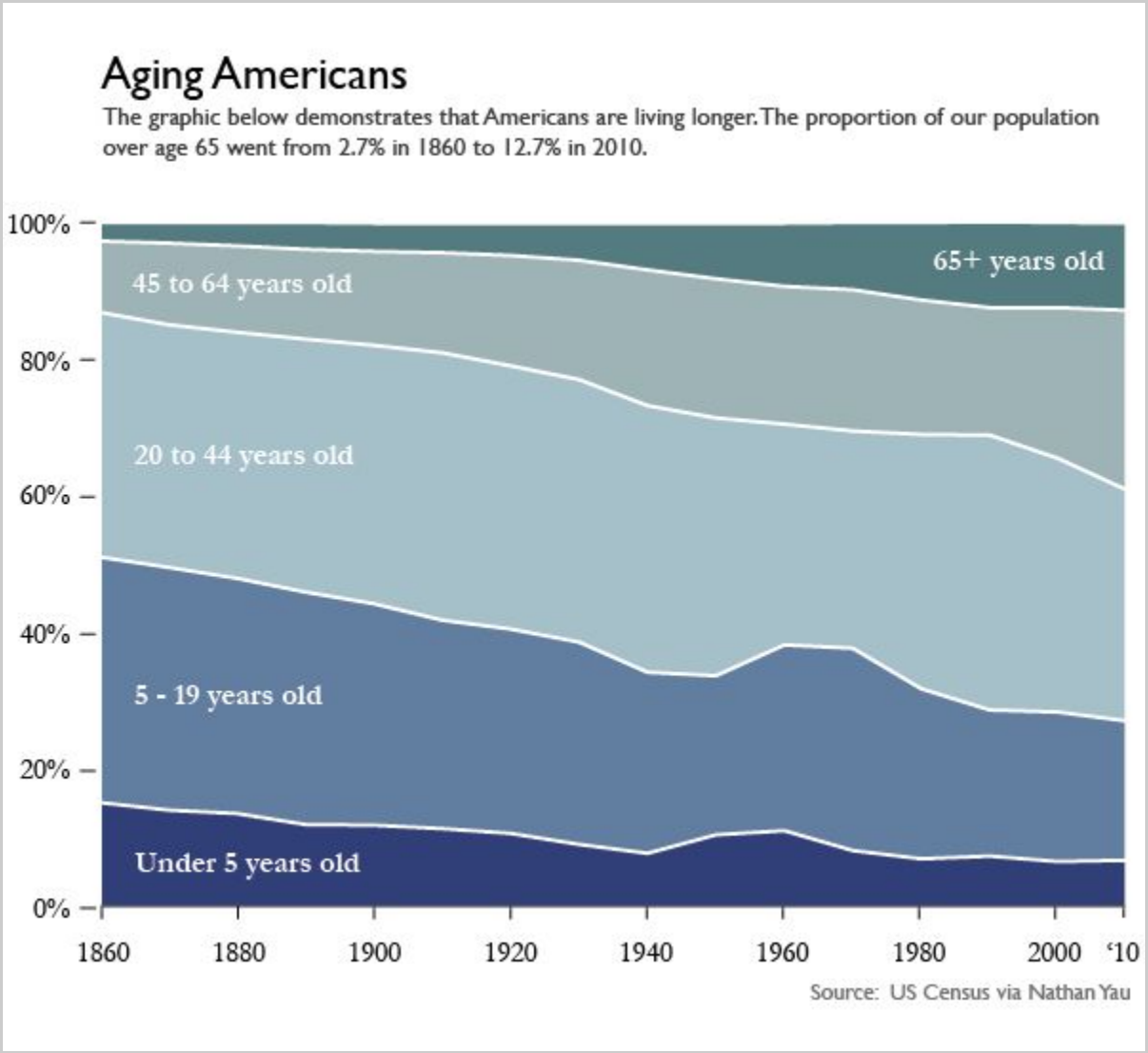

Interactive versions

Switch between scales:

How Machines Destroy (And Create!) Jobs, In 4 Graphs

Switch between line and stacked area charts:

Hurricane Sandy's Impact on NYC 311 Calls

Steamgraphs

A varient of stacked area charts

- Drop the base line and the Y axis
- keep only the “height” of each category

The Ebb and Flow of Movies: Box Office Receipts 1986 — 2008

Band charts

Instead of plotting a line per category plot a band:

- minimum/maximum values per category
- error range
- ...

Can also plot a distinct measure as width of the band, but that gets tricky

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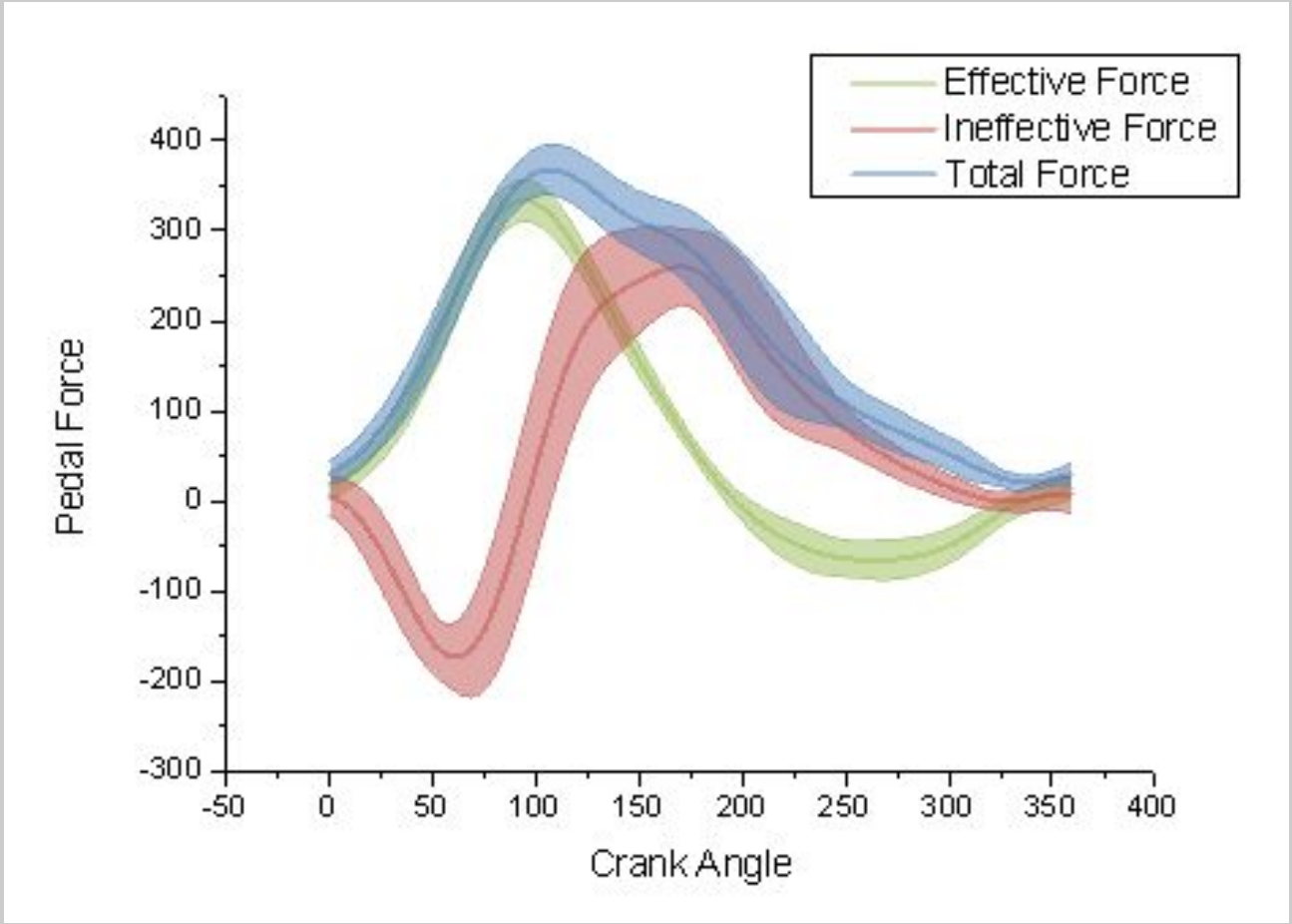


Rose Charts

Highlight the cyclicity of data

- chart the evolution of a measure over a time period
- compare that evolution to another time period

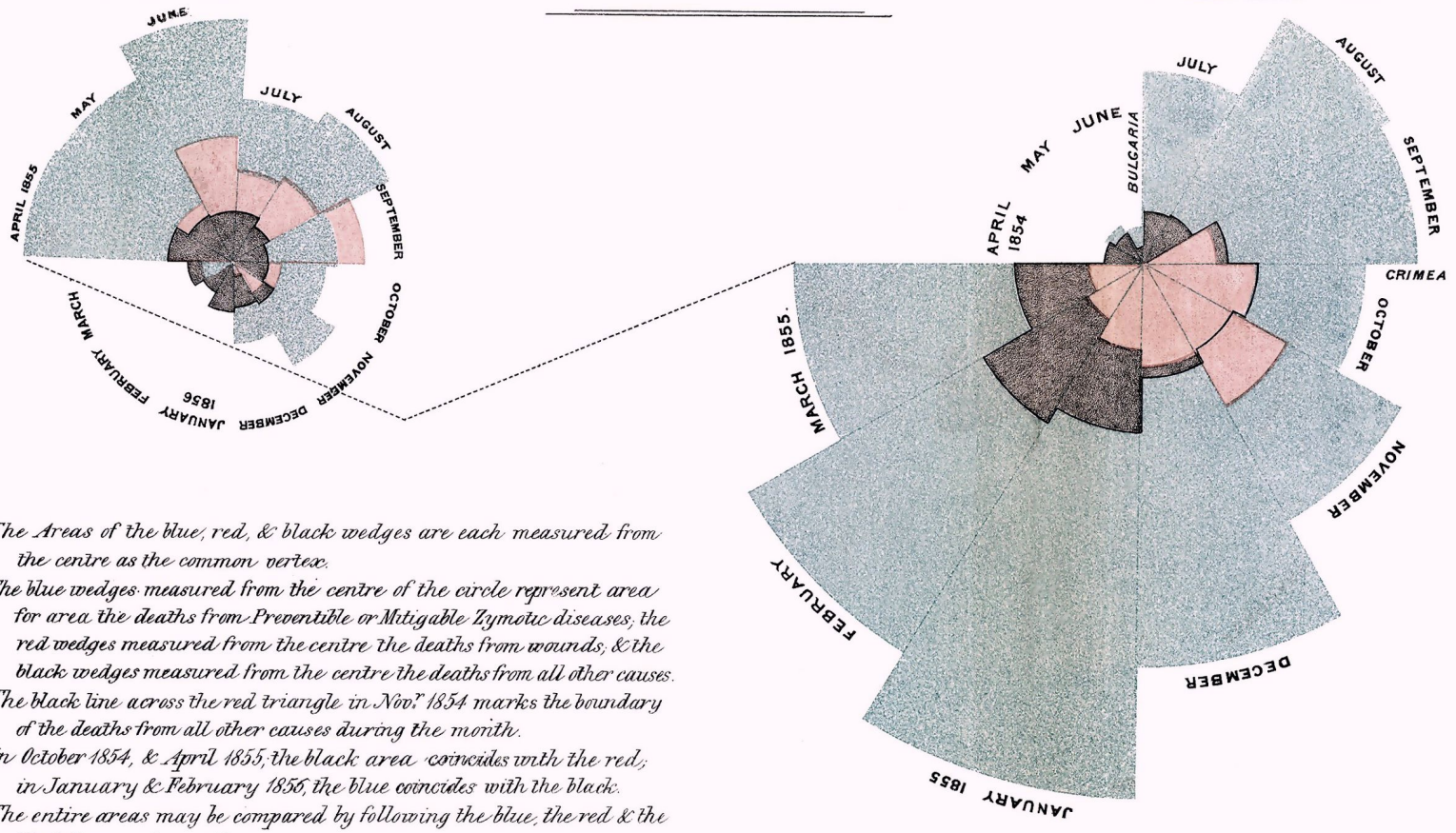
Work best when time period is discretized:

- months, weeks, time of day
- small number of “buckets”

DIAGRAM OF THE CAUSES OF MORTALITY IN THE ARMY IN THE EAST.

2.
APRIL 1855 TO MARCH 1856.

1.
APRIL 1854 TO MARCH 1855.



The Areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent area for area the deaths from Preventible or Mitigable Zymotic diseases; the red wedges measured from the centre the deaths from wounds; & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov.r 1854 marks the boundary of the deaths from all other causes during the month.

In October 1854, & April 1855, the black area coincides with the red; in January & February 1856, the blue coincides with the black.

The entire areas may be compared by following the blue, the red & the black lines enclosing them.

Discretizing Time

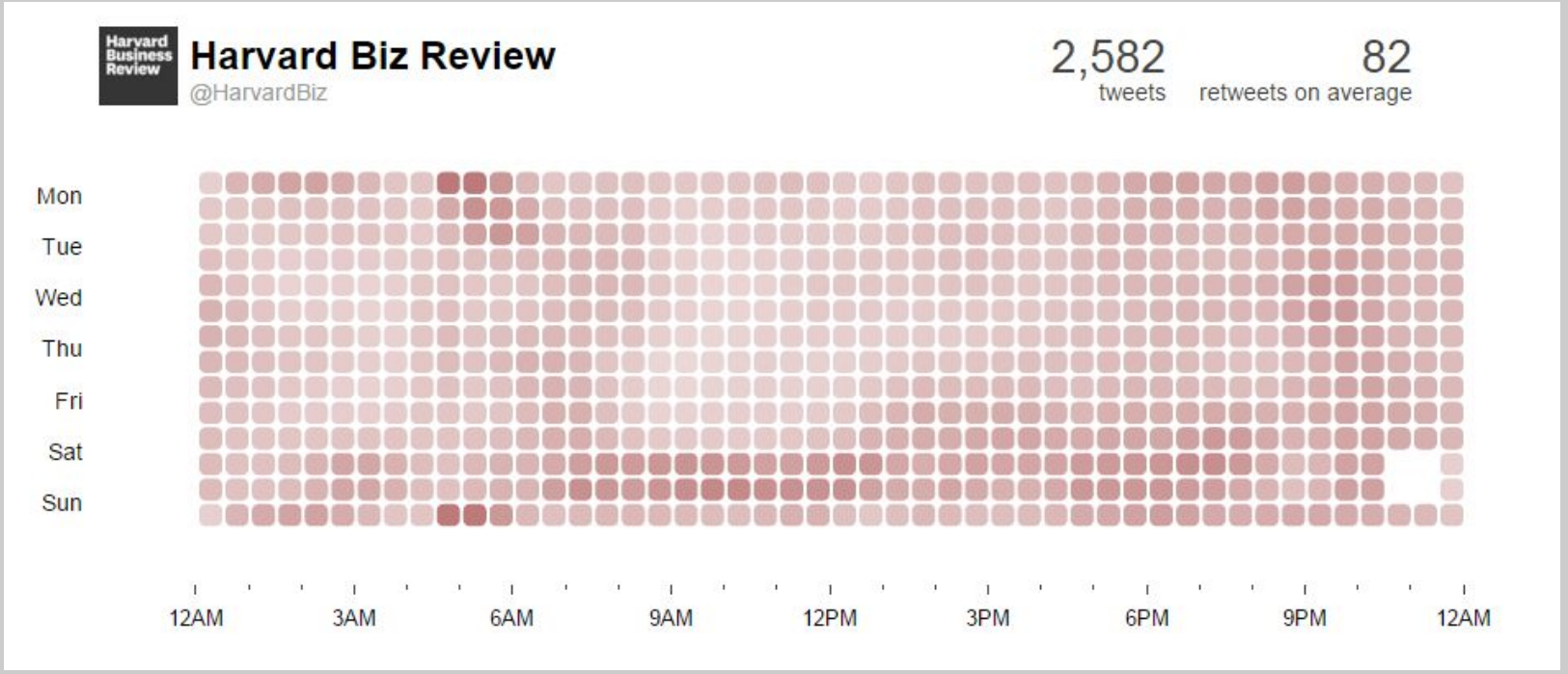
Move away from a continuous view of time

- bucket time periods

At that point, can rely on any existing categorical visualization method

E.g., heat maps for identifying hot spots in time periods

Discretizing Time



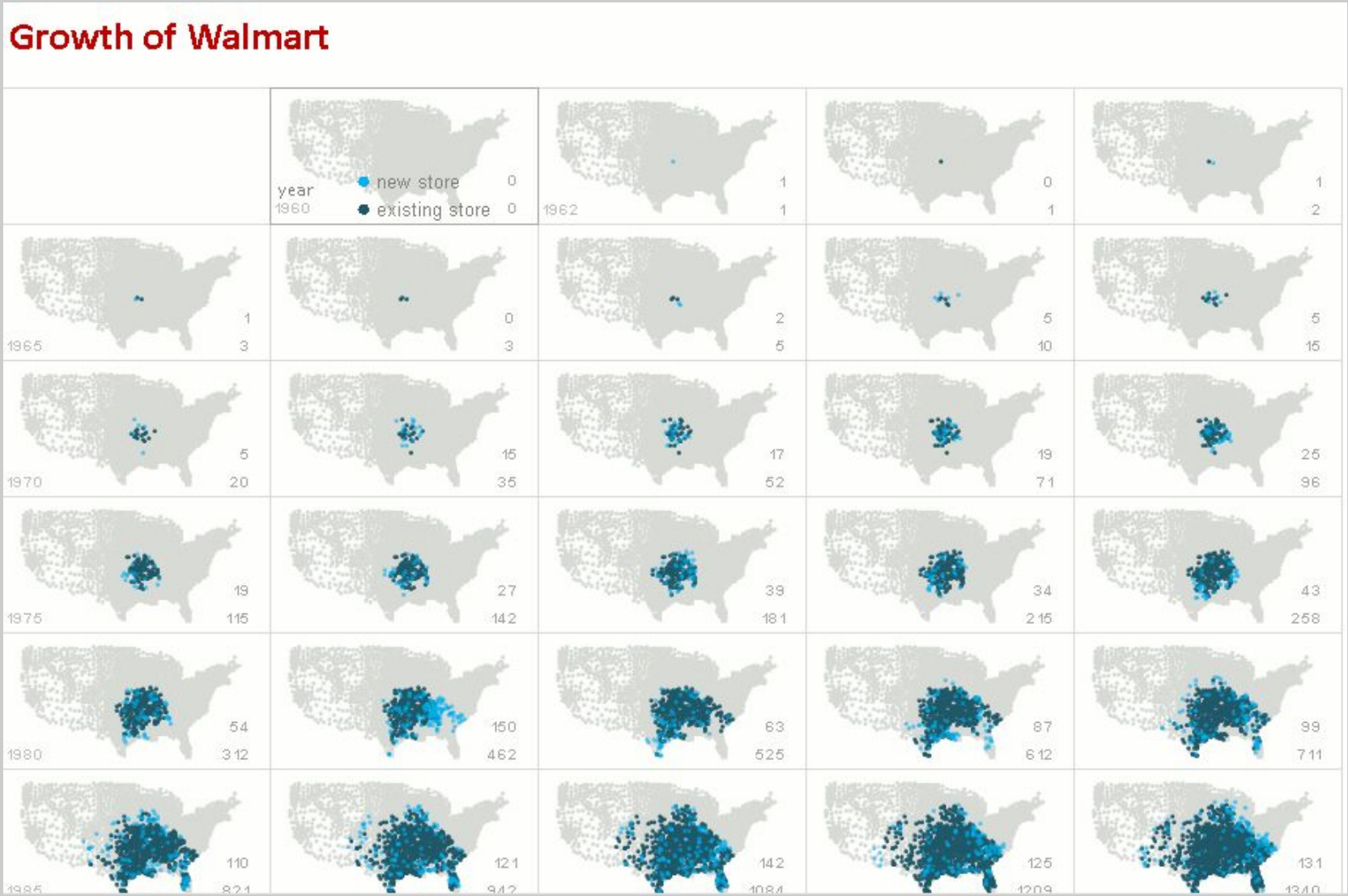
Tweet Timeline

Small Multiples

Chart data for every year (or other time period) in a different chart

Works well with spatial data

Small Multiples



Animated Charts

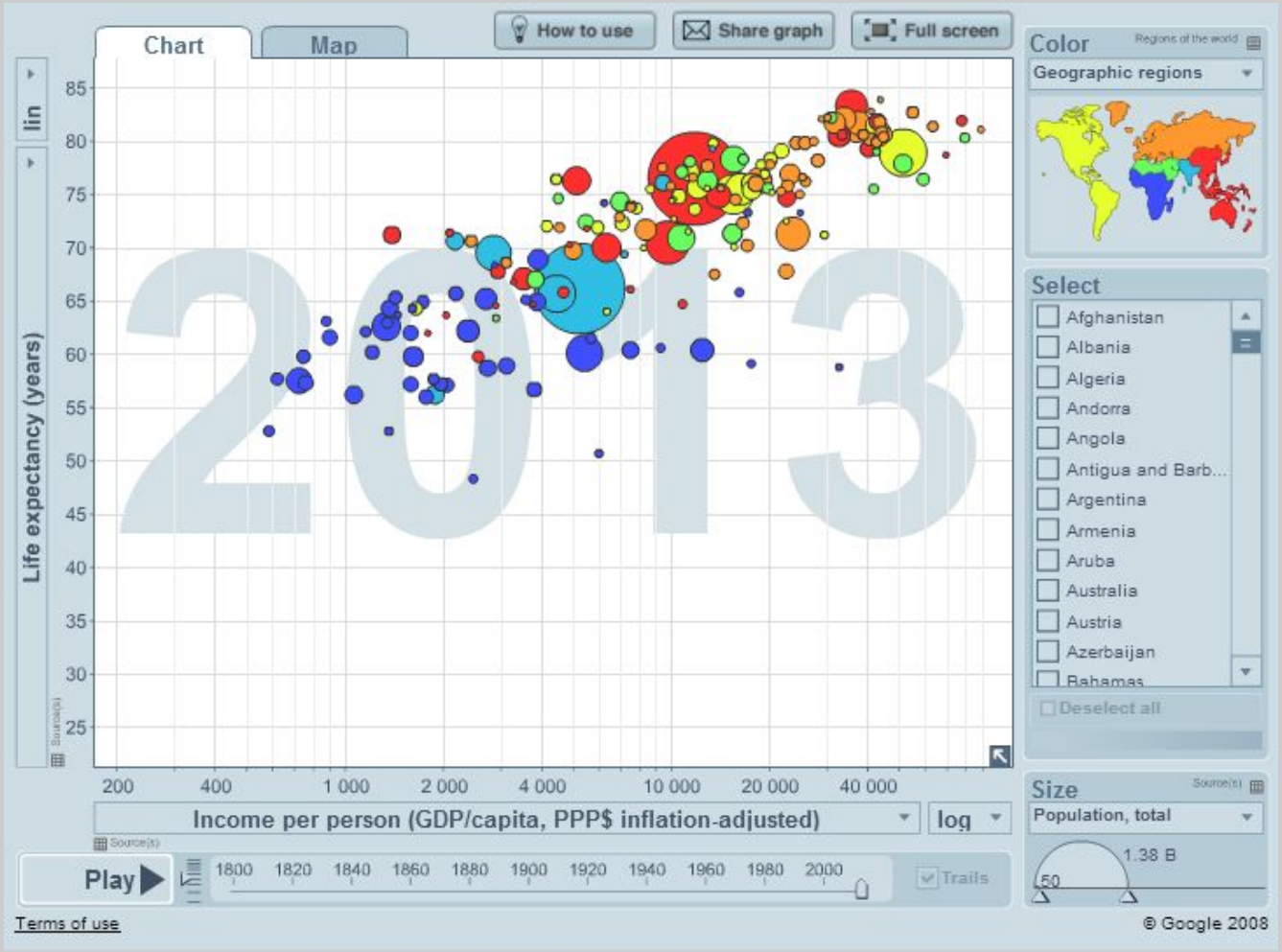
Chart data for every year (or other time period) in a different chart

Cycle through those charts

- can help see emerging patterns where there's a pattern to be seen
- not ideal for comparing data across years

Growth of Walmart (animated)

Animated Charts



Gapminder

Real-Time Data

Generally animated, more ad hoc

Rolling line charts
CPU Load (Example)

Spatial data
Wind Map