

# CS-5630 / CS-6630

# Visualization for Data Science

# Storytelling

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# WEALTH INEQUALITY IN AMERICA

54 TRILLION DOLLARS



0%

10%

20%

30%

40%

50%

60%

70%

80%

90%

100%



# Storytelling

“The world’s second-oldest profession”

Good stories do more than provide facts and data

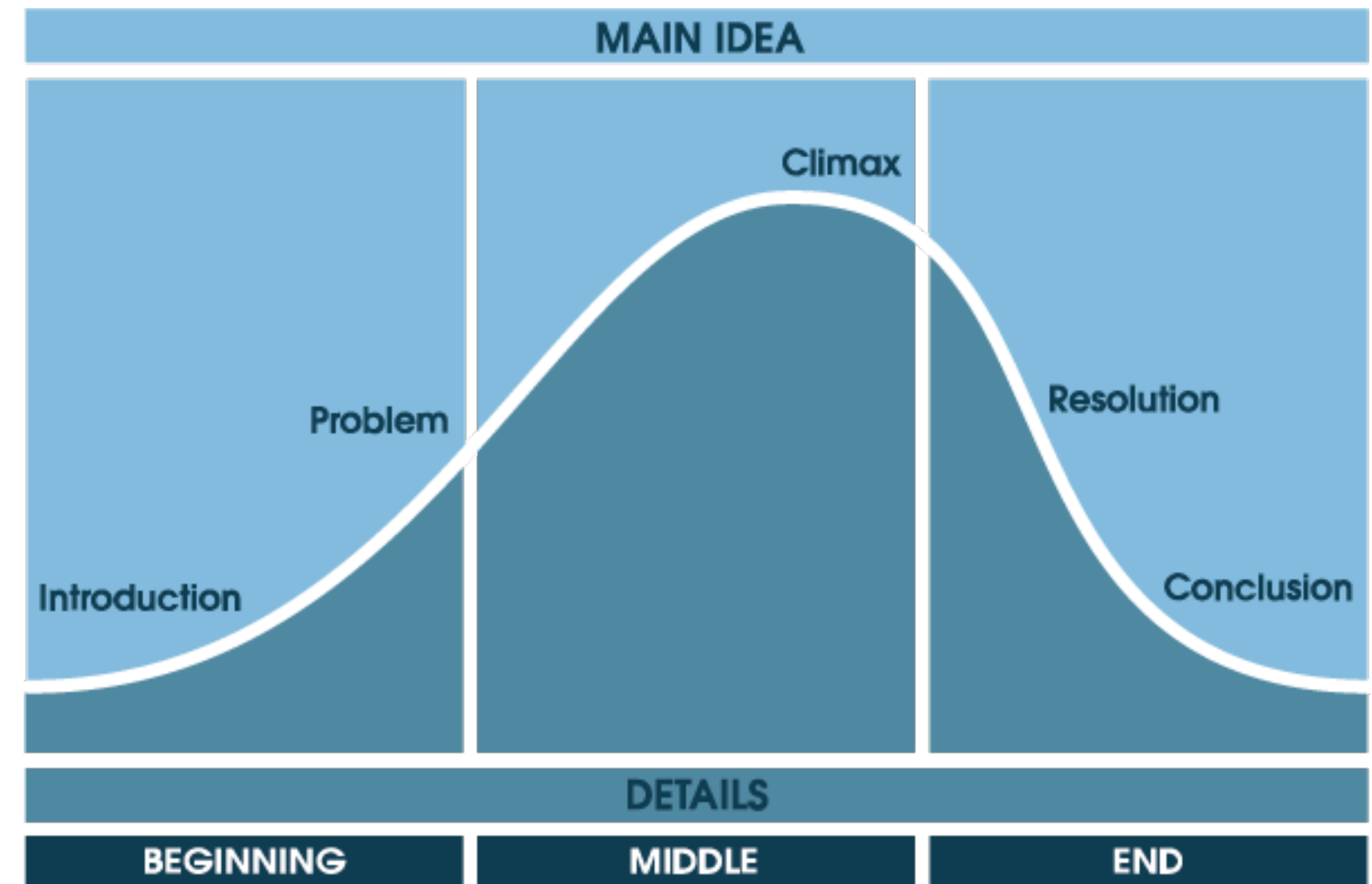
they situate and give context

they engage

they educate

Who / What / Where / When

Why / How



# Storytelling with Data / VIS

Underscore your arguments with Data/Facts

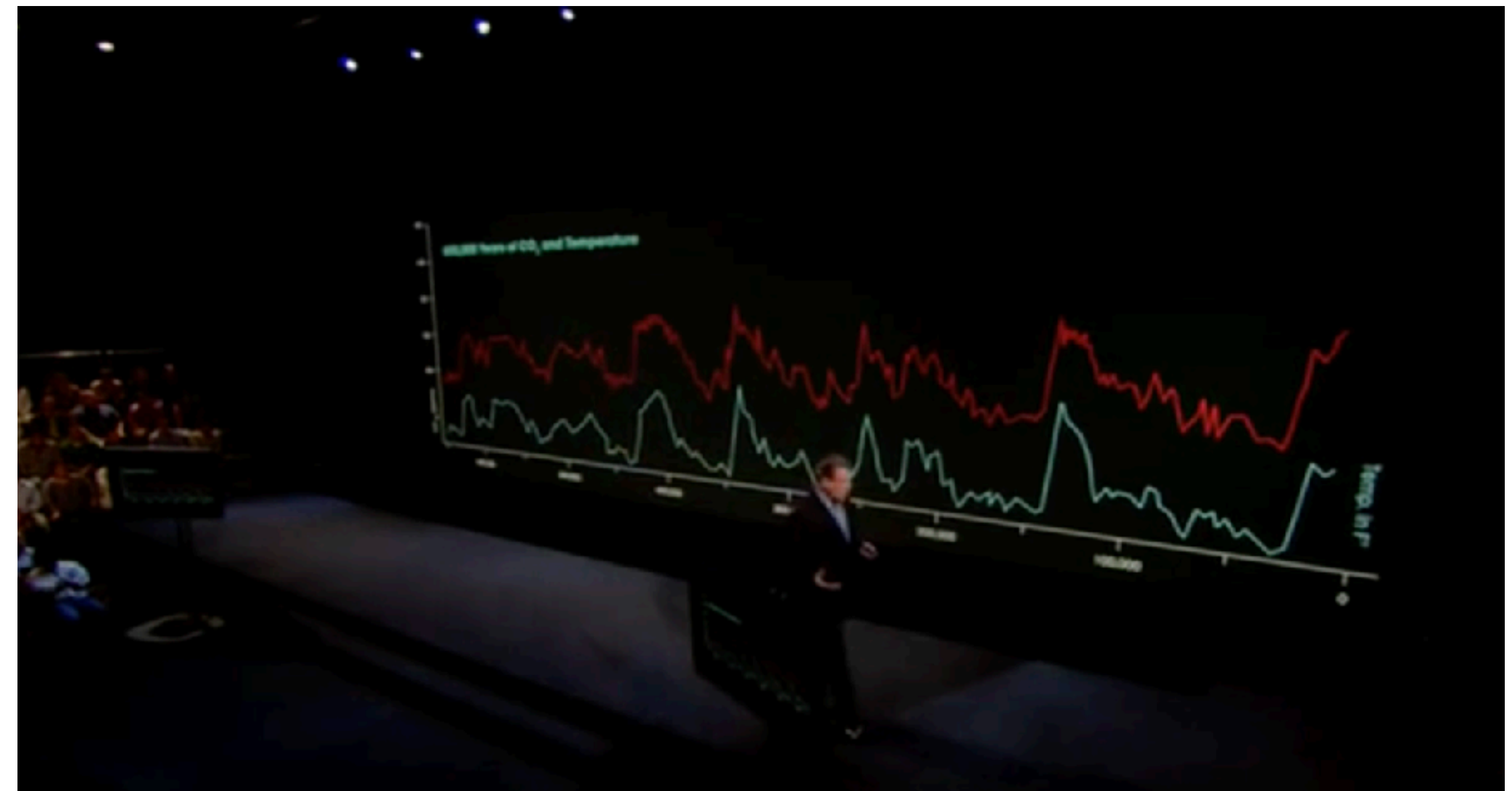
Leverage the power of Visualization

Show Trends

Show Correlations

Show Outliers

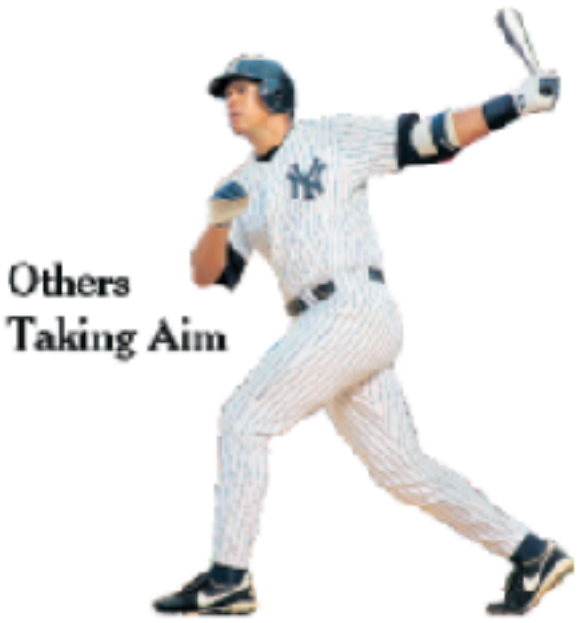
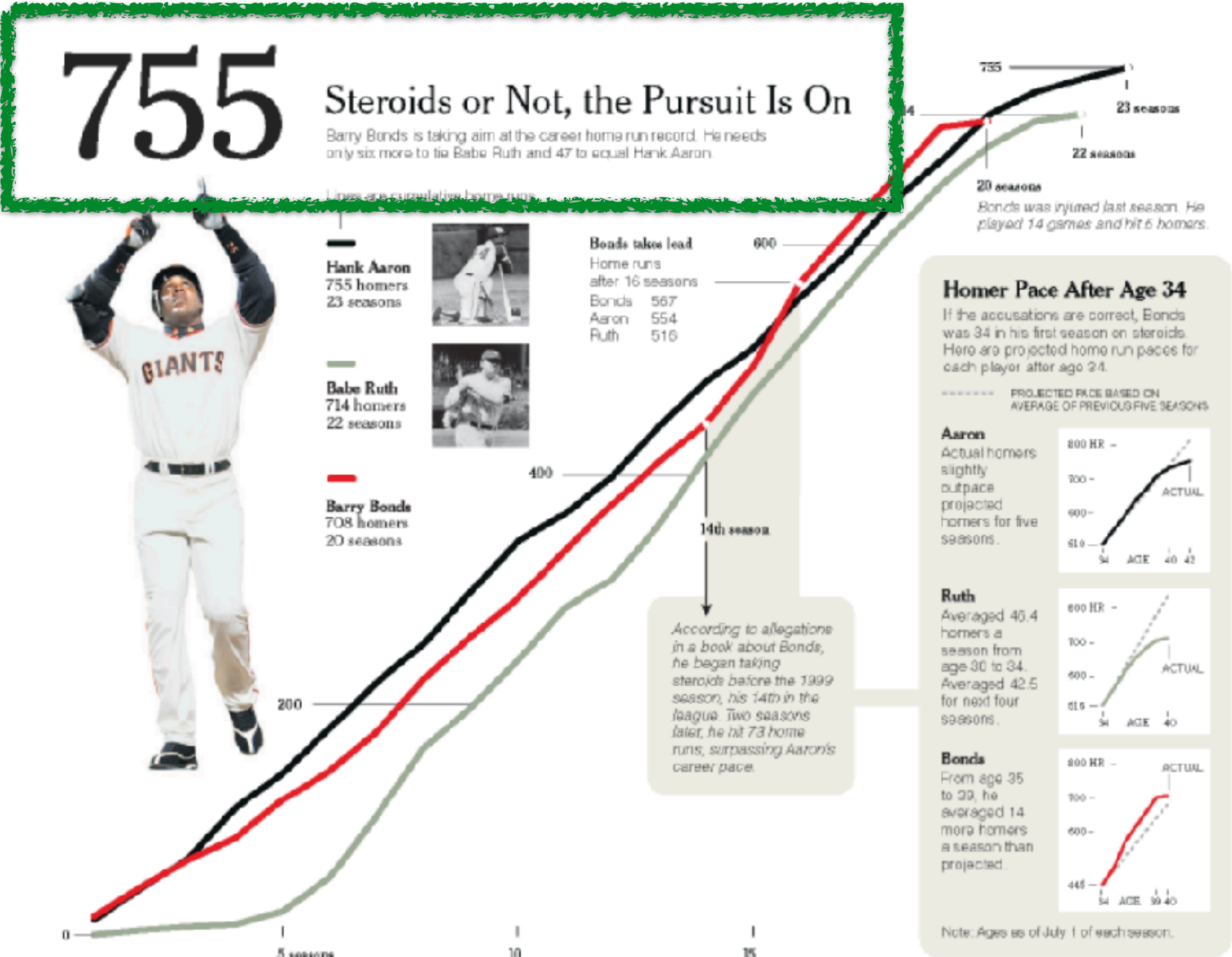
Convey Magnitudes



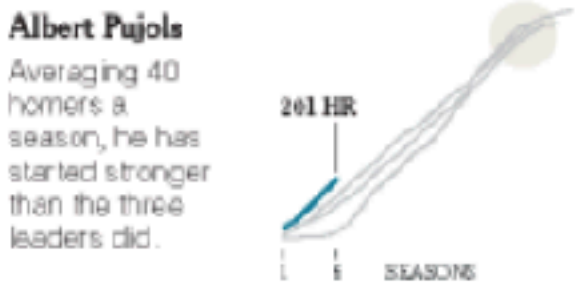
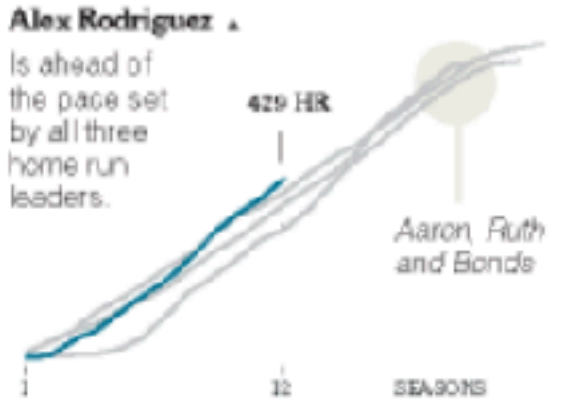


# Components of a Data Story

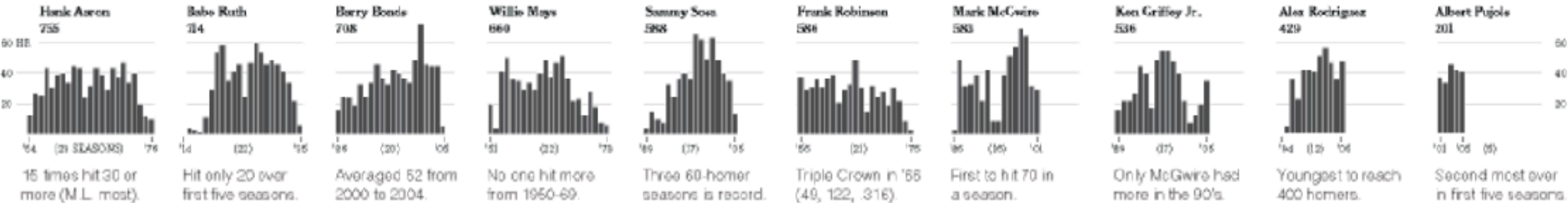
Introduction



Others Taking Aim

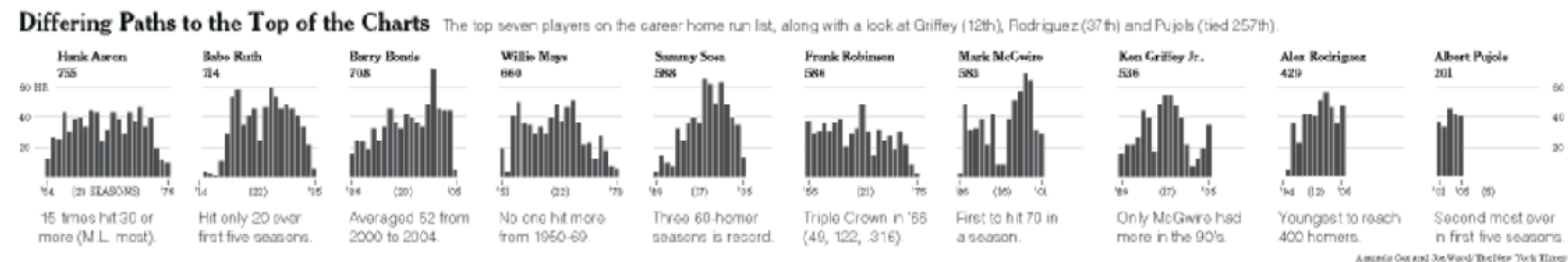
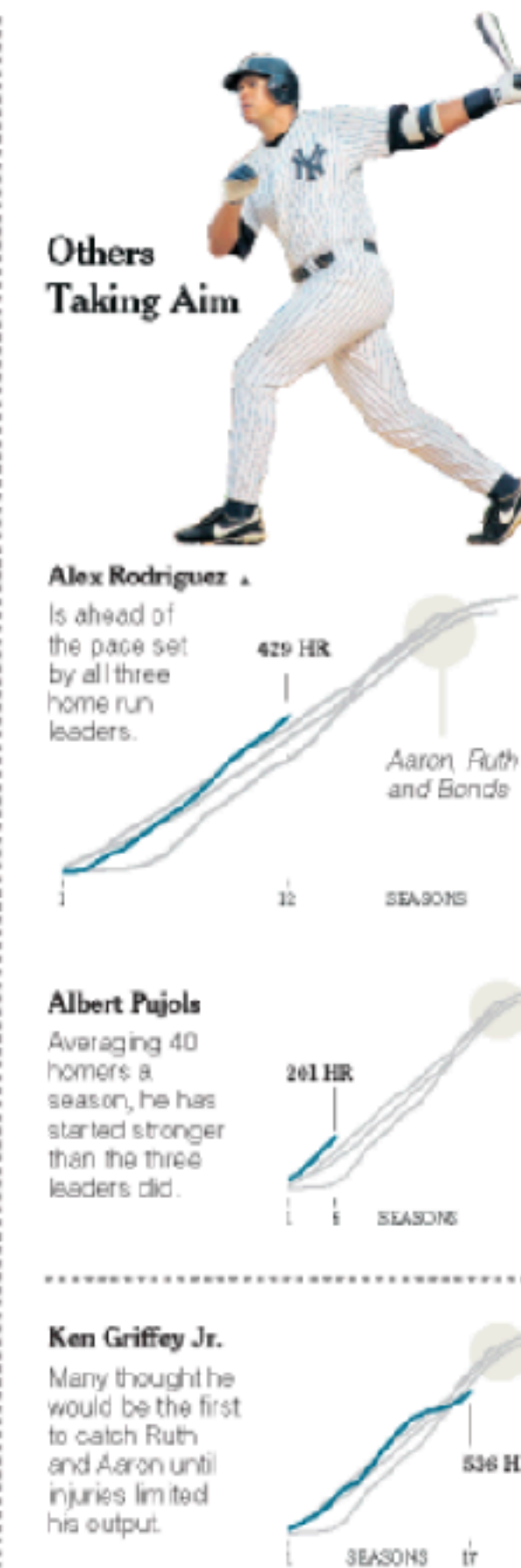
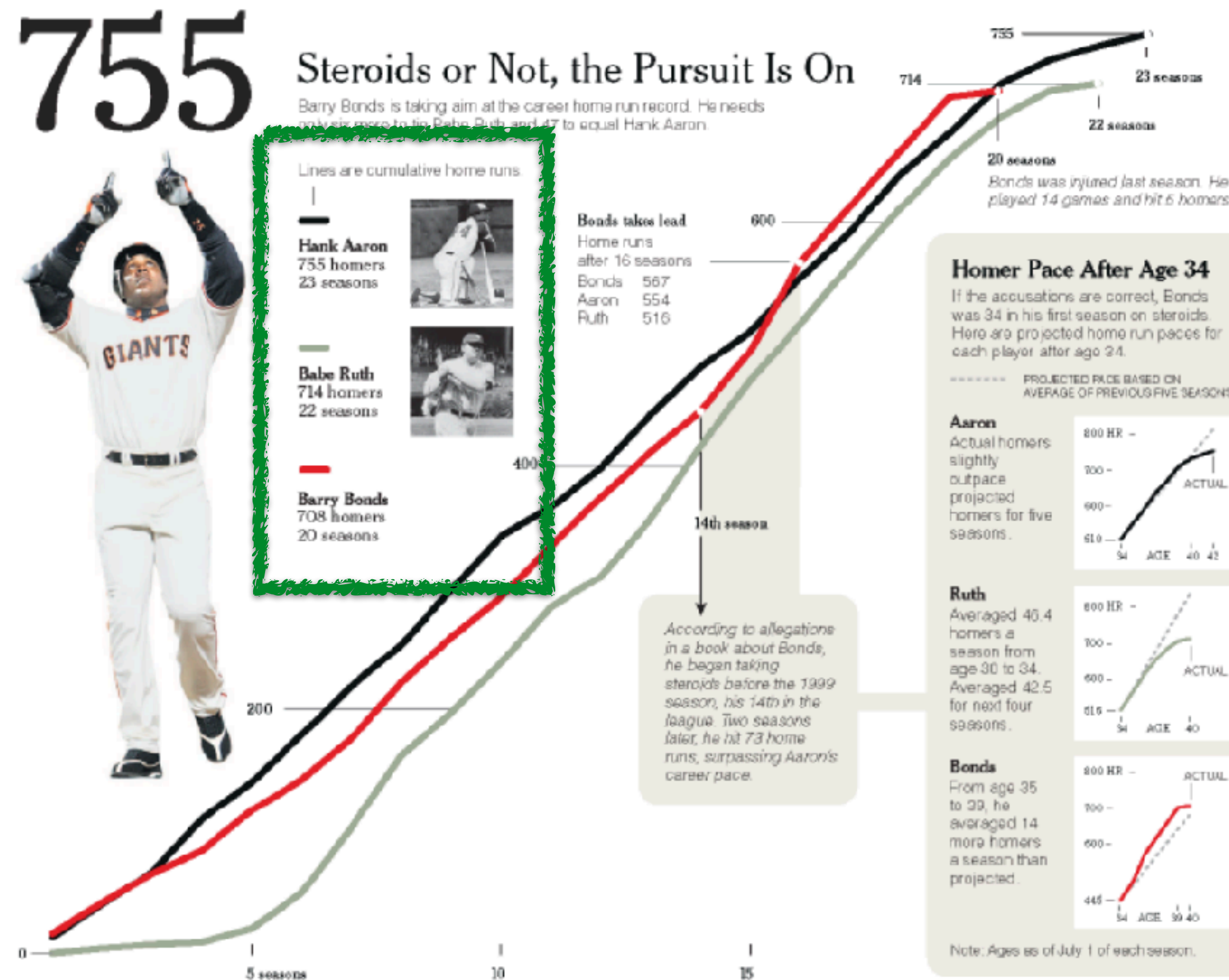


Differing Paths to the Top of the Charts The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (37th) and Pujols (tied 257th).



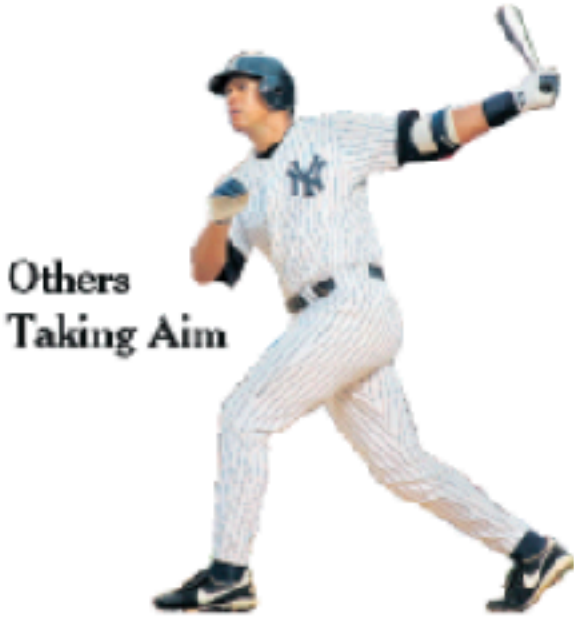
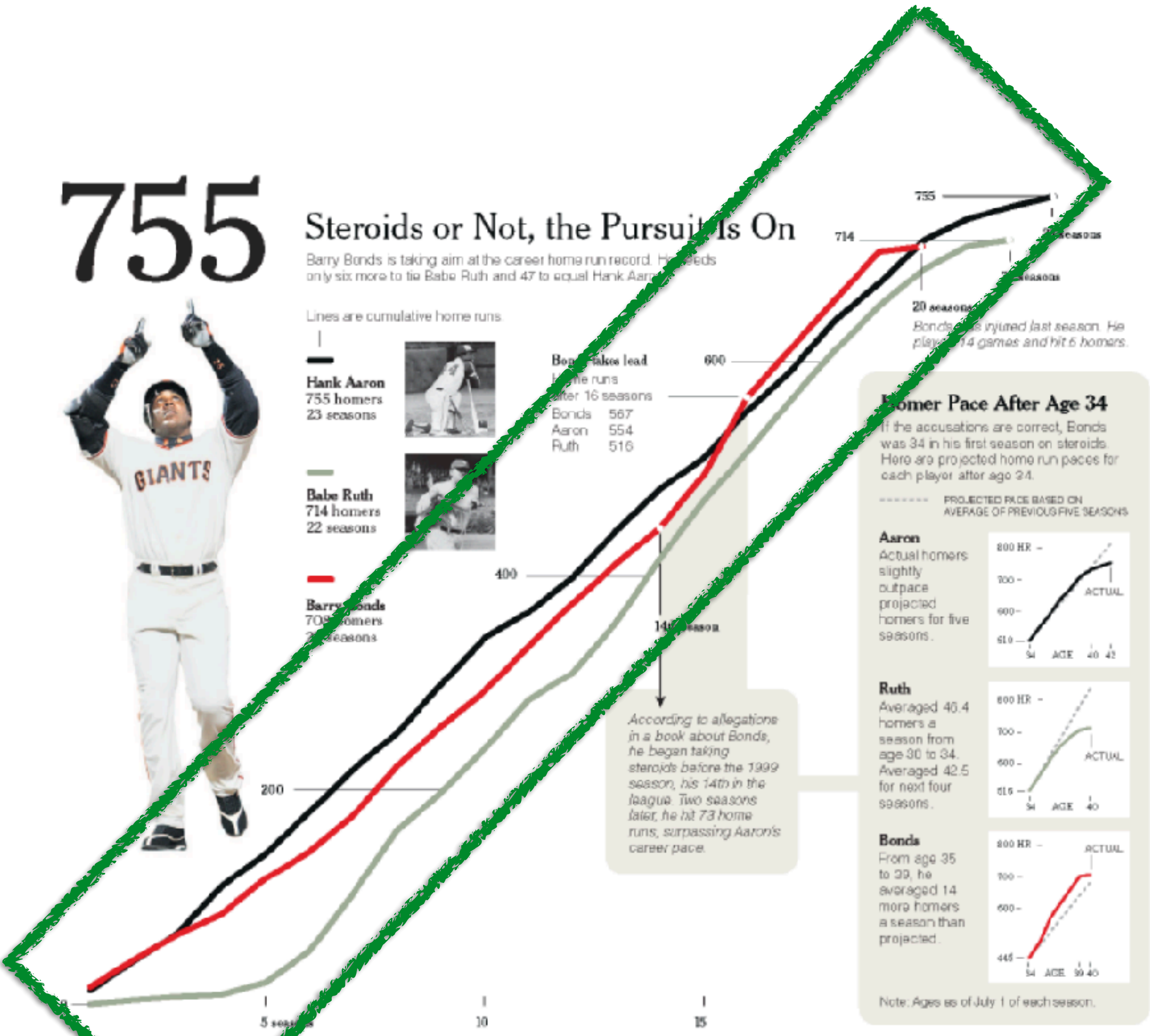


# Context / Legend

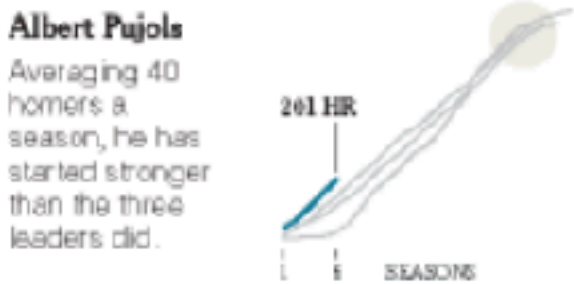
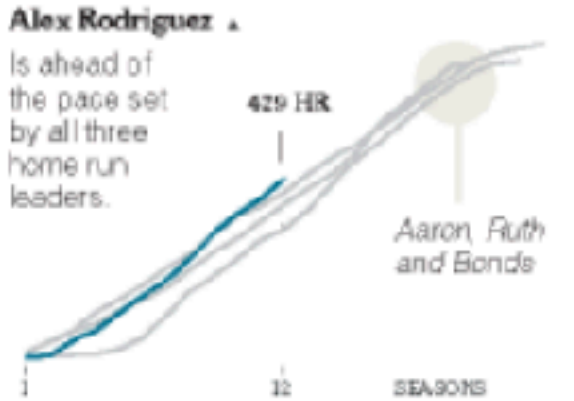




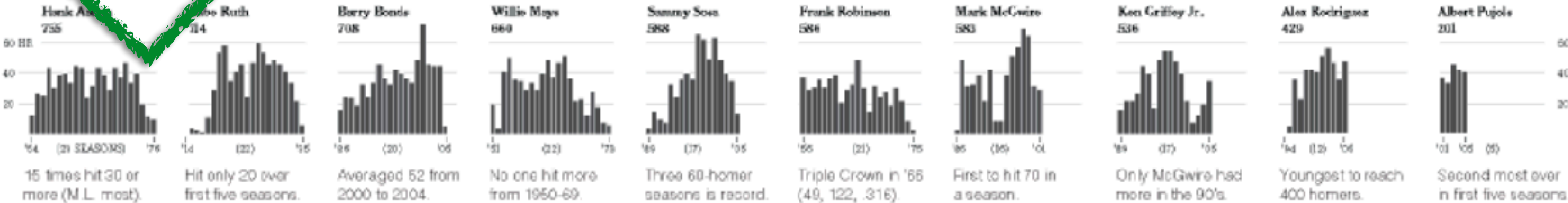
Main Story



Others Taking Aim

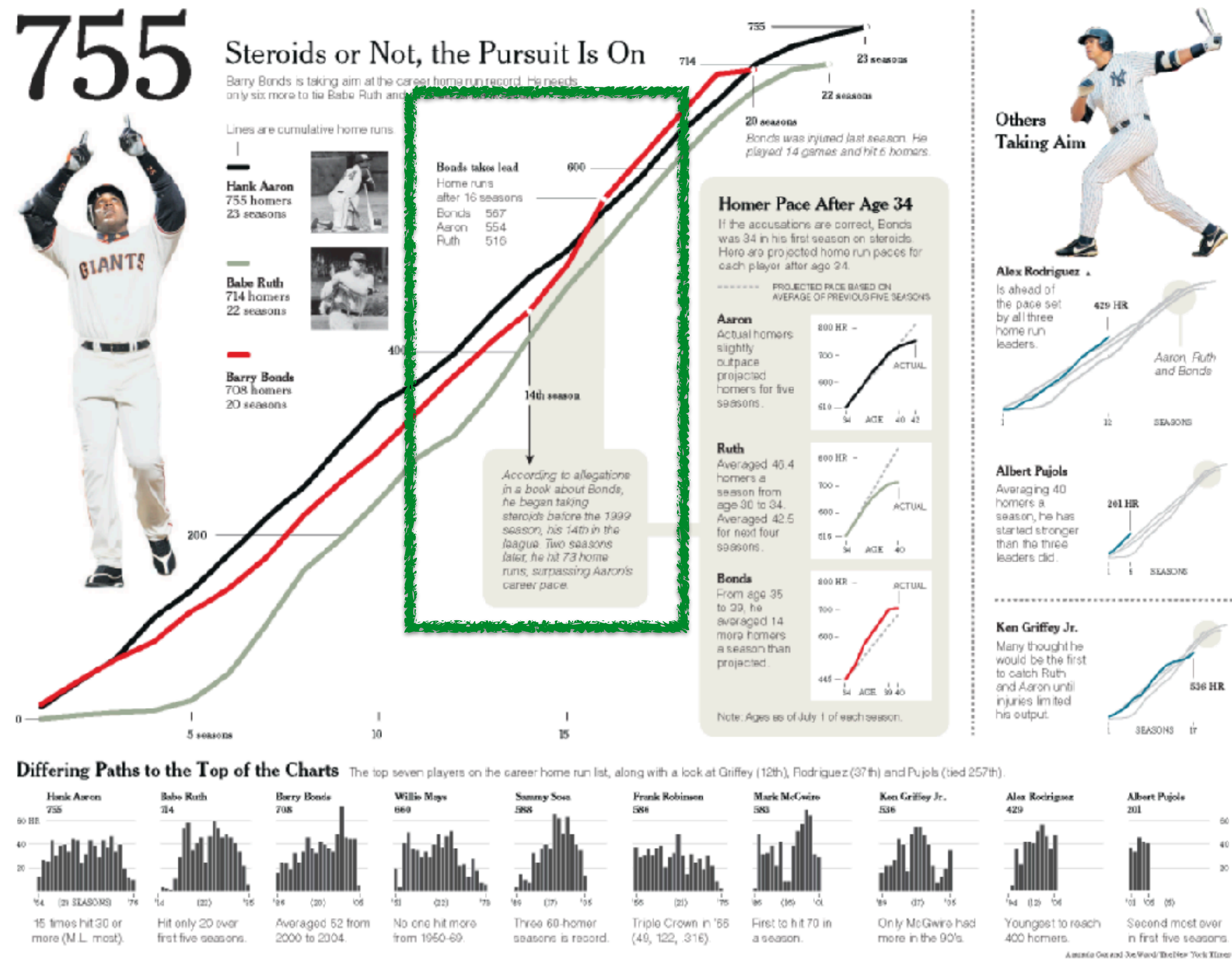


Differing Paths to the Top of the Charts



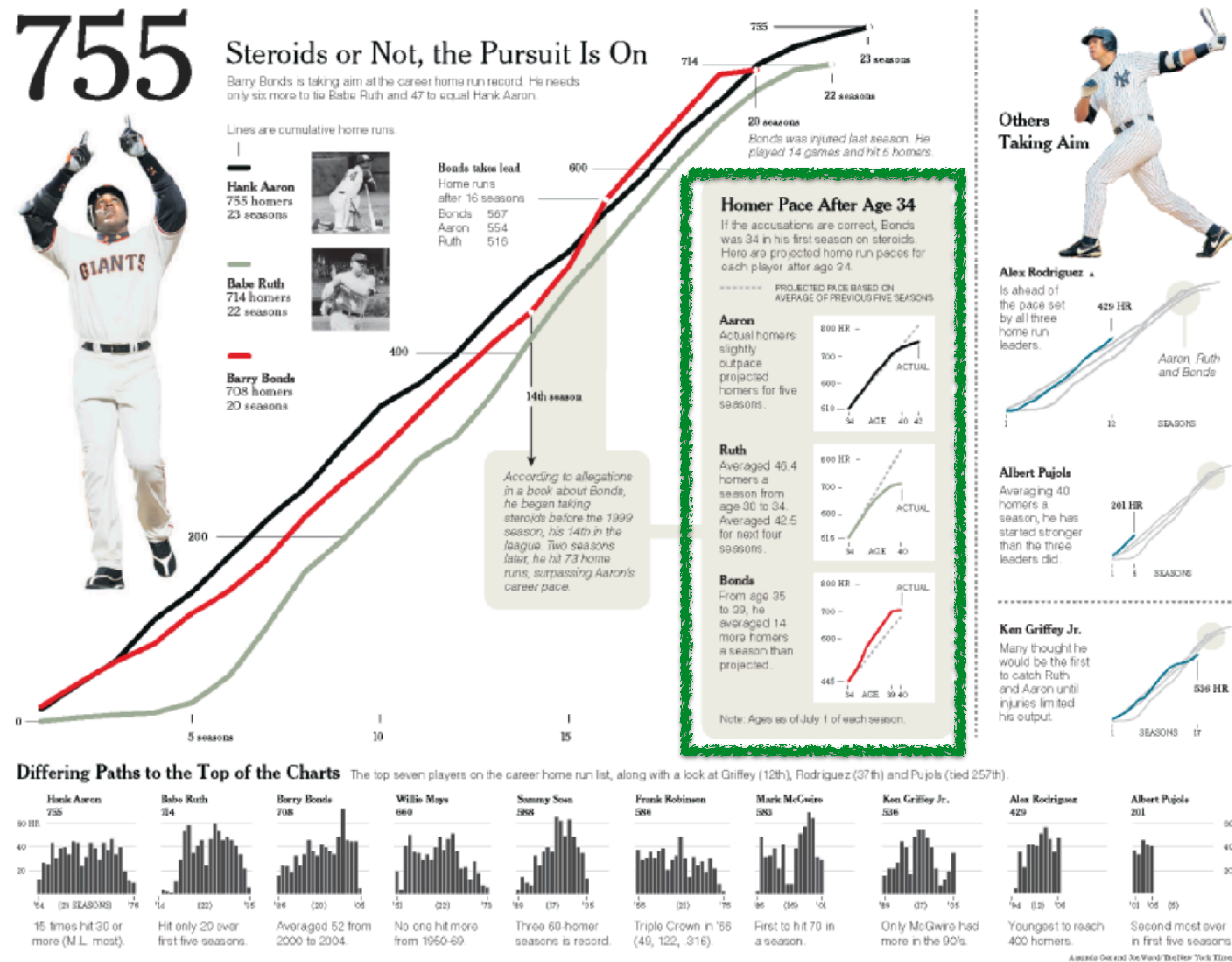


# Annotation of key point: a change in trends





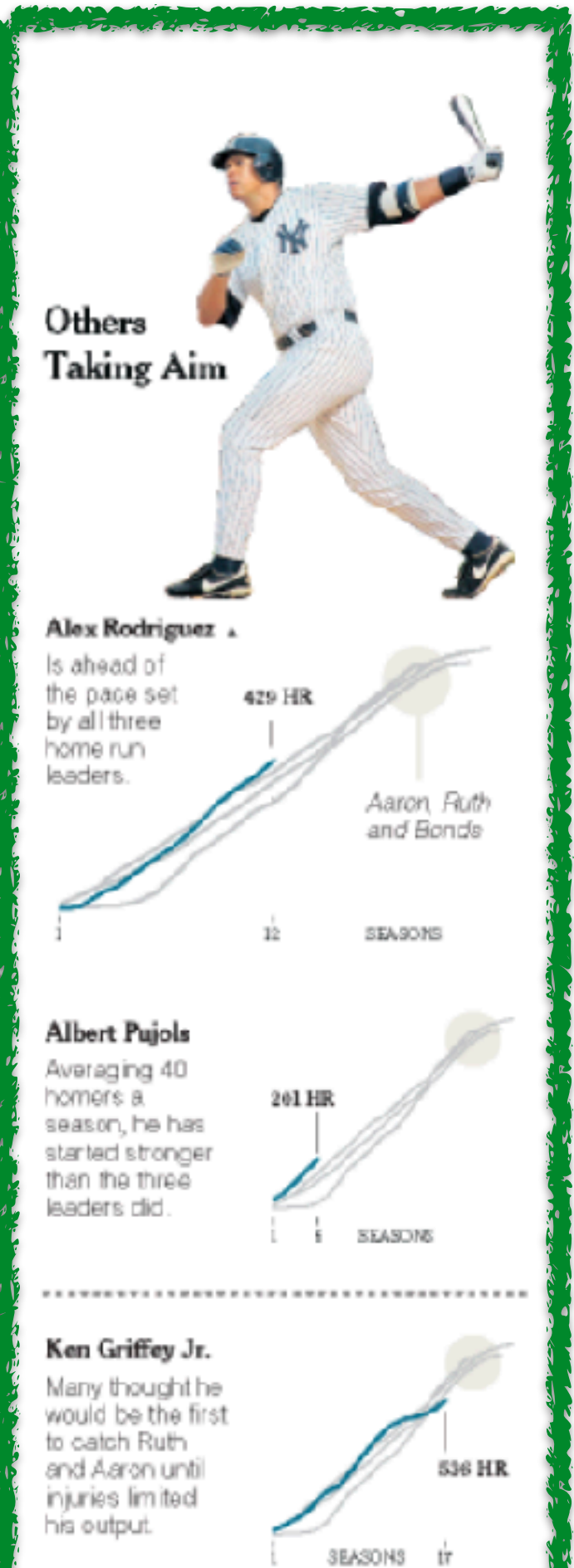
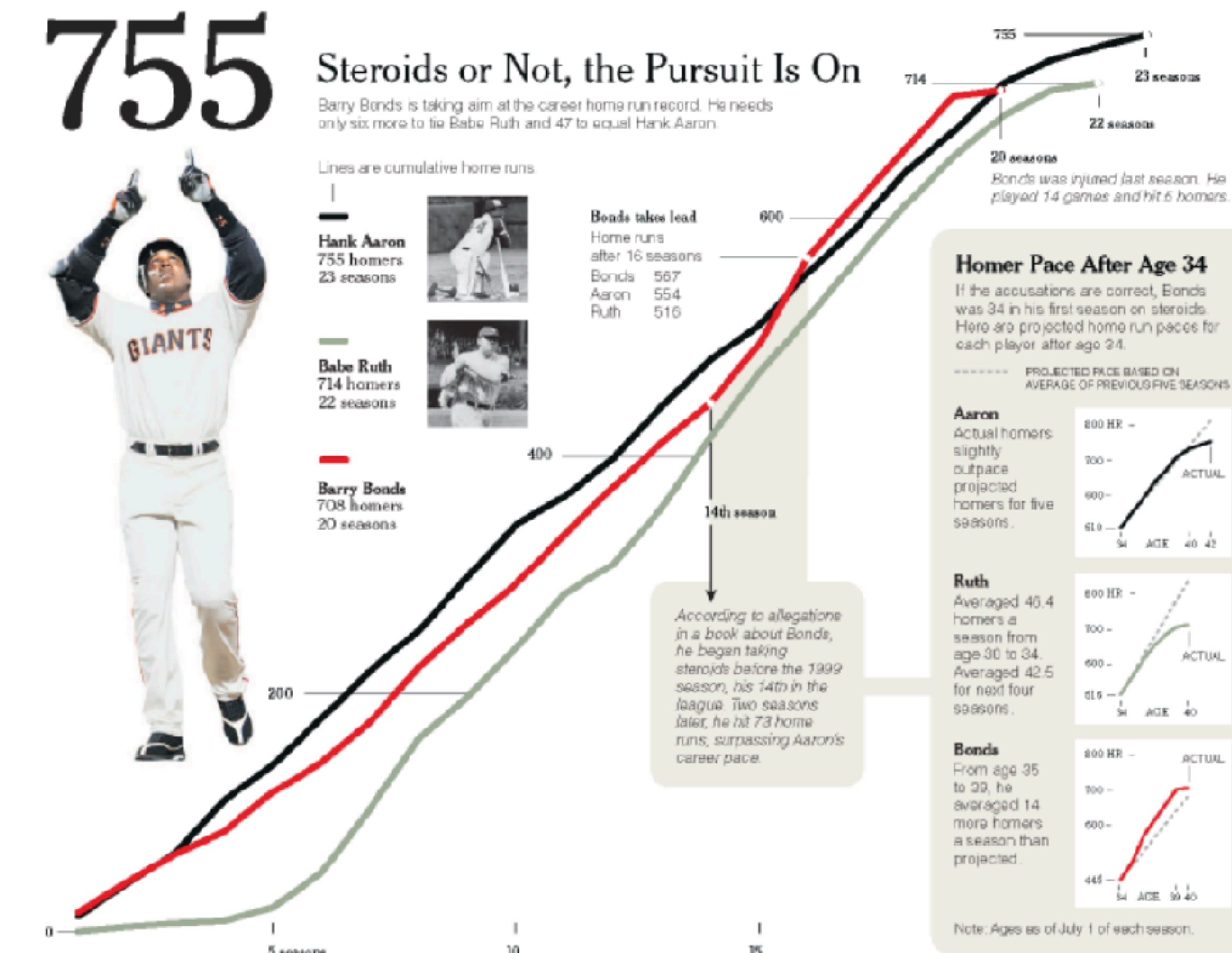
# Context, using **matching** on content (color, trend)



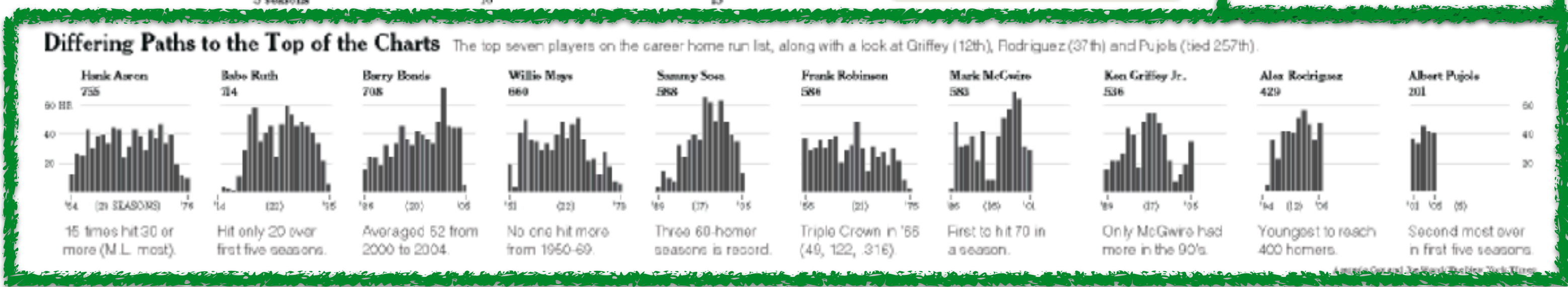


# Multi-Messaging - in-depth information

# Other Players



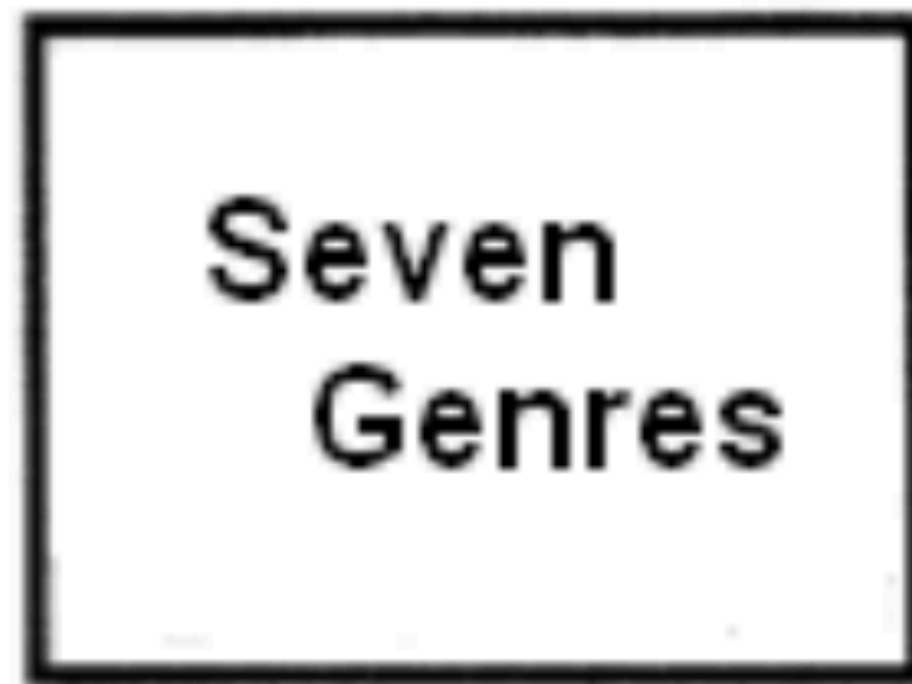
# Different Paths Why a Bar Chart?



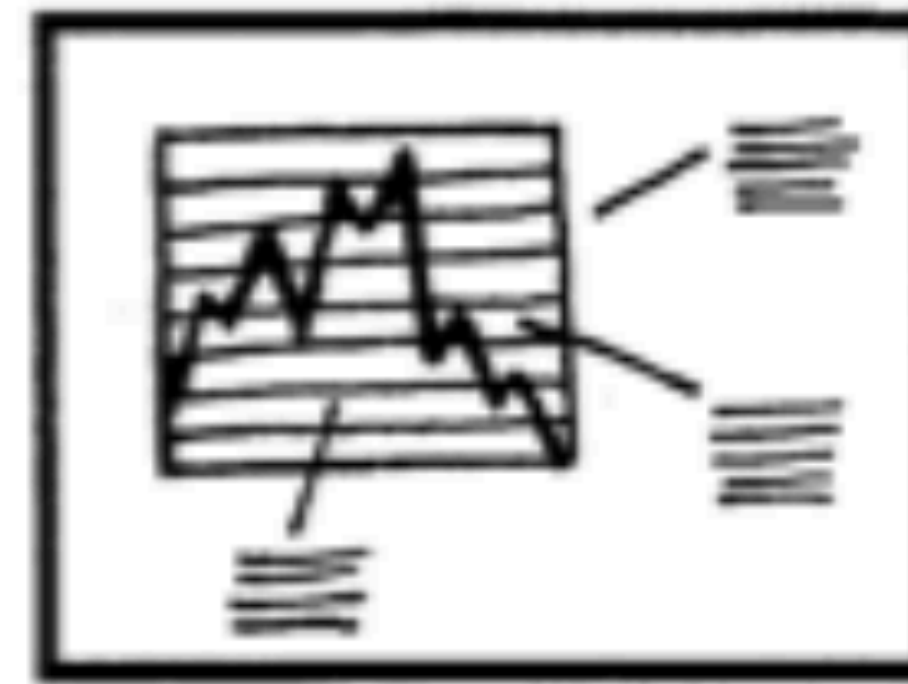
# Types of Data Stories



# Genres



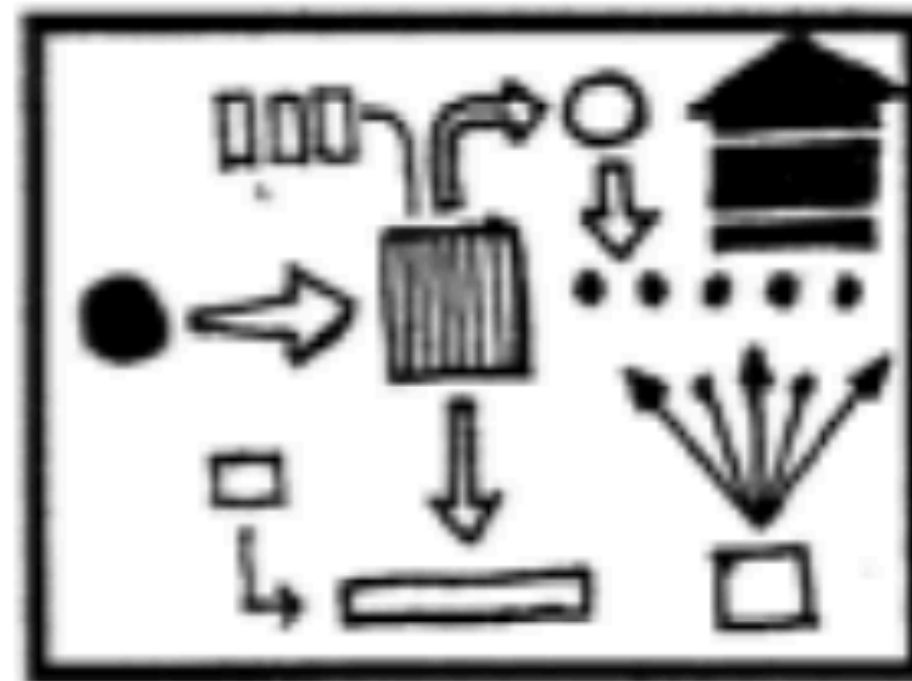
Magazine Style



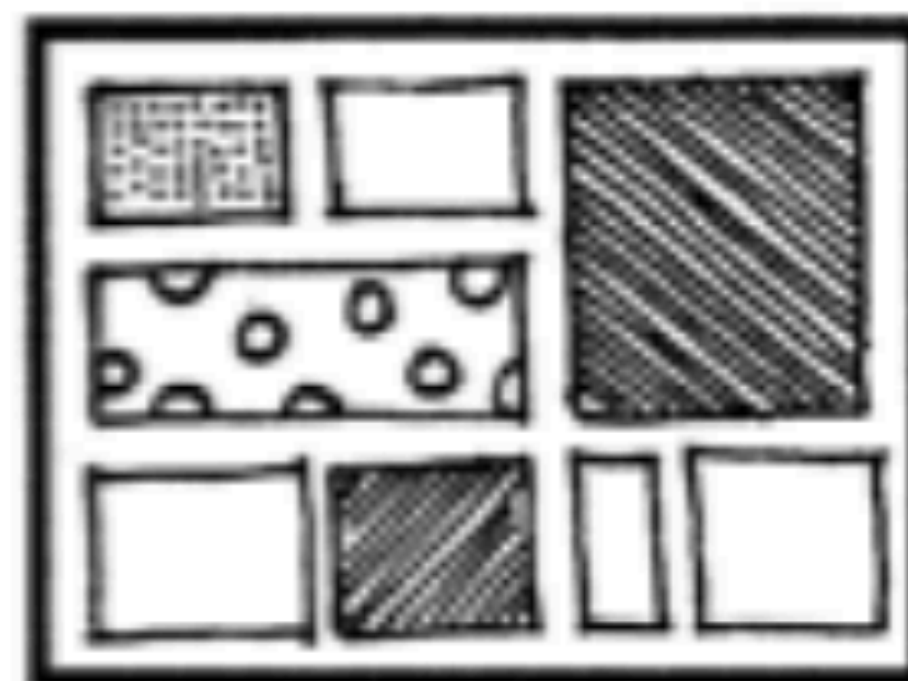
Annotated Chart



Partitioned Poster



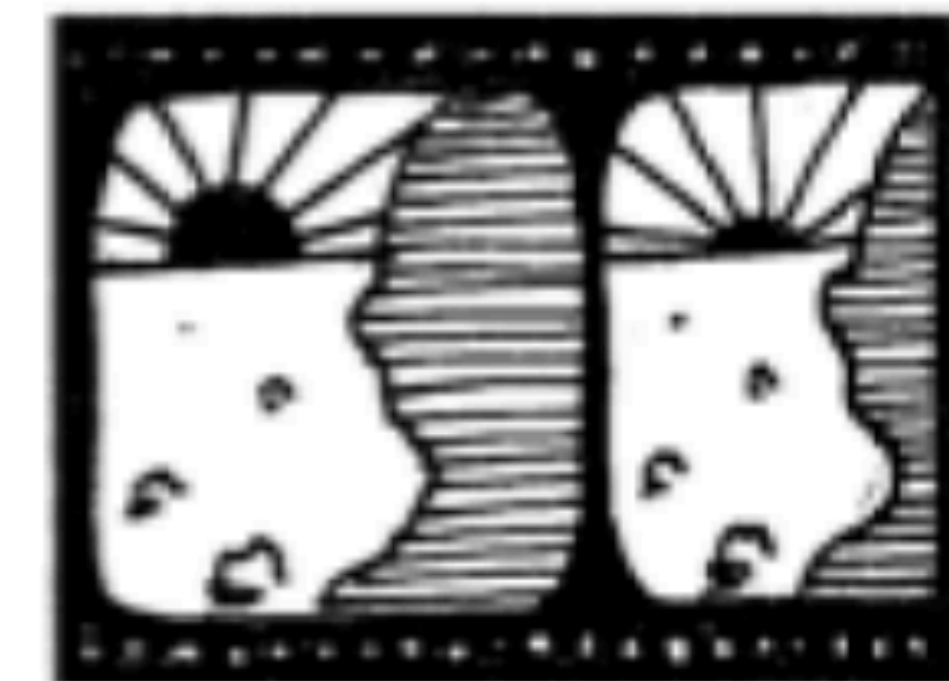
Flow Chart



Comic Strip



Slide Show



Film/Video/Animation

# Author or Reader Driven

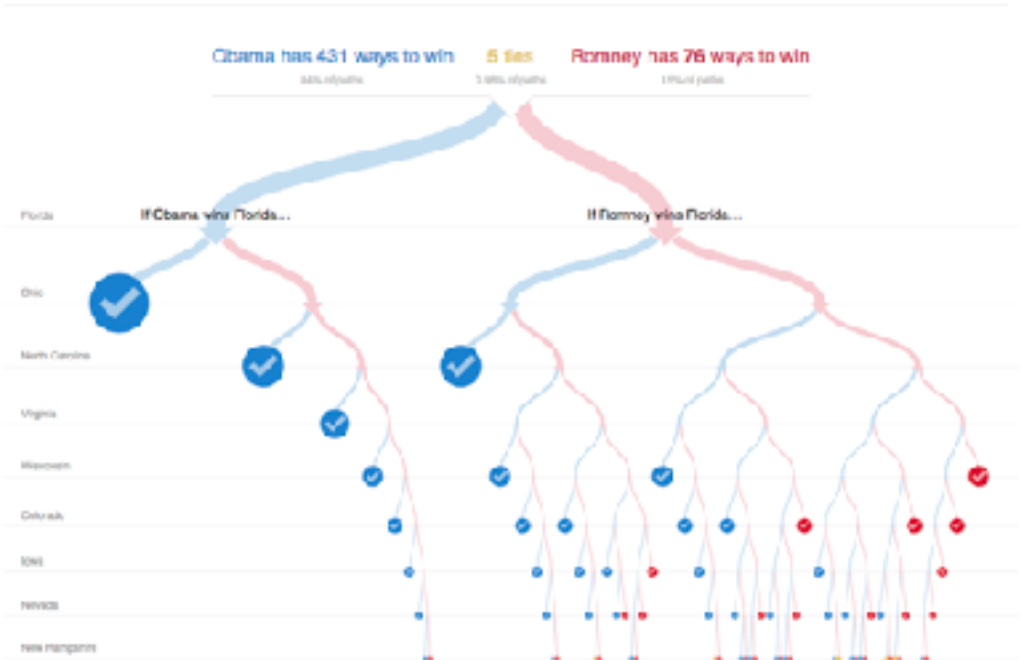
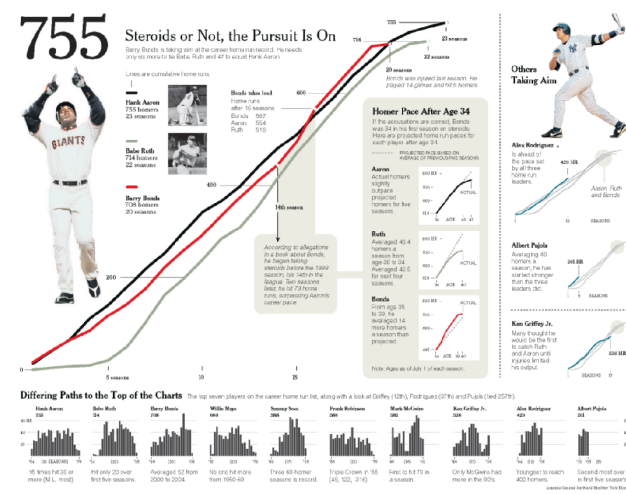
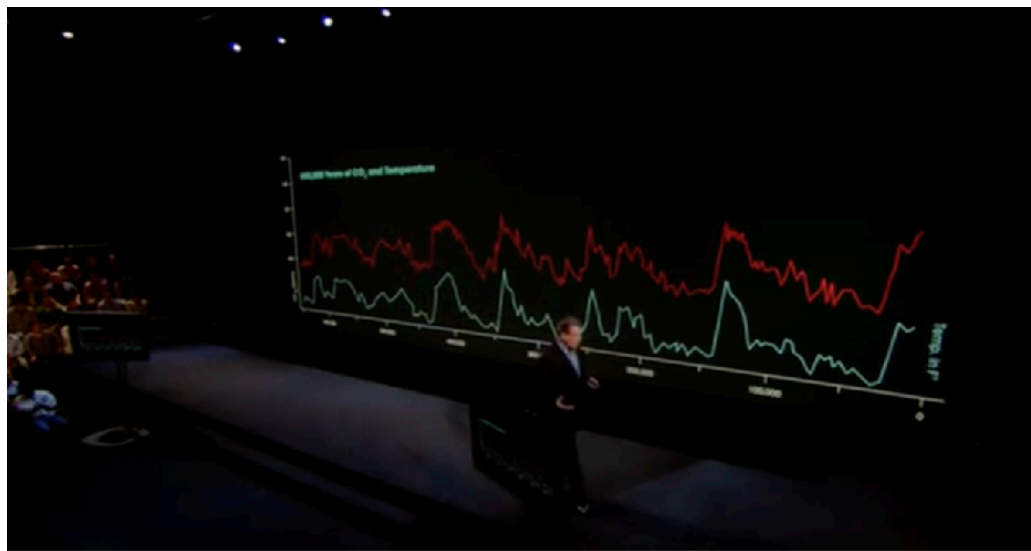
Author Driven

Reader Driven



Linear Ordering  
Heavy Messaging  
No Interactivity

No Ordering  
No Messaging  
Free Interactivity





# Author or Reader Driven

## Martini Glass Structure



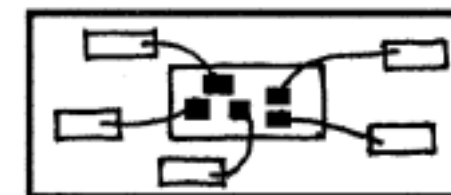
start with author driven, open up for exploration

## Interactive Slideshow

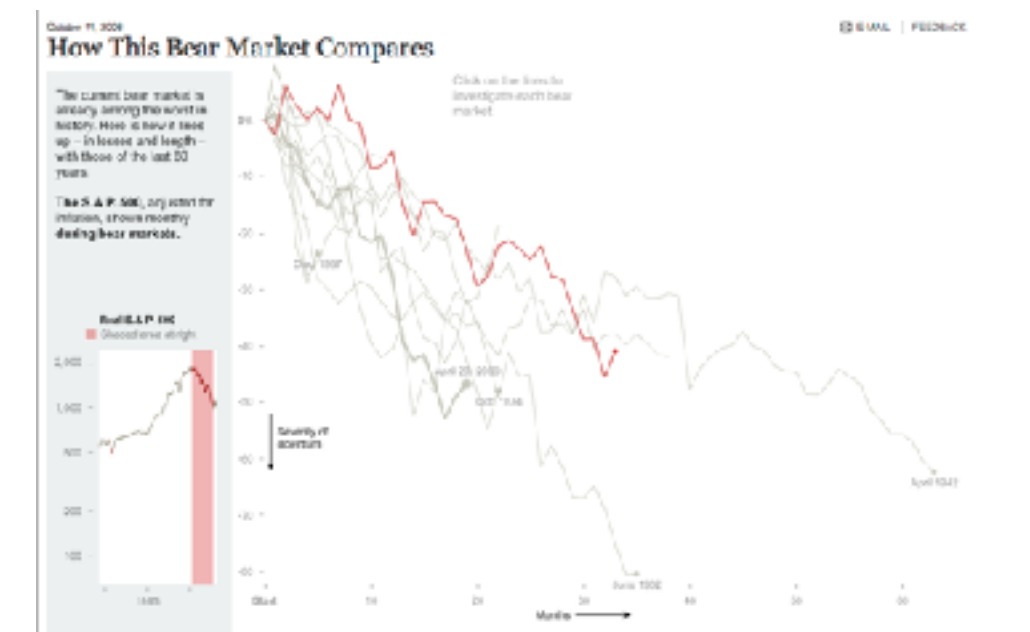
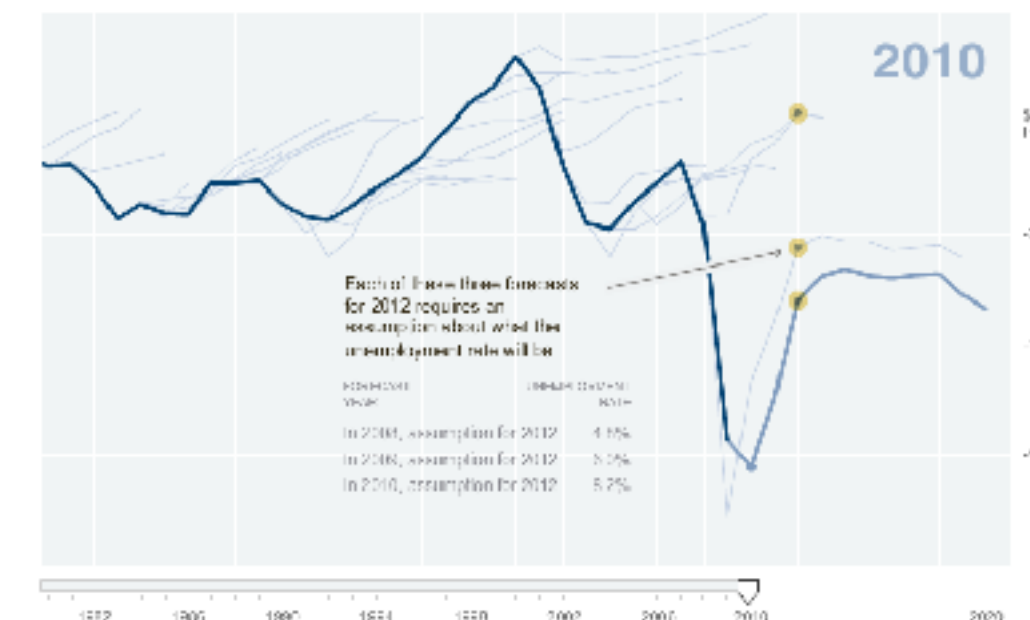
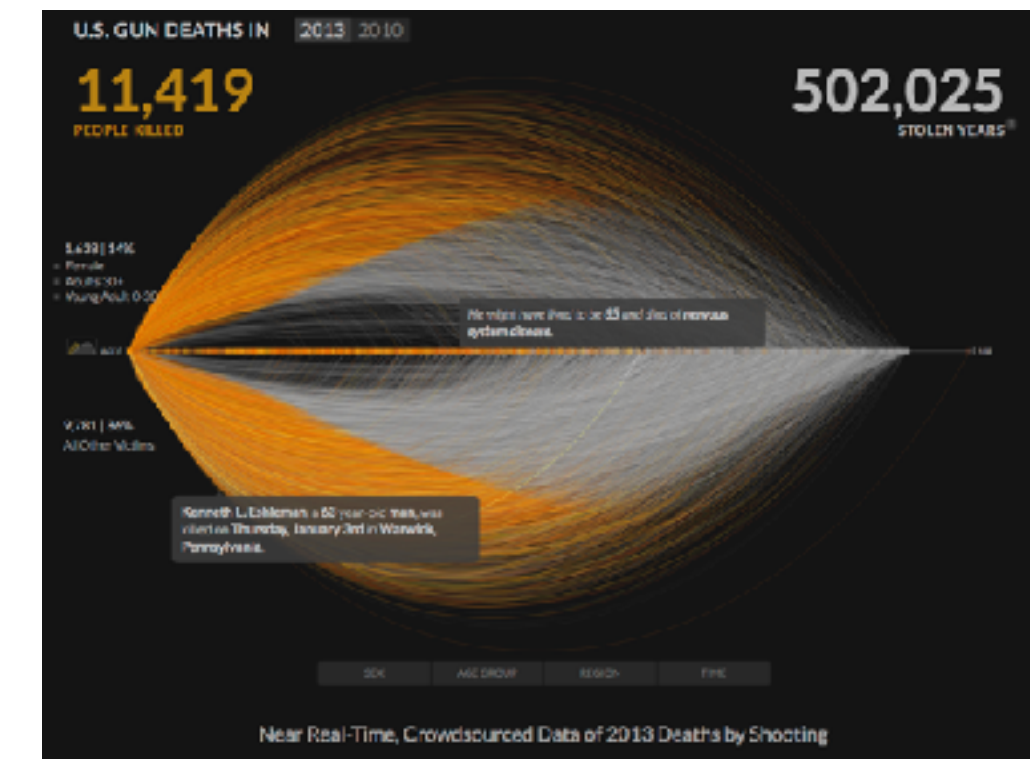


Split into multiple scenes, allow interaction mid-way

## Drill-Down Story



Let reader decide which path to follow, all paths are annotated!



# Strategies for Storytelling



# Layout Principles

Descriptive titles

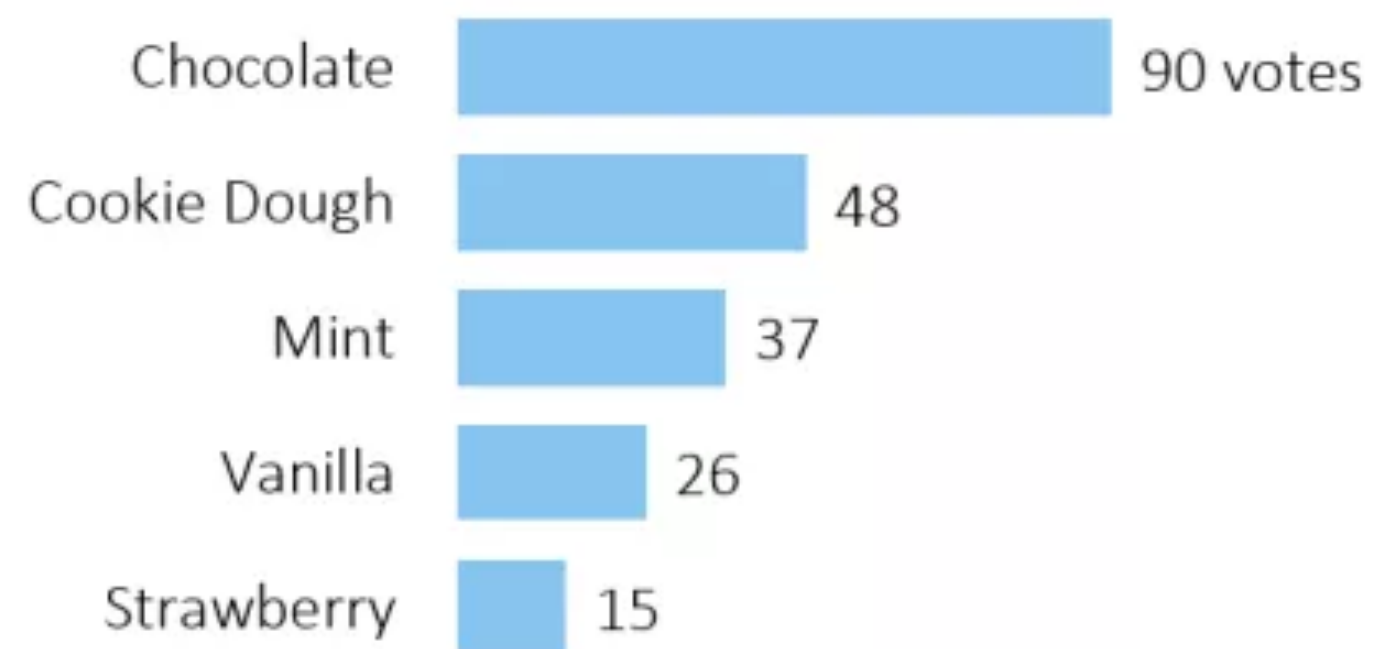
Descriptive subtitles

Annotations

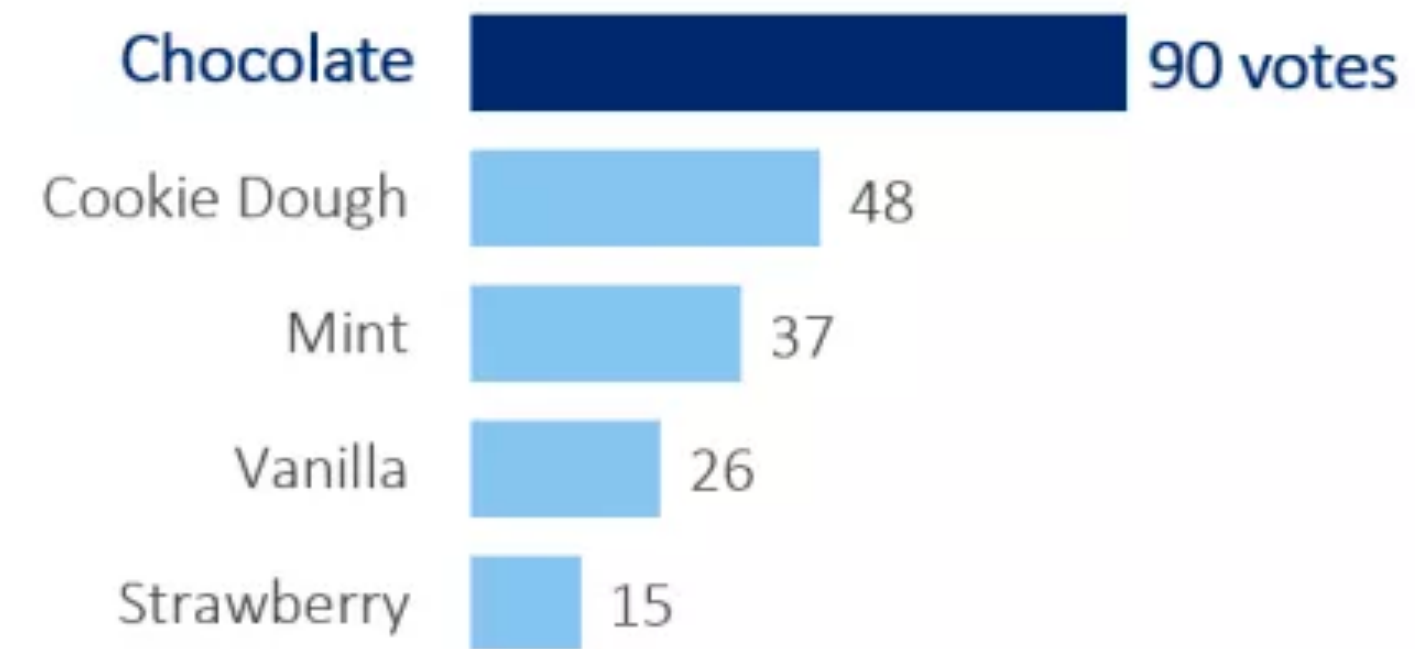
Saturation

# **Descriptive title** and **saturation** to show how chocolate is the preferred ice cream flavor

Ice cream flavor preferences based on 2014 survey of elementary school students (n=216)



or **Chocolate was most popular flavor** among elementary students surveyed

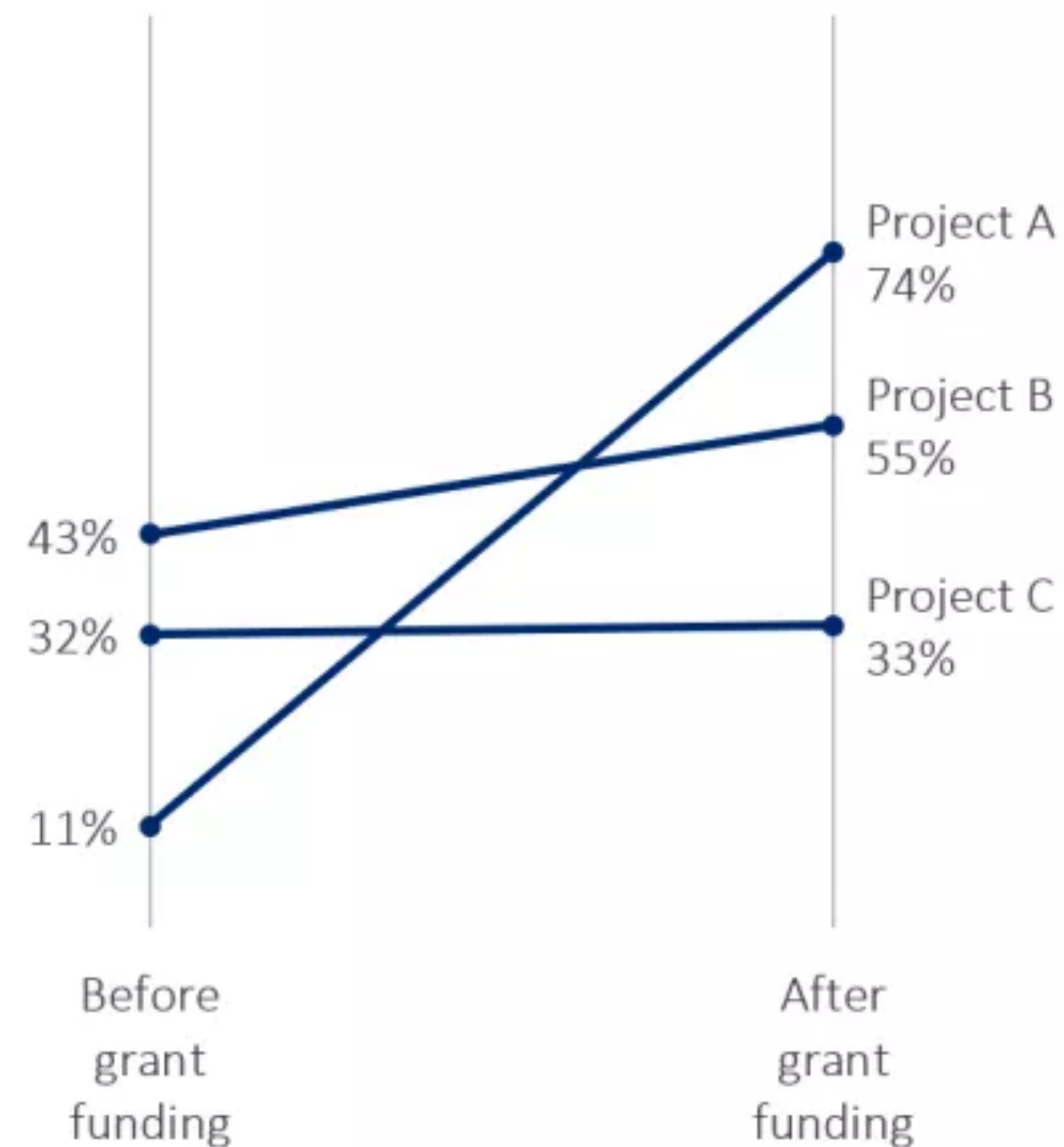


Source: 2014 survey of elementary school students (n=216)



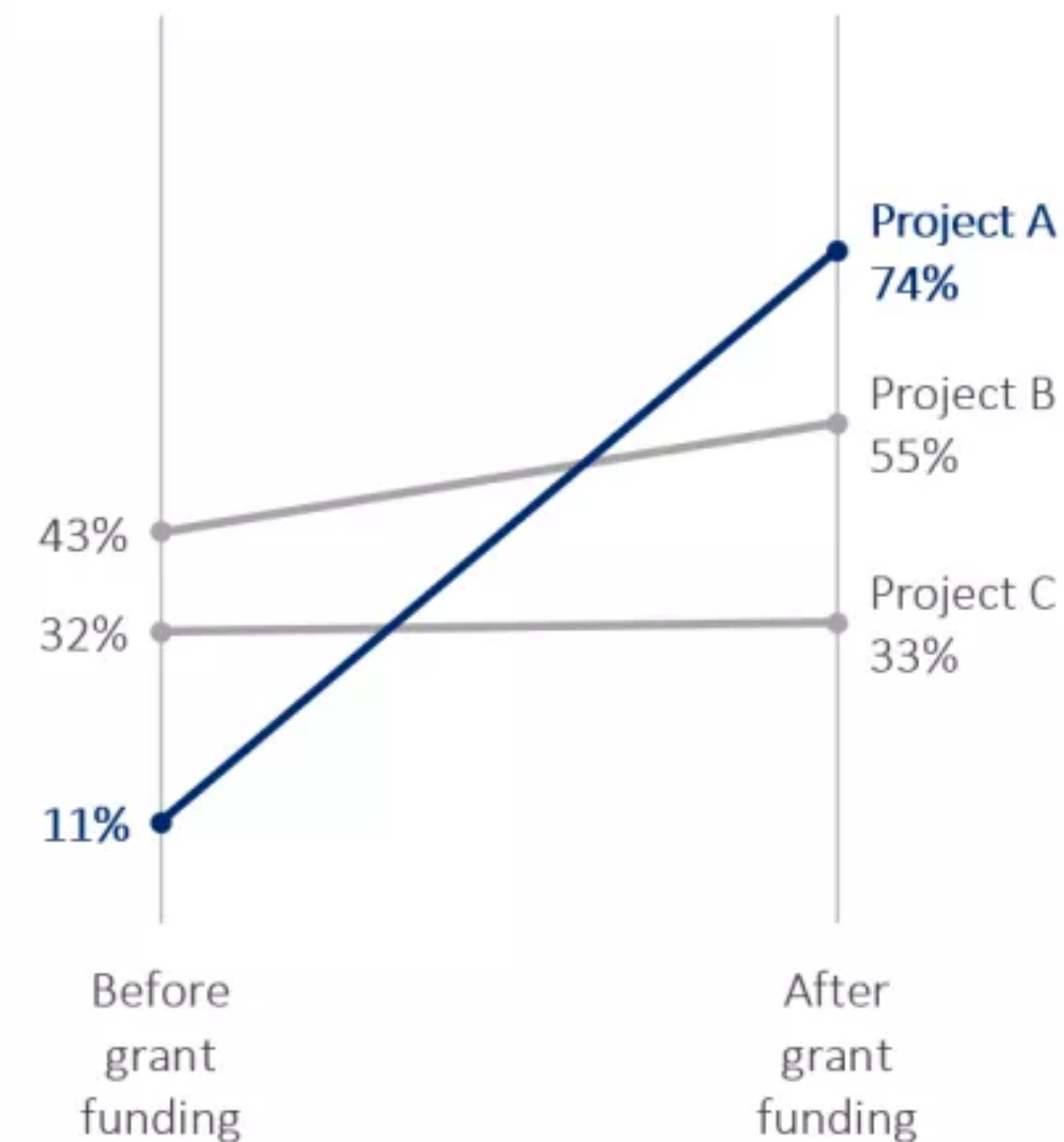
**Descriptive title** and **saturation** emphasize how Project A is performing particularly well

Project results before and after implementation of grant



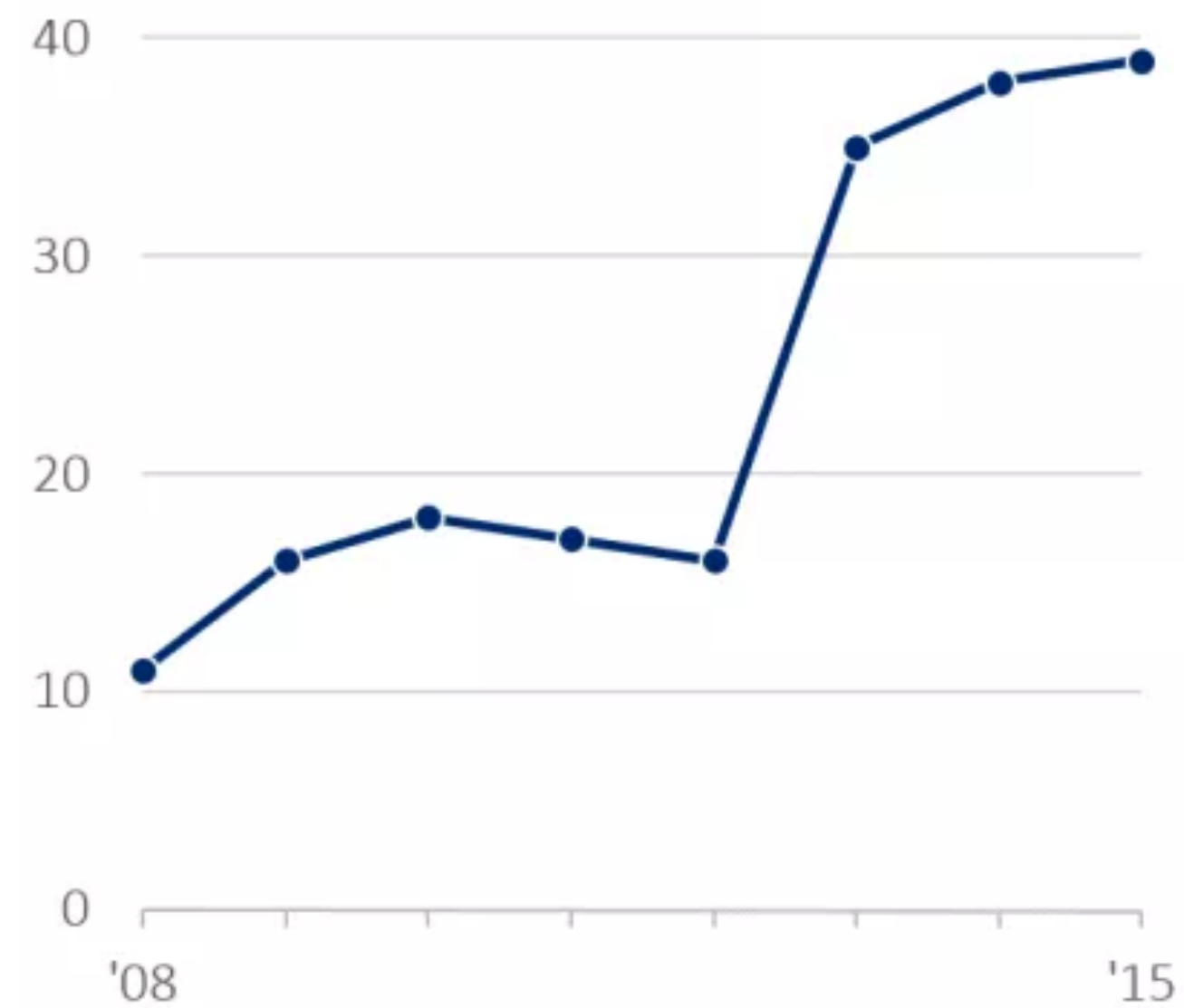
or

Project A had the greatest gains after the four-year grant funding



# Descriptive title, **descriptive subtitle**, and **annotation** for increased understanding

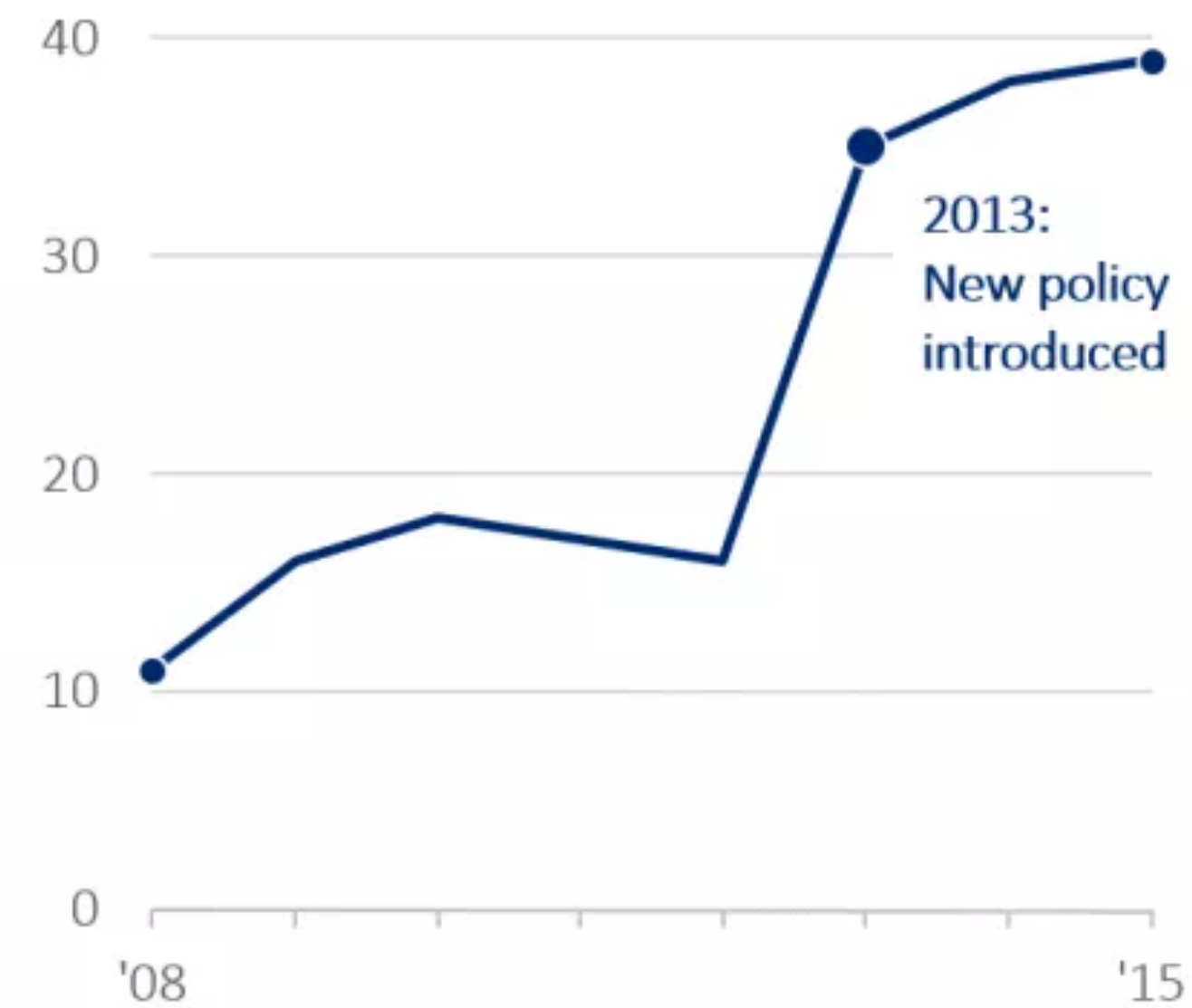
Number of studies funded each year



or

We're funding more studies each year

Beginning in 2013, we set aside new funding to measure the effectiveness of our initiatives – and we evaluated 39 of our programs in 2015 alone.





# Interactivity

## Navigation

Steppers, Scrolling, Play/Fwd/Rwd, etc.

## Details on Demand

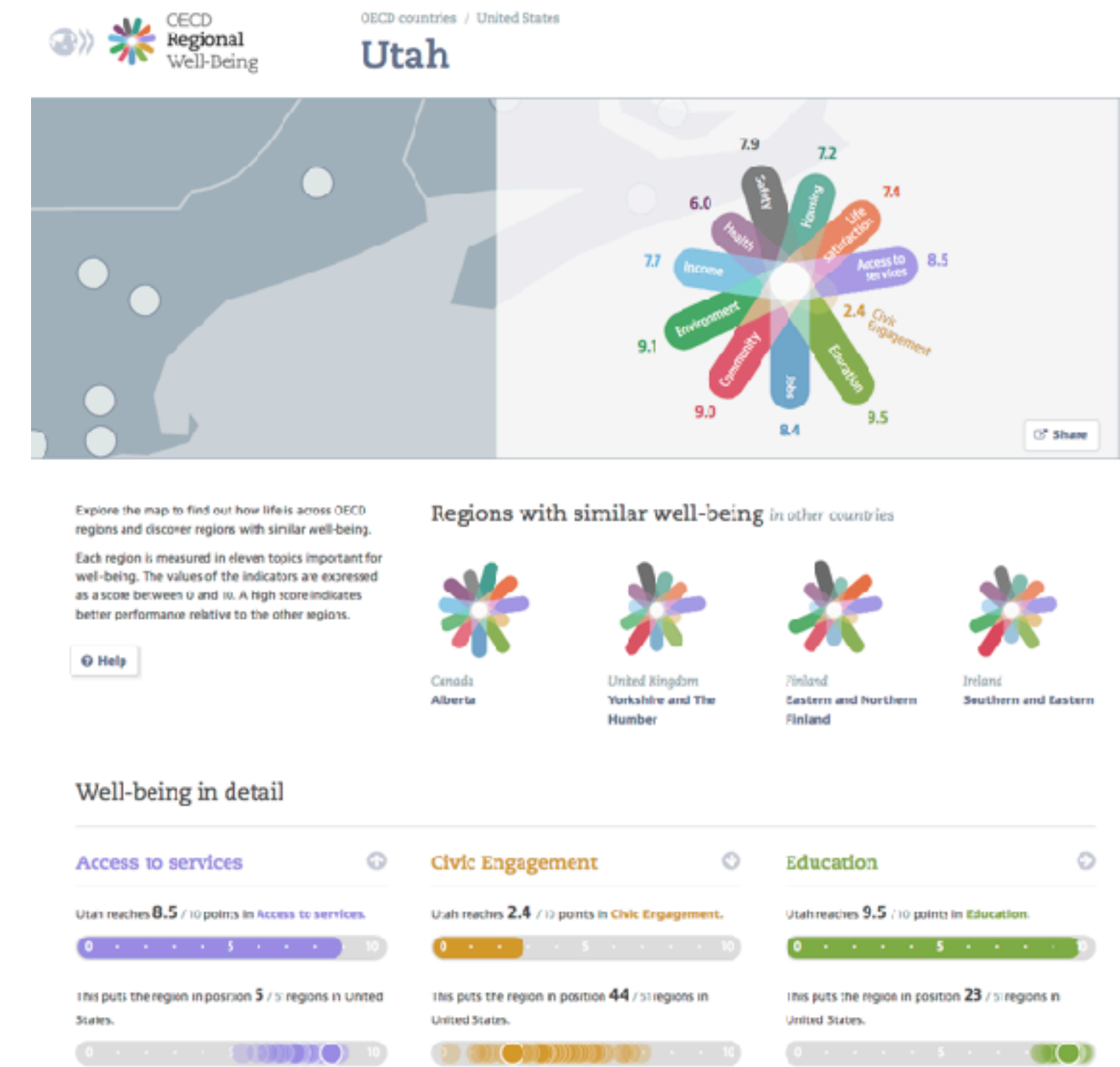
Highlights when desired

## Making it relevant to the reader

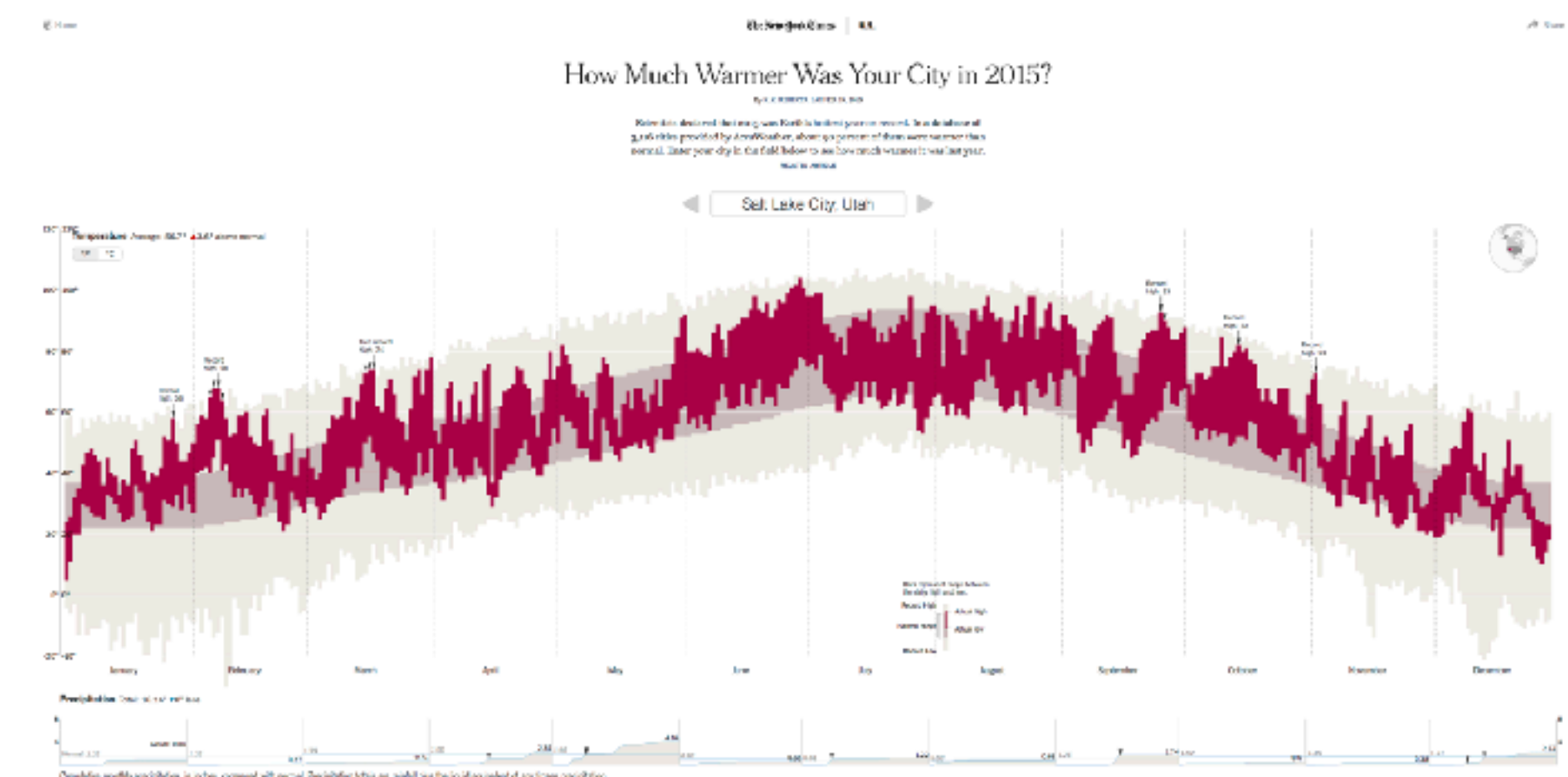
What do you think?

Who are you?

Where do you live?



<https://www.oecdregionalwellbeing.org/US49.html>



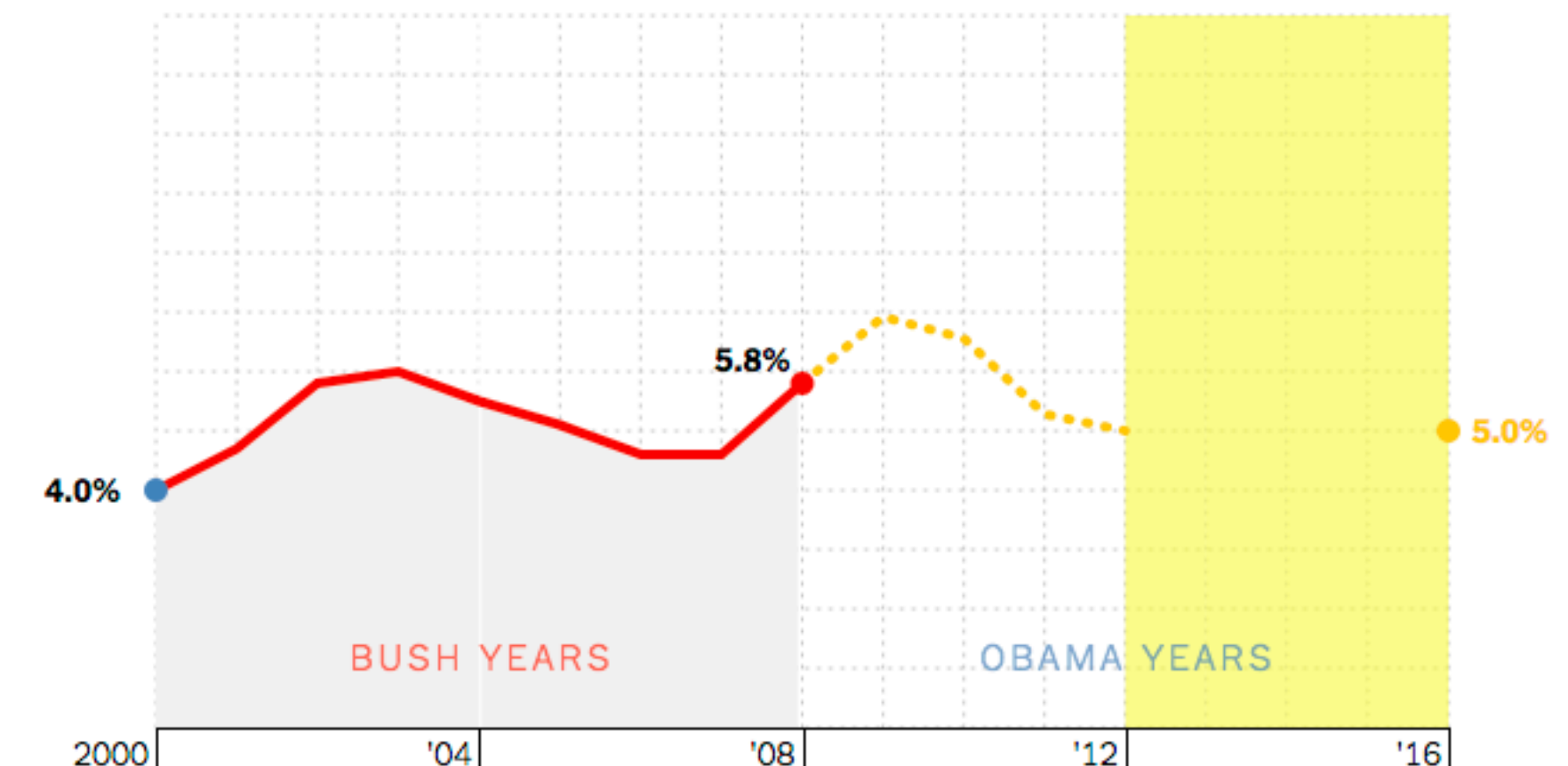
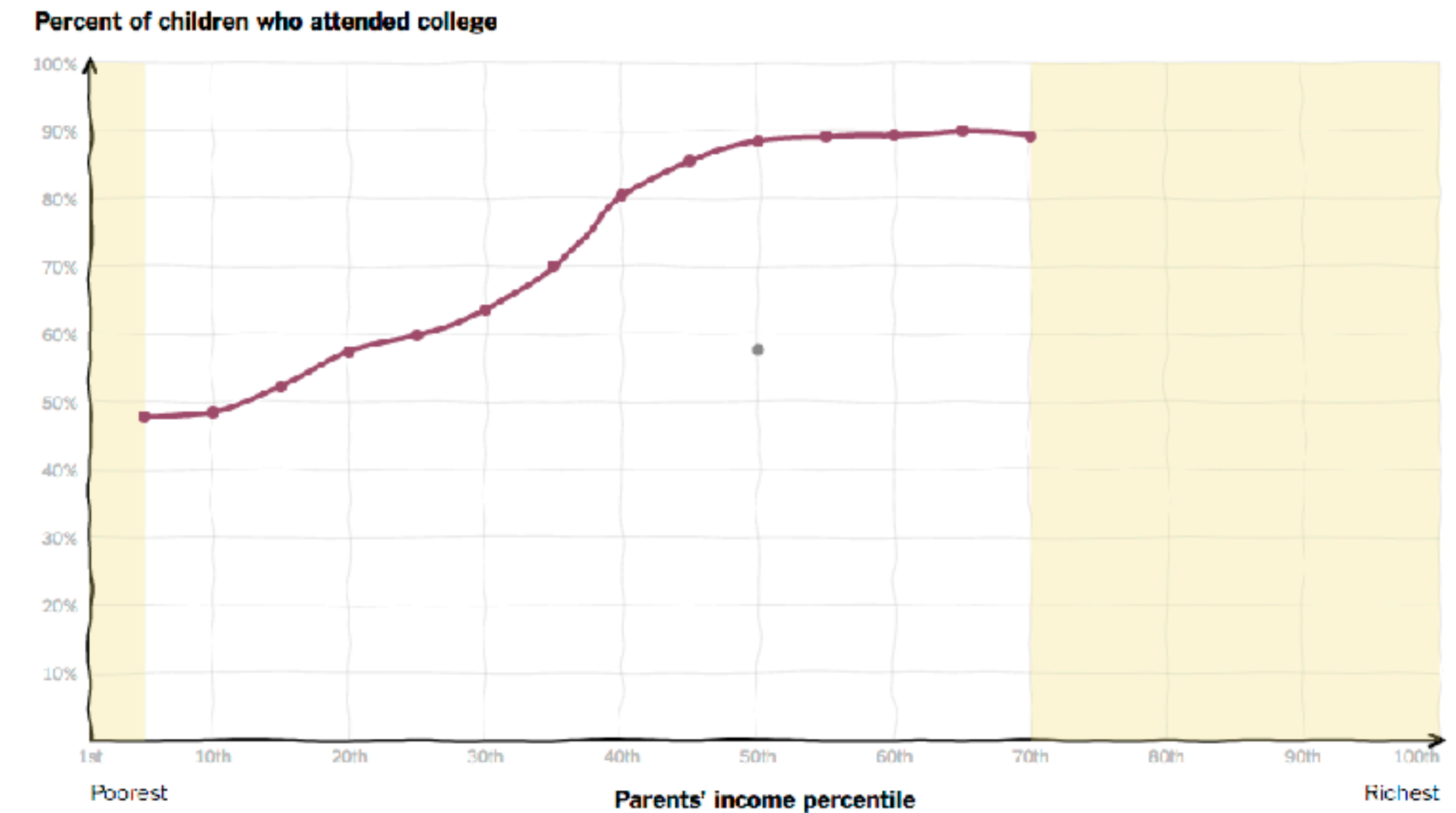
# Ask for Opinions / Prior Knowledge

Ask reader to draw a trend

Juxtapose with

reality

what other people think

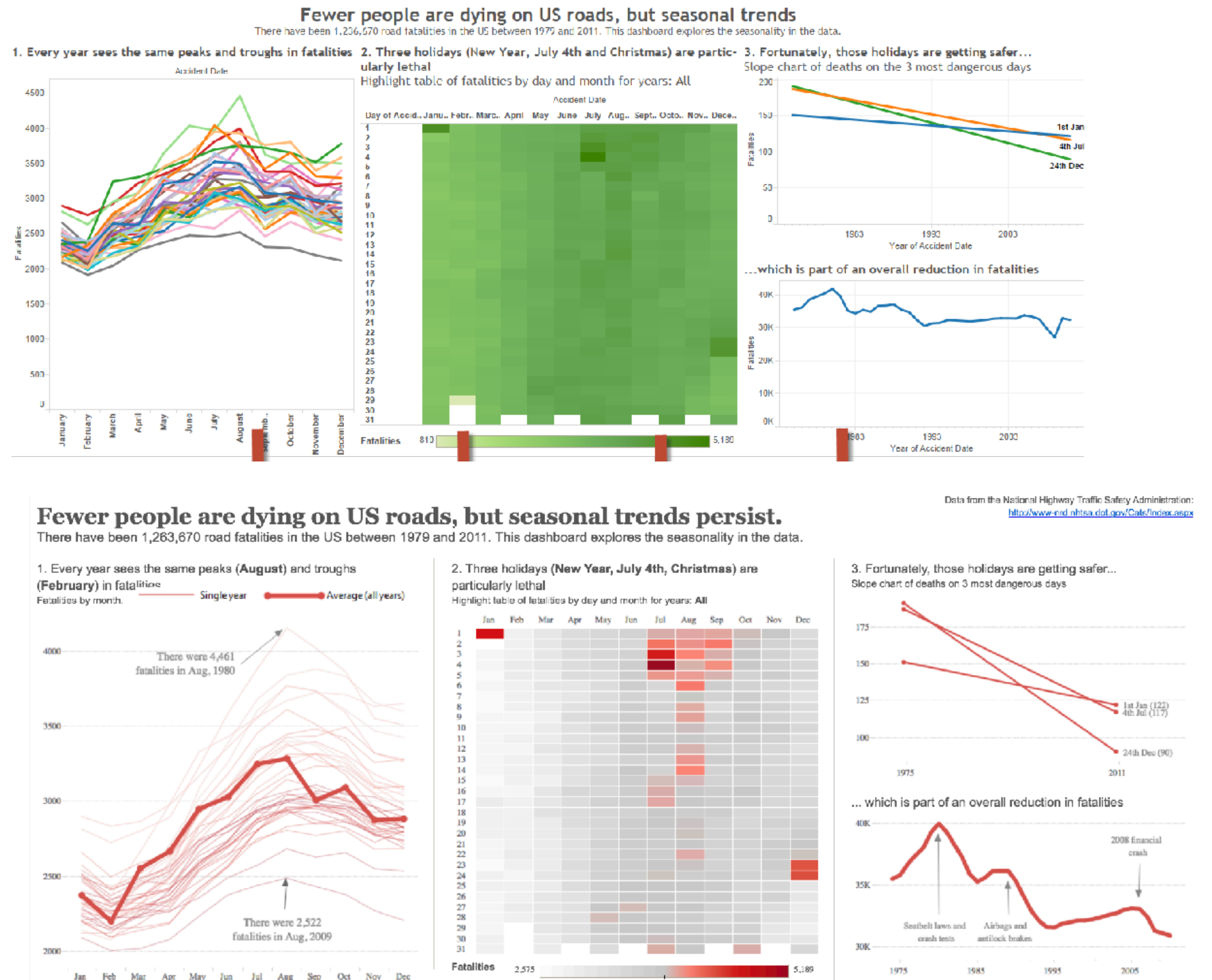


Show me how I did.



# Design Considerations

Fewer Colors  
Averages for  
Context  
Better Scales  
Richer  
Annotations





# Contrast

Making elements different increases understanding.

# Repetition

Repeat visual elements to create strong unity.

# Alignment

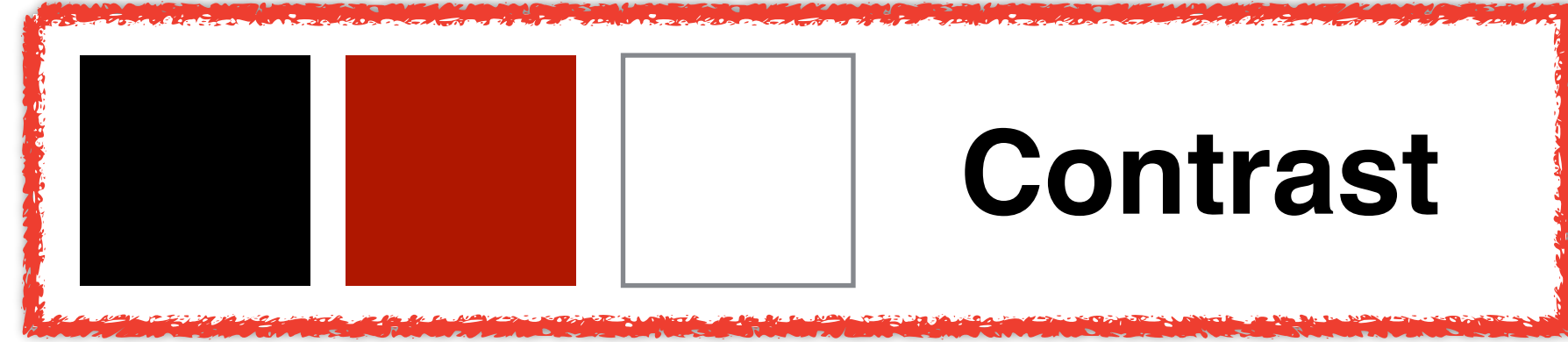
Nothing should be placed arbitrarily. Placement illustrates relationships between elements.

# Proximity

Related items should be placed together.

# Contrast

Making elements different increases understanding.



# Repetition

Repeat visual elements to create strong unity.

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Nothing should be placed arbitrarily. Placement illustrates relationships between elements.

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Nothing should be placed arbitrarily. Placement illustrates relationships between elements

# Proximity

Related items should be placed together.

**Repetition  
Similar Style**





# Contrast

Making elements different increases understanding.

# Repetition

Repeat visual elements to create strong unity.

# Alignment

Nothing should be placed arbitrarily. Placement illustrates relationships between elements.

# Proximity

Related items should be placed together.

# Contrast

Making elements different increases understanding.

# Repetition

Repeat visual elements to create strong unity.

# Alignment

Nothing should be placed arbitrarily. Placement illustrates relationships between elements.

# Proximity

Related items should be placed together.



vs

# Engagement



# Know Your Audience

People you don't know are difficult to influence

What do they know?

What motivates them?

What experiences do you share?

What are common goals?

What insights can you give them?

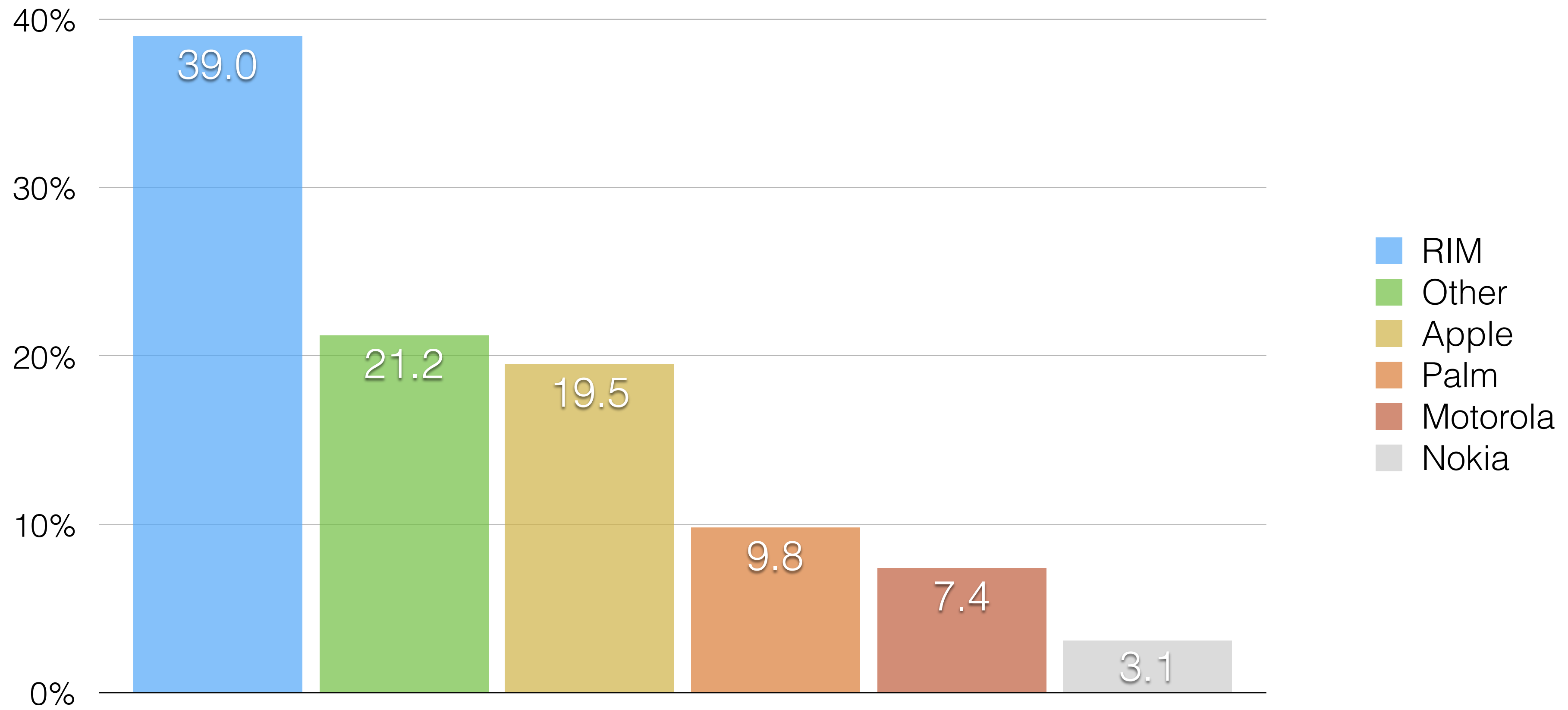




# Target Audience



Target  
Audience?





Opportunity Dashboard

Sales Dashboard

## Sales Dashboard

Total Sales

**\$3,190.2M**

Number of Deals

**16,610**

Avg Deal Size

**\$189,545**

Rev. per  
Salesperson

**\$20.1M**

Date Closed

8/7/2006

12/31/2010

Region

(All)

Country

(All)

Sales Team

☒ (All)

☐ Small and Midmarket

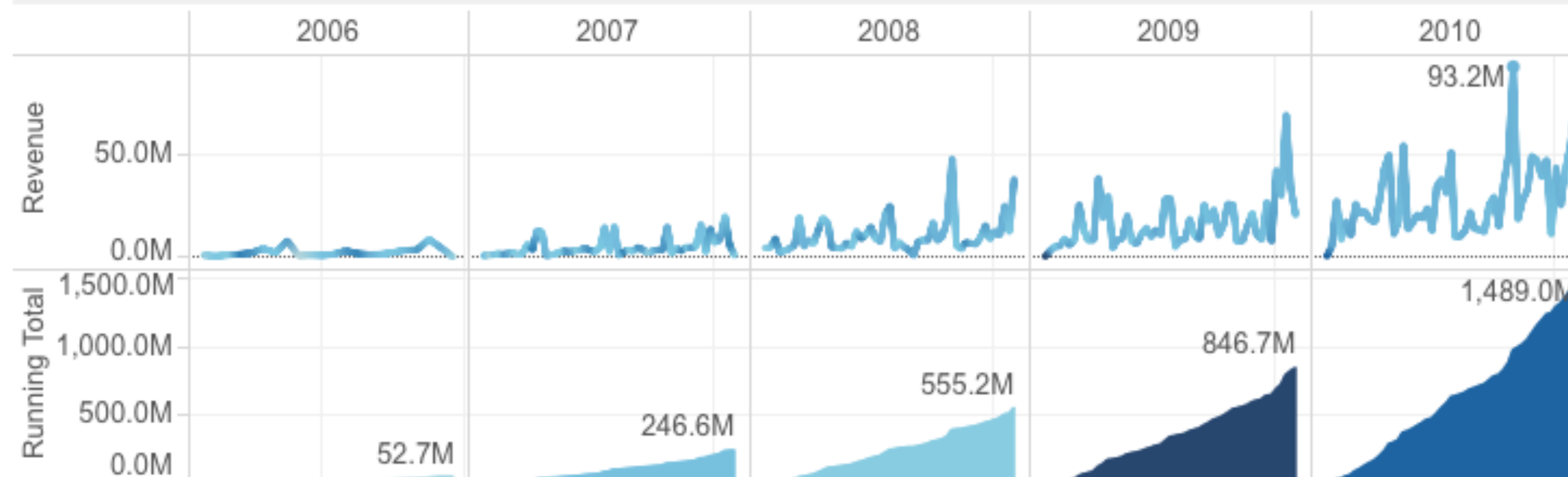
☐ Enterprise

Avg Deal Size/Salespe...

\$130,922

\$336,519

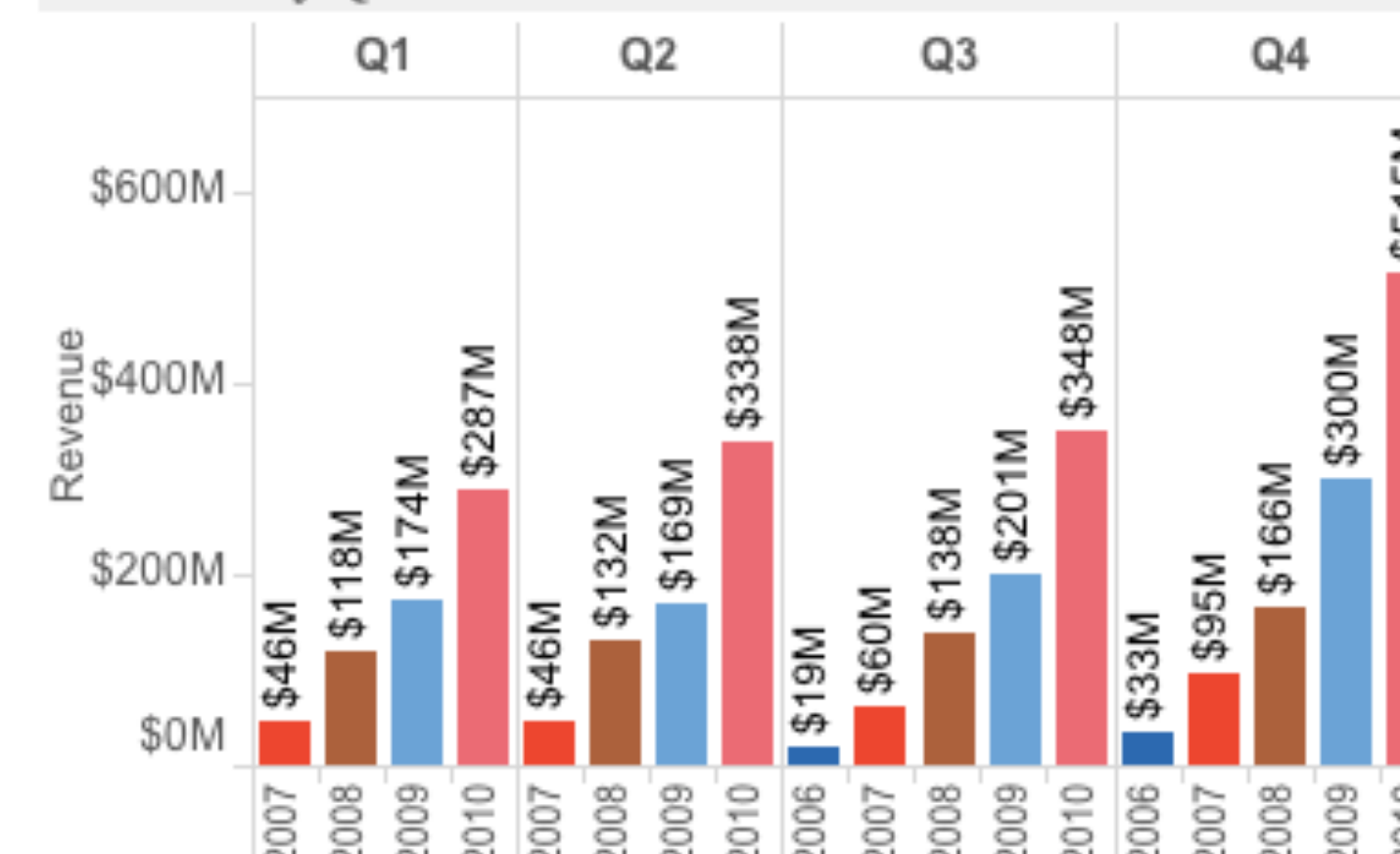
### Revenue Over Time



### Sales Team Performance

Sales Team	Salesperson	Opportunity Closed	Average Deal Size
Enterprise	Susan Olson	55.0M	0.5M
	Steve Watkins	48.2M	0.5M
	Raymond Hawkins	45.4M	0.4M
	Robert Hudson	44.1M	0.4M
	Preston Rose	43.0M	0.4M
	Sophia Willis	41.0M	0.4M
	Dan Rivera	40.3M	0.3M
	Sarah Stephens	34.2M	0.3M
	Ross Soencer	33.8M	0.3M

### Revenue by Quarter



Target  
Audience?

# WHERE THERE'S SMOKE—THERE'S CANCER

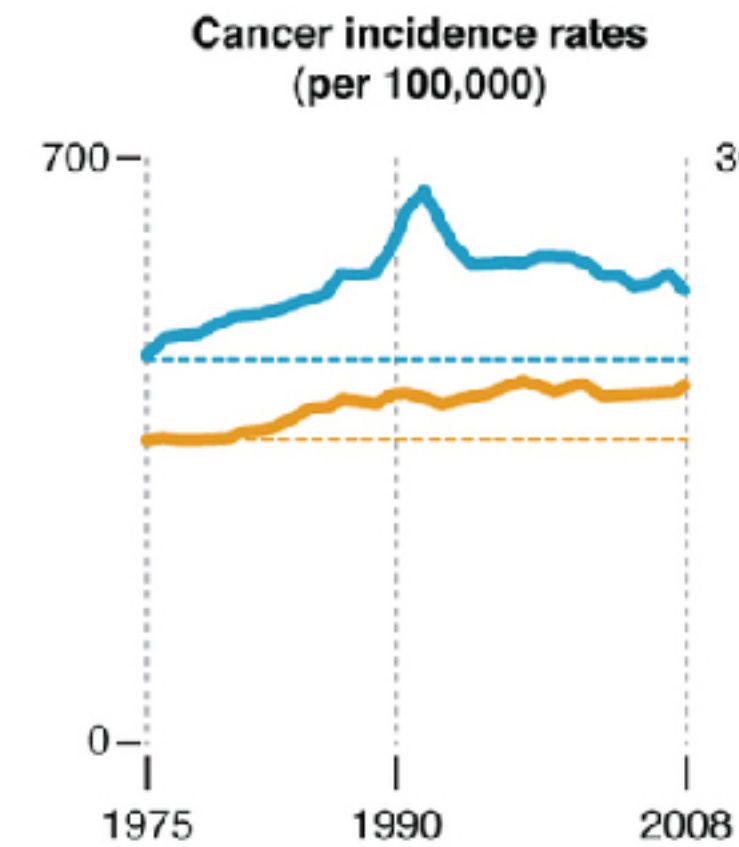
Cancer rates are up, but mortality is down. New diagnostics and treatments are responsible for part of this trend. But the greatest single contributing factor is the decline in smoking—rates are at their lowest level in 50 years.

Target Audience?

Men Women

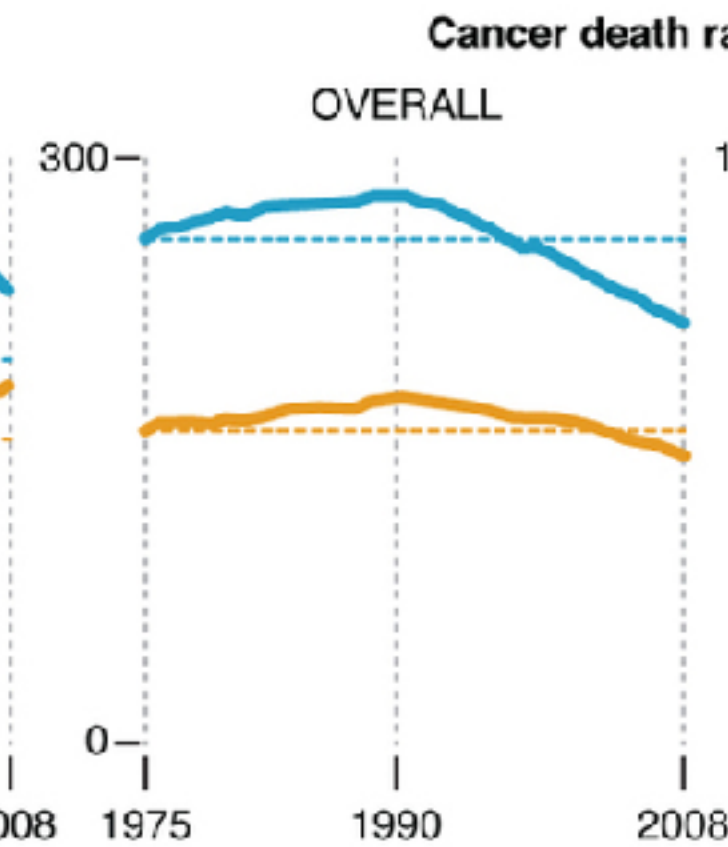
## 1 Increased incidence

An aging population contributes to rising incidence of cancer.



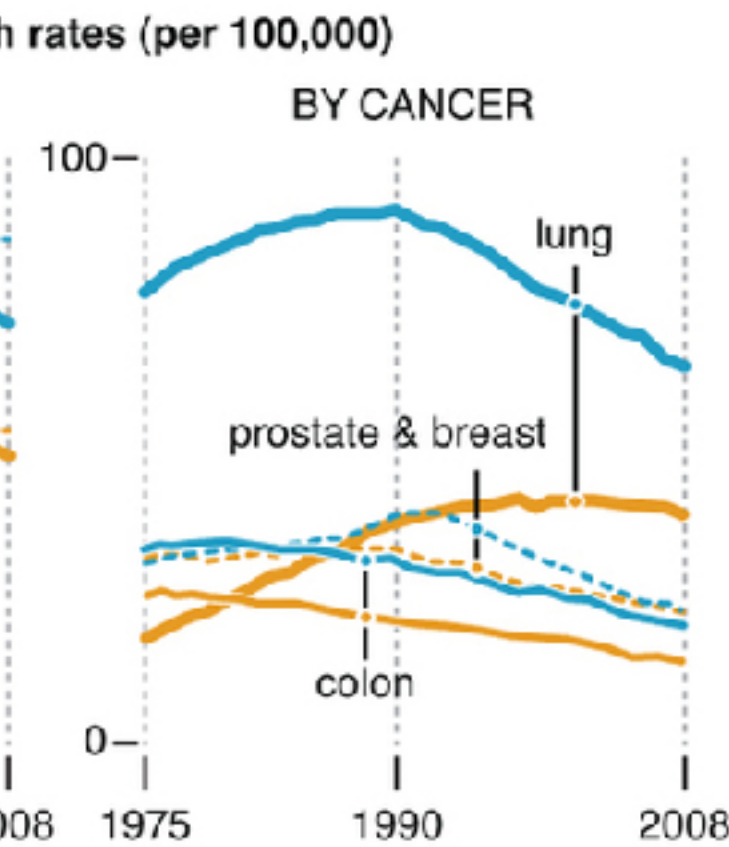
## 2 Fewer deaths

Cancer deaths have been dropping since 1991, especially in males.



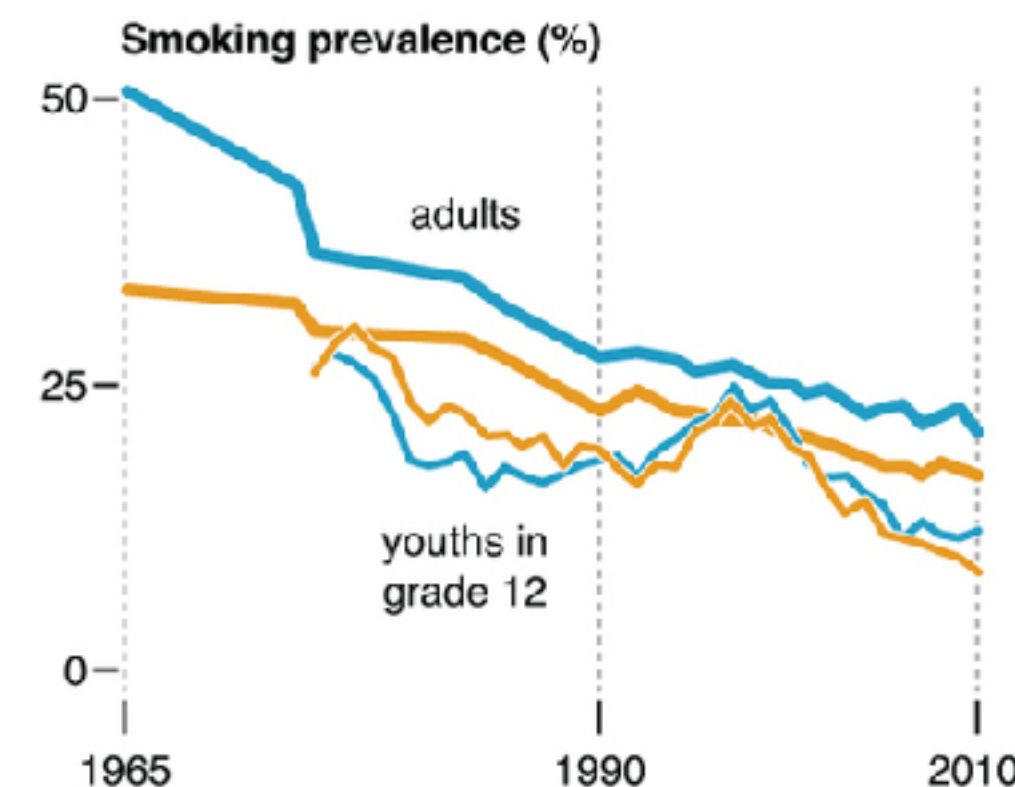
## 3 Decline of lung cancer

Drop in lung cancer deaths in males is the primary reason why death rates are down.



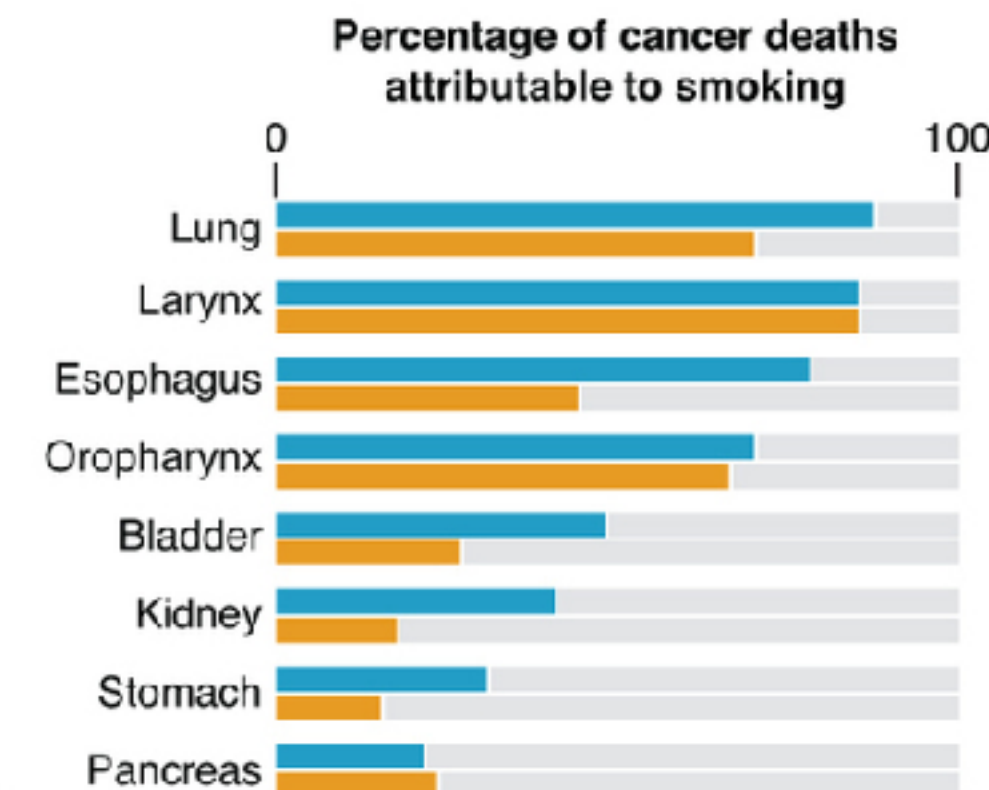
## 4 Decline in smoking

Since the 1964 first Surgeon General's report, smoking rates have been dropping. By 2010, the rate among males was down to 20%, from 50% at its peak. Among youths, rates have been on an even steeper decline since 1997.



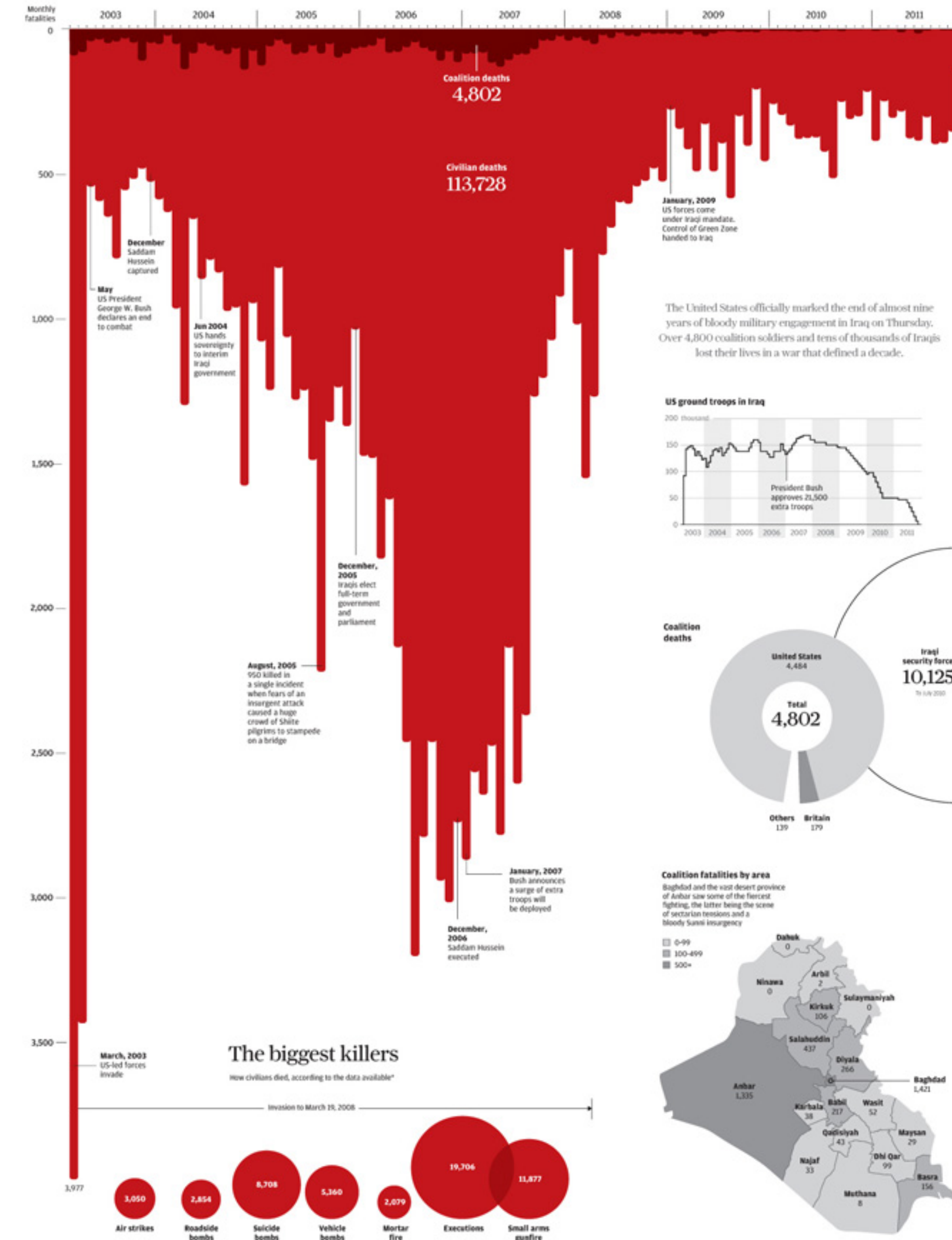
## 5 Impact of smoking on cancer deaths

Smoking is a major risk factor for many types of cancer and significant contributor to cancer-related deaths. It remains the single largest preventable cause of disease and premature death in the US.





# Iraq's bloody toll



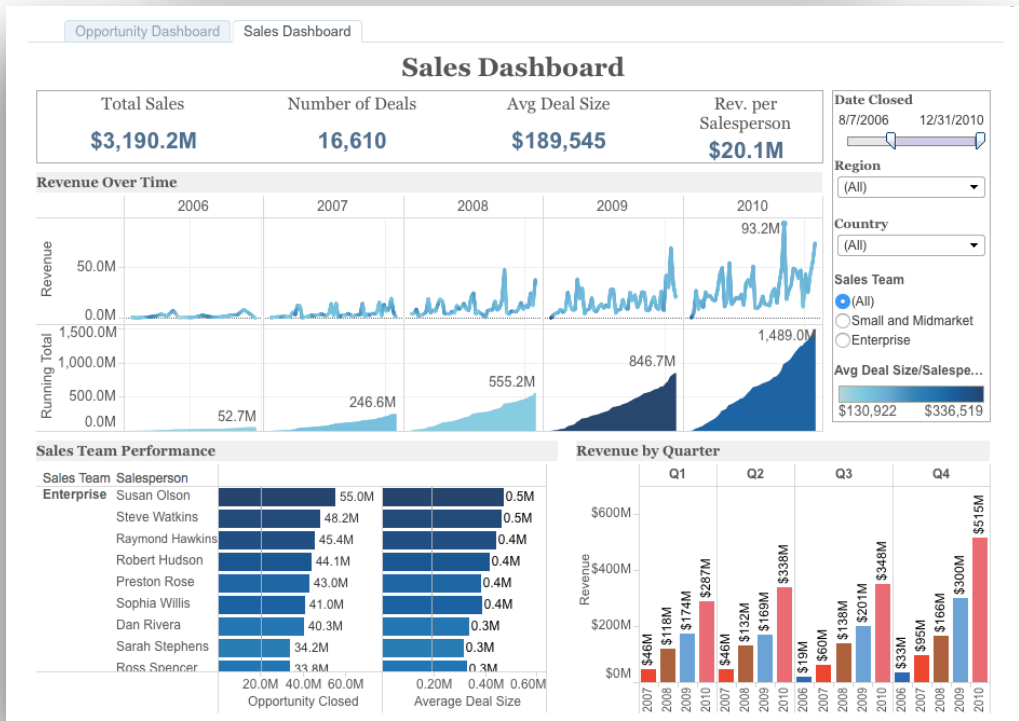
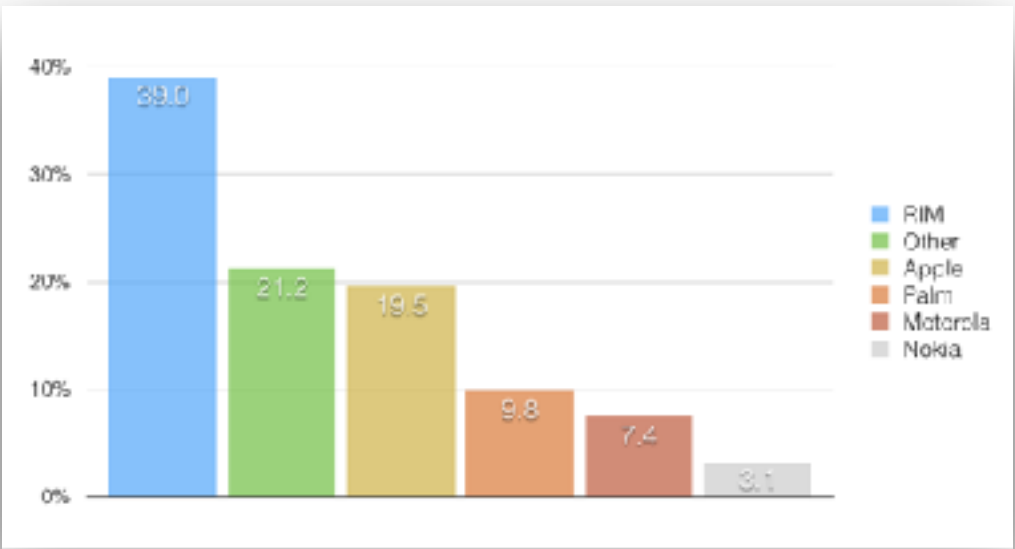
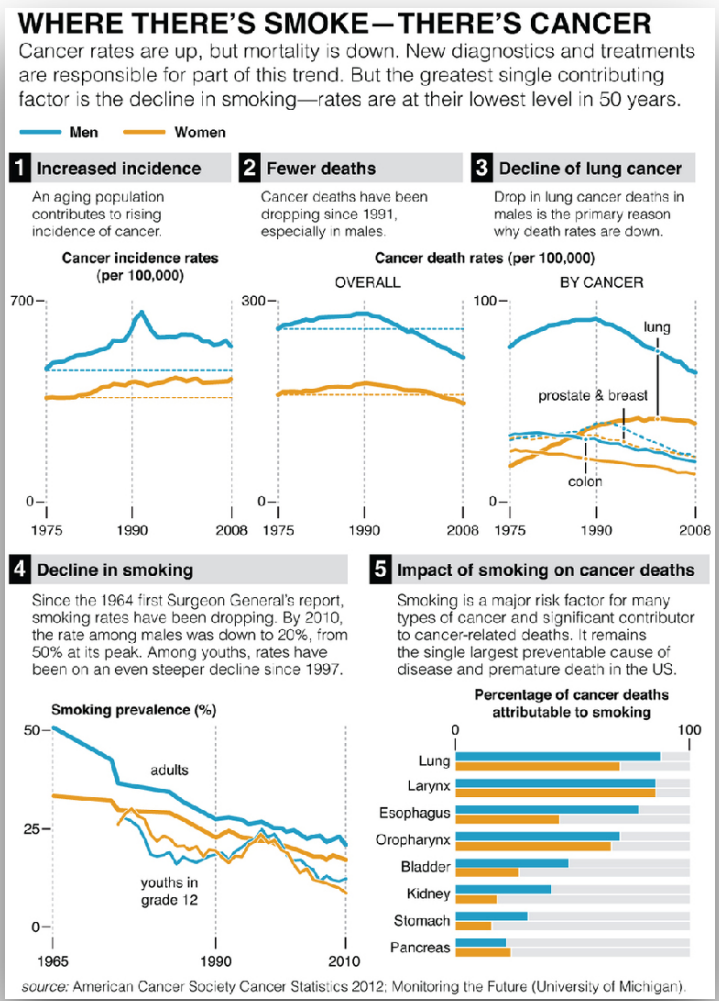
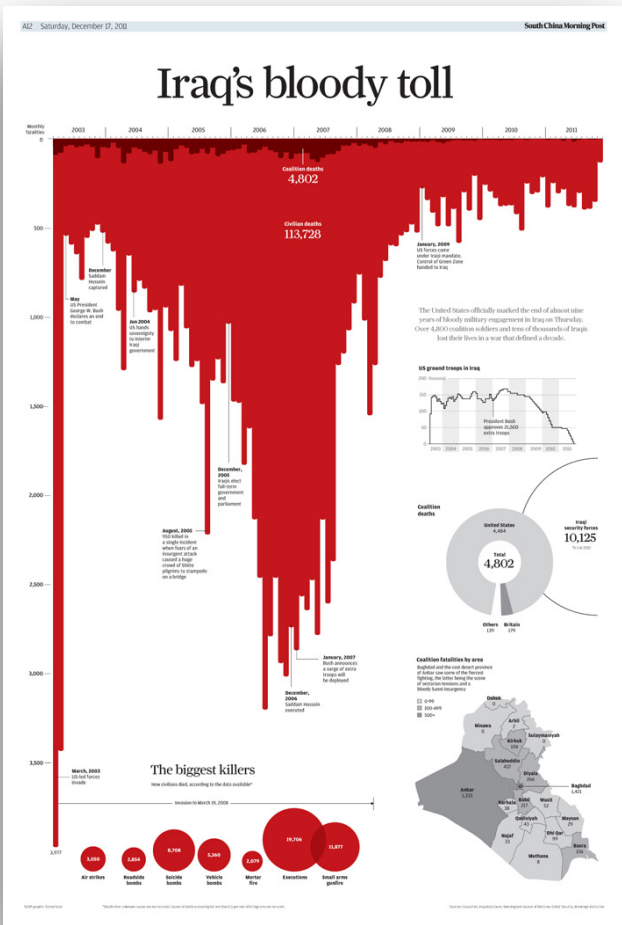
Target Audience?





# Target Audience

Opinionated



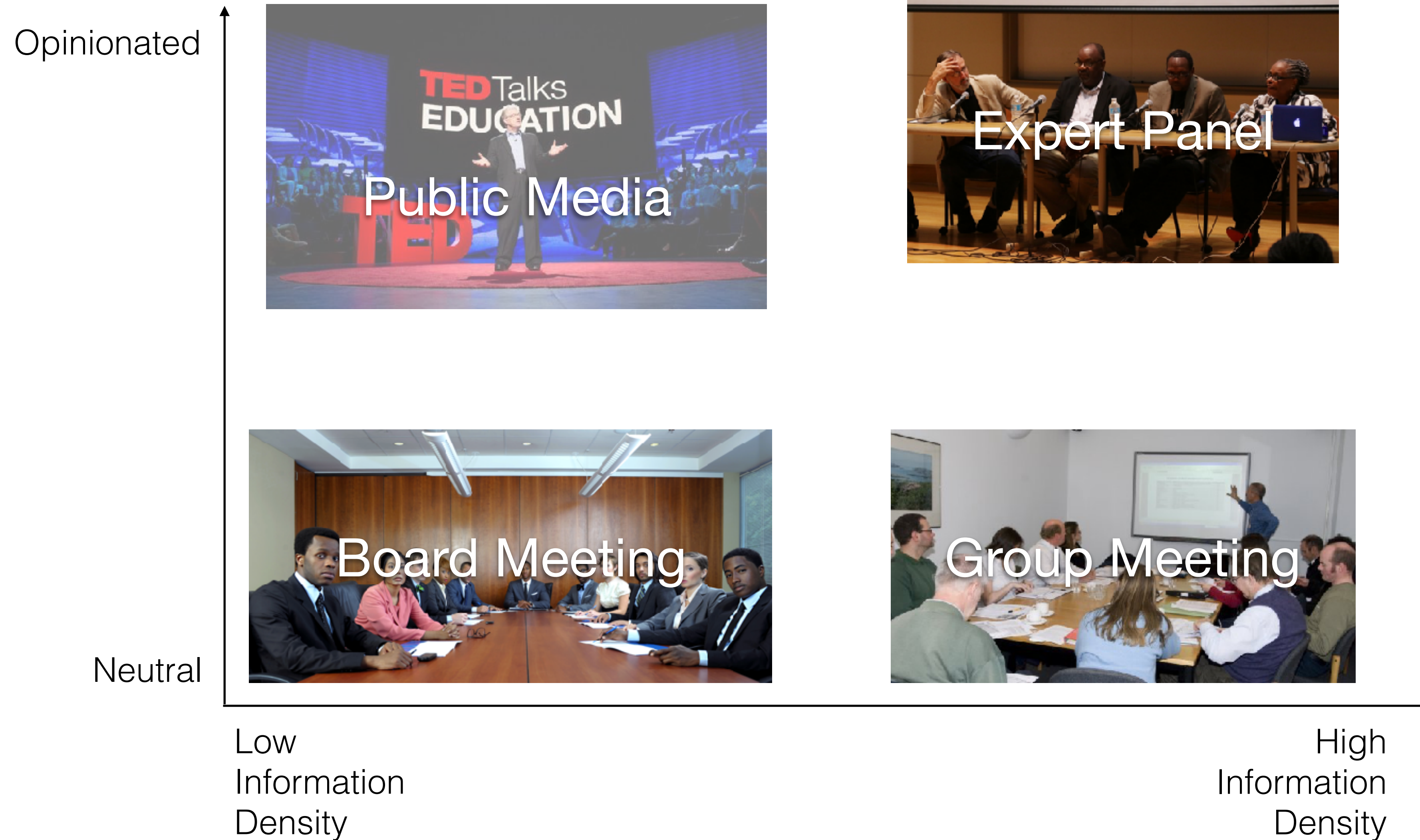
Neutral

Low  
Information  
Density

High  
Information  
Density



# Target Audience





# Exercise: Analyze Stories

## 1.5 Million Missing Black Men

By JEFFREY WOLFERS, DAVID LEONARDY and KEVIN QUENLY / APRIL 20, 2015

For every 100 black women not in jail, there are only 83 black men. The remaining men — 1.5 million of them — are, in a sense, **missing**.



Among cities with sizable black populations, the largest single gap is in **Ferguson, Mo.**



**North Charleston, S.C.**, has a gap larger than 75 percent of cities.



This gap — driven mostly by incarceration and early deaths — **barely exists among whites.**

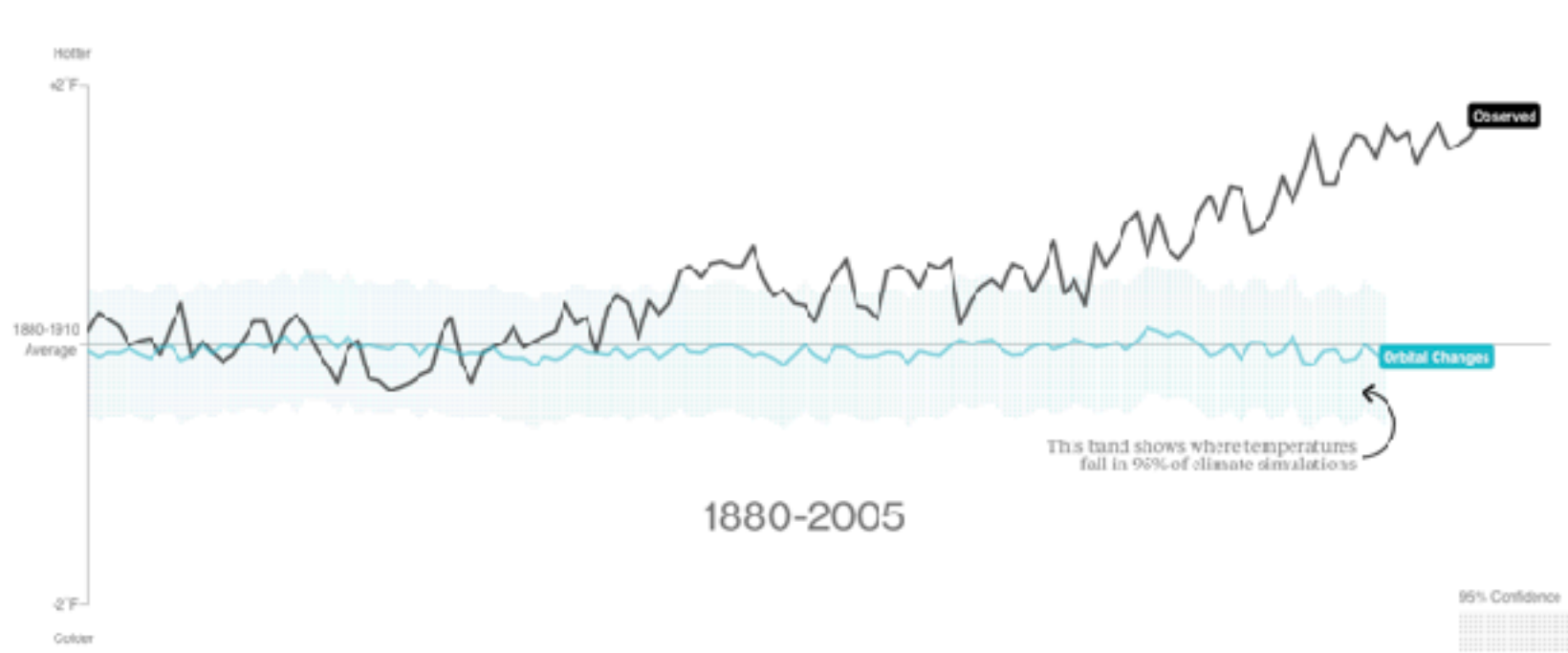


Figures are for non-incarcerated adults who are 25 to 64.

<https://www.nytimes.com/interactive/2015/04/20/upshot/missing-black-men.html>

## Is It the Earth's Orbit?

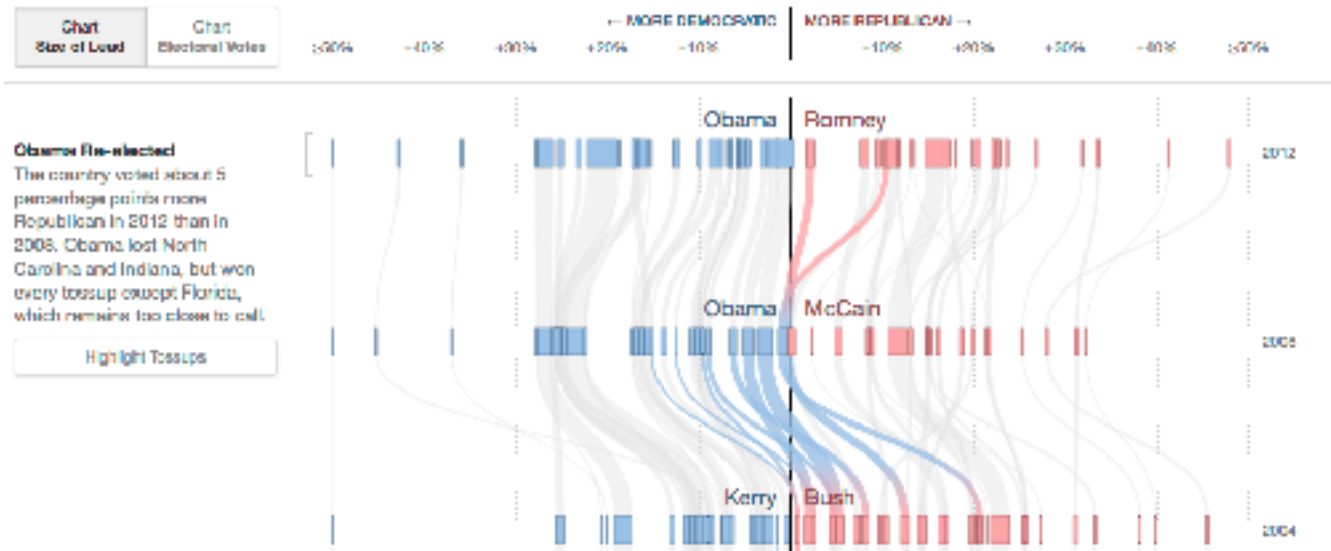
The Earth wobbles on its axis, and its tilt and orbit change over many thousands of years, pushing the climate into and out of ice ages. Yet the influence of orbital changes on the planet's temperature over 125 years has been negligible.



<https://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

## Over the Decades, How States Have Shifted

Recent elections have placed a heavy emphasis on "swing states" — Ohio, Florida and the other competitive states. Yet in the past, many more states shifted between the Democratic and Republican parties. A look at how the states stacked up in the state elections and how they have shifted over past elections.



<http://www.nytimes.com/interactive/2012/10/15/us/politics/swing-history.html>

# 1.5 Million Missing Black Men

By JUSTIN WOLFERS, DAVID LEONHARDT and KEVIN QUEALY   APRIL 20, 2015

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Figures are for non-incarcerated adults who are 25 to 54.

## What’s the Genre?

(Magazine, Annotated Chart, Partitioned Poster, Flow Chart, Comic Strip, Slide Show, Video/Animation)

## Is it Author or Reader Driven?

## Can you make out a particular structure?

(Martini Glass, Interactive Slideshow, Drill-Down Story)? Why?

## Does it have a good Introduction?

What medium is used for the introduction?

## Is the story opinionated or neutral?

## Does it use titles, legends, and highlights well?

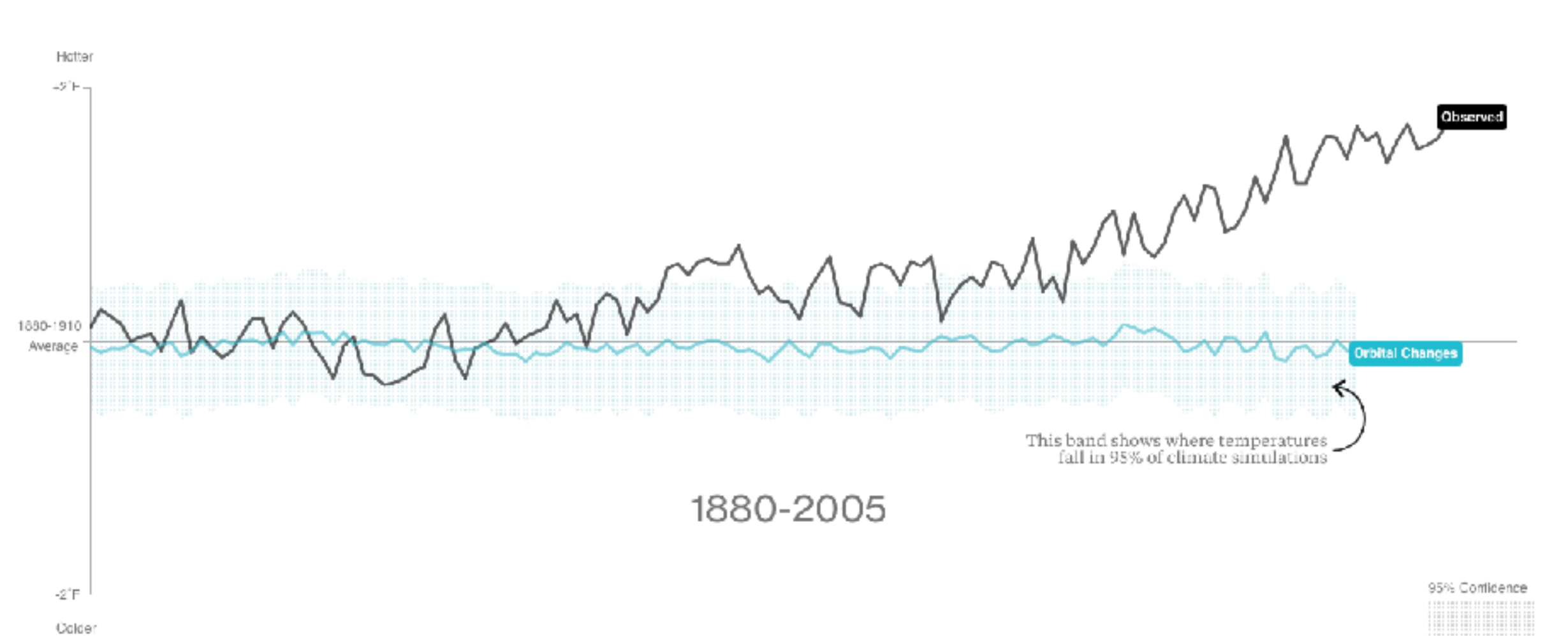
## Does it use interactivity well?

## Is the visualization well designed?



## Is It the Earth's Orbit?

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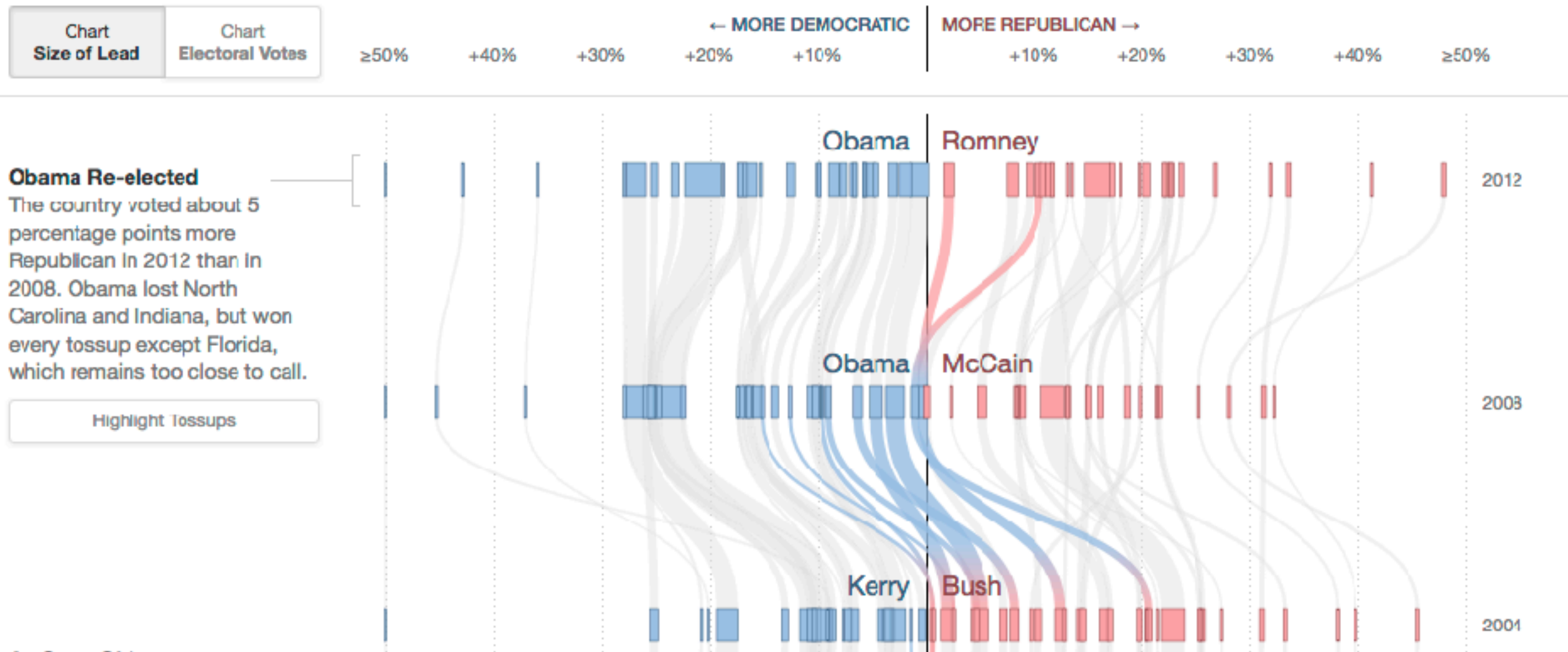
## Is the visualization well designed?

## Over the Decades, How States Have Shifted

Recent elections have placed a heavy emphasis on “swing states” — Ohio, Florida and the other competitive states. Yet in the past, many more states shifted between the Democratic and Republican parties. A look at how the states stacked up in the 2012 election and how they have shifted over past elections.

Each box represents a state sized by number of electoral votes.

Each curve shows how much it shifted left or right between elections



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## Does it use titles, legends, and highlights well?

## Does it use interactivity well?

## Is the visualization well designed?