



The School of Visual Communication
OHIO UNIVERSITY



SCHOONOVER CENTER FOR COMMUNICATION

DATAVIZ



PDRIVE

i3



Five ways to make data visualization work



1

Identify your audience





CANYON OF UNDERSTANDING

DATA VIZ —————→ **AUDIENCE**

- **Specialists**
- **People with some knowledge of the subject**
- **General public**



2

Storytelling



- **Create a narrative**
- **Headline, intro, annotation**
- **Use journalistic storytelling principles**





Flames engulfed 460 tons of lead when Notre-Dame's roof and spire burned, scattering dangerous dust onto the streets and parks of Paris.

| PLANET OR PLASTIC? |

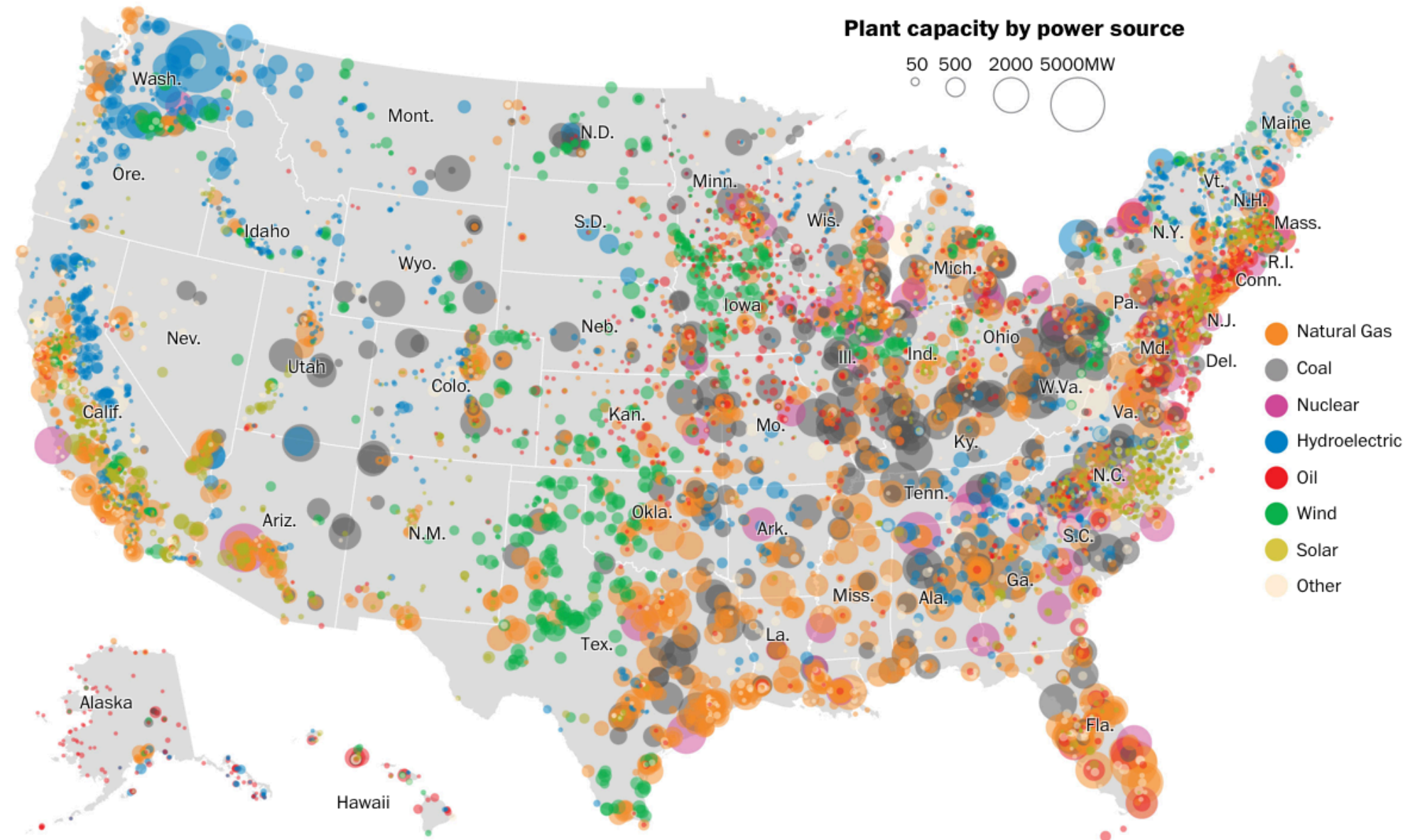
What Happens to the Plastic We Throw Out

How a piece of trash can travel from land to Henderson Island, an uninhabited, remote island in the middle of the South Pacific Ocean

SCROLL DOWN



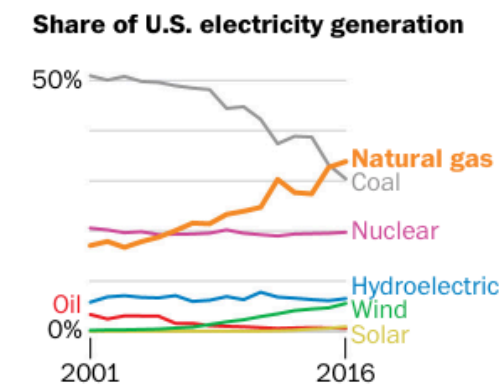
Mapping how the United States generates its electricity



By **John Muyskens, Dan Keating and Samuel Granados**

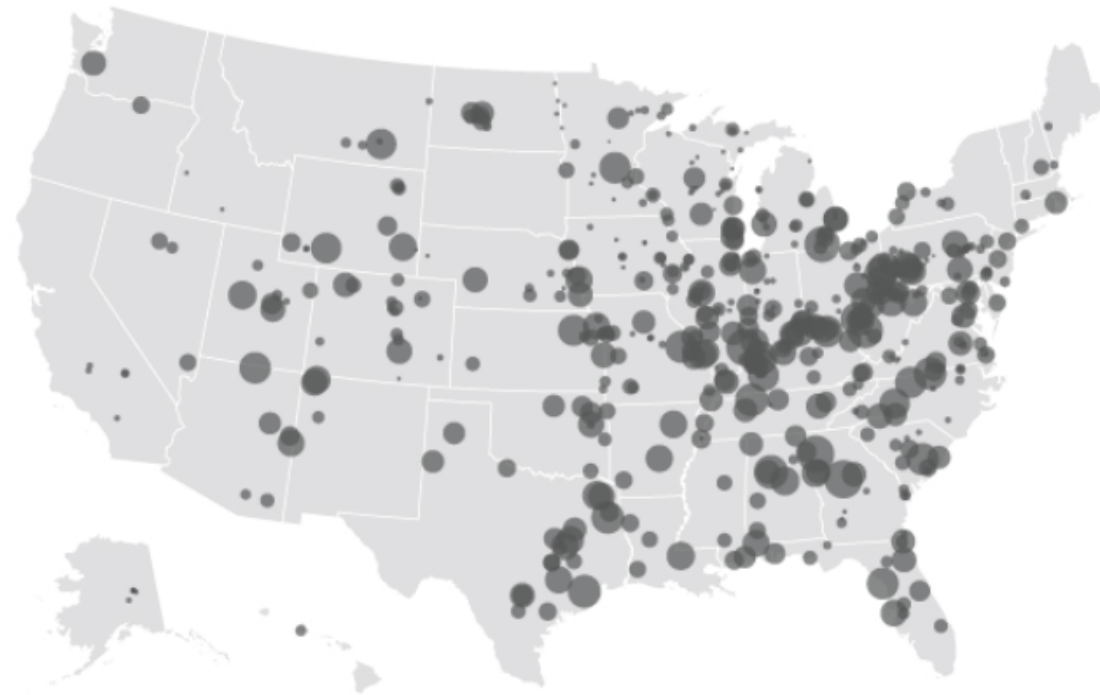
Updated March 28, 2017

President Trump signed in March orders to reverse the previous administration's energy policies, a move that he framed as "an end to the war on coal" and that comes amid a drop in the fuel's use. Natural gas surpassed coal last year as the most common source for electricity generation in the United States, according to a Post analysis of preliminary data from the Energy Information Administration. Coal was responsible for a majority of electricity generation at the start of the century and was





Coal-powered electric plants

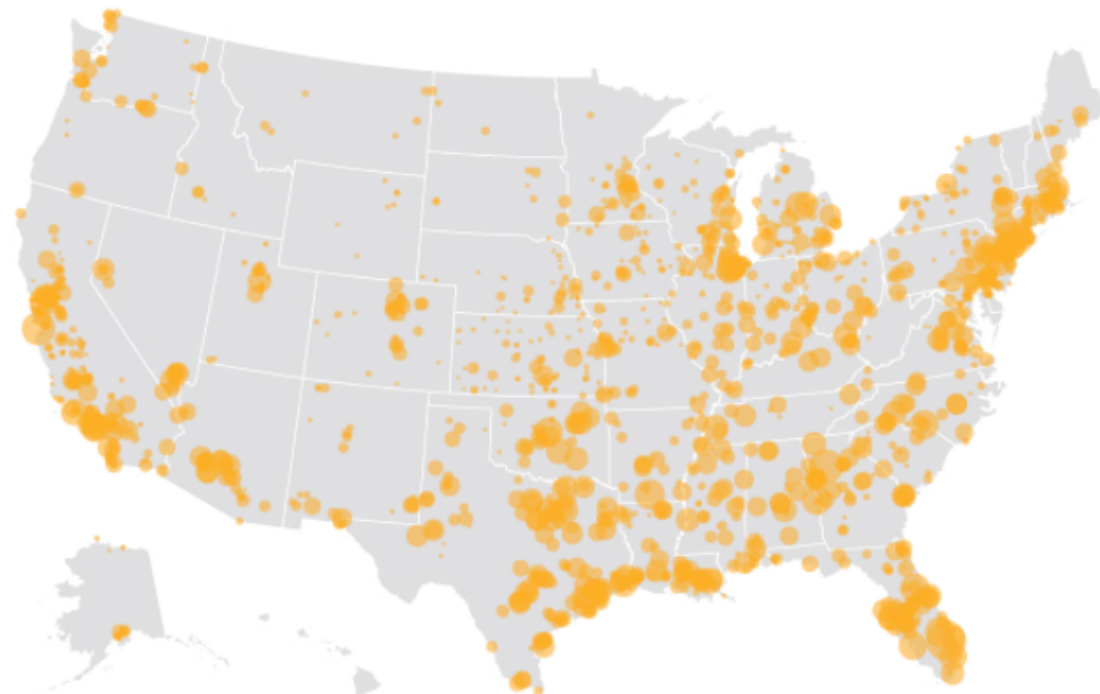


There are 511 coal-powered electric plants in the U.S. They have generated 34 percent of the nation's electricity this year.

The leading fuel for electricity generation in the country, coal is most popular in the Midwest, Appalachia and the East Coast, but is also the primary source in Wyoming, Utah, Montana and Arizona. It generated the vast majority of the nation's electricity in the late 1980s but now creates one-third with natural gas gaining steadily. Coal is the chief source of electricity in 22 states and creates a majority of the electrical power in 14 states.

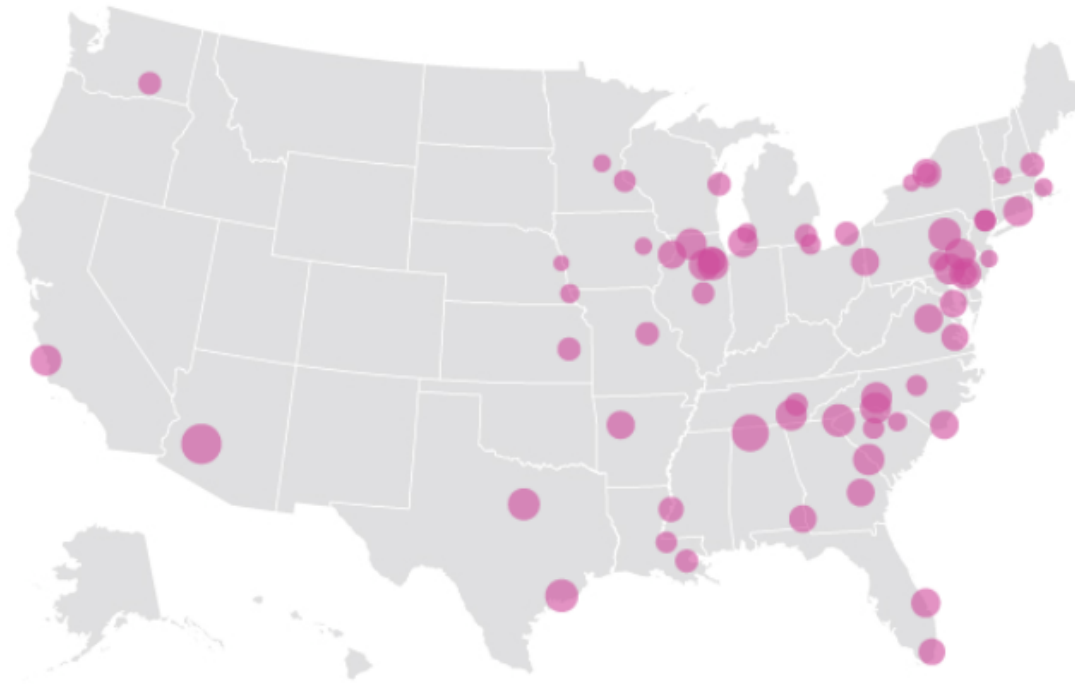


Natural gas



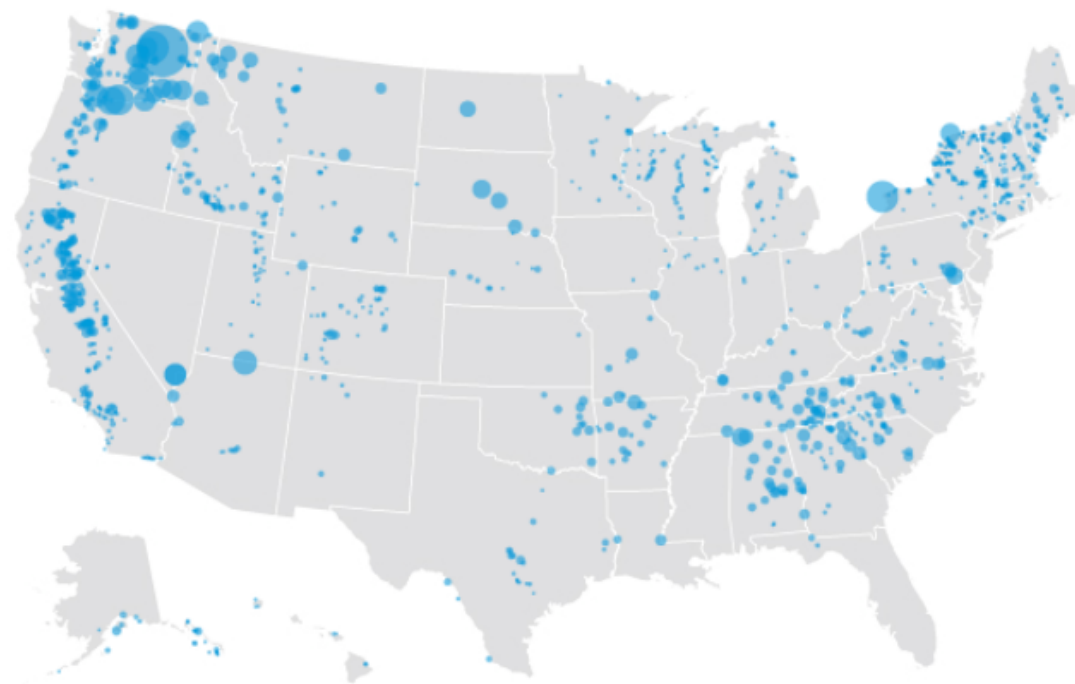
There are 1,740 natural gas-powered electric plants in the U.S. They have generated 30 percent of the nation's electricity this year.

Advances and expansion of fracking in the past decade have unlocked vast supplies of natural gas from shale deposits all over the country. Natural gas is the predominant source of power in 15 states including all of the Gulf of Mexico states, Virginia, Georgia, New York, Massachusetts, Nevada and California.



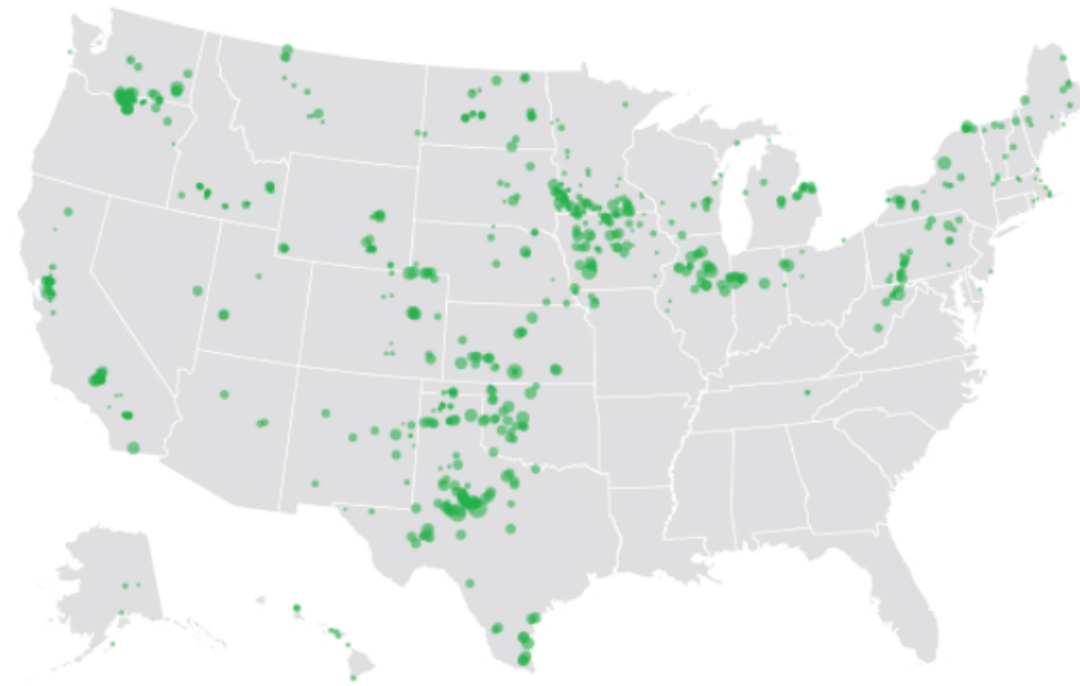
There are 99 reactors at 63 nuclear electric plants in the U.S. They have generated 20 percent of the nation's electricity this year.

Five new nuclear plants are under construction following decades of pause after the initial push in the 1970s and 1980s driven by the first oil shock. Only South Carolina, Illinois, Pennsylvania, Connecticut and New Hampshire get a plurality of their power from nuclear. Twenty states have no nuclear electricity generation at all.



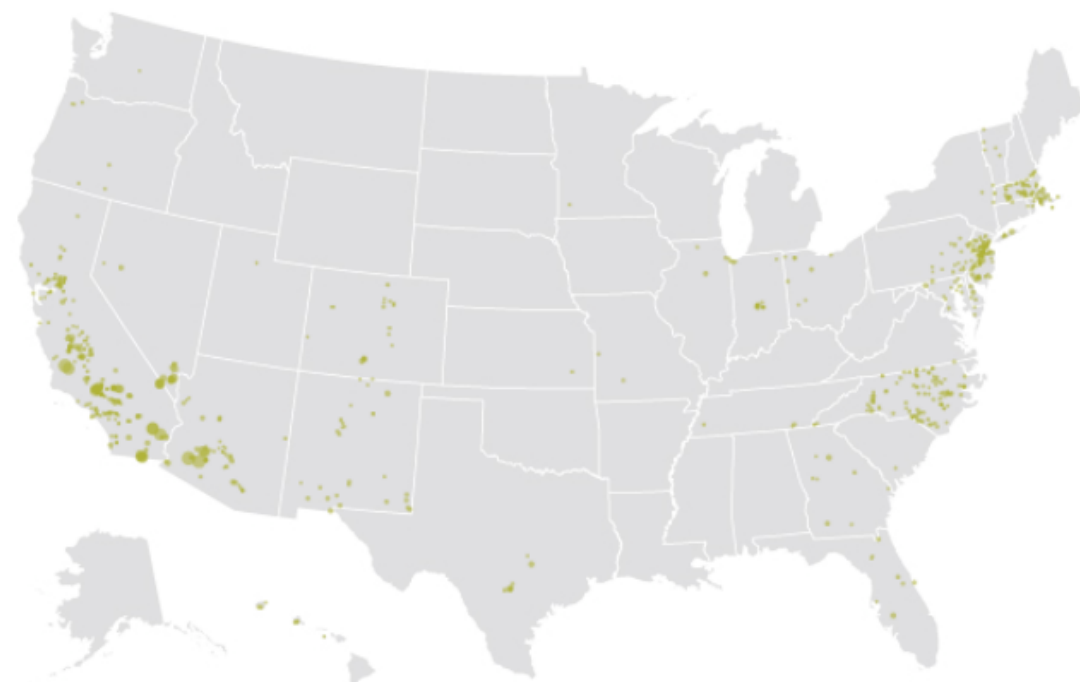
There are 1,436 hydroelectric plants in the U.S. They have generated 7 percent of the nation's electricity this year.

Washington, Oregon and Idaho lead the nation in power from hydroelectric plants. It's a feast-or-famine source, providing 48 percent or more of the power in five states, but less than 10 percent of the electricity in 40 states. Government-run plants generate most of the power.



There are **843** wind-powered electric plants in the U.S. They have generated **5 percent** of the nation's electricity this year.

Wind is the fastest growing source, finding a home in the Great Plains where wind blows reliably across wide open spaces. Iowa and South Dakota get one third of their power from wind, followed by Kansas, Vermont and North Dakota.

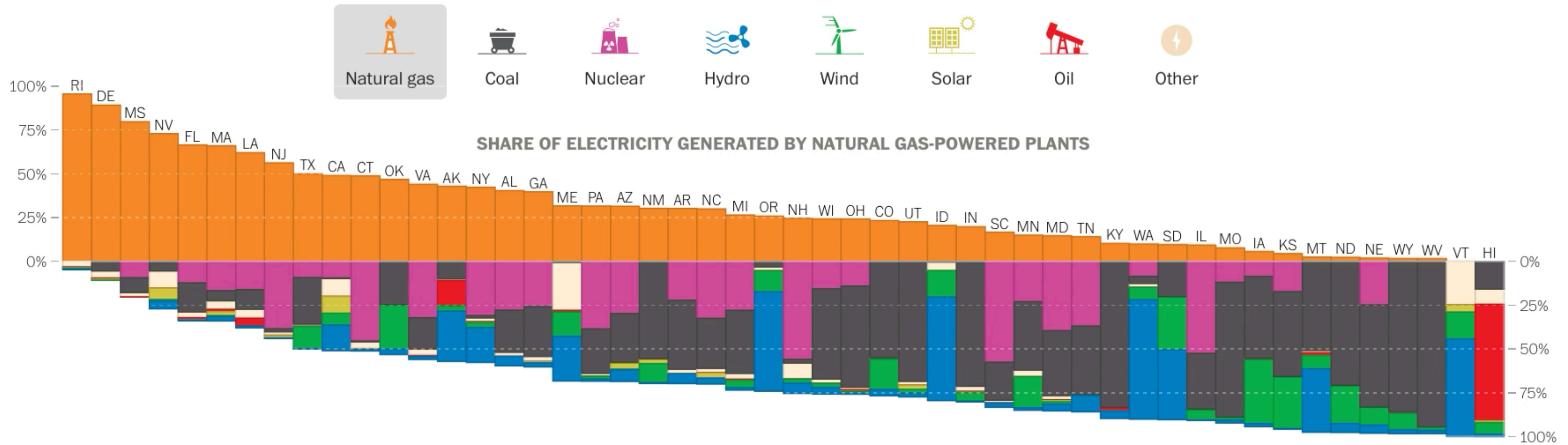


All

There are **772** solar-powered electric plants in the U.S. They have generated **1 percent** of the nation's electricity this year.

Sun power is predominantly in the Southwest where the sun shines the most. Thirty-nine states have no solar generating plants. California gets 8 percent of its electricity from solar and Nevada gets 5 percent, followed by Vermont and Arizona with 4 percent each.

Click to rearrange



3

Inform and explain



- **Put yourself in the user's position**
- **Make sure the presentation communicates clearly**
- **Build up from simplicity, not down from complexity**
- **Clarity is the target**



***“Garbage in,
garbage out.”***



KOBE BRYANT STATISTICALLY SPEAKING

A TRUE SHOOTING GUARD

In his 20 years with the Lakers, Kobe Bryant was always thinking about how to score. He fired up more than 30,000 shots in the regular season and playoffs. Below is a detailed look at his makes and misses throughout his long career.

Free throws are not shown

Game 4 of 2008 first-round playoffs vs. Phoenix

Lakers are behind by one point when Bryant hits a jumper from right side for the game-winner in overtime; Lakers win 99-98.

Final shot as a Laker

20-foot jump shot with 31 seconds left in the fourth quarter.

Game 4 of 2002 West semifinals vs. San Antonio

Final seconds, score tied. Bryant gets an acrobatic rebound with one hand and scores on a putback as Lakers win, 87-85.

Game 4 of the 2000 NBA Finals vs. Indiana

His last basket (layup after his offensive rebound) in the final seconds secures the win and gives the Lakers a 3-1 series lead, en route to his first NBA championship.

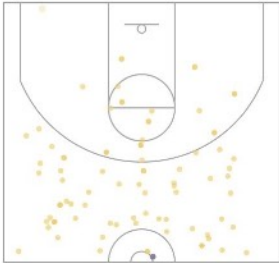
Game 2 of the 2004 NBA Finals vs. Detroit

Bryant hits a three-pointer in final seconds to tie the score at 89; Lakers win in overtime, 99-91.

Game 82: The last regular-season game of 2004

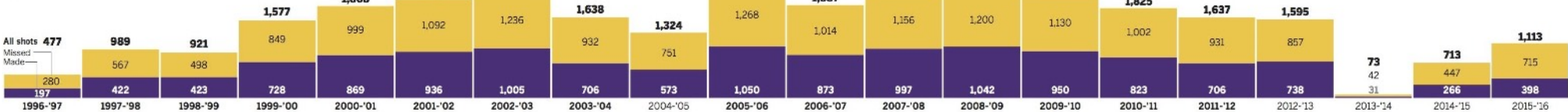
April 14, 2004: Kobe hits a three-pointer in double overtime against the Trail Blazers to secure the Pacific Division title.

Shots beyond midcourt



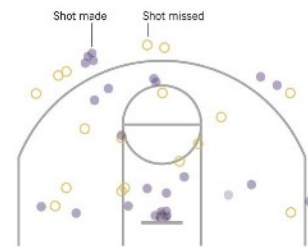
Shots taken by season

Playoff years included, shown in bold



Kobe's 81-point game

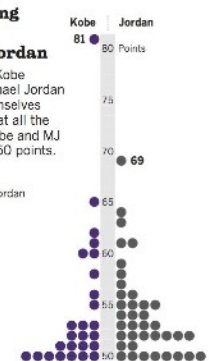
On Jan. 22, 2006, Bryant scored 81 points against the Toronto Raptors. It was second-highest total in an NBA game, behind only Wilt Chamberlain's 100-point effort in 1962.



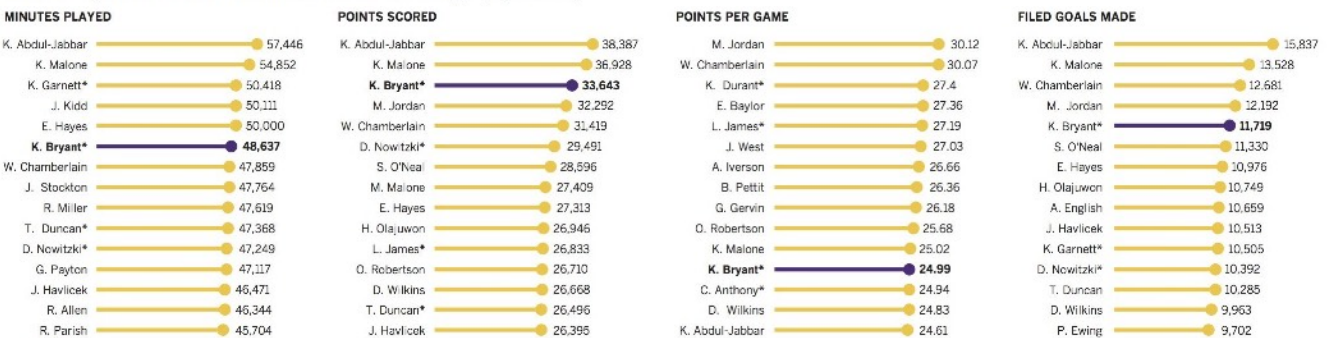
High-scoring games: Kobe vs. Jordan

Above all else, Kobe Bryant and Michael Jordan considered themselves scorers. A look at all the games when Kobe and MJ scored at least 50 points.

Number of high-scoring games: Kobe 26, Jordan 38



Where Bryant finished in the all-time NBA rankings (Regular season)



Sources: Basketball-Reference.com, Lakers.com, NBA, Times reporting.

LORENA INQUIRER ELSEBEE, JON FOX, Los Angeles Times

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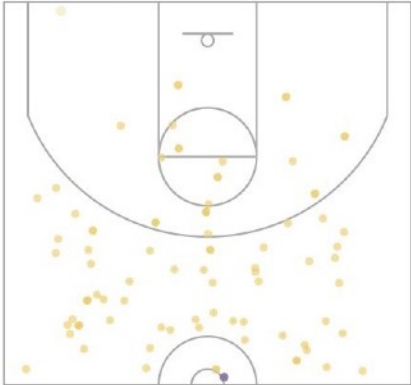
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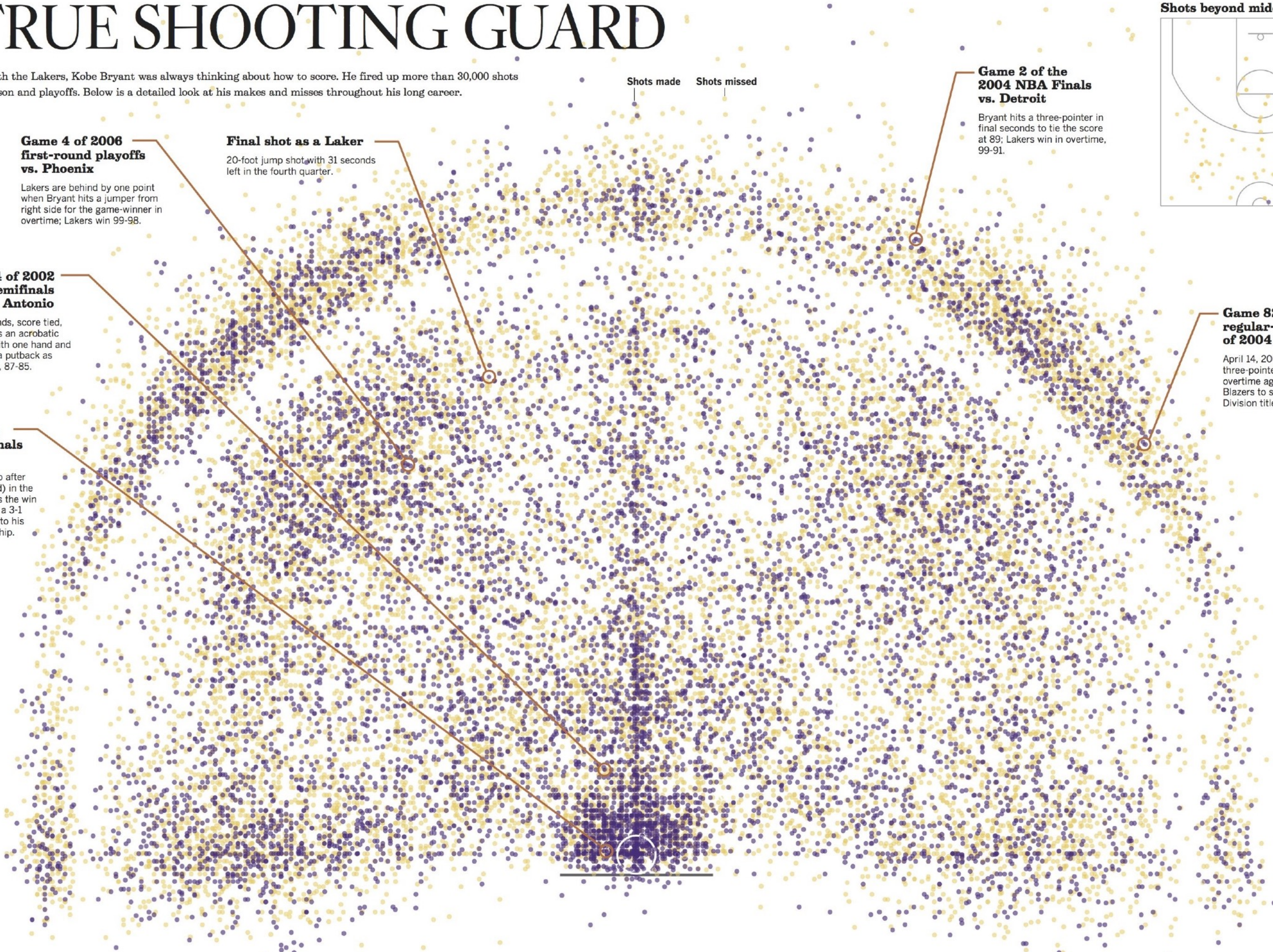
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Shots beyond midcourt

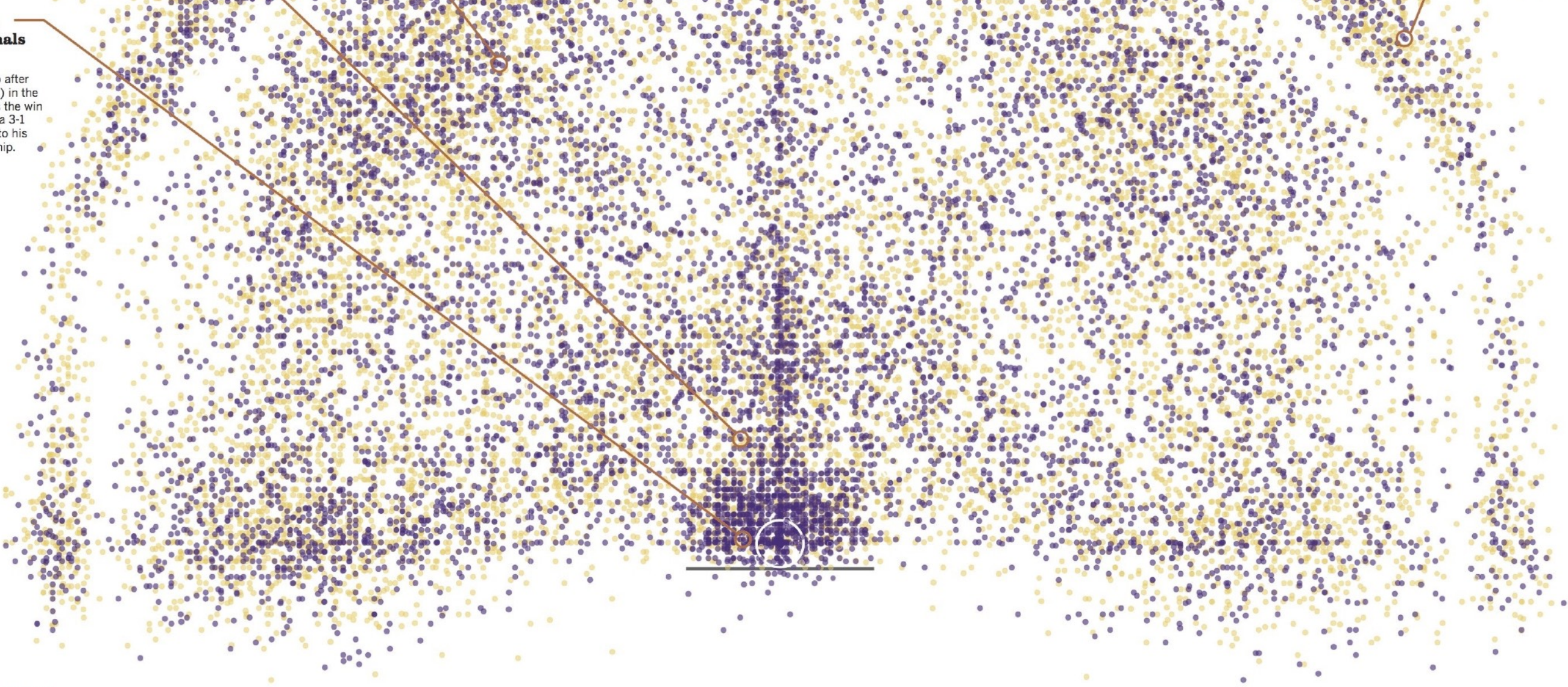


Shots made Shots missed



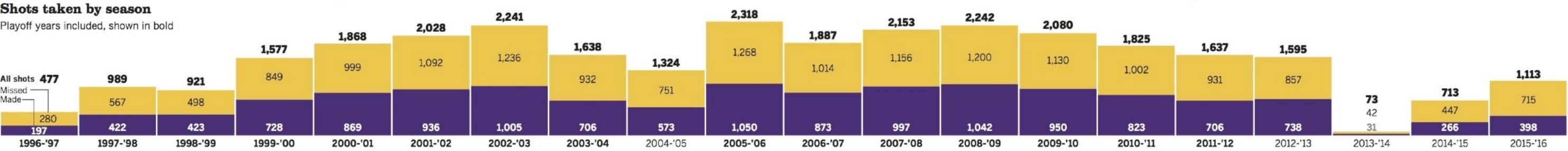
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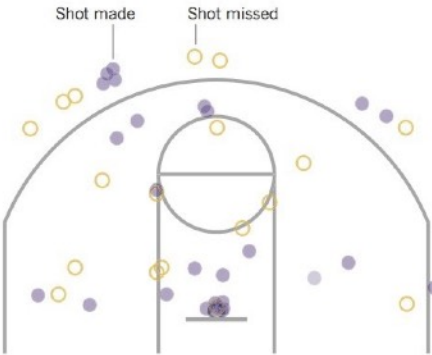
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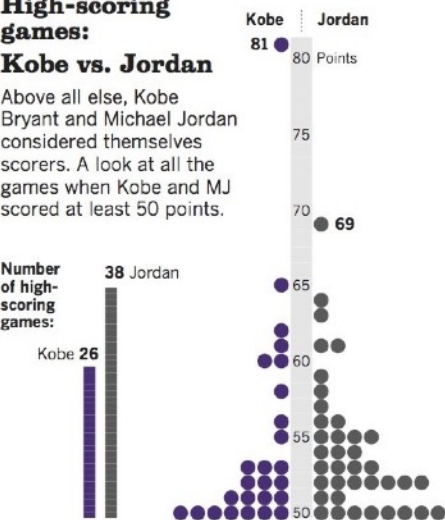


Sources: Basketball-Reference.com, Lakers.com, NBA, Times reporting

High-scoring games:

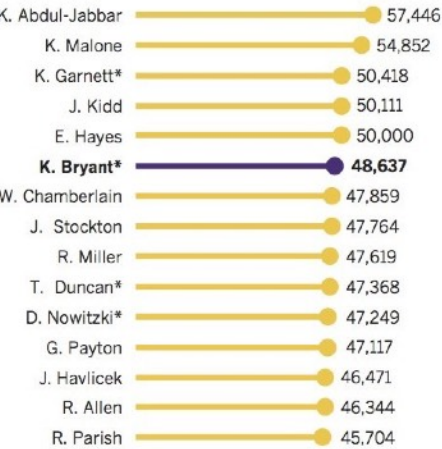
Kobe vs. Jordan

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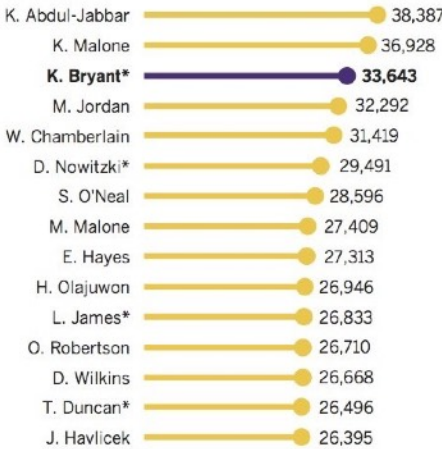
Where Bryant finished in the all-time NBA rankings (Regular season)

MINUTES PLAYED

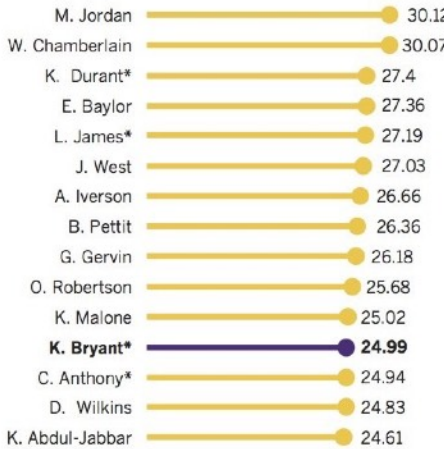


*Active player

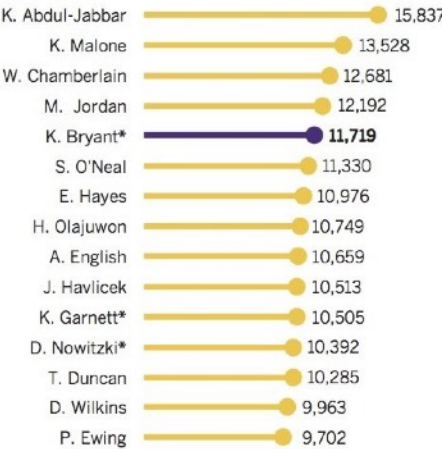
POINTS SCORED



POINTS PER GAME



FIELD GOALS MADE



LORENA IRIQUEZ ELBEE, JOE FOX Los Angeles Times



Every shot Kobe Bryant ever took. All 30,699 of them

By **JOE FOX**, **RYAN MENEZES** and **ARMAND EMAMDJOMEH**

APRIL 14, 2016

Kobe Bryant's 30,699th and final field goal came from 19 feet with 31 seconds left against the Utah Jazz. During his 20 years with the Lakers, he fired up more than 30,000 shots, including the regular season and playoffs.

Take a tour of key shots over his 20-year career, or explore the makes and misses over his long career on your own.

[Tour the data](#)

[Explore on my own](#)



Bryant attempted
30,699 shots
throughout his
career.

- Made
- Missed

Kobe's last shot:

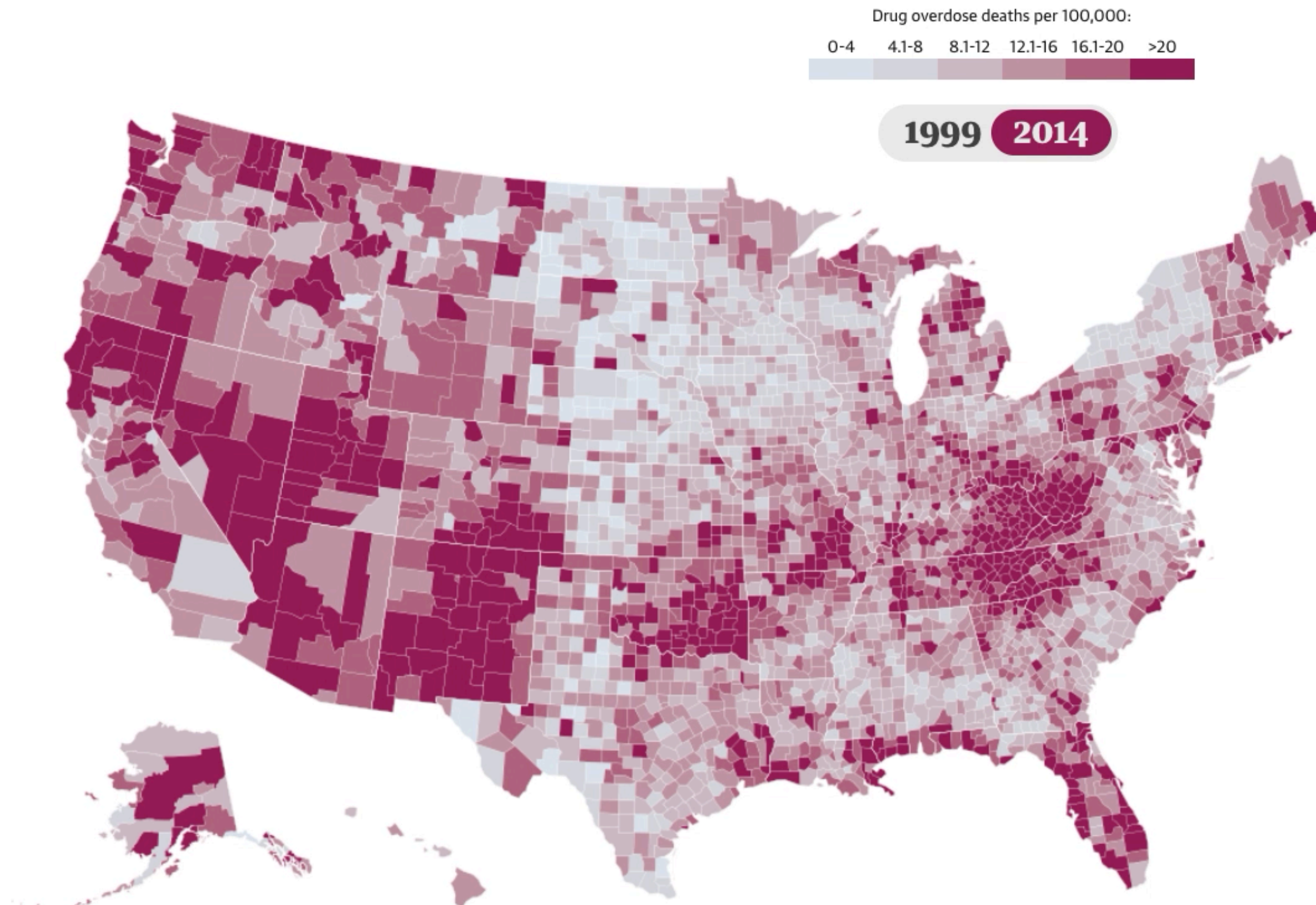
April 13, 2016: Capping a 60-point performance, Kobe's final shot from the field was a 19-foot jumper.



A deadly crisis: mapping the spread of America's drug overdose epidemic

By Nadja Popovich

Overdoses kill more Americans than car crashes or guns - and experts say the crisis hasn't yet peaked. Data reveals how a local problem became a national epidemic



4

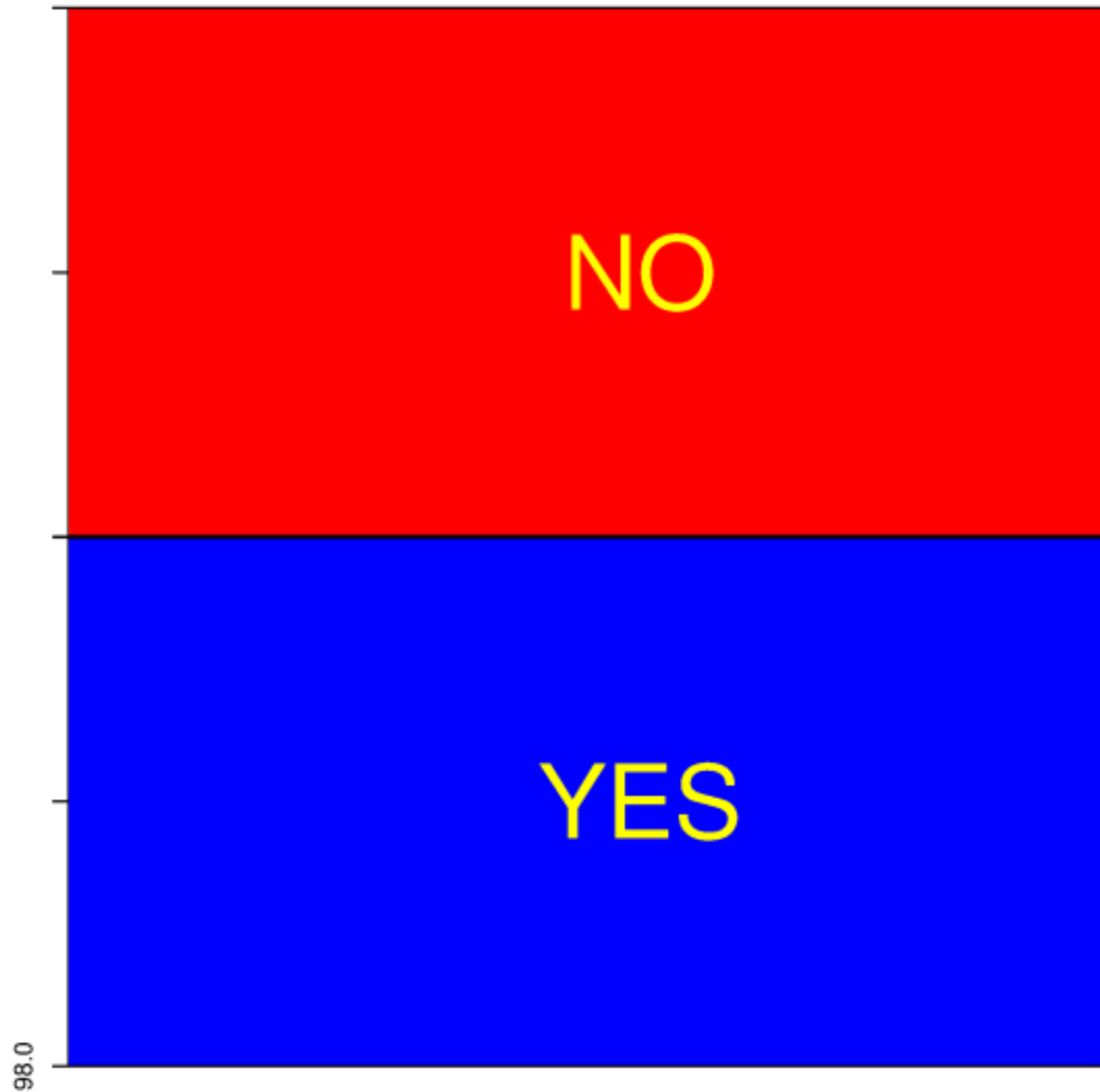
Good chart design



- **Find the right chart type for your data**
- **Use information design principles**
- **Remove redundancy**
- **Move away from generic displays**



IS CUTTING OFF THE Y-AXIS MISLEADING?



YES

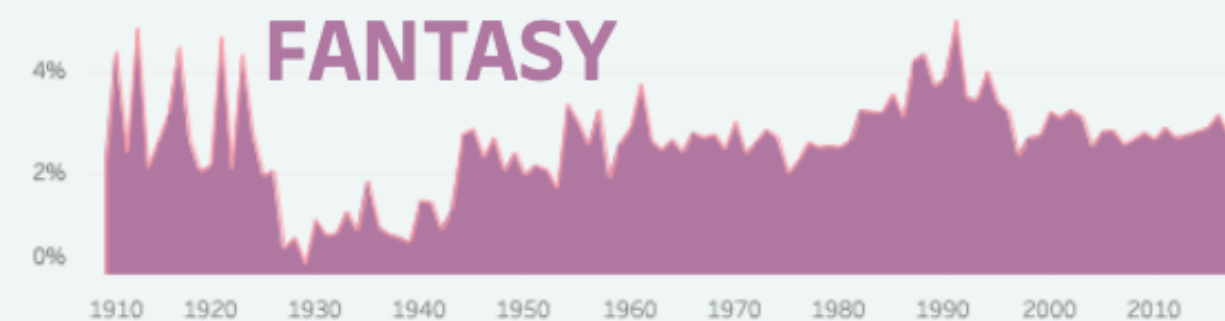
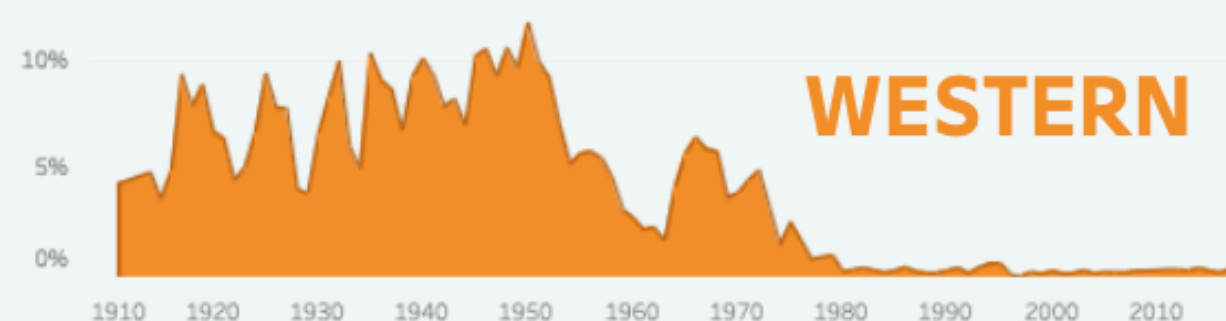
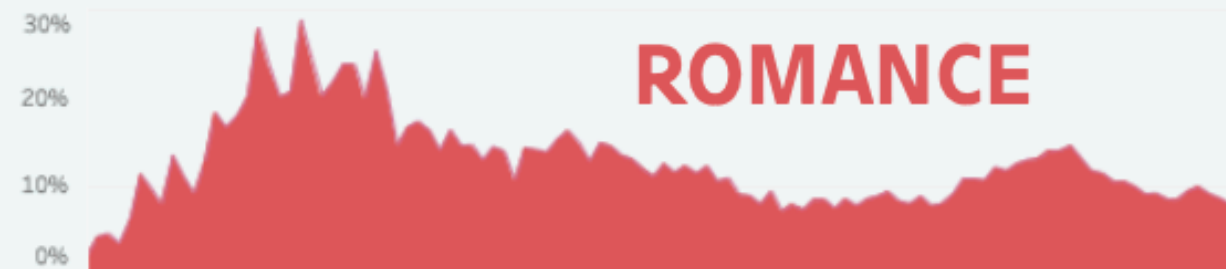
NO

FILM GENRE POPULARITY 1910-2018

CLICK TO
STANDARDIZE
AXIS RANGE

BO MCCREADY  @BOKNOWSDATA

This graphic shows film genre popularity over time, represented as the percentage of all films released that year with the specified genre tagged on IMDB. Each genre has a different axis range, so these lines show popularity relative to other years, not necessarily relative to other genres.

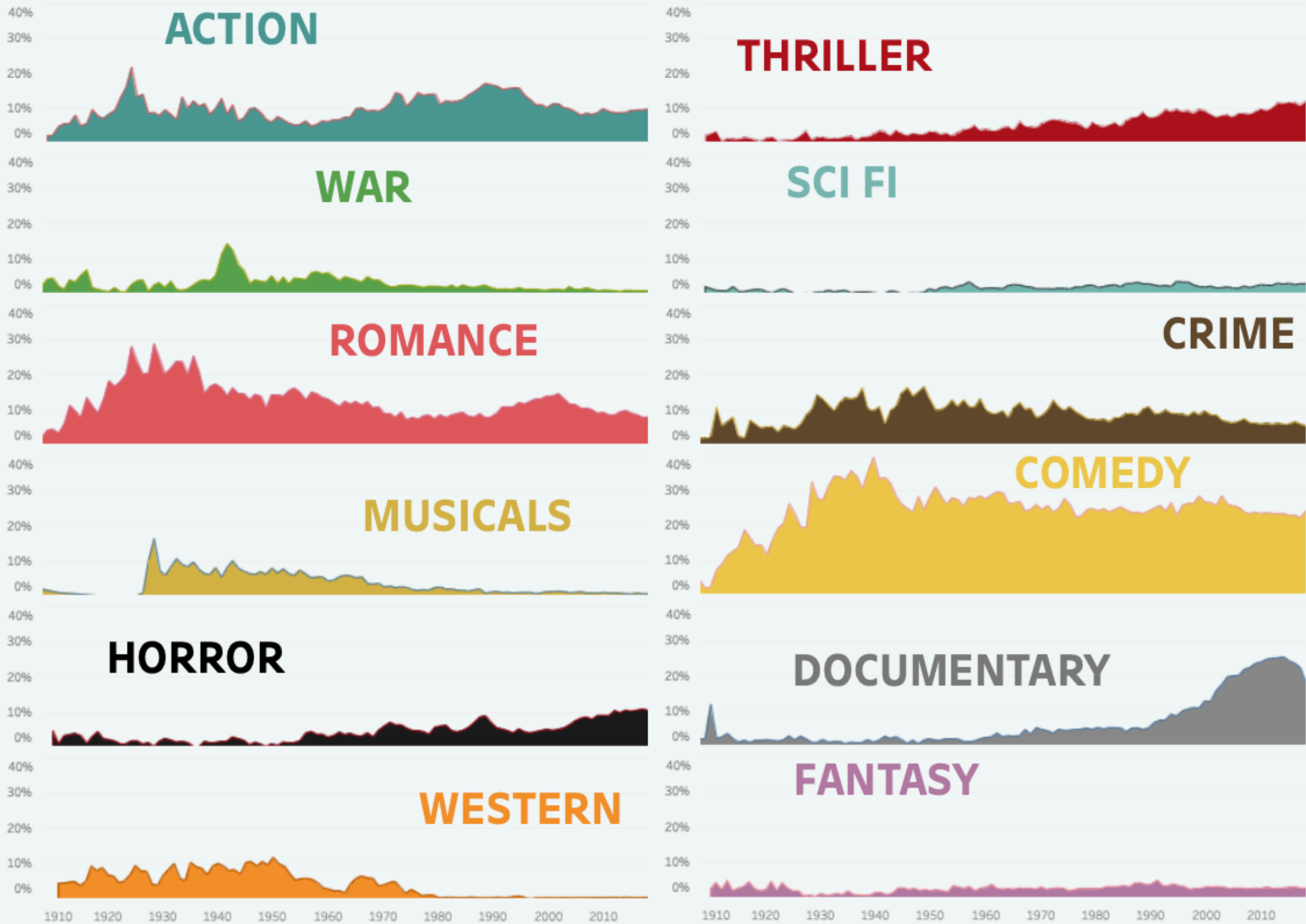


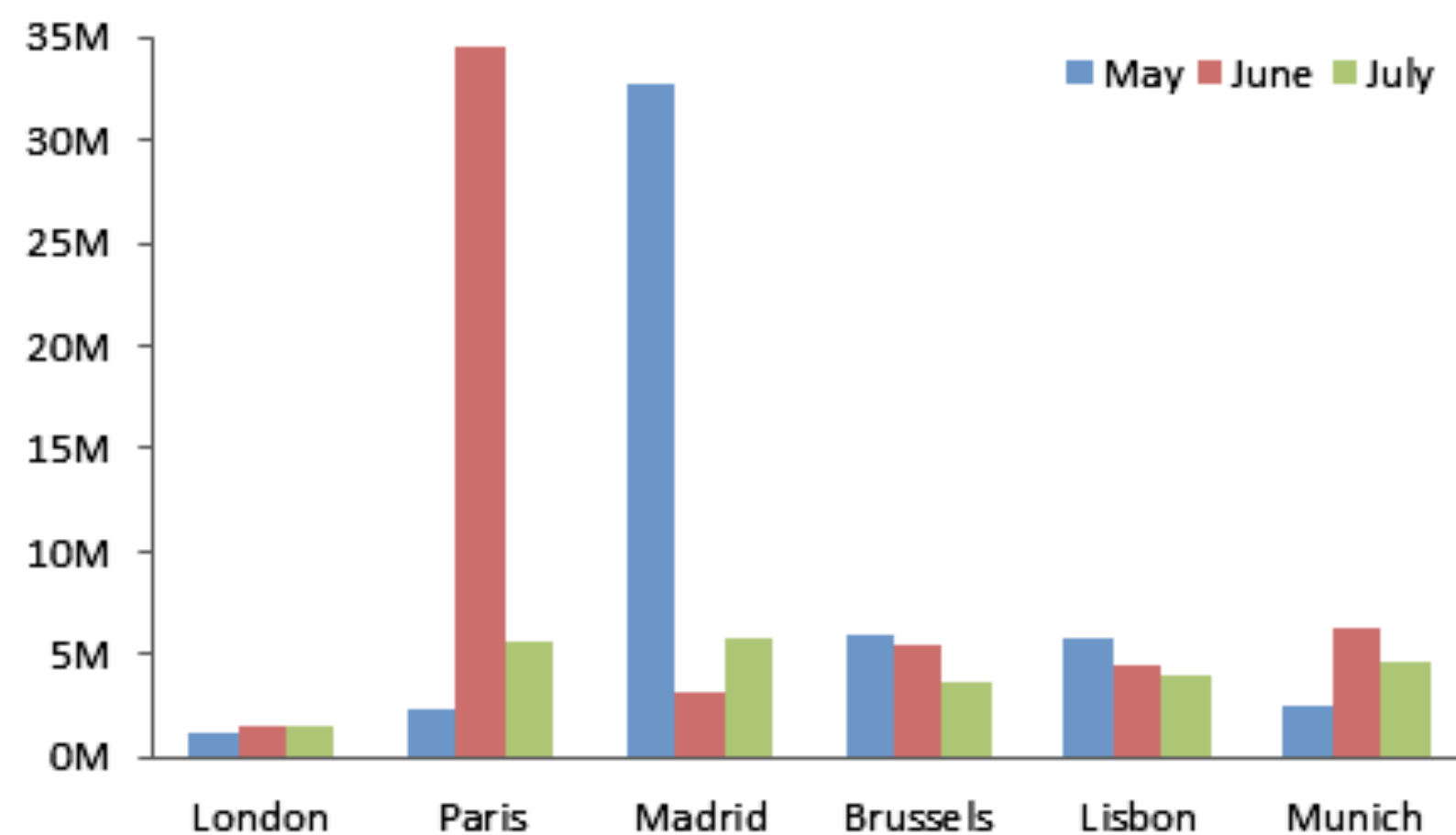
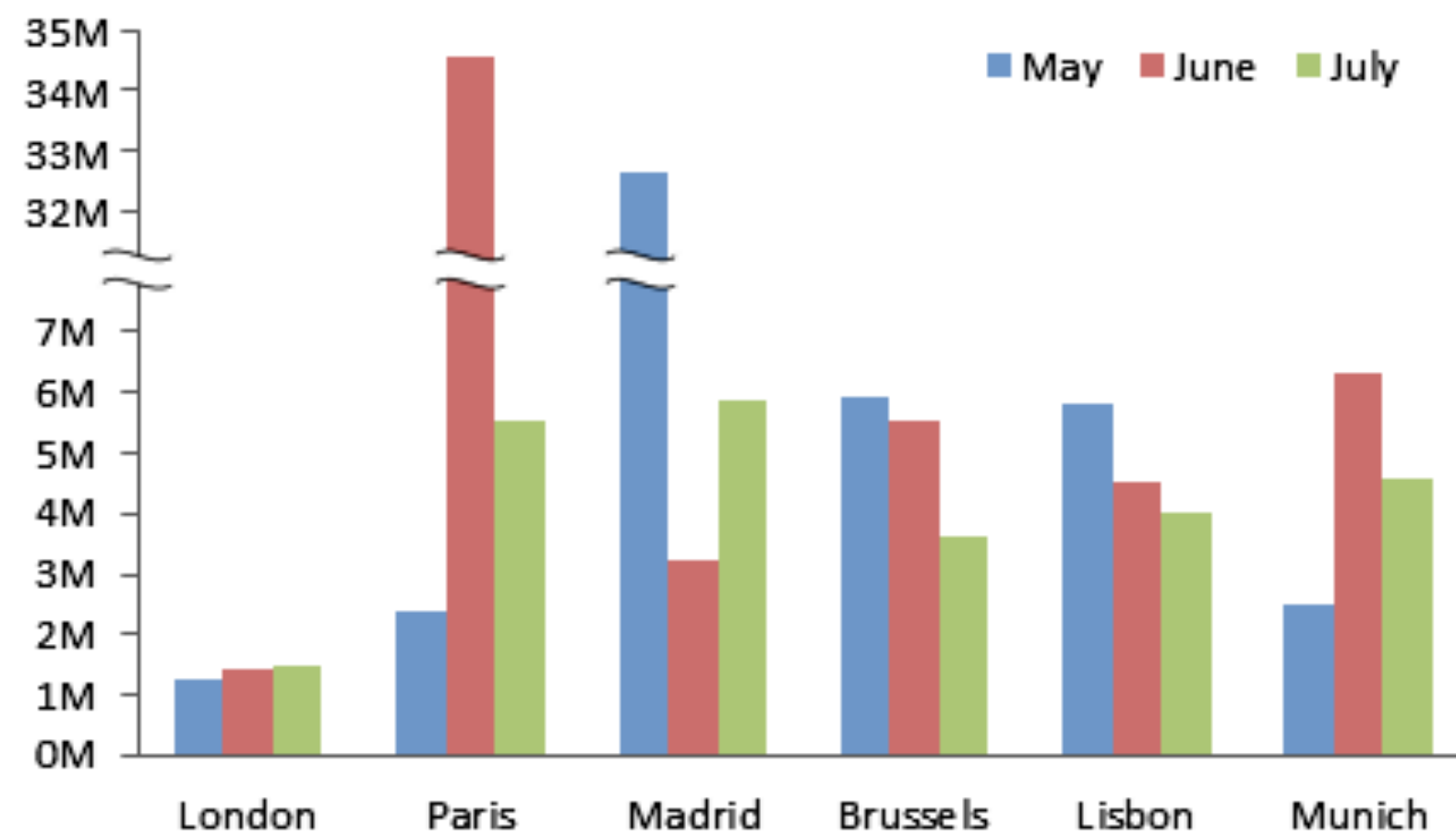
FILM GENRE POPULARITY 1910-2018

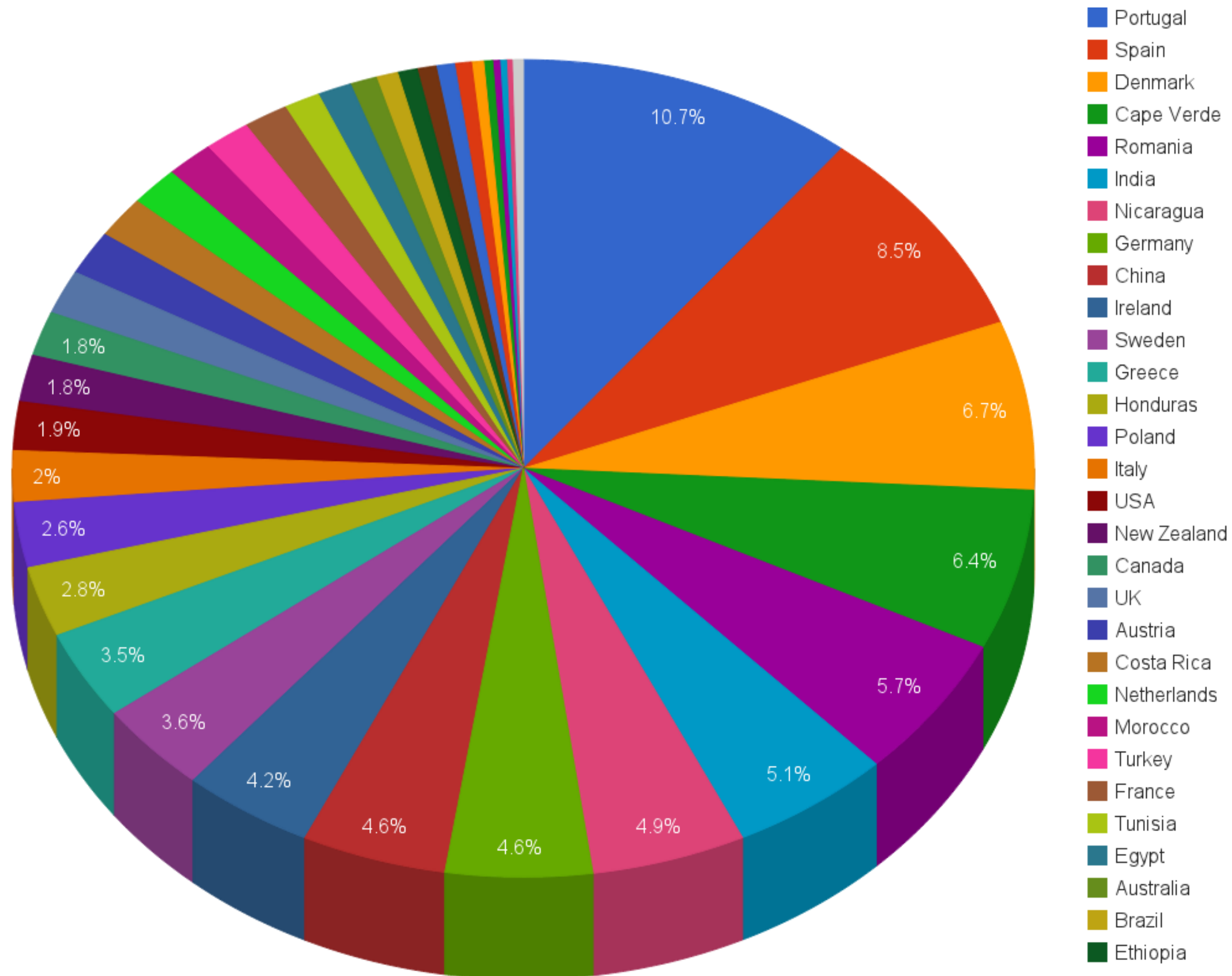
CLICK TO
VARY
AXIS RANGE

BO MCCREADY @BOKNOWSDATA

This graphic shows film genre popularity over time, represented as the percentage of all films released that year with the specified genre tagged on IMDB. Each genre has the same axis range, from 0-40%.





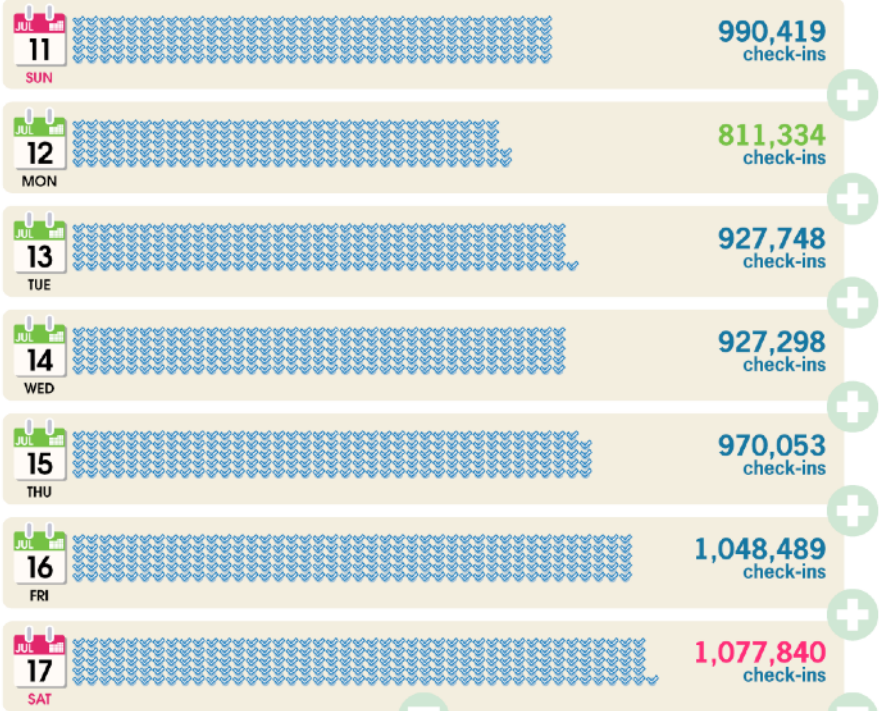


Foursquare Check-ins

Sunday July 11, 2010 through Saturday July 17, 2010

Copyright © 2010 Wiredset/Trendrr. All rights reserved.

5,000 check-ins



Approximately
952,000
daily check-ins per average day

Approximately
6.66 million
total check-ins



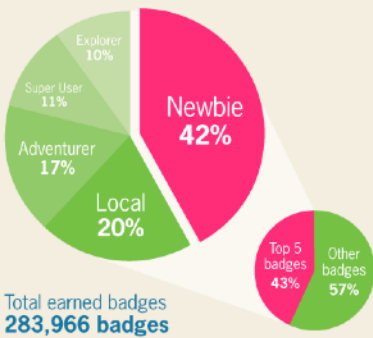
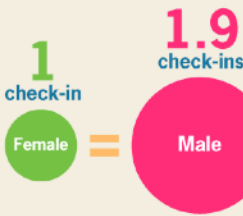
The city that had the largest amount of check-ins

Los Angeles, CA

On an average day...

The **most** check-ins @ **08:00 PM**

The **least** check-ins @ **04:00 AM**



Top 5 Badges

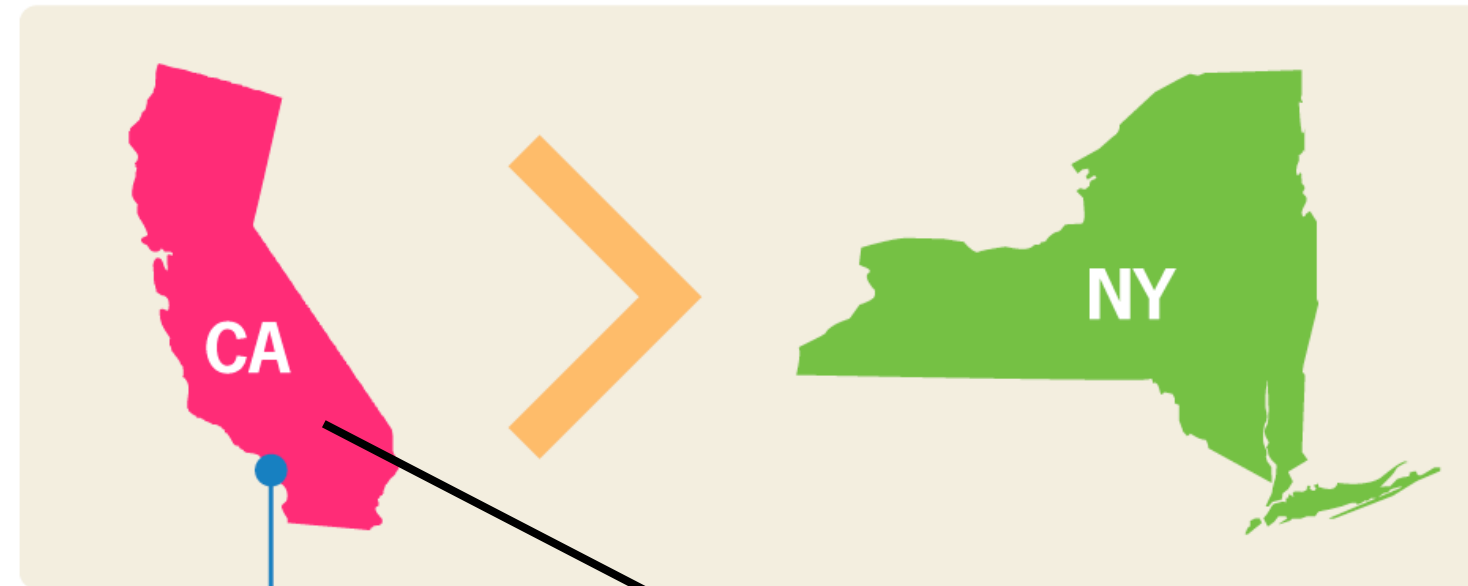
Newbie | Local | Adventurer | Super User | Explorer

- 1. Newbie** 50,314 badges
- 2. Local** 24,794 badges
- 3. Adventurer** 20,419 badges
- 4. Super User** 13,604 badges
- 5. Explorer** 11,778 badges

Copyright © 2010 Wiredset/Trendrr. All rights reserved.

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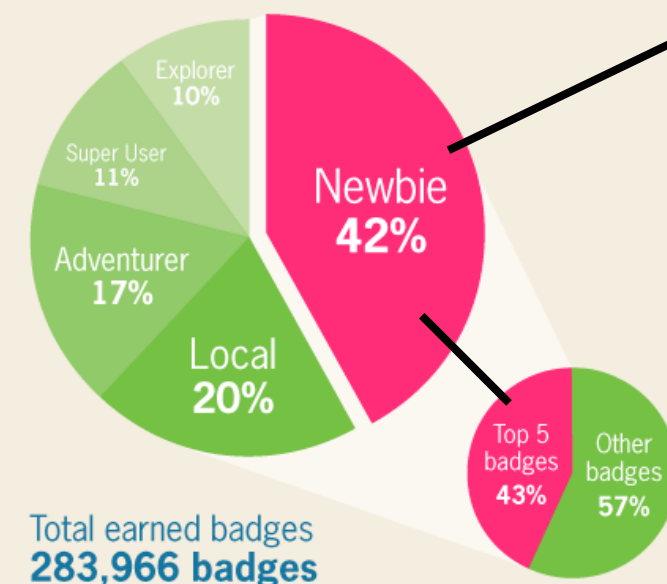
The **most** check-ins @

08:00 PM

The **least** check-ins @

04:00 AM

1 check-in
Female = **1.9** check-ins
Male



Top 5 Badges

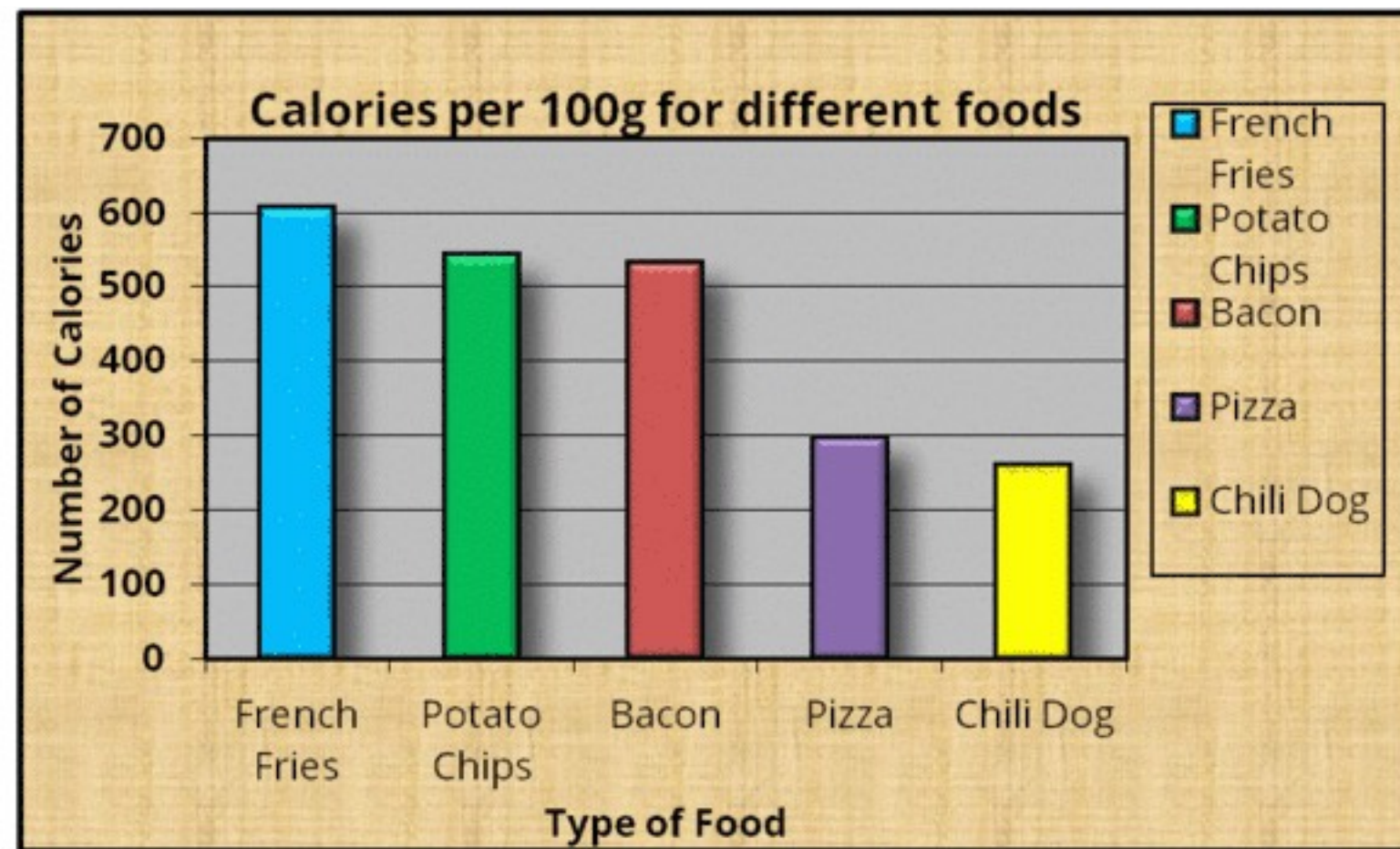
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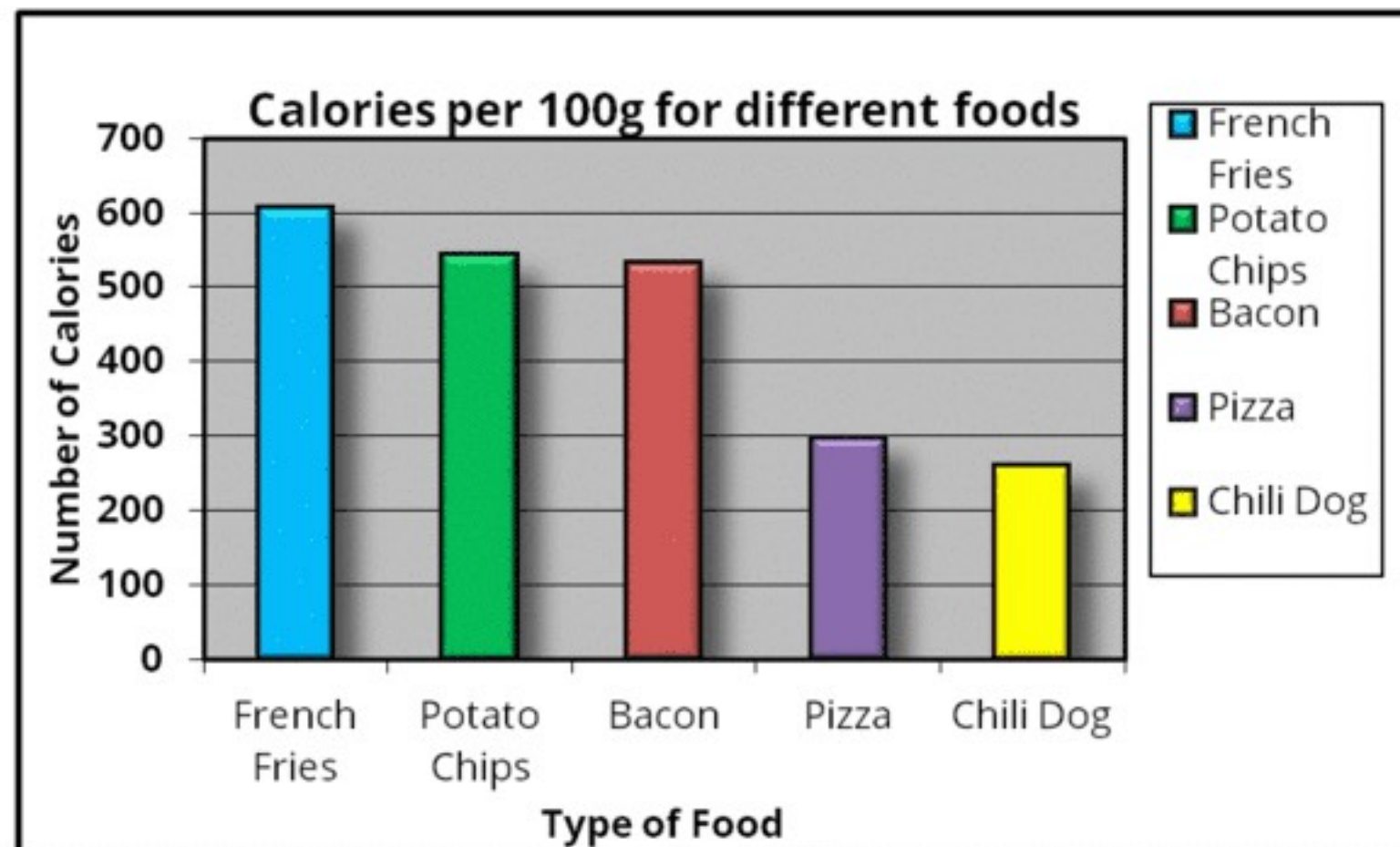
Remove background

Calories: How does bacon compare?



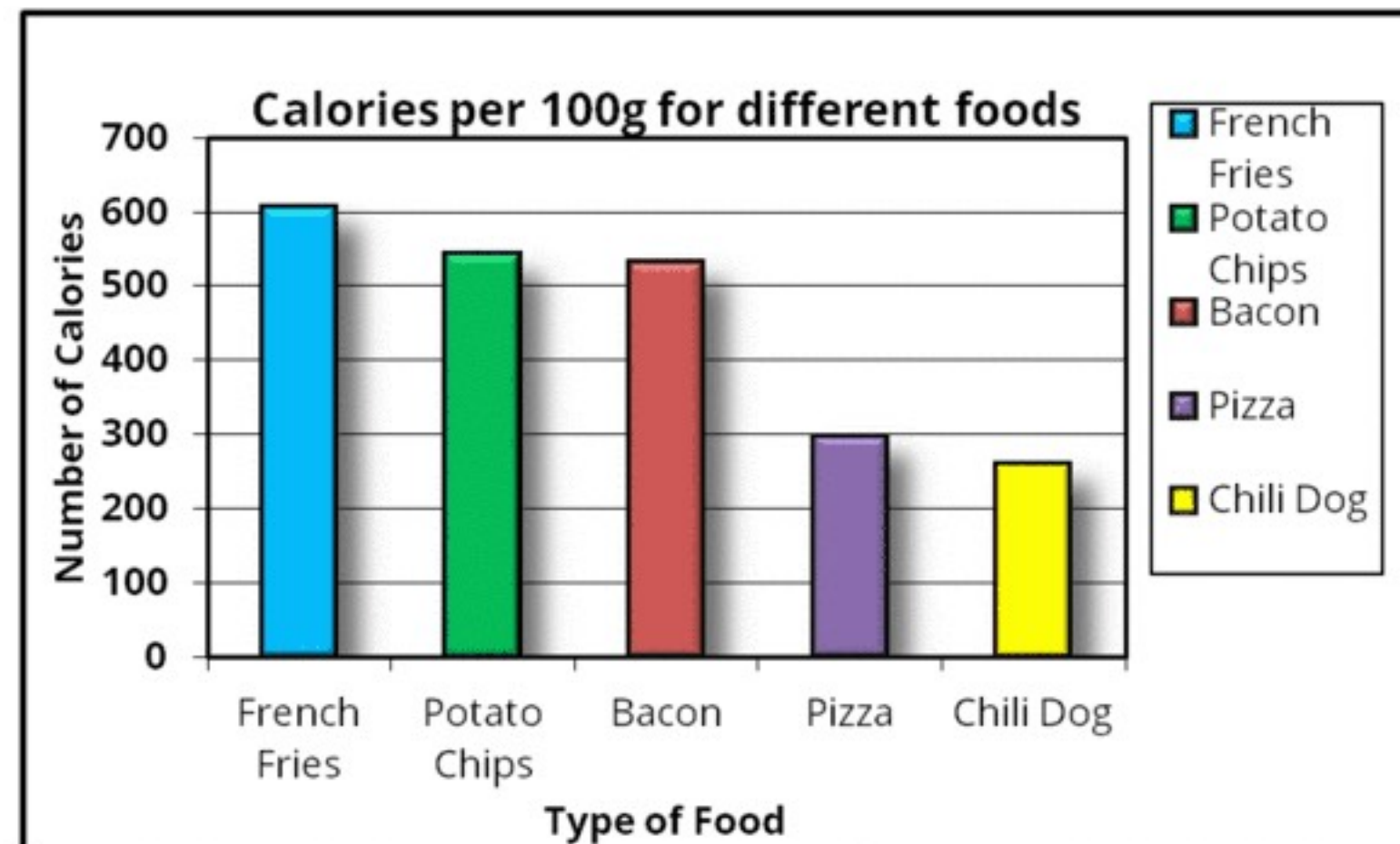
Remove chart background

Calories: How does bacon compare?



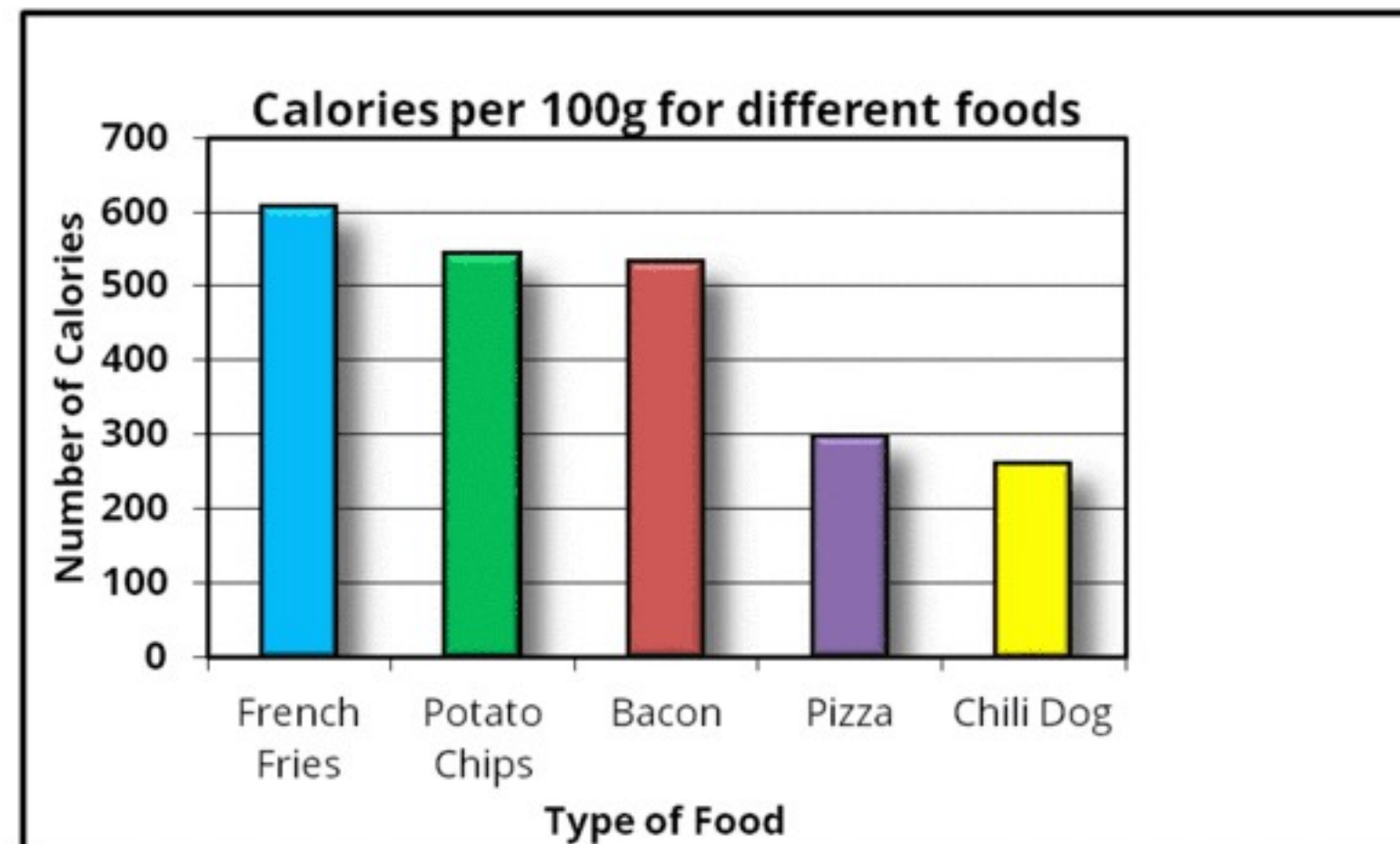
Remove redundant key

Calories: How does bacon compare?



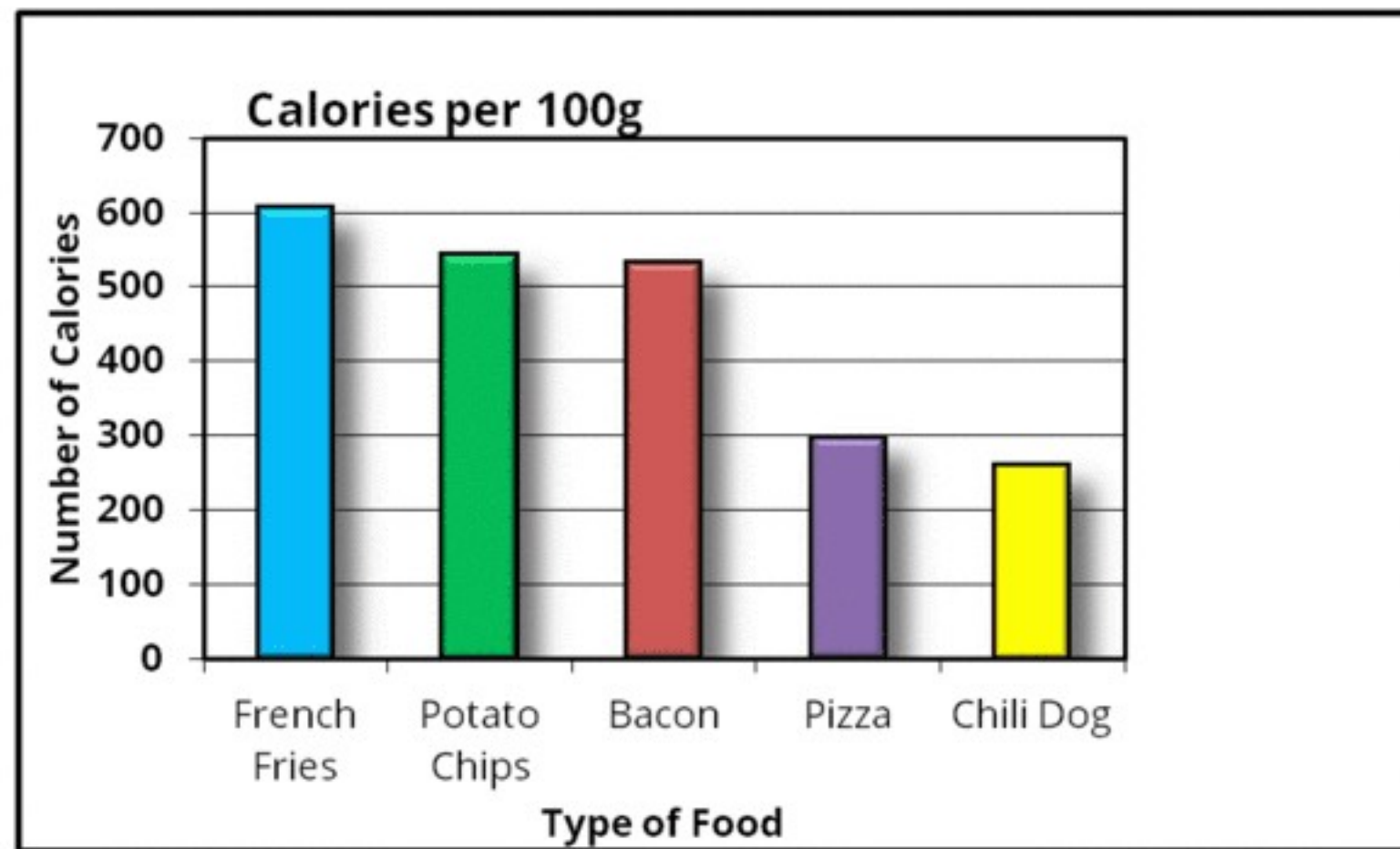
Shorten calorie description

Calories: How does bacon compare?



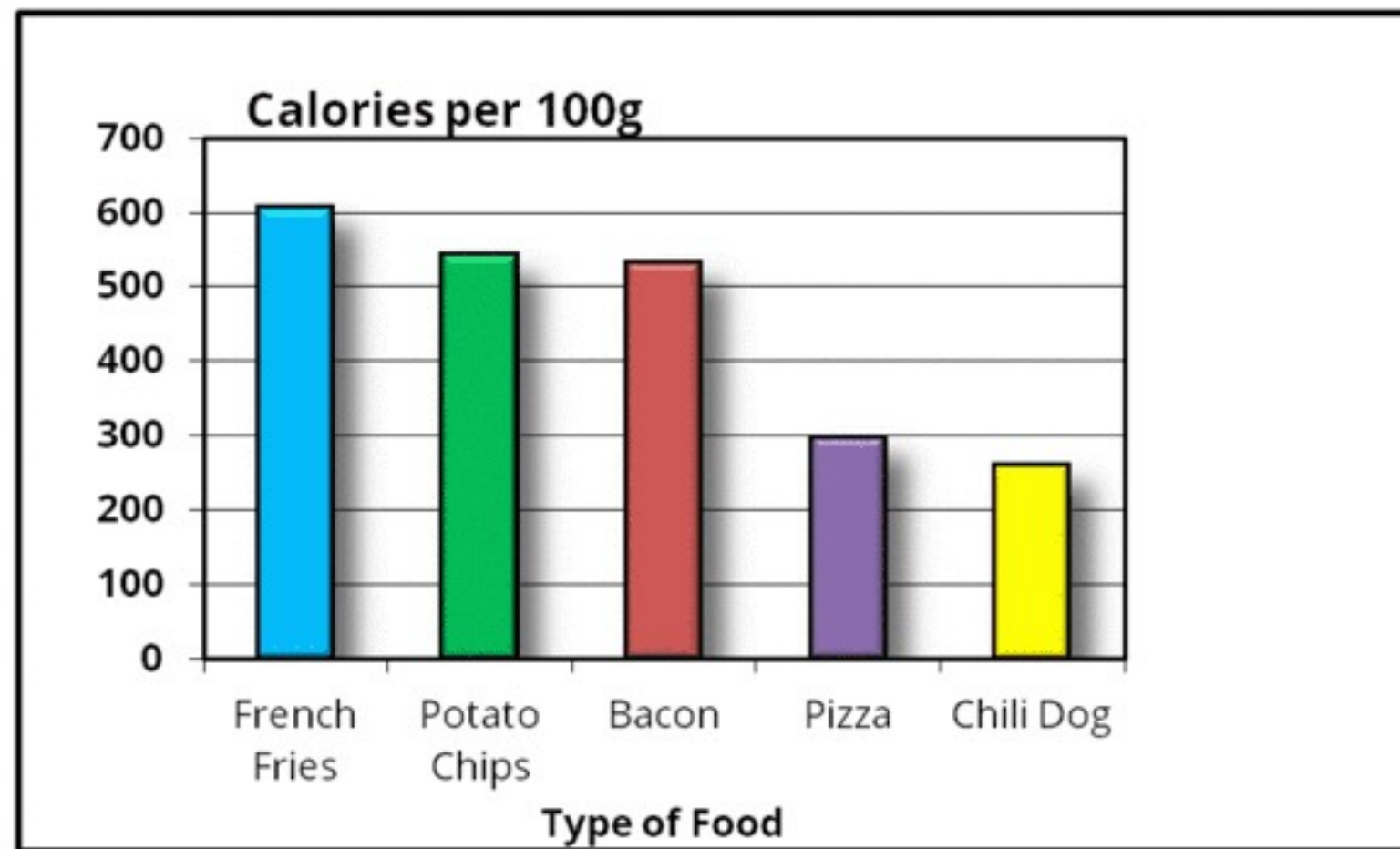
Remove redundant vertical scale description

Calories: How does bacon compare?



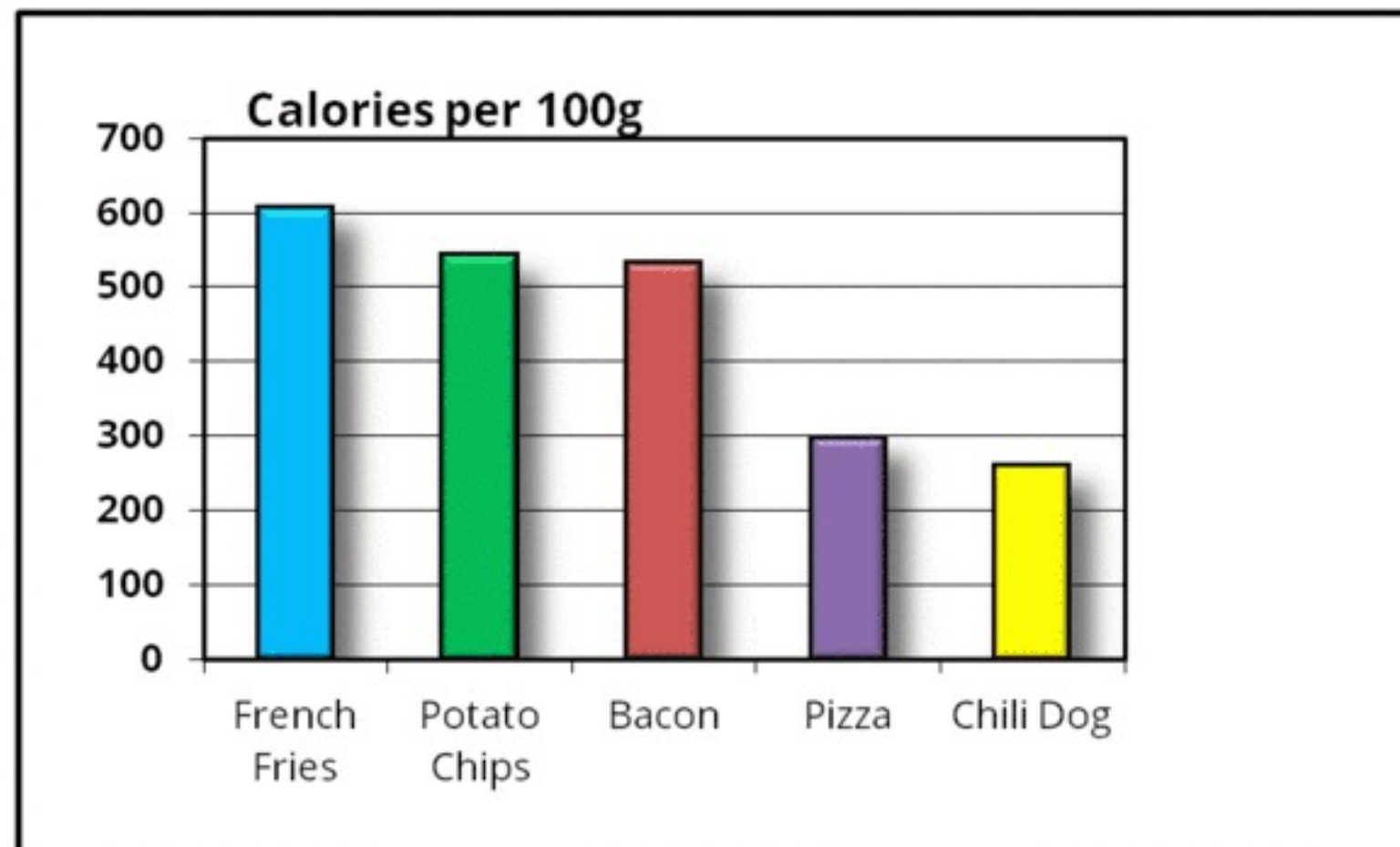
Remove redundant type of food description

Calories: How does bacon compare?



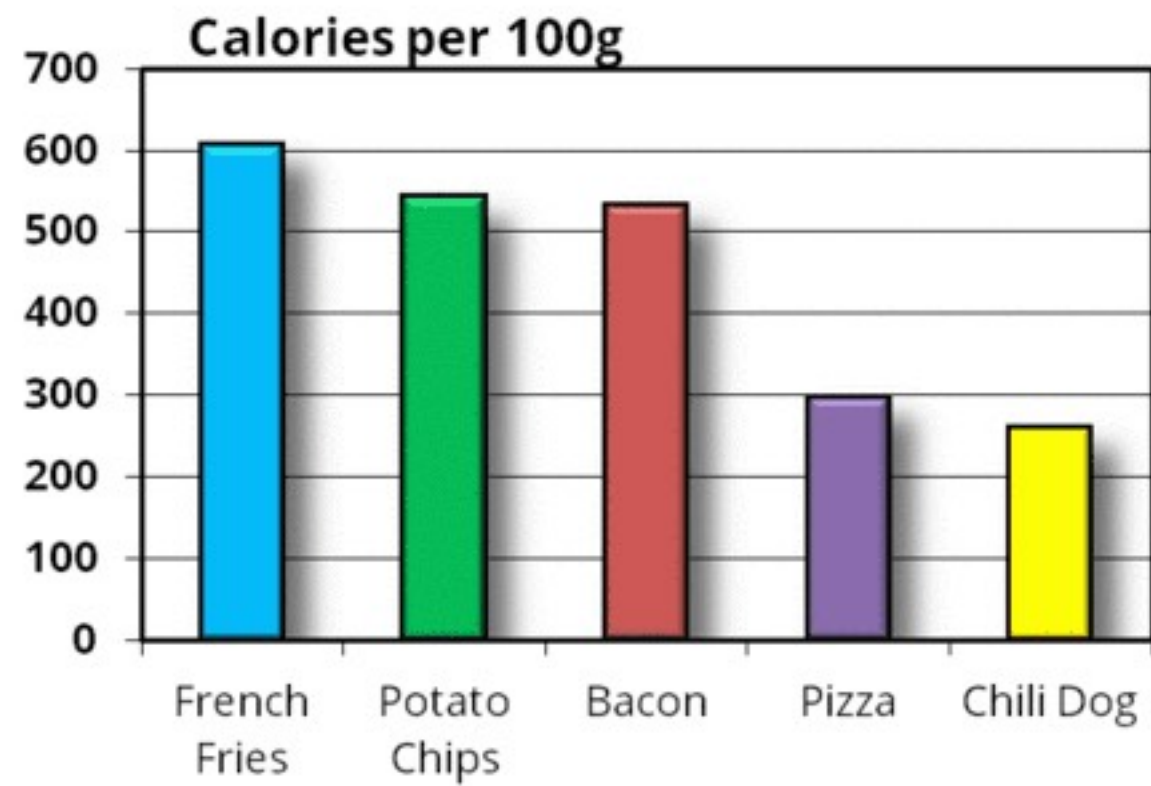
Remove outer border

Calories: How does bacon compare?



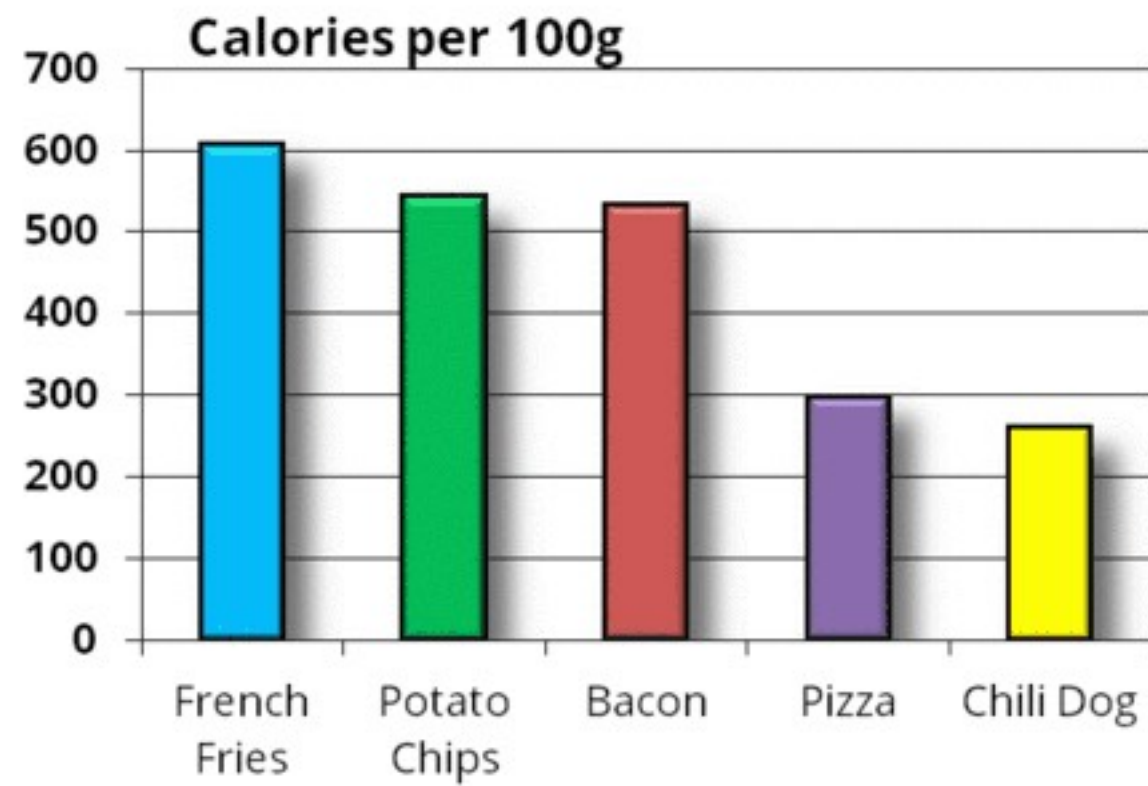
Remove inner border

Calories: How does bacon compare?



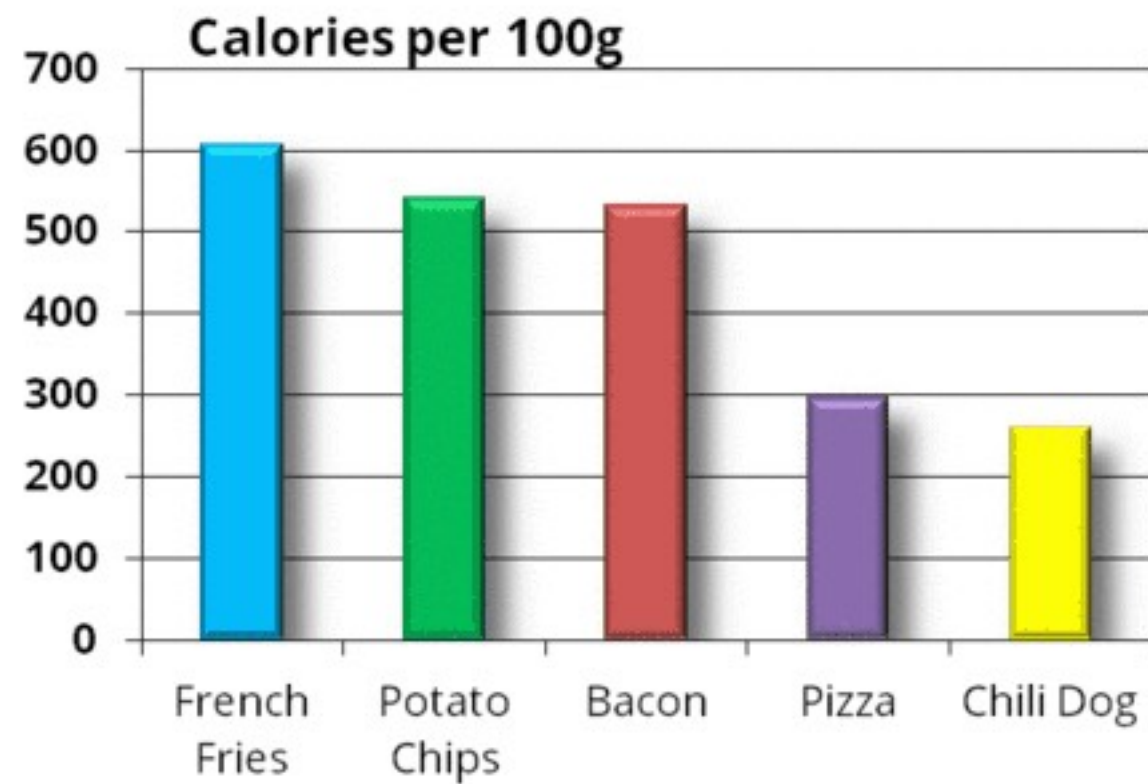
Remove outline on bars

Calories: How does bacon compare?



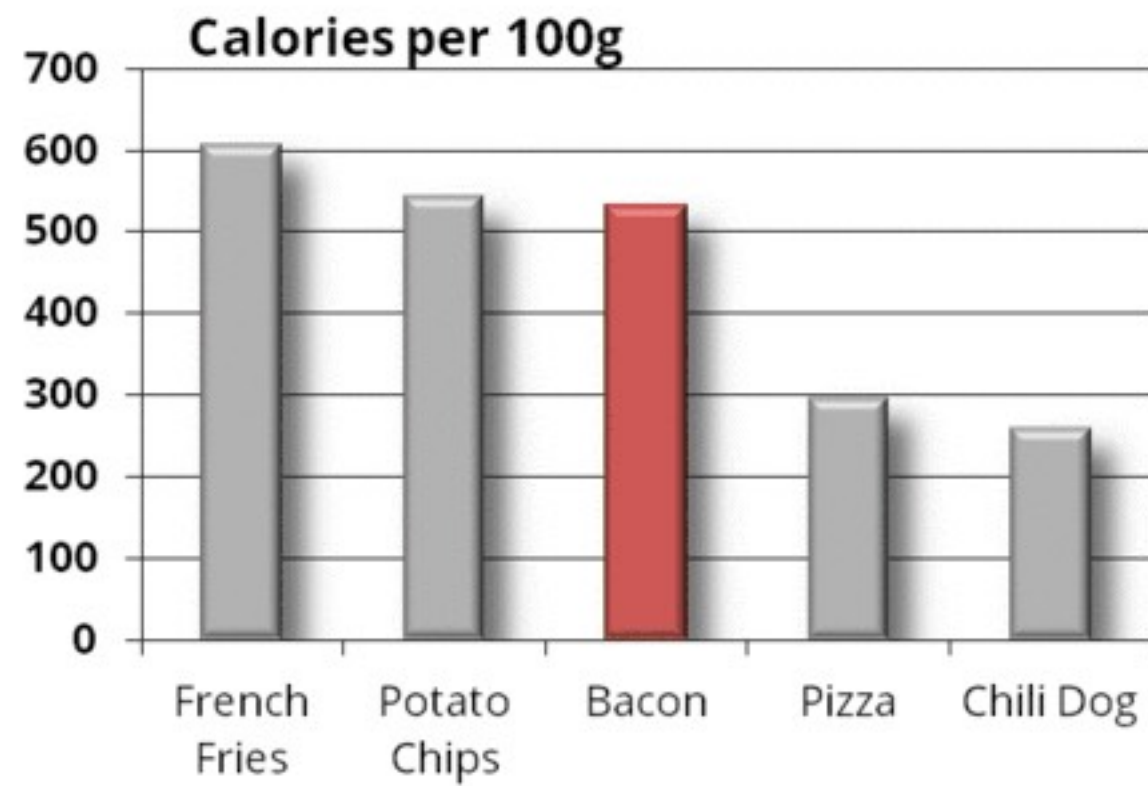
Reduce colors to emphasize the most important item

Calories: How does bacon compare?



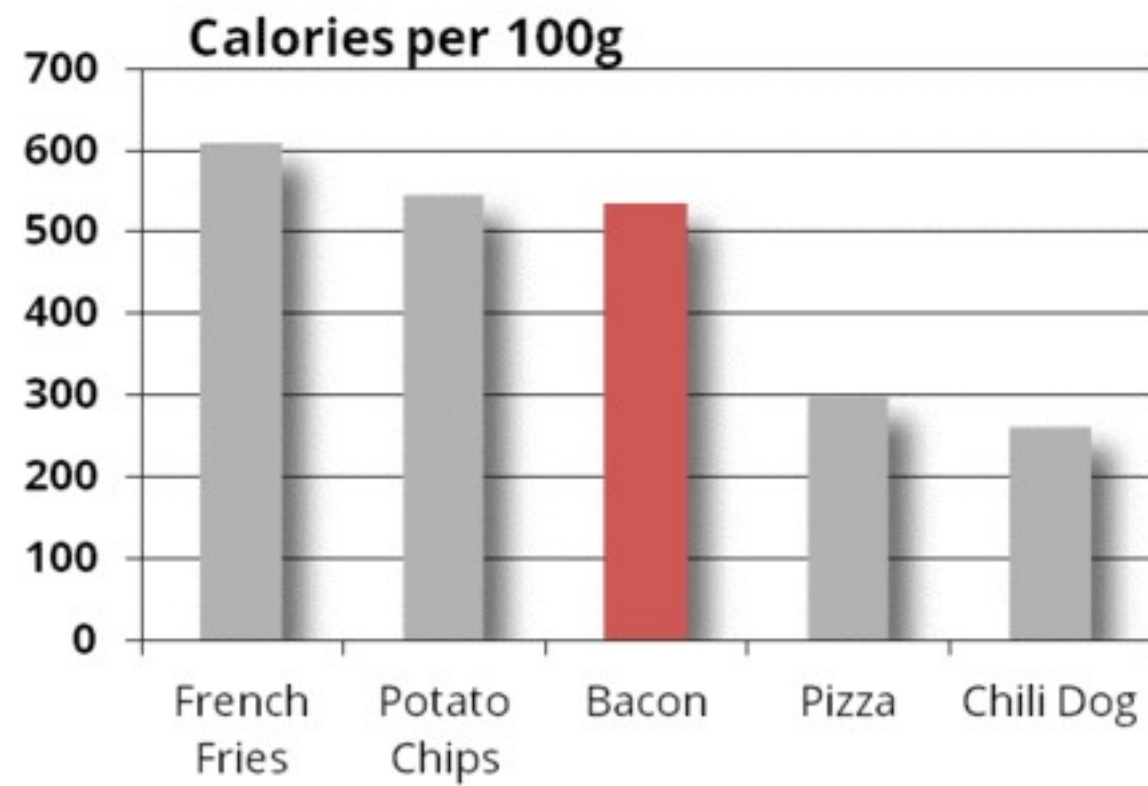
Remove modeling

Calories: How does bacon compare?



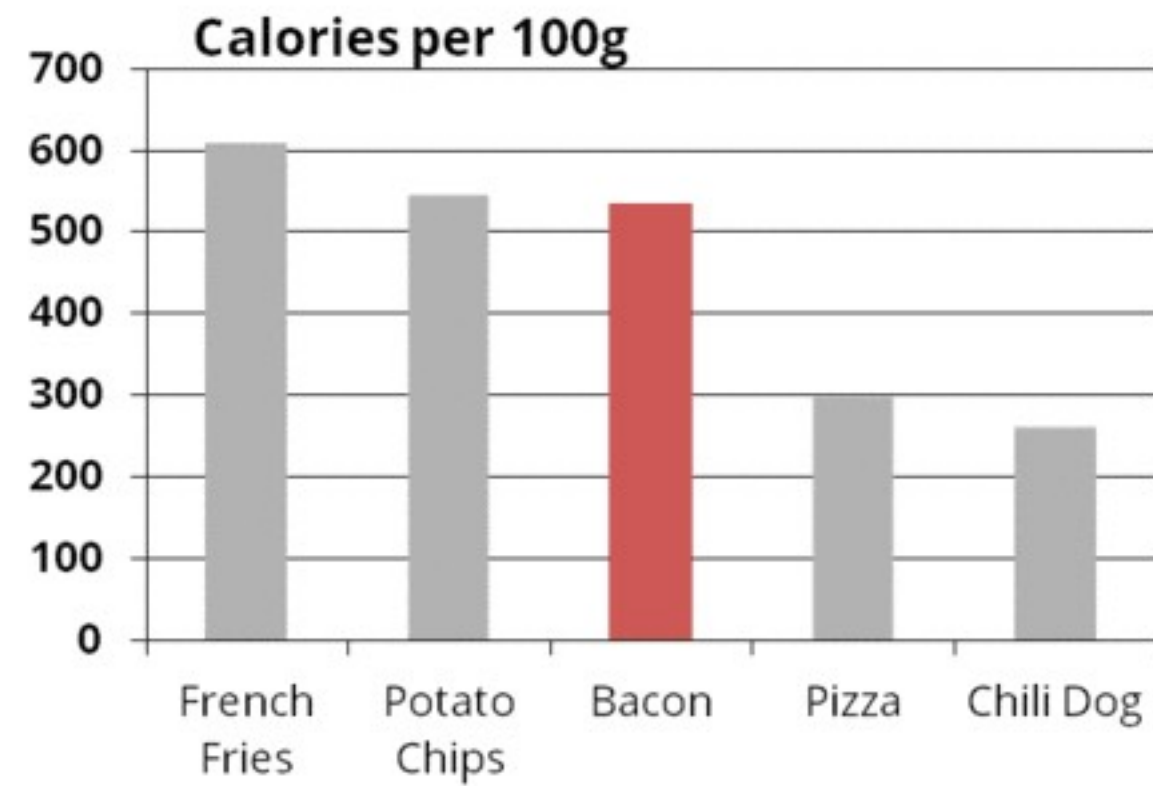
Remove shadows

Calories: How does bacon compare?



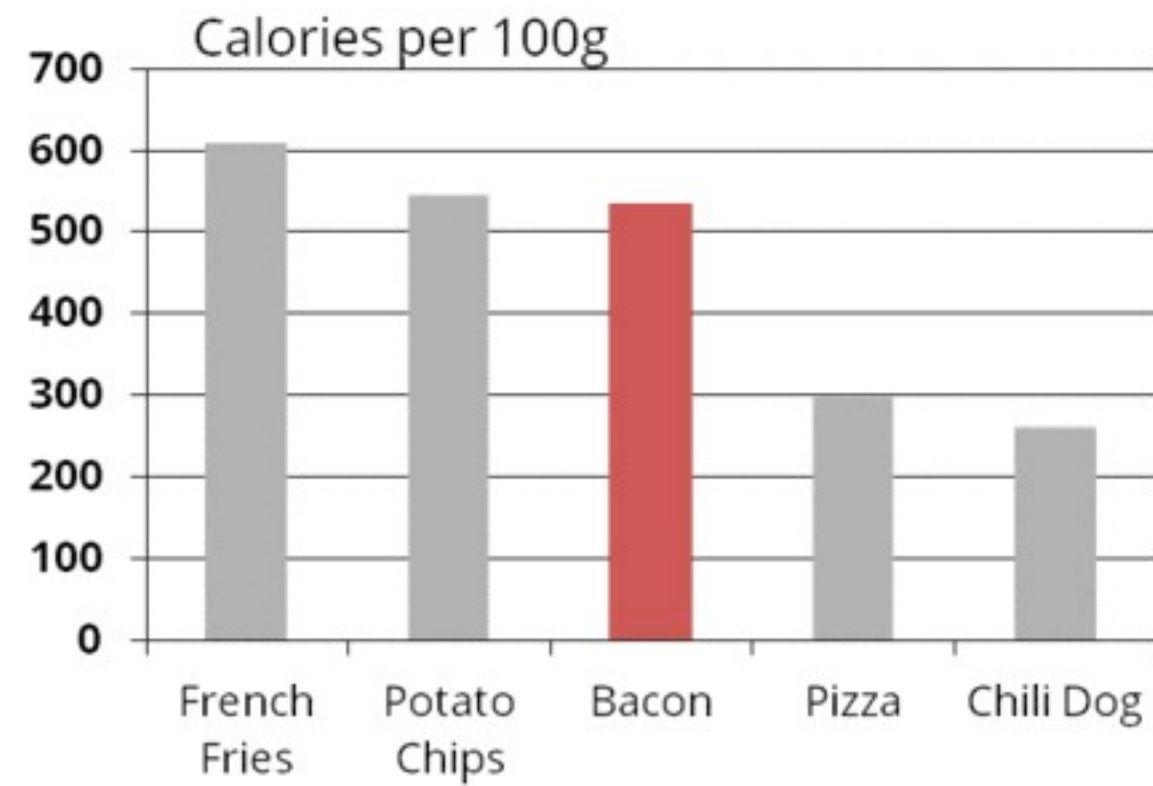
Lighten calorie label

Calories: How does bacon compare?



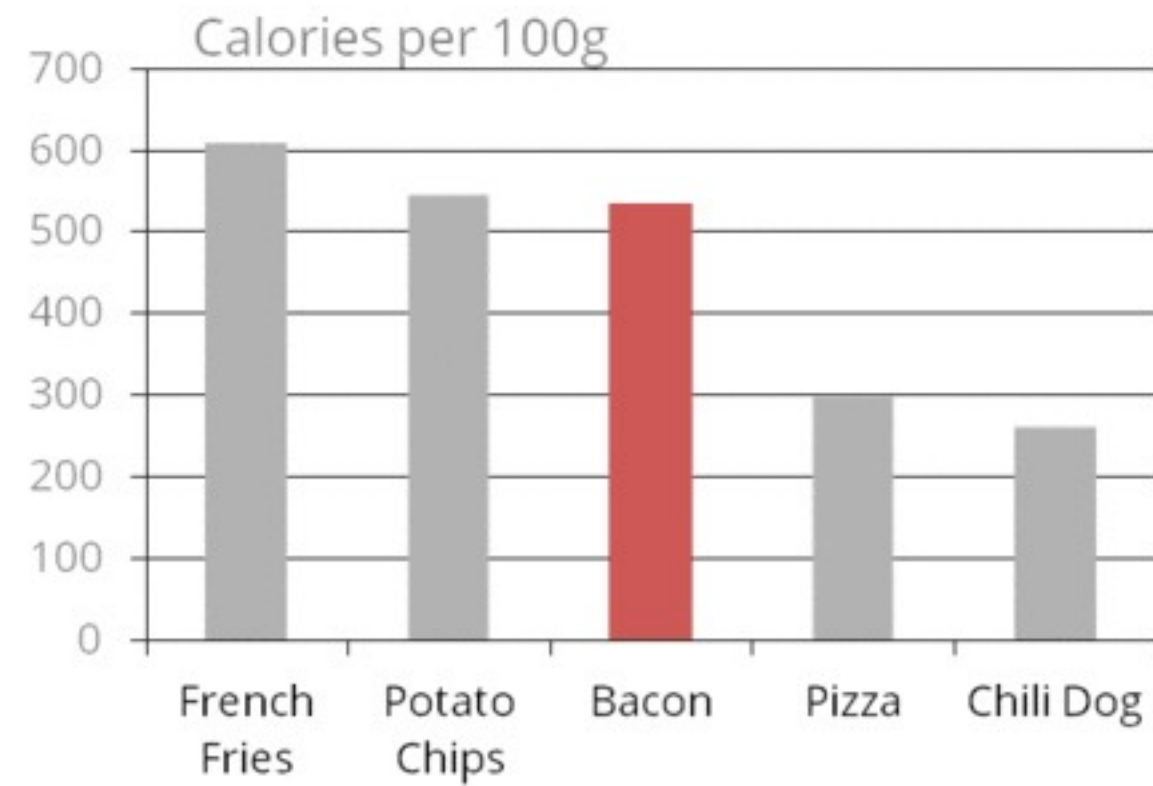
Lighten Y-axis labels

Calories: How does bacon compare?



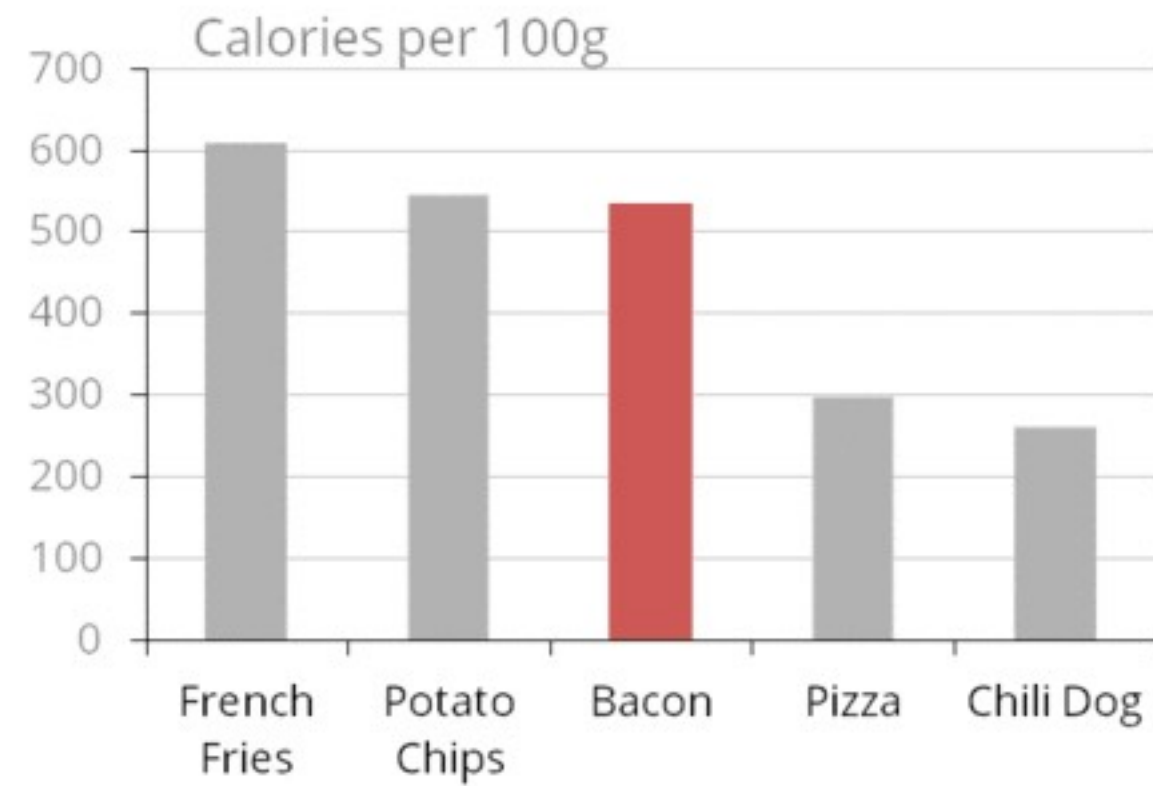
Lighten horizontal lines

Calories: How does bacon compare?



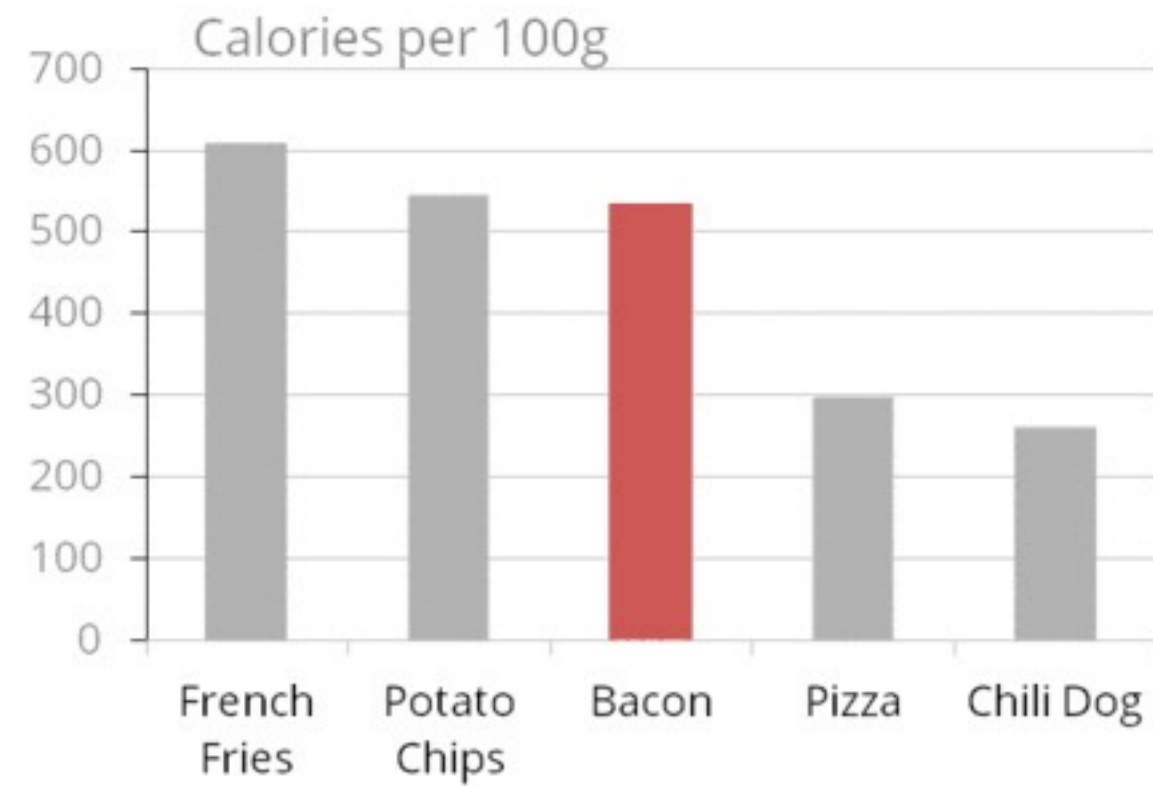
Lighten X-axis

Calories: How does bacon compare?



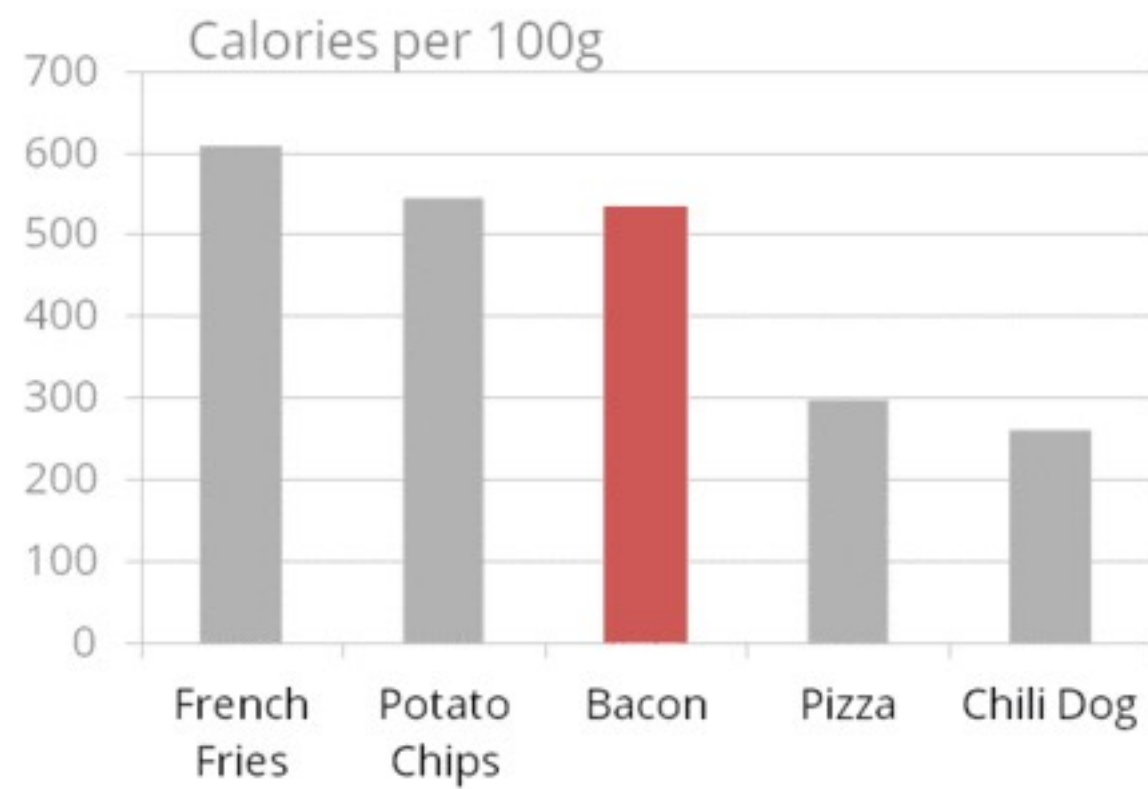
Lighten Y-axis

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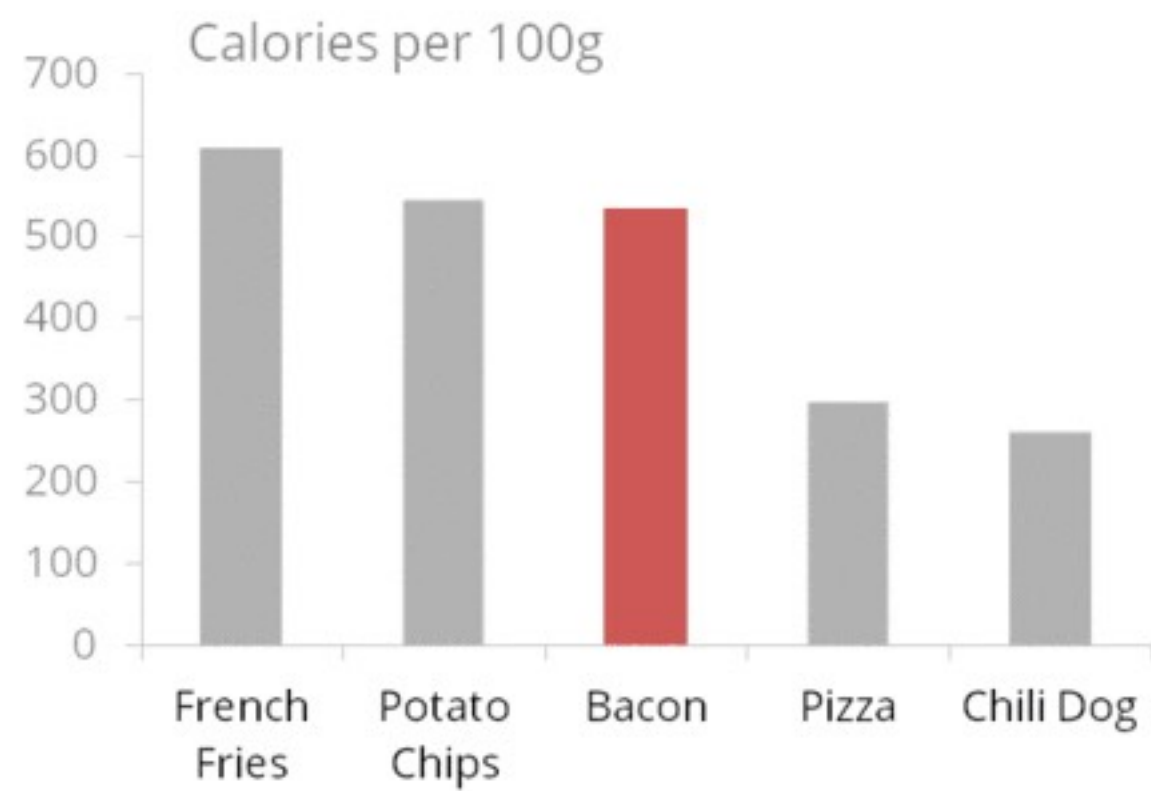
Remove chart lines

Calories: How does bacon compare?



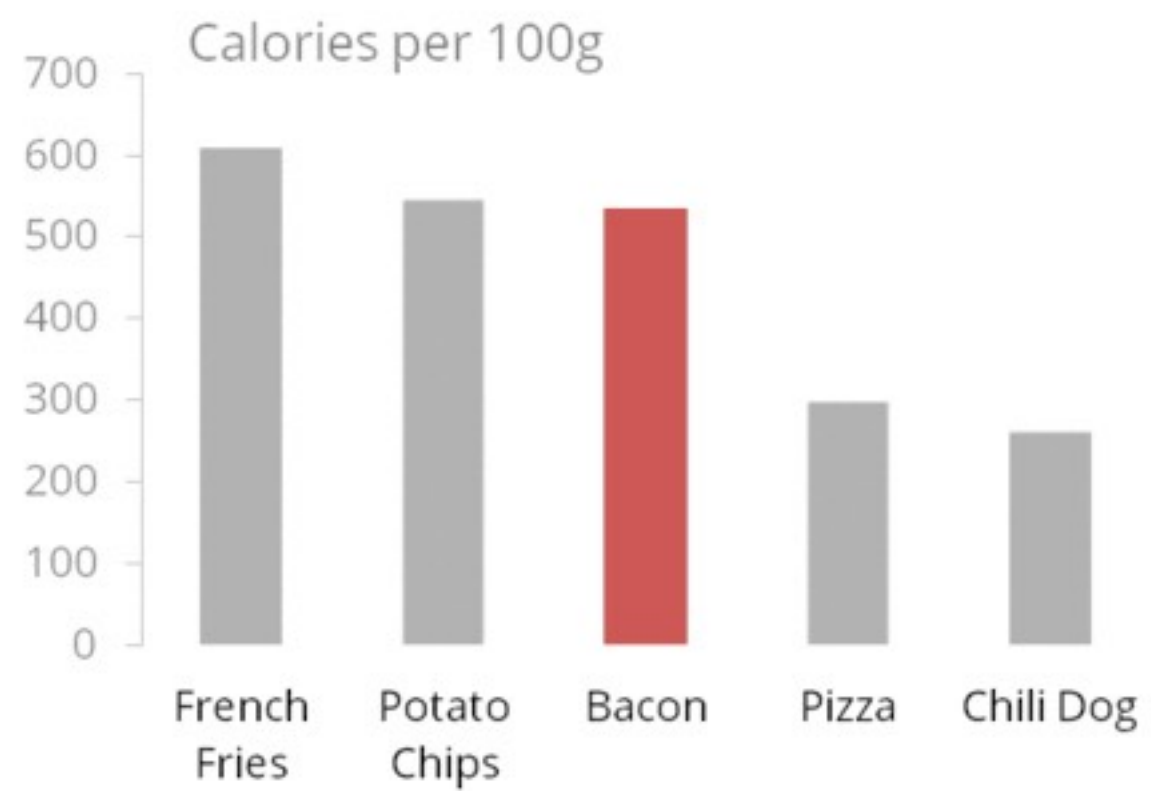
Remove X-axis

Calories: How does bacon compare?



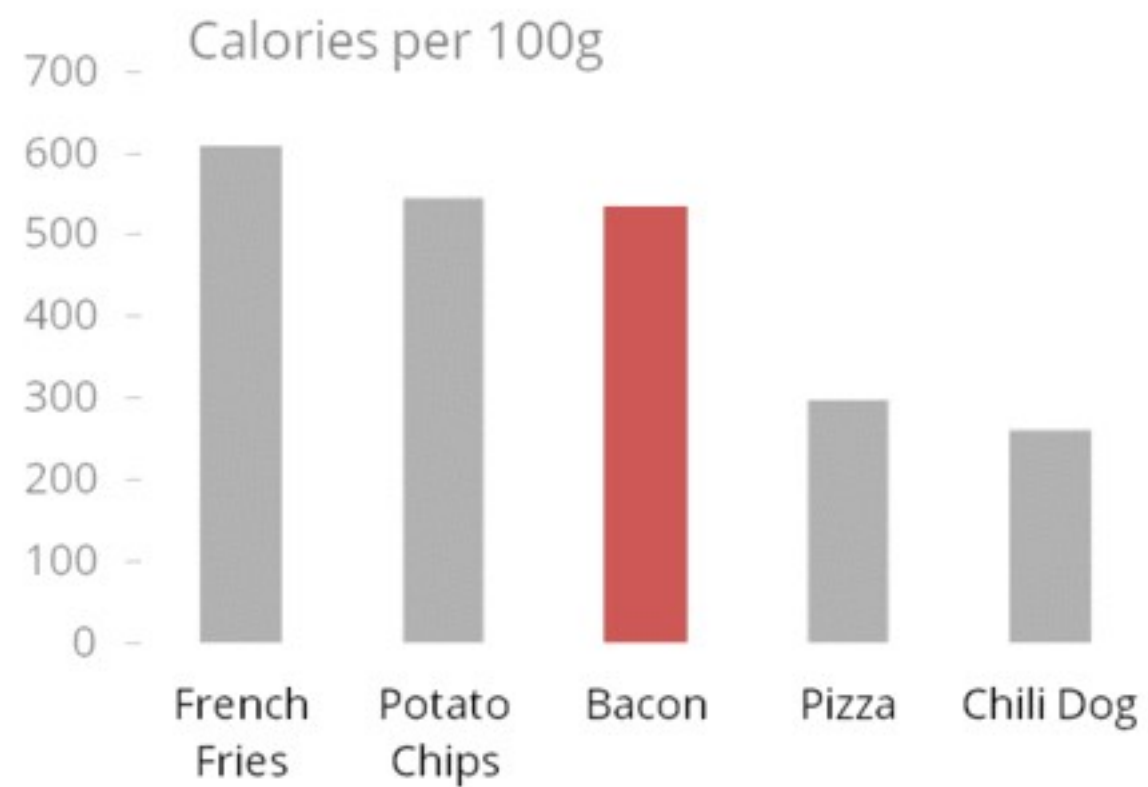
Remove Y-axis

Calories: How does bacon compare?



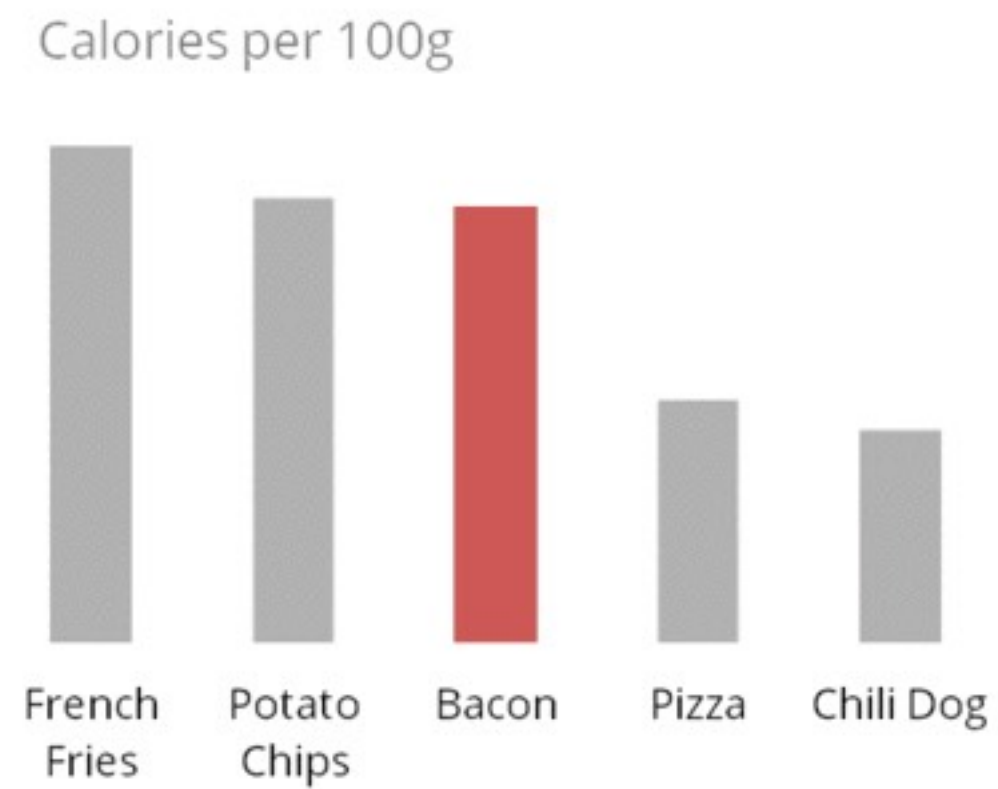
Remove vertical scale completely

Calories: How does bacon compare?



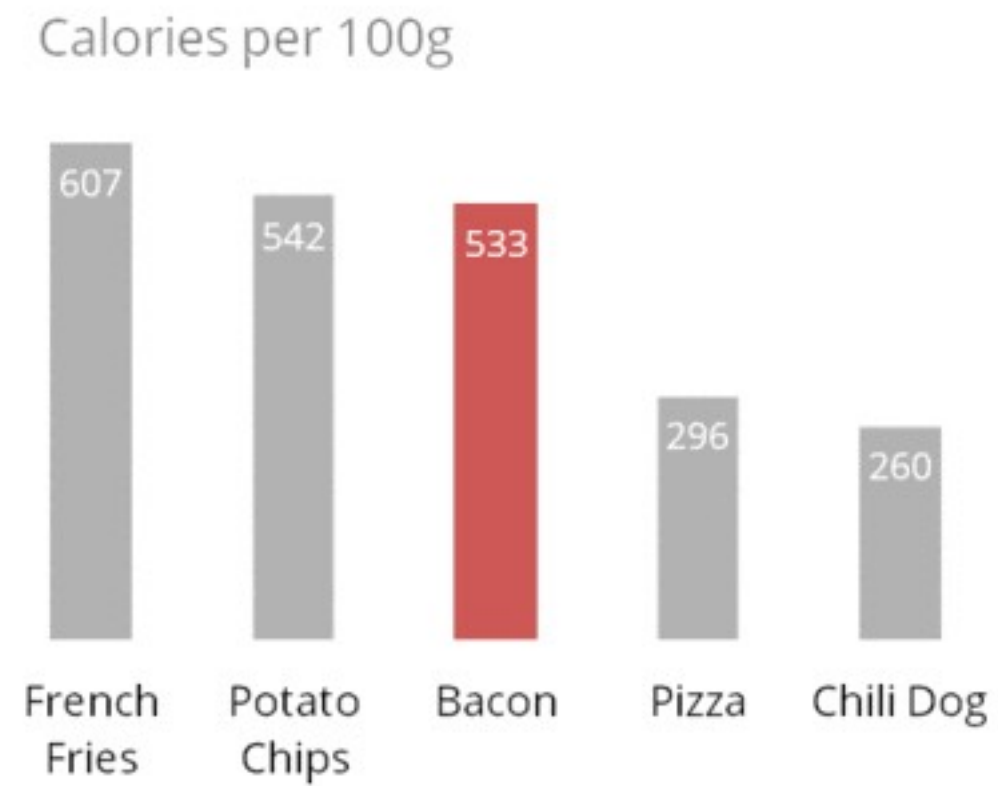
Put numbers inside bars

Calories: How does bacon compare?



Simplify headline

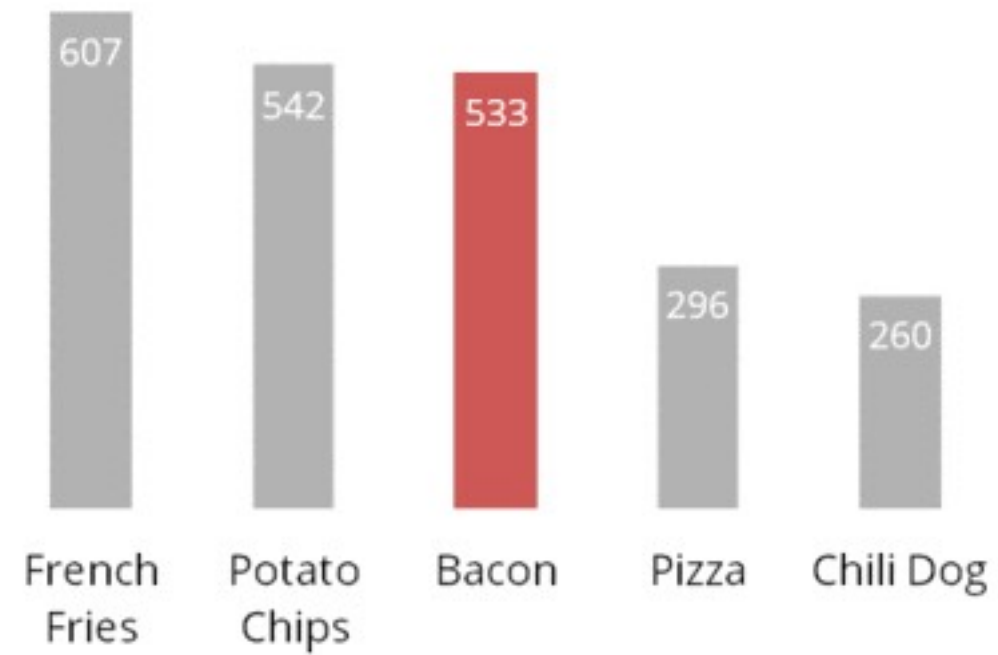
Calories: How does bacon compare?



Align headline

How does bacon compare?

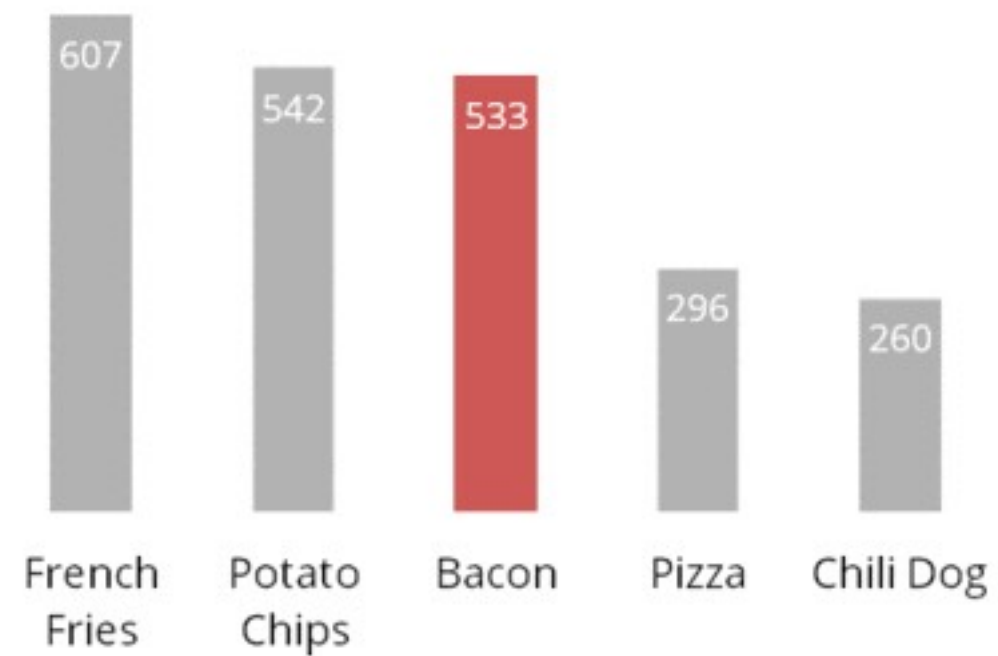
Calories per 100g



Close up space between headline and sub-heading

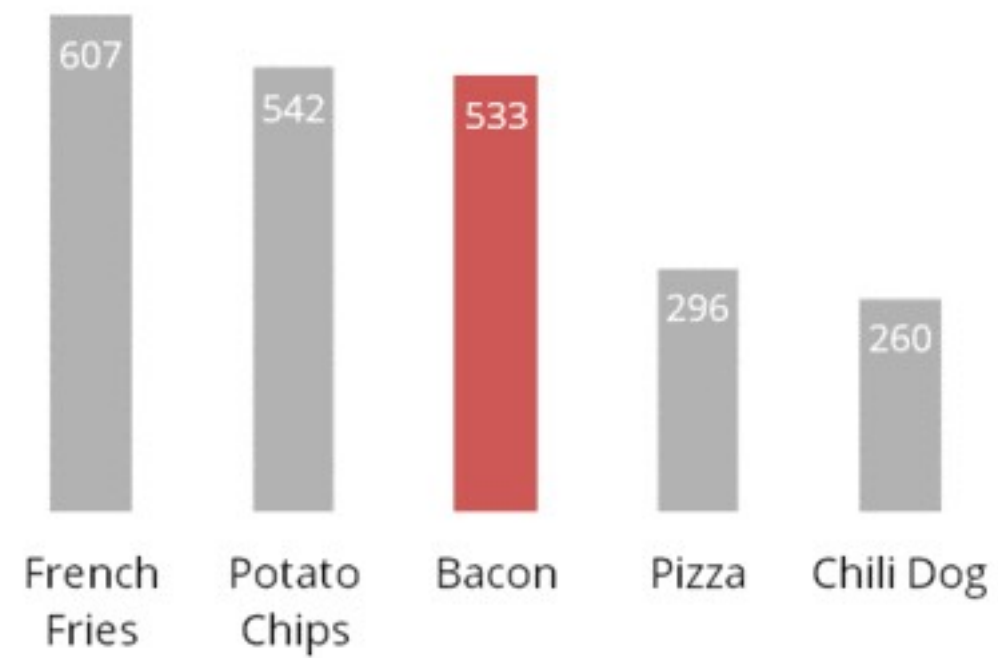
How does bacon compare?

Calories per 100g



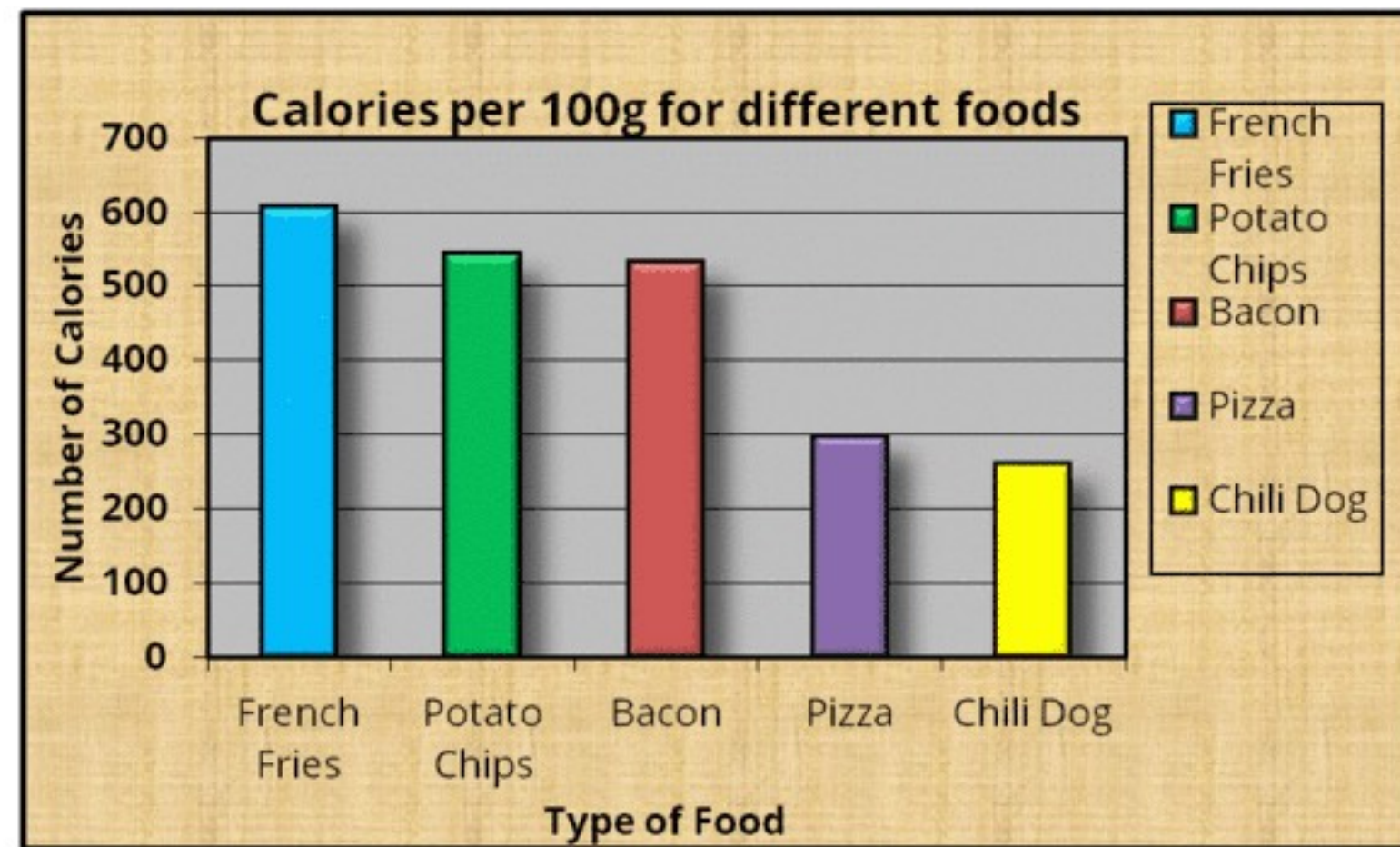
How does bacon compare?

Calories per 100g



BEFORE

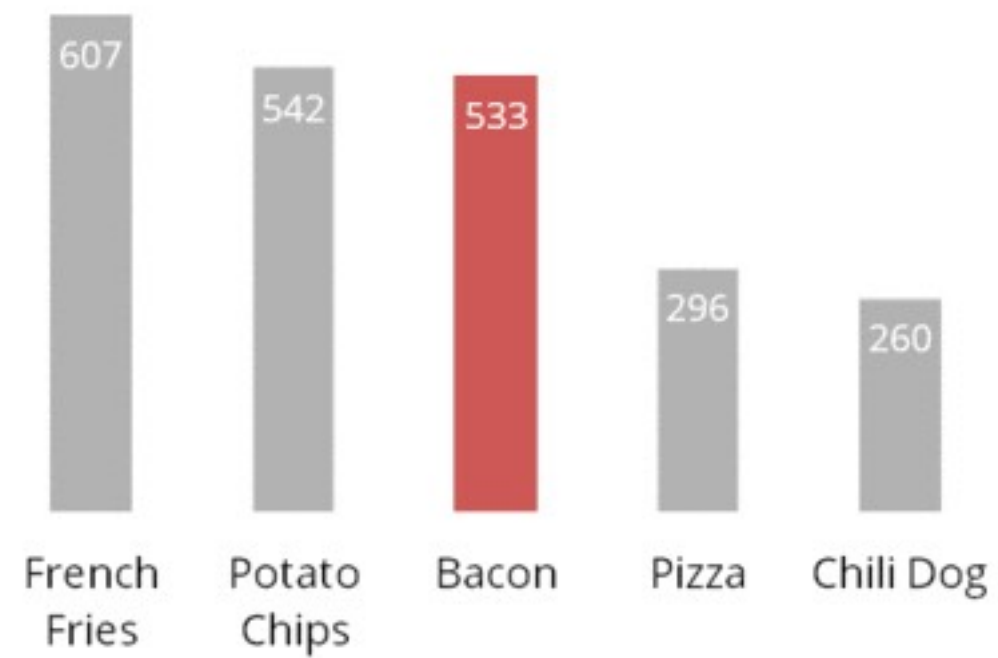
Calories: How does bacon compare?



AFTER

How does bacon compare?

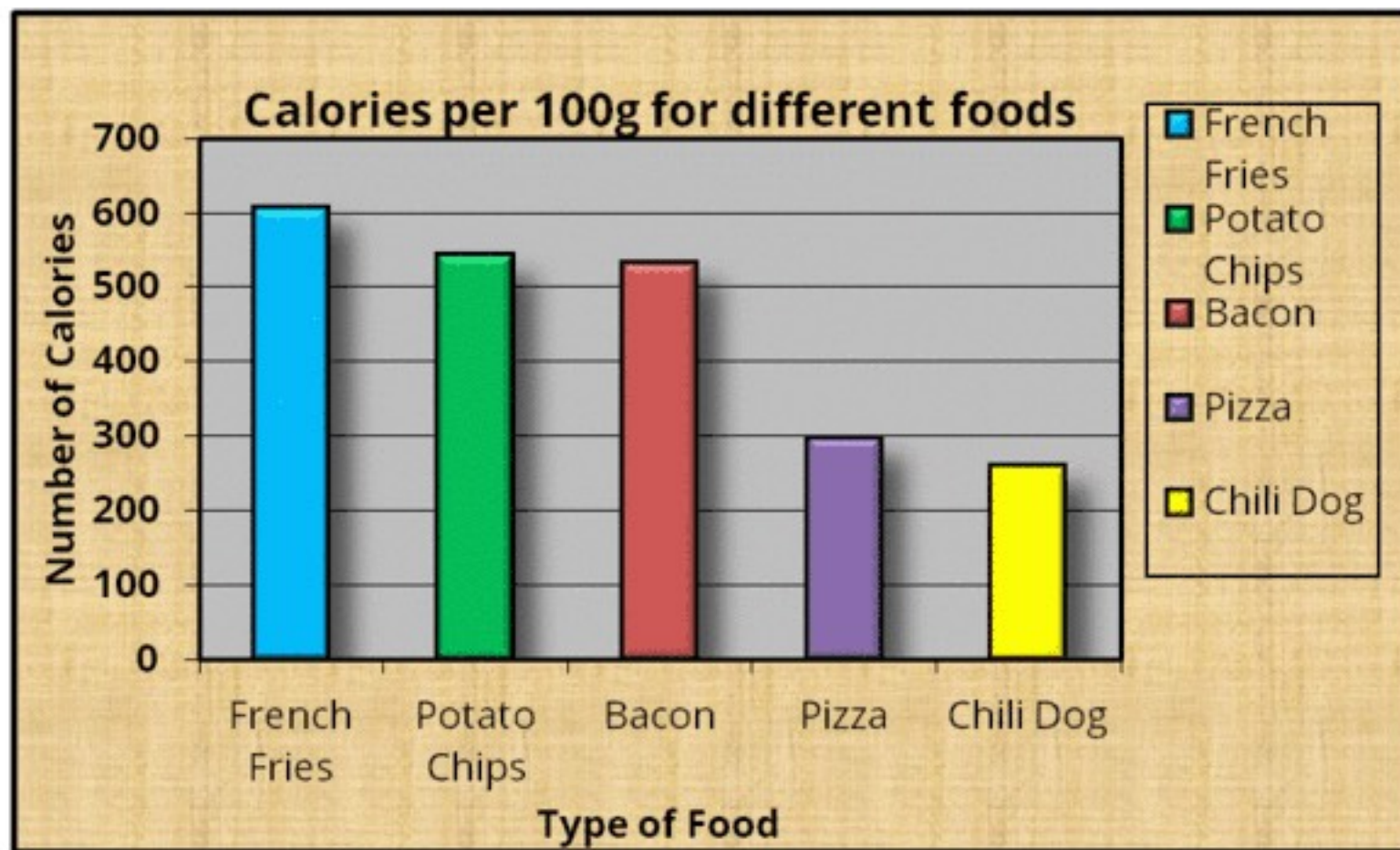
Calories per 100g



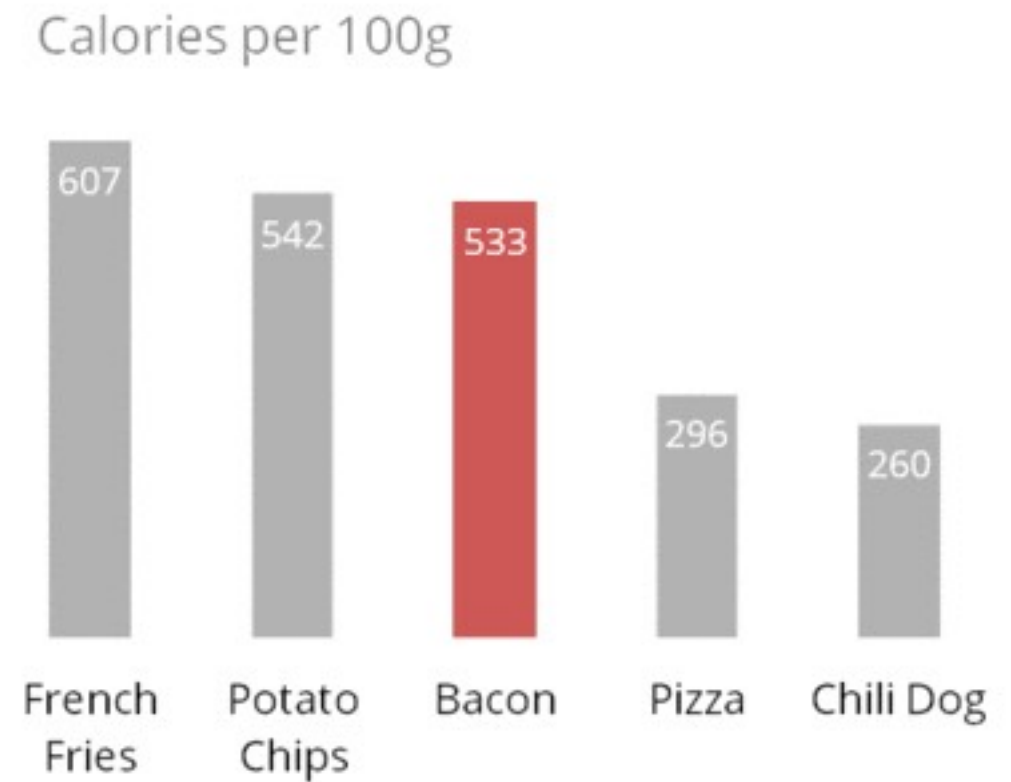
BEFORE

AFTER

Calories: How does bacon compare?



How does bacon compare?



5

Engage!



- **Look for creative visual solutions**
- **Conventional charting may not be the solution**
- **Avoid exotic chart types**
- **Make people take notice**



73.14%
Other institutional
and retail investors

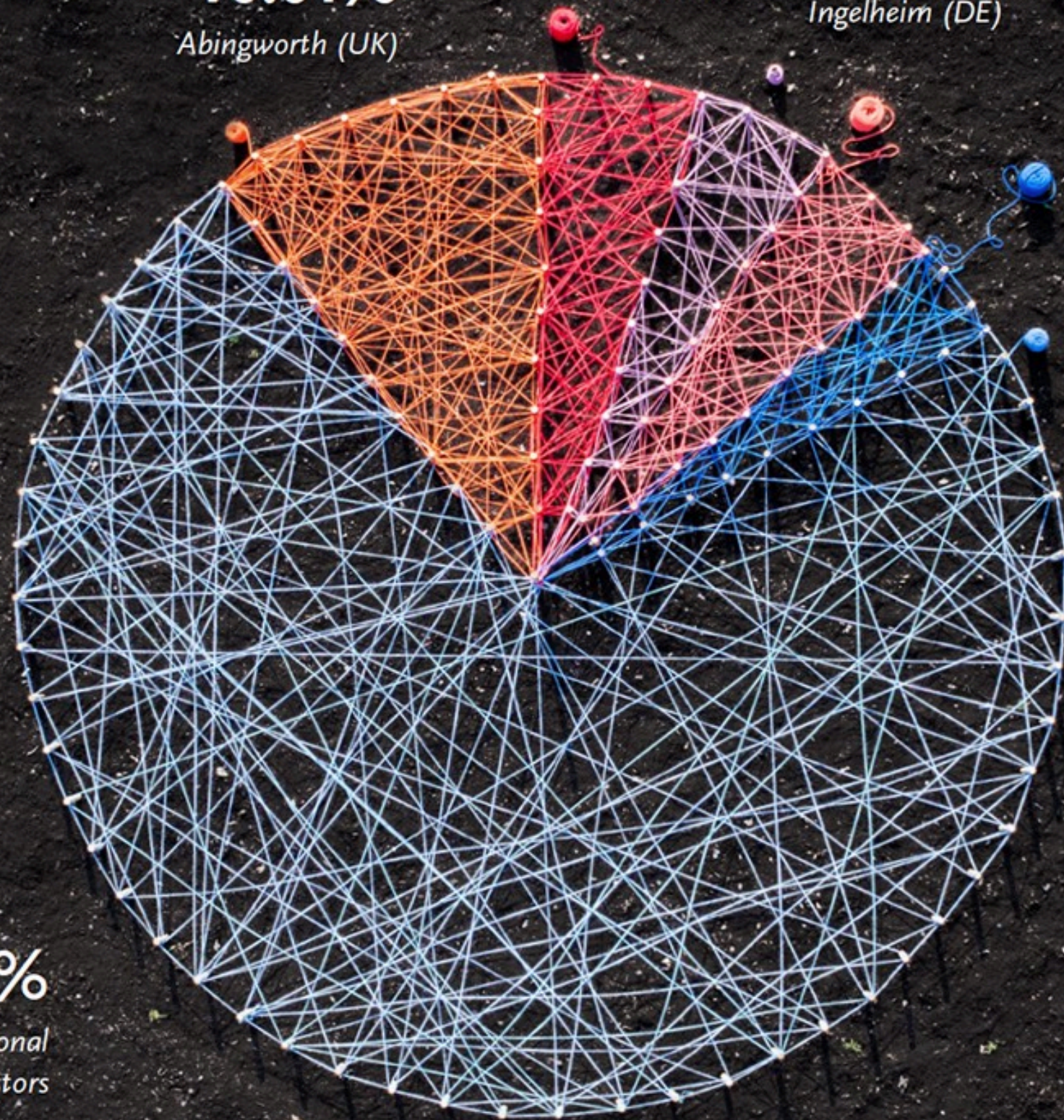
10.01%
Abingworth (UK)

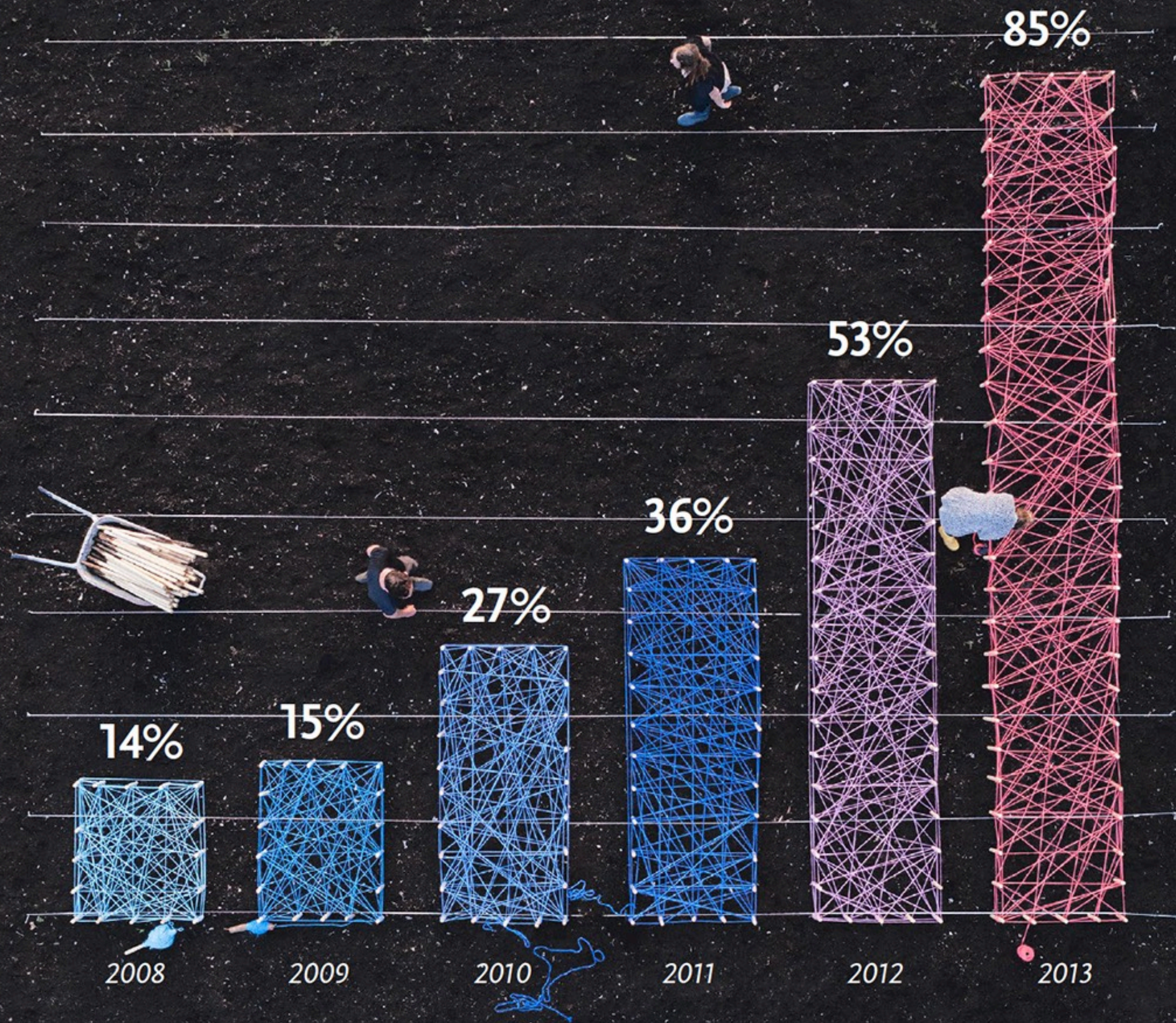
5.21%
Biotech Value
Fund (US)

4.37%
Boehringer
Ingelheim (DE)

4.24%
Perceptive
Advisors (US)

3.03%
Aviva (UK)







22.7

teaspoons a day

This is how much sugar the average American eats each day. Even without dipping into a sugar bowl, it's not hard to hit that total because of the sugars in processed foods (examples below). Though sugar consumption has dropped since 1999, we're still wildly exceeding the recommended limit (right).

LIFE-SIZE ILLUSTRATION

Sugars added to processed foods enhance flavor and texture. They also act as a preservative to extend shelf life.

1 tsp = 4.2 g

Beef and pork bologna, 4 slices, 1.18 tsp sugar

Wheat bread, 2 slices, 0.66 tsp

Lucky Charms, 1 cup, 2.55 tsp



Ketchup, 3 tbsp, 1.77 tsp

Oreo cookies, 3 cookies, 2.49 tsp

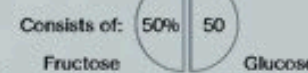
Lowfat fruit yogurt, 8 oz, 6.16 tsp

TYPES OF ADDED SUGAR CONSUMED, U.S. daily average

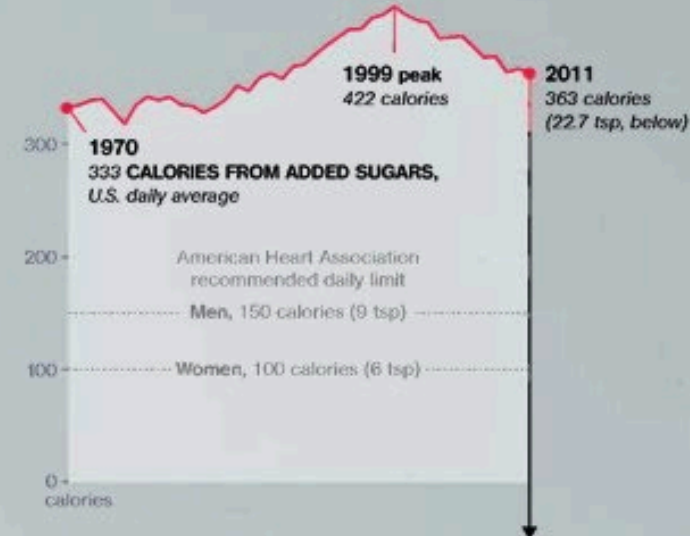


SUCROSE (11.6 tsp, 51%)

Granulated cane or beet sugar is stirred into coffee and tea and used in baking.



The problem with fructose Found in small amounts in fruits and vegetables—and in each type of sugar shown here—fructose in excess is a health hazard. The glucose in sugar is metabolized throughout the body. But fructose is processed mainly in the liver into fats, which can build up there and also enter the blood. The resulting risks: obesity, hypertension, insulin resistance, and type 2 diabetes.



DIAGNOSED DIABETES

Almost all the cases in this epidemic spike are type 2 diabetes, once called adult-onset diabetes.

1973
2% of the population, 4.2 million Americans

2010
7%,
21.1 million Americans

Can of cola, 12 oz, 7.93 tsp



22.7 tsp equal the natural sugar contained in each of the following:
7 red apples · 454 eggs · 1,135 cups of rice · 27 ears of corn

HIGH-FRUCTOSE CORN SYRUP (8.2 tsp, 36%)

Made cheap by government corn subsidies, it was first added to processed food in the 1970s.



OTHER SWEETENERS (3 tsp,* 13%)

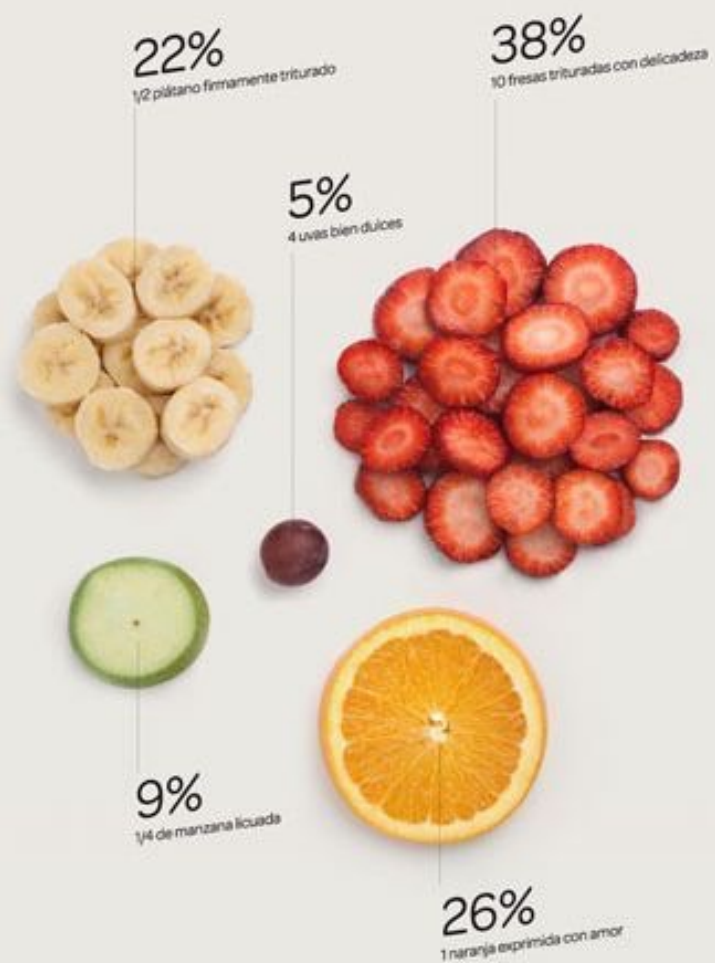
Honey, maple syrup, and molasses have slight traces of vitamins and minerals.

*Numbers do not equal 22.7 tsp due to rounding.
PHOTO ILLUSTRATION: ROBERT CLARK, LAWSON PARKER, NGM STAFF; AMANDA HOBBS; SOURCES: USDA; CDC (DIABETES)



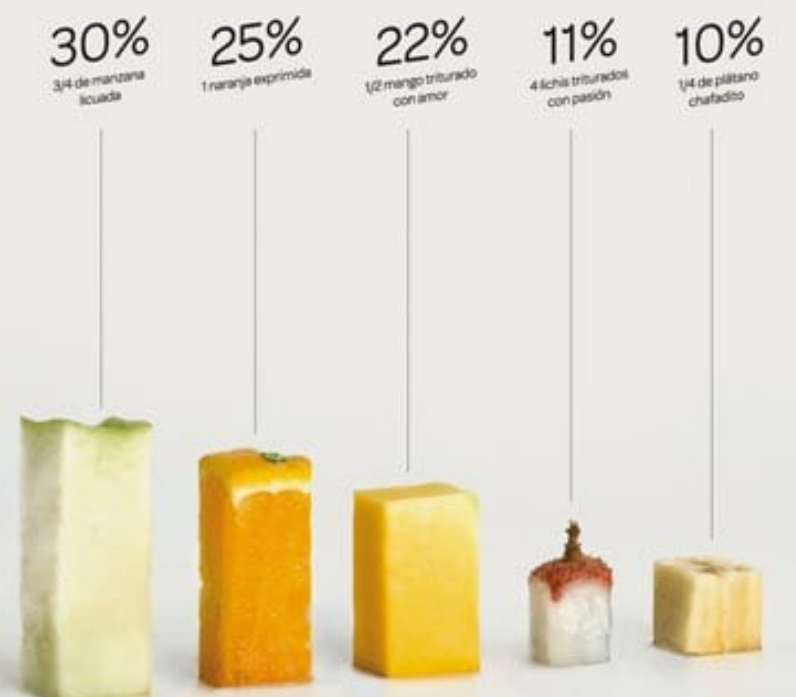
Naranja, piña & plátano.

Fruta y ya está.



Fresa & plátano.

Fruta y ya está.



Mango & lichis.

Fruta y ya está.



POPULATION DENSITY BY COUNTRY, inhabitants per sq.km

INDIA
UNITED STATES
INDONESIA
BRAZIL
TAIWAN
PAKISTAN
NIGERIA
BANGLADESH
RUSSIA
JAPAN
MEXICO
PHILIPPINES
VIETNAM
ETHIOPIA
EGYPT
GERMANY
IRAN
TURKEY
THAILAND
FRANCE
UNITED KINGDOM
ITALY
SOUTH AFRICA
SOUTH KOREA
COLOMBIA
SPAIN
UKRAINE
HONG KONG (CHINA)
TANZANIA
KENYA
ARGENTINA
POLAND
ALGERIA
CANADA
IRAQ
MOROCCO
PERU
SAUDI ARABIA
VENEZUELA
NEPAL
AFGHANISTAN
NORTH KOREA
GHANA
MOZAMBIQUE
AUSTRALIA
SYRIA
MADAGASCAR
ANGOLA
CAMEROON
SRI LANKA
ROMANIA
NIGER
KAZAKHSTAN
NETHERLANDS
CHILE
MALAWI
ECUADOR
GUATEMALA
MALI
CAMBODIA
SENEGAL
ZAMBIA
ZIMBABWE
CHAD
SOUTH SUDAN
BELGIUM
CUBA
TUNISIA
GUINEA
GREECE
PORTUGAL
RWANDA
CZECH REPUBLIC
SOMALIA
HAITI
BENIN
BURUNDI
BOLIVIA
HUNGARY
SWEDEN
BELARUS
DOMINICAN REPUBLIC
HONDURAS
AUSTRIA
UNITED ARAB EMIRATES
ISRAEL
SWITZERLAND
BULGARIA

DATAWORLD

We hacked into the top-secret FIFA servers to reveal the official 2018 World Cup statistics.*

*Not really, but it sounds good. Our source is the 2018 FIFA World Cup Technical Report, which was published on October 16.

169 goals An average of 2.64 goals per game.

WHEN THEY WERE SCORED

Dramatic late strikes with time running out were a feature of the tournament.



FIRST HALF
65

ADDED TIME

SECOND HALF
101

EXTRA TIME
3

TYPE OF PLAY

Record numbers of own goals, penalties, and set pieces.



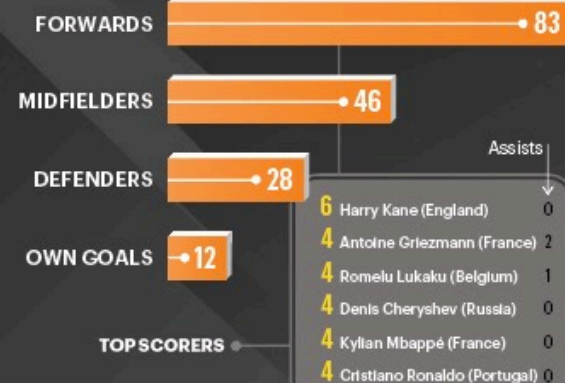
The VAR effect
There were only 13 penalties awarded in 2014.

WHERE FROM?

145 scored from inside the 18-yard box.

WHO SCORED THEM?

Leading from the front.



24 Outside the penalty area

22 Penalties

Telstar 18 group stage ball

91 In the rest of the penalty area

32 Inside the goal area

Harry Kane
ENGLAND

219 YELLOWS

4 REDS

STRAIGHT REDS
SECOND YELLOWS

A new record in good behavior this time. Four reds were issued in just one game at the 2006 World Cup between Portugal and the Netherlands, nicknamed "The Battle of Nuremberg."

2014: 181

2014: 10

Discipline

Well, the Video Assistant Referee was watching.

VAR

Some people don't love it, but the calls were correct.



Playing time

How much action did we see?

Chelsea were the best team in the Premier League last season, as far as minutes actually played: **58 min. 31 sec.**



Record breakers

In a World Cup of upsets, the record book was rewritten.



PASS-O-RAMA

Spain made **770** passes against Russia before extra time and lost. It was the most ever in a World Cup game, and **1,114 total** is the most in any game for an international side. Russia's total for the game: 202.



FASTEST CAUTION

A yellow card just **13 seconds** into the game for Jesús Gallardo, Mexico vs. Sweden. (Fastest red card ever: **56 seconds**. José Batista, Uruguay vs. Scotland, 1986.)



THE RACE TO GET LEVEL

Fastest to reach a **1-1** score: **3 minutes 40 seconds**, Denmark vs. Croatia. The game went on for another 125 minutes without a goal, then Croatia won in a penalty shoot-out.



CHAMPIONS' CURSE

Four of the last five champions have gone out in the group stage. And all of the last three have **failed to advance** to the last 16: Germany, Spain, and Italy.



UNDERDOGS

Russia are the lowest-ranked team to reach the World Cup quarterfinals. Their FIFA pre-tournament ranking was **70**. It's now **48**. (in the November 29 list).

Romelu Lukaku
BELGIUM

Telstar Mechta
knockout stage ball



ACADEMIC YEAR?



Resources



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S O F T W A R E



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Search by Function

View by List



Arc Diagram



Area Graph



Bar Chart



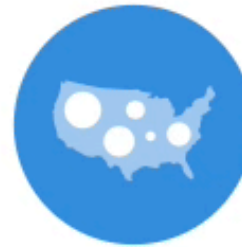
Box & Whisker Plot



Brainstorm



Bubble Chart



Bubble Map



Bullet Graph



Calendar



Candlestick Chart



Chord Diagram



Choropleth Map



Circle Packing



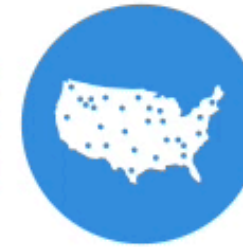
Connection Map



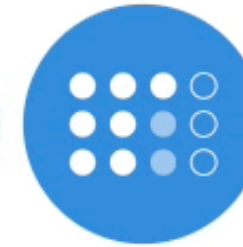
Density Plot



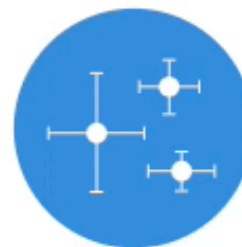
Donut Chart



Dot Map



Dot Matrix Chart



Error Bars



Flow Chart



Flow Map



Gantt Chart



Heatmap



Histogram

Interactive Chart Chooser

Wondering which type of graph is the best fit for your data? Explore our interactive chart chooser using the filters. For example, if you click on 3+ Points in Time, you'll see familiar faces like line graphs and meet new friends like multimedia timelines.

[All](#) | [1 Point in Time](#) | [2 Points in Time](#) | [3+ Points in Time](#) | [Comparisons](#) | [Correlation](#) | [Distribution](#) | [Exploratory](#) | [Part to Whole](#) | [Progress Towards Goals](#) | [Relationships](#)

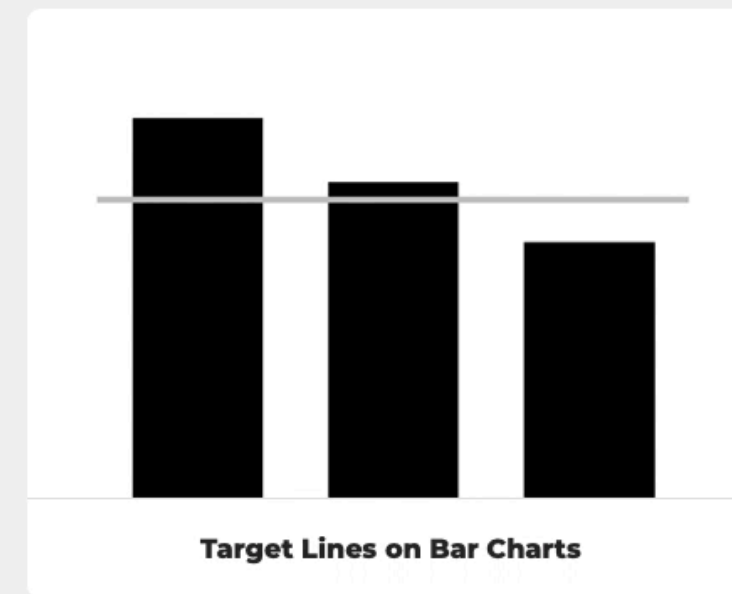
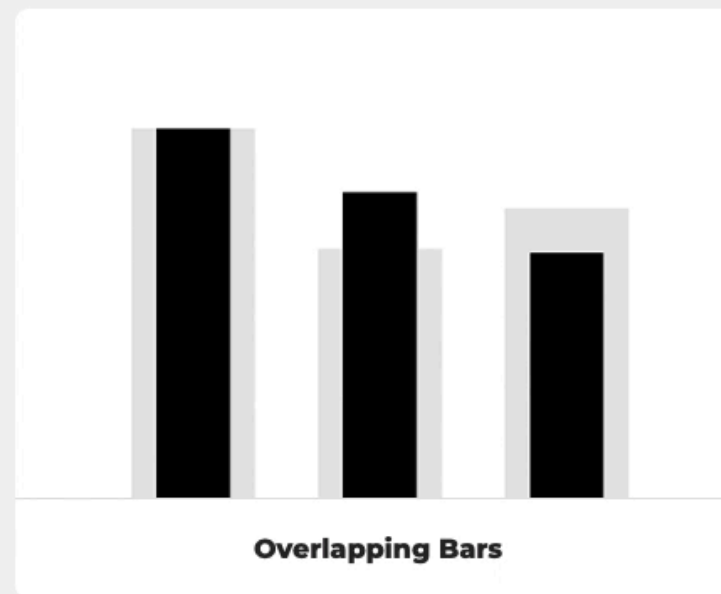
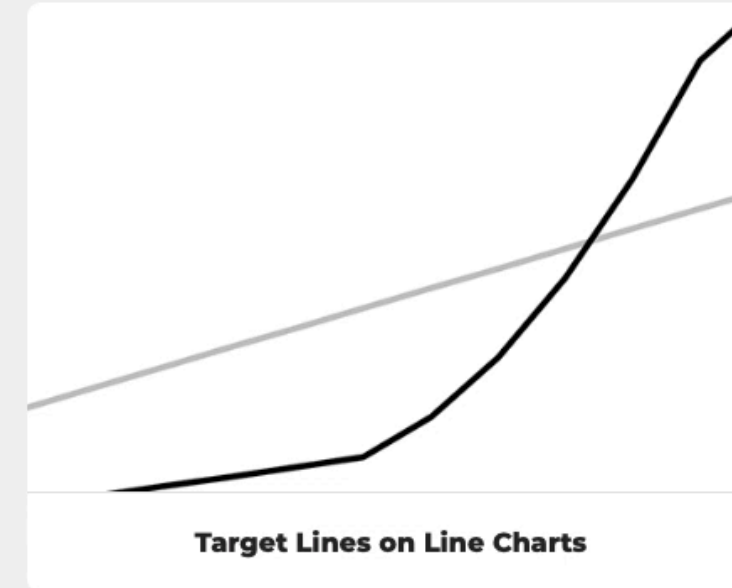
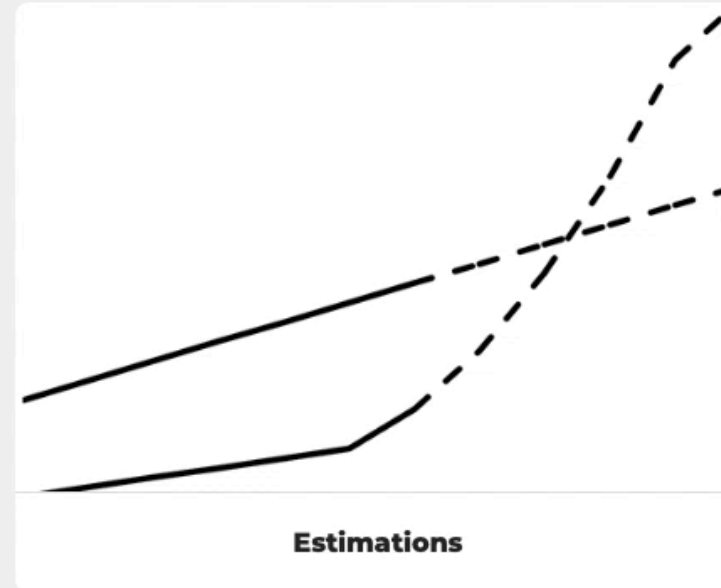
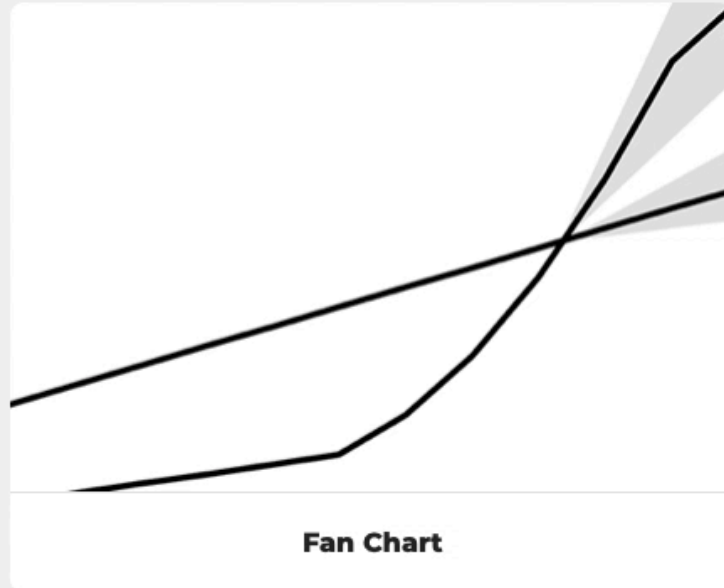


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presenting data.

SCHEDULE A DEMO

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Welcome to Chart Chooser — our favorite tool for improved Excel and PowerPoint charts.

Use the filters below to find the right chart type for your needs, then download as Excel or PowerPoint templates and insert your own data.
Learn more about the origins of Chart Chooser [here](#).

Viewing 17 of 17

What type of visualization do you need for your data?:

- All Comparison Distribution Composition Trend Relationship Table

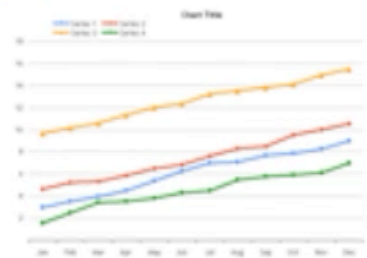
For which program?:

- Powerpoint Excel

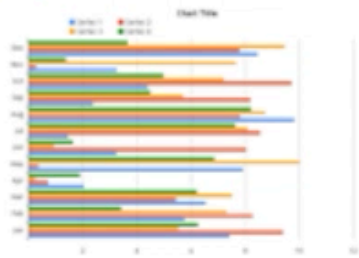
Are you a fan?

- Share +

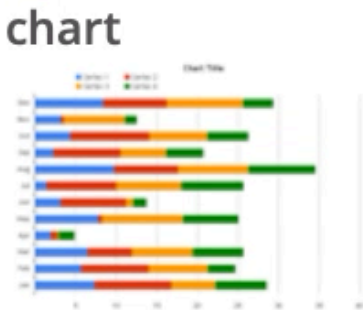
Line chart



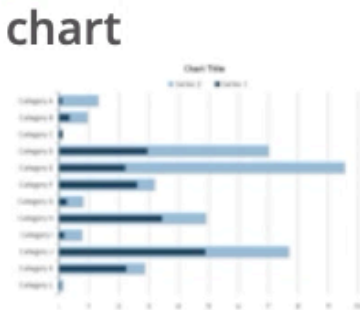
Bar chart



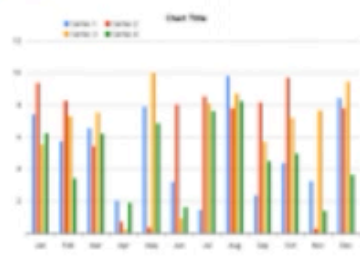
Stacked bar chart



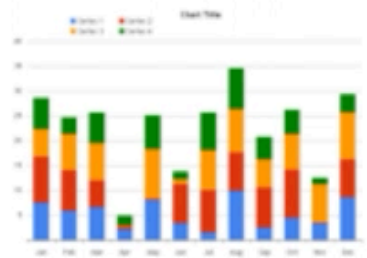
Bullet bar chart



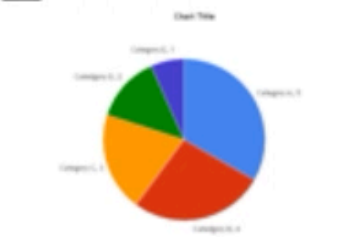
Column chart



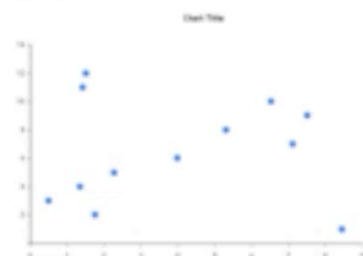
Stacked column chart



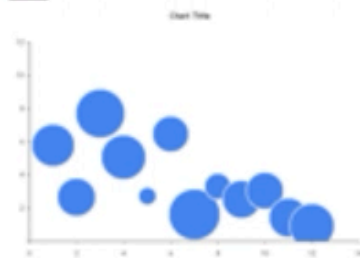
Pie chart



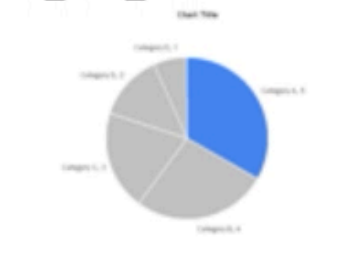
Scatterplot chart



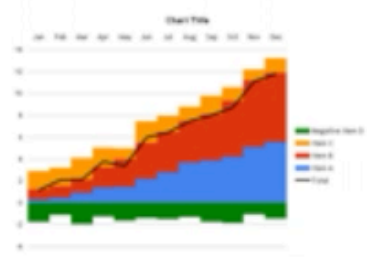
Bubble chart



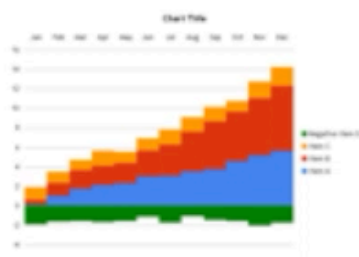
Pie chart with highlight



Stacked column volume with total chart



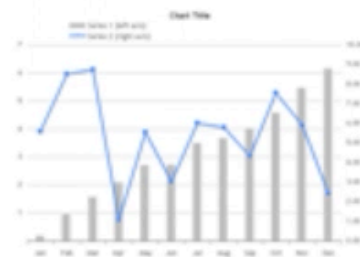
Stacked column volume chart



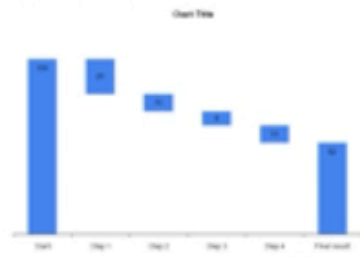
Alternating rows table

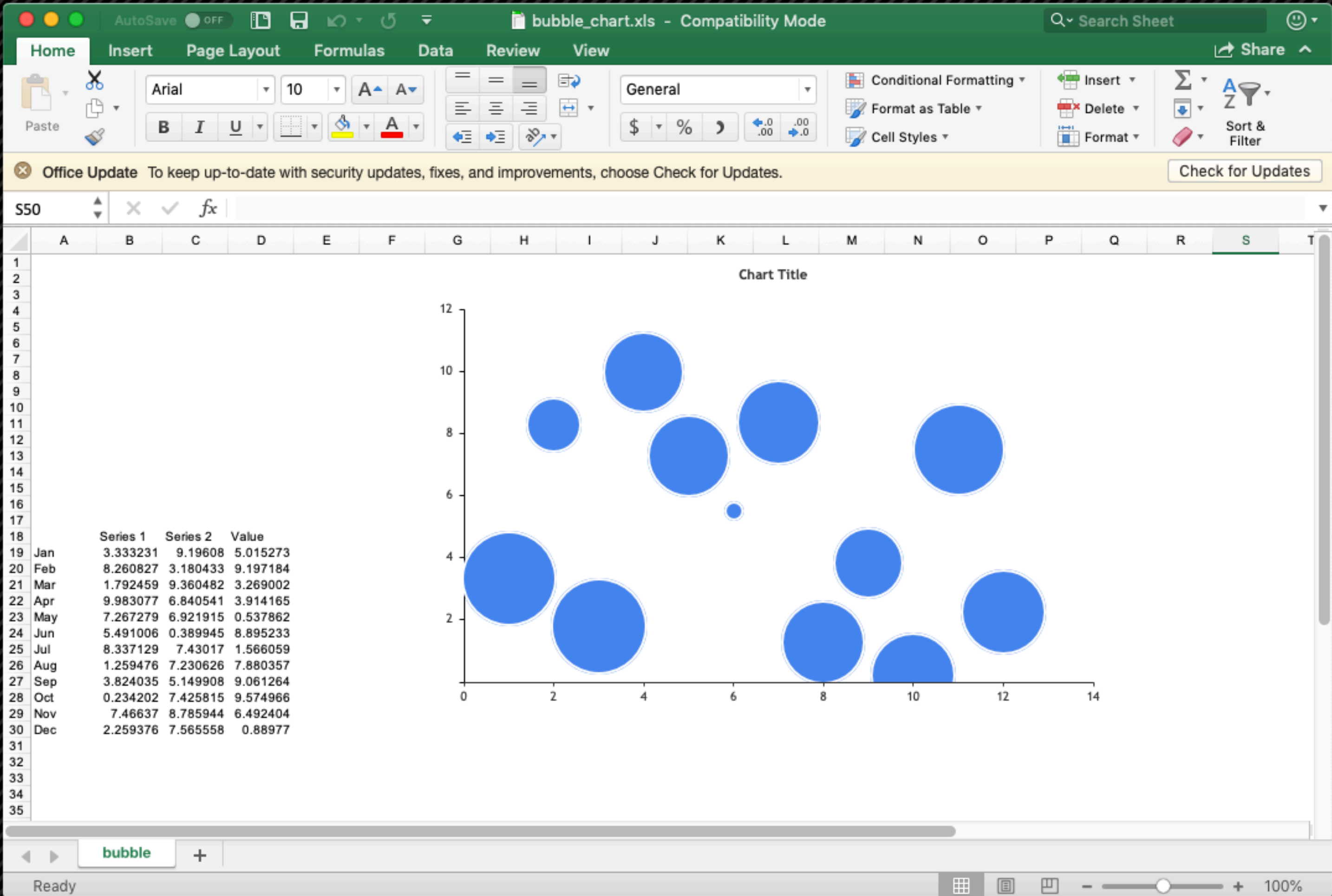
Name	Age	WVC	MB	MB	E
Robert Thompson	305	324	12	26	17
Albert Pujols	291	320	32	57	26
Scott Helberg	266	321	9	43	21
Lance Berkman	326	326	26	62	64
Travis Hafner	305	311	26	52	74
Austin Maroney	337	308	25	27	40
Edo Gonsky	307	305	16	34	57
Pavel Kuznetsov	340	302	24	36	66
Nick Johnson	324	302	14	63	33
Glen Hershland	298	301	12	14	40
Adrian Gonzalez	336	296	16	21	62
Jon Thome	327	297	32	61	46
Wally Pichler	363	296	11	46	76
Mike Jacobs	296	294	14	30	43
David Nelson	262	294	11	56	37
Todd Helton	297	293	6	36	26
Bryan Howard	342	291	31	37	104

Two axis column line chart



Waterfall chart





the truthful art

data, charts, and maps
for communication



alberto cairo

"Cairo sets the standard for how data should be understood, analyzed, and presented. *The Truthful Art* is both a manifesto and a manual for how to use data to accurately, clearly, engagingly, imaginatively, beautifully, and reliably inform the public."

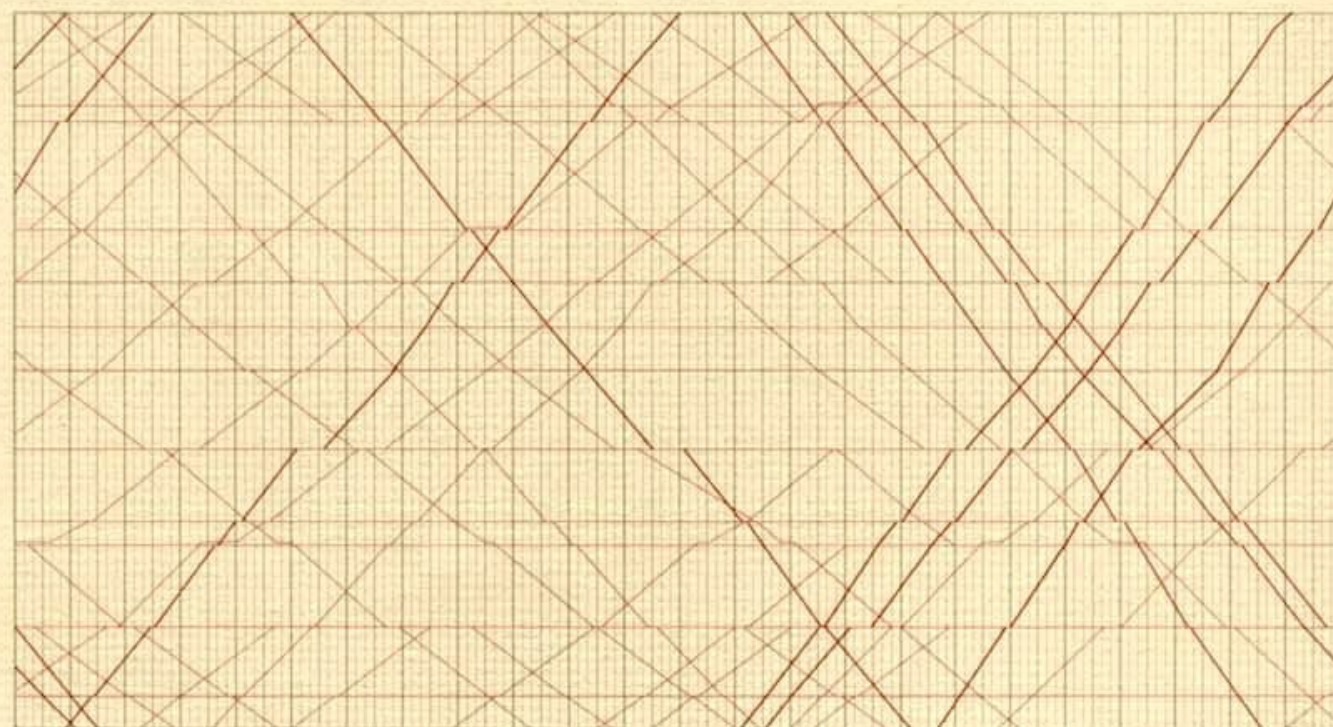
Jeff Jarvis, professor, CUNY Graduate School of Journalism,
and author of *Geeks Bearing Gifts: Imagining New Futures for News*

How Charts Lie



Getting Smarter about
Visual Information

Alberto Cairo



The Visual Display of Quantitative Information

EDWARD R. TUFTE



johnngrimwade.com/blog



Infographics for the People

INFORMATION DESIGN AND DATA VISUALIZATION

NOVEMBER 23, 2017

DNA

PRINTING THE GENOME, AND THE DOUBLE HELIX STORAGE SOLUTION.



And finally...



The data viz pretzel



DATA VIZ THAT
DOES NOT WORK

DATA VIZ
THAT MAKES ME
WANT TO CRY

DATA VIZ
THAT WORKS