Data Analytics for Procurement Professionals

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center4procurement.org/dfw

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Agenda

- Understanding today's market trends
- Introduction to Visual Analytics
- Fundamentals of Visual Analytics
- Understanding Data Types & Available Tools

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NOTICE

All Data is as of April 14, 2023

The Supply Chain is Changing RAPIDLY

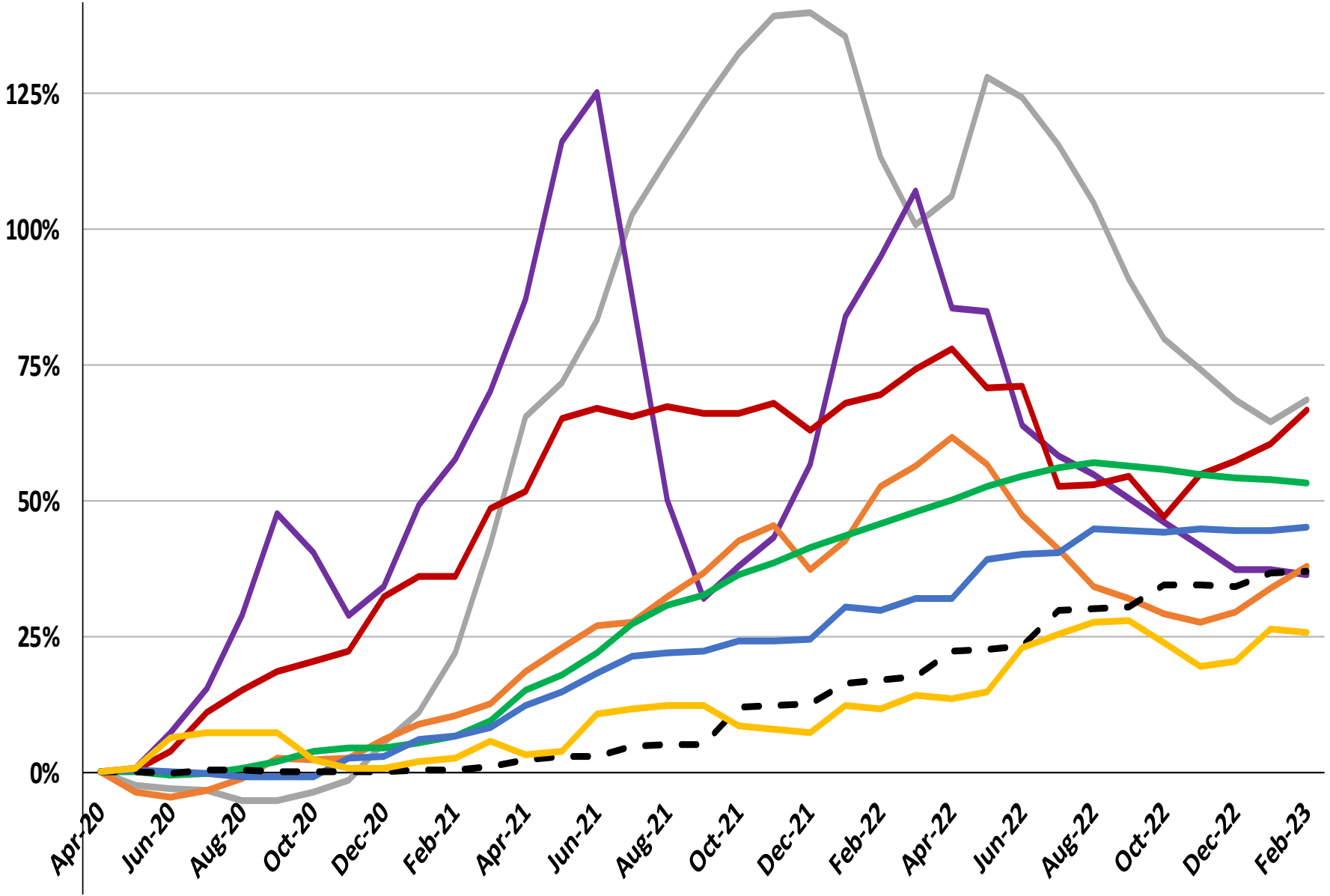
The Data Should be Updated REGULARLY

Many Headwinds in Today's Supply Chain

- Cost Escalation & Volatility
- Materials Shortages & Supply Chain Challenges
- Workforce

Escalation & Volatility

PPIs for Selected Inputs



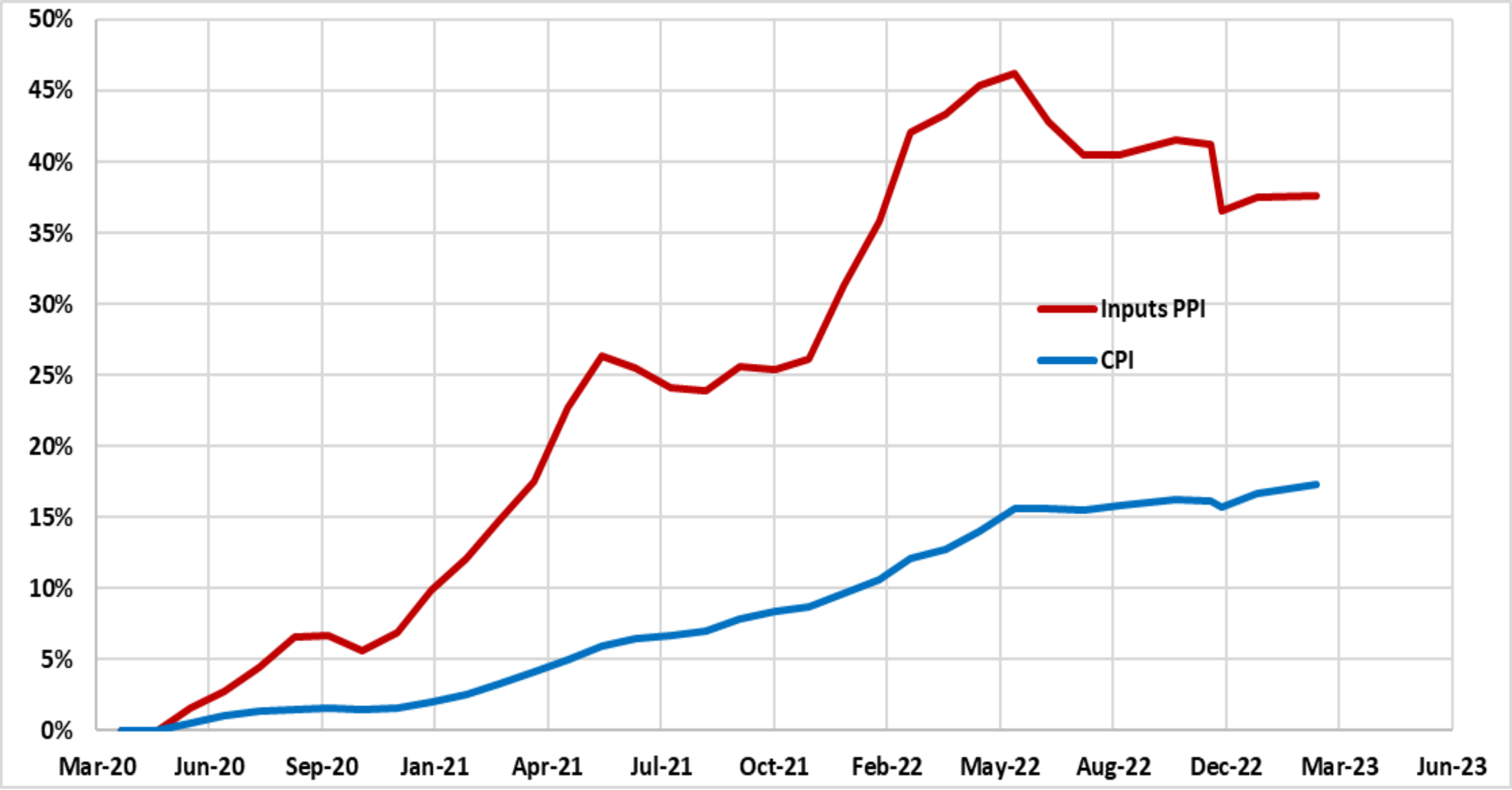
% change from Apr 2020 to Feb 2023:

Steel Mill Products	69%
Copper & Brass Mill Shapes	67%
Plastic Construction Products	53%
Gypsum products	45%
Aluminum Mill Shapes	38%
Bid Price - - - - - - - - - -	37%
Lumber and Plywood	36%
Electric Power	26%

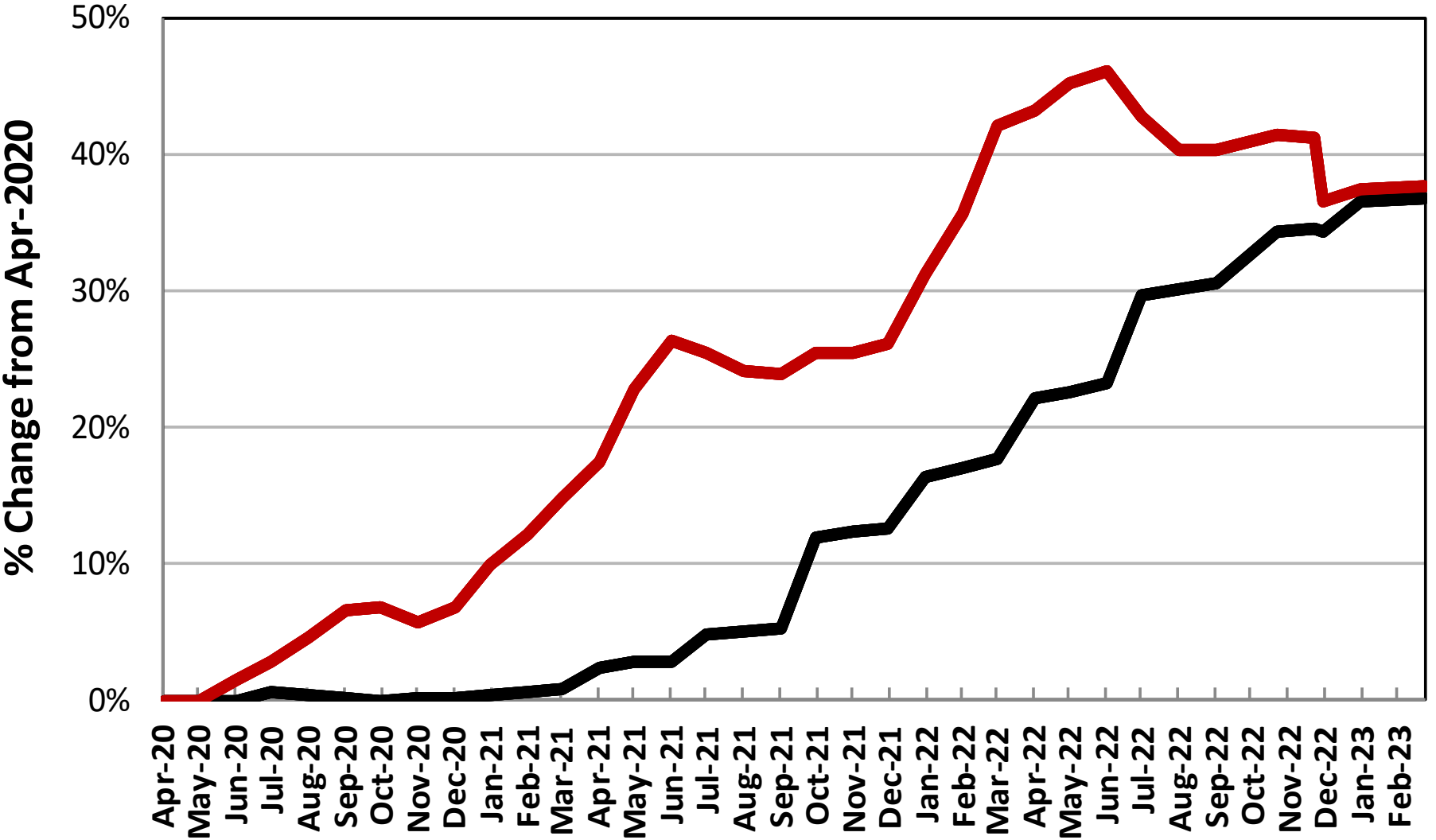
Source:
Bureau of Labor Statistics
PPI Percent Change Tables
www.bls.gov/ppi/tables/

SIMPLAR

CPI vs. Inputs PPI: Benchmarked to April 2020



Input Prices vs. Bid Prices for New Nonresidential Construction



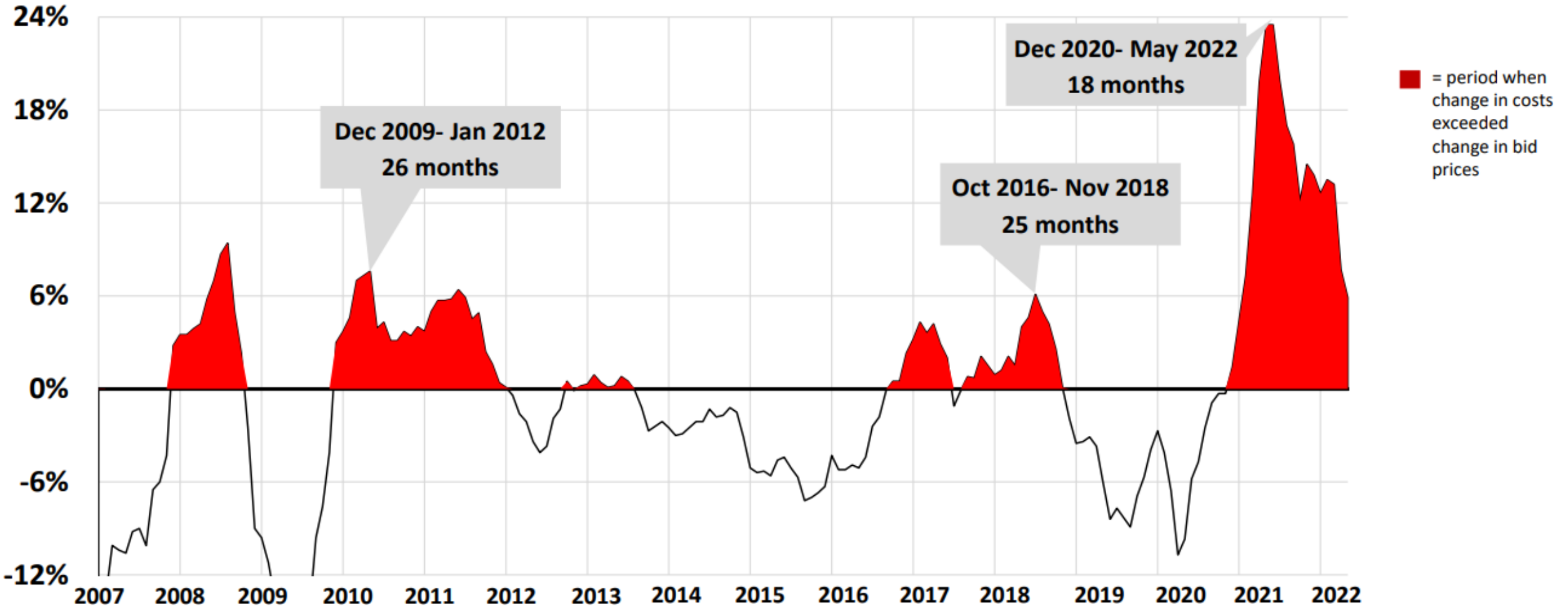
	% change from Apr 2020 to Feb 2023
Inputs PPI	37.7%
Bid Prices	36.9%

Source:
Bureau of Labor Statistics
Producer Price Index (PPI) Percent Change Tables
www.bls.gov/ppi/tables/

Cost squeeze on contractors can last two years or more

Difference between year-over-year change in materials costs vs. bid prices, Jan 2007-May 2022

AGC THE CONSTRUCTION ASSOCIATION



Source: Source: Bureau of Labor Statistics, www.bls.gov/ppi, producer price indexes for goods inputs to nonresidential construction (material costs) and new school building construction (bid prices)

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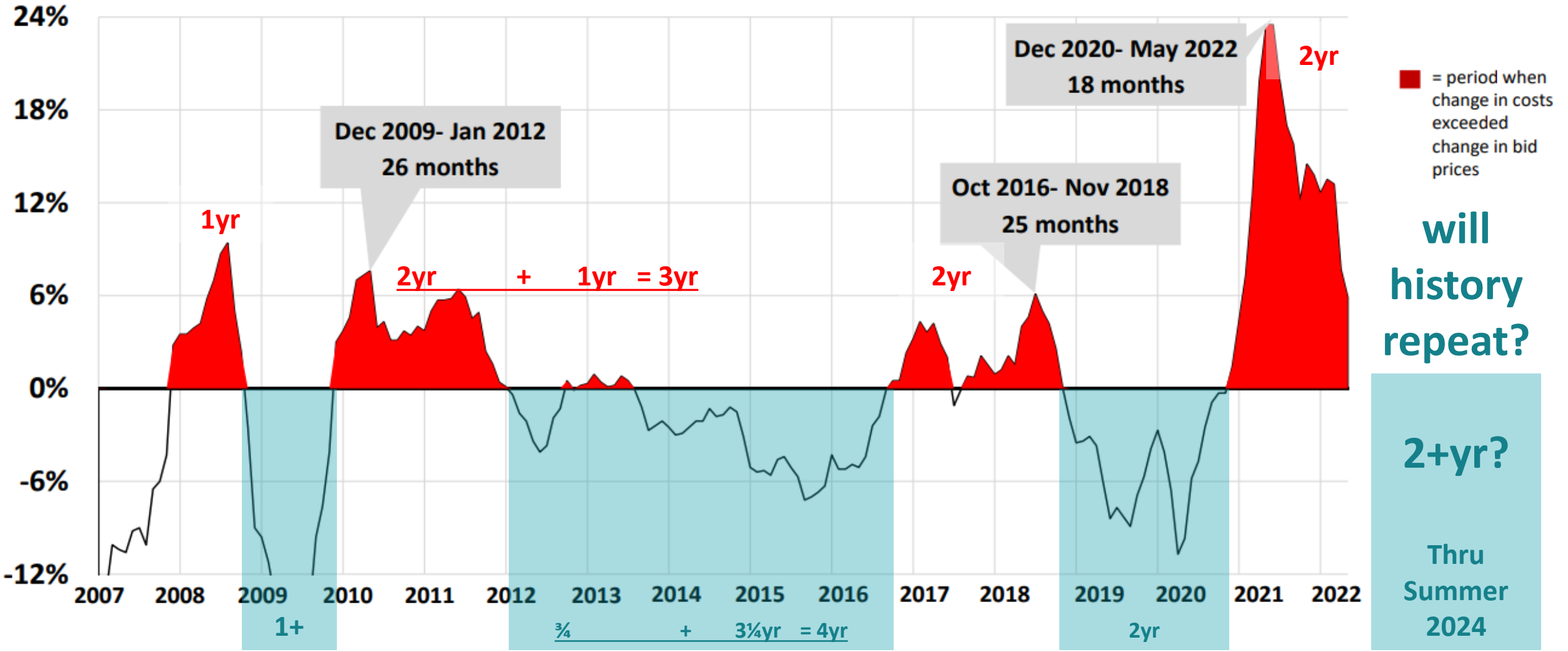

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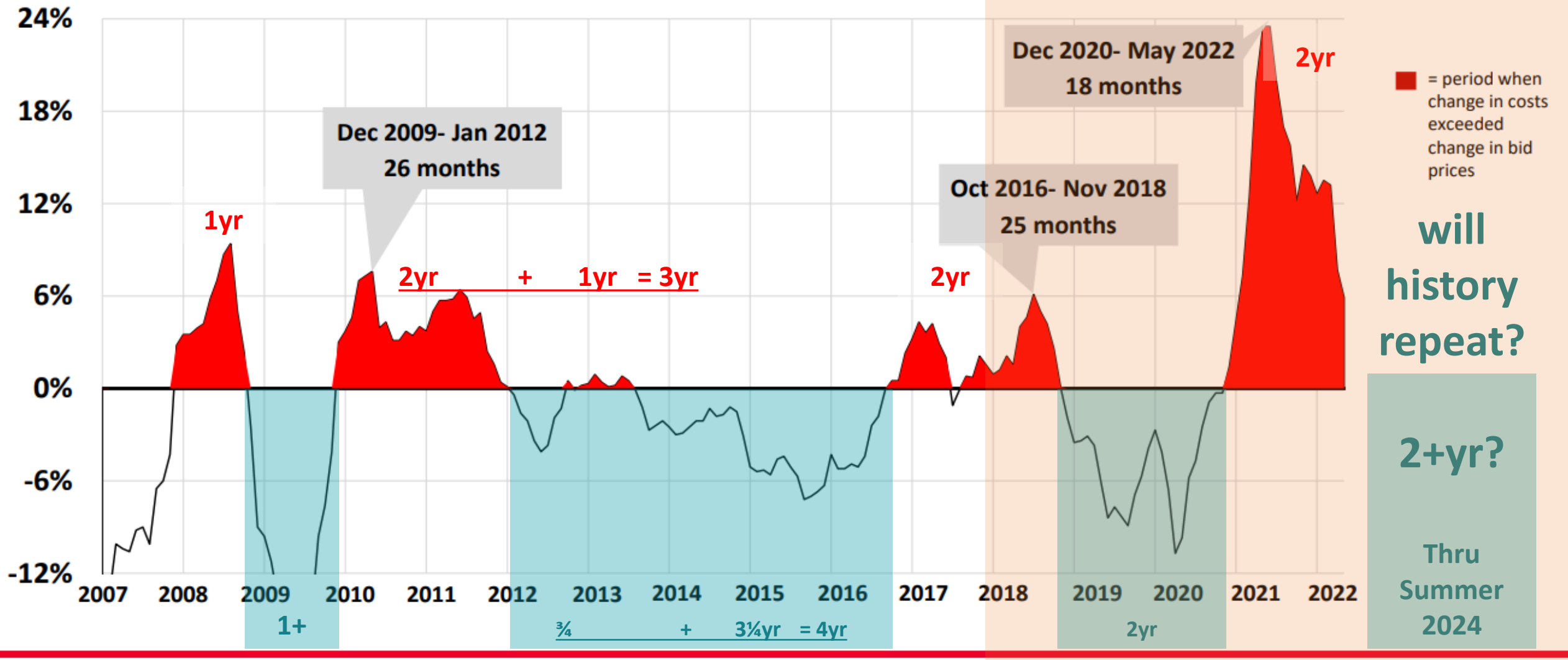

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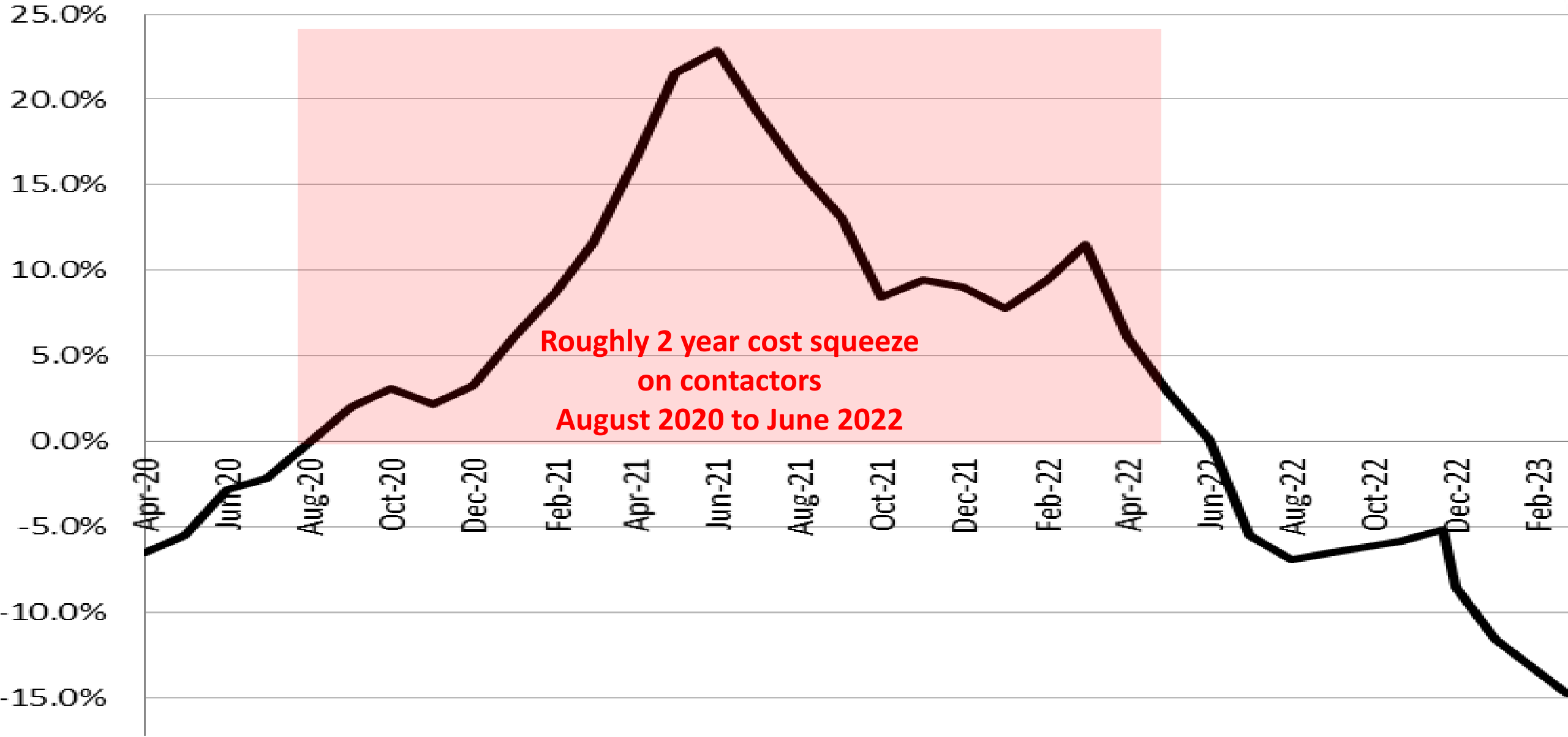
Materials Costs vs. Bids (YOY % change)



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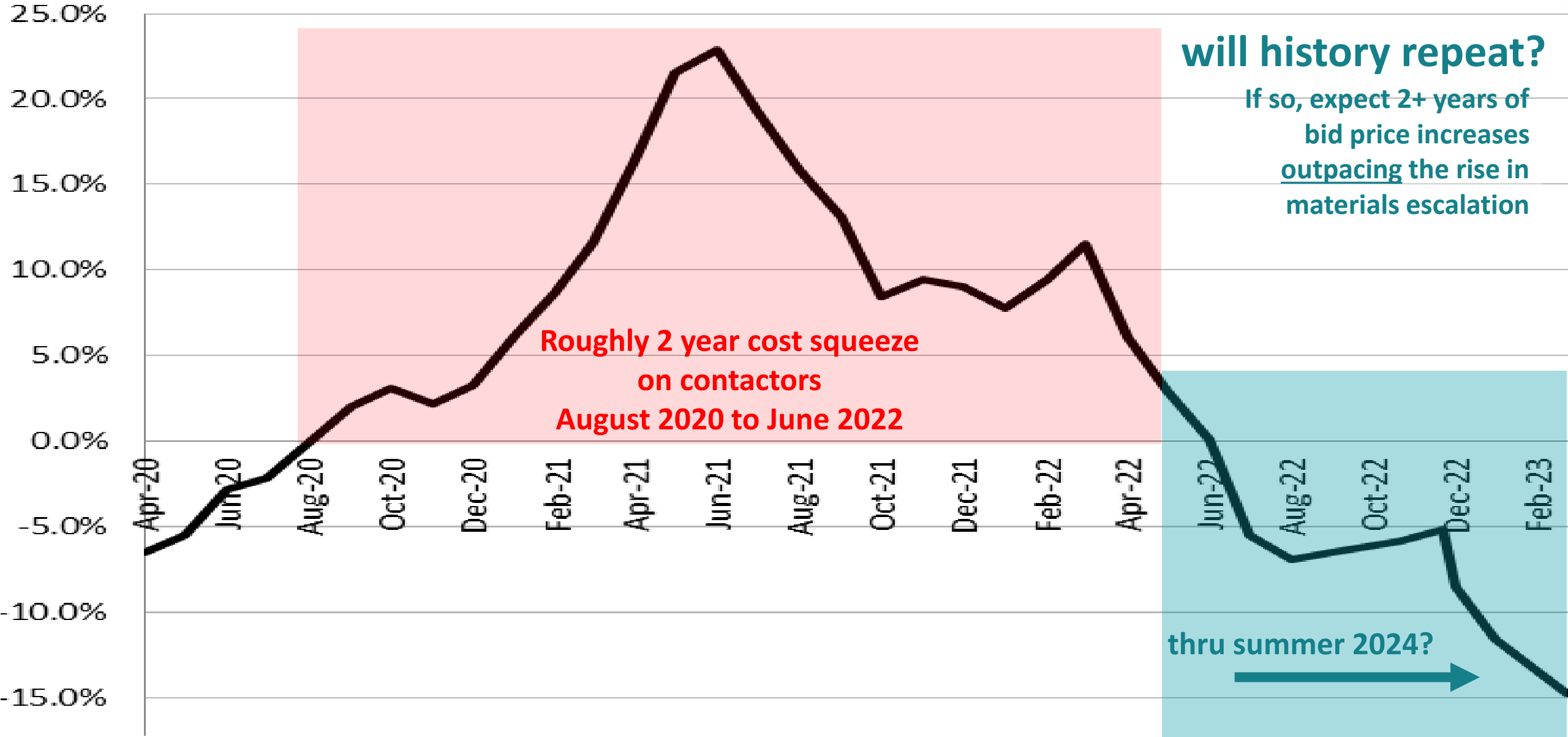


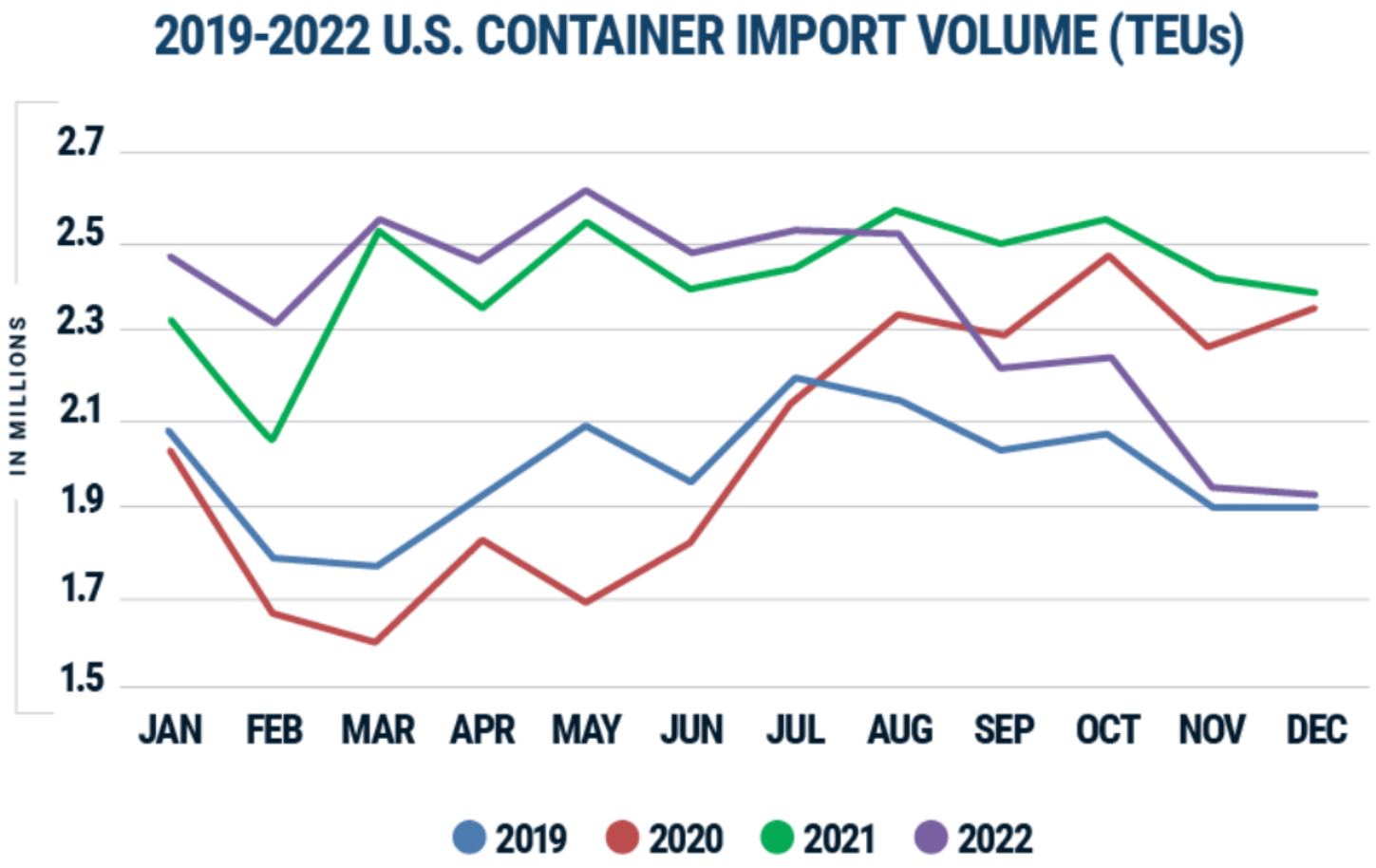
Many Headwinds in Today's Supply Chain

- Cost Escalation & Volatility
- Materials Shortages & Supply Chain Challenges
- Workforce

Supply Chain: shipping

DESCARTES

Jan 2023



US Container Imports:

- Dec 2022: import volumes approach 2019
  - China typ. 35-45% all imports, somewhat dipped recently but less than India and South Korea
  - West Coast ports have labor issues
  - Smaller ports getting busier (supply chain predictability vs. transit time)
- Shipping had shifted from West to East Coast Ports in Q2/Q3 of 2022
  - By June 2022: Ships waiting off all ports climbed 36% to 125 in June
  - Delays down on West Coast Ports
  - Delays up in East Coast Ports

Supply Chain Issues

- 90% of projects have had supply chain impacts
- 84% of projects have had higher cost
- 72% of projects have taken longer

- Actions People are Taking:
  - Accelerated purchasing after contract award (cash flow)
  - Alternative suppliers
  - Alternative materials/products (change the spec)
  - Stocking inventory
  - Increasing Bids/Budgets
  - Longer Completion Times
  - Some Primes advising Owners to push Risk to Subs

Materials Shortages

PCA Since 1916
America's Cement Manufacturers™

- 43 states had shortages in cement by Oct 2022
- No cement capacity has been added in the US since 2009
- Additional cement production capacity coming 2023, but PCA expects demand to outpace supply

Recent Data Sample – Before vs Now (August 2022)

Observed Items	Past	Now
HVAC	6 Weeks	~ 14 - 18 Weeks
Steel Joists	18 Weeks	~ 54 Weeks
Electrical SES	20 Weeks	~ 55 Weeks
TPO Roofing	13 Weeks	~ 36 Weeks
Utility Pipe Materials	6 Weeks	~ 27 Weeks

Forecast on Materials Shortages?

- Has mostly cooled since mid-2022.
  - (delays/longer lead times became dominant issue)

- But on-shoring and infrastructure initiatives likely means greater demand.

- Ex: Electrical Contractors Executive Group (March 7, 2023)
  - “lead times for switch gear went from 1yr to almost 2”
  - “we are now competing with Tesla battery plants. This is direct competition now”

Many Headwinds in Today's Supply Chain

- Cost Escalation & Volatility
- Materials Shortages & Supply Chain Challenges
- Workforce

Construction Workforce Numbers

- The construction industry lost 1.1 million employees from February to April 2020—a 15% decline in just two months

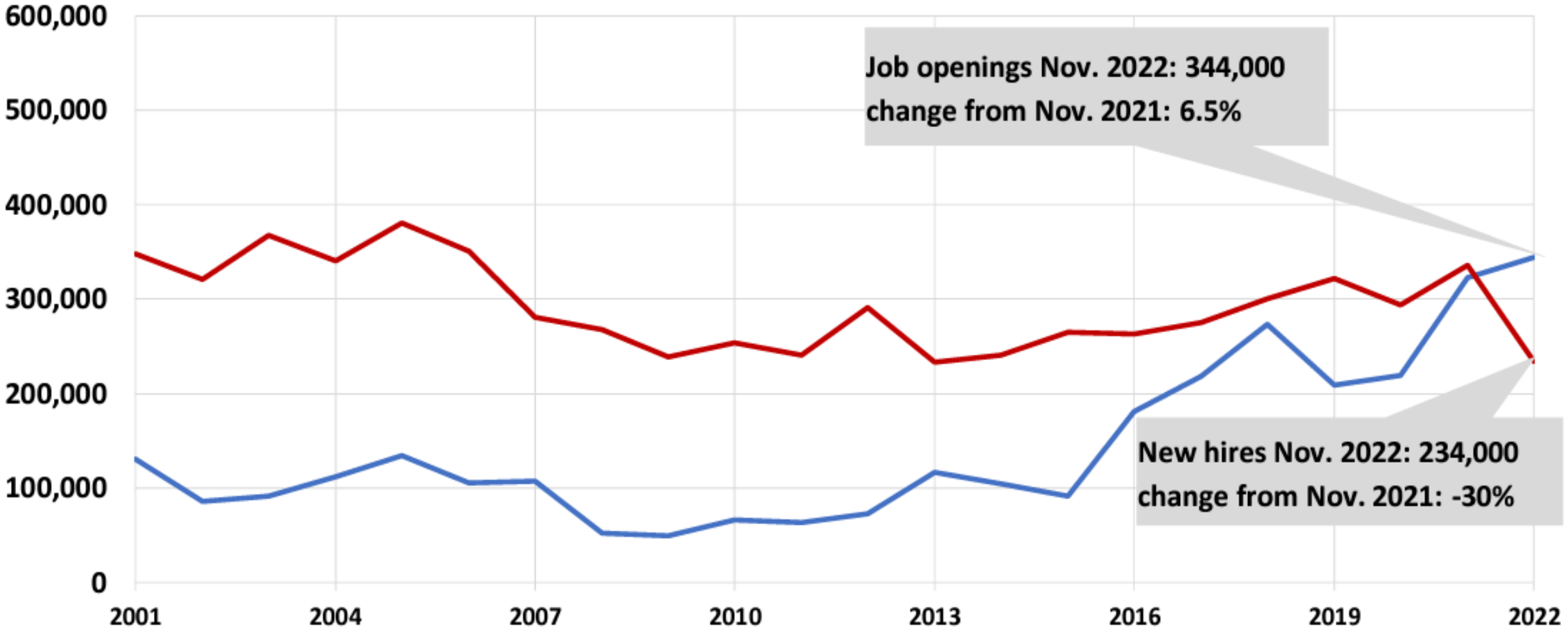
- By June 2022, seasonally adjusted construction employment totaled 7,670,000—modestly higher than the 7,624,000 employed in February 2020.

- Summer 2022 Compared to February 2020 levels:
  - residential construction firms had added nearly 180,000 workers
  - nonresidential construction still down 134,000 employees or 2.9%

Source:
AGC Construction Inflation Alert
https://www.agc.org/learn/construction-data/agc-construction-inflation-alert

Construction job openings & new hires

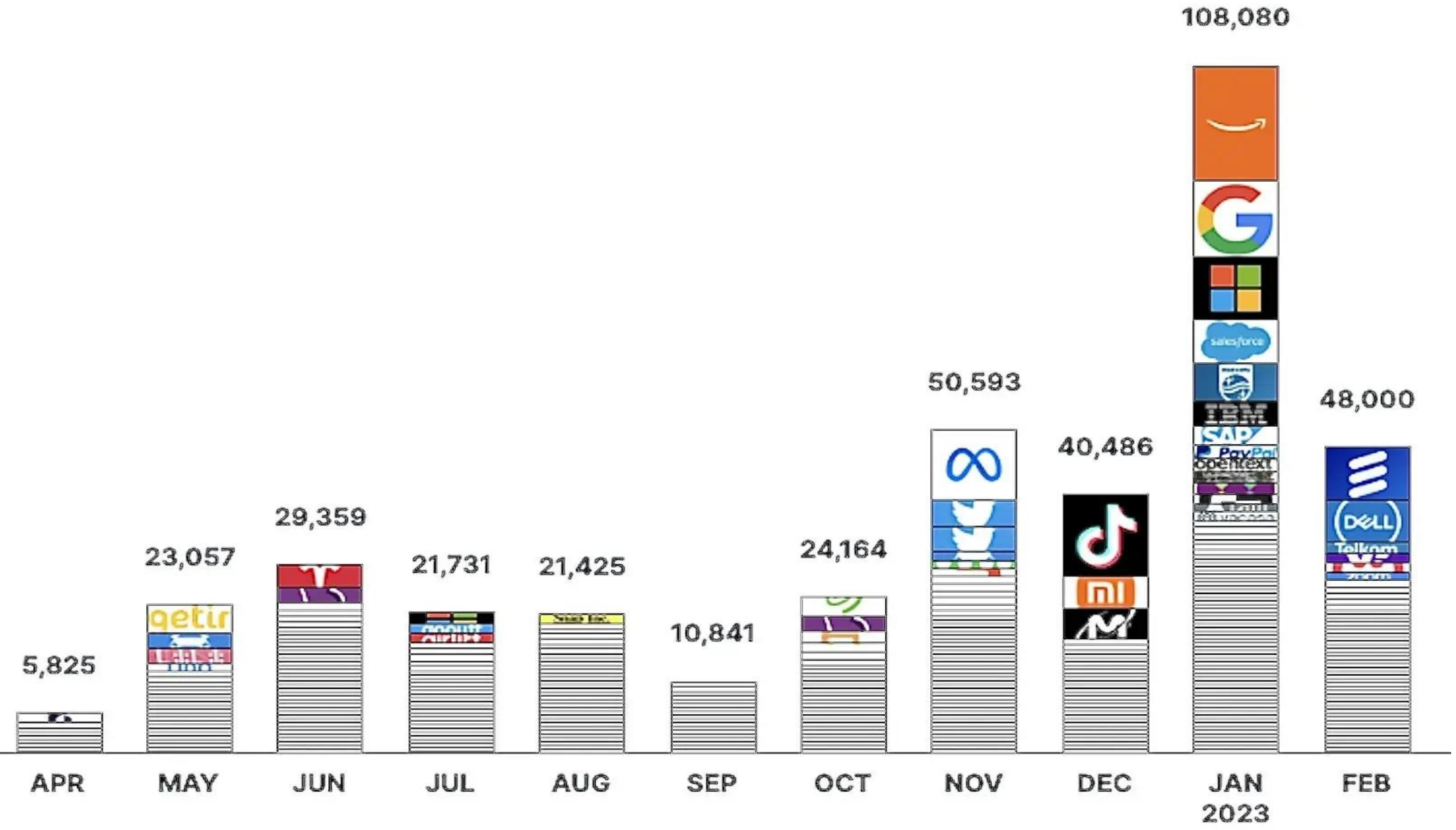
Job openings and hires, Nov. 2001-Nov. 2022, not seasonally adjusted



 Source: Source: Bureau of Labor Statistics, www.bls.gov/jlt, Job Openings & Labor Turnover Survey (JOLTS)

Layoffs at tech companies

(not necessarily tech workers)



NEWS ANALYSIS

Are tech firms really firing their IT workers? No.

Headlines about 'tech' layoffs abound, but the reports can be misleading. While Big Tech companies may be letting workers go, the layoffs aren't dominated by IT talent firings. In fact, there are fewer IT workers than job openings — a lot fewer.

By Lucas Mearian

Senior Reporter, Computerworld | MAR 9, 2023 3:00 AM PST

STAMFORD, Conn., January 30, 2023

Gartner Survey Shows 86% of CFOs Plan to Increase Employee Compensation in 2023, Despite Recession Fears

CFOs Plan to Remain Competitive in Tight Labor Market; Only 5% Plan Cuts to Compensation

Q: Do all of the layoffs in Big Tech mean the talent crunch is over?

A: The tech talent crunch is far from over. Current demand for tech talent greatly outstrips supply, which Gartner expects will be the case until at least 2026, based on forecast IT spend.

Contrary to what we're seeing in the headlines, many of those being impacted by layoffs are in business functions, rather than tech roles. Additionally, there are increasingly opportunities for IT jobs outside traditional tech companies, so it's important to look beyond just the tech provider community to truly grasp the state of the tech talent crunch.

Gartner research found that the companies behind the 10 largest layoffs in tech talent still employ over 150,000 more people in total than at the beginning of 2020.

Workforce

- Since the year 2000, the US Population has gotten:
  - Older or Younger?

Workforce

- Since the year 2000, the US Population has gotten:
  - Older by 3.4 years

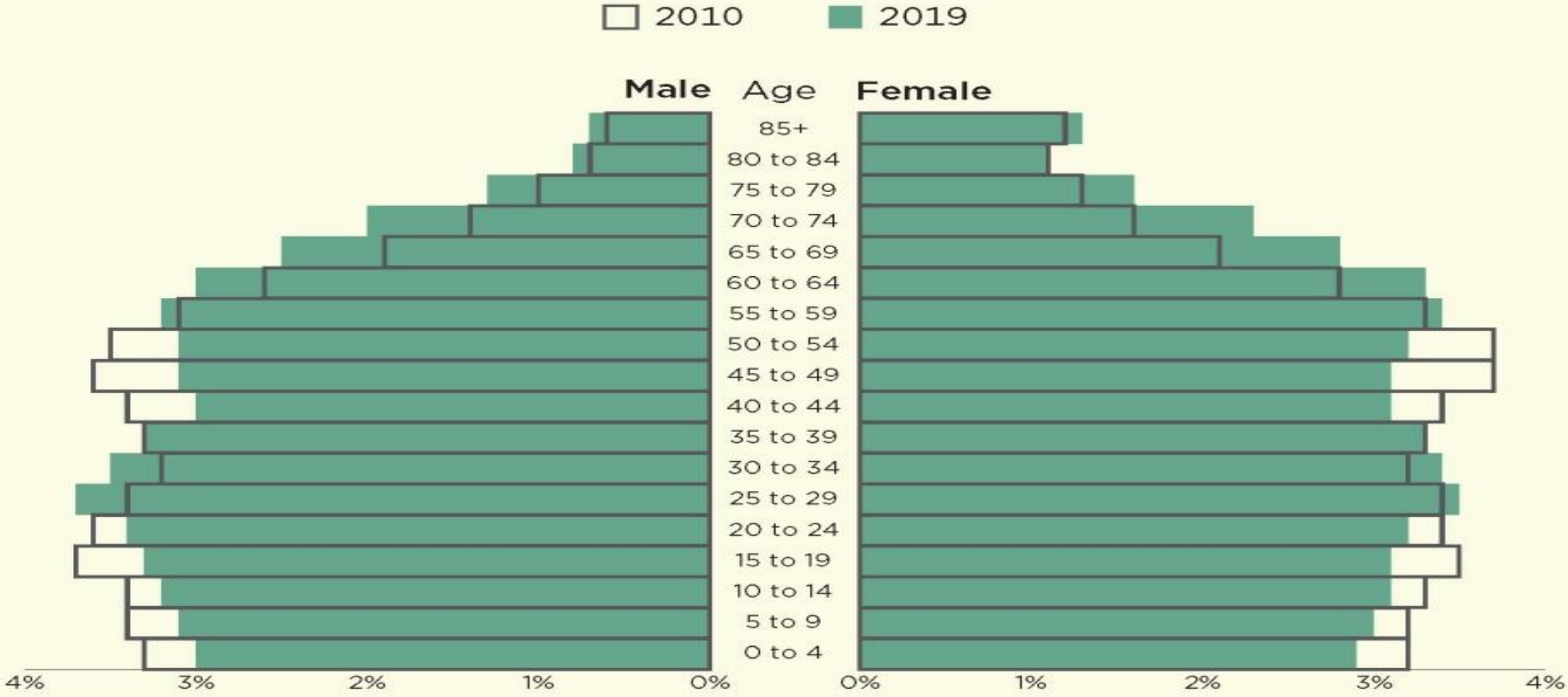
Workforce

- Since the year 2000, the US Population has gotten:
  - Older by 3.4 years
- This trend is:
  - Accelerating or Decelerating?

Workforce

- **Since the year 2000, the US Population has gotten:**
  - **Older by 3.4 years**
- **This trend is:**
  - **Accelerating (2021 was most rapid increase across the 21yr range)**

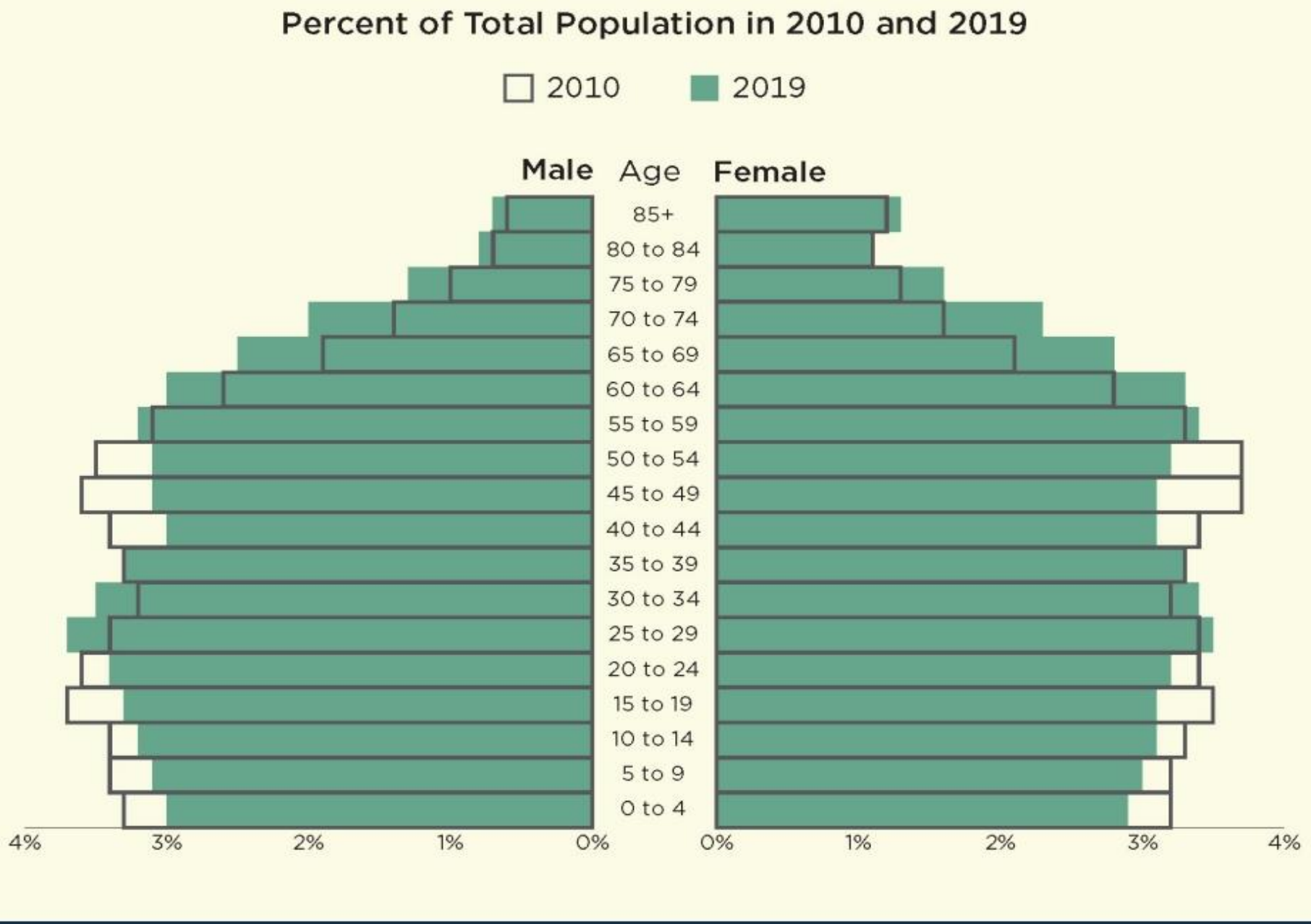
Percent of Total Population in 2010 and 2019



United States® Census Bureau

U.S. Department of Commerce
U.S. CENSUS BUREAU
census.gov

Source: Vintage 2019 Population Estimates
www.census.gov/programs-surveys/popest.html



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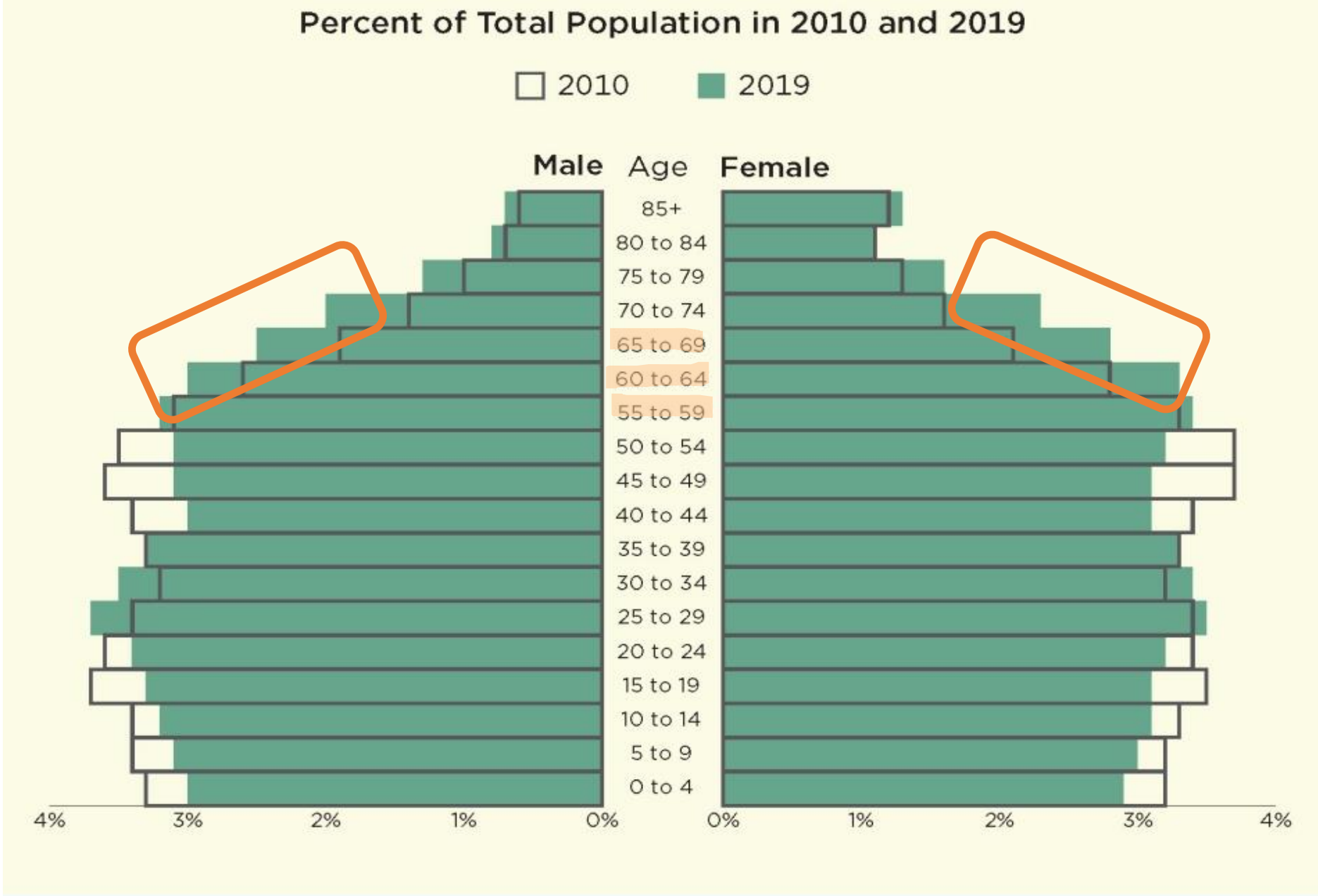
- **Senior Leaders**
  leaving the workforce



- **Senior Leaders**
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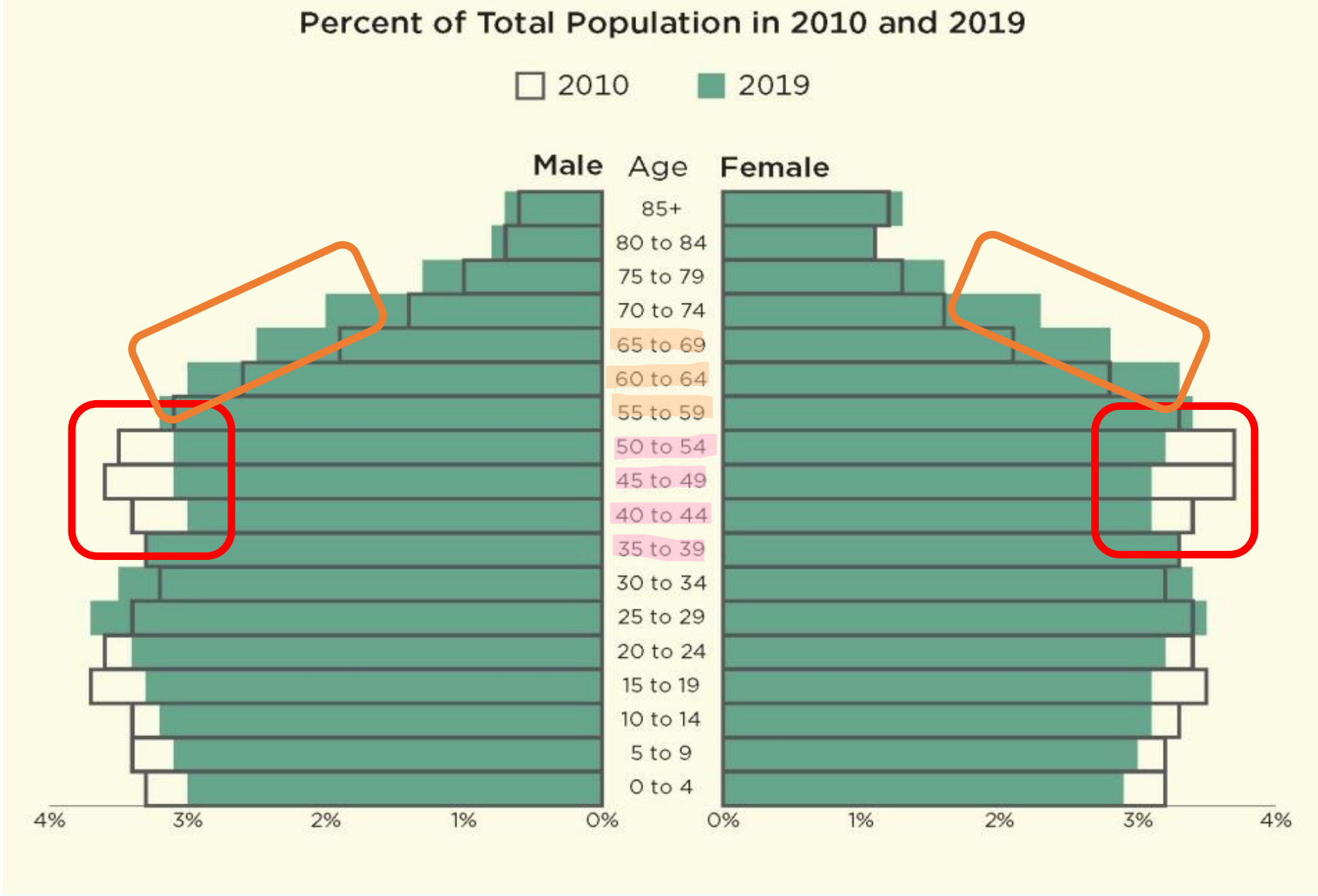
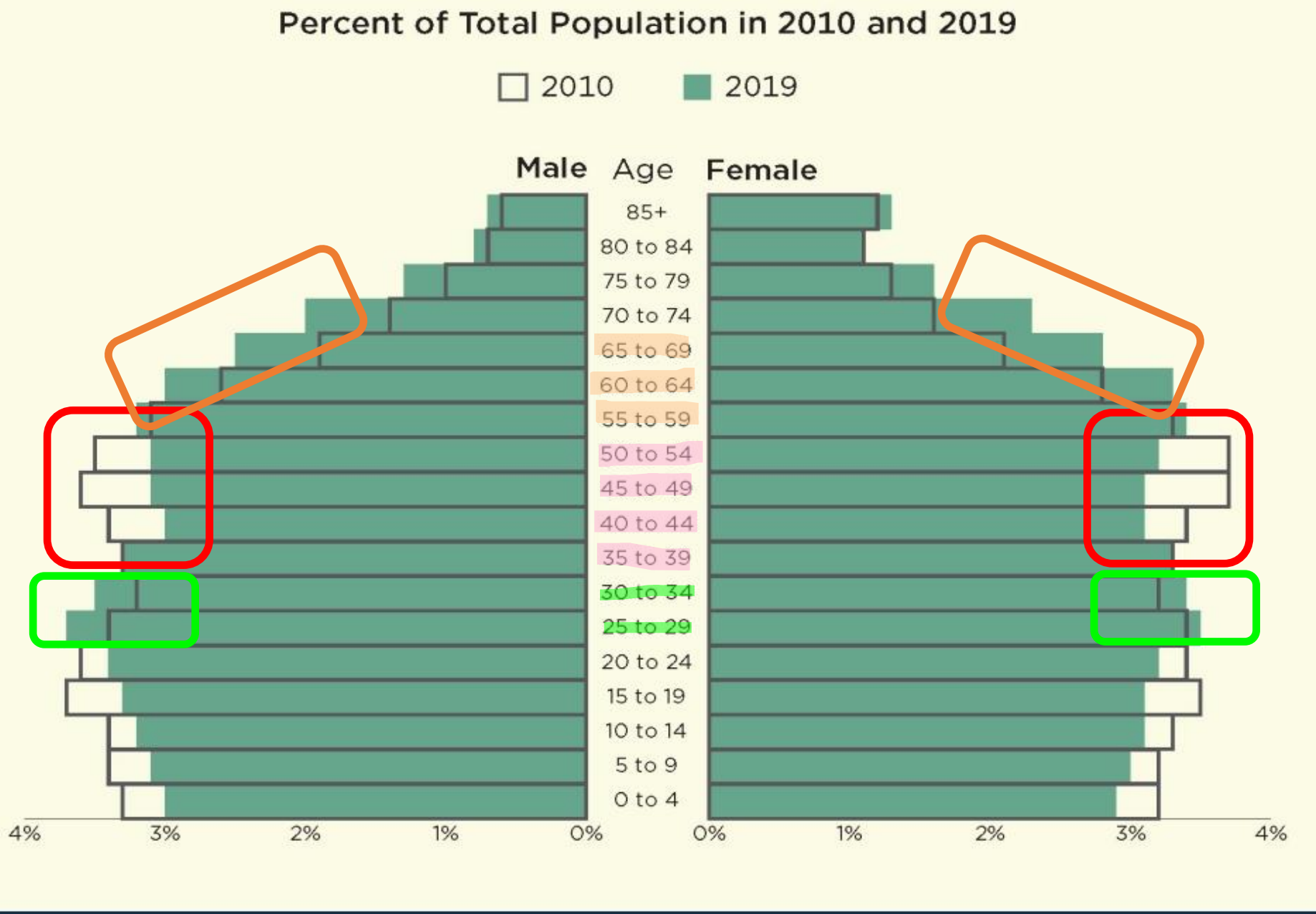
- **Next Leaders**
  large gap coming

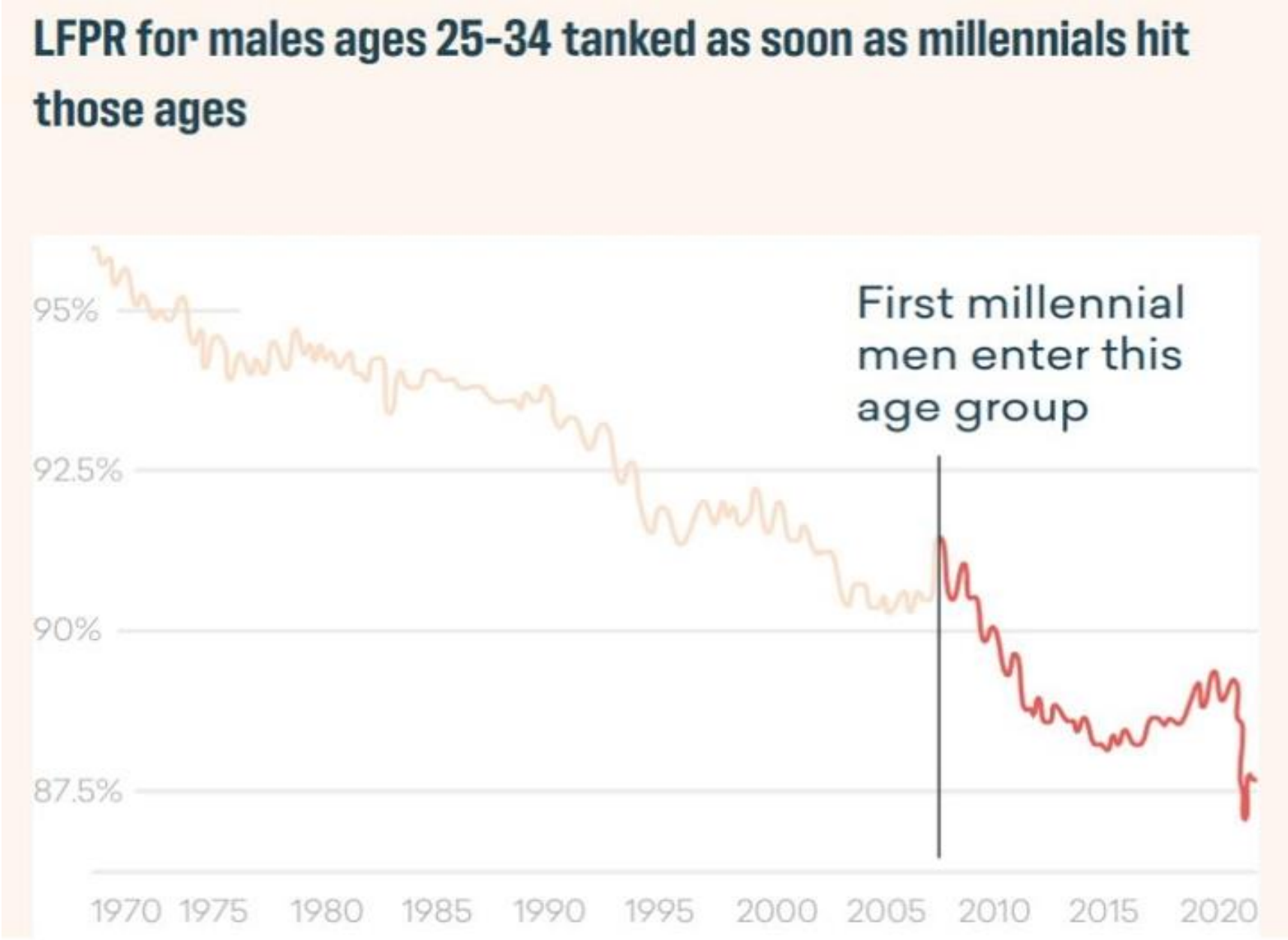


- **Senior Leaders**
  leaving the workforce
- **Next Leaders**
  large gap coming
- **Millennial "Bump"**
  (brief) return to normal

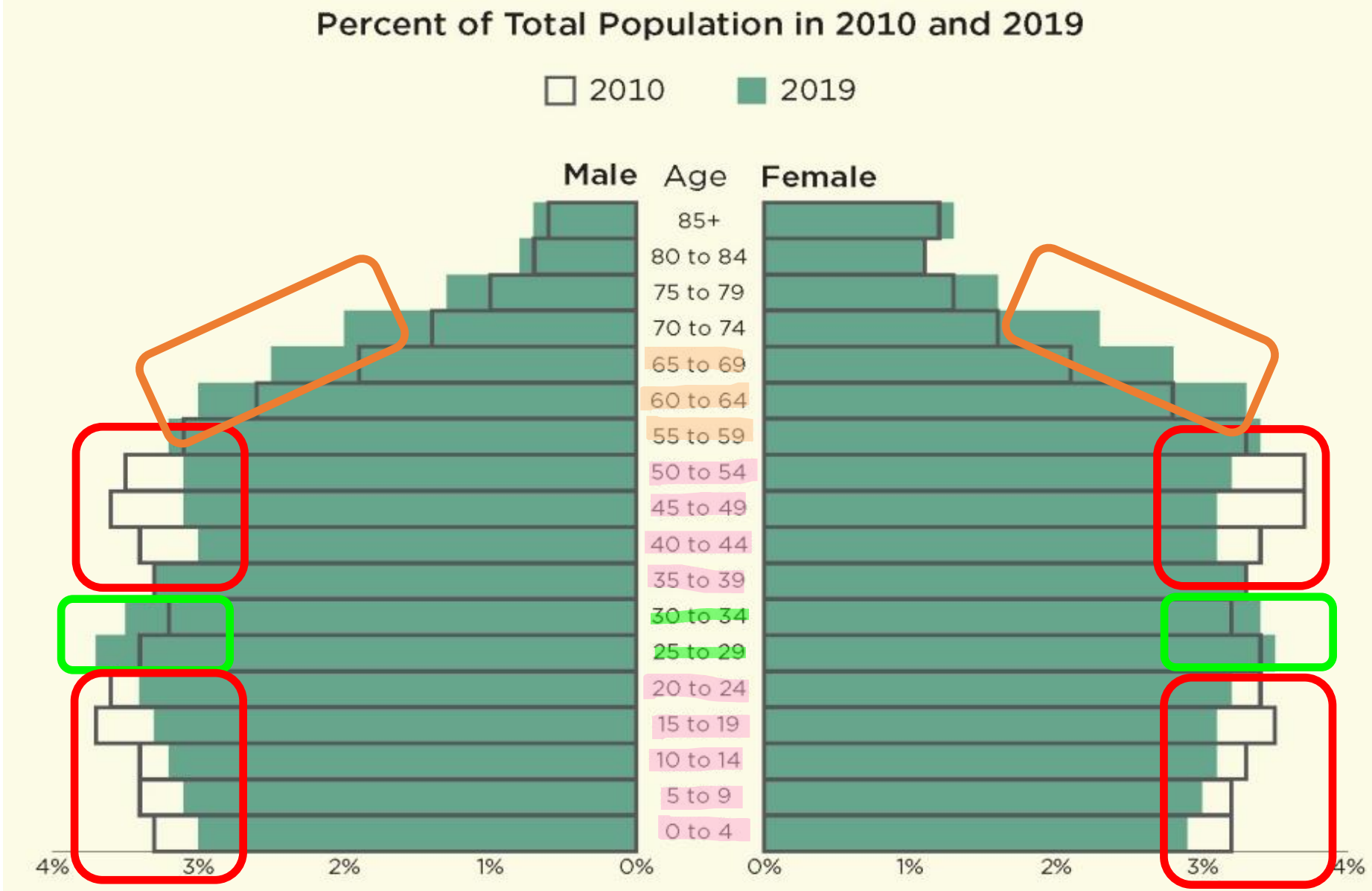


Workforce

- More men 25-34 yo live with parents than with spouse
  - First time since 1880
- Leisure hours have increased
  - 75% of which are spent playing video and computer games
- Drugs are a big problem
  - Robbing nearly 1M prime-age men from the workforce every year



- **Senior Leaders**
  leaving the workforce
- **Next Leaders**
  large gap coming
- **Millennial "Bump"**
  (brief) return to normal
- **Future Workforce**
  shrinking reinforcements



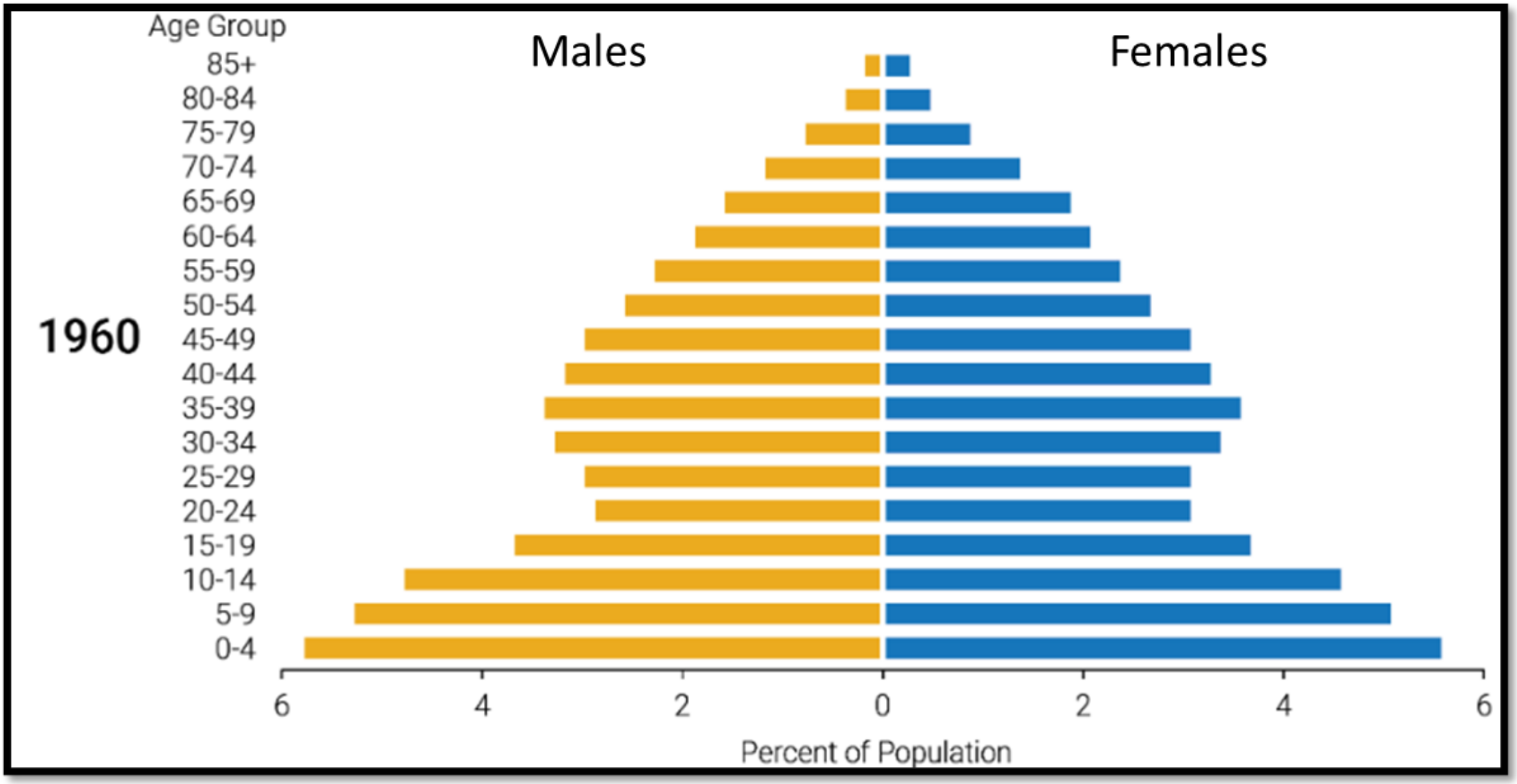
Workforce

- *Pre-Pandemic* **Forecast of 2020 to 2029** (www.dol.gov)
  - **Prime Age (25-54) Male Workforce Participation Rates to decrease by another 1.9%**
  - **Prime Age (25-54) Female Workforce Participation Rates to increase by 3.8%**
  - ***but these are % of a decreasing total population in prime age demos***

- **2.4M Women left workforce since Feb 2020**

- **Baby Boomers created incredible wealth**
  - **Millennials expected to inherit ~$70 Trillion by 2030 from their parents**

US Population Histogram



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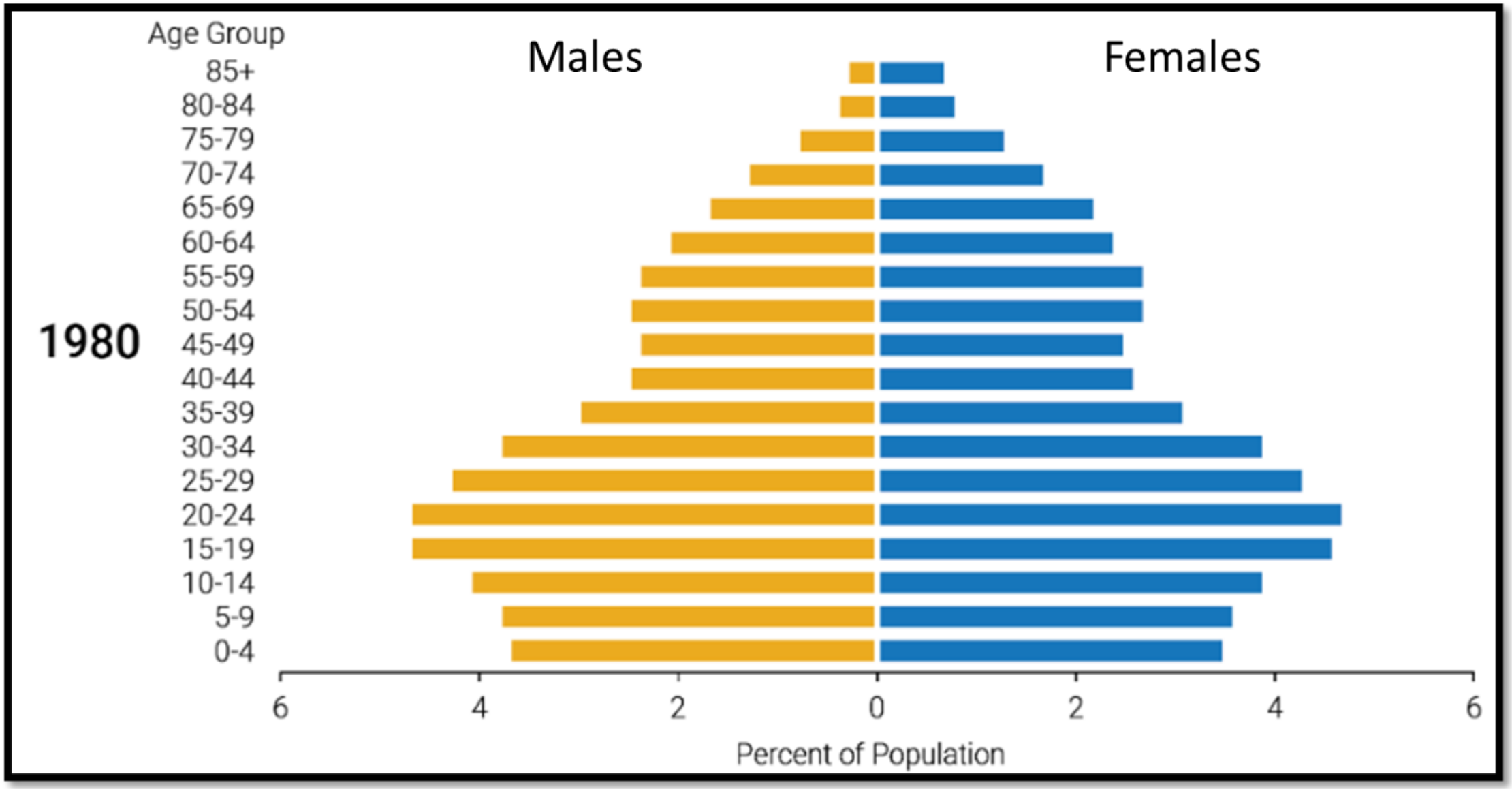

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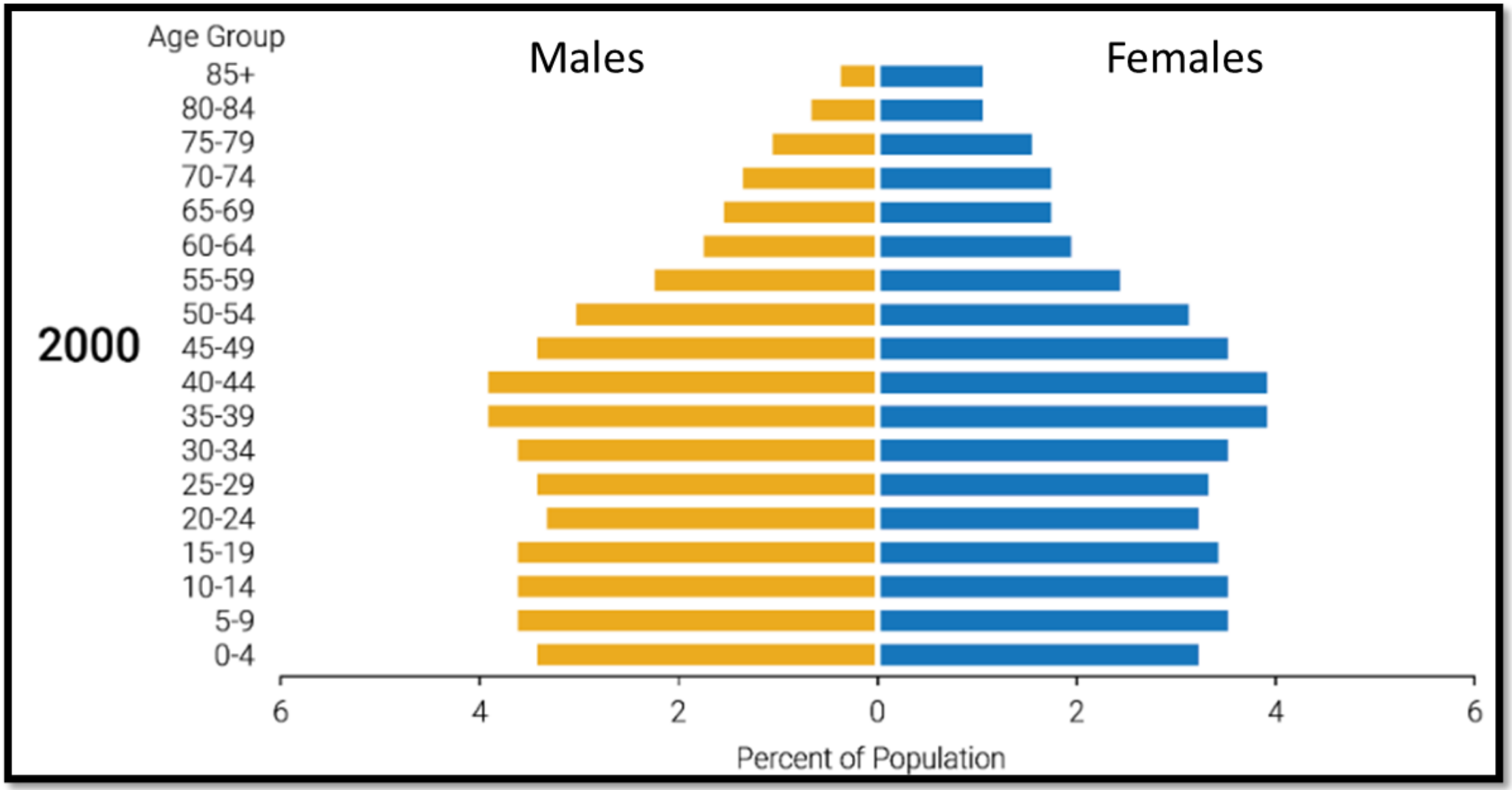

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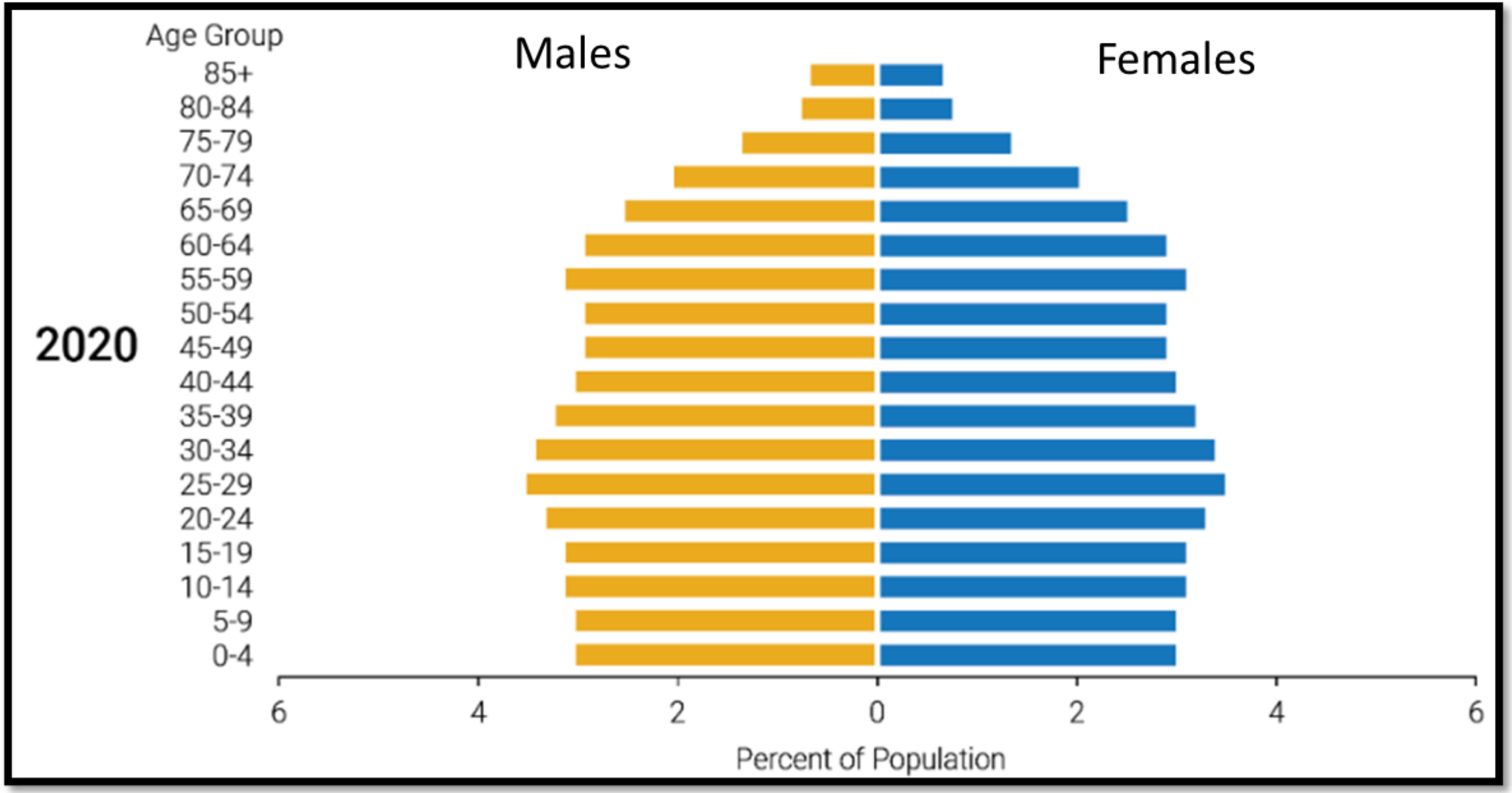

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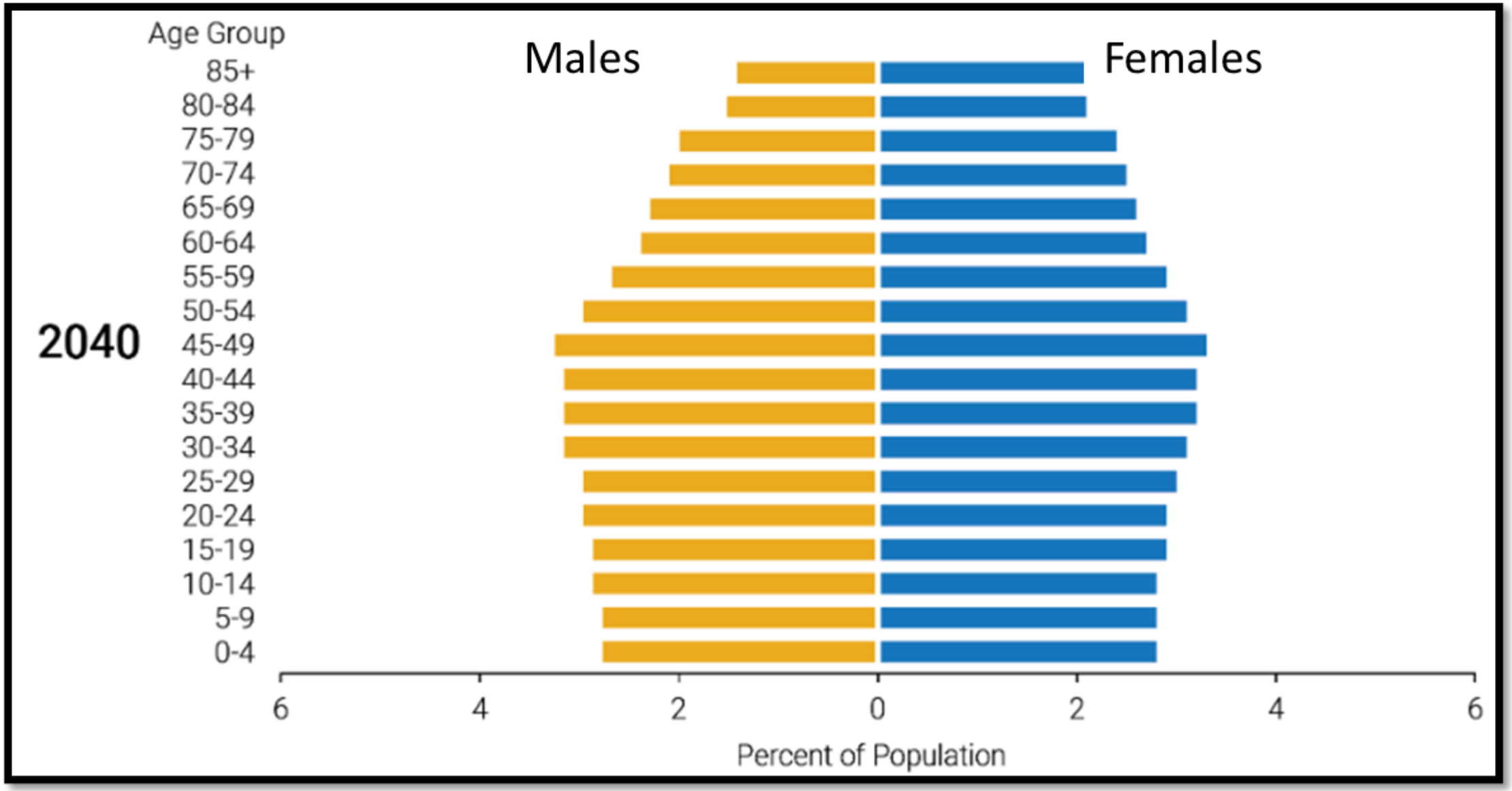


Mid- and Long-Term Outlook

this is the

BEST

it will ever be

(for the remainder of our careers)

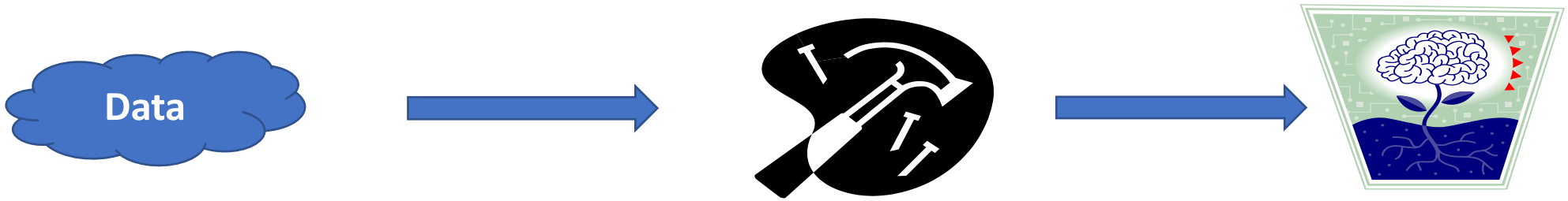
2023+ Outlook for Workforce

- Dec 2022 - 80% of firms struggling to fill positions
  - Dec 2022 – lowest construction unemployment rate for Dec ever recorded for US
- 69% of Firms looking to INCREASE headcount (Dec 2022, was at 71% in Aug ‘22)
  - 1-10% = 46% of firms
  - 11-25% = 18% of firms
  - >25% = 5% of firms
- Next 12 Months
  - 41% of firms expect it to continue to be hard to hire
  - 17% of firms expect it will become harder
- Projections Sept/Dec 2022
  - BLS projects only 0.3% per year growth in construction labor next 10 years
  - And an average of 41,500 management openings per year due to retirements and growth
  - **Total Workforce shortages projected to grow to over 900k short/year over the next 10 to 15 years (100k-200k short now)**

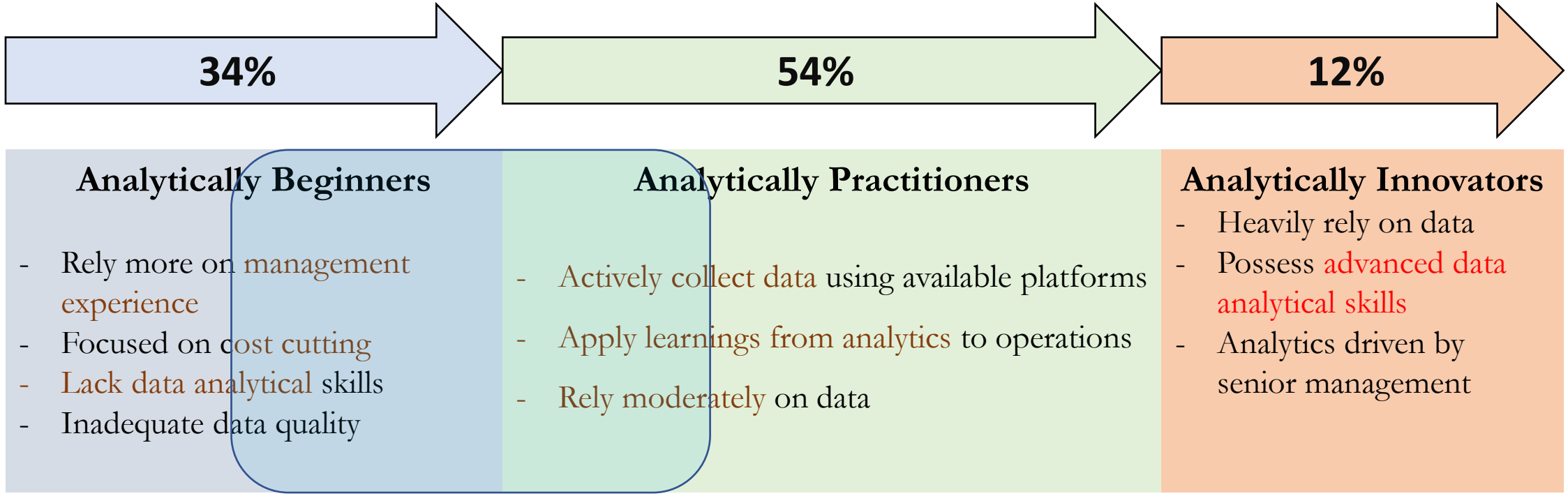

When You See a Another Employer
Talking To Your Top Performer

What is Business/Data Analytics?

Using data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions



THREE levels of Analytics: Where do most Procurement organizations stand?



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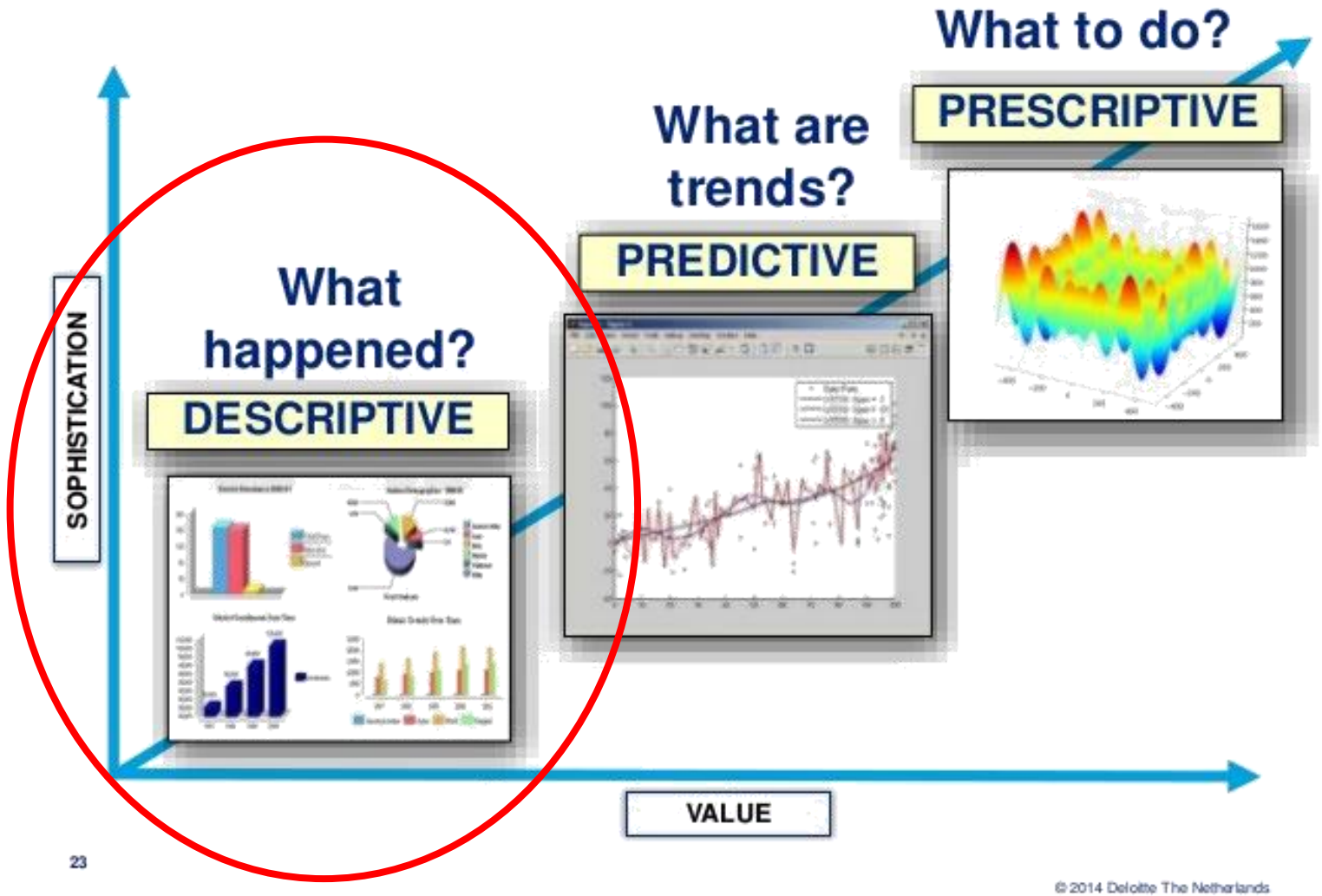
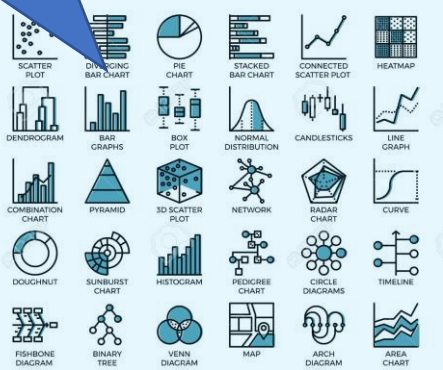
Types of Data Analysis



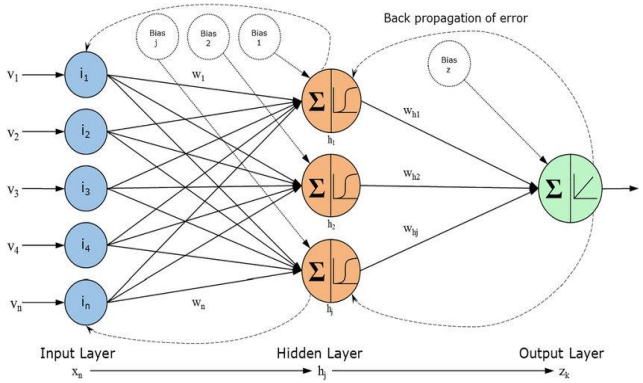
Tell a credible **story** about a real data problem

DATABASE

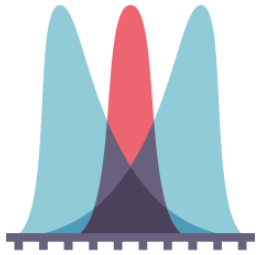
DATA VISUALIZATION



Model Based Analytics



Model Inference



STORY

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Visual Analytics: Applications in Industry

- Decision making
- Understand risks
- Identify nature of relationships
- Strategic initiatives
- Develop financial strategies

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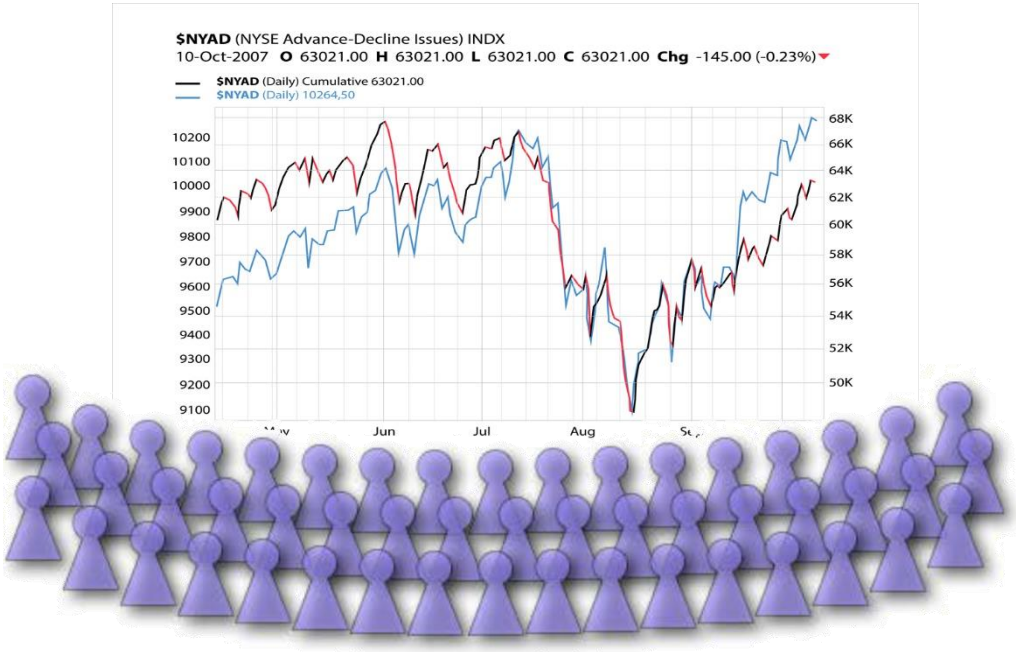
Know Your Audience!

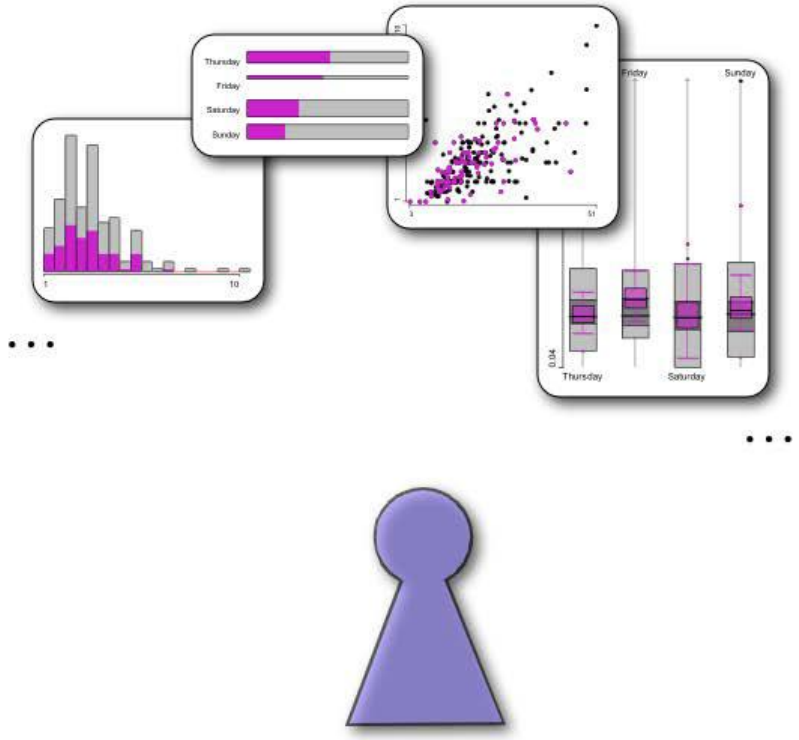


Presentation

The “Wow!” experience

Single image for a large audience

Tells a clear story!



Exploration

The “Ah ha!” Experience

Many images, for a narrow audience

Analysis graphs: design to see patterns, trends, aid the process of data description, interpretation

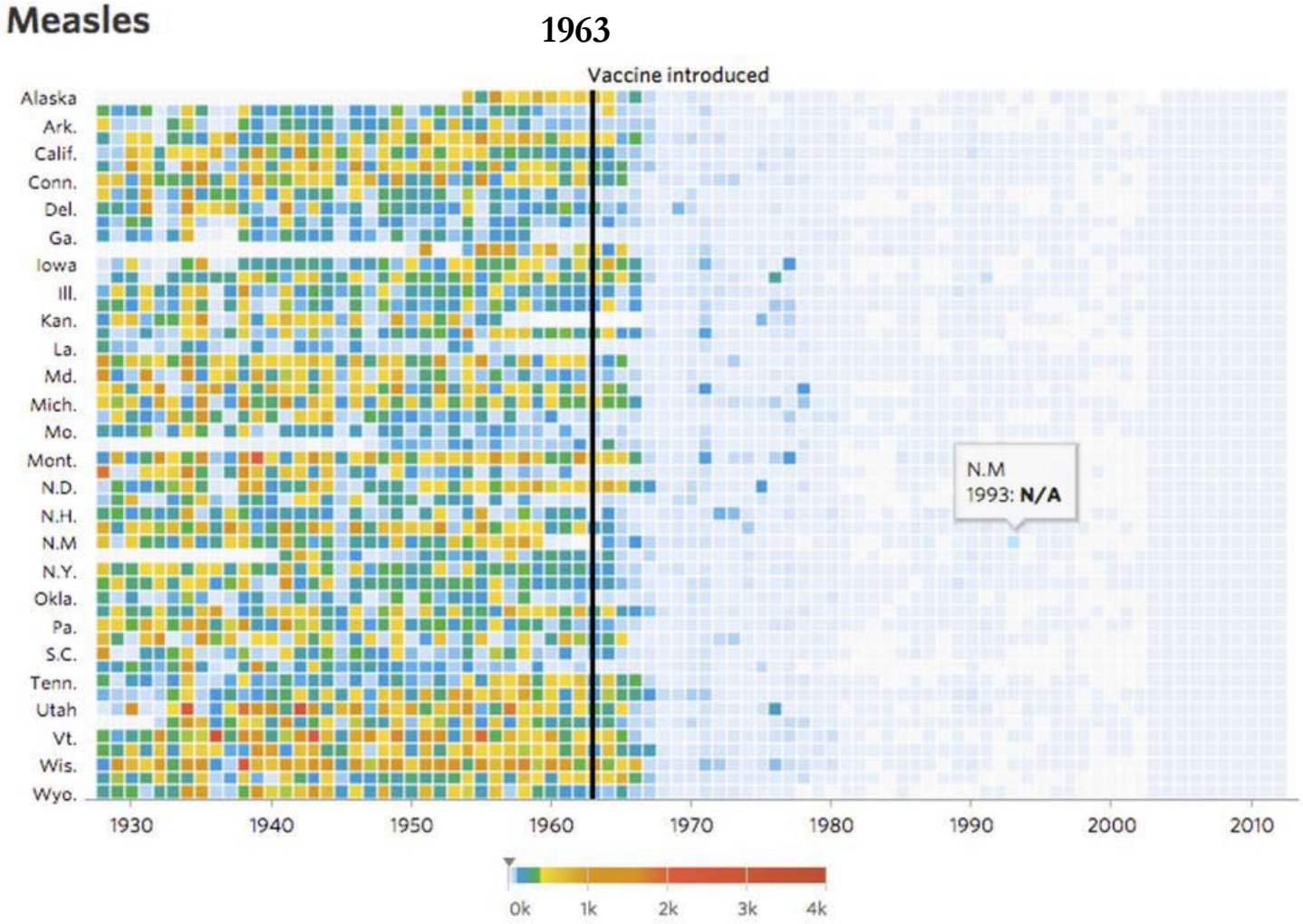
Powerful Graphs

- In 2015, ***Tynan DeBold & Dov Friedman*** in the Wall Street Journal show the **effect of the introduction of vaccination** programs in the US states on disease incidence, using color-coded heat maps for a variety of diseases

- Effective graphs can cure ignorance

BEFORE: 17.0 M cases, 1926--1963

AFTER: 1.70 M cases, 1963--2015



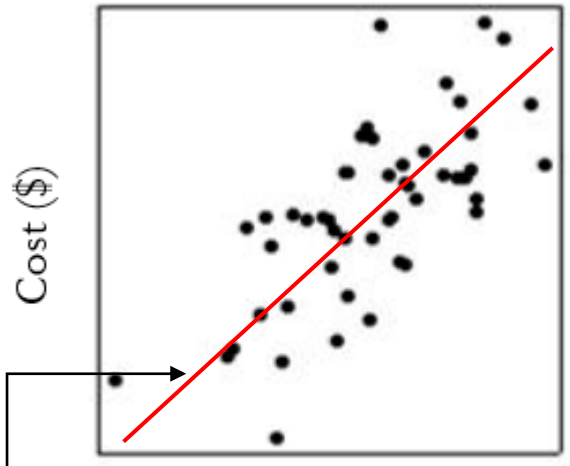
Why plot your data?

- **3 different datasets to study cost vs. time for Procurement tasks among three organizations**
- **Statistical Summary:**

Organization **A:**
- Average Change Order Rate = **10%**
- Correlation b/w cost & Time= **0.65**

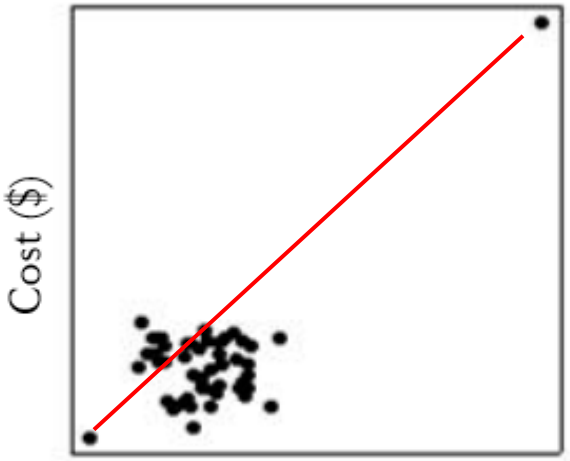
Organization **B:**
- Average Change Order Rate = **10%**
- Correlation = **0.65**

Organization **C:**
- Average Change Order Rate = **10%**
- Correlation = **0.65**

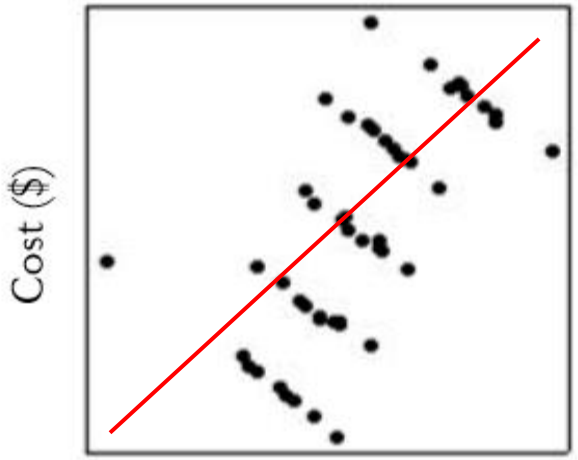


Best Fit Line of the data

Dataset 1



Dataset 2



Dataset 3

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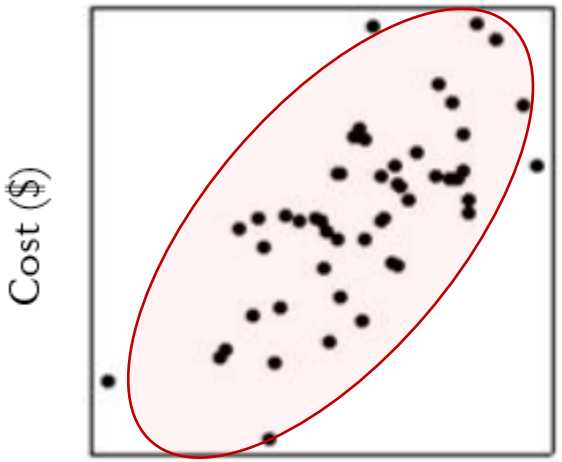
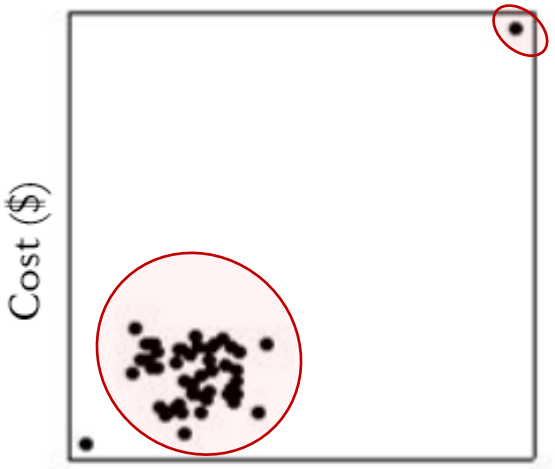
Why plot your data?

- **Statistical Summary tell us that all three datasets are the same.**

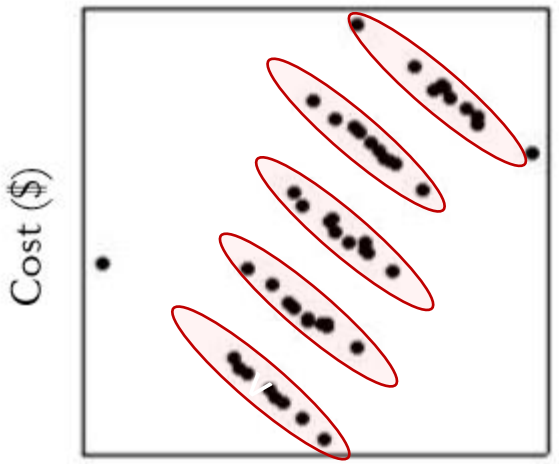
- **Plots tell us a different story!**



Dataset 1



Dataset 2



Dataset 3

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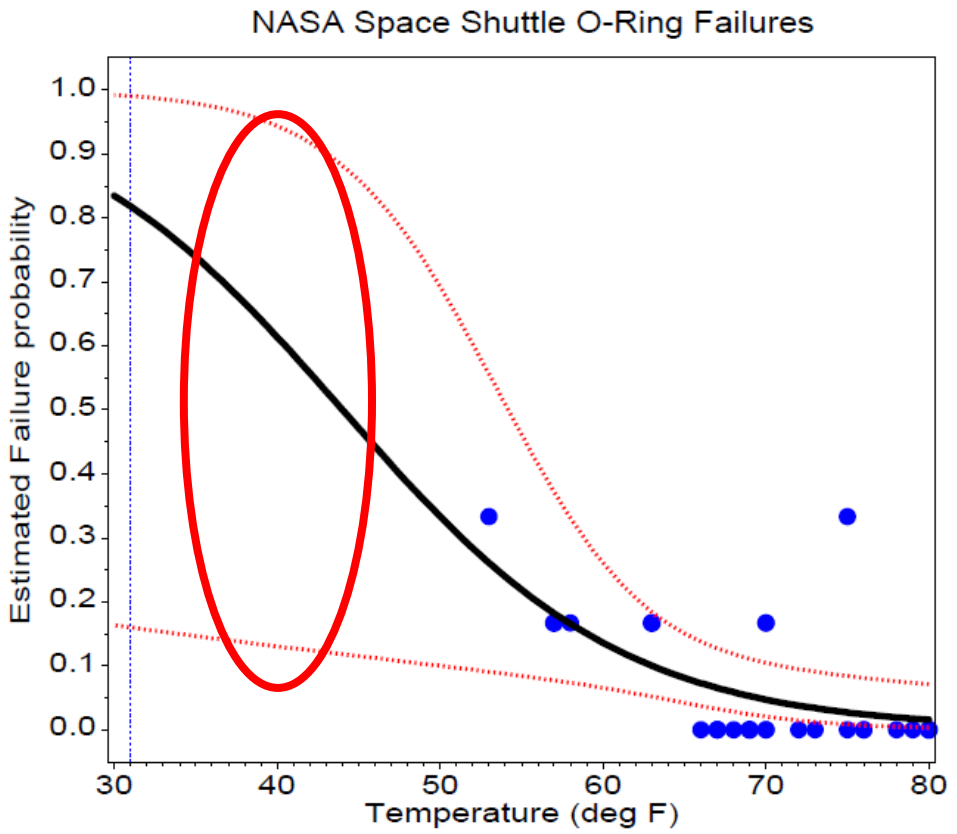
Importance of Proper Arrangement the Challenger disaster

- On January 28, 1986, the space shuttle Challenger exploded on take-off.
- The cause was later determined to be that rubber O-rings failed due to cold weather.
- NASA appointed members of the Rogers Commission: physicist Richard Feynman discovered the cause: at low temperature, O-rings became brittle and were subject to failure
- Tables and charts presented to NASA by Thiokol engineers showed data from prior launches ordered by time (launch number), rather than by temperature—the crucial factor.



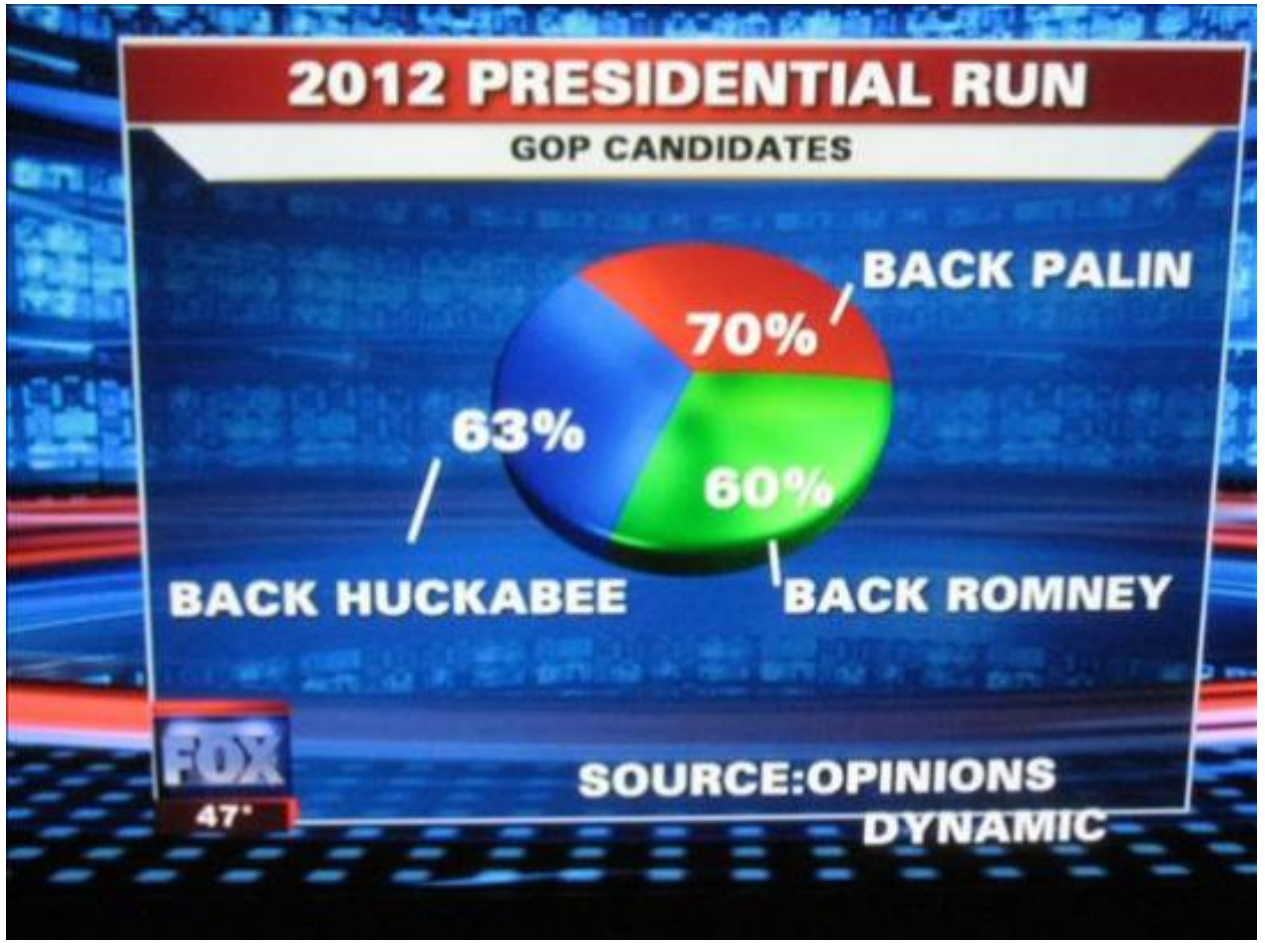
How many **6s** do you see?

1235869865809847539578123847234709347924739837493479874391073497324987349874590854650934285094358034658546545454 84

Highlight key findings or insights

1235**6**98**6**5809847539578123847234709347924739837493479874391073497324987349874590854**6**5093428509435803**6**5854**6**54545484

What's wrong with the picture?



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Key Data Parameters within Procurement

- **RFI response times**: Show how long it takes to respond to questions & answers.
- **Average number of proposers**: this shows the level of industry from your industry partners (also indicative of Fair, Open, Transparent?)
- **Client Customer Satisfaction**: once the service / project is complete, ask end-users their overall level of satisfaction with the supplier / contractor.
- **Industry Feedback**: average satisfaction levels or interest in working with your organization on future efforts
- **RFP or SOW Quality**: conduct a review of RFPs or SOWs after they are issued. Ideas: # of questions asked, % differences in price (+ vs. average and the budget), schedule accuracy

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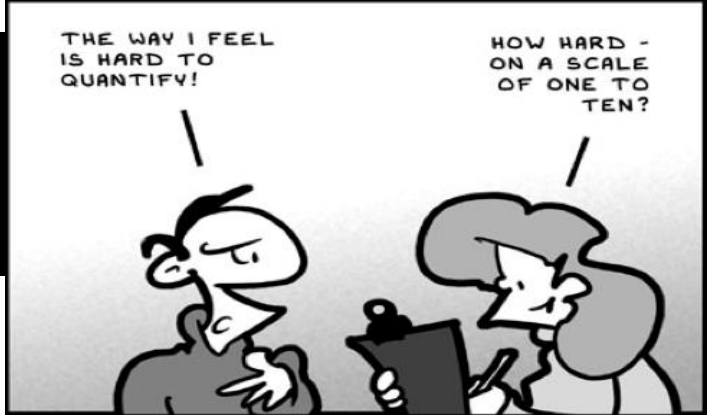
Data Types



QUALITATIVE / Categorical Data

- **Boolean** (Binary outcome - True or False)
- **Ordinal** (Ordered or Ranked categories)
  - Example: Level of satisfaction (high=5 to low=1), Agreement level, etc.)
- **Nominal** (Unordered or unranked categories)
  - Example: colors, directions, days (M to F), political parties (R,D,Ind.), etc.
- **Text**
- **Geospatial** (Latitude, Longitude, zip code, City, State, Country)

QUANTITATIVE Data

- **Continuous** – can take any value (e.g. weight, height, area, etc.)
  - i.e. 2.457, 4.22, 56.32, etc.
- **Discrete** – can take only particular values (e.g. number of students, shoe sizes, course credits, etc.)
  - **i.e. 7, 32, 12 ½, etc.**

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Common Visual Analytics Tools

Tableau, Rstudio, PowerBI, SAS, etc.

Why did we use Tableau?

- Flexible to handle various types of data
- Easy to learn & understand
- Try different visualizations using simple techniques
- One of the top interactive visualization platforms
- More data analysis & LESS data wrangling (transforming raw data)

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THIS AFTERNOON

Developing a High-Performing Statement of Work

Capital Ballroom I & II

3:40pm – 5:00pm

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FREE Online Course!

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NASPO™
National Association of State Procurement Officials

Procurement U®

Better RFPs = Better Projects

- Session #1 = Organizing a High-Performing RFP
- Session #2 = Effective Statements of Work (SOWs)
- Session #3 = Evaluation Best Practices & RFP Admin
- Session #4 = RFP Ethics & Vendor Debriefings

Register via NASPO's Procurement U

- Log on to the Procurement U Learning Management System (LMS) to register, access the course and materials.
  - www.naspo.org/procurement-u/
- Open to all (even non-members of NASPO)
- Limited to first 100 participants.

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Free Webinar Series

3rd Thursdays every month
@ 12pm Central

15-min Teaching Moment
(learn a new tip, trick, or tool)

30-min Virtual Peer Group
(network with professionals)

Office Hours
(open Q&A until the questions run out!)

ASK the RFP Doctor

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Previous Recordings Available Online!

center4procurement.org

Key Learning Points

- The industry is in flux right now… and it's becoming more challenging
- We need to leverage DATA to help understand what's going you
  - And you have access to so much!
- Simple is always better!

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