Logistics

- This presentation is being recorded
  - Recording and slides will be on CWDI website
- We will be collecting transcripts from the small group sessions
- We will be monitoring for and removing bots and AI notetakers
- You will have two opportunities to share your input
  - Q&A using the Zoom function
  - Small group sessions

National Center for Science and Engineering Statistics
Measuring America's progress in science, technology, and innovation

Part of the National Science Foundation (NSF)

One of 13 principal federal statistical agencies

Overseen by the U.S. Chief Statistician within the Office of Management and Budget (OMB)

MANDATE

Serve as a central **federal clearinghouse** for the collection, interpretation, analysis, and dissemination of **objective data** on the **U.S. science and engineering enterprise**

Section 505 of the America COMPETES Reauthorization Act of 2010

Cybersecurity Workforce Data Initiative

Why is it important to assess supply and demand in the cybersecurity workforce?

- The CHIPS and Science Act of 2022 section 10317 mandates that NCSES assess the feasibility of providing estimates and statistical information on the cybersecurity workforce

- As part of assessing the feasibility of providing estimates, we need to understand:
  - What are the key questions that estimates of the workforce can help answer?

- One important question that cybersecurity workforce estimates can answer: What is the magnitude of supply and demand in the cybersecurity workforce?

Goals of today's workshop

1. Discuss what we know about challenges related to the supply and demand of the cybersecurity workforce

2. Discuss a proposed methodology to quantify supply and demand in the cybersecurity workforce and sources of labor market data available and their limitations and drawbacks

3. Hear preliminary estimates of supply and demand

4. Connect with other organizations working to advance the cybersecurity workforce

5. Provide feedback to the CWDI

About Us

RTI is an independent nonprofit research institute dedicated to improving the human condition.

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Agenda

- About the CWDI and Background

- Supply and Demand Objective and Methods

- Current Workforce Supply Estimates

- Workforce Demand Estimates

- Challenges and Recommendations

- Next Steps

Background on the Cybersecurity Workforce Data Initiative (CWDI)

- Mandated by the CHIPS and Science Act of 2022
    - Led by the National Center for Science and Engineering Statistics (NCSES)

- The goal of the CWDI is to assess the feasibility of producing nationally representative estimates and statistics on the cybersecurity workforce in the United States
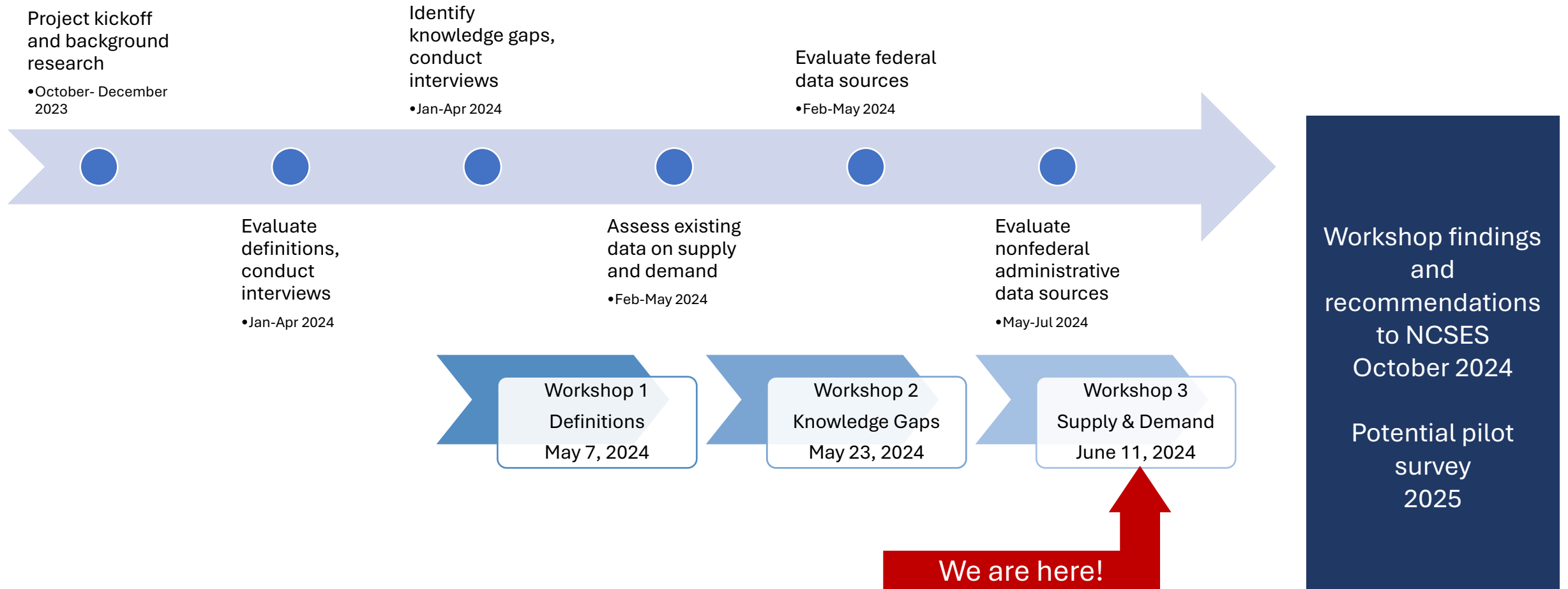
CWDI working definition

The cybersecurity workforce includes a **"core" set of cybersecurity occupations focused on cybersecurity**. Workers in other occupations where their **primary**, or **secondary work activities** include cybersecurity are also part of the core cybersecurity workforce.

The cybersecurity "involved" and "adjacent" workforce include those occupations and workers where cybersecurity is a work activity, but not primary or secondary.

CWDI working definition, details

Cybersecurity Core	Cybersecurity Involved	Cybersecurity Adjacent
Cybersecurity is the **primary work activity** and is **explicitly at the core** of the occupation. • Cybersecurity analysts, engineers • Penetration testers Cybersecurity is a **primary or secondary work activity** of the occupation. • Cybersecurity lawyers • Database architects • Systems engineers • Software developers	Cybersecurity is an **explicit or other work activity**, but where an employee may not rank it as a primary or secondary part of their regular work roles. • Other computer and tech • Engineering • Financial and business • Legal and management • Military, protective services • Office support	Roles where cybersecurity is not an explicit work activity but where there are **cybersecurity implications** or a small number of required tasks, knowledge, and/or skills from the NICE Framework central to the occupation.

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Knowledge Gaps

Mismatch between the skills and experience demanded by employers and available in the labor force

Fragmented data and definitions

Lack of understanding about educational pathways, labor market pathways, and work roles

Supply and Demand of Cybersecurity Workers

Our objective is to operationalize our definition and analyze federal labor market data to understand the state of supply and demand for cybersecurity professionals.

Methods

To compile this information, our team

- Reviewed existing research and estimates on the current supply of workers, the short-term demand for workers, and the long-term demand for workers.

- Identified proposed occupation (SOC) codes and educational program (CIP) codes that describe cybersecurity jobs and educational programs respectively.

- Calculated a range of estimates of labor force and inflow of workers using BLS, ACS, NCSES, and IPEDS.

- Reviewed a variety of job boards, O*NET, and BLS growth projections to estimate the number of cybersecurity job openings.

Existing Workforce Data Estimates

The NICE Framework is a useful tool to understand cybersecurity work, but it has not yet been translated or operationalized with federal labor market data.

Cybersecurity work does not fit easily into a single occupation code or title.

Administrative data and surveys provide valuable but limited data.

Select Administrative Sources of Cybersecurity Workforce Data

Source	Method
CyberSeek	NICE Framework and proprietary Lightcast data
ISC2	Member Survey & data modeling
WiCyS, N2K	Member survey
SANS/GAIC	Member survey
Other professional organizations (CompTIA)	Member data

Estimation Methods

Cybersecurity work is not limited to a single occupation and is not uniform across all occupations.

Proposed 9 occupation codes to estimate the core cybersecurity workforce and corresponding CIP codes

This allows for analysis of federal data from sources including BLS, Census Bureau, NCSES, and Department of Education.

Data presented provides a preliminary range of values to understand the scope of the workforce and the data available.

Core cybersecurity Occupations

Computer and information systems managers

Computer network support specialists

Computer network architects

Database administrators

Network and computer systems administrators

Computer occupations, all other*

Key occupation

Information security Analysts
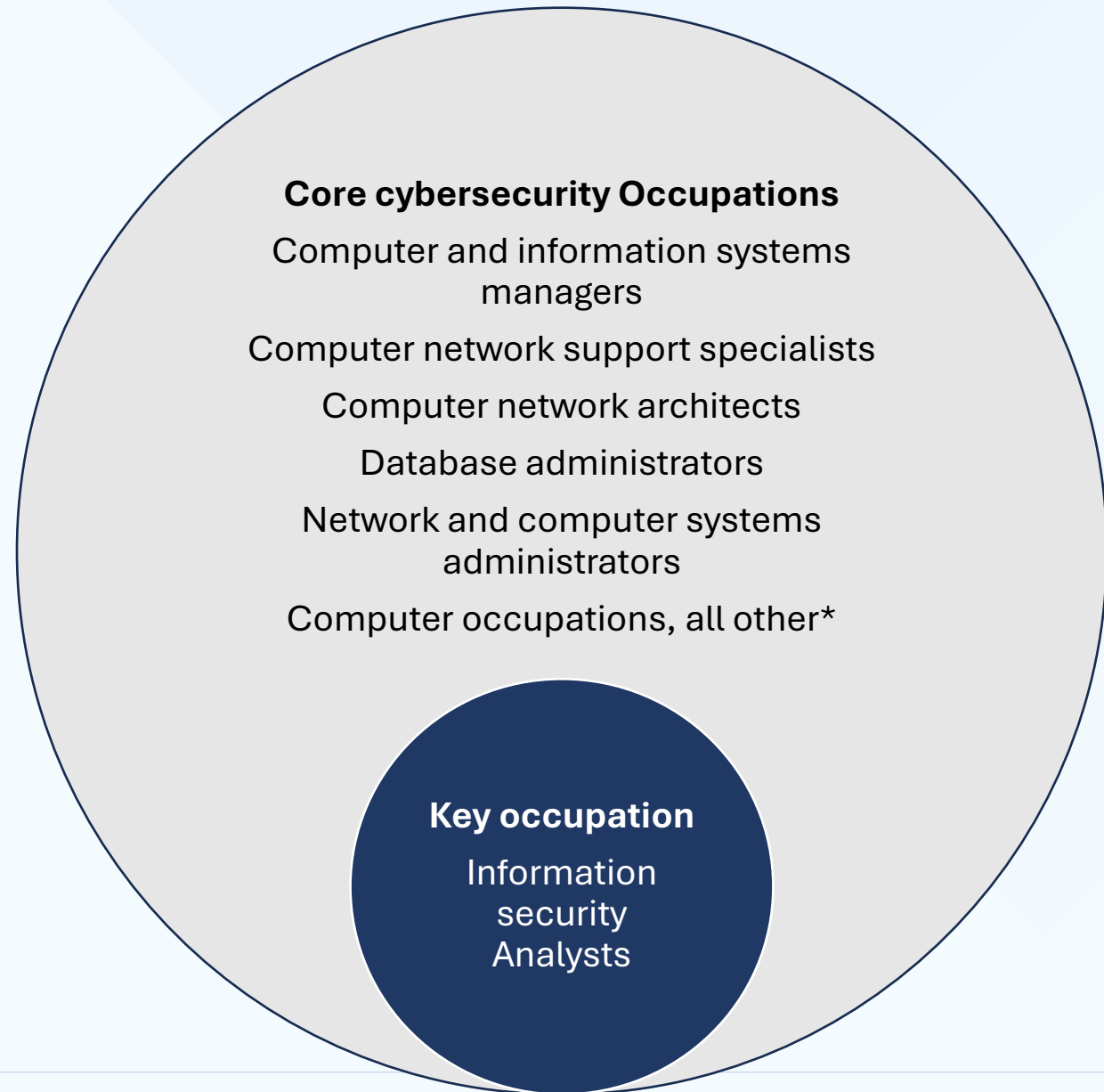
Estimates of Supply: Size of the Workforce

Based on this methodology and analysis of federal data, the size of the <u>core workforce</u> (individuals who are employed) ranges from

Under **200,000** to nearly **3.5 million,** depending on the data source

Between **0.1%** and **2.1%** of the U.S. workforce

Estimates of Supply: Size of the Workforce Ranges

■ Independent estimate   ■ Low estimate: Includes information security analysts (SOC code 15-1212) only

□ High estimate: Includes all 9 core occupations defined by SOC codes

Federal - Census Bureau ACS	192,000 — 3,492,000
Federal - BLS OEWS	164,000 — 2,430,000
Federal - NCSES NSCG	126,000 — 1,885,000
ISC2	1,340,000
Cyberseek	1,180,000

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Estimates of Supply: Unemployed Cybersecurity Workers

Labor force Status: Cybersecurity Workers

Not in labor force
323,000

In labor force,
unemployed
74,000

In labor force,
employed
3,490,000

- ■ In labor force, employed
- ■ In labor force, unemployed
- ■ Not in labor force

Source(s): U.S. Census Bureau ACS
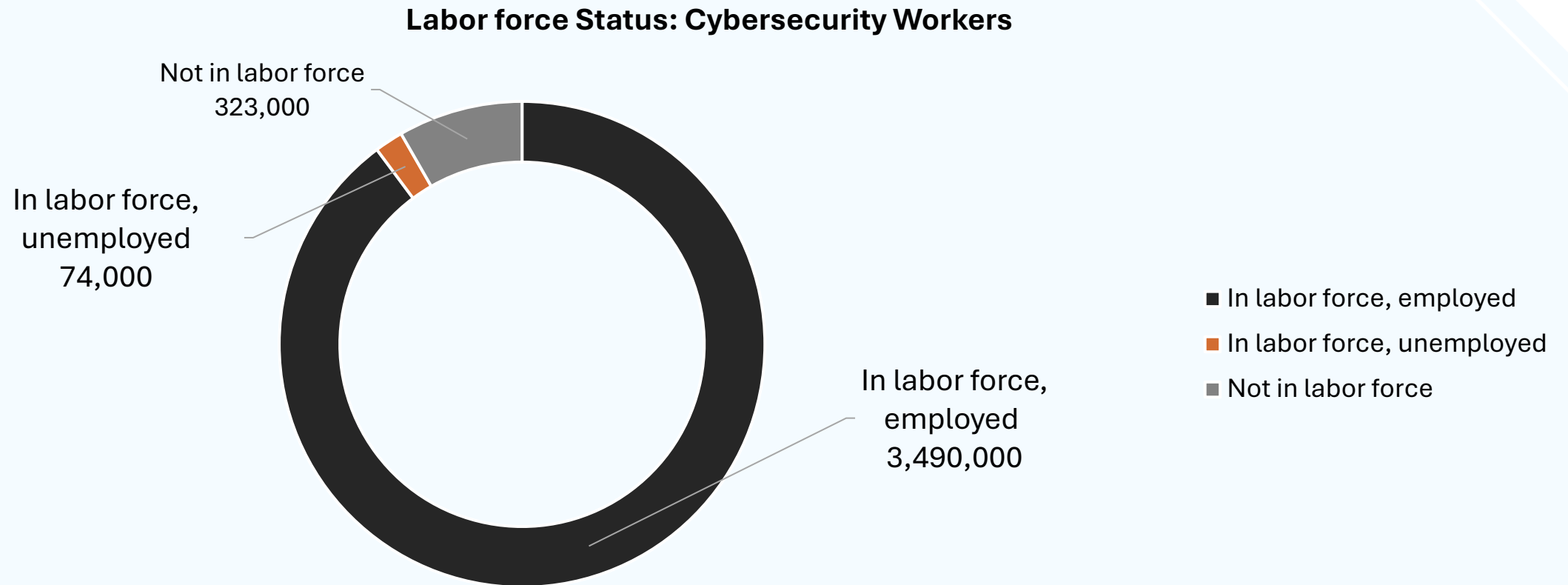
Estimates of Supply: New Graduates

In 2022, we estimate between

24,964 (narrowest definition) and

258,733 (broadest definition)

New degrees awarded in computer and information systems & security grew by **271%** from 2012 to 2022, one of the fastest growing degree programs in the U.S.

A large and fast-growing number of new graduates indicates a large and growing supply of early career workers.

Source(s): U.S. Department of Education IPEDS

Estimates of Short-Term Demand

In May 2024, there were nearly **24,000** active postings for information security analysts.

- Job postings varied widely across the search term and occupation titles used when linked to O*NET using data from CareerOneStop and ZipRecruiter

Searches for "cybersecurity" on LinkedIn and Indeed produced between **14,000** and **55,000** results.

Results varied widely across job sites and search terms.
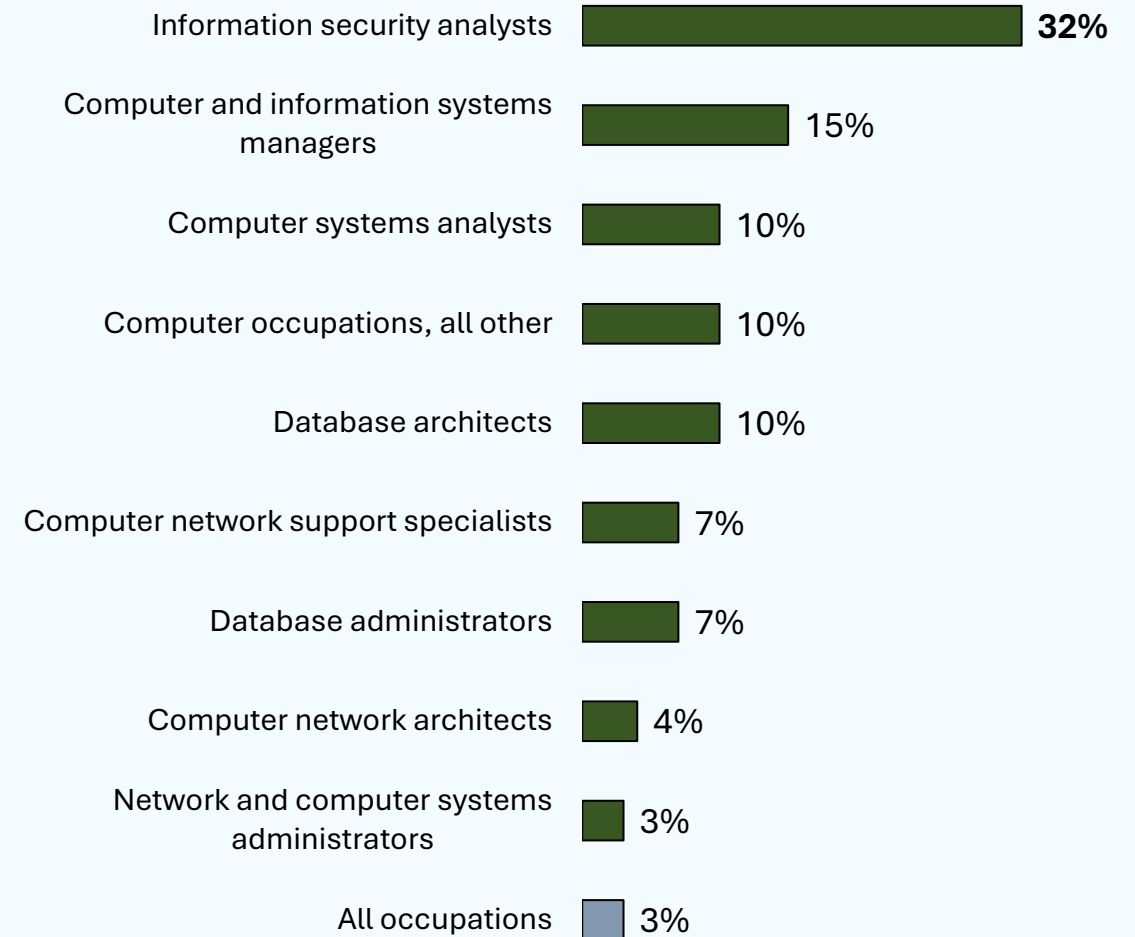
Estimates of Long-Term Demand

In the 9 occupation codes, BLS estimates a demand for more than **274,000 new jobs**, or 11% growth over its current 2.4 million jobs, in the next 10 years.

This outpaces national growth, projected at 3%

Information security analysts are projected to grow by 32%, one of the fastest growing occupations in the country.

Note that new projections from BLS will be available later this year.

Projected Job Growth, by Occupation 2022–2032

| Occupation	Growth
Information security analysts	**32%**
Computer and information systems managers	15%
Computer systems analysts	10%
Computer occupations, all other	10%
Database architects	10%
Computer network support specialists	7%
Database administrators	7%
Computer network architects	4%
Network and computer systems administrators	3%
All occupations	3%

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Select Statistics on the Workforce

- The cybersecurity workforce is **73.5% male**, compared to 49.5% of the U.S. workforce.

- More than **61% of workers in cybersecurity fields hold a bachelor's degree or higher**, compared to 33% of the U.S. workforce.

- Annual median wages in the cybersecurity workforce ranged from **$68,000 to $164,000**, all of which are higher than national figures.

Sex of U.S. Workforce and Cybersecurity Workforce

☐ Female ■ Male

U.S. Workforce: Female 50.5%, Male 49.5%
Cybersecurity Workforce: Female 26.5%, Male 73.5%
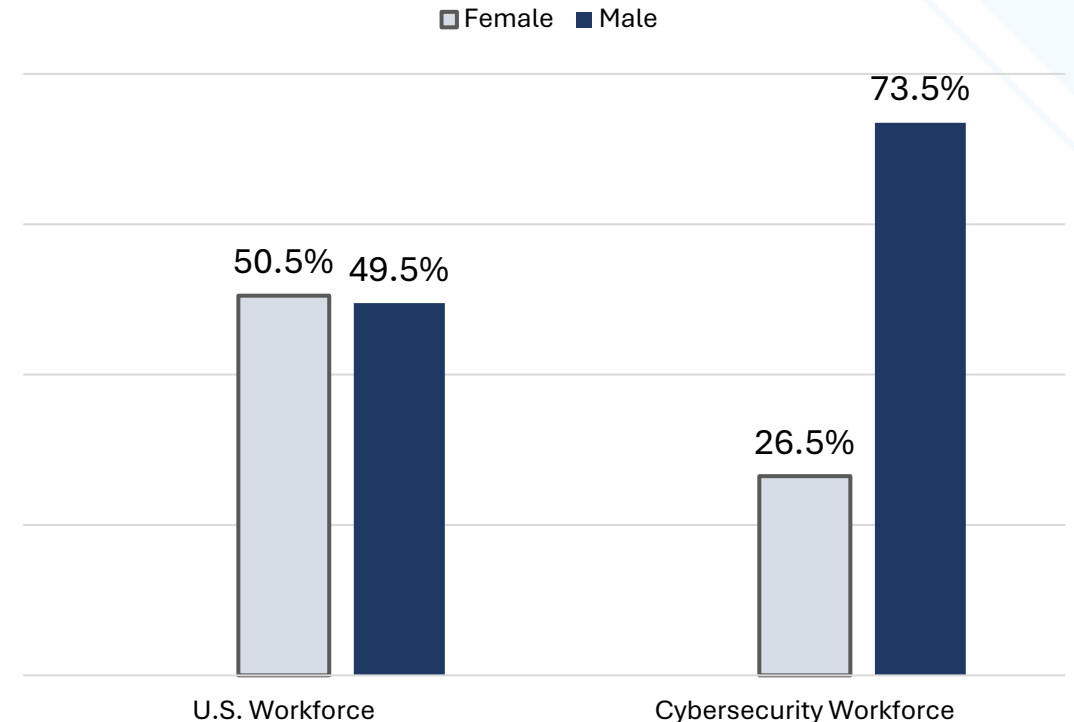
Challenges in Cybersecurity Workforce Supply and Demand

Workforce Supply & Demand Challenges
• Experience gap – many openings, few experienced workers on job market
• Rapid growth of new graduates from degree and certificate programs
• Few entry points for early career workers
• Workforce is disproportionately men with bachelor's degrees or higher

Challenges in Cybersecurity Workforce Data

Workforce Data Challenges
• Cybersecurity work defined by work activities, not occupation titles
• Job titles and descriptions range widely and are not uniform
• Occupation codes last revised in 2018 and do not include new cybersecurity occupations
• Knowledge gaps about workforce pathways
• Data lags from public sources

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Recommendations (part 1)

Incorporate cybersecurity into NCSES surveys.

- Test if the methodology to measure research, development, and design (R&D) workers is suitable for measuring cybersecurity workers.

- Examine if surveys on certificates, certifications, and licenses are sufficient for understanding the pathways of the cybersecurity workforce.

Recommendations (part 2)

Connect with data from federal sources:

- Merge KSAs from 2024 NICE Framework revision into occupation definitions and data from O*NET, to better map to occupation codes

- Incorporate cybersecurity into new occupation code (SOC) revisions from BLS due to be updated in 2028

- Incorporate cybersecurity into new program codes (CIP) from the Dept. of Education

Next Steps

Evaluating data from federal and administrative providers

Send us your feedback by June 28, 2024

Workshop recommendations to NCSES in October 2024 to inform a potential **pilot study in FY 2025**
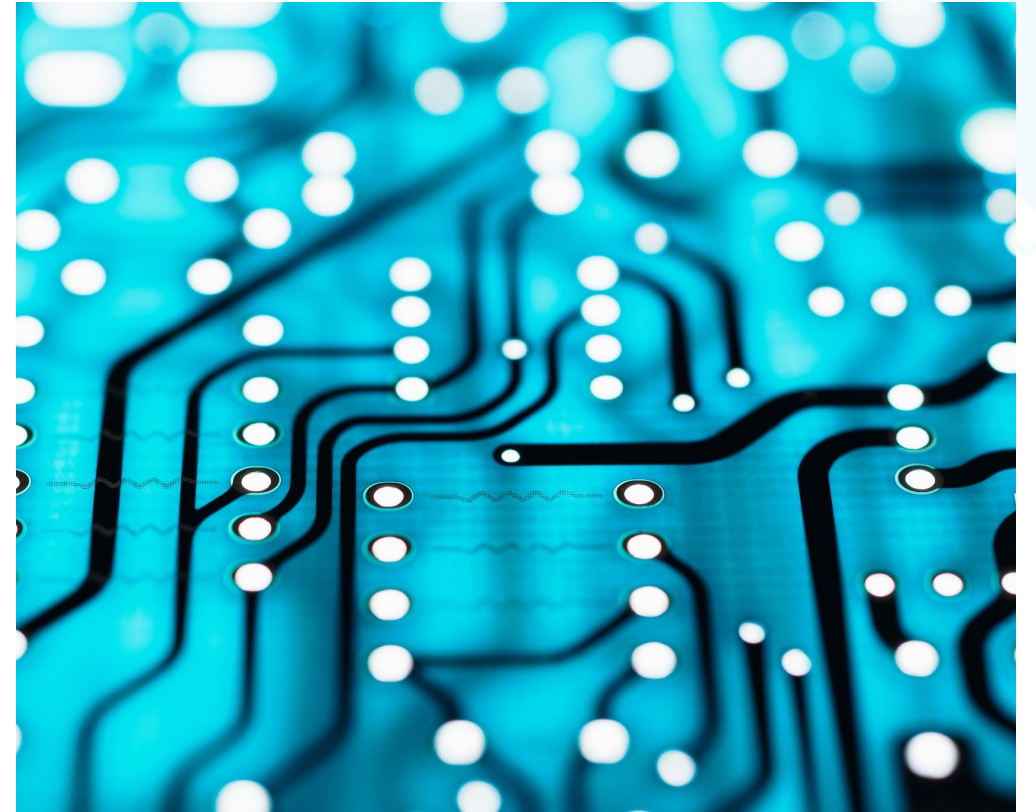
More Information

- Learn more about the CWDI here: https://ncses.nsf.gov/about/cybersecurity-workforce-data-initiative

- Recording of prior workshops (when available): https://ncses.nsf.gov/about/cybersecurity-workforce-data-initiative/workshops

- Reach us at NCSES-CWDI@nsf.gov and CWDI@rti.org

Panel Discussion

Toni Benson
DHS CISA

Will Markow
Lightcast

Tatyana Bolton
Google

Jeffrey Alexander
RTI
Moderator

Poll Questions

Poll Question 1

- Which 3 job posting sites do you think are most critical for understanding the demand for cybersecurity workers?

o CareerOneStop

o ClearanceJobs.com

o CyberSeek

o Indeed

o LinkedIn

o O*NET

o USAJobs.gov

o ZipRecruiter

o Other (please enter in chat)

Poll Question 1 Results

Job Posting Site	Frequency	Percent
LinkedIn	42	75%
Indeed	32	57%
CyberSeek	29	52%
USAJobs.gov	26	46%
ClearanceJobs.com	9	16%
ZipRecruiter	7	13%
CareerOneStop	7	13%
Other	2	4%
O*NET	0	0%

Poll Question 2

- Which federal data sets have you used to understand to the cybersecurity workforce? (select all that apply)

Name	Abbreviation	Federal Agency
American Community Survey	ACS	Census Bureau
Integrated Postsecondary Education Data System	IPEDS	NCES
National Survey of College Graduates	NSCG	NCSES
NICE Framework	N/A	NIST
Occupational Employment and Wage Statistics	OEWS	BLS
Office of Personnel Management Cyber Workforce Dashboard	N/A	OPM
Survey of Graduate Students and Postdoctorates in Science and Engineering	GSS	NCSES

Poll Question 2 Results

Federal Data Set	Frequency	Percent
NICE Framework (NIST)	41	84%
Office of Personnel Management Cyber Workforce Dashboard (OPM)	18	37%
Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS; NCSES)	12	24%
National Survey of College Graduates (NSCG; NCSES)	12	24%
Integrated Postsecondary Education Data System (IPEDS; NCES)	10	20%
Occupational Employment and Wage Statistics survey (OEWS; BLS)	9	18%
American Community Survey (ACS; Census Bureau)	9	18%
Other	1	2%

Small Group Discussions

Please stay for the breakout discussions, if able

- We are very interested in hearing from you

- This is your opportunity to shape a potential future cybersecurity workforce data collection

- Please click "Ok" in the breakout room pop up to enter your assigned break out room

Discussion Questions

Primary discussion questions:

1. What data have you used to quantify the *supply* of the cybersecurity workforce?
2. What data have you used to quantify the *demand* of the cybersecurity workforce?
3. To what degree do you think the gap in the supply and demand of the cybersecurity workforce is driven by the mismatch in the knowledge, skills, and experiences of jobseekers and employers? What can we do to address this mismatch?

Additional discussion questions:

1. Conditional on position:

   a. If you are hiring or managing cybersecurity workers, what are the gaps you see between supply and demand?
   b. If you are an educator, what are the gaps you see between graduates and employment?
   c. If you represent a government agency or research organization, what data would help you to better understand the cybersecurity workforce?

2. What information is missing on the cybersecurity workforce?
3. Current estimates indicate that about 70% of cybersecurity workers are male. How important is closing this gender gap and do you have any suggestions for how to do so?
4. Is there anything else about the cybersecurity workforce you would like to share?

Next Steps for CWDI

- The CWDI initiative will continue our efforts to assess the feasibility of producing national estimates of the cybersecurity workforce
  - Evaluate existing federal survey data
  - Explore existing administrative data

- Send workshop feedback for consideration to NCSES by **June 28, 2024**

- To send feedback or ask questions: NCSES-CWDI@nsf.gov or cwdi@rti.org

Thank you!

https://ncses.nsf.gov/about/cybersecurity-workforce-data-initiative