Occupational data research

Clean energy technology in our administrative records

Employment Security Department
WASHINGTON STATE

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SOC codes and job titles team

Manager

Kondratjeva, Olga (ESD)
Program Evaluation, Research and Analysis Mana...

Supervisor

Grafsgaard, Joseph (ESD)
Data Scientist

Bryant, Justin (ESD)
Data Consultant 3

Lopez, Darwin (ESD)
Data Consultant 2

Outline

- Overview
- Defining clean energy technologies
- Clean energy job titles
- New wage data product

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Overview

- Employment Security administers the unemployment insurance system in Washington state
- Our state's administrative data includes occupation since 2022 Q4
- We measured clean energy technology employment using the administrative data and other sources (CETWAC report)
- We are investigating new methods for clean energy technology

Unemployment insurance wage records

- Employers file quarterly wage records on employees
- Since 2022 Q4, this has included occupational data
- Since 1978, this has included hours worked in the quarter
- Necessary for accurate administration of unemployment insurance

Occupation, industry, and clean energy

Standard occupational classification (SOC) codes

- Low clean energy coverage
- *Solar photovoltaic installers (47-2231)*
- *Wind turbine service technicians (49-9081)*

North American industry classification system (NAICS)

- Low clean energy coverage
- *Hydroelectric power generation (221111)*
- *Solar electric power generation (221114)*
- *Distribution of renewable natural gas (221210)*

We need new methods to better identify clean energy businesses and employment

Advantages of administrative data

- Included as part of regular employer participation in state processes
- Direct individual data rather than aggregates
- Census of employment rather than a survey
  - However, not all employment
    - Federal, railroad, independent contractors, UI exemptions
- We used administrative data to measure CET employment

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Defining clean energy technology

- There is no plain definition of clean energy technology
- This is because CET encompasses many different technologies, both emerging and longstanding
- We examined authoritative sources to bring together the many parts

Definitions: policy and legislation

- White House Council on Environmental Quality (2022)
  - Defines renewable energy per U.S. Code (42 U.S.C.15852(b)(2))
  - Includes marine, solar, wind, biomass, landfill gas, geothermal, municipal solid waste, new hydroelectric capacity
- Environmental Protection Agency (2019)
  - Prioritizes renewable resources with highest environmental benefit
  - Emphasizes solar wind, geothermal, biogas, some biomass, low-impact hydro
- U.S. Department of Energy (2022)
  - Defines clean energy as low/no GHG emissions, minimal environmental impact
  - Includes renewables (solar, wind, hydro, geo, bio) nuclear, hydrogen, fuel cells
- WA Clean Energy Transformation Act (2019)
  - Defines renewable as water, wind, solar, geothermal, renewable gas/ hydrogen, marine, biodiesel, biomass

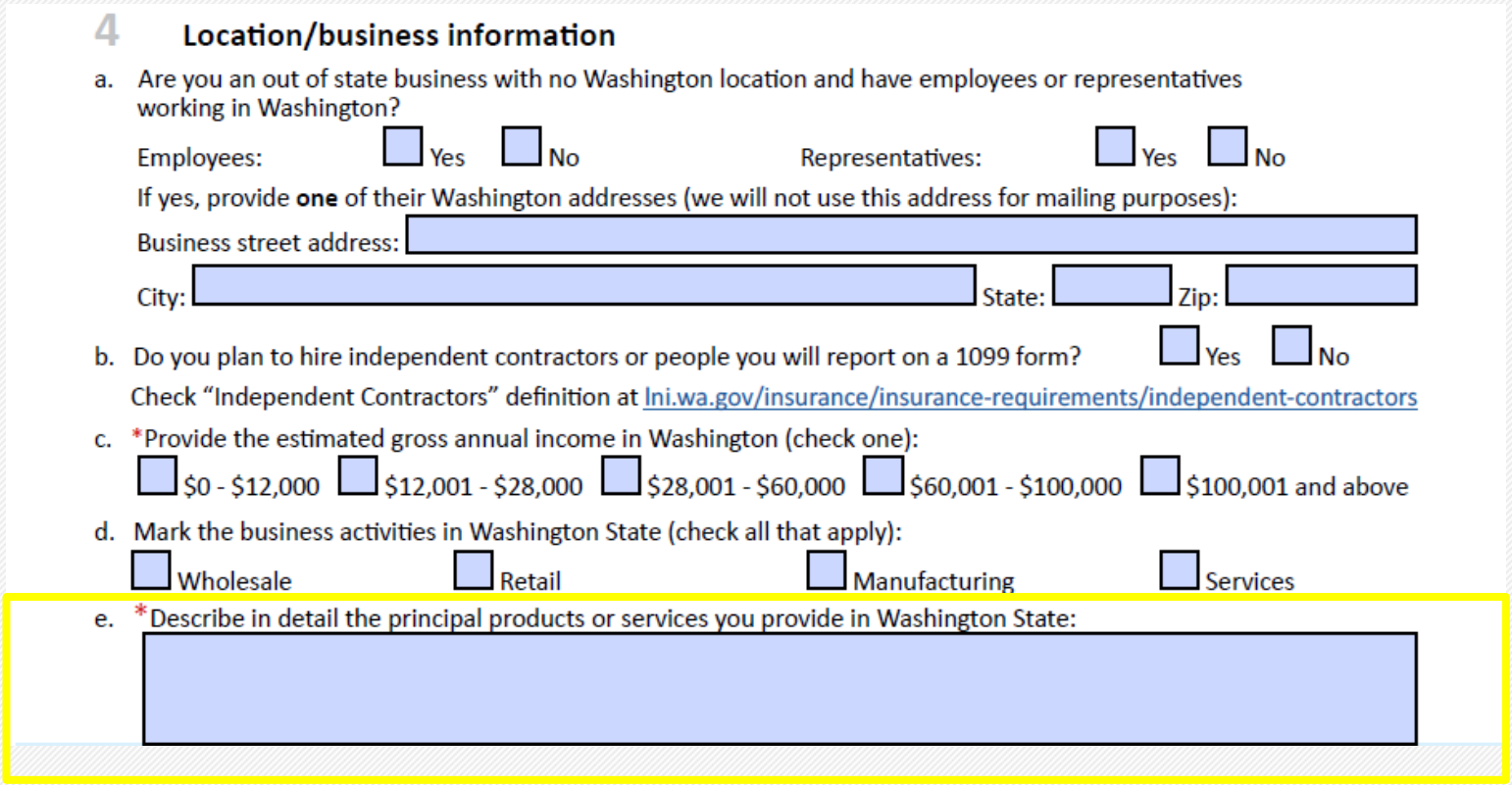
Definitions: reports

- United States Energy & Employment Report (USEER) (2024)
  - Uses BLS data to analyze energy workforce trends
  - Broad definition: renewables, nuclear, efficiency, EVs, transmission
- National Renewable Energy Laboratory (2021)
  - Uses BLS data with set requirement for full-time clean energy jobs
  - Includes nuclear, efficient natural gas, clean coal, energy efficiency
  - State-level report has efficiency, storage, solar, wind sectors
- Clean Jobs America (E2) (2022)
  - Expands on USEER with focus on efficiency and job creation
  - Includes, renewable generation, efficiency, storage/grid, biofuels
- Net-Zero Northwest (2023)
  - Groups clean energy and traditional energy jobs together
  - Focuses on low-cost, low-carbon sources to reach net-zero by 2050

Clean energy technology categories

- Alternative fuels
- Clean energy
- Energy efficiency
- Fossil fuels
- Storage and grid
- Transportation

Business registration form



4 Location/business information

a. Are you an out of state business with no Washington location and have employees or representatives working in Washington?

Employees: ☐ Yes ☐ No Representatives: ☐ Yes ☐ No

If yes, provide **one** of their Washington addresses (we will not use this address for mailing purposes):

Business street address:

City: State: Zip:

b. Do you plan to hire independent contractors or people you will report on a 1099 form? ☐ Yes ☐ No

Check "Independent Contractors" definition at lni.wa.gov/insurance/insurance-requirements/independent-contractors

c. *Provide the estimated gross annual income in Washington (check one):

☐ $0 - $12,000 ☐ $12,001 - $28,000 ☐ $28,001 - $60,000 ☐ $60,001 - $100,000 ☐ $100,001 and above

d. Mark the business activities in Washington State (check all that apply):

☐ Wholesale ☐ Retail ☐ Manufacturing ☐ Services

e. *Describe in detail the principal products or services you provide in Washington State:

Source: Business License Application

Alternative fuels keywords

- hydrogen batteries
- bio diesel
- bio fuel
- bio gas
- fuel alternative
- fuel renewable
- hydrogen power
- landfill gas
- nuclear fuel
- precommercial thinnings
- reforestation
- renewable natural gas

Clean energy keywords

- clean energy
- clean power
- fission
- fusion
- gasification
- geothermal
- hydro
- nuclear
- photovoltaic
- solar
- tidal
- wind

Energy efficiency keywords

- CFL
- energy efficiency
- energy star
- geothermal
- greenhouse
- heating
- HVAC
- insulation
- LED
- LEED
- solarium
- ventilation

Storage and grid keywords

- batteries
- battery
- battery alternative
- battery renewable
- battery hydrogen
- battery sustainable
- hydrogen cell
- micro grid
- smart grid

Transportation keywords

- charging station
- EV charge
- hydrogen vehicle
- electric charge
- electric vehicle
- natural gas vehicle
- electric motor
- hybrid electric

Advantages of CET keyword searches

- The business registration keywords exist outside of coding systems
- We have identified hundreds of clean energy technology businesses using these keywords
- However, these are limited to the stated principal products and services of the entire business
  - Larger companies with many products and services will not be identified

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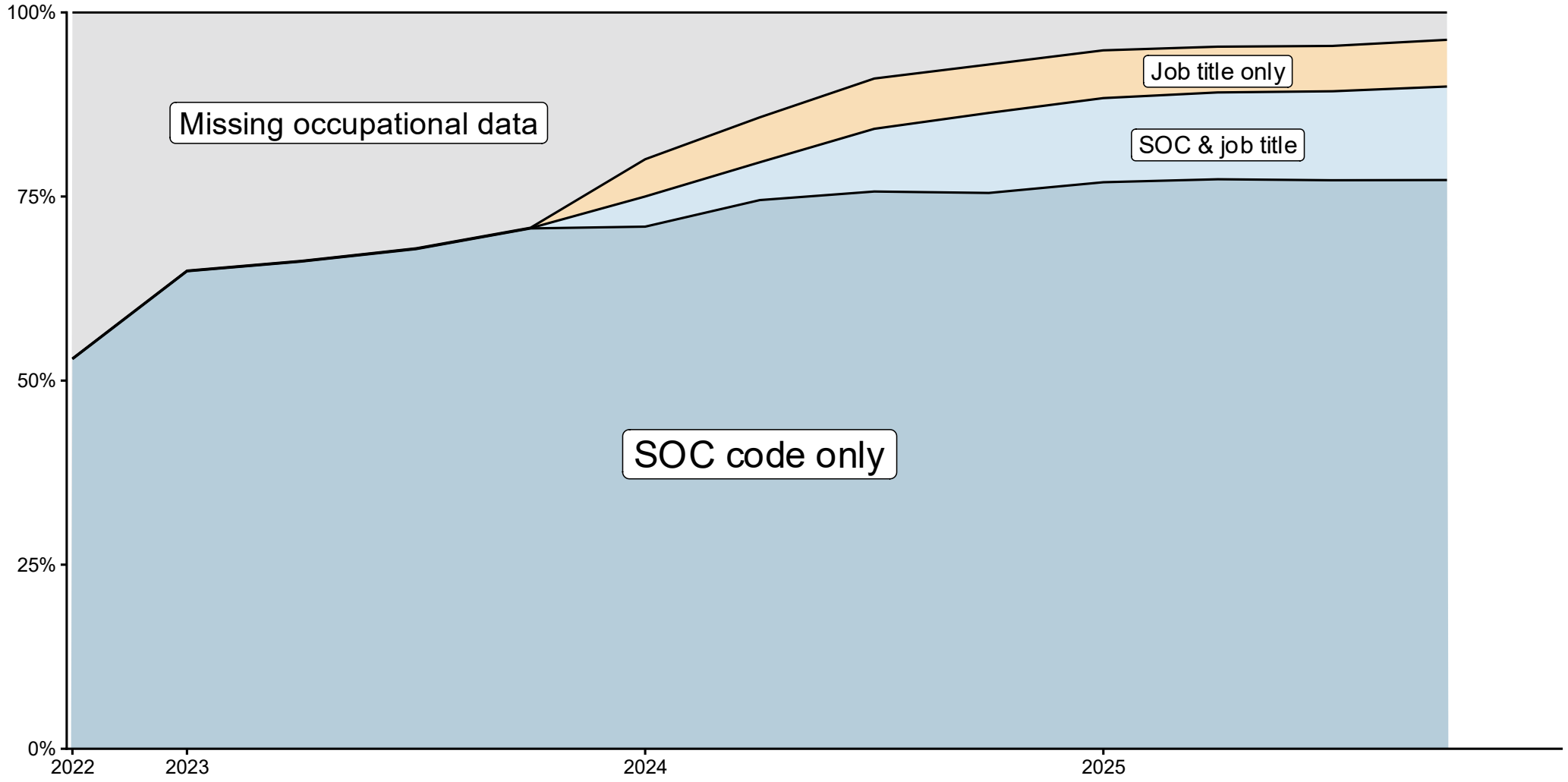
Clean energy job titles

- Returning to employer UI wage filings
- Occupational data includes SOC codes *and* job titles
- We have started investigating employer job title filings for niche clean energy technology occupations

Increasing occupational reporting



Job title reporting

Actual employer entries

Team Member [*restaurant*]
MORTGAGE LOAN OFFICER
Home Health Physical Therapist

Barista	Groundsperson
~~A50~~	GAS TECH 1
LMP	WEX

- Employers can enter any text
  - We remove:
    ~~Placeholder values~~
    ~~Numeric codes alone~~
- At least two alphabet letters
  - Non-alphabet characters are okay
- Acronyms and jargon expected

O*NET Alternate Titles data file

Analyzing job title text

1. Clean up the job titles: removing placeholders and non-job titles

2. Reduce the job titles to components
   - These are known as stemmed tokens in natural language processing
   - Project manager → project manag

3. Make pairs of job title components
   - These are known as bigrams and they do not preserve ordering
   - project manag <-> manag project

4. Analyze the job title component pairs → create statistics

Top 10 job titles in Construction

- Project manager
- Service technician
- Installer hourly
- Cleaning technician
- Project engineer
- Operator group
- Construction laborer
- Service tech
- Laborer group
- Construction manager

CET: renewable energy job titles

- solar technician
- lead solar
- residential solar
- solar array
- tech solar
- solar energy
- solar impact
- solar installer
- construction solar
- solar design
- solar sales
- outside solar
- hydroelectric maintenance
- hydroelectric operator
- hydro oper
- hydro utility
- hydro mechanic
- hydrology program
- hydrologic tech
- hydrogen plant
- hydro wireman
- wind site
- wind turbine
- wind tech
- wind laborer

CET: power production job titles

- nuclear engineer
- nuclear projects
- nuclear waste
- nuclear consultant
- mgr powerplant
- power plant
- powerplant engineering
- powerplant planner
- gas turbine
- turbine engine
- turbine operator
- turbine technician

CET: commercial/ residential job titles

- electrical construction
- electrician install
- electrical engineer
- electrician constructor
- electrical service
- electrical power
- modification electrician
- electrician spcl
- assembly electrician
- electrical apprentice
- electrical designer
- meter electrician
- electrical inspector
- signal electrician
- journeyman electrician
- electrician supv
- maintenance electrician
- communications electrician
- control electrician
- electrician crew
- principal electrical
- electrical technician
- electrician foreman

Advantages of clean energy job titles

- SOC codes are based on main duties and do not represent clean energy technology well
- We see clean energy technology job titles provided by employers
- We can match these job titles to the employers and to the industry segments of employers
- Job titles can overlap and supplement SOC codes

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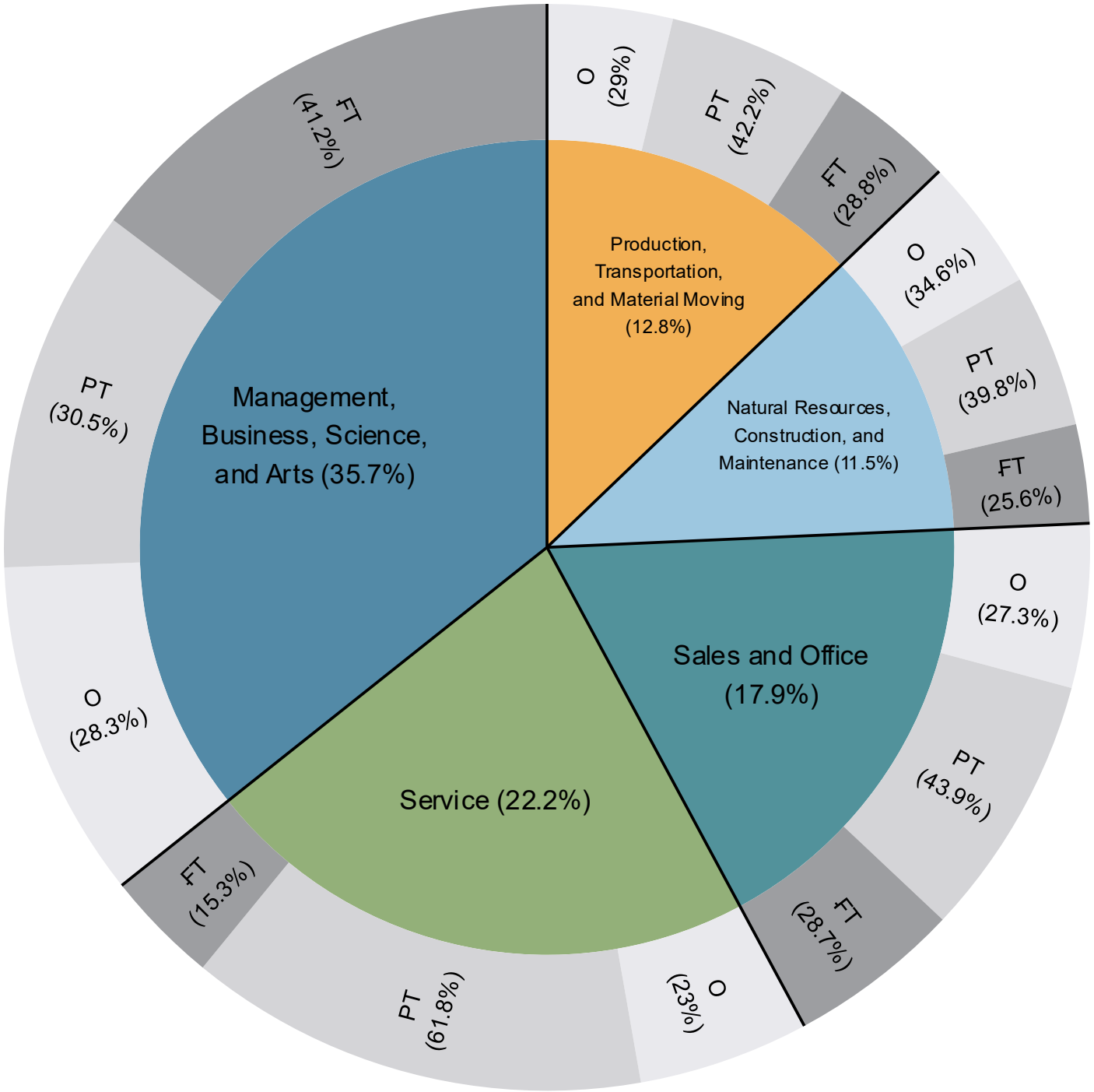
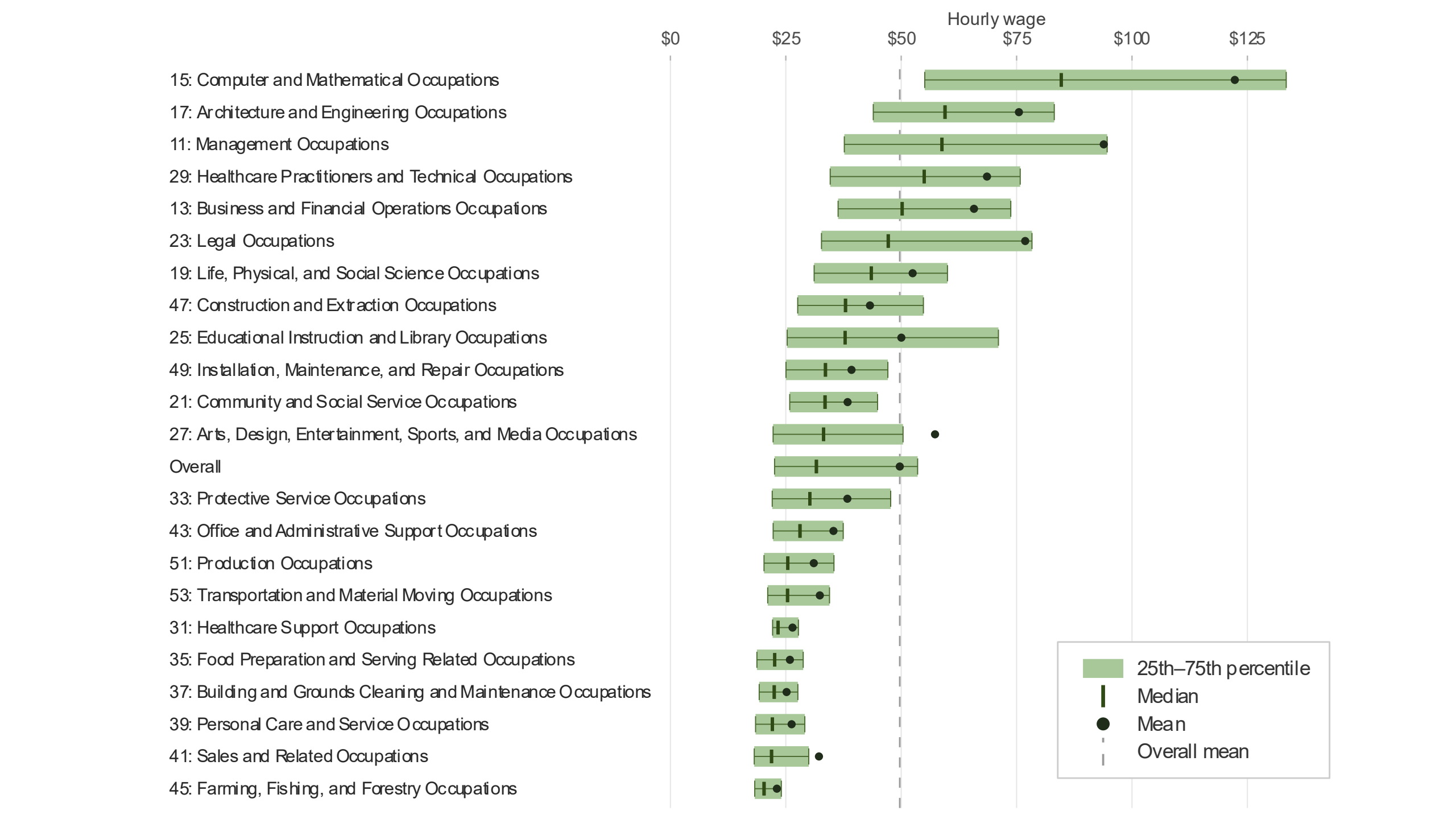
New wage data product

- Washington state unemployment insurance administrative data include occupation and hours worked in a quarter
- Existing data products are based on surveys and assumptions of hours worked in a year
- We created a new data product to provide advanced insights into occupational employment, wages, and hours worked

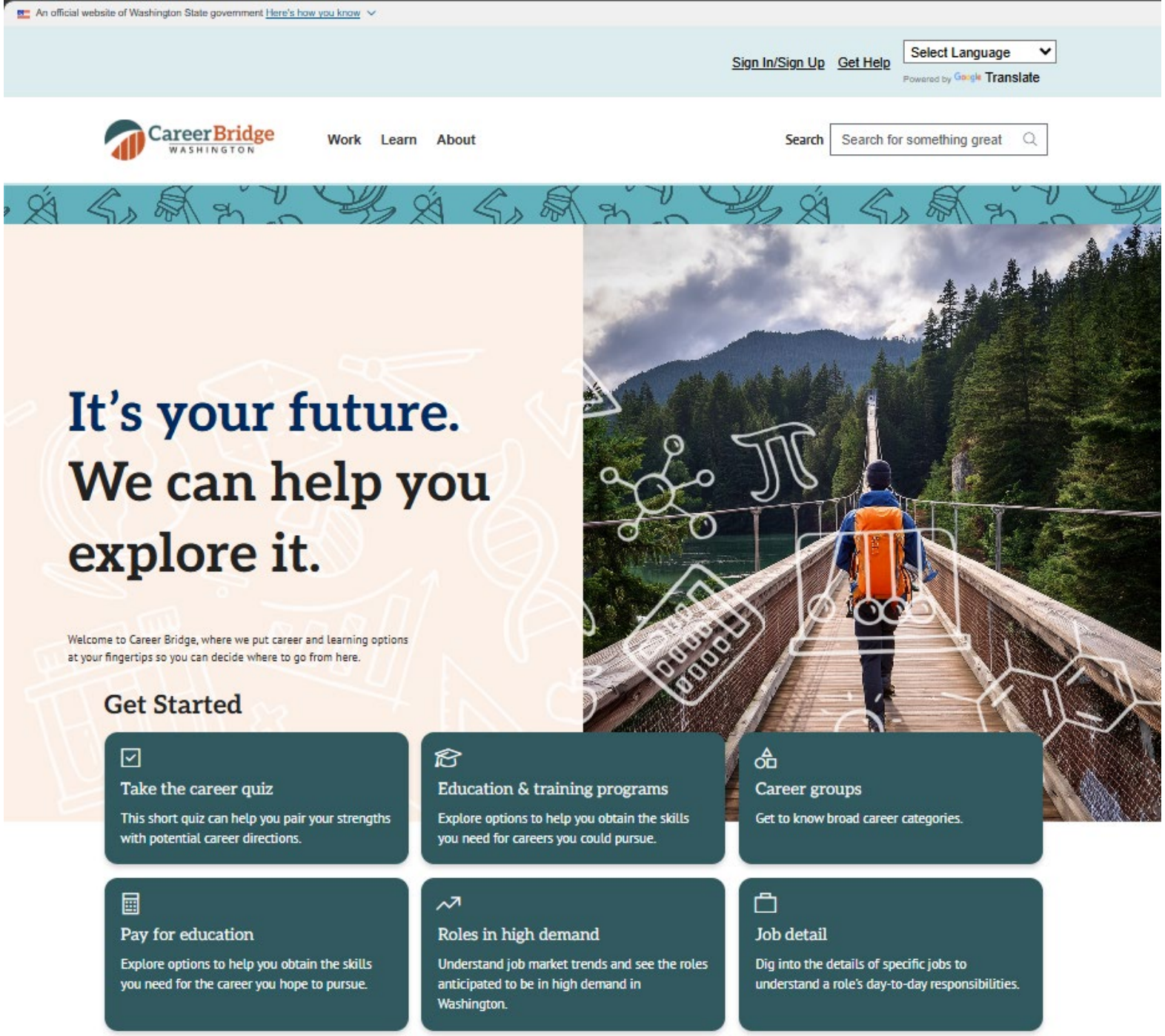
Occupational individuals

- We count occupational employment at the level of individuals
  - Using the employer-provided SOC codes
- We collapse employment in the same occupation by the same individual to one *occupational individual*
- This is very important to certain occupations like rideshare app drivers, dental hygienists, and others


Production, Transportation, and Material Moving (12.8%)
O (29%)
PT (42.2%)
FT (28.8%)
Natural Resources, Construction, and Maintenance (11.5%)
O (34.6%)
PT (39.8%)
FT (25.6%)
Sales and Office (17.9%)
O (27.3%)
PT (43.9%)
FT (28.7%)
Service (22.2%)
O (23%)
PT (61.8%)
FT (15.3%)
Management, Business, Science, and Arts (35.7%)
O (28.3%)
PT (30.5%)
FT (41.2%)


Hourly wage
$0
$25
$50
$75
$100
$125
15: Computer and Mathematical Occupations
17: Architecture and Engineering Occupations
11: Management Occupations
29: Healthcare Practitioners and Technical Occupations
13: Business and Financial Operations Occupations
23: Legal Occupations
19: Life, Physical, and Social Science Occupations
47: Construction and Extraction Occupations
25: Educational Instruction and Library Occupations
49: Installation, Maintenance, and Repair Occupations
21: Community and Social Service Occupations
27: Arts, Design, Entertainment, Sports, and Media Occupations
Overall
33: Protective Service Occupations
43: Office and Administrative Support Occupations
51: Production Occupations
53: Transportation and Material Moving Occupations
31: Healthcare Support Occupations
35: Food Preparation and Serving Related Occupations
37: Building and Grounds Cleaning and Maintenance Occupations
39: Personal Care and Service Occupations
41: Sales and Related Occupations
45: Farming, Fishing, and Forestry Occupations
25th–75th percentile
Median
Mean
Overall mean

Career Bridge



Solar photovoltaic installers

Solar photovoltaic installers (SOC 47-2231)

- Over the past year there have been 330 workers in this occupation in Washington.
- Overall (employed all 4 quarters)
  - Average hourly rate is **$41.96** per hour with an average wage of **$80,284** per year.
  - Half of all workers earn between $33.06 and $50.47 per hour.
  - Half of all workers earn between $59,369 and $98,025 per year.
  - **38.8%** of individuals in this occupation have been employed for the past year.
- 23.9% of individuals in this occupation were exclusively employed full-time for the past year.
- 35.2% of individuals in this occupation were exclusively employed part-time for the past year.
- 26.1% of individuals in this occupation were employed in another occupation in the same quarter.

Wind turbine service techinicians

Wind turbine service technicians (SOC 49-9081)

- Over the past year there have been 275 workers in this occupation in Washington.
- Overall (employed all 4 quarters)
  - Average hourly rate is **$44.12** per hour with an average wage of **$97,042** per year.
  - Half of all workers earn between $35.52 and $49.16 per hour.
  - Half of all workers earn between $73,396 and $110,775 per year.
  - **56.4%** of individuals in this occupation have been employed for the past year.
- 46.2% of individuals in this occupation were exclusively employed full-time for the past year.
- 13.5% of individuals in this occupation were exclusively employed part-time for the past year.
- 10.6% of individuals in this occupation were employed in another occupation in the same quarter.

Electricians

Electricians (SOC 47-2111)

- Over the past year there have been 22,913 workers in this occupation in Washington.
- Overall (employed all 4 quarters)
  - Average hourly rate is **$56.66** per hour with an average wage of **$105,903** per year.
  - Half of all workers earn between $39.92 and $70.48 per hour.
  - Half of all workers earn between $70,240 and $134,442 per year.
  - **58.3%** of individuals in this occupation have been employed for the past year.
- 27.7% of individuals in this occupation were exclusively employed full-time for the past year.
- 27.3% of individuals in this occupation were exclusively employed part-time for the past year.
- 11.8% of individuals in this occupation were employed in another occupation in the same quarter.

Conclusion

- Employers in our state have stepped up to provide extensive occupational information
  - Washington state has the best/largest occupational reporting in the nation
- There are still coding system gaps in niche areas like clean energy
- Employment Security is investigating new methods to identify clean energy businesses and employment

Future work

- The strongest possible data will come from bringing together multiple sources of evidence

- Bringing it together
  - Identify niche clean energy technology businesses
  - Mark employment according to the CET niche
  - Create new data on the clean energy technology niche employment

- Other potential sources?

Longitudinal perspective

- With highly detailed administrative data, we can expand our perspective on individuals to entire careers
  - Employment stability

- Our new data product shows that many Washington state workers engage in multiple employment and/or work part-time

- Clean energy technology workers' careers

Employment Security Department
WASHINGTON STATE

Thank you!

Please feel free to contact lmir@esd.wa.gov with further questions.