

LEHD Program Overview: Data and Tools

Maryland State Data Center Annual Meeting

September 19, 2019

Baltimore, MD

Matthew Graham

matthew.graham@census.gov

Disclaimer

- Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.
- Additionally, these opinions and conclusions are not representative of other data products or programs within the Census Bureau.

Agenda

- LEHD Program Overview (5m)
- LEHD Origin-Destination Employment Statistics – LODES; OnTheMap (15m)
- OnTheMap for Emergency Management (5m)
- Job-to-Job Flows – J2J (5m)
- Post Secondary Employment Outcomes – PSEO (5m)
- Quarterly Workforce Indicators – QWI (5m)
- Q&A (10m)

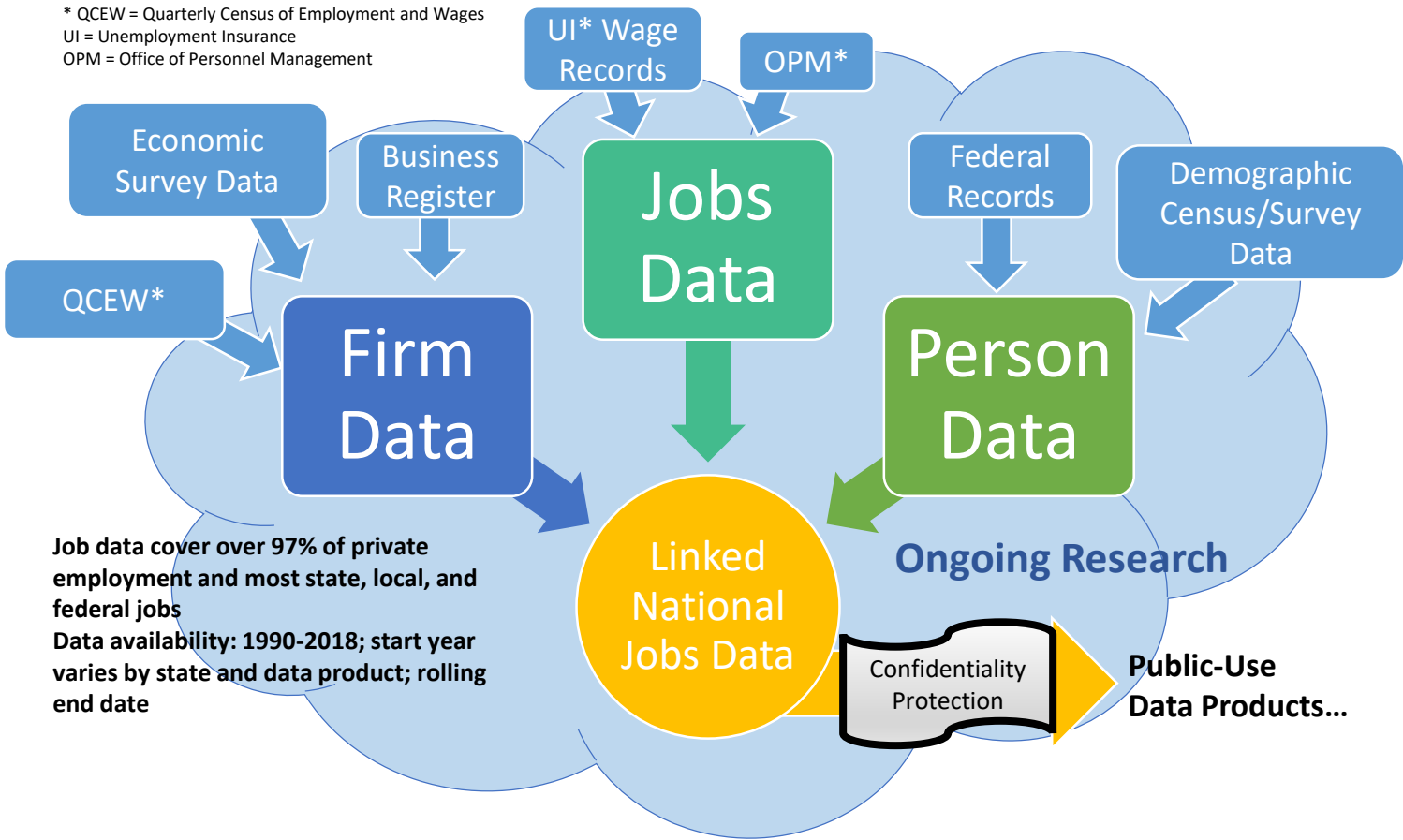
Lots of extra slides for reference!

LEHD Program Overview

What are LEHD and LED?

- LEHD (Longitudinal Employer-Household Dynamics)
 - The LEHD Program at the US Census Bureau has constructed unique linked employer-employee data for the United States.
 - It connects administrative records with census and survey data to produce new public-use data products as well as microdata for research.
- LED (Local Employment Dynamics) Partnership
 - LEHD accesses state data through the LED Partnership - a cooperative partnership with states and DC, PR, and USVI
 - State-provided data:
 - Unemployment Insurance (jobs/workers)
 - Quarterly Census of Employment and Wages (firms)
 - Other data available to the Census Bureau
 - Censuses, Surveys, and Tax Information

LEHD Data Infrastructure



Data Products

- Quarterly Workforce Indicators (QWI)
 - 32 indicators by
 - Industry (NAICS 2, 3, and 4-digit), Firm Age, Firm Size
 - Worker Age, Race, Ethnicity, Sex, Education
 - State, County, CBSA, WIB Area
 - >150 Million job records processed each quarter
 - Longitudinal series starts in 1990 for some states
- LEHD Origin-Destination Emp. Statistics (LODES)
 - Connects a job/worker's employment and residential locations
 - Data at census block detail
 - Less characteristic detail than QWI
- Job-to-Job Flows (J2J) – Beta
 - Flows between jobs as well as into/out of nonemployment
- Post-Secondary Employment Outcomes (PSEO) – Pilot
 - Provides earnings and employment outcomes for select college/university graduates by degree level, degree major, and post-secondary institution.

LEHD Data Products

What do you want?	Scope	Data Product
Employment, hires, separations, turnover, or earnings by detailed firm and person characteristics; quarterly time resolution; relatively short data lag	32 Indicators published quarterly, 150 million jobs records processed each quarter.	QWI
Employment for detailed or customized geography; residential patterns of the workforce; relationship between worker employment and home locations	Connects employment and residential locations, census block level.	LODES
Transitions between jobs by timing and firm or worker characteristics; transitions to/from nonemployment	Worker characteristics by firm characteristics.	J2J
Earnings outcomes for specific degree programs at selected colleges/universities	Earnings percentiles for specific grad. cohorts at certain times.	PSEO (pilot)

Dissemination Tools/Applications

- J2J Explorer (Beta)
 - j2jexplorer.ces.census.gov
 - Dashboard-style analysis tool for Job-to-Job Flows
- OnTheMap
 - onthemap.ces.census.gov
 - Map-based analysis tool for LODES
- OnTheMap for Emergency Management
 - onthemap.ces.census.gov/em.html
 - Integrates live feeds of emergency/disaster areas
- QWI Explorer
 - qwiexplorer.ces.census.gov
 - Dashboard-style analysis tool for QWI
- LED Extraction Tool
 - ledextract.ces.census.gov
 - Provides precise extracts of data (QWI only for now)
- PSEO Data Viz (Pilot)
 - lehd.ces.census.gov/data/pseo_beta_viz.html
 - Dynamic bar charts for Post-Secondary Employment Outcomes

Choosing Among LED Data Access Points

Data Product	Explore the data, answer questions, or get visualizations	Bulk data for use in analysis process/software	Live queries for building web applications
QWI	QWI Explorer	LED Extraction Tool Raw data download	Census Bureau API
LODES	OnTheMap OnTheMap for Emergency Management	Raw data download	Future development
J2J	Job-to-Job Explorer	Raw data download	Future Development
PSEO	PSEO Visualization Tool	Raw data download	Future Development

LEHD Origin-Destination Employment Statistics (LODES)/OnTheMap



LODES/OnTheMap Update

- Big News: LODES for 2016 and 2017 were released at the end of August.
 - Both in OnTheMap and raw data files.
- Additional releases:
 - Backfilled Wyoming data for 2014 and 2015
 - Updated to TIGER 2018 (only affects the operation of OnTheMap and the geography crosswalk provided with LODES data)
- Other key points of the update:
 - Data for Alaska and South Dakota are not available in 2017
 - Jobs for federal workers are not available in 2016 and 2017
 - The default Job Type of OnTheMap was changed to “Private Primary Jobs”

What is LODES?

(LEHD Origin-Destination Employment Statistics)

- Developed in mid-2000s as way to get spatially detailed commuting-like information from the LEHD data infrastructure
- Geographic patterns of jobs
 1. by employment locations
 2. and residential locations
 3. as well as the connections between the two
- Tabulated by several categorical variables
 - Age, Earnings, and Industry
 - Sex, Race, Ethnicity, and Education
 - Firm Age and Firm Size
 - Ownership, Job Dominance, and Job Type
- Raw data files available at: <https://lehd.ces.census.gov/data/#lodes>

Details About LODES

(See LODES 7.4 Documentation: <https://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.4.pdf> for more info.)

- Employment: Counts of “beginning-of-quarter” jobs
- Job Type:
 - A cross of ownership and job dominance (which job earns a worker the most \$)
- Labor Market Segment
 - 10 categories: 3 earnings, 3 industry, 3 worker age, 1 total
 - Used for both OD and residence/workplace margins
- Characteristics
 - 51 categories: 3 earnings, 20 industry, 3 worker age, 2 worker sex, 6 worker race, 2 worker ethnicity, 5 firm age, 5 firm size, 1 total
 - Used only on residence/workplace margins, crossed with labor market segments*

More Details About LODES

(See LODES 7.4 Documentation: <https://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.4.pdf> for more info.)

- File Types:
 - **rac** – Residence Area Characteristics
 - **wac** – Workplace Area Characteristics
 - **od** – Origin-Destination; 2 flavors:
 - **main** – Work in state and live *in state*
 - **aux** – Work in state and live *out of state*
- File organization:
 - State, file type, year, job type (ownership/dominance), labor market segment, characteristic
 - Example: `ak_rac_S000_JT00_2015.csv.gz` is a
 - Gzipped CSV file (“`.csv.gz`”) containing
 - Residence data (“`rac`”)
 - For Alaska (“`ak`”)
 - In the Total labor market segment (“`S000`”)
 - In 2015

LODES Coverage “Scorecard”

Year(s)	Count of Available States	Missing Employment in States/Territories ¹	Federal Jobs	Race, Ethnicity, Education, Sex variables	Firm Age, Firm Size variables ²
2002	46	Arkansas, Arizona, DC, Massachusetts, Mississippi	No	No	No
2003	47	Arizona, DC, Massachusetts, Mississippi	No	No	No
2004-2008	49	DC, Massachusetts	No	No	No
2009	49	DC, Massachusetts	No	Yes	No
2010	50	Massachusetts	Yes	Yes	No
2011-2015	51	(none)	Yes	Yes	Yes
2016	51	(none)	No	Yes	Yes
2017	49	Alaska, South Dakota	No	Yes	Yes

¹ Employment data in Puerto Rico and the U.S. Virgin Islands are missing from all years of LODES.

² Firm Age and Firm Size variables are only available on the All Private Job Type (JT02).

LODES Variable Crossings

Data Type	Residence Block	Workplace Block	Labor Market Segments	Characteristics		
			Total, Industry (3), Earnings (3), Worker Age (3)	Total, NAICS Sector (20), Earnings (3), Worker Age (3)	Race (6), Ethnicity (2), Education (4), Sex(2) ¹	Firm Age (5), Firm Size (5) ²
Origin-Destination (OD)	Yes	Yes	Yes	No		
Residence Area Characteristics (RAC)	Yes	No	Yes	Yes	Yes	No
Workplace Area Characteristics (WAC)	No	Yes	Yes	Yes	Yes	Yes

¹ Race, ethnicity, education, and sex: Only in available years.

² Firm age and firm size: Only in available years and only for All Private Job Type (JT02).

What is OnTheMap?

- OnTheMap provides a web application for interacting with the LODES data
- A resource for
 - mapping the employment patterns of workers
 - identifying small-area workforce characteristics
- Outputs maps, charts, tables, and some reports summarizing answers to questions where jobs are located and where workers holding those jobs live.
- OnTheMap Documentation:
<https://lehd.ces.census.gov/applications/help/onthemap.html>

Demo of OnTheMap

<https://onthemap.ces.census.gov/>

OnTheMap Basic Details

- All years of data (2002-2017) available.
- Only 4 of the 6 job types available (federal employment as a separate job type is not accessible via the application)
- 6 analysis types
- Any supported legal/statistical areas (20+) plus custom areas can be used for analyses
- Imports from various spatial data sources and exports to PDF, Excel, Images, etc.

LODES/OnTheMap References

- LODES

- [LODES Data Overview](#)
- [LODES Data Notices](#)
- [LODES Technical Doc](#)
- [Design Comparison of LODES and ACS Commuting](#)
- [Microdata Comparison of LODES and ACS Commuting](#)
- [LODES and Confidentiality Protection](#)
- [LED in Action: LODES](#)

- OnTheMap

- [OnTheMap Help](#)
- [OnTheMap Analysis Guides](#)
- [Additional OnTheMap Tutorials](#)
- [FAQs](#)
- [LED in Action: OnTheMap](#)

OnTheMap for Emergency Management

OnTheMap for Emergency Management

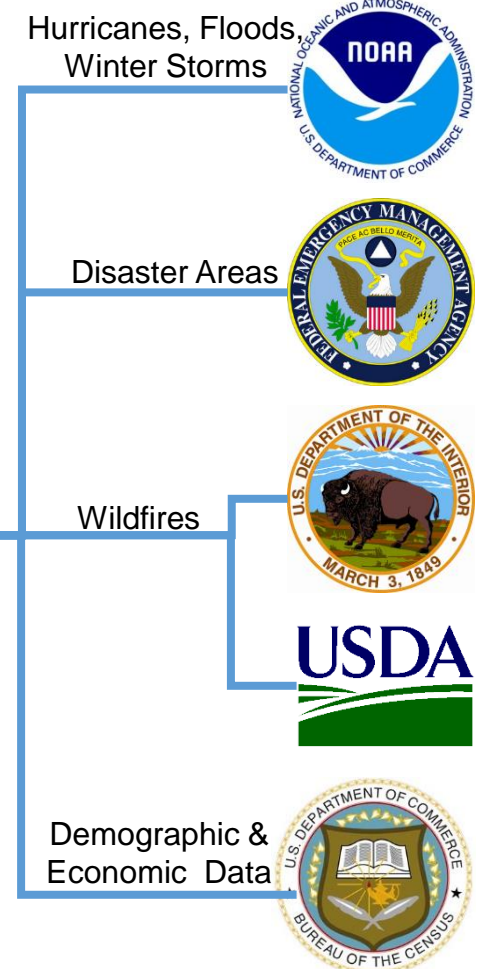
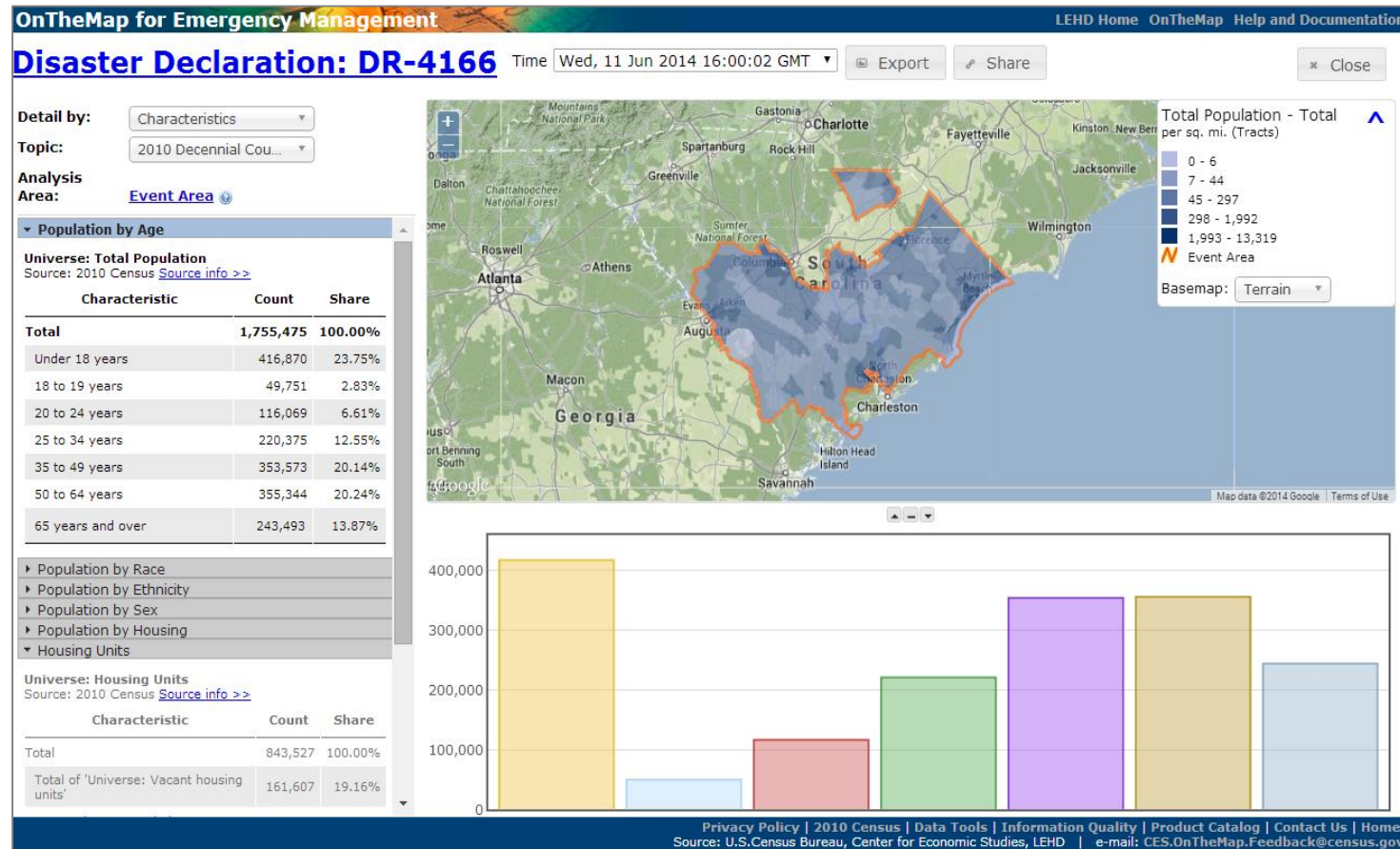
- Free public web application that gives emergency preparedness/disaster recovery analysts easy access to economic & demographic summaries for emergency events in near real time.
- Disseminates some statistics from 2010 Decennial, American Community Survey (ACS), and LEHD Origin Destination Employment Statistics (LODES).
- Automatically incorporates real-time weather and hazard event data from various authoritative federal sources into a single searchable archive and map display, for rapid access, visualization, and reporting.
- Building early LEHD tools (OnTheMap) resulted in lots of requests for analysis, particularly during emergency events or disasters.
- But we're not emergency management analysts...
 - So we built OnTheMap for Emergency Management to automate the mechanical work.

Details About OnTheMap for Emergency Management: Event Requirements*

- Clear Event Definition
- Scale Compatibility
- Data Access
- Event Identifiability
- Event Organizability

*See https://www.census.gov/ces/pdf/2013_CES_Research_Report.pdf (page 13) for more detail.

Details About OnTheMap for Emergency Management: Data Sources



Details About OnTheMap for Emergency Management: Geographic Approximation

- Event boundaries do not align with statistical boundaries...
- Many possibilities:
 - Inclusive?/Exclusive?
 - Minimize areal difference? Margin of error (MOE)?
 - Data-driven?
 - Deterministic/probabilistic?
- Methodology should be consistent with statistical constraints and be explainable to users.*

* Current methods are documented at

https://lehd.ces.census.gov/applications/help/onthemap_em.html#!methodology

Demo of OnTheMap for Emergency Management

<https://onthemap.ces.census.gov/em>

OnTheMap for Emergency Management References

- [OnTheMap for Emergency Management Help](#)
- [Application Overview](#)
- [FAQs](#)
- [About the Data Sources](#)
- [Detailing the Selection Methods](#)
- [Detailing the Statistical Methods](#)

Job-to-Job Flows (J2J)

Job-to-Job Flows

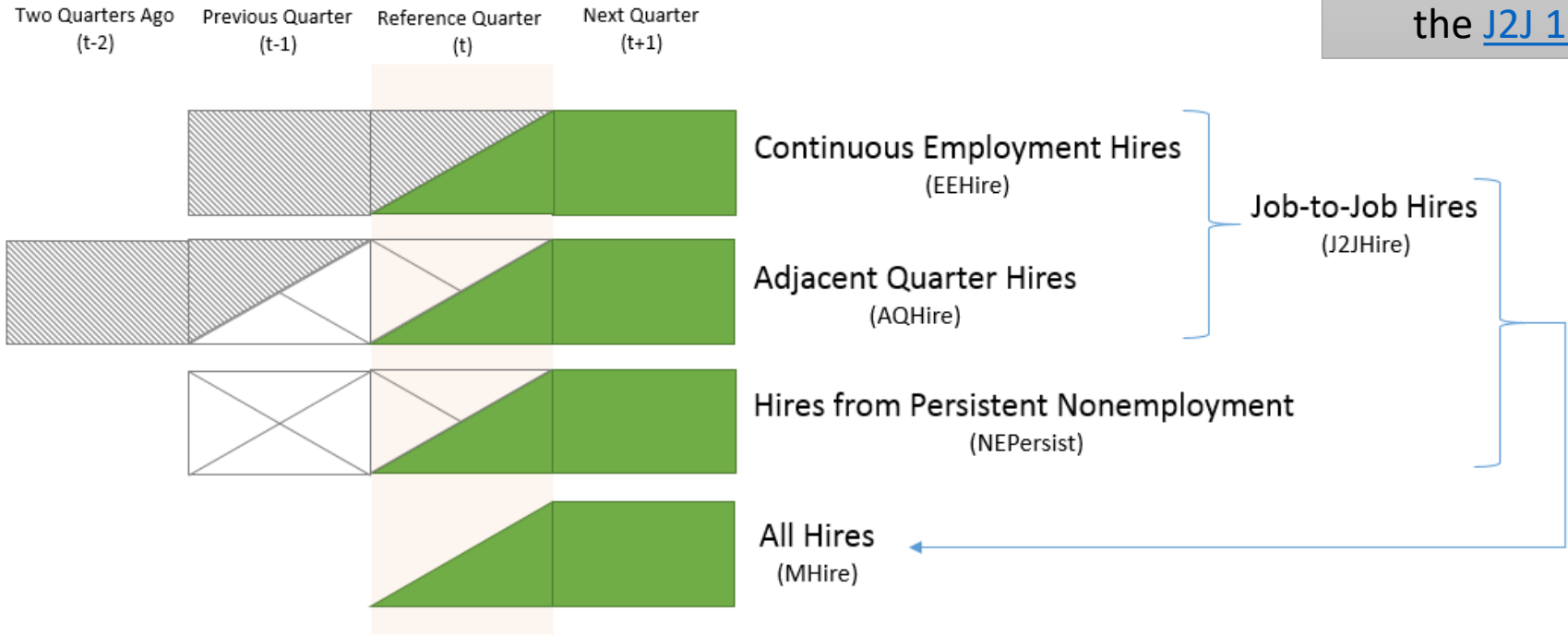
- Job-to-Job Flows (J2J) expands our understanding of the country's labor market by focusing on transitions into and out of jobs.
- Hires and separations are tabulated by worker origin and destination employment characteristics
- Key uses:
 - What labor markets are we losing workers to?
 - What industries are we attracting workers from?
 - Who is hiring workers from unemployment?

J2J Data

- More than 40 different measures of worker reallocation, data back to 2000 for some states, firm and worker characteristics, for national, state, and MSA tabulations. Recently expanded in scope.
- Data on worker reallocation (job mobility) – flows across employers, industries, and labor markets
- Tabulations released as counts (j2j), rates (j2jr), and origin-destination (j2jod)
- Raw data files: <https://lehd.ces.census.gov/data/#j2j>

Diagramming J2J Hires

NOTE: Diagrams like this appear as visual references in the [J2J 101 document](#).



Working for Firm A

Working for Firm B

Last quarter working for Firm A (Separation)

First quarter working for Firm B (Hire)

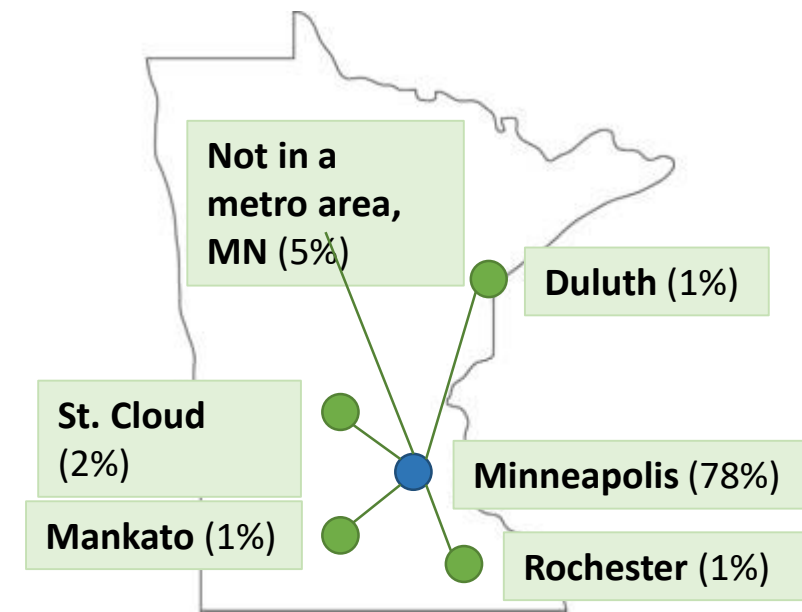
Period of Nonemployment

EEHire: Hires following a separation with no observed nonemployment spell
AQHire: Hires following a separation with a short nonemployment spell
J2JHire: Hires following a separation with a short or no observed nonemployment spell (sum of EEHire and AQHire)
NEPersist: Hires following a spell of persistent nonemployment
MHire: Hires into a worker’s main job (sum of J2JHire and NEPersist)
Note: “Separation” J2J Indicators are mirror images of the above indicators, except the separations take place in the reference quarter (t).

New J2J Tabulations

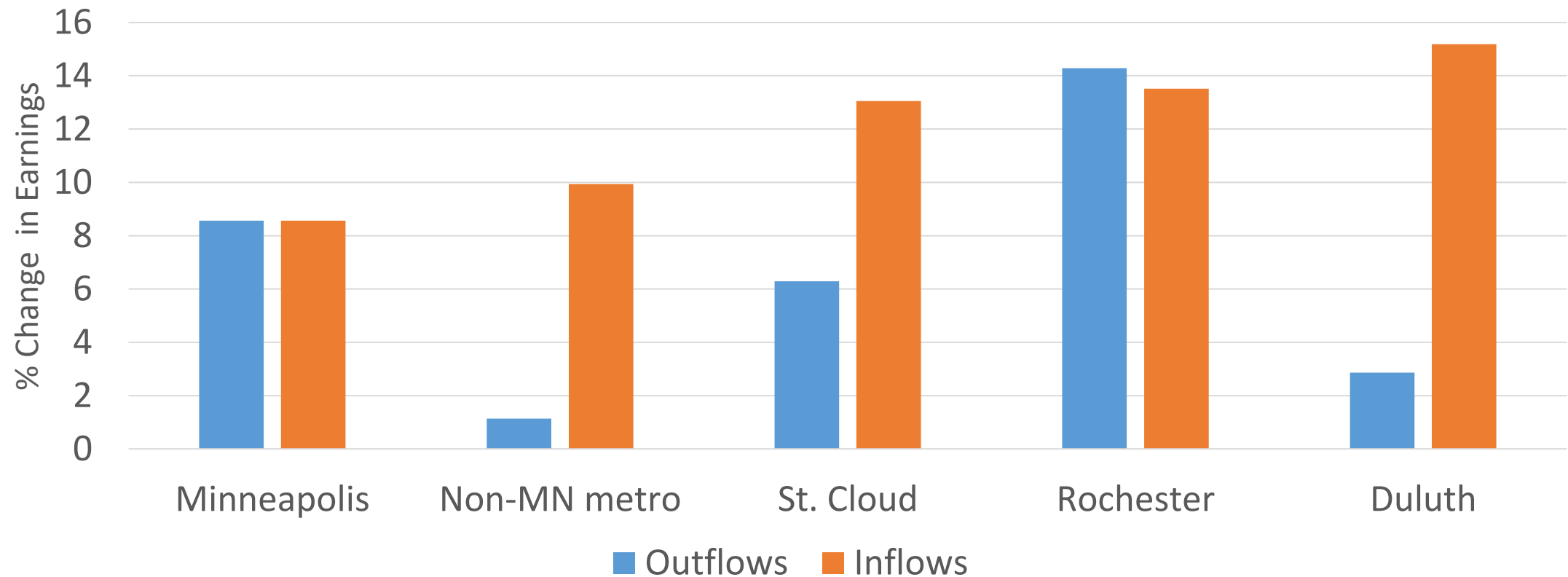
- Metro Area Tabulations
 - Count and origin-destination data
- Earnings Measures
 - Earnings by origin and destination job in OD data
 - Earnings for hires and separations as well as job stayers in count data
- More Detailed Cross-Tabulations
 - Industry by demographics

Workers
leaving/starting jobs
in Minneapolis went
to/came from jobs in...



New J2J Tabulations

Earnings increased more for job changers whose new jobs were in Minneapolis



J2J Explorer (Beta)

- ✓ 40 Measures of Worker Reallocation
- ✓ Six Visualization Modules with a flexible dashboard interface
- ✓ Export reports to Excel or CSV
- ✓ Trace worker movements through industries, geographic labor markets, and to/from employment
- ✓ Analyze/report by origin and destination geographies: national and state-level tabulations



- ✓ Analyze/report by origin and destination firm characteristics: NAICS Sector, firm age, and firm size
- ✓ Analyze/report by worker demographics: age, earnings, race, ethnicity, educational attainment, and sex
- ✓ Data updated every quarter

Demo of J2J Explorer (Beta)

<https://j2jexplorer.ces.census.gov/>

Job-to-Job Flows/J2J Explorer (Beta)

References

- Job-to-Job Flows
 - [J2J Data Info Page](#)
 - [J2J Data Notices](#)
 - [J2J 101 Document](#)
 - [J2J Original Research Paper](#)
 - [J2J “Relatedness” Diagram](#)
 - [LED in Action: J2J](#)
- J2J Explorer (Beta)
 - [J2J Explorer Help](#)
 - [Application Overview](#)
 - [J2J Explorer Analysis Guides](#)
 - [FAQs](#)

Post-Secondary Employment Outcomes (PSEO)

PSEO

- PSEO data provide earnings and employment outcomes for college and university graduates by degree level, degree major, and post-secondary institution.
- These statistics are generated by matching university transcript data with a national database of jobs, using state-of-the-art confidentiality protection mechanisms to protect the underlying data.
- Currently, PSEO data are available for the University of Texas System, higher education institutions in Colorado, University of Michigan, and University of Wisconsin, Madison.

PSEO Data

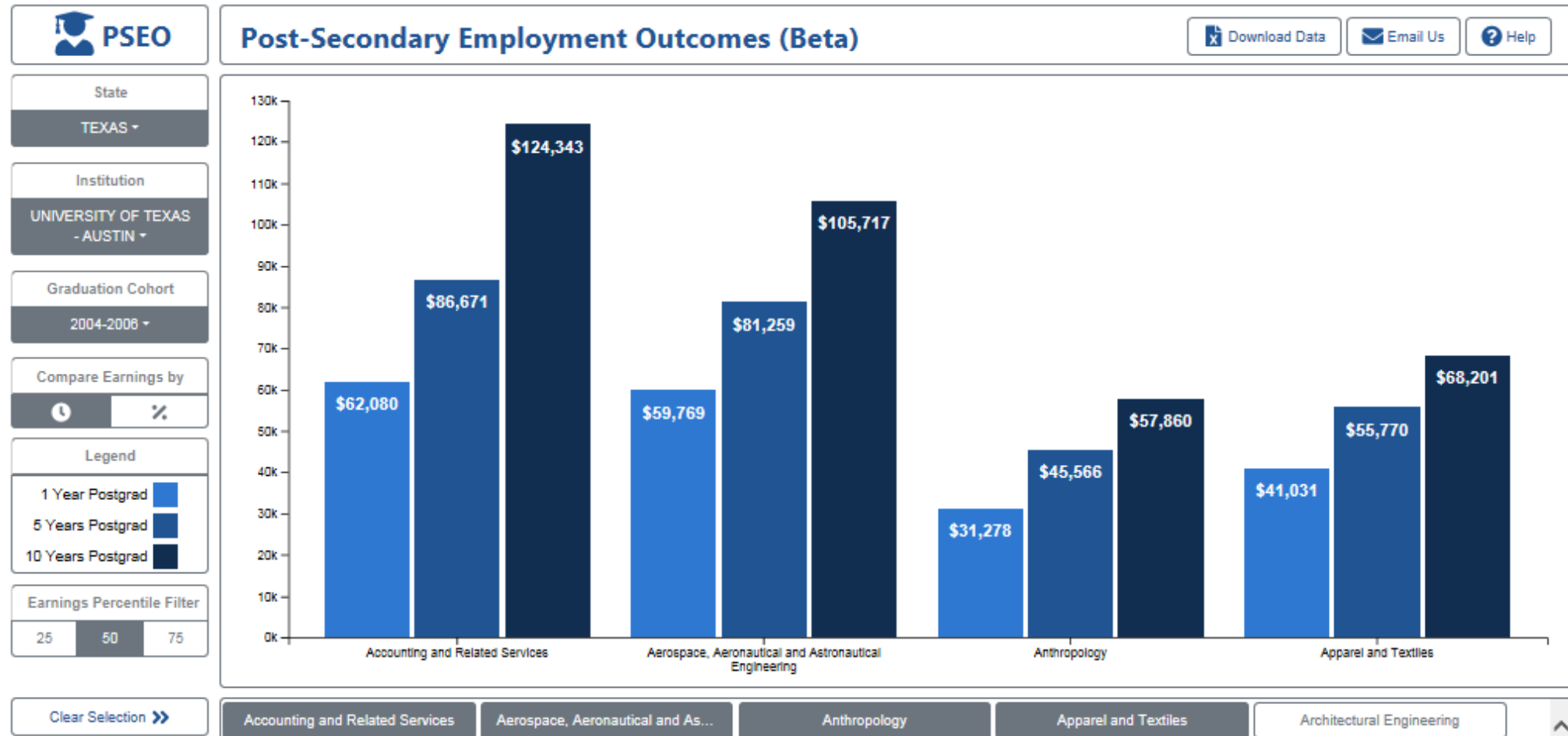
- Earnings are available at the
 - 25th, 50th, and 75th percentiles,
 - one, five, and ten years after graduation, by
 - institution, degree level, degree field, and
 - graduation cohort
- [Raw data download](#)
- [Latest schema for file layout](#)

Column	First Row from the Public Data
institution_id	1345
institution_name	ADAMS STATE COLLEGE
deglevl_code	03
deglevl	Associates
degcip_4dig	2401
ciptitle	LIBERAL ARTS AND SCIENCES, GENERAL STUDIES AND HUMANITIES
grad_cohort	1996
grad_cohort_label	1996-2000
year_postgrad	1
p25_earnings	
p50_earnings	
p75_earnings	
cellcount	
cell_suppressed	1
state	CO
system	cdhe
first_release	08242018
last_update	08242018
cpi_reportyear	2016

PSEO Visualization Tool

- PSEO is LEHD's simplest data product
- We wanted users to get started working with the data, without too much explanation required
- The user interface is flat, simple, and responsive – in keeping with the simplicity of the data.
- As the number of institutions covered by PSEO increases, we will keep the tool as simple and responsive as possible.

How Much are UT Austin Graduates Earning?



Demo of PSEO Viz Tool

https://lehd.ces.census.gov/data/pseo_beta_viz.html

**New Version
with FLOWS
Coming Soon!**

PSEO References

- [PSEO Data Info Page](#)
- [PSEO Data Files and Schema](#)
- [PSEO Confidentiality Protection System](#)
- [PSEO Viz Tool Tutorial](#)

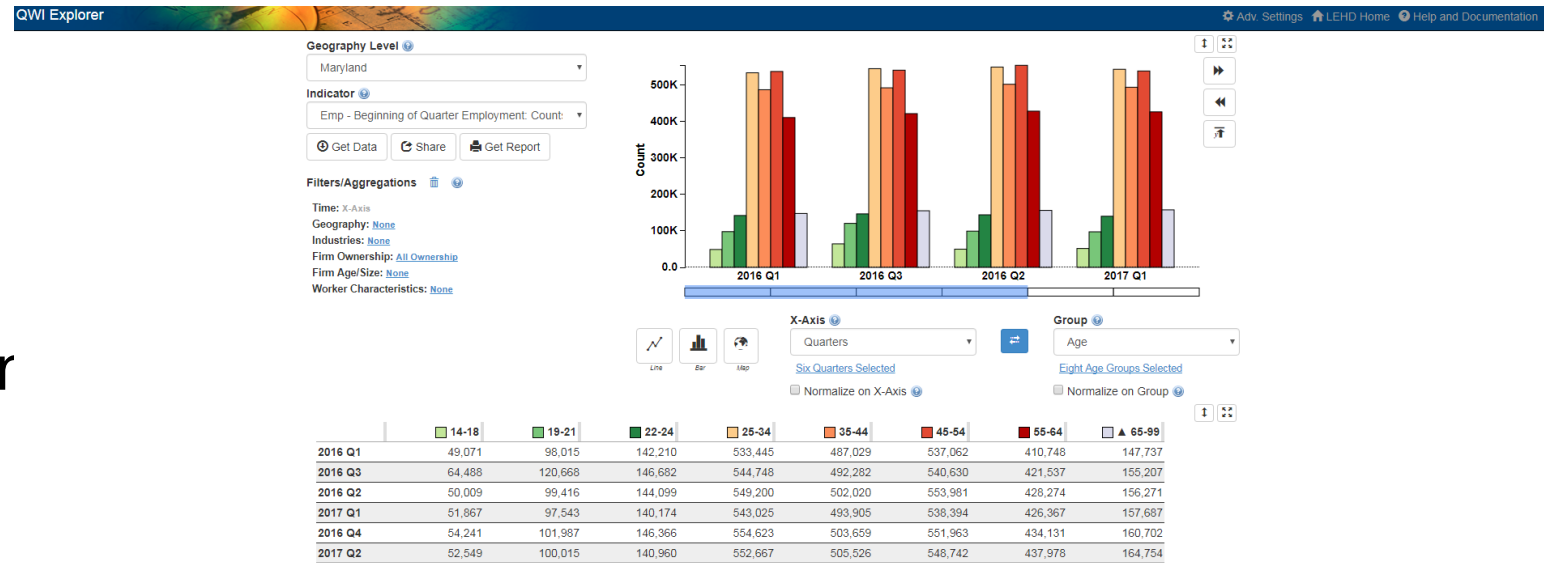
Quarterly Workforce Indicators (QWI)

QWI Data

- 32 economic indicators including employment, job creation, earnings, and other measures of employment flows
 - Multiple forms of each basic measure, differentiated by timing
- Reported by firm characteristics (geography, industry, age, size) and worker demographics information (sex, age, education, race, ethnicity)
 - Geographies: National, state, metro/micro, county, workforce investment board (WIB)
- Schema:
https://lehd.ces.census.gov/data/schema/latest/lehd_public_use_schema.html
- QWI available in analysis application, data cutting tool, zipped CSV files, and Census Bureau's API.

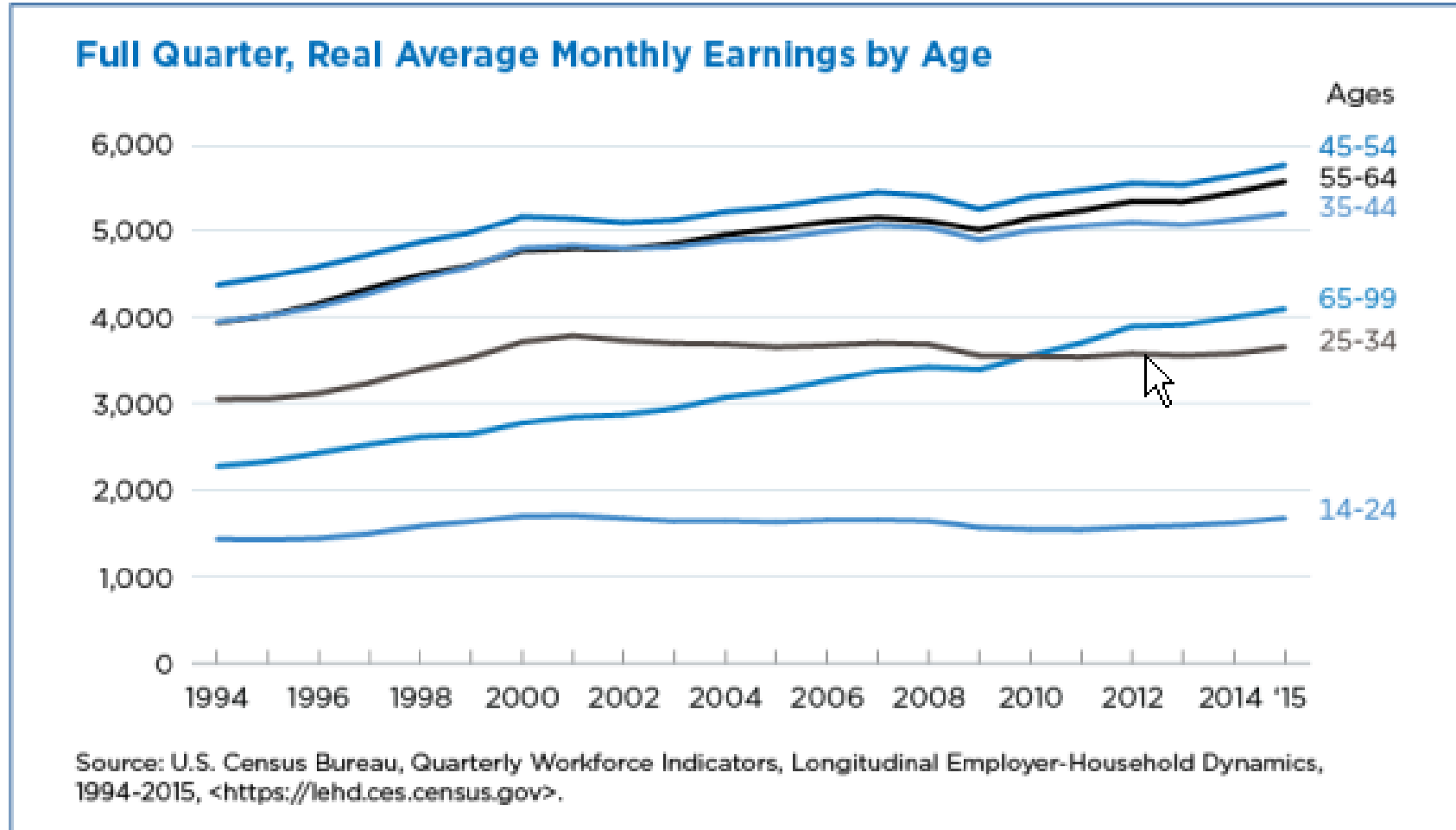
QWI Explorer

- ✓ 32 Quarterly Workforce Ir
- ✓ Flexible Pivot Table and Map/Chart interface
- ✓ Data on detailed interactions between firms and workers include employment, employment change (individual and firm), and earnings
- ✓ Analyze/report by worker demographics: age, earnings, race, ethnicity, educational attainment, and sex



- ✓ Analyze/report by firm characteristics: NAICS classification (sector, 3, 4), firm age, and firm size
- ✓ Quarterly data very current (9-12 months old)
- ✓ National and 50 states available (plus DC)

Average Monthly Earnings by Age



Demo of QWI Explorer

<https://qwiexplorer.ces.census.gov/>

LED Extraction Tool

- The LED Extraction Tool provides easy access to the Quarterly Workforce Indicators (QWI) dataset available through a simple query-building interface.
- The LED Extraction Tool provides:
 - Access to all 32 QWIs, all available years/quarters, all firm and worker characteristics, the Beta release of National QWI, and 50 states (plus the District of Columbia).
 - A streamlined interface that walks users through the process of selecting the data they need and ignoring the data they don't. Grab only a single tabulation, all the data for a particular cluster of industries or geographies, or a state's full longitudinal set of data using the intuitive query-building interface.
 - Fast processing of the requested data tables, which are available for download as CSV and/or ZIP files (complete with metadata).

Demo of LED Extraction Tool

<https://ledextract.ces.census.gov/>

QWI/QWI Explorer/LED Extraction Tool References

- QWI
 - [QWI Data Info Page](#)
 - [QWI Data Notices](#)
 - [QWI 101 Document](#)
 - [National QWI Information](#)
- QWI Explorer/LED Extraction Tool
 - [QWI Explorer Overview](#)
 - [QWI Explorer Help Page](#)
 - [LED Extraction Tool Overview](#)
 - [LED Extraction Tool Help Page](#)

Questions and Answers

Getting Help

- First: Read the Docs 😊
- Second: Email us!
 - LODES/OnTheMap/OnTheMap for Emergency Management: CES.OnTheMap.Feedback@census.gov
 - Job-to-Job Flows/J2J Explorer: CES.J2J.Feedback@census.gov
 - QWI/QWI Explorer/LED Extraction Tool: CES.QWI.Feedback@census.gov
 - General LEHD/LED Questions: CES.Local.Employment.Dynamics@census.gov
 - These email addresses are monitored by several people, so it's the fastest way to get a response.