The U.S. Department of Transportation provides over $51 billion in surface transportation construction funding each year to build, repair, and operate our Nation's highways, bridges, and public transportation systems. For every $1 billion in transportation infrastructure investments, 13,000 jobs are projected to be created over the next 10 years. In addition to these hundreds of thousands of jobs that will be created, transportation employers across the main subsectors of trucking, transit, air, highway, rail, and maritime will need to hire up to 4.6 million workers—1.2 times the current transportation workforce—in the next decade, due to the industry's employment needs that will result from growth, retirements, and turnover. Many of these individuals will require training to meet the skill requirements of transportation employers.

While demand for transportation workers will vary by region, subsector, and occupation, there will be a large number of job openings for high-skill and middle-skill workers across the transportation industry. Successful recruitment and upskilling of new and current workers who will be responsible for the operation, maintenance, and construction of the Nation's transportation infrastructure will be critical to a system that meets the economic and security needs of the 21st century.

The U.S. Departments of Education, Transportation, and Labor have worked together and with industry stakeholders to project the employment and skill needs of the transportation industry over the next 10 years, and to ensure that America has job-driven education and workforce development systems in place that can provide students, job seekers, and workers with the skills needed for these careers. At an October 2014 convening, the Departments presented and discussed a draft of these projections with industry, education, and workforce stakeholders.

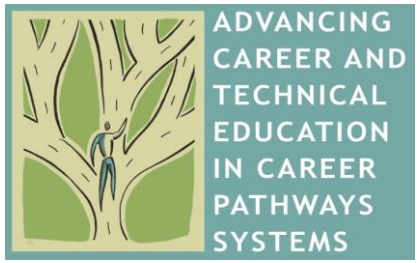
The collection and analysis of employment and skills data highlights the future growth areas and employment "hot spots" in transportation by industry subsectors, occupations, career areas, and geographic areas. It also emphasizes the need for skills training and Career Pathways across the transportation industry. The report identifies high-demand jobs with good wages, and analyzes the patterns in the education and work experience required for entry, as well as on-the-job training required for new entrants to gain full competency.

We present this report as a blueprint to the field for aligning investments in transportation with high-quality career pathways programs that can create ladders of opportunity for millions of Americans, while strengthening communities and meeting the demand for the movement of people and goods across the U.S. and the world.

Secretary Arne Duncan
U.S. Department of Education

Secretary Anthony R. Foxx
U.S. Department of Transportation

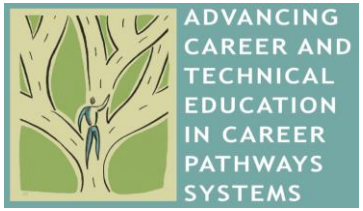
Secretary Thomas Perez
U.S. Department of Labor



STRENGTHENING SKILLS TRAINING AND CAREER PATHWAYS ACROSS THE TRANSPORTATION INDUSTRY

Data Report on Future Transportation Workforce Needs
August 2015

Introduction



As America's population grows, there is also a growth in transportation demand for moving both people and products. Transportation investments and policies can improve access to jobs, education, and goods movement, while providing construction and operations jobs. The choices that are made regarding transportation infrastructure can strengthen communities, create pathways to jobs, and improve the quality of life for all Americans.

While demand for transportation workers will vary by region, subsector, and occupation, these workforce changes will result in a large number of job openings for skilled and semi-skilled workers across the transportation sector over the next decade. The recruitment and training of new workers who will be responsible for the operation, maintenance, and construction of the nation’s transportation infrastructure will be critical.

This collection and analysis of employment and skills data for the transportation industry is laid out in this report, *Strengthening Skills Training and Career Pathways across the Transportation Industry*, highlighting the future growth areas or employment “hot spots” in transportation by industry subsectors, occupations, career areas, and geographic areas. It also identifies high-demand jobs with good wages and analyzes the patterns in the education and work experience required for entry, as well as On-the-Job training required for new entrants to gain full competency.

Six Transportation Subsectors

Six transportation subsectors have been identified as key for examination within the transportation industry (in the order of current employment from highest to lowest)[1]:

- **Trucking Transportation** (not including warehousing and logistics)
- **Transit and Ground Passenger Transportation** (including urban transit—privately and publicly operated[2], charter bus, taxis, interurban and rural bus, and school and employee transportation)
- **Air Transportation** (scheduled and nonscheduled air transportation, including airport operations, aircraft maintenance, and other support activities)
- **Highway Construction and Maintenance**
- **Rail Transportation**
- **Maritime Transportation** (Deep sea, coastal, great lakes, and inland water transportation, including ports)

Data Analysis

The data analysis highlights:

- Current industry employment, and worker distribution by age, sex, race, and ethnicity
- Projected industry and occupational job openings based on:
  - Net job growth
  - Separations (such as occupational transfers, retirement, and other exits)
- Job openings by career area (construction, operations, maintenance, central services, and other)
- Top occupations by sector, based on long-term projections
- Geographic “hot spots” for future transportation jobs
- Wages and Education/Work Experience/Training Requirements for high-demand transportation jobs
- Annual job openings compared to educational program completions

Key Sources

- Current Population Survey of the US Bureau of Labor Statistics (BLS) is used for the worker distribution by age and sex for all US industries (but not for the transportation industry or its six subsectors), and for worker distribution by race and ethnicity for transportation-related and all US occupations.
- Economic Modeling Specialists International (EMSI) reports[3] are used for customized analysis of data for the transportation industry and its six subsectors, including:
  - Worker distribution by age and sex
  - 2012–2022 projected industry and occupational job openings due to *growth*
  - 2012–2022 state and metropolitan employment growth
- 2012–2022 projected long-term job openings due to *separations* are based on researchers' analysis of EMSI reports and the BLS Employment Projections program: *Projected occupational separation rates, 2012–22 experimental data set*, http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014, this BLS experimental data set is generated using "a new method for measuring occupational separations that would replace the current method of measuring replacements needs," according to BLS. BLS announced in March 2015 that it is in the process of implementing this new method. Additional information about the implementation process will be available in the near future. Further description of this new method can be found at: http://www.bls.gov/emp/ep_separations.htm. The BLS official 2012–2022 projected job replacement rates are at: http://www.bls.gov/emp/ep_table_110.htm.

Key Data Limitations

- This analysis covers workers engaged in the transportation of people and goods. The following related sectors are not included in this specific report:
  - Warehousing and logistics
  - Manufacturers and suppliers of transportation vehicles and equipment such as aircraft manufacturing, shipbuilding, and bus and rail vehicle manufacturing
  - Sightseeing transportation, postal service, couriers, pipeline transportation, and other support activities for transportation [4]
- Occupational titles in this report are based on the Standard Occupational Classification (SOC). Accuracy of current employment and projections data are constrained by the SOC definitions and data collection methodologies of the data sources.
- Wage estimates are retrieved from EMSI Staffing Patterns reports, which are based on BLS's Occupational Employment Statistics and the American Community Survey.
  - Median annual wages are calculated by multiplying the national median hourly wage by a "year-round, full-time" hours figure of 2,080 hours.
  - Wage variations based on locality, employer, employment status, work hours, union representation, seniority, supply chain, and other factors are not reflected in these national median figures. Fringe benefits are also not included.

Note: Additional information on data sources, methodologies, and limitations are provided in Source under each figure and in the Endnote section.

Summary Findings: Growth

ADVANCING CAREER AND TECHNICAL EDUCATION IN CAREER PATHWAYS SYSTEMS

- Transportation is projected to add 417,000 net jobs from 2012 to 2022 due to industry growth (p. 17).
- Between 2012 and 2022, the average employment growth rate of 11 percent across transportation subsectors is similar to that of the entire economy (10.8 percent) and of the infrastructure industry (11 percent) which includes transportation, logistics, water, energy, telecommunications, and public works (p. 18)[5].
- Net transportation job growth will occur in all but two states between 2012 and 2022. Kentucky and Vermont will experience a slight decline but only by 1 percent. The fastest growth will occur on the West Coast, the Gulf Coast, the upper Mid-Atlantic, several Mountain States, and the Midwest (p. 23).
- Much of the regional transportation job growth is driven by growth in the large metropolitan areas within those regions. The highest number of job openings in transportation, including all six subsectors, will likely be generated in New York City, Dallas, Los Angeles, Houston, and Chicago between 2012 and 2022 (p. 24).

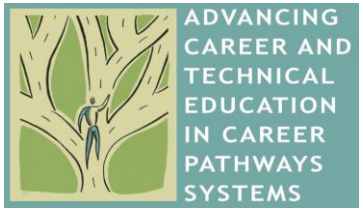
Summary Findings: Retirement and Separation

- In 2014, approximately 53 percent of current transportation workers are 45 years or older, which creates significant workforce development challenges. Transit (35 percent) and railroad (29 percent) respectively have the highest percentage of workers over 55 years old (p. 13).
- From 2012 to 2022, an additional 4.2 million transportation workers will need to be hired to fill vacancies created by separations (occupational transfers, retirement, and other exits) (p. 17).
- Combining growth and separations, transportation industry employers will need to hire approximately 4.6 million workers, an equivalent of 1.2 times the current transportation employment between 2012 and 2022. Transit and ground passenger transportation have the highest percentage of total job openings at 133 percent. Developing a qualified and trained workforce will be a critical task (pp. 17 and 18).

Unique Scenarios:

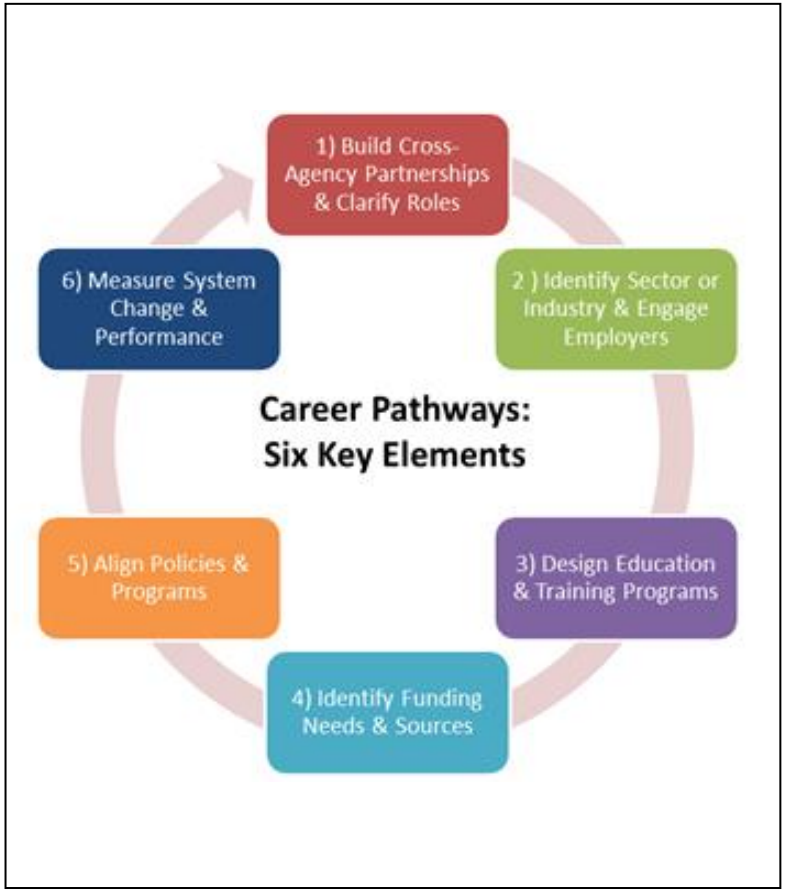
- In smaller sectors such as railroad and maritime, the effect of a large percentage of older workers retiring can be significant, even though the absolute number of job openings may not be large (pp. 17 and 18).
- Trucking has by far the largest number of projected 2012–2022 job openings. Combining growth and separations, over 2 million jobs will need to be filled (p. 17).

Summary Findings: Skilled Labor Shortage



- The jobs in greatest demand are semi-skilled and skilled jobs in operations and maintenance. For every future job opening in central services or construction in the transportation industry, there will be an estimated two jobs in maintenance and 21 in operations (pp. 21 and 22).
- Transportation jobs pay relatively well. Thirteen out of the top 20 highest demand transportation jobs pay above the median wage, sometimes substantially. Because union density in most transportation subsectors is much higher than in the general economy, many of these jobs include strong benefits in addition to good wages (p. 25).
- Preliminary analysis indicates that projected annual job openings are 68 percent larger than the number of students who are completing related educational programs annually across selected transportation occupational groups. This highlights a significant skills gap that must be addressed to meet expected industry demand (p. 26).
- While a high school diploma and demonstration of math and language proficiency is sufficient to gain access to many entry-level jobs in transportation, training through some combination of career and technical education programs, apprenticeships, or On-the-Job Learning is required to attain mastery (e.g., advancing from being a bus maintenance apprentice to a journeyperson technician). In some transportation crafts, there is a need to earn postsecondary certificates or other industry-recognized credentials prior to entering work. For instance, aircraft mechanics and service technicians are typically certified by the Federal Aviation Administration (pp. 25, 34, 43, 52, 61, 70 and 79).

Career Pathways Models



- Career and Technical Education programs of study, beginning in high school and continuing into postsecondary education or apprenticeship can provide the foundational and early occupational skills training needed in skilled occupations.
- Pre-apprenticeship programs for disadvantaged youth and adults can prepare low-skilled and underrepresented populations for entry into these skilled positions.
- Career Pathways systems* that are aligned with Registered Apprenticeship programs can expand the number of people who can access these high-demand jobs.
- Significant training at the workplace helps people move from novice to skilled practitioner in their craft.

*Definition of Career Pathways can be found at: http://s3.amazonaws.com/PCRN/docs/RPOS_2012/Joint_Letter_Career_Pathways.pdf

Table of Contents

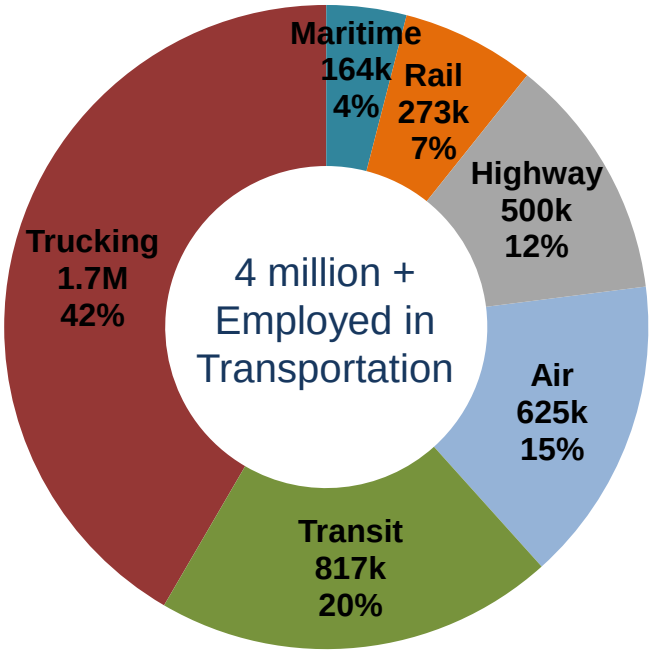
Overview: Six Subsectors of the U.S. Transportation Industry

- Trucking Transportation
- Transit and Ground Passenger Transportation
- Air Transportation
- Highway Construction and Maintenance
- Rail Transportation
- Maritime Transportation

Overview: Transportation

A. Current: Share of Industry Employment

2014 Share of Current Industry Employment

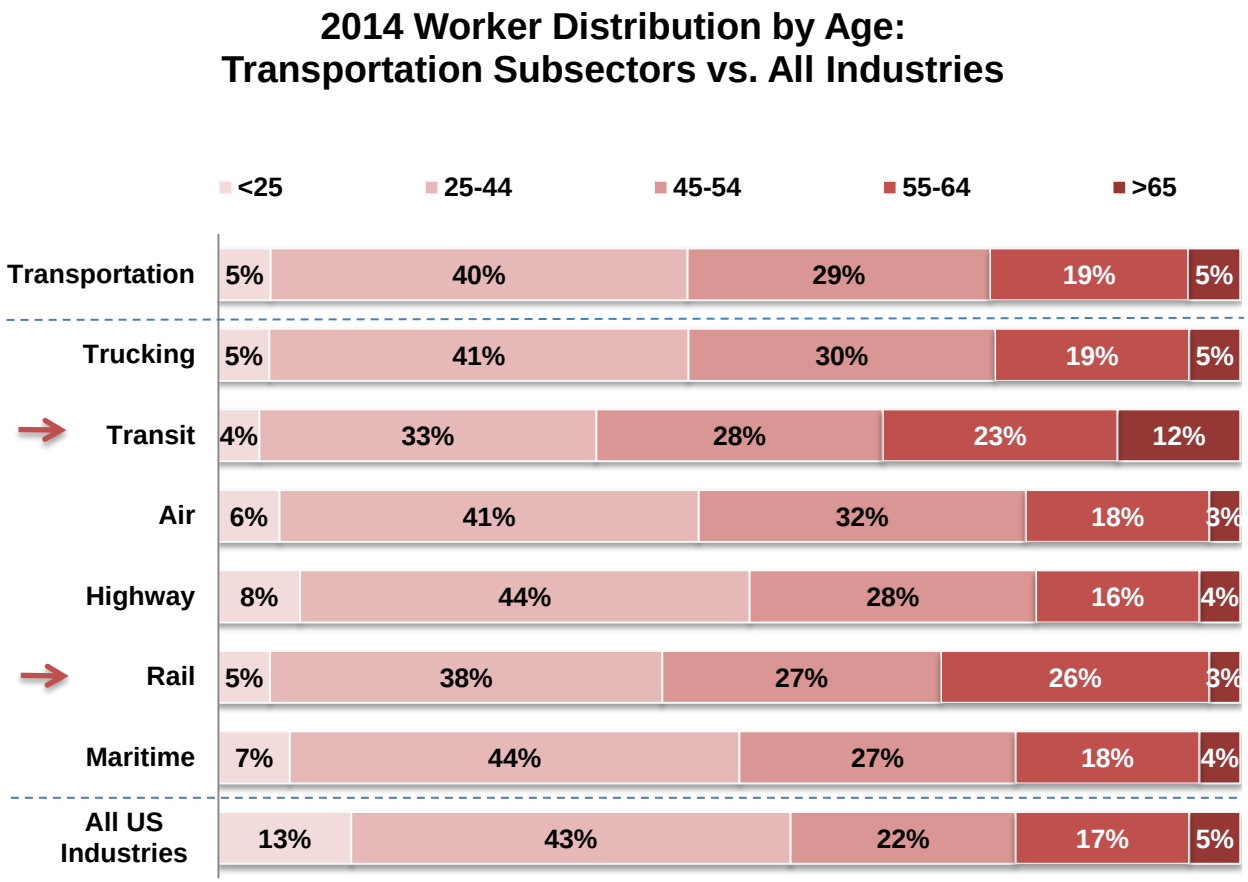


- In 2014, the six subsectors in the transportation industry employed just over 4 million employees, roughly 3 percent of the total non-farm national economy.
- With 1.7 million currently employed, trucking takes up the largest share of the total transportation employment (42 percent). Transit and ground passenger transportation follows with 20 percent of the total share and 817,000 employees.
- Railroad and maritime transportation represent the two smallest sectors among the six, accounting for 7 percent and 4 percent of the overall transportation employment.

Source: Transportation Learning Center (TLC) and Jobs for the Future (JFF) analysis based on EMSI 2014 Industry Report.
Data retrieved from EMSI in June 2014.

Overview: Transportation

B. Current: Worker Distribution by Age [6]

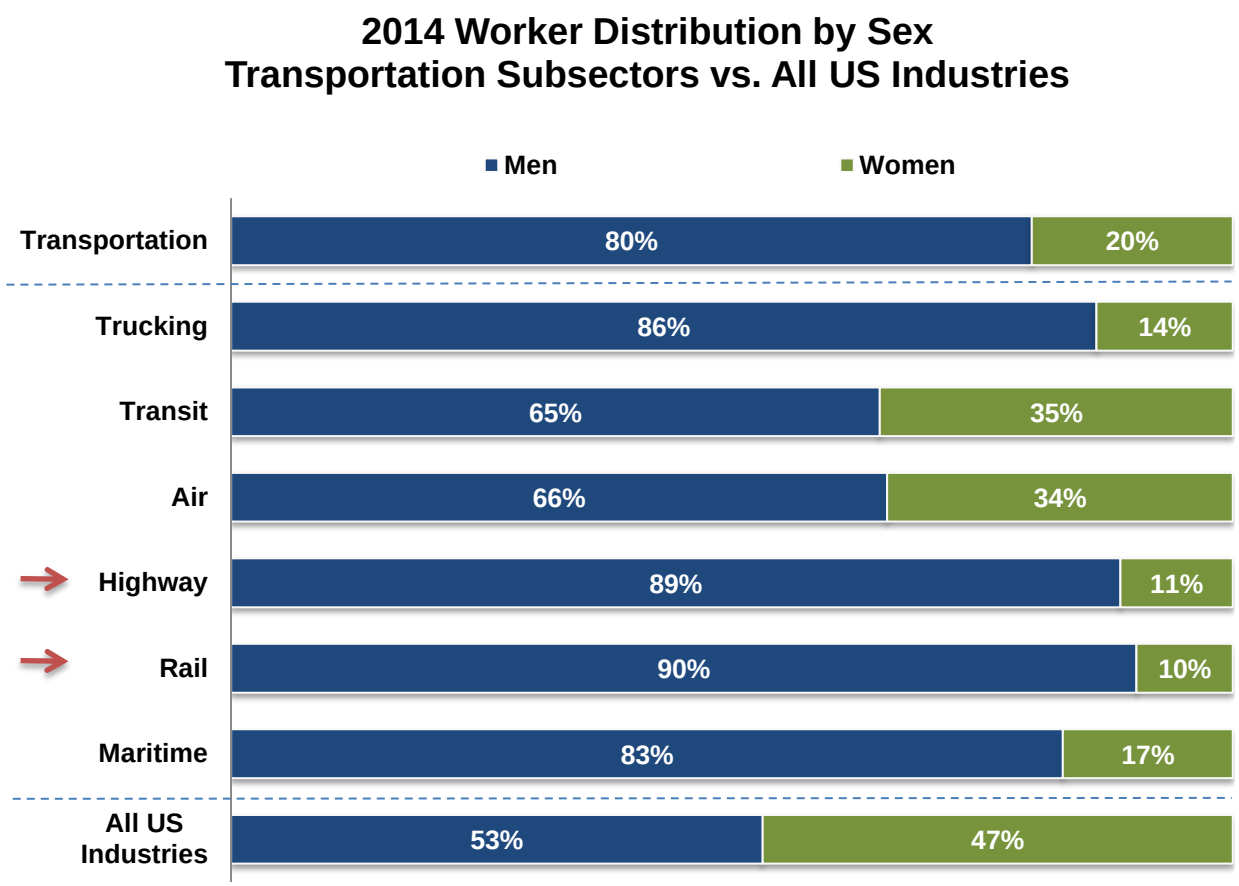


- Fifty-three percent of current workers within the six subsectors are 45 years or older, 9 percent more than the national average. The need to replace retiring workers creates significant workforce development challenges.
- Transit (35 percent) and railroad (29 percent) respectively have the highest percentage of workers over 55 years old.

Source: Worker distribution by age data for transportation and its six subsectors from TLC and JFF analysis of EMSI 2014 Industry Report. Highway data from EMSI Industry Report on Highway, Street and Bridge Construction. Data retrieved from EMSI in June 2014. Data for All US Industries from TLC and JFF analysis of BLS published table, *Employment status of the civilian noninstitutional population by age, sex, and race, Annual Averages 2014*, (Current Population Survey), retrieved from BLS.gov in June 2015. Percentages may not add up to 100 percent due to rounding.

Overview: Transportation

C. Current: Worker Distribution by Sex

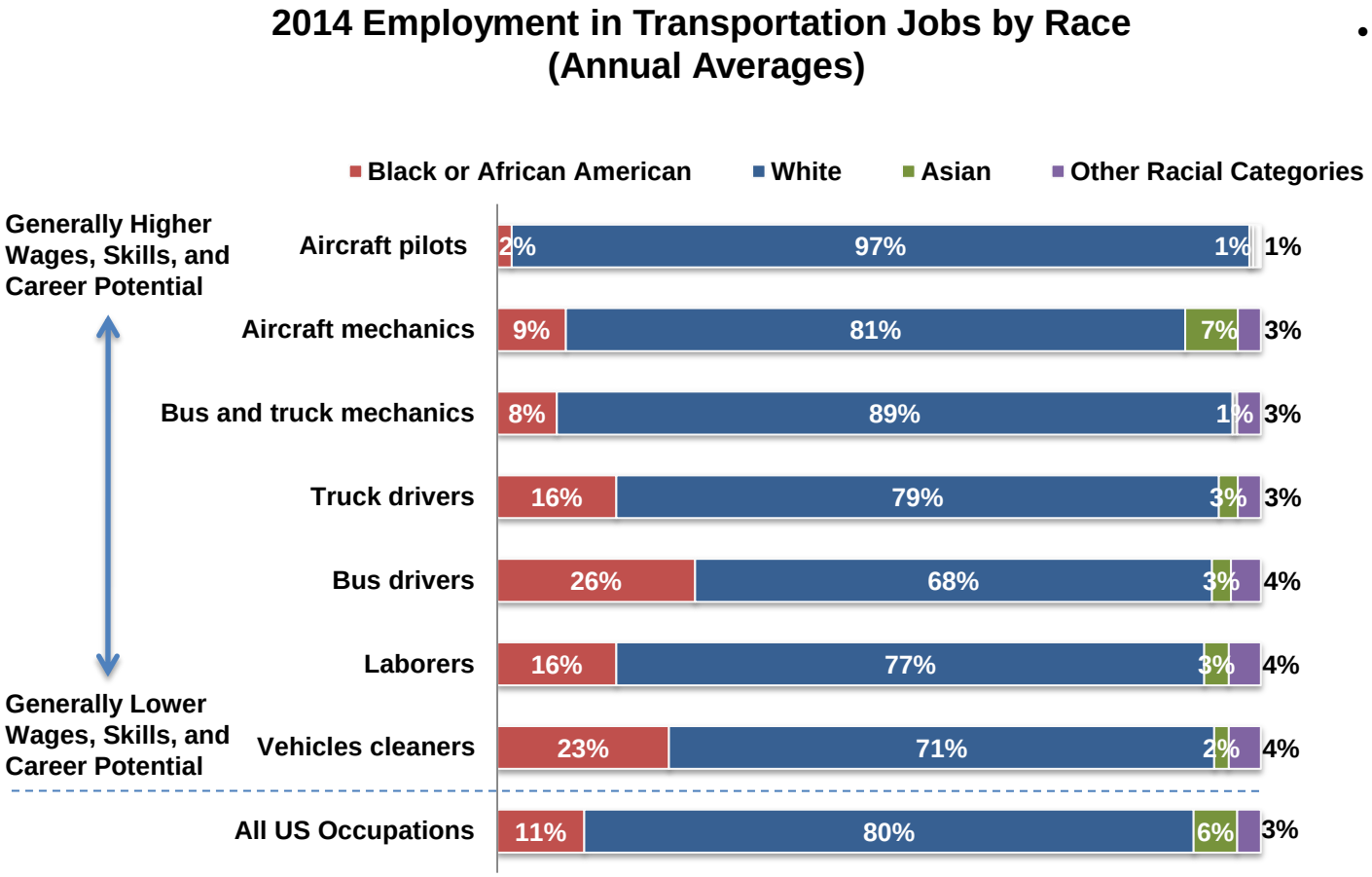


- In 2014, women comprised 47 percent of the US total employment.
- Women are highly underrepresented throughout the transportation industry.
- The largest gender gap exists in railroad and highway construction where only 10 percent and 11 percent of the workers are women.
- At 35 percent and 34 percent, transit and air have relatively higher shares of women employees, yet still significantly lower than the national average.

Source: Worker distribution by sex for transportation and its subsectors from TLC and JFF analysis of EMSI Industry Reports. Highway data from EMSI Industry Report on Highway, Street and Bridge Construction. Data retrieved from EMSI in June 2014. Worker distribution by sex for All US Industries from BLS published table, *Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity, 2014 Annual Averages* (Current Population Survey), published on February 12, 2015. Percentages may not add up to 100 percent due to rounding.

Overview: Transportation

D. Current: Worker Distribution by Race [7]

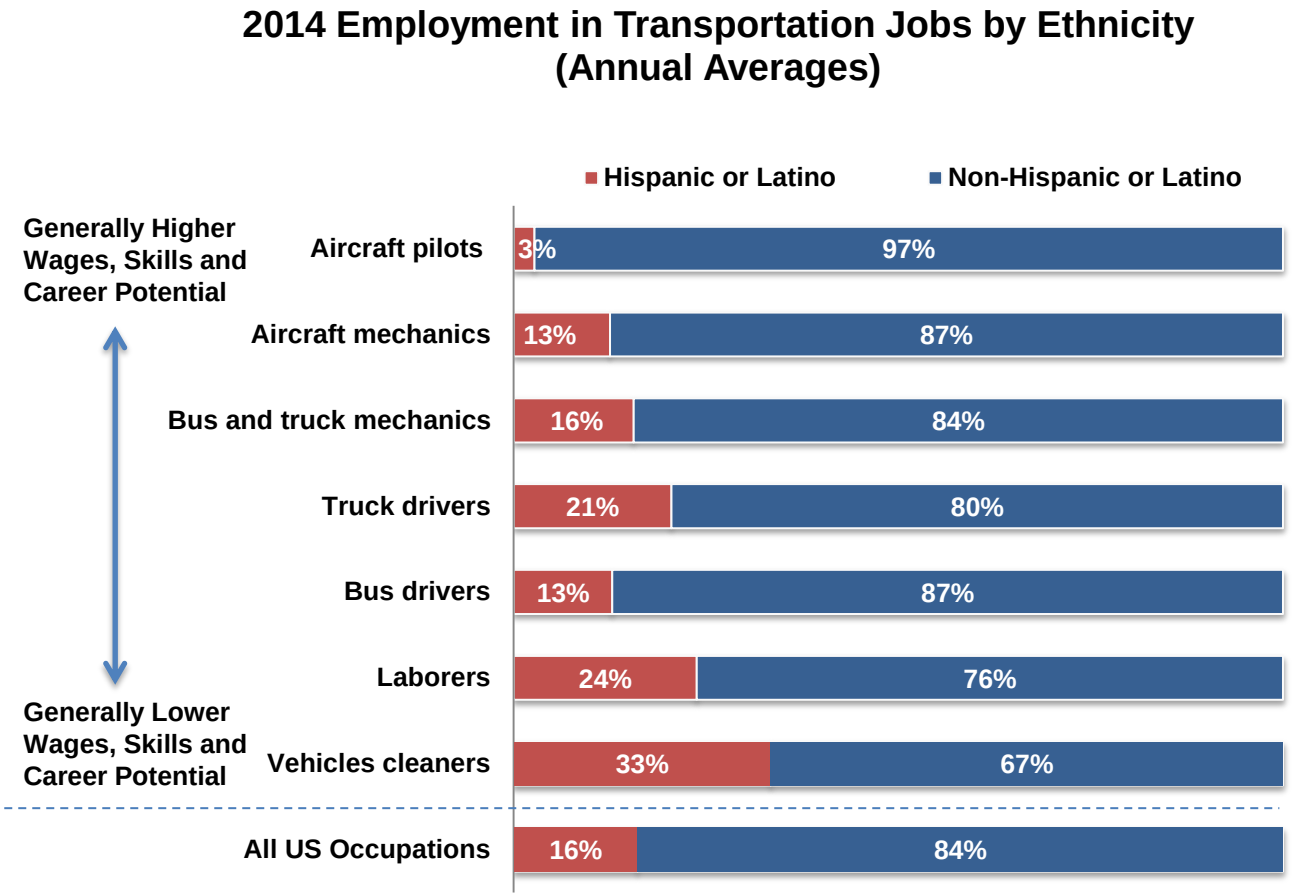


Source: All data from BLS unpublished data table *Employed and experienced unemployed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2014* (Current Population Survey). Percentages may not add up to 100 percent due to rounding.

- Analysis of the employment of racial and ethnic groups in selected transportation occupations, as illustrated in Charts D and E indicates that African-Americans and Hispanics are underrepresented in jobs that generally require higher skills, pay better wages, and provide more career ladder opportunities.

Overview: Transportation

E. Current: Worker Distribution by Ethnicity [7]

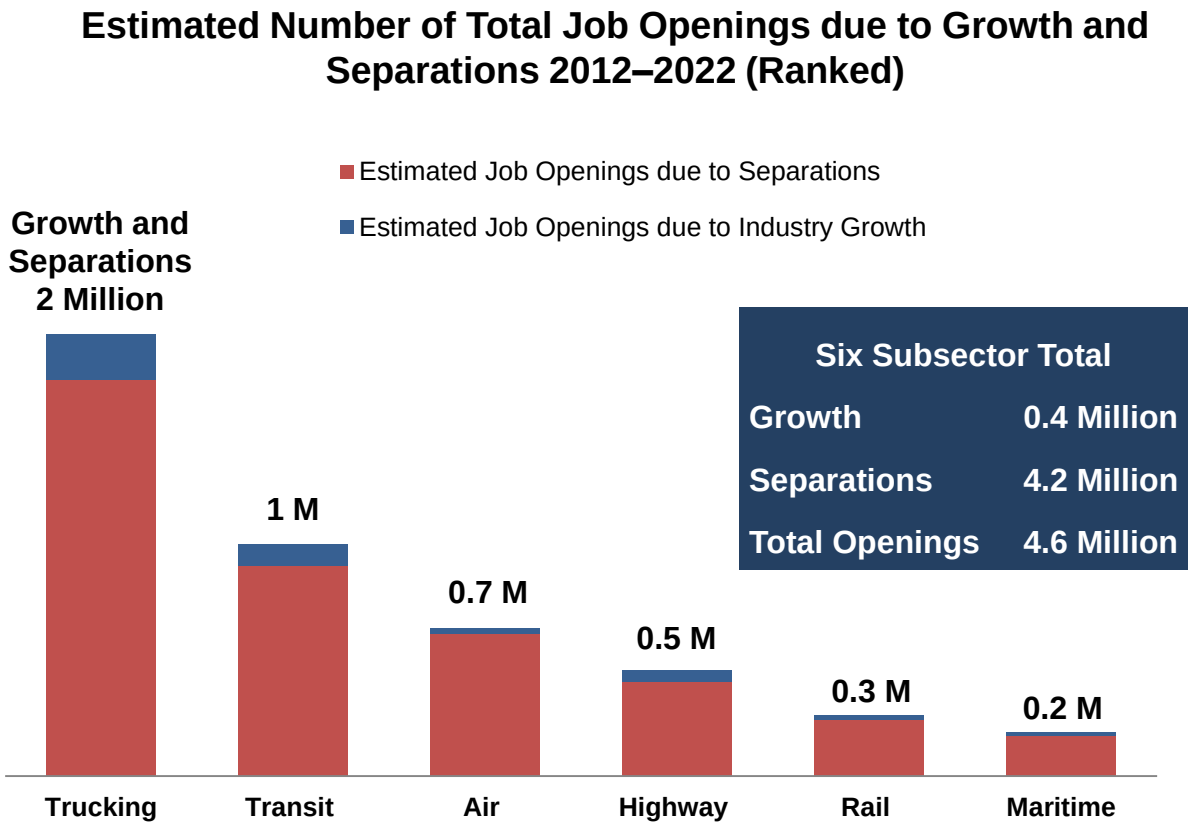


Source: All data from BLS unpublished data table *Employed and experienced unemployed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, Annual Average 2014* (Current Population Survey). Percentages may not add up to 100% due to rounding.

- Analysis of the employment of minorities and ethnic groups in selected transportation occupations, as illustrated in Charts D and E indicates that African-Americans and Hispanics are underrepresented in jobs that generally require higher skills, pay better wages, and provide more career ladder opportunities.

Overview: Transportation

F. Long Term: Estimated Number of Total Job Openings due to Growth and Separations [8]

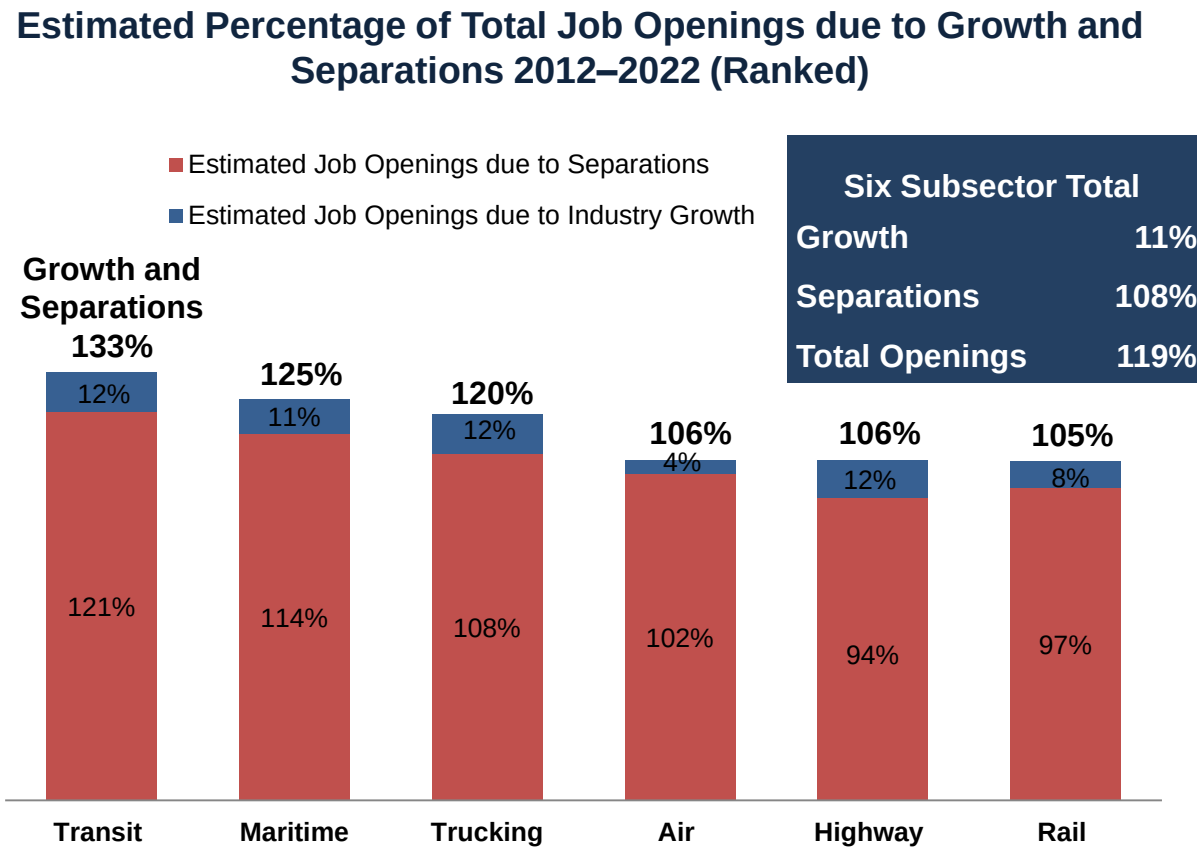


- Transportation is projected to add 417,000 net jobs from 2012 to 2022 due to industry growth. An additional 4.2 million workers will be needed for openings created by separations (occupational transfers, retirement, other exits).
- Trucking has the largest number of projected job openings from 2012 to 2022. Combining growth and separations, over 2 million openings will need to be filled.
- In smaller sectors such as railroad and maritime, the effect of a large percentage of older workers retiring can be significant, even though the absolute number of job openings may not be as large.

Source: Subsector job openings due to *growth* based on TLC and JFF analysis of EMSI Industry Report. Data retrieved from EMSI June 2014. Subsector job openings due to *separations* based on TLC and JFF analysis of EMSI Industry Report and Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

Overview: Transportation

G. Long Term: Estimated Percentage of Total Job Openings due to Growth and Separations [8]

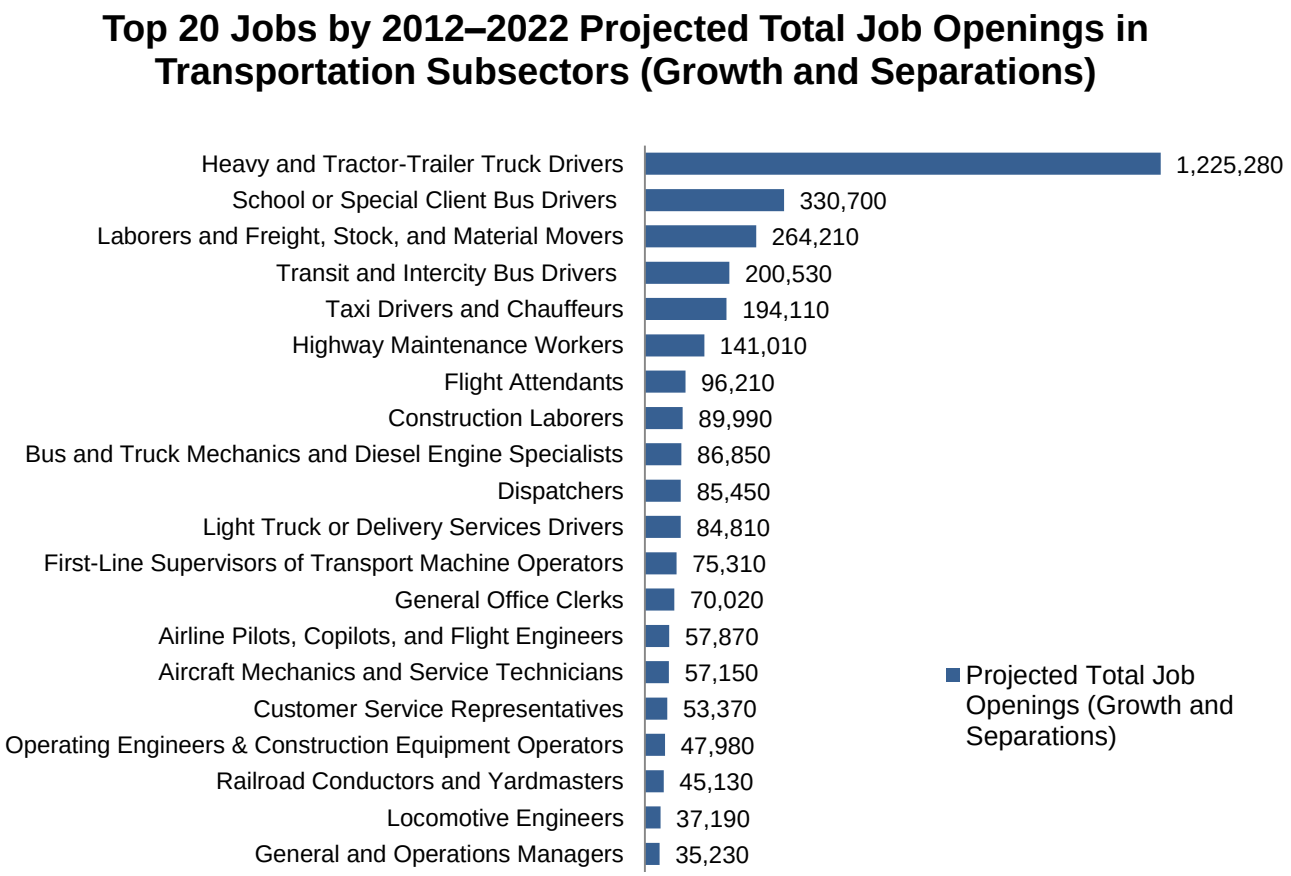


Source: Subsector job openings due to growth based on TLC and JFF analysis of EMSI Industry Report. Data retrieved from EMSI June 2014. Subsector job openings due to separations based on TLC and JFF analysis of EMSI Industry Report and Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- The average employment growth rate of 11 percent across transportation subsectors is similar to that of the entire economy (10.8 percent) and the infrastructure industry (11 percent) which includes transportation, logistics, water, energy, telecommunications, and public works.
- However, transportation industry employers will need to hire an equivalent of 1.2 times the current employment, to meet the needs of growth and separations between 2012 and 2022.
- Transit and ground passenger transportation has the highest percentage of total job openings at 133 percent.

Overview: Transportation

H. Long Term: Top 20 Jobs by Projected Total Job Openings in Transportation Subsectors [9]

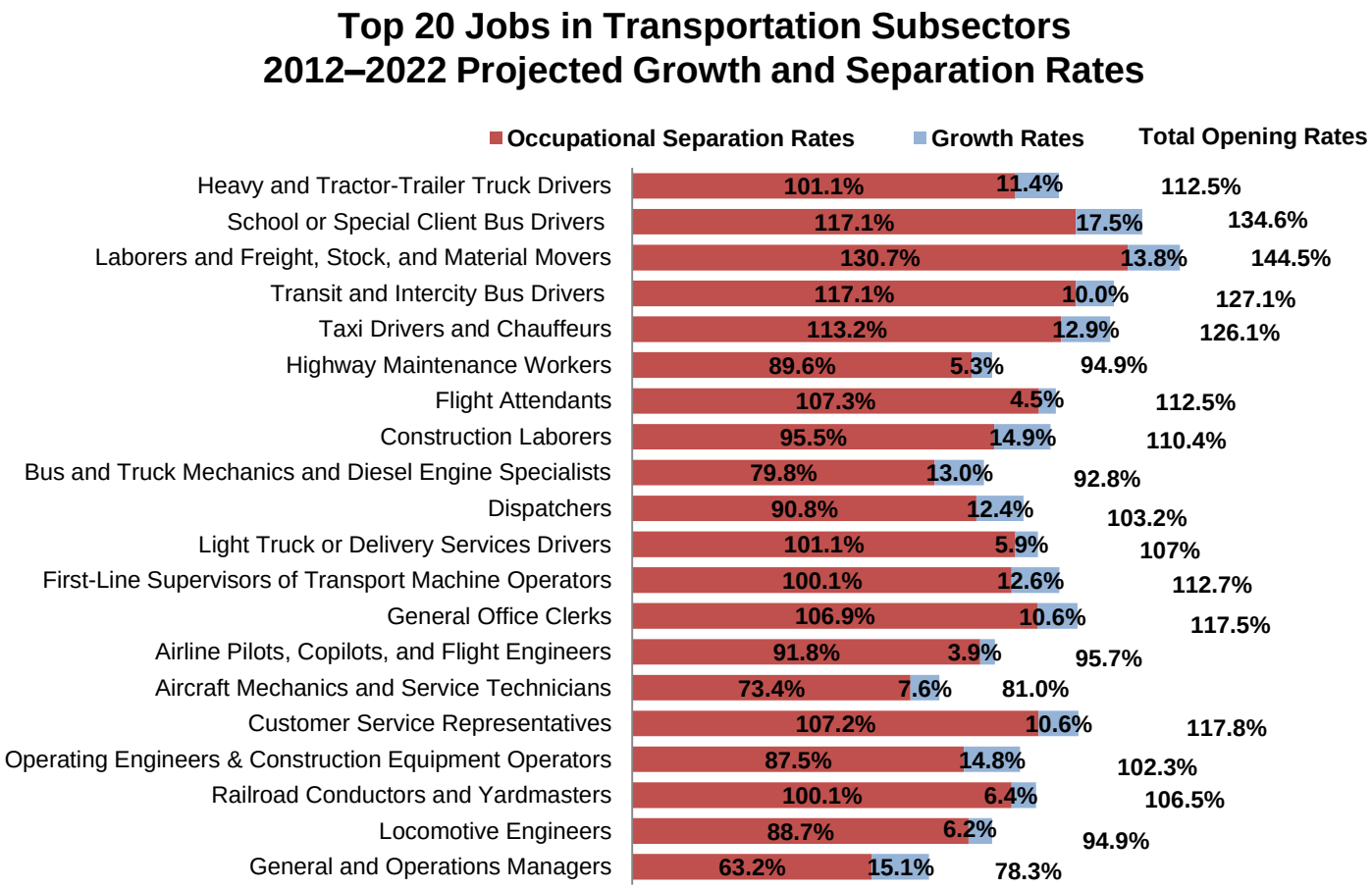


- Heavy truck drivers account for one-third of the projected total job openings among the top 20 transportation occupations.
- Other occupations with high projected demand include school and transit bus drivers, taxi drivers, transportation laborers, and highway maintenance workers.

Source: Occupational job openings due to *growth* are based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* are based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

Overview: Transportation

I. Long Term: Projected Growth and Separation Rates of Top 20 Jobs



Source: Occupational employment *growth* rates based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational *separation* rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- Moderate growth rates (blue bars) are expected among the top 20 occupations in the six subsectors, ranging between 3.9 percent and 17.5 percent.
- Separation rates (red bars), which include transfers out of the occupations and labor force exits (e.g., retirement and death) are as high as 130.7 percent.
- Growth and labor force separation rates combined can be as high as 144.5 percent, indicating a major need to recruit new workers to fill these jobs.

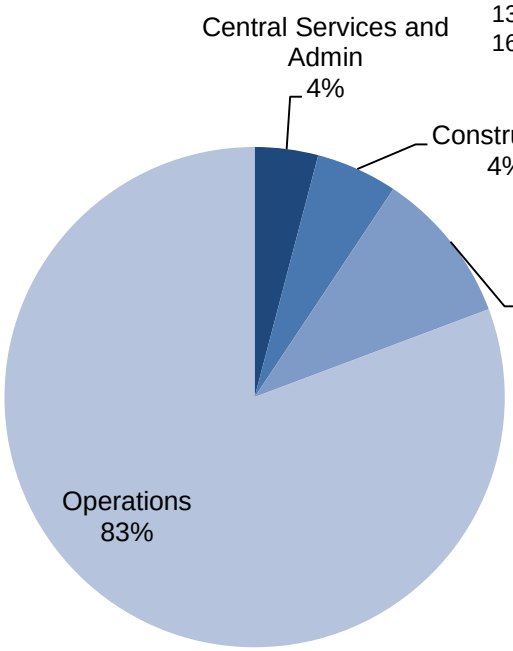
Overview: Transportation

J. Long Term: Projected Total Job Openings by Career Area

Top 20 Jobs in Transportation Subsectors Based on 2012–2022 Projected Job Openings Share by Career Area

Operations (13 titles of Top 20 jobs):

1. Heavy and Tractor-Trailer Truck Drivers
2. School or Special Client Bus Drivers
3. Laborers and Freight, Stock, and Material Movers
4. Transit and Intercity Bus Drivers
5. Taxi Drivers and Chauffeurs
7. Flight Attendants
10. Dispatchers
11. Light Truck or Delivery Services Drivers
12. First-Line Supervisors of Transport Machine Operators
14. Airline Pilots, Copilots, and Flight Engineers
18. Railroad Conductors and Yardmasters
19. Locomotive Engineers
20. General and Operations Managers



Central Services (2 titles of Top 20 jobs):

13. General Office Clerks
16. Customer Service Representatives

Construction (2 titles of Top 20 jobs):

8. Construction Laborers
17. Operating Engineers and Construction Equipment Operator

Maintenance (3 titles of Top 20 jobs):

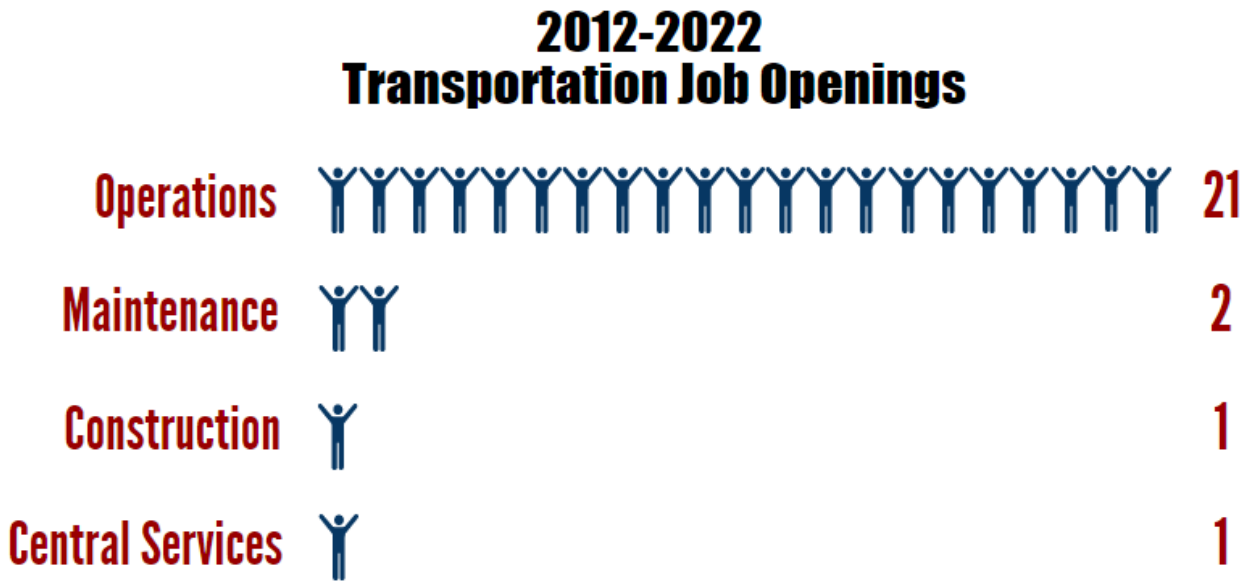
6. Highway Maintenance Workers
9. Bus and Truck Mechanics and Diesel Engine Specialists
15. Aircraft Mechanics and Service Technicians

- Future transportation job openings, like current transportation jobs, will be concentrated in frontline areas—with 96 percent of the openings in the top 20 occupations falling in operations, maintenance, and construction.
- Only 4 percent of the new openings will be in central services and administration.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Percentages may not add up to 100 percent due to rounding.

Overview: Transportation

K. Long Term: Ratio of Projected Total Job Openings by Career Area

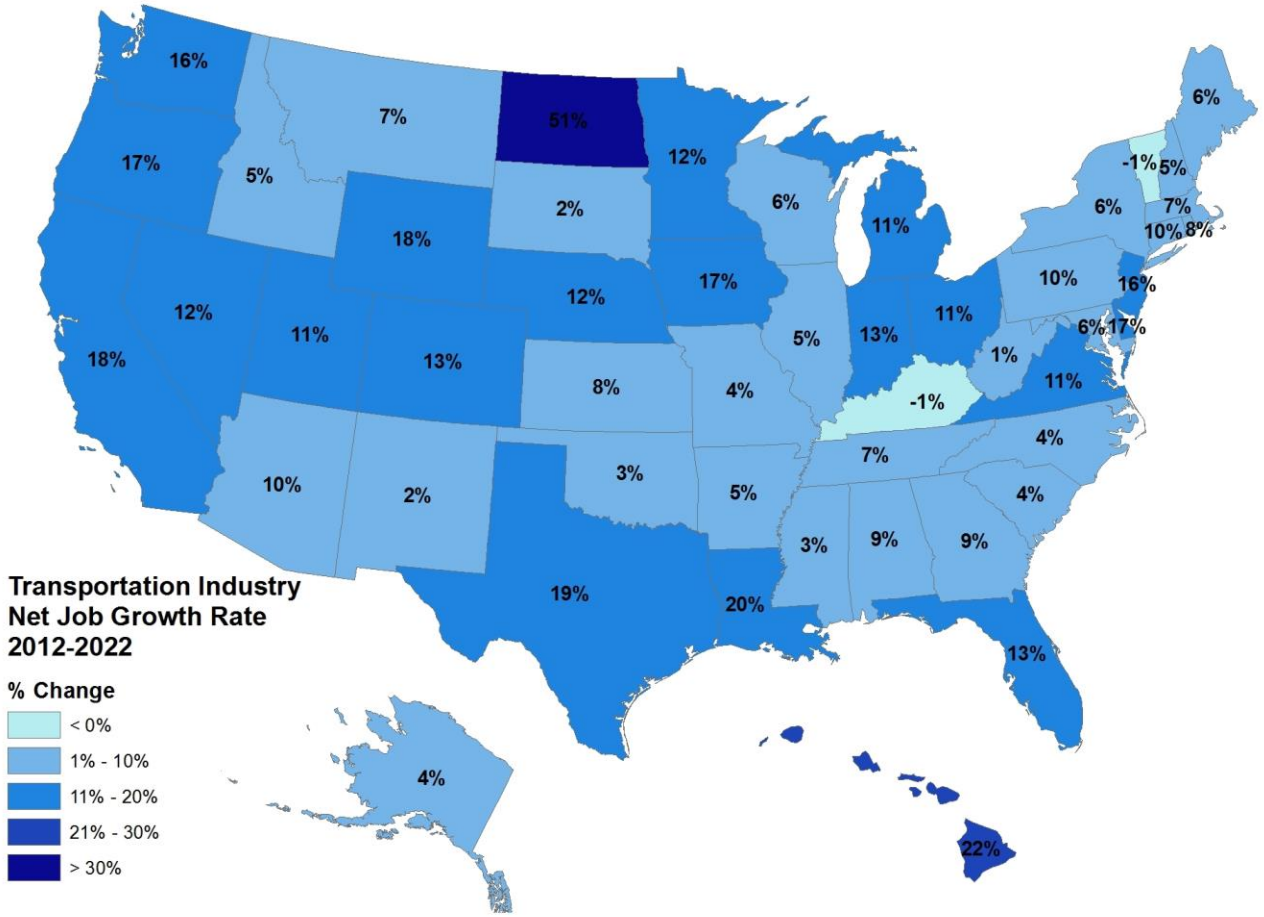


- Based on the analysis of the top 20 transportation jobs with the largest projected openings, for every future job opening in central services or construction in the transportation industry, there will be an estimated two jobs in maintenance and 21 in operations.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

Overview: Transportation

L. Long Term: 2012–2022 Projected Net Job Growth Rate by State

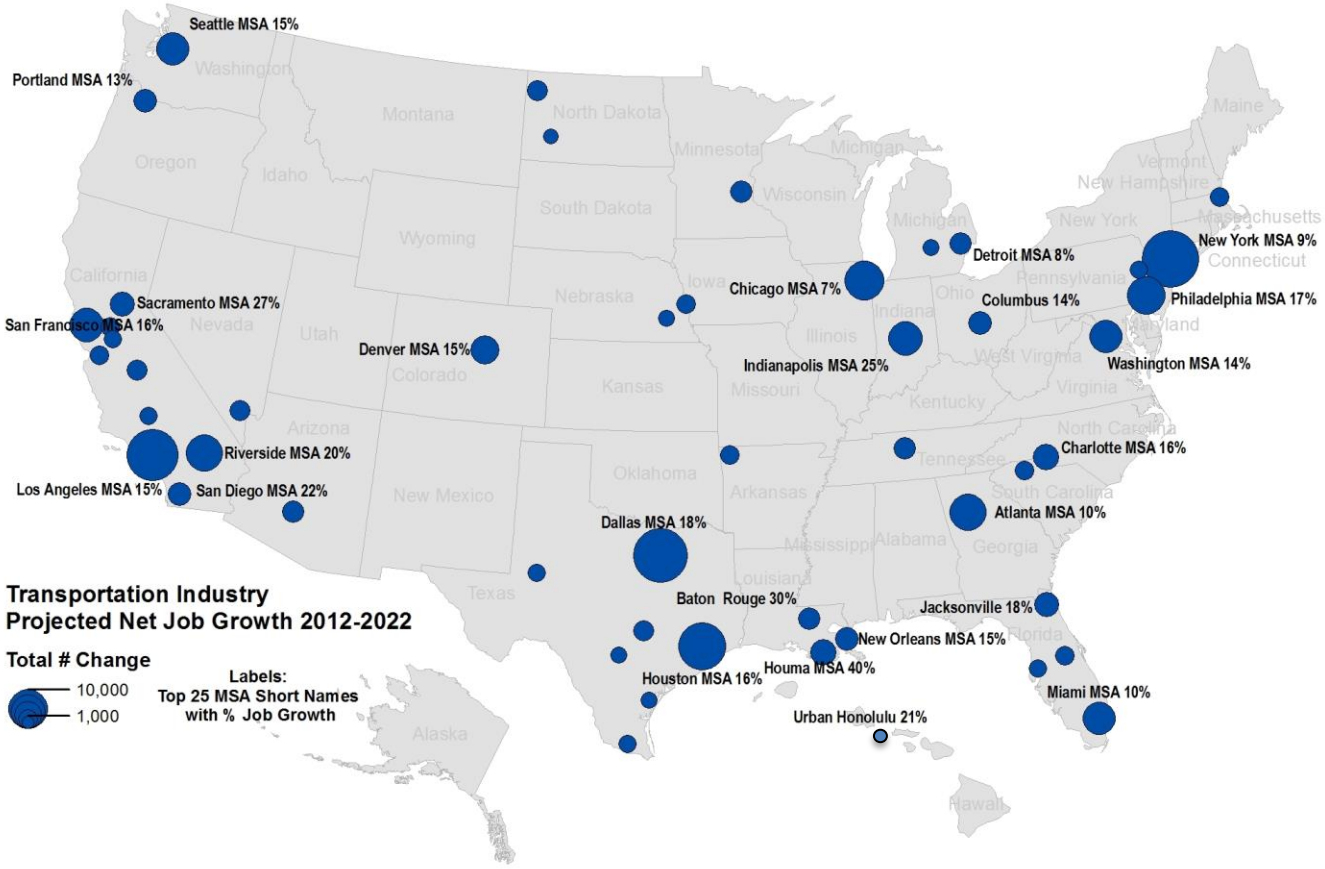


- Net transportation job growth will occur in all but two states between 2012 and 2022. Kentucky and Vermont will experience a slight decline but only by 1 percent.
- The fastest growth will occur on the West Coast, the Gulf Coast, the upper Mid-Atlantic, several mountain states, and the Midwest.
- The highest percentage growth will occur in North Dakota, caused by the oil boom.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

Overview: Transportation

M. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 labeled)

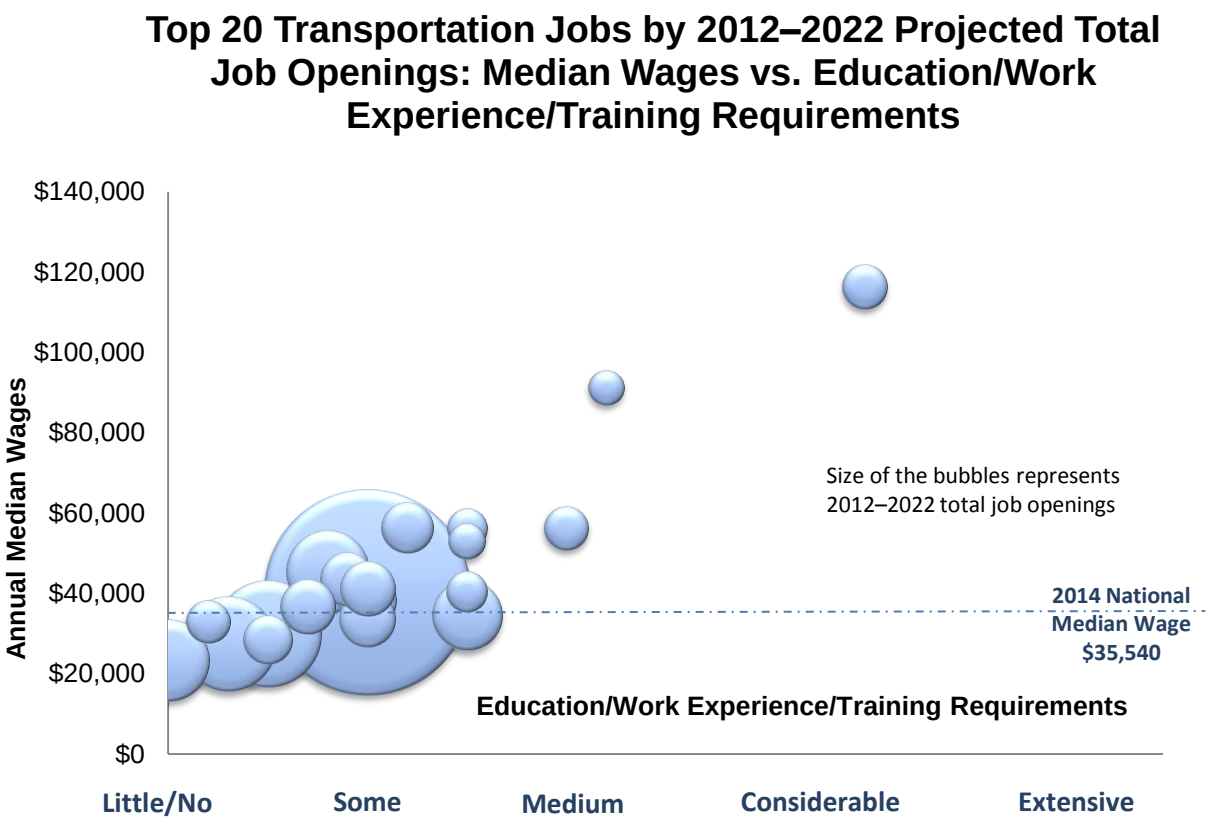


- The metropolitan layer reveals that much of the regional transportation job growth is driven by growth in the large metro areas within those regions.
- The highest job growth in transportation, including all six subsectors, will likely be generated in New York City, Dallas, Los Angeles, Houston, and Chicago between 2012 and 2022, with more than 10,000 new jobs.
- Of the top five metro areas mentioned above, Dallas has the highest concentration and fastest growth in transportation jobs.

Source: TLC and JFF analysis and mapping of EMSI state and metropolitan area employment projections. Data retrieved from EMSI June 2014.

Overview: Transportation

N. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 20 Jobs



- Thirteen of the top 20 highest demand transportation jobs provide wages higher than the 2014 national median wage of $35,540. Because union density in most transportation subsectors is much higher than in the general economy, many of these jobs include strong benefits in addition to good wages.
- While a high school diploma is sufficient to gain access to many entry-level jobs, training through some combination of career and technical education, apprenticeship, or On-the-Job Learning is required to attain mastery.
- Though not depicted in the chart, the level of competency and expertise required in many of these jobs is increasing with technological advances.

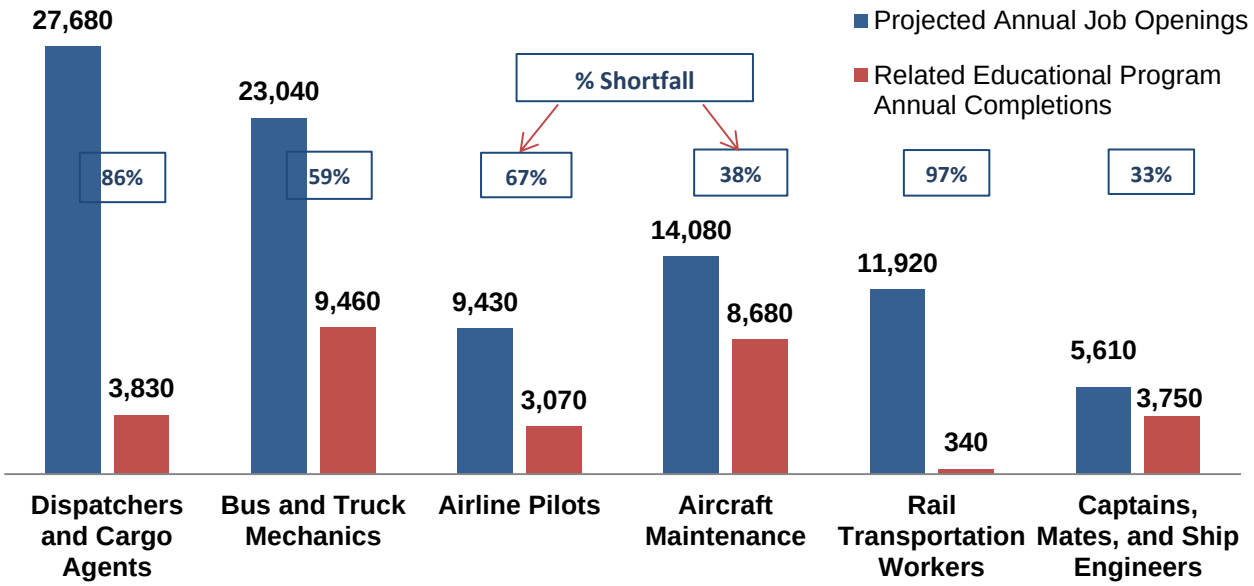
Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

Overview: Transportation

O. Supply and Demand: Projected Annual Job Openings (2012–2022) vs. Related Educational Program Completions [10]

Projected Annual Job Openings for Selected Transportation Job Groups (based on BLS Experimental Data—2012–2022) vs. Annual Completions of Related Educational Programs (2012)

Projected annual job openings are 68% larger than annual completions in related educational programs across selected transportation occupational groups



- Preliminary analysis indicates that projected annual job openings are 68 percent larger than annual completions in related educational programs across selected transportation occupational groups.
- This highlights a significant skills gap that must be addressed to meet expected industry demand.

Source: Projected annual job openings based on TLC and JFF analysis of BLS Employment Projections program, *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Related Educational Program Completions based on TLC and JFF analysis of 2012 Classification of Institutional Programs (CIP) completion data from National Center for Educational Statistics (NCES). Data retrieved from NCES's IPEDS website in June 2014.

1. Trucking
Industry Definition

- The 5-digit North American Industry Classification System (NAICS) industries included in our data analysis on truck transportation are:

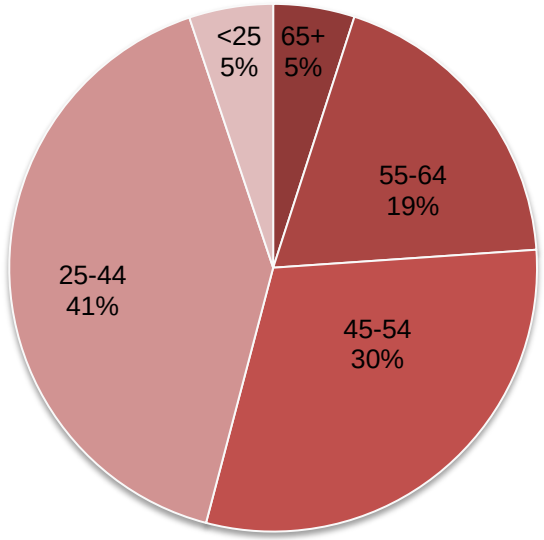
NAICS Code	Description
48411	General Freight Trucking, Local
48412	General Freight Trucking, Long-Distance
48421	Used Household and Office Goods Moving
48422	Specialized Freight (except Used Goods) Trucking, Local
48423	Specialized Freight (except Used Goods) Trucking, Long-Distance
48841	Motor Vehicle Towing
48849	Other Support Activities for Road Transportation

- Industries in the Truck Transportation subsector provide over-the-road transportation of cargo using motor vehicles such as trucks and tractor trailers. The subsector is subdivided into general freight trucking and specialized freight trucking. This distinction reflects differences in equipment used, type of load carried, scheduling, terminal, and other networking services. General freight transportation establishments handle a wide variety of commodities, generally palletized, and transported in a container or van trailer. Specialized freight transportation is the transportation of cargo that, because of size, weight, shape, or other inherent characteristics require specialized equipment for transportation. Each of these industry groups is further subdivided based on distance traveled. Local trucking establishments primarily carry goods within a single metropolitan area and its adjacent nonurban areas. Long distance trucking establishments carry goods between metropolitan areas.
- The Specialized Freight Trucking industry group includes a separate industry for Used Household and Office Goods Moving. The following Support Activities for Road Transportation were also included in our analysis. Motor Vehicle Towing comprises establishments primarily engaged in towing light or heavy motor vehicles, both local and long distance. These establishments may provide incidental services such as storage and emergency road repair services. Other Support Activities for Road Transportation comprises establishments primarily engaged in providing services (except motor vehicle towing) to road network users.
- This analysis covers workers engaged in the transportation of people and goods. Warehousing and logistics is not the focus of the report.

1. Trucking

A. Current: Worker Distribution by Age

2014 Trucking Worker Distribution by Age

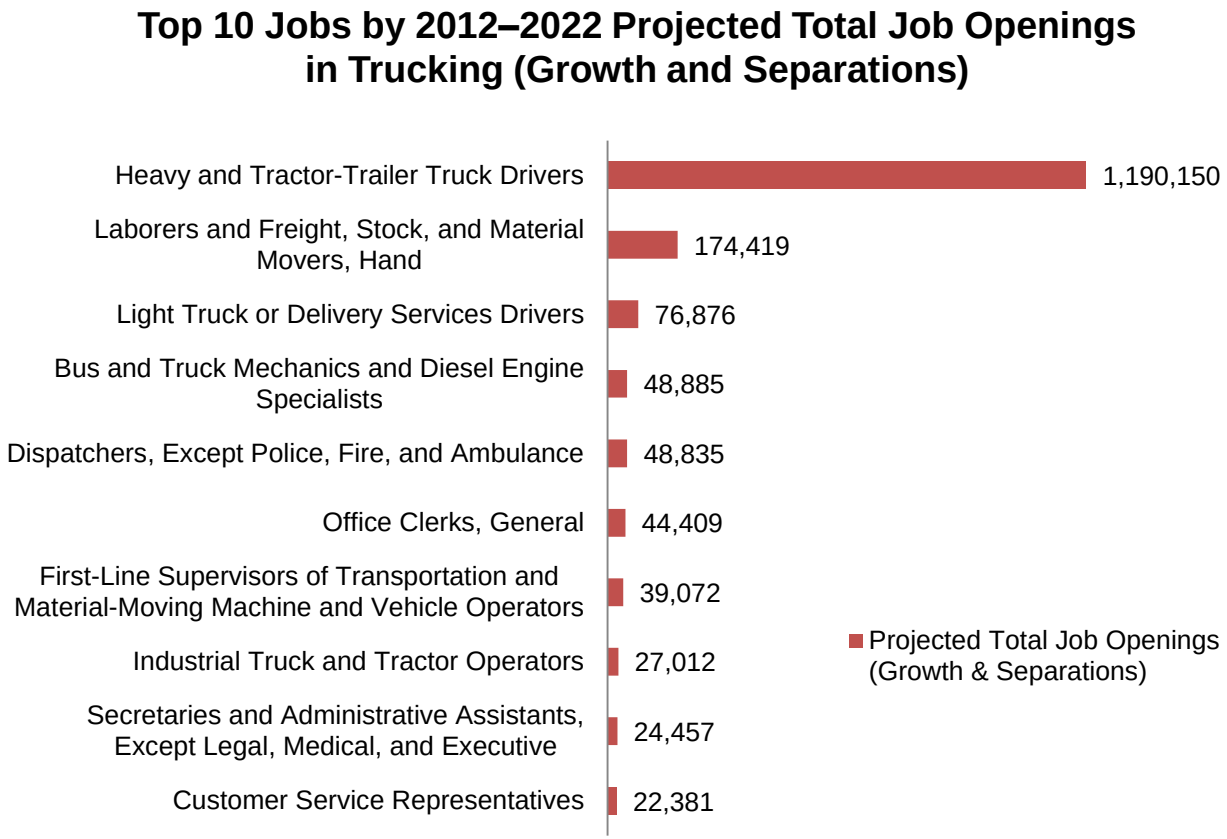


- Fifty-four percent of workers in trucking are 45 years of age or older.
- Since many trucking employees retire early, the trucking industry will need major hiring to replace incumbents that are exiting.

Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014.

1. Trucking

B. Long Term: Top 10 Jobs by Projected Total Job Openings in Trucking



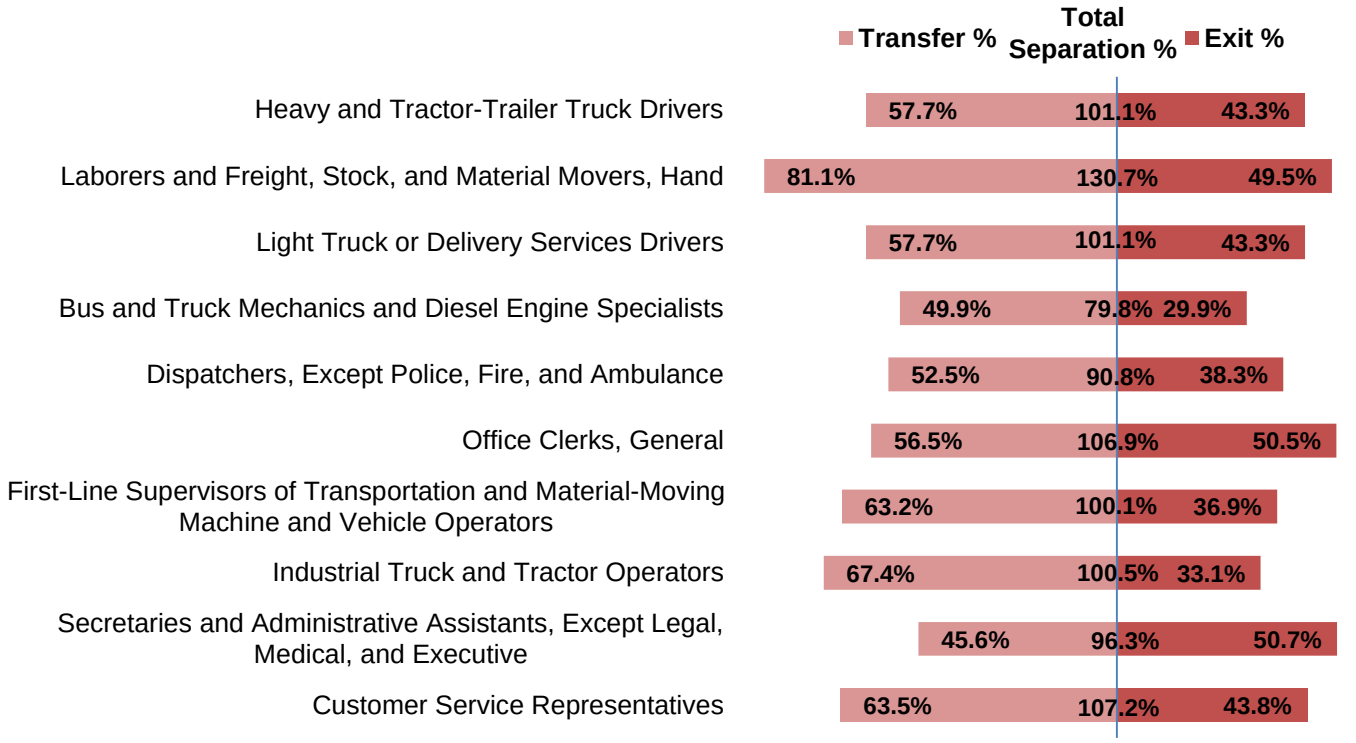
- Heavy and tractor-trailer truck drivers lead in total job openings by a large margin. Close to 1.2 million heavy truck driving jobs within the trucking industry will need to be filled between 2012 and 2022.
- The American Trucking Association reports that the 2014 average turnover rate for large truckload fleets was 95 percent, and turnover at small fleets was 90 percent. Driver shortage is becoming more pervasive in the truckload sector. The turnover rate at less-than-truckload fleets was much lower at 11 percent.
- Recent online job posting data also suggest that heavy truck drivers are in high demand (chart not shown).

Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Truckload and less-than-truckload fleet turnover rates from American Trucking Association news release: *Truckload Turnover Remained High in Fourth Quarter.* Released April 1, 2015. http://www.trucking.org/article.aspx?uid=ee5468d9-0b00-4e01-9f9b-42d970b1510c.

1. Trucking

C. Long Term: Top 10 Jobs—Projected Occupational Transfer and Labor Force Exit Rates

Top 10 Jobs in Trucking: 2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)



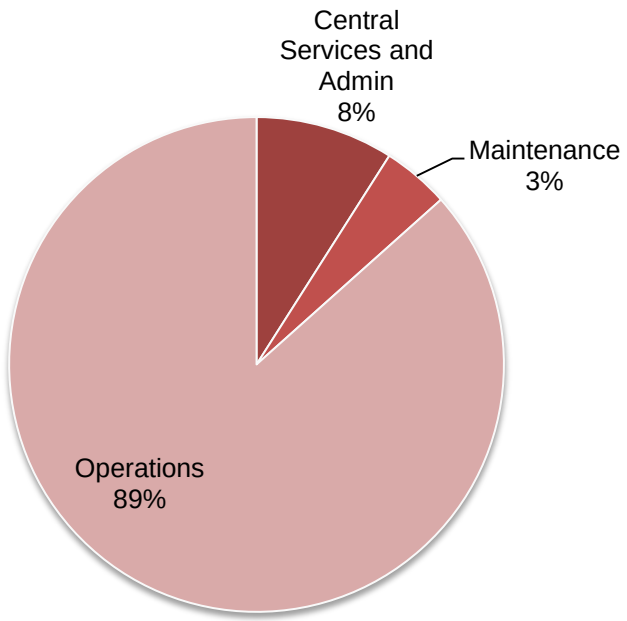
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

1. Trucking

D. Long Term: Projected Total Job Openings by Career Area

Top 20 Trucking Jobs
based on 2012–2022 Projected Total Job Openings
Share by Career Area

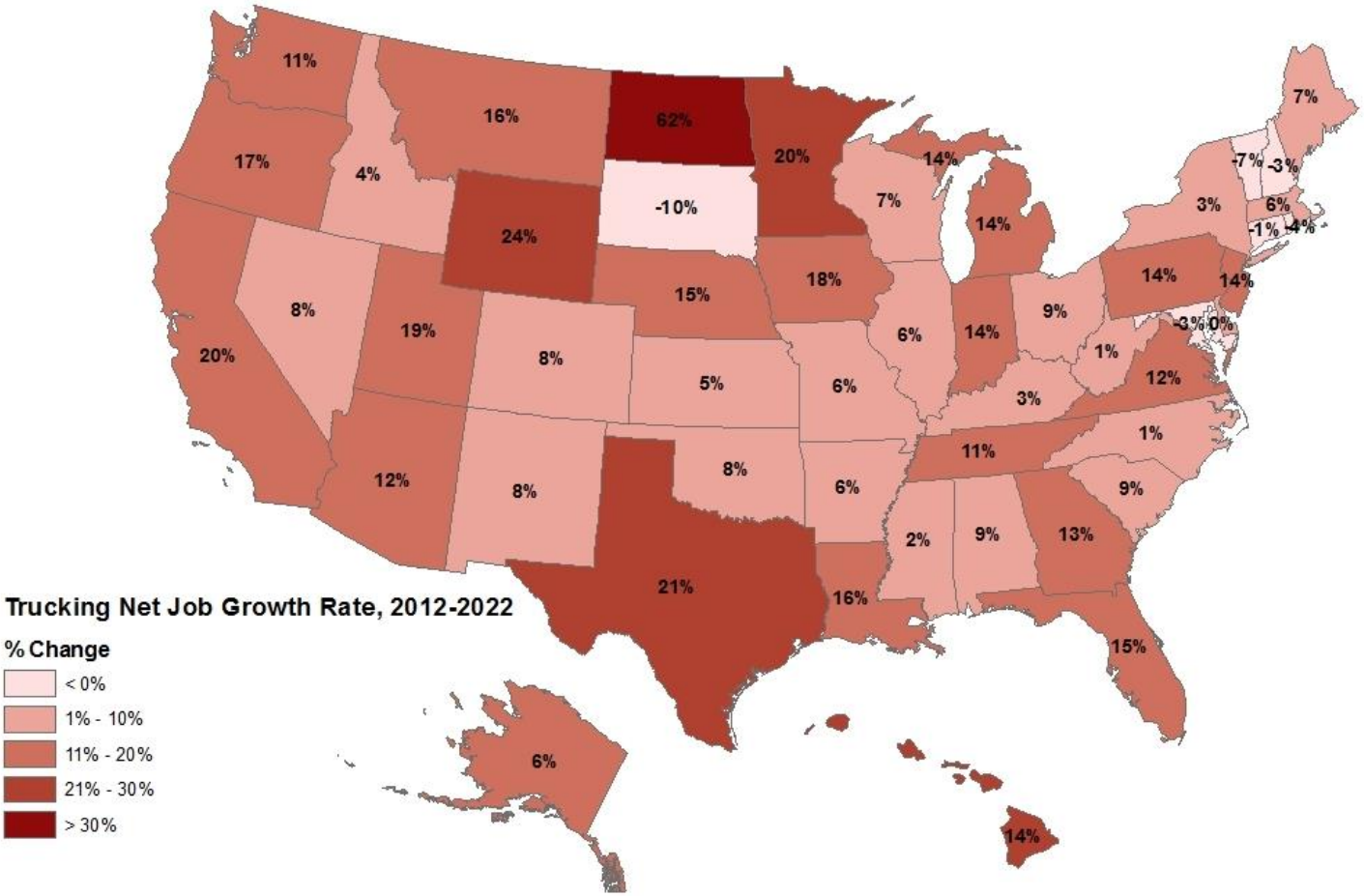


- An overwhelming majority (89 percent) of the top 20 trucking occupations based on total job openings are engaged in operations.
- This is largely due to the extremely high numbers of heavy truck and tractor-trailer drivers in this industry.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

1. Trucking

E. Long Term: 2012–2022 Projected Net Job Growth Rate by State

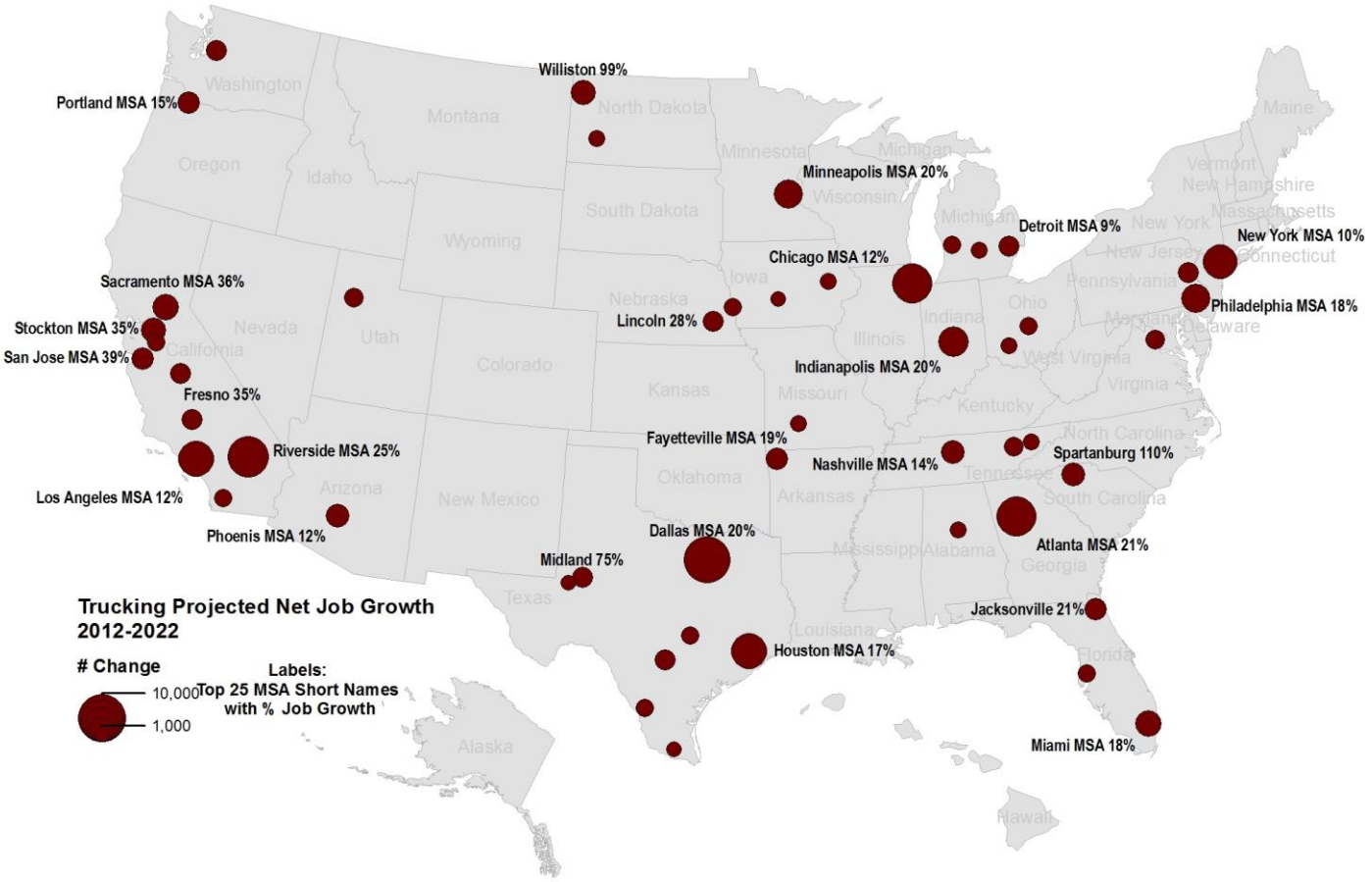


- Job growth in trucking is widely dispersed across the country, with North Dakota, Wyoming, Texas, Minnesota, and California all experiencing over 20 percent growth rate.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

1. Trucking

F. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 Labeled)



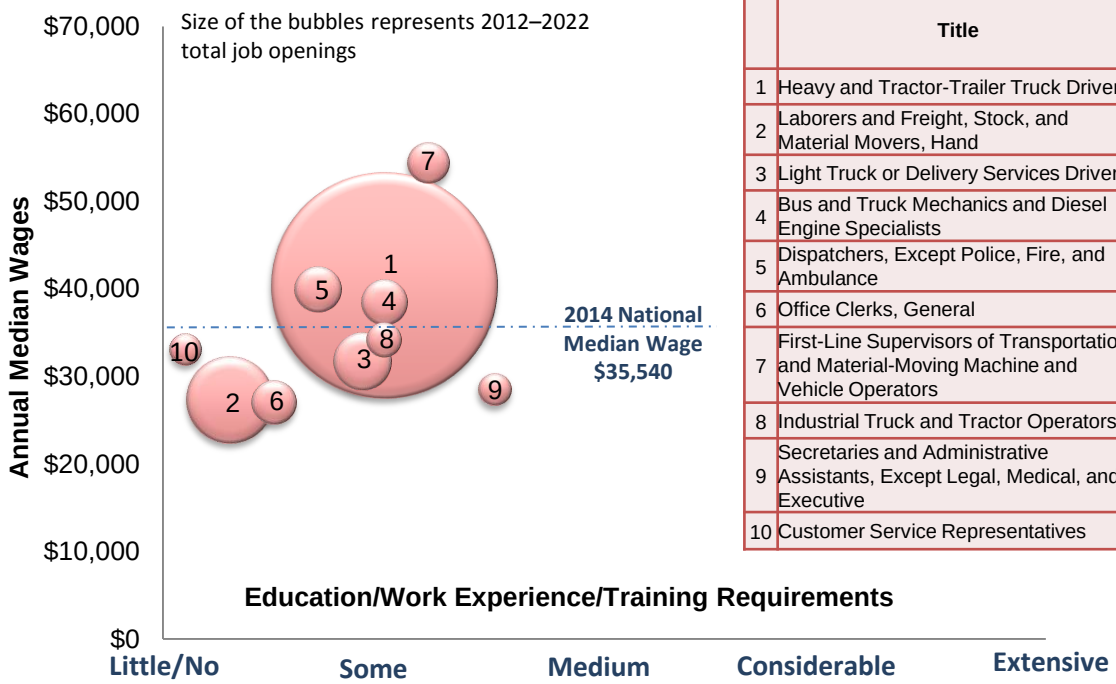
- Dallas, Chicago, Riverside, Los Angeles, and Atlanta are among the cities that will enjoy the largest growth in trucking employment.
- California and Texas have the highest concentration of metropolitan areas with the highest projected job growth in trucking.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

1. Trucking

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs

Top 10 Trucking Jobs by 2012–2022 Projected Total Job Openings: Median Wages vs. Education/Work Experience/Training Requirements



	Title	10 Yr Job Openings	Median Annual Wages
1	Heavy and Tractor-Trailer Truck Drivers	1,190,150	$40,435
2	Laborers and Freight, Stock, and Material Movers, Hand	174,419	$27,331
3	Light Truck or Delivery Services Drivers	76,876	$31,803
4	Bus and Truck Mechanics and Diesel Engine Specialists	48,885	$38,522
5	Dispatchers, Except Police, Fire, and Ambulance	48,835	$39,998
6	Office Clerks, General	44,409	$27,061
7	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	39,072	$54,434
8	Industrial Truck and Tractor Operators	27,012	$34,237
9	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	24,457	$28,558
10	Customer Service Representatives	22,381	$33,155

- Four of the top ten trucking jobs provide wages higher than the national median wage of $35,540 (heavy truck drivers, truck mechanics, dispatchers, and first-line supervisors of vehicle operators).
- Having a high school diploma can gain workers entry into many top trucking jobs. However, short-term to long-term On-the-Job training is required for nearly all of these jobs.

Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

1. Trucking

Standard Occupational Classification Definitions of Top 10 Occupations

1. **Heavy and Tractor-Trailer Truck Drivers:** Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). May be required to unload truck. Requires commercial driver's license.
2. **Laborers and Freight, Stock, and Material Movers, Hand:** Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified.
3. **Light Truck or Delivery Service Drivers:** Drive a light vehicle, such as a truck or van, with a capacity of less than 26,000 pounds Gross Vehicle Weight (GVW), primarily to deliver or pick up merchandise or to deliver packages. May load and unload vehicle.
4. **Bus and Truck Mechanics and Diesel Engine Specialists:** Diagnose, adjust, repair, or overhaul buses and trucks, or maintain and repair any type of diesel engines. Includes mechanics working primarily with automobile or marine diesel engines.
5. **Dispatchers, except Police, Fire, and Ambulance:** Schedule and dispatch workers, work crews, equipment, or service vehicles for conveyance of materials, freight, or passengers, or for normal installation, service, or emergency repairs rendered outside the place of business. Duties may include using radio, telephone, or computer to transmit assignments and compiling statistics and reports on work progress.
6. **Office Clerks, General:** Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures. Clerical duties may be assigned in accordance with the office procedures of individual establishments and may include a combination of answering telephones, bookkeeping, typing or word processing, stenography, office machine operation, and filing.
7. **First-line Supervisors of Transportation and Material-Moving and Vehicle Operators:** Directly supervise and coordinate activities of transportation and material-moving machines and vehicle operators and helpers.
8. **Industrial Track and Tractor Operators:** Operate industrial trucks or tractors equipped to move materials around a warehouse, storage yard, factory, construction site, or similar location.
9. **Secretaries and Administrative Assistants, Except Legal, Medical, and Executive:** Perform routine clerical and administrative functions such as drafting correspondence, scheduling appointments, organizing and maintaining paper and electronic files, or providing information to callers.
10. **Customer Service Representatives:** Interact with customers to provide information in response to inquiries about products and services and to handle and resolve complaints.

2. Transit
Industry Definition

- The 5-digit NAICS industries included in our data analysis on Transit and Ground Passenger Transportation are:

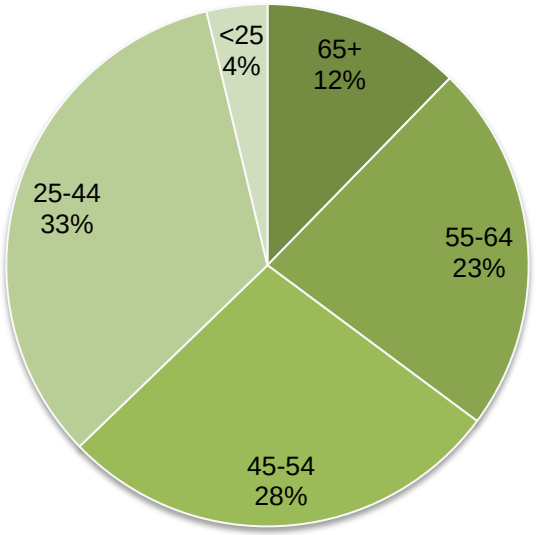
NAICS Code	Description
48511	Urban Transit Systems
48521	Interurban and Rural Bus Transportation
48531	Taxi Service
48532	Limousine Service
48541	School and Employee Bus Transportation
48551	Charter Bus Industry
48599	Other Transit and Ground Passenger Transportation
N/A	Local Government Passenger Transit

- Industries in the Transit and Ground Passenger Transportation subsector include a variety of passenger transportation activities such as urban transit systems (public and private), chartered bus, school bus, interurban bus transportation, and taxis. These activities are distinguished based primarily on production process factors such as vehicle types, routes, and schedules.
- In this subsector, the principal splits identify scheduled transportation as separate from nonscheduled transportation. The scheduled transportation industry groups are Urban Transit Systems, Interurban and Rural Bus Transportation, and School and Employee Bus Transportation. The nonscheduled industry groups are the Charter Bus Industry and Taxi and Limousine Service. The Other Transit and Ground Passenger Transportation industry group includes both scheduled and nonscheduled transportation.

2. Transit

A. Current: Worker Distribution by Age

2014 Transit and Ground Passenger Transportation Worker Distribution by Age



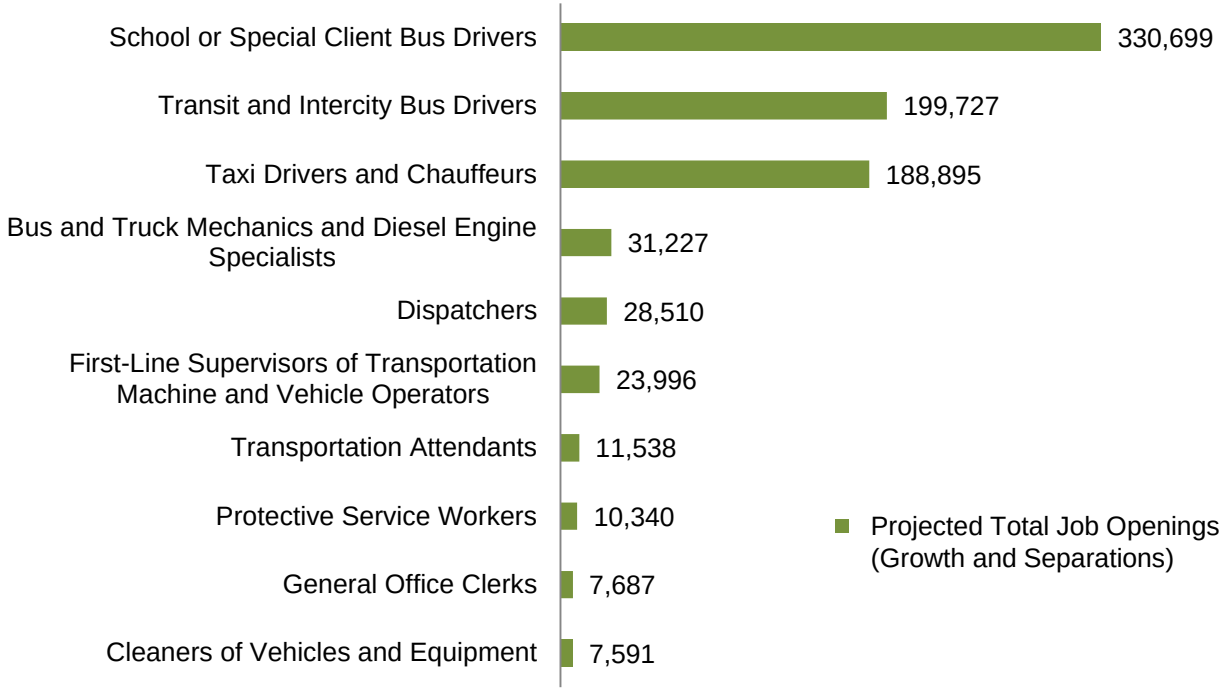
- With 63 percent of the workers in transit and ground passenger transportation above age 45, retirement will loom large in the future.
- In a number of transit agencies, workers can retire with negotiated pension eligibility such as thirty years of service or 62 years of age. This means that some workers who were hired young can be eligible to retire as early as their late 40s.

Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014.

2. Transit

B. Long Term: Top 10 Jobs by Projected Total Job Openings

Top 10 Jobs by 2012–2022 Projected Total Job Openings in Transit and Ground Passenger Transportation (Growth and Separations)



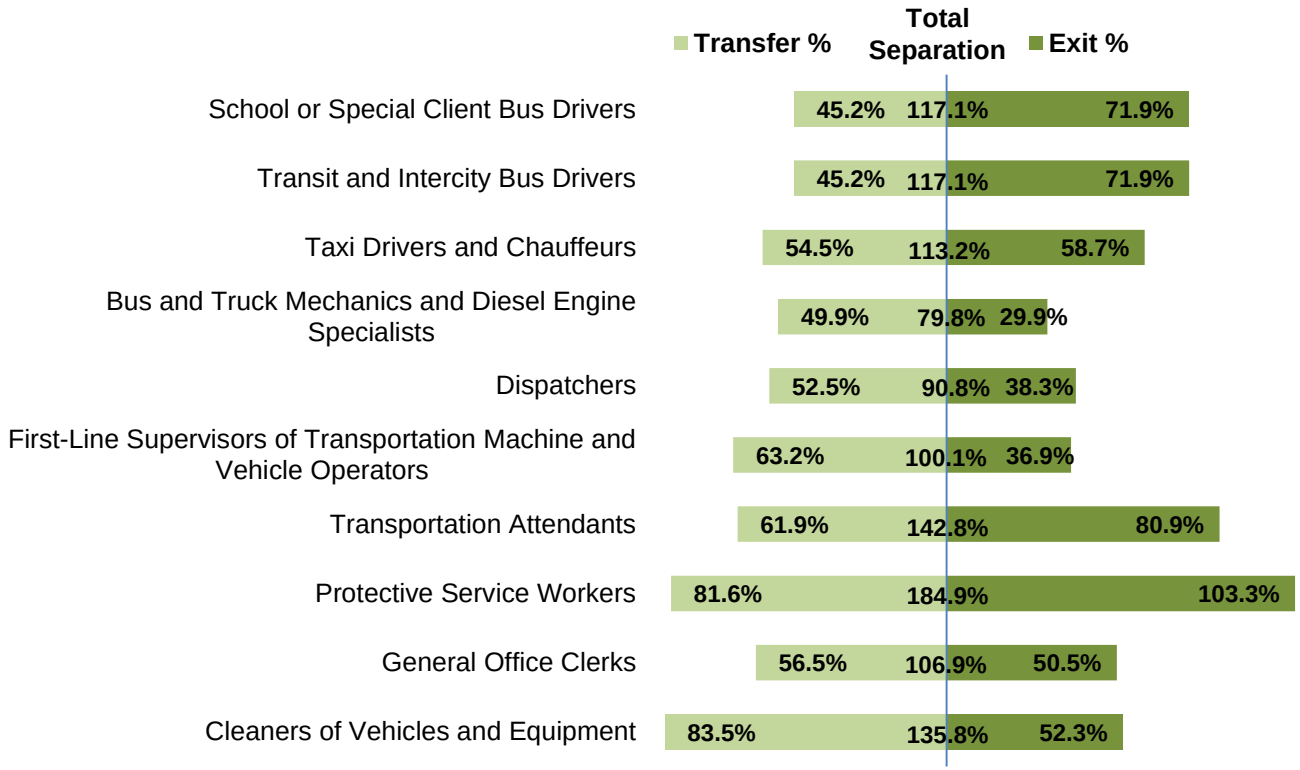
- Drivers of school buses, transit buses, taxis, and limousines account for the largest job growth in transit with lesser but significant growth in demand for mechanics and dispatchers.
- Similar to what long-term analysis suggests, drivers are also in high demand based on real-time online job postings (chart not shown). Maintenance and repair workers, laborers, material movers, and IT workers also have relatively higher numbers of recent job postings.

Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

2. Transit

C. Long Term: Top 10 Jobs—Projected Separations (Occupational Transfer and Labor Force Exit Rates)

Top 10 Jobs in Transit and Ground Passenger Transportation—2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)



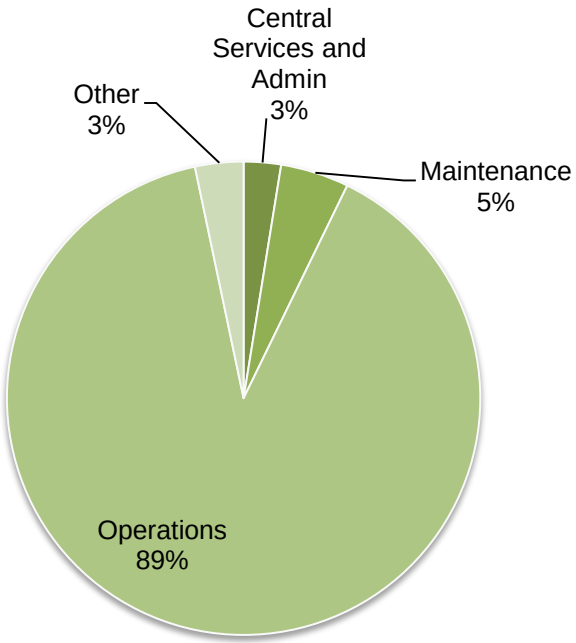
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

2. Transit

D. Long Term: Projected Total Job Openings by Career Area

Top 20 Transit and Ground Passenger Transportation Jobs based on 2012–2022 Projected Total Job Openings Share by Career Area

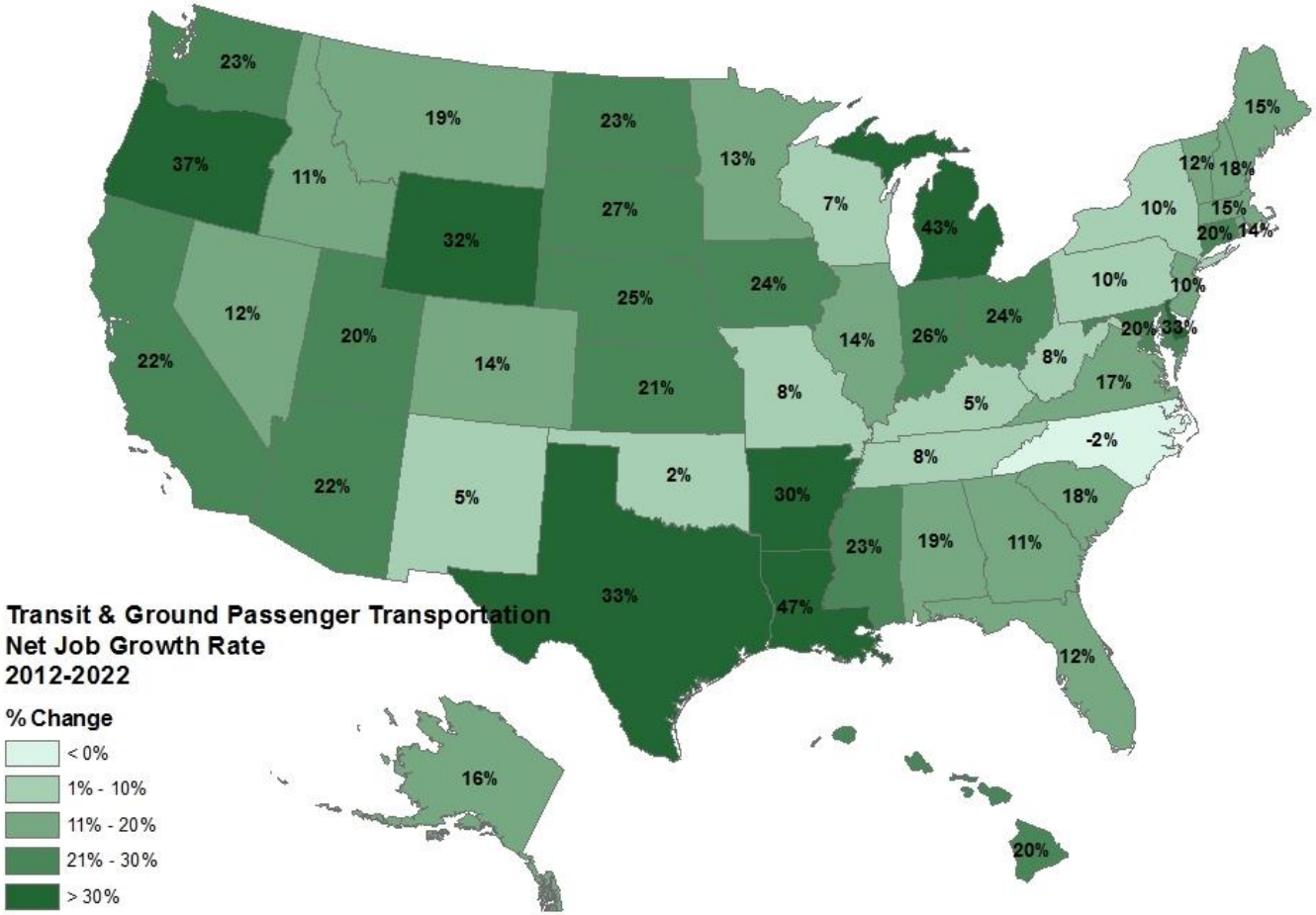


- Operations and maintenance jobs account for 94 percent of the job openings among the top 20 jobs in transit and ground transportation.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

2. Transit

E. Long Term: 2012–2022 Projected Net Job Growth Rate by State

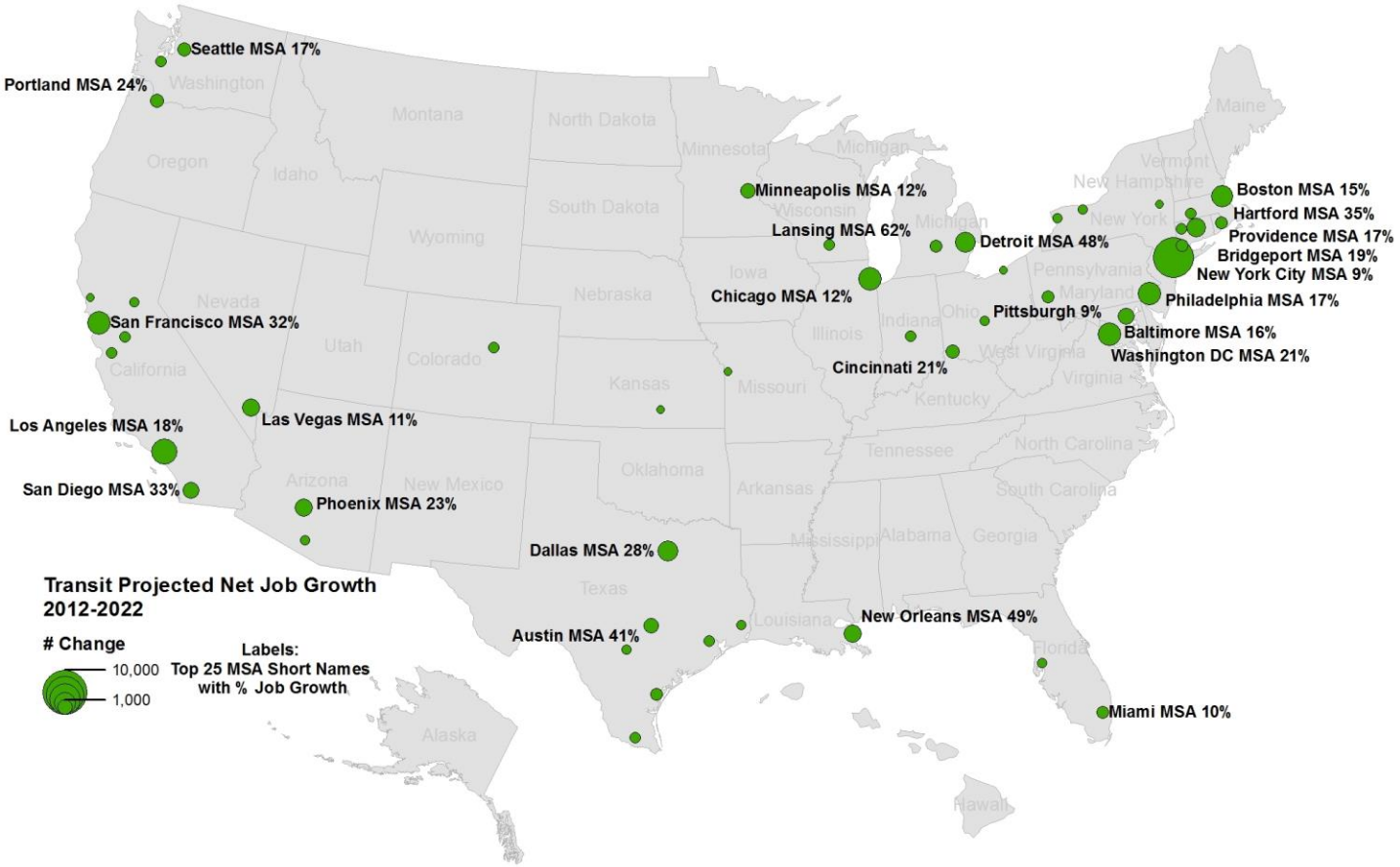


- Transit and ground passenger transportation employment is growing fast in many states, especially in the West and Southwest, the eastern Gulf states, the eastern Midwest, Wyoming, and the western Great Plains states.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014. Employment growth data for Local Government Passenger Transit by state and metropolitan areas is not available from EMSI and is not included in the maps on Pages 41 and 42.

2. Transit

F. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 labeled)

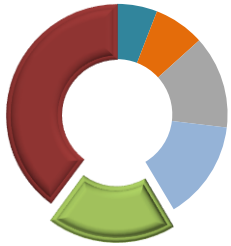


- Transit and ground passenger transportation job growth has strong concentration in traditional hub cities on the East Coast, the Great Lakes region, and the West Coast—but growth is also dispersed fairly broadly across the country.

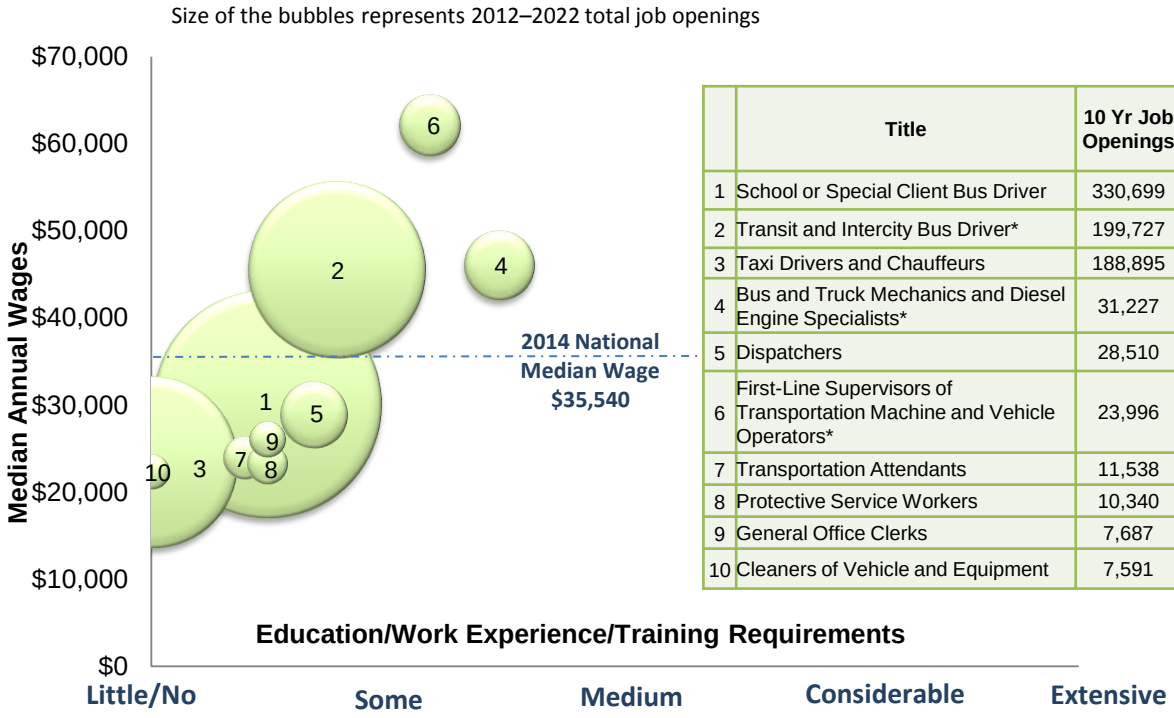
Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014. Employment growth data for Local Government Passenger Transit by state and metropolitan areas is not available from EMSI and is not included in the maps on Pages 41 and 42.

2. Transit

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs



Top 10 Transit Jobs by 2012–2022 Projected Total Job Openings: Median Wages vs. Education/Work Experience/Training Requirements



	Title	10 Yr Job Openings	Median Annual Wages
1	School or Special Client Bus Driver	330,699	$30,098
2	Transit and Intercity Bus Driver*	199,727	$45,531
3	Taxi Drivers and Chauffeurs	188,895	$23,483
4	Bus and Truck Mechanics and Diesel Engine Specialists*	31,227	$46,051
5	Dispatchers	28,510	$28,954
6	First-Line Supervisors of Transportation Machine and Vehicle Operators*	23,996	$62,171
7	Transportation Attendants	11,538	$24,003
8	Protective Service Workers	10,340	$23,317
9	General Office Clerks	7,687	$26,104
10	Cleaners of Vehicle and Equipment	7,591	$22,360

- Transit and ground passenger transportation jobs generally have low barriers to entry, though skilled maintenance jobs require significant On-the-Job training or apprenticeship.
- Some jobs in public transportation, such as bus drivers, bus mechanics, and frontline supervisors, pay well above national median wage and provide good benefits.

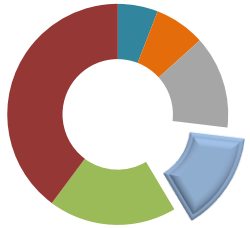
Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. For occupations with asterisks, the median wages are based on the Local Government industry sector because of their concentration in local government transit. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

2. Transit

Standard Occupational Classification Definitions of Top 10 Occupations

1. **Bus Drivers, School or Special Client:** Transport students or special clients such as the elderly or persons with disabilities. Ensure adherence to safety rules. May assist passengers in boarding or exiting.
2. **Bus Drivers, Transit and Intercity:** Drive bus or motor coach, including regular route operations, charters, and private carriage. May assist passengers with baggage. May collect fares or tickets.
3. **Taxi Drivers and Chauffeurs:** Drive automobiles, vans, or limousines to transport passengers. May occasionally carry cargo. Includes hearse drivers.
4. **Bus and Truck Mechanics and Diesel Engine Specialists:** Diagnose, adjust, repair, or overhaul buses and trucks, or maintain and repair any type of diesel engines. Includes mechanics working primarily with automobile or marine diesel engines.
5. **Dispatchers, except Police, Fire, and Ambulance:** Schedule and dispatch workers, work crews, equipment, or service vehicles for conveyance of materials, freight, or passengers, or for normal installation, service, or emergency repairs rendered outside the place of business. Duties may include using radio, telephone, or computer to transmit assignments and compiling statistics and reports on work progress.
6. **First-line Supervisors of Transportation and Material-Moving and Vehicle Operators:** Directly supervise and coordinate activities of transportation and material-moving machines and vehicle operators and helpers.
7. **Transportation Attendants, Except Flight Attendants:** Provide services to ensure the safety and comfort of passengers aboard ships, buses, trains, or within the station or terminal. Perform duties such as greeting passengers, explaining the use of safety equipment, serving meals or beverages, or answering questions related to travel.
8. **Protective Service Workers:** All protective service workers not listed separately.
9. **Office Clerks, General:** Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures. Clerical duties may be assigned in accordance with the office procedures of individual establishments and may include a combination of answering telephones, bookkeeping, typing or word processing, stenography, office machine operation, and filing.
10. **Cleaners of Vehicles and Equipment:** Wash or otherwise clean vehicles, machinery, and other equipment. Use such materials as water, cleaning agents, brushes, cloths, and hoses.

3. Air Transportation
Industry Definition



- The 5-digit NAICS industries included in our data analysis on Air Transportation are:

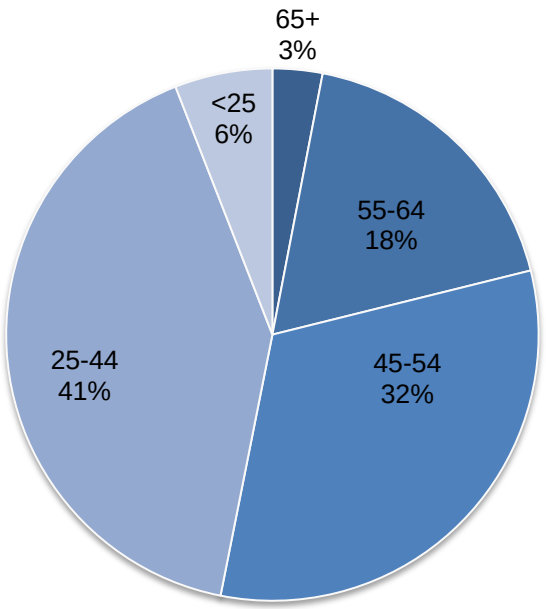
NAICS Code	Description
48111	Scheduled Air Transportation
48121	Nonscheduled Air Transportation
48811	Airport Operations
48819	Other Support Activities for Air Transportation

- Industries in the Air Transportation subsector provide air transportation of passengers and/or cargo using aircraft such as airplanes and helicopters. The subsector distinguishes scheduled from nonscheduled air transportation. Scheduled air carriers fly regular routes on regular schedules and operate even if flights are only partially loaded. Nonscheduled carriers often operate during nonpeak time slots at busy airports. These establishments have more flexibility with respect to choice of airport, hours of operation, load factors, and similar operational characteristics. Nonscheduled carriers provide chartered air transportation of passengers, cargo, or specialty flying services. Specialty flying services establishments use general-purpose aircraft to provide a variety of specialized flying services.
- The following Support Activities for Air Transportation were also included in our analysis. Support Activities for Air Transportation comprises establishments primarily engaged in providing services to the air transportation industry. These services include airport operation, servicing, repairing (except factory conversion and overhaul of aircraft), maintaining and storing aircraft, and ferrying aircraft.
- This analysis covers workers engaged in the transportation of people and goods. Aircraft manufacturing is not the focus of the report.

3. Air Transportation

A. Current: Worker Distribution by Age

2014 Air Transportation Worker Distribution by Age

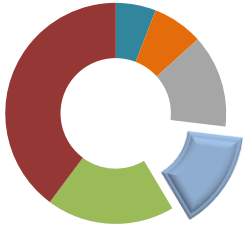


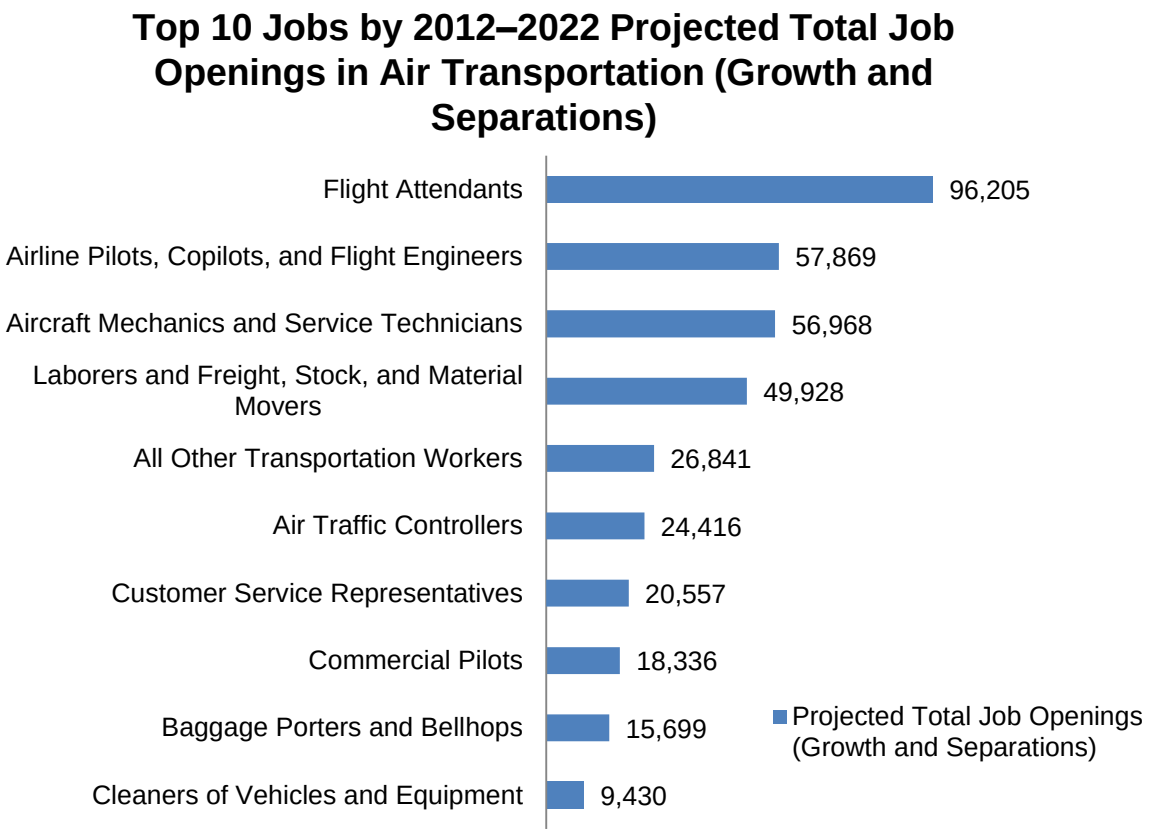
- Fifty-three percent of the workers in air transportation are 45 years or older, similar to the transportation industry average.

Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014.

3. Air Transportation

B. Long Term: Top 10 Jobs by Projected Total Job Openings



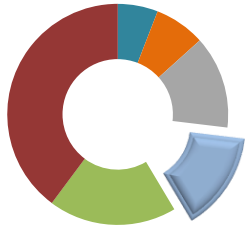


- Flight attendants, pilots, and aircraft mechanics are expected to add the highest number of job openings in air transportation, as a result of workers switching careers, retirement, and industry growth.
- Aerospace engineers and aerospace engineering/operations technicians are also expected to have a large number of job openings (roughly 56,900). However, the majority of these jobs are classified outside of the transportation industry, in manufacturing or professional services.

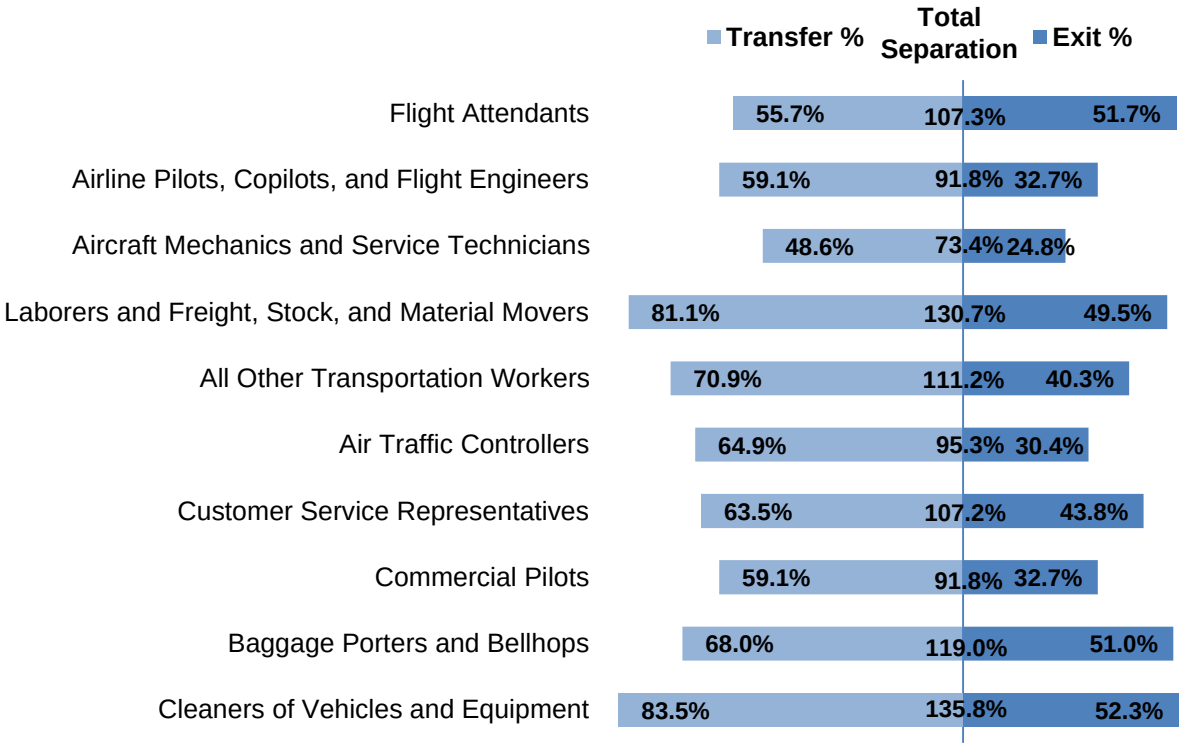
Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

3. Air Transportation

C. Long Term: Top 10 Jobs—Projected Separations (Occupational Transfer and Labor Force Exit Rates)



Top 10 Jobs in Air Transportation: 2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)

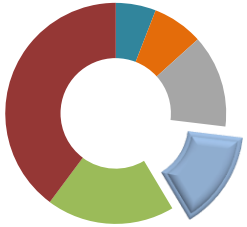


- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

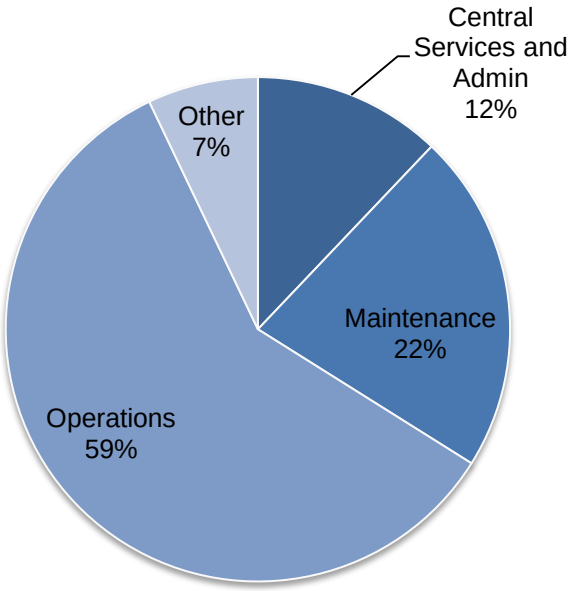
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

3. Air Transportation

D. Long Term: Projected Total Job Openings by Career Area



Top 20 Air Transportation Jobs based on 2012–2022 Projected Total Job Openings Share by Career Area

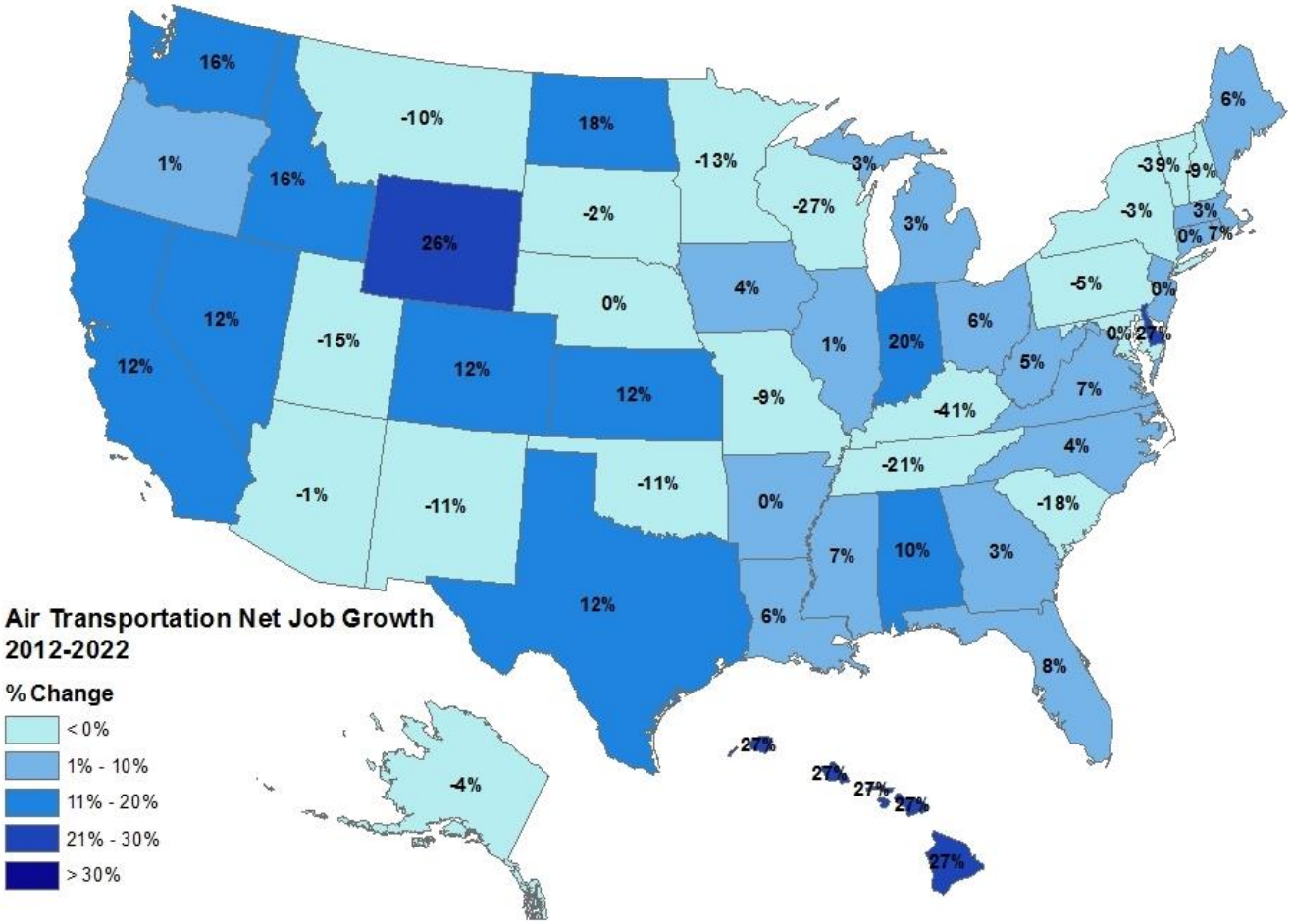


- Occupations engaged in air transportation operations account for roughly 59 percent of the projected job openings among the top 20 occupations.
- A total of 81 percent of these projected job openings are in operations and maintenance functions.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

3. Air Transportation

E. Long Term: 2012–2022 Projected Net Job Growth by State

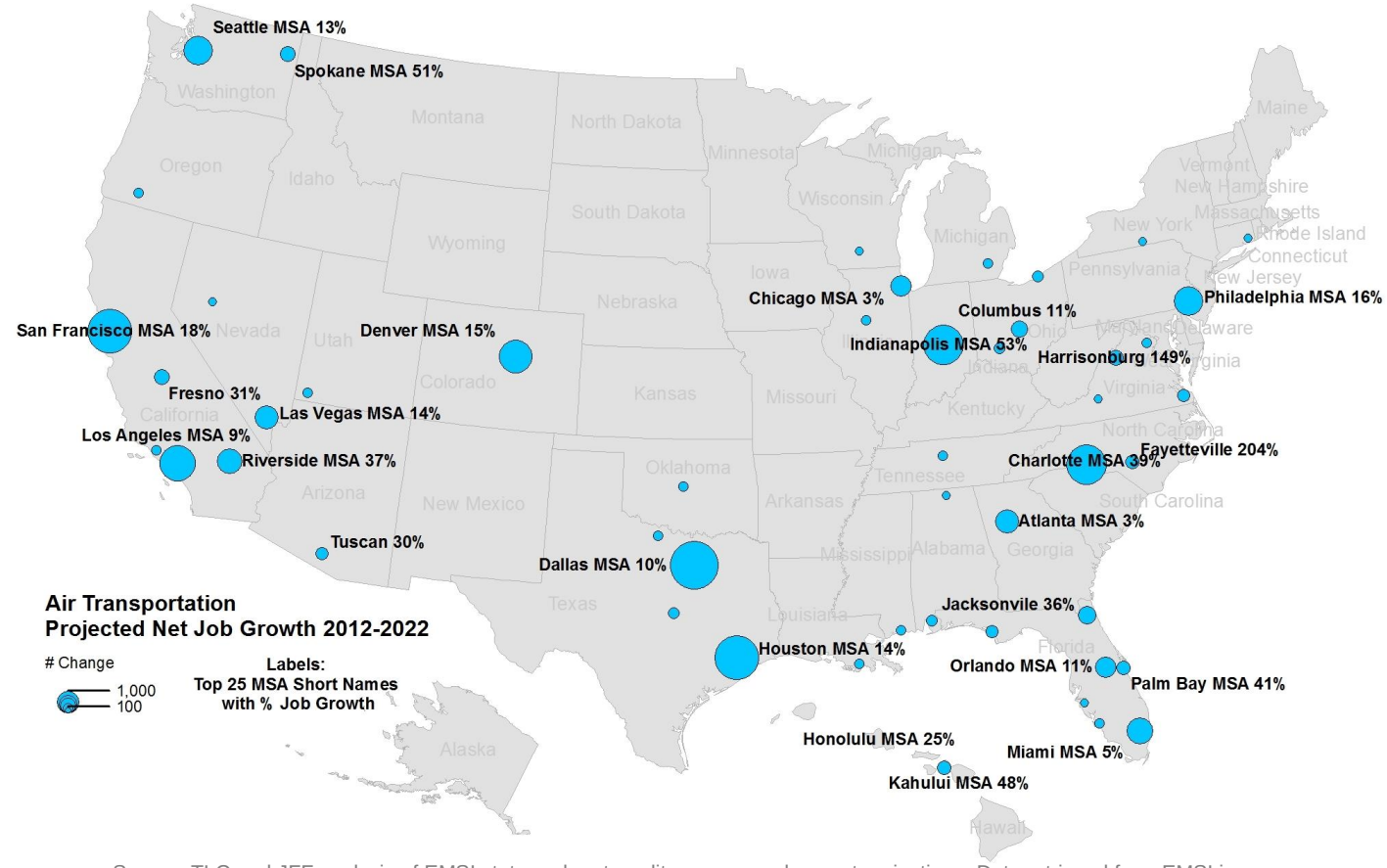


Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

- Service reductions for smaller airports and overall population shifts are leading to the expansion of air transport employment in some states, and declines in other states.

3. Air Transportation

F. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 labeled)

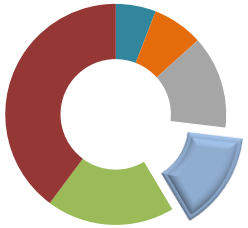


- Metropolitan areas displaying the largest air transportation net job growth follow patterns similar to the state map on the previous page.
- Dallas, San Francisco, Indianapolis, Houston, and Charlotte lead the growth in terms of number of jobs.

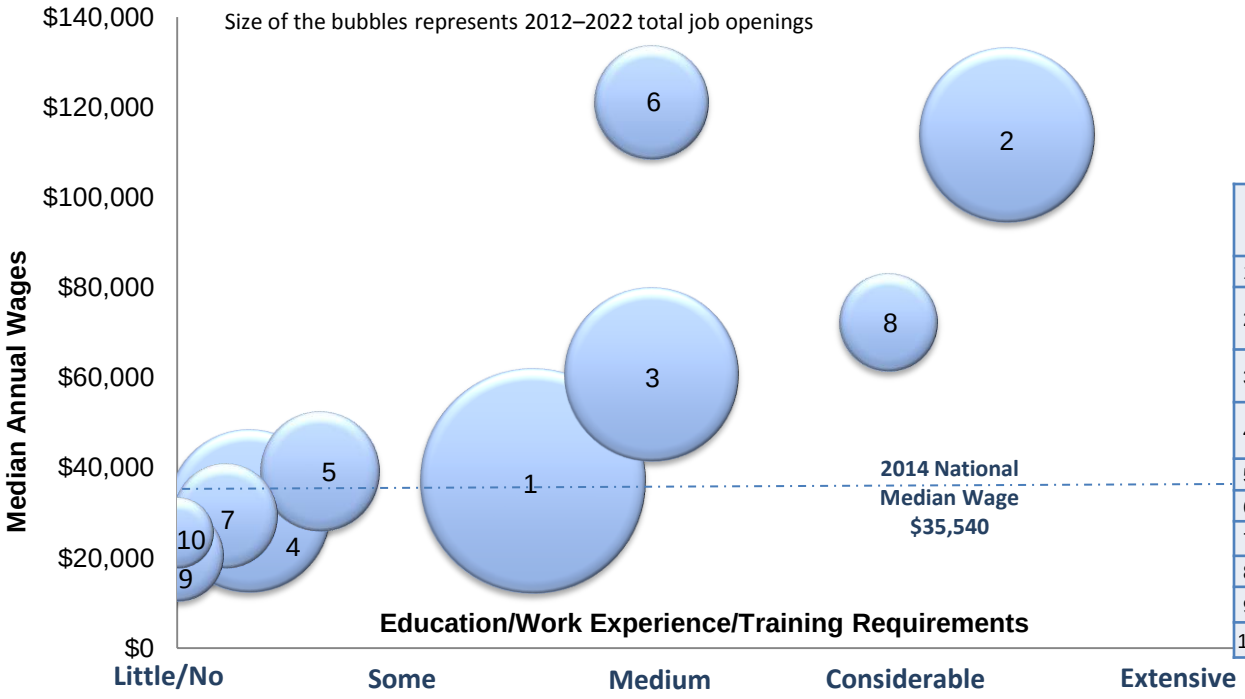
Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

3. Air Transportation

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs



Top 10 Air Transportation Jobs by 2012–2022 Projected Total Job Openings: Median Wages vs. Education/Work Experience/Training Requirements



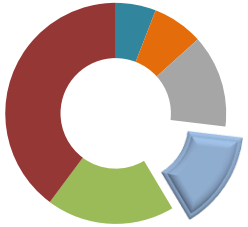
- Among the top air transportation jobs, median wages progressively increase as educational and skills requirements go up.
- Aircraft mechanics and service technicians are typically certified by the Federal Aviation Administration.

	Title	10 Yr Job Openings	Median Annual Wages
1	Flight Attendants	96,205	$37,240
2	Airline Pilots, Copilots, and Flight Engineers	57,869	$113,877
3	Aircraft Mechanics and Service Technicians	56,968	$60,861
4	Laborers and Freight, Stock, and Material Movers, Hand	49,928	$30,493
5	Transportation Workers, All Other	26,841	$39,312
6	Air Traffic Controllers	24,416	$121,280
7	Customer Service Representatives	20,557	$29,494
8	Commercial Pilots	18,336	$72,386
9	Baggage Porters and Bellhops	15,699	$20,634
10	Cleaners of Vehicles and Equipment	9,430	$25,771

Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

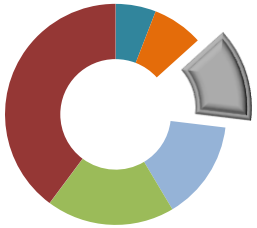
3. Air Transportation

Standard Occupational Classification Definitions of Top 10 Occupations



1. **Flight Attendants:** Provide personal services to ensure the safety, security, and comfort of airline passengers during flight. Greet passengers, verify tickets, explain use of safety equipment, and serve food or beverages.
2. **Airline Pilots, Copilots, and Flight Engineers:** Pilot and navigate the flight of fixed-wing, multi-engine aircraft, usually on scheduled air carrier routes, for the transport of passengers and cargo. Requires Federal Air Transport Pilot certificate and rating for specific aircraft type used. Includes regional, national, and international airline pilots and flight instructors of airline pilots.
3. **Aircraft Mechanics and Service Technicians:** Diagnose, adjust, repair, or overhaul aircraft engines and assemblies such as hydraulic and pneumatic systems. Includes helicopter and aircraft engine specialists.
4. **Laborers and Freight, Stock, and Material Movers, Hand:** Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified.
5. **Transportation Workers, All Other:** All transportation workers not listed separately.
6. **Air Traffic Controllers:** Control air traffic on and within vicinity of airport and movement of air traffic between altitude sectors and control centers according to established procedures and policies. Authorize, regulate, and control commercial airline flights according to government or company regulations to expedite and ensure flight safety.
7. **Customer Service Representatives:** Interact with customers to provide information in response to inquiries about products and services and to handle and resolve complaints.
8. **Commercial Pilots:** Pilot and navigate the flight of fixed-winged aircraft on nonscheduled air carrier routes, or helicopters. Requires Commercial Pilot certificate. Includes charter pilots with similar certification, and air ambulance and air tour pilots.
9. **Baggage Porters and Bellhops:** Handle baggage for travelers at transportation terminals or for guests at hotels or similar establishments.
10. **Cleaners of Vehicle and Equipment:** Wash or otherwise clean vehicles, machinery, and other equipment. Use such materials as water, cleaning agents, brushes, cloths, and hoses.

4. Highway
Industry Definition



- The 5-digit NAICS industry and SOC job title included in our data analysis on Highway Construction and Maintenance are:

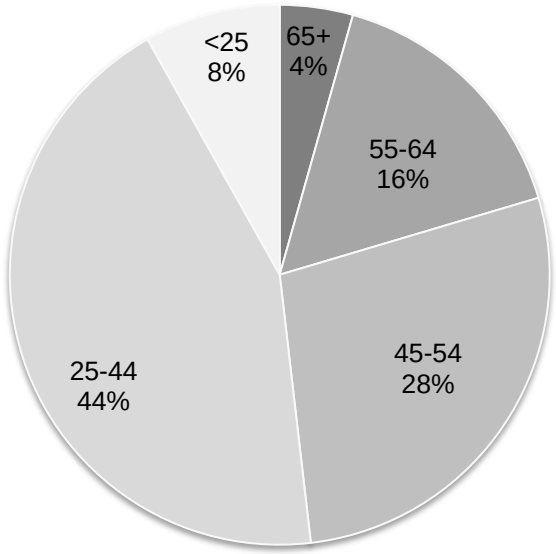
NAICS/SOC Code	Description
23731	Highway, Street, and Bridge Construction
47 4051 (SOC)	Highway Maintenance Workers

- This industry comprises establishments primarily engaged in the construction of highways (including elevated), streets, roads, airport runways, public sidewalks, and bridges. The work performed may include new work, reconstruction, rehabilitation, and repairs. Specialty trade contractors are included in this group if they are engaged in activities primarily related to highway, street, and bridge construction (e.g., installing guardrails on highways).
- Illustrative Examples:
  - Airport runway construction
  - Highway line painting
  - Causeway construction
  - Painting traffic lanes or parking lot lines
  - Culverts for highways, roads, and street construction
  - Pothole filling for highways, roads, streets, or bridges
  - Elevated highway construction
  - Resurfacing for highways, roads, streets, or bridges
  - Guardrail construction
  - Sign erection for highways, roads, streets, or bridges
- Highway Maintenance Worker is an occupation title that is primarily employed in the industry group of Government, outside of Highway Construction. In this analysis, its occupational employment data was added to the industry employment of Highway, Street, and Bridge Construction, where possible.

4. Highway

A. Current: Worker Distribution by Age

2014 Highway Construction and Maintenance Worker Distribution by Age

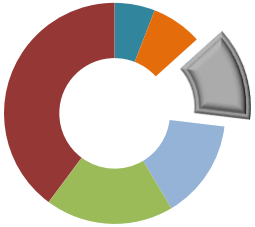


- Fifty-two percent of highway workers are under age 45, indicating a relatively younger workforce compared with other transportation subsectors such as transit and railroad.
- Physically demanding construction and maintenance work often leads to early retirement, so replacement needs may still be large.

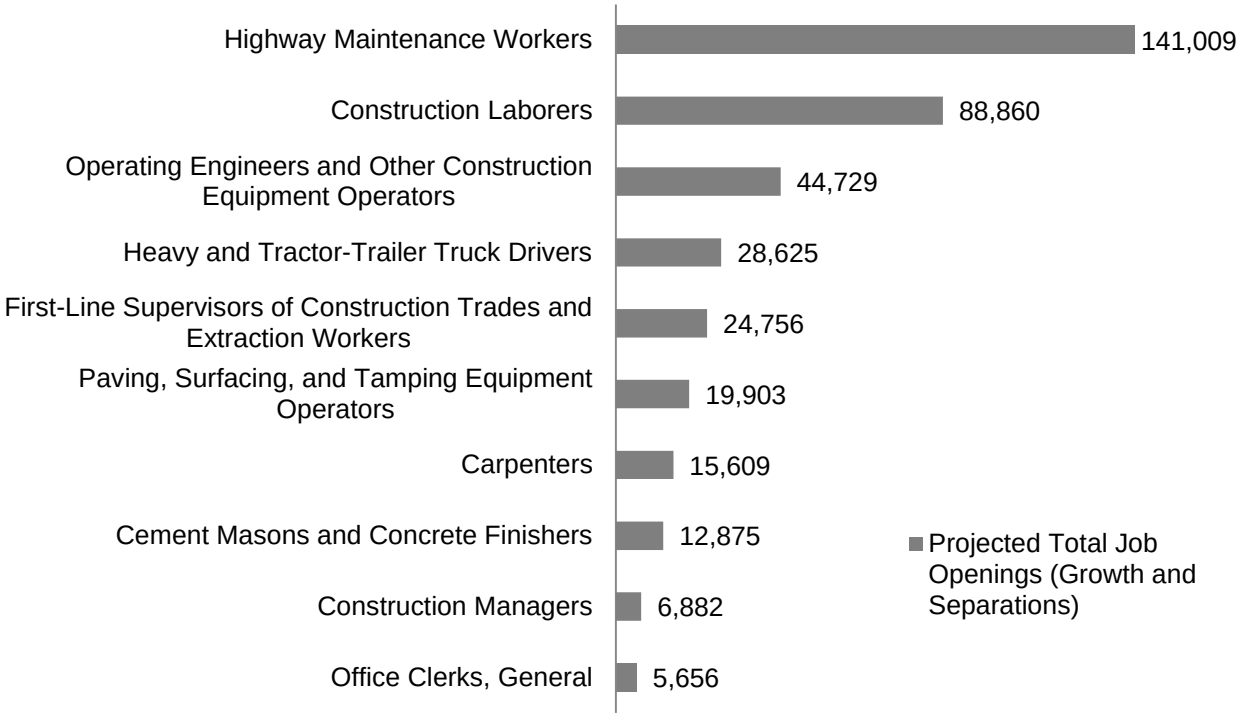
Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014.

4. Highway

B. Long Term: Top 10 Jobs by Projected Total Job Openings



Top Jobs by 2012–2022 Projected Total Job Openings in Highway Construction and Maintenance (Growth and Separations)

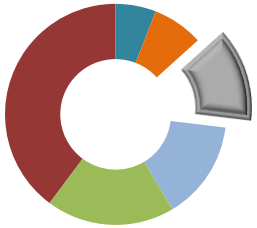


- Most highway job openings between 2012 and 2022 are for semi-skilled and highly skilled blue-collar workers such as highway maintenance workers, construction laborers, and operating engineers.
- Equipment operators, truck drivers, and construction managers are among the highest in demand in highway construction based on online job ads (chart not shown).

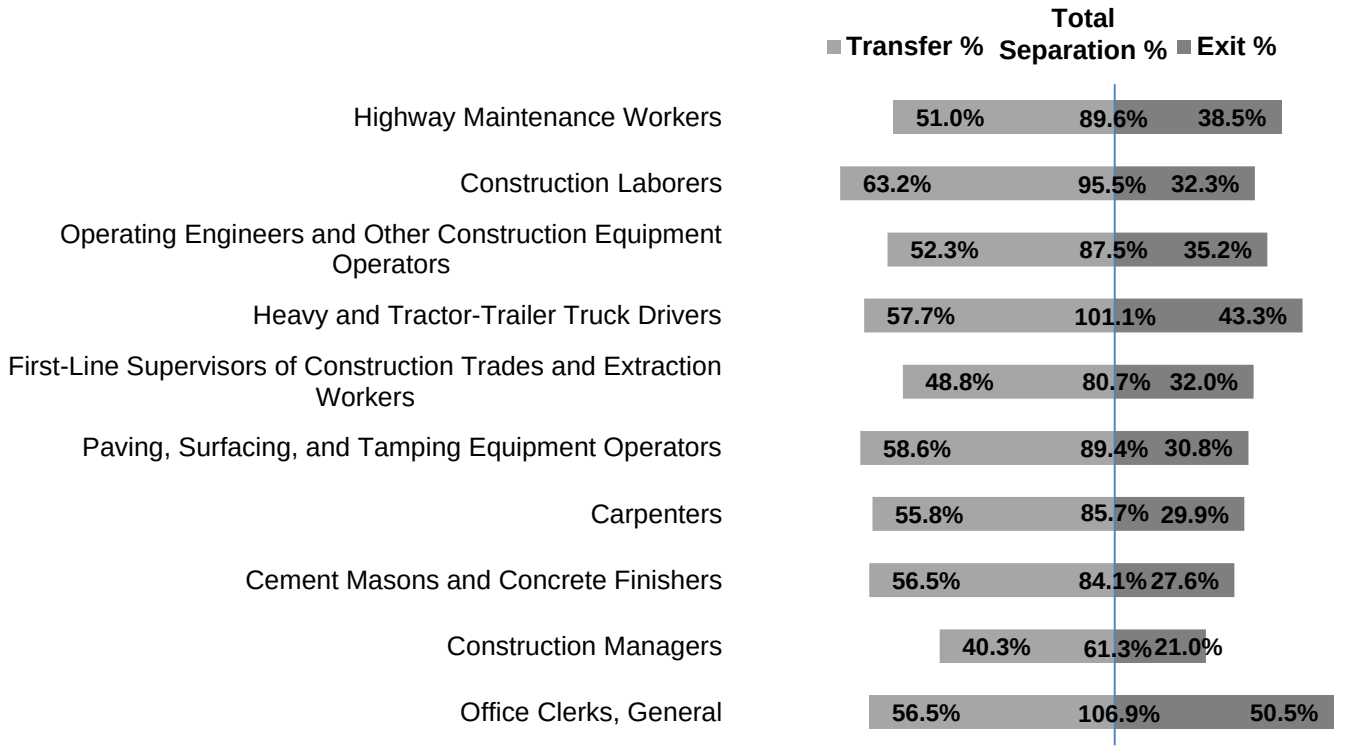
Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

4. Highway

C. Long Term: Top 10 Jobs—Projected Separations (Occupational Transfer and Labor Force Exit Rates)



Top 10 Jobs in Highway: 2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)



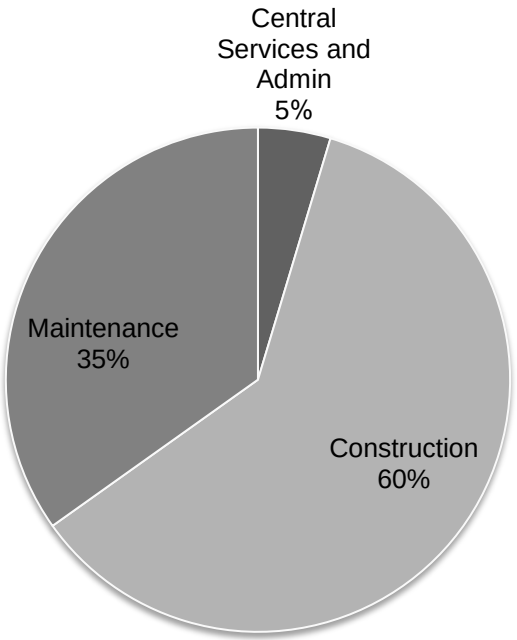
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

4. Highway

D. Long Term: Projected Total Job Openings by Career Area

Top 20 Highway Construction and Maintenance Jobs based on 2012–2022 Projected Total Job Openings Share by Career Area

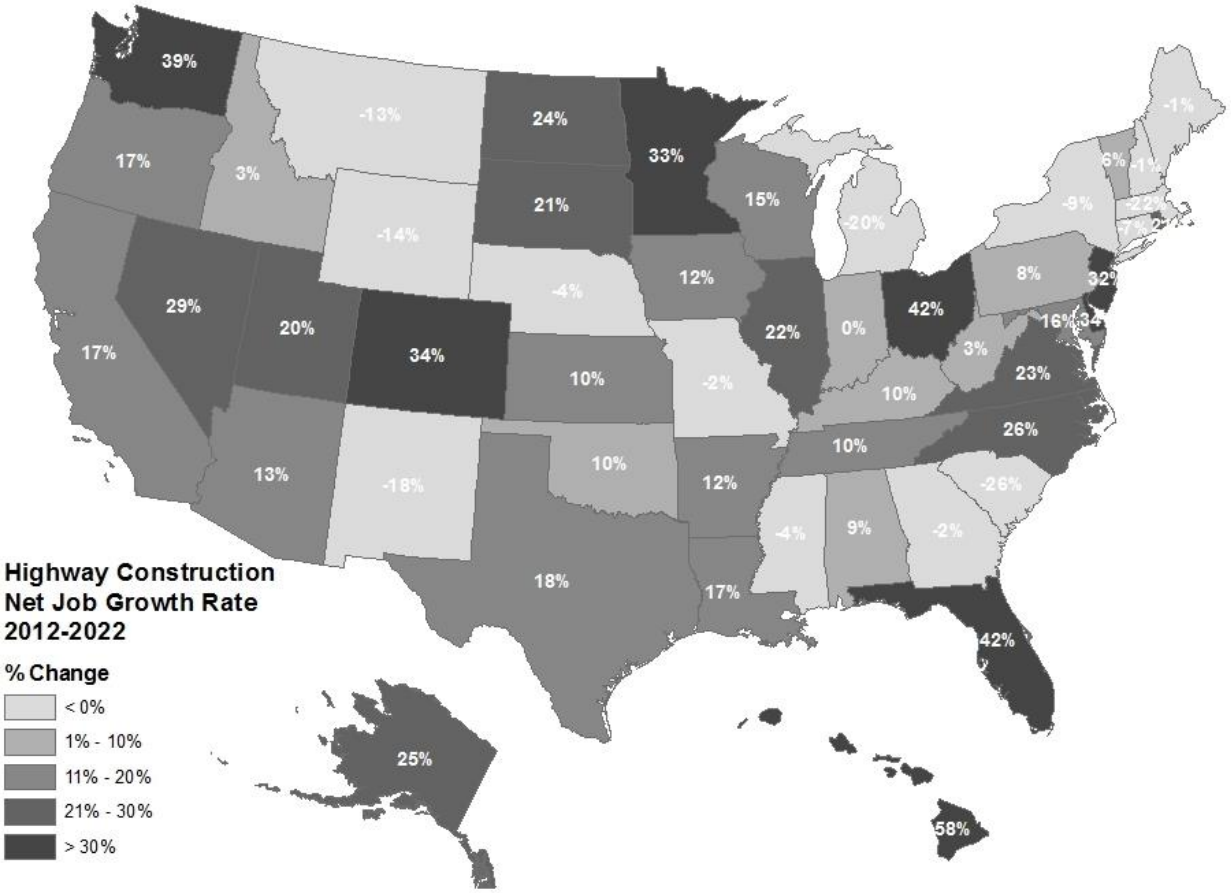


- Ninety-five percent of the job openings among the top 20 jobs in highway are found in construction and maintenance career areas.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

4. Highway

E. Long Term: 2012–2022 Projected Net Job Growth Rate by State

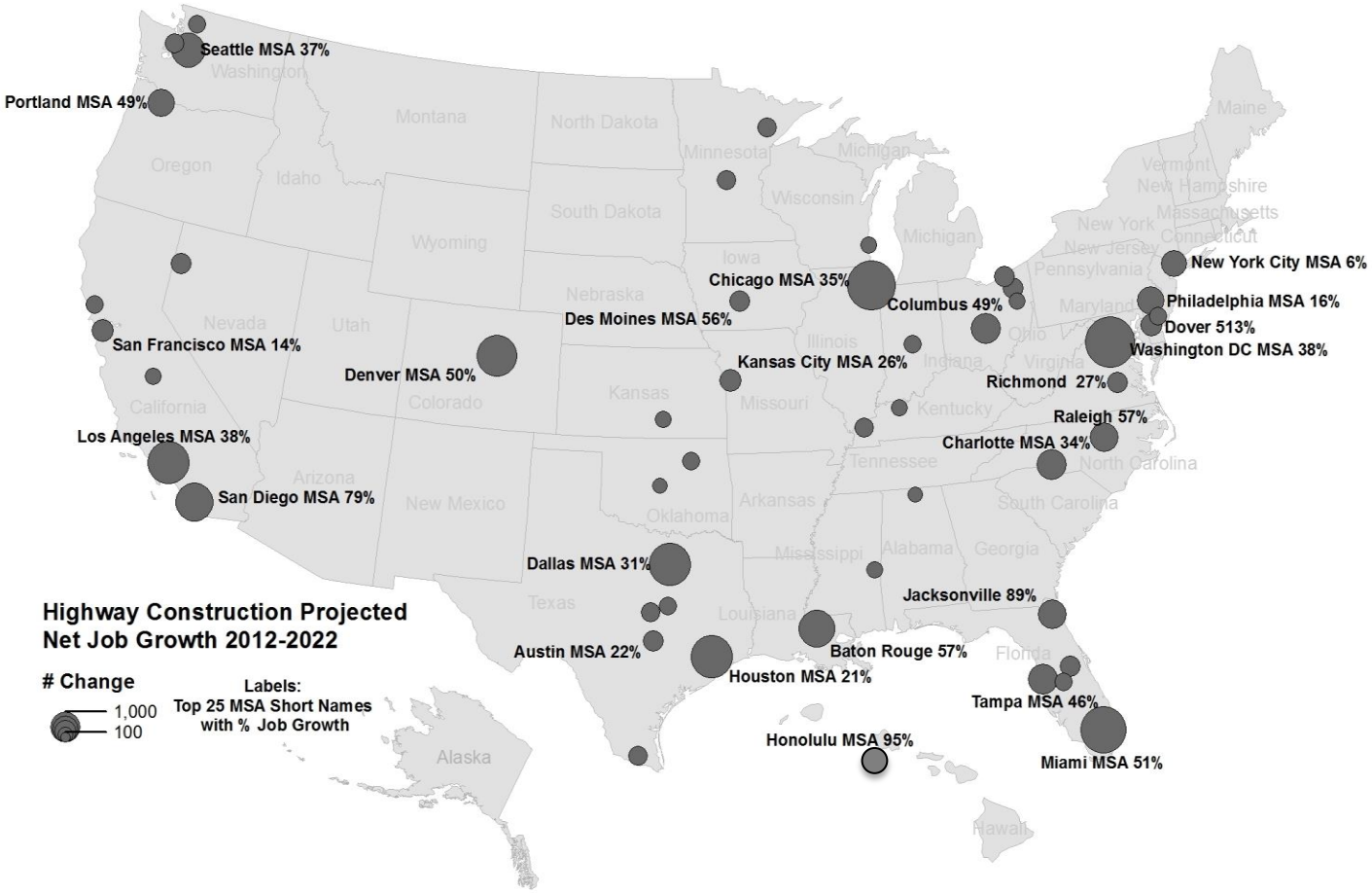


- Highway employment is projected to expand in all but 15 states.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

4. Highway

F. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 labeled)

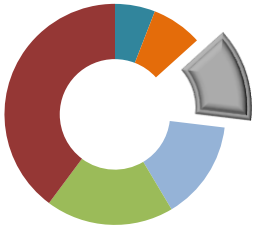


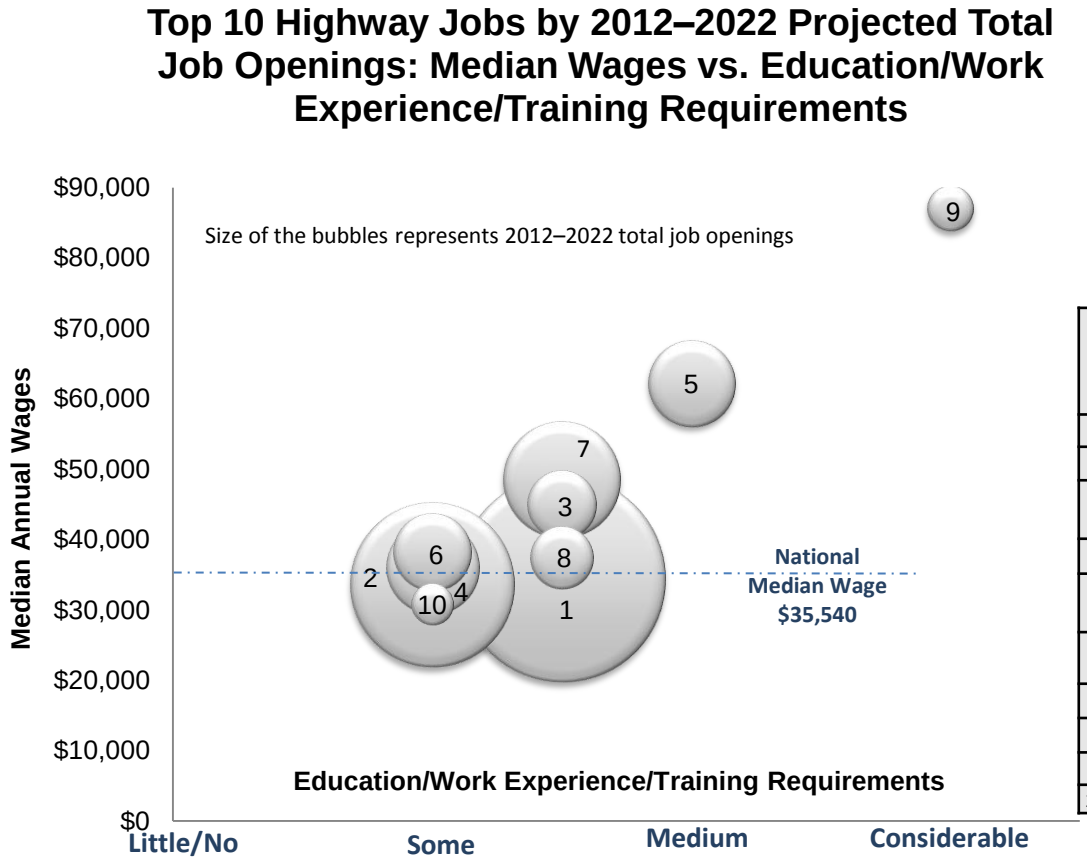
- Growth in highway employment is widely dispersed across the country, with some concentration in the mid-Atlantic region, the Gulf states, the West Coast, and the Midwest.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

4. Highway

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs



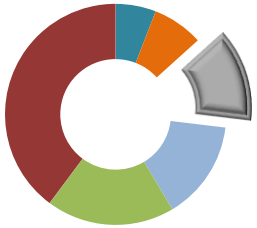


- Barriers to entry for many highway jobs are low. Joint apprenticeship and training programs prepare qualified entry level workers for well-paid, skilled jobs such as heavy equipment operator, carpenter, and cement mason.

	Title	10 Yr Job Openings	Median Annual Wages
1	Highway Maintenance Workers	141,009	$34,507
2	Construction Laborers	88,860	$33,592
3	Operating Engineers and Other Construction Equipment Operators	44,729	$48,568
4	Heavy and Tractor-Trailer Truck Drivers	28,625	$36,005
5	First-Line Supervisors of Construction trades and Extraction Workers	24,756	$62,254
6	Paving, Surfacing, and Tamping Equipment Operators	19,903	$38,189
7	Carpenters	15,609	$44,970
8	Cement Masons and Concrete Finishers	12,875	$37,502
9	Construction Managers	6,882	$87,048
10	Office Clerks, General	5,656	$30,846

Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

4. Highway
Standard Occupational Classification Definitions of Top 10 Occupations



1. **Highway Maintenance Workers:** Maintain highways, municipal and rural roads, airport runways, and rights-of-way. Duties include patching broken or eroded pavement, repairing guard rails, highway markers, and snow fences.
2. **Construction Laborers:** Perform tasks involving physical labor at construction sites. May operate hand and power tools of all types: air hammers, earth tampers, cement mixers, small mechanical hoists, surveying and measuring equipment, and a variety of other equipment and instruments. May clean and prepare sites, dig trenches, set braces to support the sides of excavations, erect scaffolding, and clean up rubble, debris, and other waste materials. May assist other craft workers.
3. **Operating Engineers and Other Construction Equipment Operators:** Operate one or several types of power construction equipment such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, and tractors or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement. May repair and maintain equipment in addition to other duties.
4. **Heavy and Tractor-Trailer Truck Drivers:** Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). May be required to unload truck. Requires commercial driver's license.
5. **First-line Supervisors of Construction Trades and Extraction Workers:** Directly supervise and coordinate activities of construction or extraction workers.
6. **Paving, Surfacing, and Tamping Equipment Operators:** Operate equipment used for applying concrete, asphalt, or other materials to road beds, parking lots, or airport runways and taxiways, or equipment used for tamping gravel, dirt, or other materials. Includes concrete and asphalt paving machine operators, form tampers, tamping machine operators, and stone spreader operators.
7. **Carpenters:** Construct, erect, install, or repair structures and fixtures made of wood such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors.
8. **Cement Masons and Concrete Finishers:** Smooth and finish surfaces of poured concrete such as floors, walks, sidewalks, roads, or curbs using a variety of hand and power tools. Align forms for sidewalks, curbs, or gutters; patch voids; and use saws to cut expansion joints.
9. **Construction Managers:** Plan, direct, or coordinate, usually through subordinate supervisory personnel, activities concerned with the construction and maintenance of structures, facilities, and systems. Participate in the conceptual development of a construction project and oversee its organization, scheduling, budgeting, and implementation.
10. **Office Clerks, General:** Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures.

5. Railroad
Industry Definition

- The 5-digit NAICS industries included in our data analysis on Rail Transportation are:

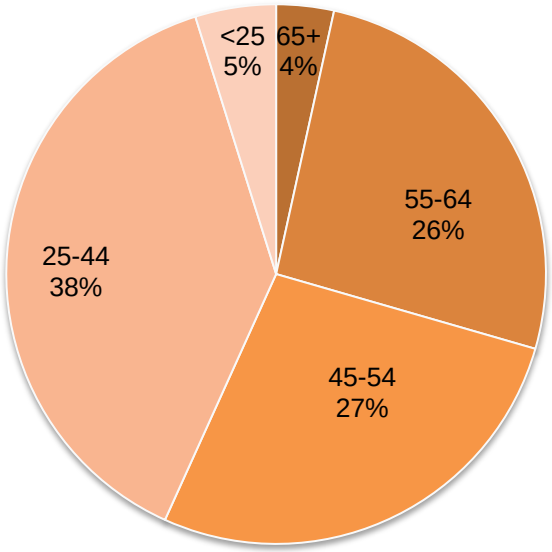
NAICS Code	Description
48211	Rail Transportation
48821	Support Activities for Rail Transportation

- Industries in the Rail Transportation subsector provide rail transportation of passengers and/or cargo using railroad rolling stock. The railroads in this subsector primarily either operate on networks with physical facilities, labor force, and equipment spread over an extensive geographic area, or operate over a short distance on a local rail line.
- Street railroads, commuter rail, and rapid transit are not included in this subsector but are included in Subsector 485, Transit and Ground Passenger Transportation. Commuter railroads operate in a manner more consistent with local and urban transit and are often part of integrated transit systems.
- The following Support Activities for Rail Transportation were also included in our analysis. Support Activities for Rail Transportation comprise establishments primarily engaged in providing specialized services for railroad transportation including servicing, routine repairing (except factory conversion, overhaul, or rebuilding of rolling stock), and maintaining rail cars; loading and unloading rail cars; and operating independent terminals.
- This analysis covers workers engaged in the transportation of people and goods. Rail vehicle manufacturing is not the focus of this report.

5. Railroad

A. Current: Worker Distribution by Age

2014 Railroad Worker Distribution by Age

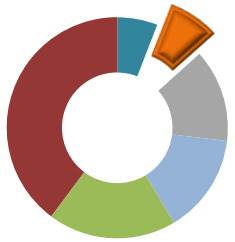


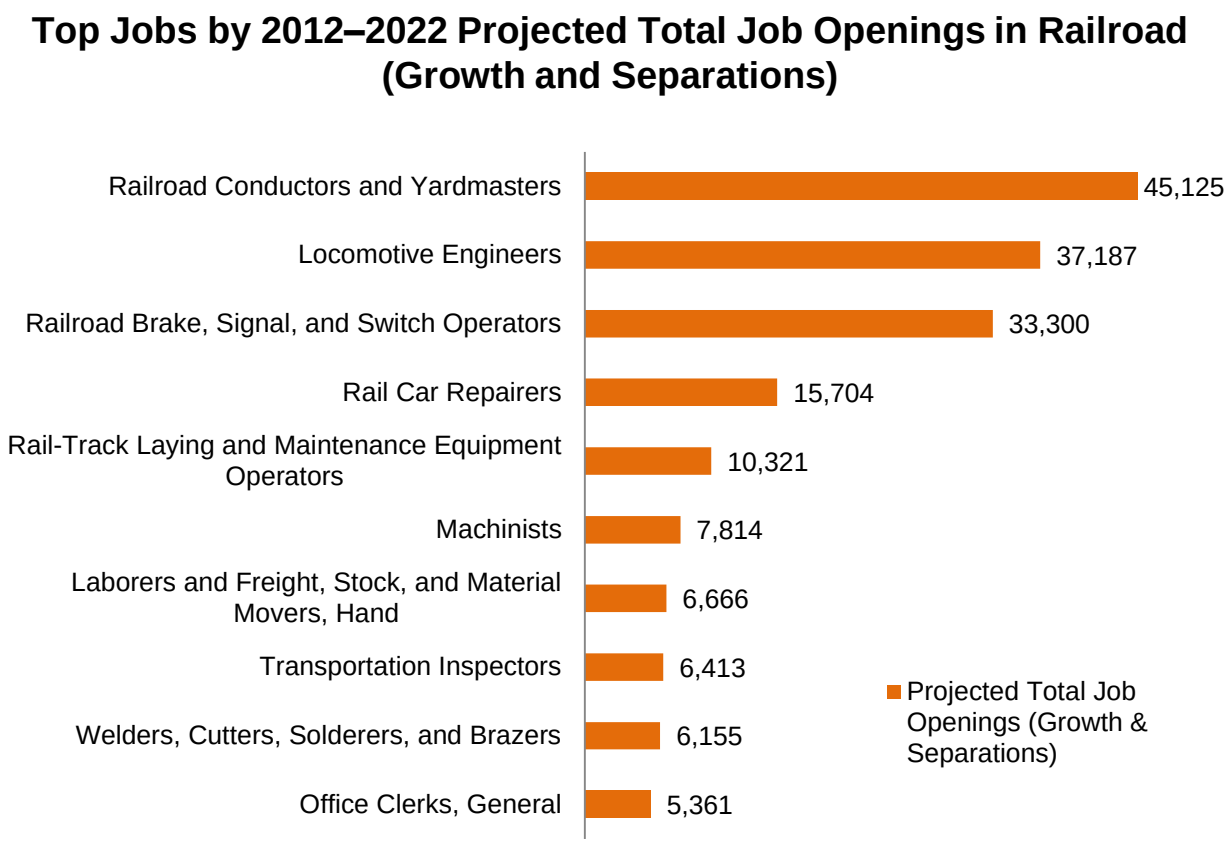
- Railroads have succeeded in attracting some younger workers in recent years. However, with 57 percent of the railroad workers above 45, retirement will pose challenges.

Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014.

5. Railroad

B. Long Term: Top 10 Jobs by Projected Total Job Openings





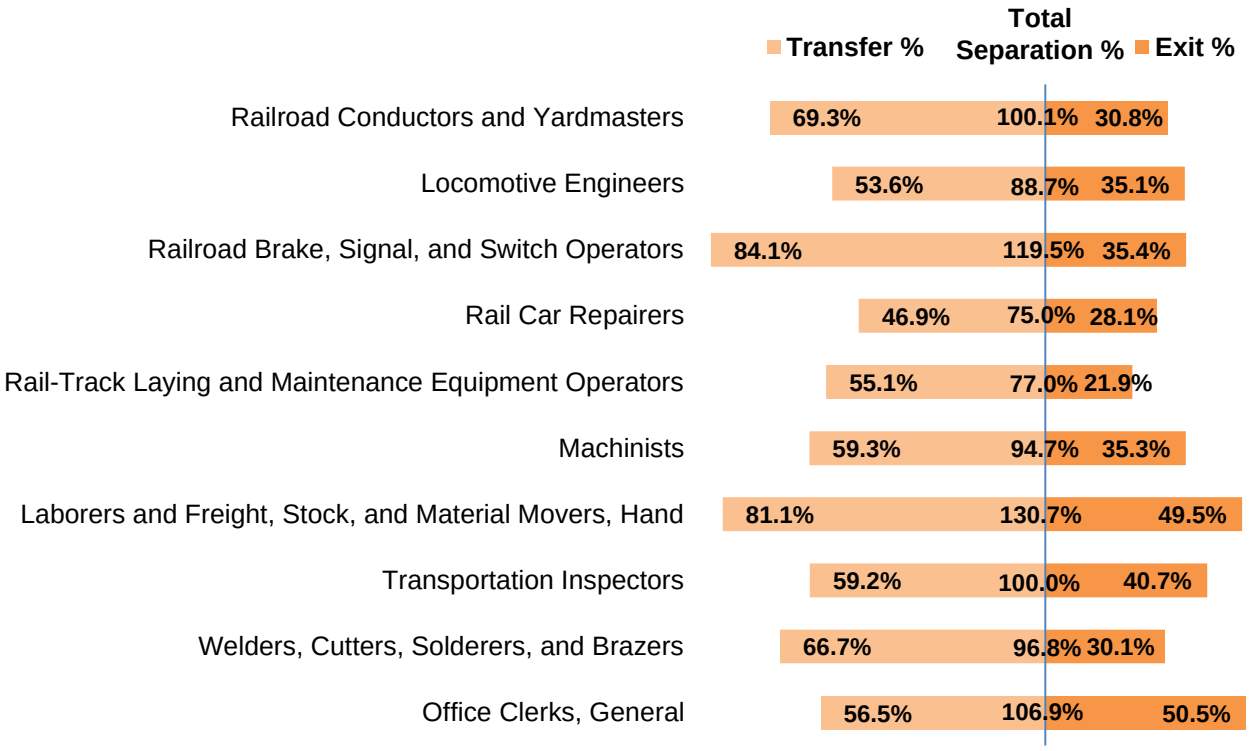
- Top railroad jobs based on long-term job openings include conductors, locomotive engineers, switch operators, and several groups of rail maintenance workers.
- Past year online job postings in railroading are generally consistent with long-term projections—with operations and maintenance jobs taking up the largest share of openings (chart not shown).

Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

5. Railroad

C. Long Term: Top 10 Jobs—Projected Separations (Occupational Transfer and Labor Force Exit Rates)

Top 10 Jobs in Railroad: 2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)



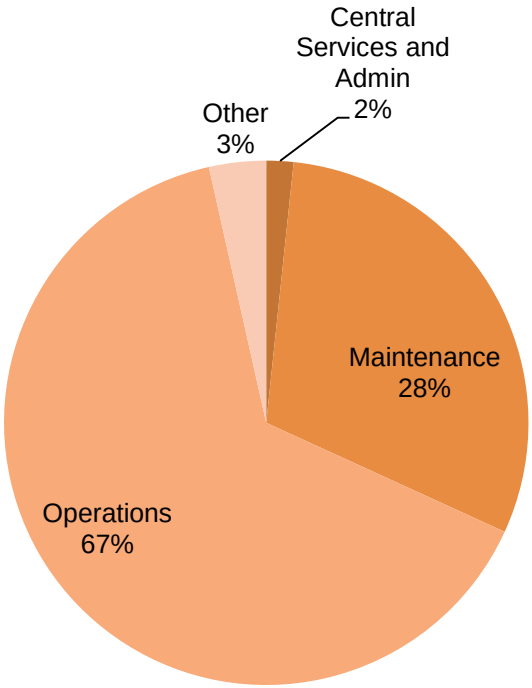
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

5. Railroad

D. Long Term: Projected Total Job Openings by Career Area

Top 20 Railroad Jobs
based on 2012–2022 Projected Total Job Openings
Share by Career Area

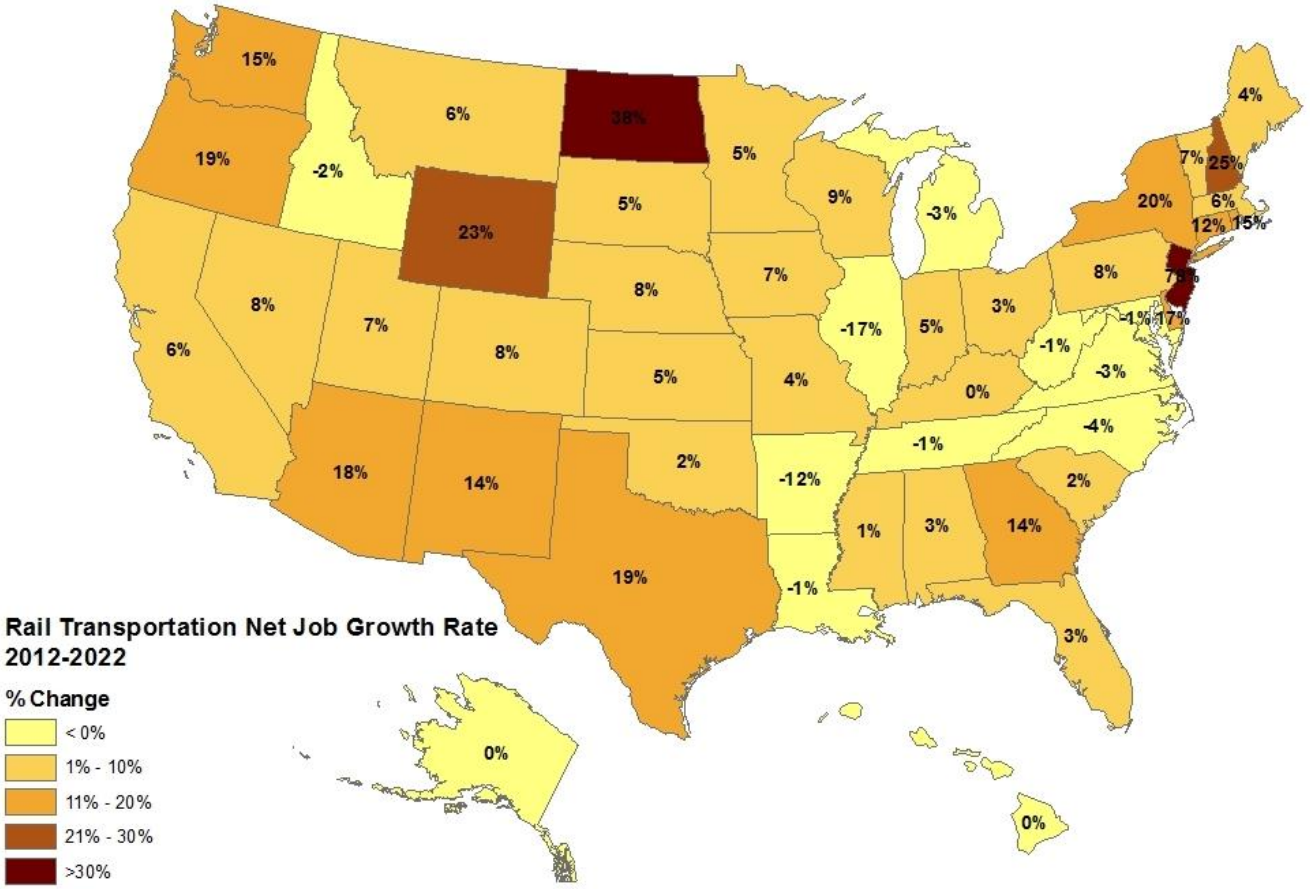


- Of the top 20 occupations with the highest job openings in railroading, 95 percent of the openings are in operations and maintenance.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

5. Railroad

E. Long Term: 2012–2022 Projected Net Job Growth Rate by State

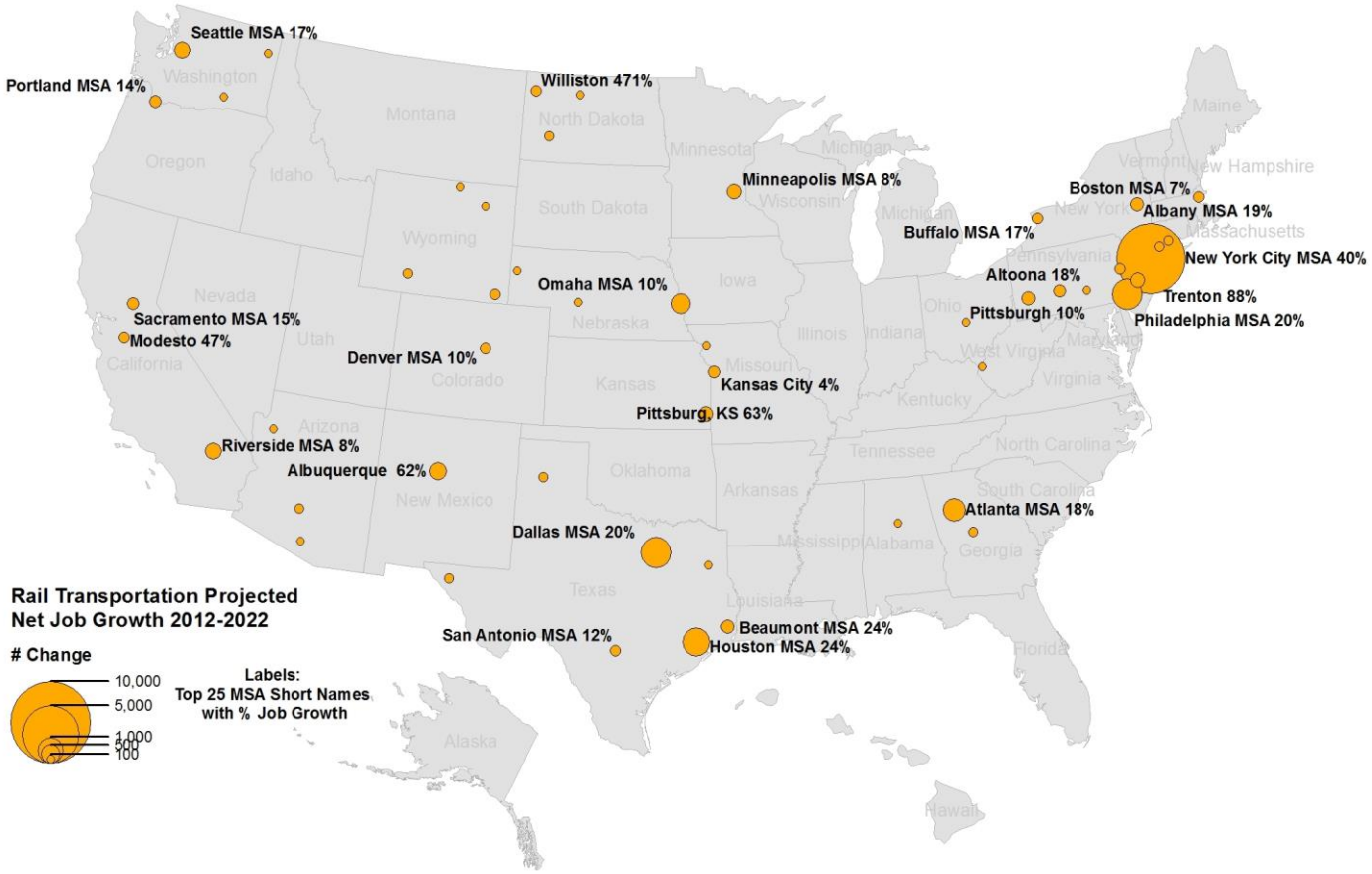


Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

- In the railroad industry, employment growth will be concentrated in the Northeast, with significant growth also in the new oil states of North Dakota and Wyoming.

5. Railroad

F. Long Term: Top 50 Metro Areas with Most 2012–2022 Projected Net Job Growth (25 labeled)



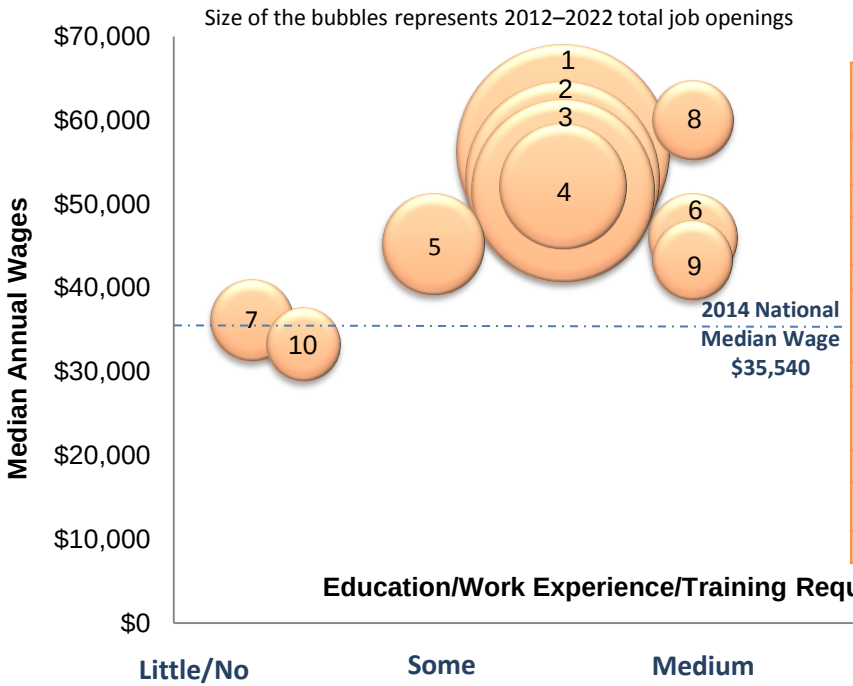
- New York City has by far the largest job growth in rail transportation, creating 7,400 new jobs in the ten years between 2012 and 2022, representing 40 percent growth.
- Philadelphia, Dallas, Atlanta, and Houston also expect relatively high numbers of job openings and growth rates of around 20 percent.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

5. Railroad

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs

Top 10 Rail Jobs by 2012–2022 Projected Total Job Openings: Median Wages vs. Education/Work Experience/Training Requirements



	Title	10 Yr Job Openings	Median Annual Wages
1	Railroad Conductors and Yardmasters	45,125	$56,368
2	Locomotive Engineers	37,187	$53,144
3	Railroad Brake, Signal, and Switch Operators	33,300	$51,626
4	Rail Car Repairers	15,704	$52,187
5	Rail-Track Laying and Maintenance Equipment Operators	10,321	$45,282
6	Machinists	7,814	$45,968
7	Laborers and Freight, Stock, and Material Movers, Hand	6,666	$36,150
8	Transportation Inspectors	6,413	$60,050
9	Welders, Cutters, Solderers, and Brazers	6,155	$43,326
10	Office Clerks, General	5,361	$33,280

- Nine of the ten high-demand rail jobs pay above the national median wage.
- While a high school diploma and demonstration of math and language proficiency is sufficient to gain access to many entry-level jobs in railroad, training through some combination of career and technical education, apprenticeship, or On-the-Job Learning is required to attain mastery.

Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

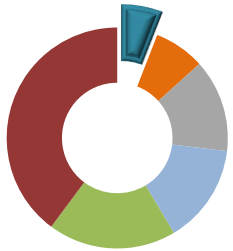
5. Railroad

Standard Occupational Classification Definitions of Top 10 Occupations

1. **Railroad Conductors and Yardmasters:** Coordinate activities of switch-engine crew within railroad yards, industrial plants, or similar locations. Conductors coordinate activities of train crew on passenger or freight trains. Yardmasters review train schedules, switching orders, and coordinate activities of workers engaged in railroad traffic operations such as the makeup or breakup of trains and yard switching.
2. **Locomotive Engineers:** Drive electric, diesel-electric, steam, or gas-turbine-electric locomotives to transport passengers or freight. Interpret train orders, electronic or manual signals, and railroad rules and regulations.
3. **Railroad, Brake, Signal and Switch Operators:** Operate railroad track switches. Couple or uncouple rolling stock to make up or break up trains. Signal engineers by hand or flagging. May inspect couplings, air hoses, journal boxes, and hand brakes.
4. **Rail Car Repairers:** Diagnose, adjust, repair, or overhaul railroad rolling stock, mine cars, or mass transit rail cars.
5. **Rail-Track Laying and Maintenance Equipment Operators:** Lay, repair, and maintain track for standard or narrow-gauge railroad equipment used in regular railroad service or in plant yards, quarries, sand and gravel pits, and mines. Includes ballast cleaning machine operators and railroad bed tamping machine operators.
6. **Machinists:** Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.
7. **Laborers and Freight, Stock, and Material Movers, Hand:** Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified
8. **Transportation Inspectors:** Inspect equipment or goods in connection with the safe transport of cargo or people. Includes rail transportation inspectors such as freight inspectors, rail inspectors, and other inspectors of transportation vehicles, not elsewhere classified.
9. **Welders, Cutters, Solderers, and Brazers:** Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.
10. **Office Clerks, General:** Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures. Clerical duties may be assigned in accordance with the office procedures of individual establishments and may include a combination of answering telephones, bookkeeping, typing or word processing, stenography, office machine operation, and filing.

6. Maritime

Industry Definition



- The 5-digit NAICS industries included in our data analysis on Maritime Transportation are:

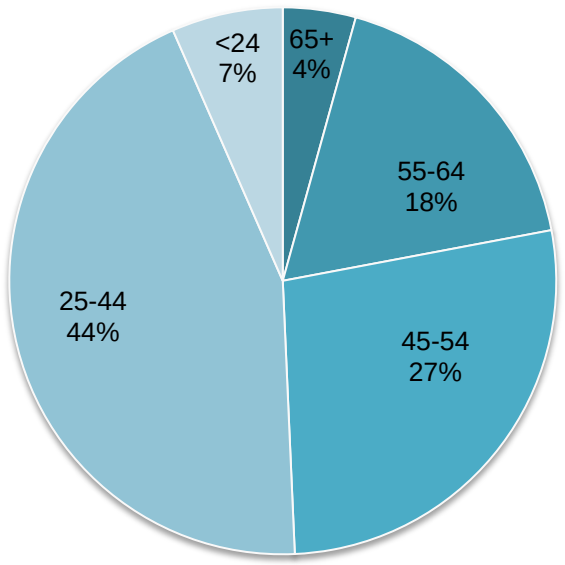
NAICS Code	Description
48311	Deep Sea, Coastal, and Great Lakes Water Transportation
48321	Inland Water Transportation
48831	Port and Harbor Operations
48832	Marine Cargo Handling
48833	Navigational Services to Shipping
48839	Other Support Activities for Water Transportation

- Industries in the Water Transportation subsector provide water transportation of passengers and cargo using watercraft such as ships, barges, and boats. The subsector is composed of two industry groups: (1) one for deep sea, coastal, and Great Lakes; and (2) one for inland water transportation. This split typically reflects the difference in equipment used.
- The following Support Activities for Water Transportation were also included in our analysis. Port and Harbor Operation comprises establishments primarily engaged in operating ports, harbors (including docking and pier facilities), or canals. Marine Cargo Handling comprises establishments primarily engaged in providing stevedoring and other marine cargo handling services (except warehousing). Navigational Services to Shipping comprise establishments primarily engaged in providing navigational services to shipping. Marine salvage establishments are included in this industry. Examples:
  - Docking and undocking marine vessel services
  - Piloting services, water transportation
  - Marine vessel traffic reporting services
  - Tugboat services, harbor operation
- Other Support Activities for Water Transportation include establishments primarily engaged in providing services for water transportation (except port and harbor operations, marine cargo handling services, shipping navigational services).
- This analysis covers workers engaged in the transportation of people and goods. Shipbuilding and manufacturing of other watercrafts is not the focus of the report.

6. Maritime

A. Current: Worker Distribution by Age

2014 Maritime Worker Distribution by Age

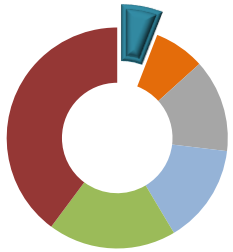


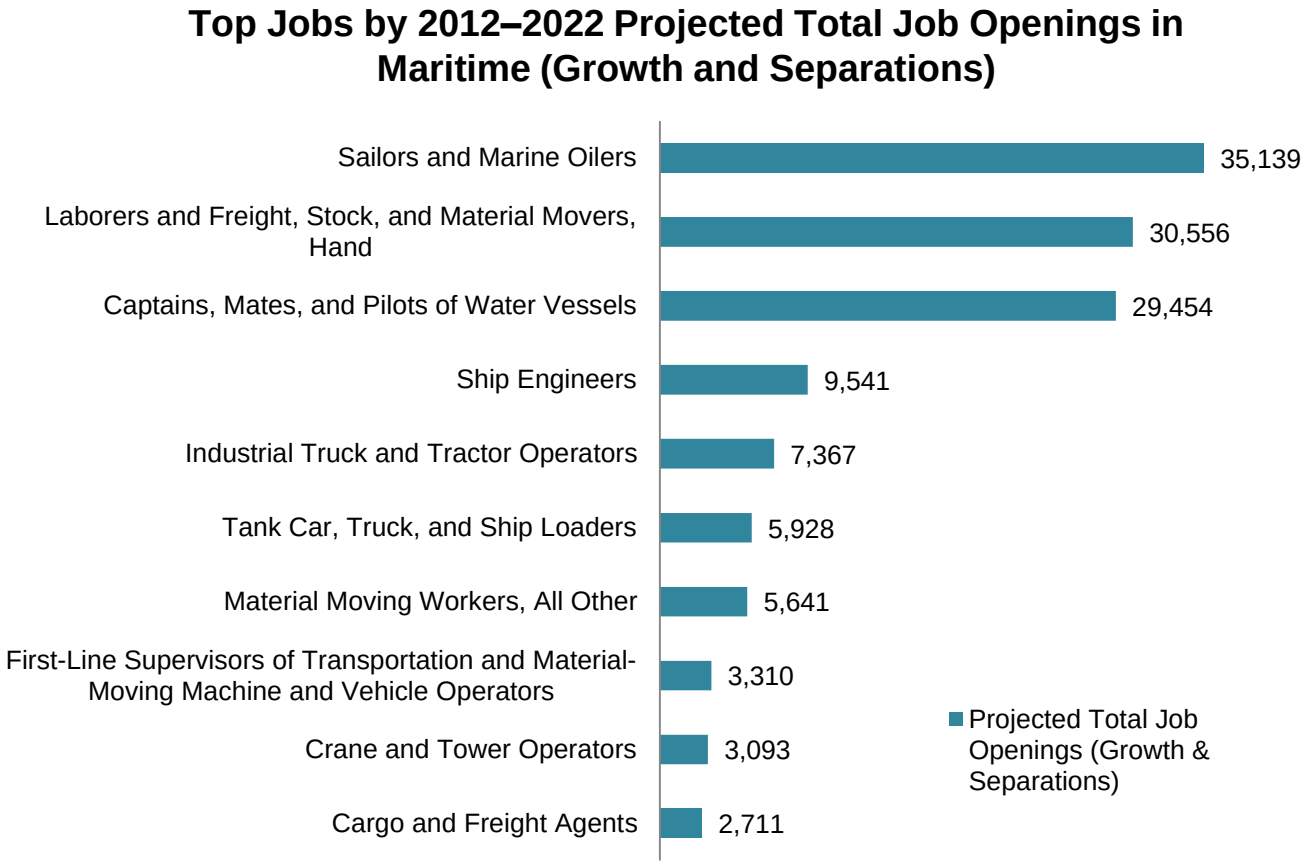
- Maritime workers are relatively young, compared with other transportation sectors such as transit and trucking.
- The exception is the U.S. Coast Guard (USCG) credentialed merchant mariners. Based on the Maritime Administration's analysis of this population the average age of USCG credentialed merchant mariners is 46 as of March, 2014.

Source: TLC and JFF analysis based on EMSI 2014 Industry Report. Data retrieved from EMSI in June 2014. Merchant mariner age data in side bullet provided by US DOT Maritime Administration (MARAD) in October 2014.

6. Maritime

B. Long Term: Top 10 Jobs by Projected Total Job Openings



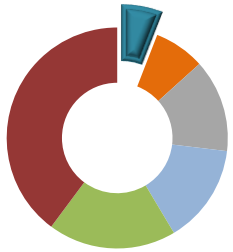


- The overwhelming majority of job openings in maritime will be for occupations serving on vessels.

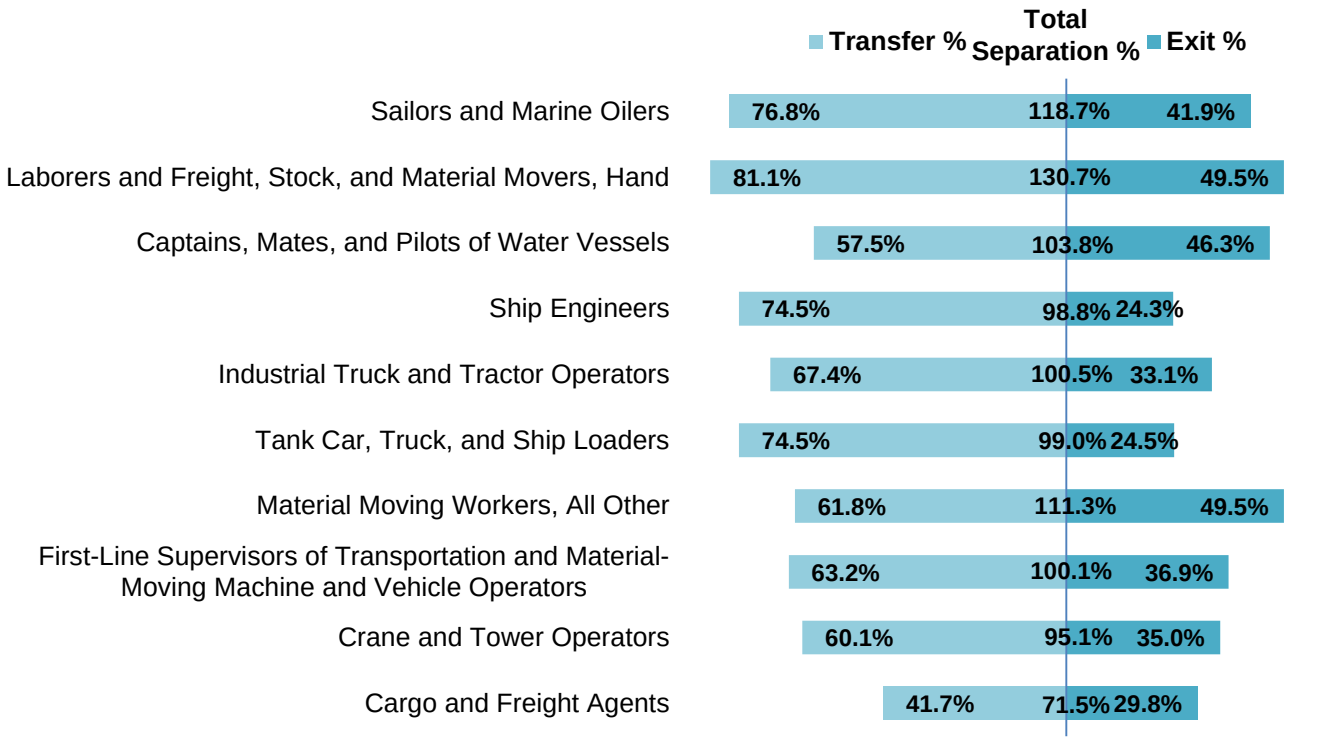
Source: Occupational job openings due to *growth* based on TLC and JFF analysis of EMSI Staffing Patterns Report. Data retrieved from EMSI June 2014. Occupational job openings due to *separations* based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

6. Maritime

C. Long Term: Top 10 Jobs—Projected Separations (Occupational Transfer and Labor Force Exit Rates)



Top 10 Jobs in Maritime: 2012–2022 Projected Separations by Occupational Transfer and Labor Force Exit Rates (Excluding Growth)



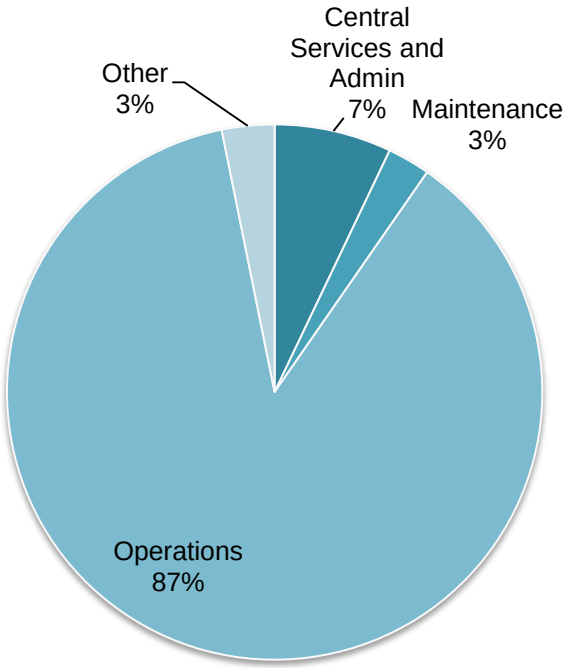
Source: Occupational Transfer, Exit and Separation Rates based on BLS, Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

- **Occupational Transfer Rates (left)** represent the percentage of workers leaving an occupation and entering a different occupation, using current occupational employment as the baseline. It does not capture those who switch employers but remain in the same occupation.
- **Labor Force Exit Rates (right)** represent the percentage of workers who leave the labor force entirely, for reasons such as retirement, death, and long-term illnesses.
- Taking transfer and exit rates together, the **Total Separation Rates (middle)** represent the percentage of total job openings that will need to be filled.

6. Maritime

D. Long Term: Projected Total Job Openings by Career Area

Top 20 Maritime Jobs
based on 2012–2022 Projected Total Job Openings
Share by Career Area

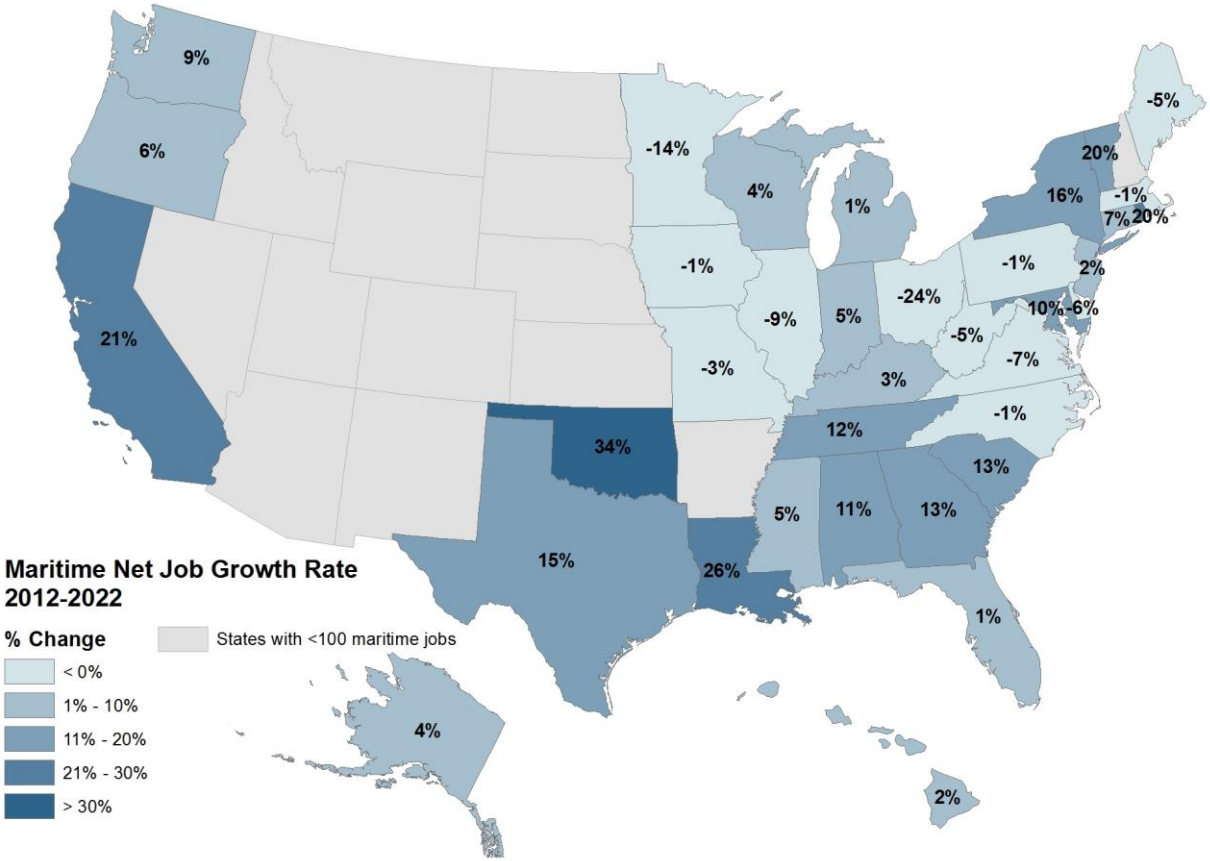


- Of the top 20 maritime occupations, 87 percent of the job openings will be in operations.

Source: TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014.

6. Maritime

E. Long Term: 2012–2022 Projected Net Job Growth Rate by State

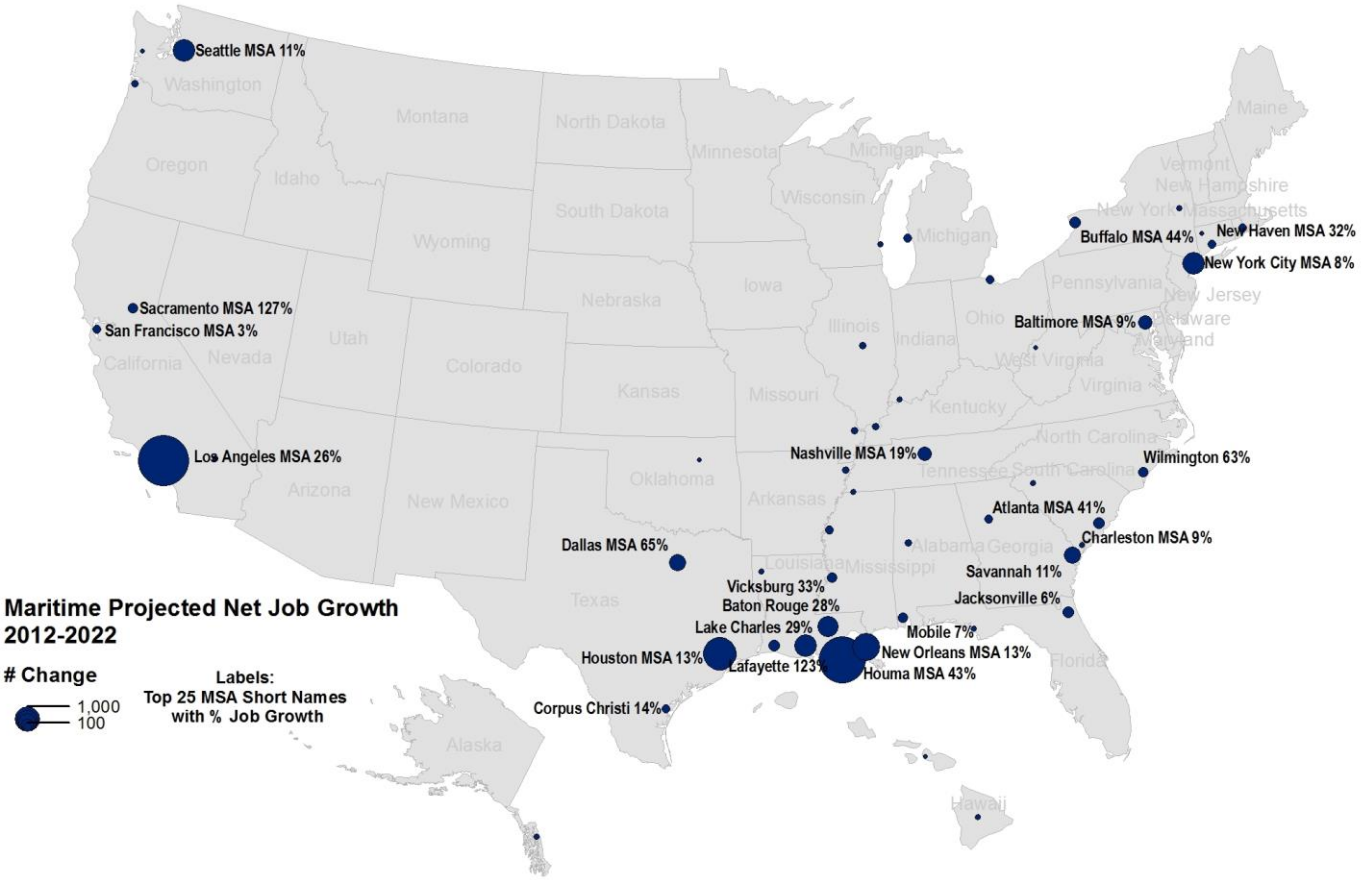


- In the maritime industry, significant growth is concentrated on the Pacific and Gulf Coasts, and the Northeast.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

6. Maritime

F. Long Term: Top 50 Metro Areas with the Most 2012–2022 Projected Net Job Growth (25 Labeled)

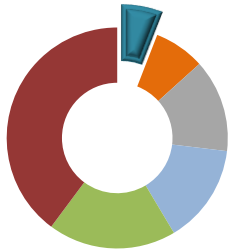


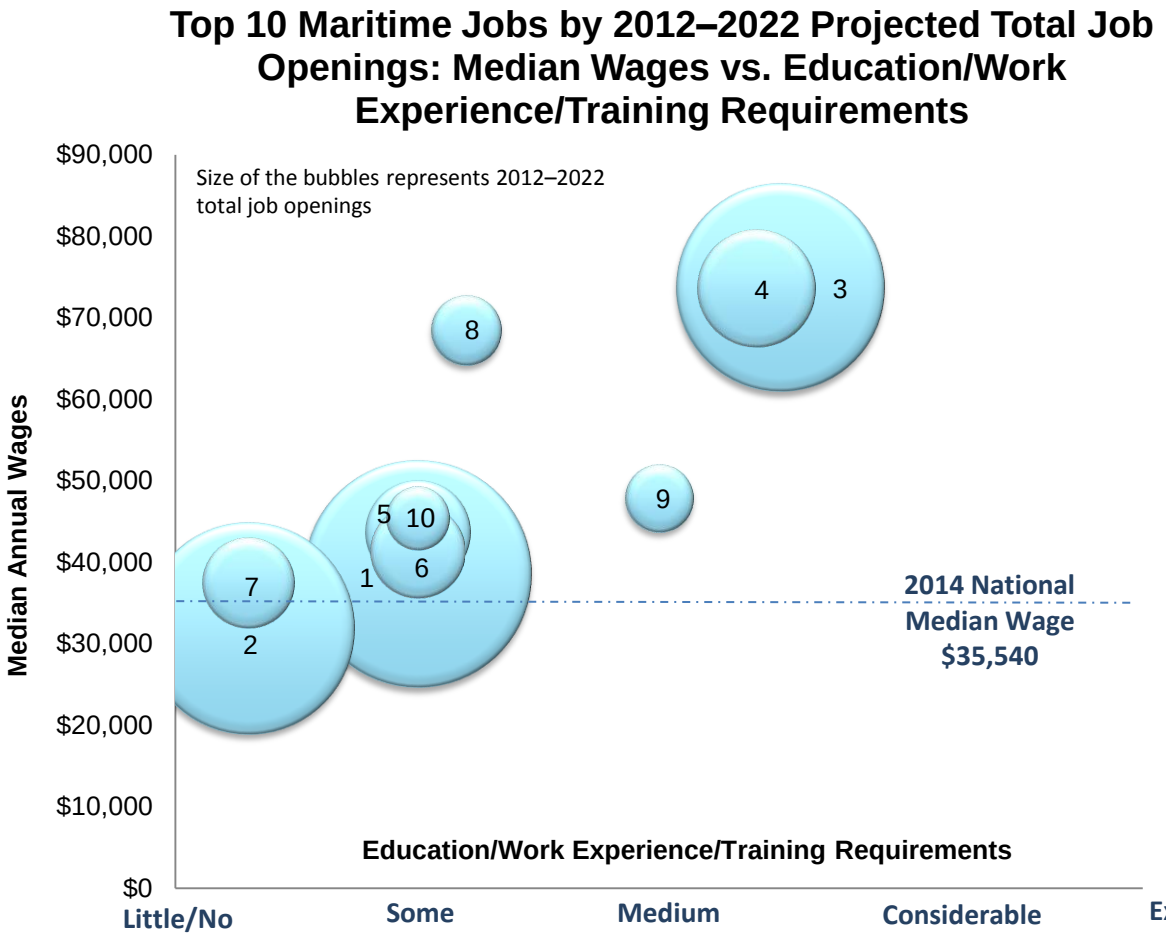
- Older Atlantic ports will still generate some job growth, but Gulf and Pacific ports will see greater employment growth.

Source: TLC and JFF analysis of EMSI state and metropolitan area employment projections. Data retrieved from EMSI in June 2014.

6. Maritime

G. Long Term: Wages and Education/Work Experience/ Training Requirements for Top 10 Jobs





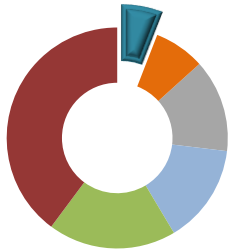
- Nine out of the ten high-demand maritime occupations pay above the national median, and many jobs have relatively low barriers to entry.

	Title	10 Yr Job Openings	Median Annual Wages
1	Sailors and Marine Oilers	35,139	$38,605
2	Laborers and Freight, Stock, and Material Movers, Hand	30,556	$31,949
3	Captains, Mates, and Pilots of Water Vessels	29,454	$73,757
4	Ship Engineers	9,541	$73,674
5	Industrial Truck and Tractor Operators	7,367	$43,722
6	Tank Car, Truck, and Ship Loaders	5,928	$41,434
7	Material Moving Workers, All Other	5,641	$37,523
8	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	3,310	$68,557
9	Crane and Tower Operators	3,093	$47,902
10	Cargo and Freight Agents	2,711	$45,448

Source: Job openings based on TLC and JFF analysis of EMSI Staffing Patterns Report and Occupational Separation Rates from BLS Employment Projections program. *Projected occupational separation rates, 2012-22 experimental data set*. http://www.bls.gov/emp/ep_separations_data.xlsx. Released May 9, 2014. Education/Work Experience/Training Requirements based on O*Net Job Zones, adjusted by TLC and JFF for some occupations. Median annual wages from EMSI Staffing Patterns Report, calculated by multiplying the median hourly wage of incumbents in the transportation industry by a "year-round, full-time" hours figure of 2,080 hours. Fringe benefits not included. 2014 National Median Wage from BLS published table, *May 2014 National Occupational Employment and Wage Estimates. Retrieved from:* http://www.bls.gov/oes/current/oes_nat.htm in June 2015.

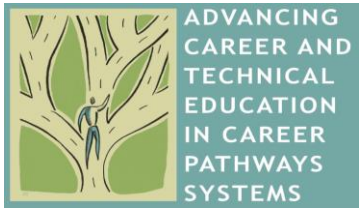
6. Maritime

Standard Occupational Classification Definitions of Top 10 Occupations



1. **Sailors and Marine Oilers:** Stand watch to look for obstructions in path of vessel, measure water depth, turn wheel on bridge, or use emergency equipment as directed by captain, mate, or pilot. Break out, rig, overhaul, and store cargo-handling gear, stationary rigging, and running gear. Perform a variety of maintenance tasks to preserve the painted surface of the ship and to maintain line and ship equipment. Must hold government-issued certification and tankerman certification when working aboard liquid-carrying vessels. Includes able seamen and ordinary seamen.
2. **Laborers and Freight, Stock, and Material Movers, Hand:** Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified
3. **Captain, Mates, and Pilots of Water Vessels:** Command or supervise operations of ships and water vessels such as tugboats and ferryboats. Required to hold license issued by U.S. Coast Guard.
4. **Ship Engineers:** Supervise and coordinate activities of crew engaged in operating and maintaining engines, boilers, deck machinery, and electrical, sanitary, and refrigeration equipment aboard ship.
5. **Industrial Truck and Tractor Operators:** Operate industrial trucks or tractors equipped to move materials around a warehouse, storage yard, factory, construction site, or similar location. Excludes "Logging Equipment Operators".
6. **Tank Car, Truck, and Ship Loaders:** Load and unload chemicals and bulk solids such as coal, sand, and grain into or from tank cars, trucks, or ships using material moving equipment. May perform a variety of other tasks relating to shipment of products. May gauge or sample shipping tanks and test them for leaks.
7. **Material Moving Workers, All Other:** All material moving workers not listed separately.
8. **First-line Supervisors of Transportation and Material-Moving and Vehicle Operators:** Directly supervise and coordinate activities of transportation and material-moving machines and vehicle operators and helpers.
9. **Crane and Tower Operators:** Operate mechanical boom and cable or tower and cable equipment to lift and move materials, machines, or products in many directions. Excludes "Excavating and Loading Machine and Dragline Operators."
10. **Cargo and Freight Agents:** Expedite and route movement of incoming and outgoing cargo and freight shipments in airline, train, and trucking terminals, and shipping docks. Take orders from customers and arrange pickup of freight and cargo for delivery to loading platform. Prepare and examine bills of lading to determine shipping charges and tariffs.

In Conclusion



This report identifies the critical need for building a qualified and skilled transportation workforce. We must ensure that America's education and workforce development systems can provide students, jobseekers, and workers with the skills needed for these careers.

The U.S. Departments of Education, Transportation, and Labor will work together and with stakeholders to align skills training and Career Pathways programs with job demand in the transportation industry:

- Career and Technical Education programs of study, beginning in high school and continuing into postsecondary education or apprenticeship can provide the foundational and early occupational skills training needed in skilled occupations.
- Pre-apprenticeship programs for disadvantaged youth and adults can prepare low-skilled and underrepresented populations for entry into these skilled positions.
- Career Pathways systems that are aligned with Registered Apprenticeship programs can expand the number of people who can access these high-demand jobs.
- Significant training at the workplace helps people move from novice to skilled practitioner in their craft.

Endnote

1. Pages 27, 36, 45, 54, 63, and 72 list the five-digit North American Industry Classification System (NAICS) codes covered in each transportation subsector of this report. Because of the need for detailed analysis of customized industry subsectors, five-digit NAICS codes from multiple three-digit standard industries were selected and combined. Specifically, in Bureau of Labor Statistics (BLS) industry employment data, some workers operating and maintaining transportation infrastructure (e.g. airport operations, aircraft mechanics, port operations) are clustered into "Support Activities," separate from the passenger and goods moving jobs of the same transportation mode. In this analysis, they have been merged back into their respective modes. Analysis of these customized industries is not available from the BLS. Researchers of this data report used Economic Modeling Specialists International (EMSI)'s data and analysis where necessary.
2. The NAICS-defined urban transit systems industry does not include many publicly operated transit systems, which represents the majority of employment in US urban transit. To obtain a complete picture of the workforce, relevant data from the local government passenger transit industry have been added to data from privately operated transit, using EMSI Industry and Staffing Pattern reports.
3. EMSI reports aggregate BLS data and additional data sources. EMSI industry data have various sources depending on the class of worker. (1) For QCEW (Quarterly Census of Employment and Wages) Employees, EMSI primarily uses the QCEW, with supplemental estimates from County Business Patterns and Current Employment Statistics. (2) Non-QCEW employees data are based on a number of sources including QCEW, Current Employment Statistics, County Business Patterns, Bureau of Economic Analysis (BEA) State and Local Personal Income reports, the National Industry-Occupation Employment Matrix (NIOEM), the American Community Survey, and Railroad Retirement Board statistics. (3) Self-Employed and Extended Proprietor classes of worker data are primarily based on the American Community Survey, Nonemployer Statistics, and BEA State and Local Personal Income Reports. Projections for QCEW and Non-QCEW Employees are informed by NIOEM and long-term industry projections published by individual states. EMSI's occupational employment data are compiled from several sources using a specialized process. For QCEW and Non-QCEW Employees classes of worker, sources include Occupational Employment Statistics, the National Industry-Occupation Employment Matrix, and the American Community Survey. For the Self-Employed and Extended Proprietors classes of worker, the primary source is the American Community Survey, with a small amount of information from Occupational Employment Statistics. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry. For additional information on EMSI data sources, please refer to http://www.economicmodeling.com/.
4. Other Support Activities for Transportation: NAICS 4889 is excluded because the services covered are not specific enough to be categorized under any of the six subsectors. According to NAICS definition, this industry comprises establishments, not classified to any other industry, primarily engaged in providing specialized services to transportation establishments. Example Activities: Arrangement of carpools and vanpools Driving service (auto and truck delivery); Liquefaction and regasification of natural gas for purposes of transport at mine site; Livestock feeing station service, livestock in transit; Packing and crating service transportable goods (except used household goods); Pipeline terminal facilities independently operated.

Endnote

5. The average employment growth rates of the transportation industry and its subsectors are based on analysis of EMSI Industry Reports. The economy-wide employment growth rate is from BLS Economic News Release: Employment Projections: 2012–2022 Summary, December 19, 2013. Retrieved from: http://www.bls.gov/news.release/ecopro.nr0.htm. The infrastructure industry growth rate is from Joseph Kane and Robert Puentes. *Beyond Shovel-Ready: The Extent and Impact of U.S. Infrastructure Jobs.* Brookings Institution. May 9, 2014. Retrieved from: http://www.brookings.edu/research/interactives/2014/infrastructure-jobs#/M10420.
6. The percentages of the <25 age group for transportation and its subsectors are calculated using EMSI Industry Report data. This category includes those 14 to 24 years old. BLS does not publish employment numbers of persons that are younger than 16. Therefore the <25 age group for All US Industries (last bar in the chart) covers only those that are 16 to 24 years old. Percentages may not add up to 100 percent due to rounding.
7. Race and ethnicity are not mutually exclusive. Person of Hispanic or Latino ethnicity may be of any race. Other Racial Categories in Chart D include any racial group outside of White, African American and Asian (for example, Native American and persons of two or more races).
8. BLS does not produce data on separations by industry, only by occupation. To generate estimates of transportation subsector job openings due to separations, researchers of this report used the weighted averages of separations of the top 20 jobs within each subsector. The total job openings in the transportation industry are then calculated by summing the subsector openings. A series of assumptions were made: (a) all separations out of an occupation are also out of the industry; b) no workers change industry but remain within the same occupation; (c) occupational separation rates are consistent across all industries that an occupation is employed in; and (d) the top 20 jobs within each subsector represent a significant portion of the total subsector employment. These limitations should be considered when interpreting the chart.
9. Generally, occupational employment and projected job openings presented here do not cover employment in all US industries, but only in the six transportation subsectors defined earlier. For example, truck drivers employed by retail, manufacturing, agriculture or mining industries are not included. Based on BLS's experimental data, there will be a need to hire over 2 million heavy and tractor-trailer truck drivers throughout the economy, compared with 1.2 million within the transportation subsectors.
10. Not all workers who are projected to fill job openings that result from growth and separations require training. Because job openings can be filled by workers who were previously employed in other occupations, these workers may already have the necessary training employers need based either on their work experience in a related occupation or on their prior education. The related educational programs include degree and certificate programs tracked by NCES only. National data continues to be hard to track for credentials obtained through some non-degree programs, apprenticeships, training sponsored by employers, unions or community-based organizations, and public programs such as the Workforce Investment Act and Supplemental Nutrition Assistance Program Employment and Training. In addition, the data in this chart is comparing projected openings with historical educational program completions. These limitations should be considered when interpreting the chart.

Reprint and Citation

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