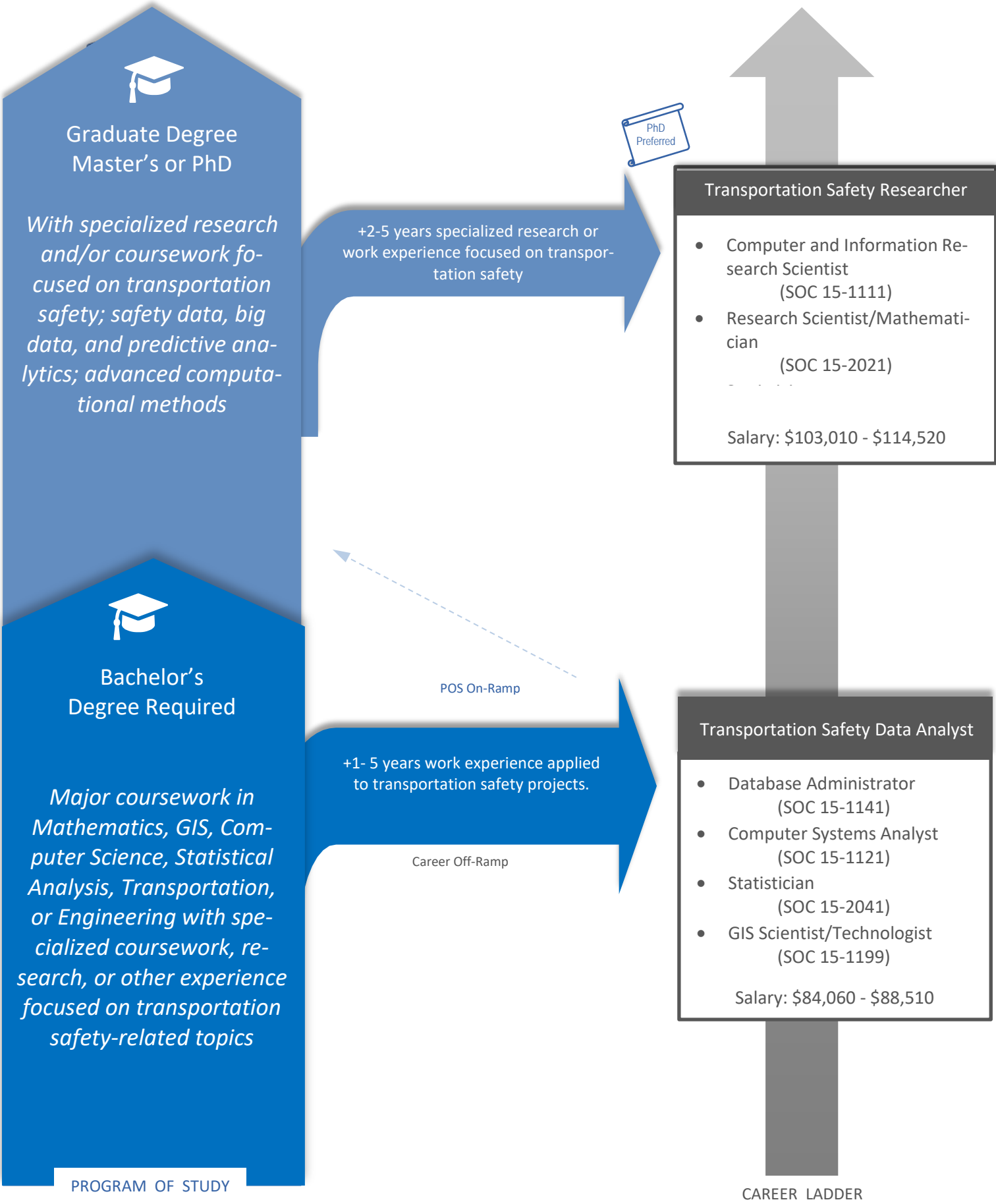# Transportation Safety

Data Analysis

Career Pathway Documentation

Career Pathway: Transportation Safety Data Management and Analysis

NNTW National Network for the Transportation Workforce

Graduate Degree Master's or PhD

With specialized research and/or coursework focused on transportation safety; safety data, big data, and predictive analytics; advanced computational methods

PhD Preferred

+2-5 years specialized research or work experience focused on transportation safety

Transportation Safety Researcher

- Computer and Information Research Scientist
  (SOC 15-1111)
- Research Scientist/Mathematician
  (SOC 15-2021)

Salary: $103,010 - $114,520

Bachelor's Degree Required

Major coursework in Mathematics, GIS, Computer Science, Statistical Analysis, Transportation, or Engineering with specialized coursework, research, or other experience focused on transportation safety-related topics

POS On-Ramp

+1- 5 years work experience applied to transportation safety projects.

Career Off-Ramp

Transportation Safety Data Analyst

- Database Administrator
  (SOC 15-1141)
- Computer Systems Analyst
  (SOC 15-1121)
- Statistician
  (SOC 15-2041)
- GIS Scientist/Technologist
  (SOC 15-1199)

Salary: $84,060 - $88,510

PROGRAM OF STUDY

CAREER LADDER

Alternative Job Titles

FARS Manager/Analyst; Database Administrator, Statistician, Computer Systems Analyst, GIS Scientist, Research Scientist/Mathematician

Job Description

A Transportation Safety Data Analyst supports data-driven transportation safety improvements by ensuring that transportation and other relevant organizations collect, manage, and share high quality data in an efficient and coordinated manner to support transportation safety decision-making and resource allocation. They assist others in identifying relationships and trends in data; use techniques to display results of analyses; review data for accuracy, quality, and completeness; establish protocols for data management and security; and utilize multiple strategies to integrate safety data and analysis into transportation decision-making processes. Other duties may include:

- Develop systems and establish processes to ensure data quality and type of data elements are properly collected and validated to enable robust safety analysis.
- Work with stakeholders from both the public and private sectors to establish interoperability between different data sources to support transportation safety data analytics.
- Develop data analysis and data visualization tools, and user interface systems to facilitate data access, user friendly data queries, and data system functionality.
- Use advanced predictive analytics, computational methods, and modeling and simulation techniques to identify and mitigate safety risk.

Knowledge Requirements

- Analysis/Research/Report Methods
- Regulation/Legislation/Organizational/Funding Policies and Goals related to Safety
- Principles of Road Safety
- Statistical Theory/Methods
- Data Analysis Techniques and Tools
- Computer Programming
- Data & Systems Management

Required Skills & Abilities

- Analyze and Present Data
- Highway Safety Reporting & Evaluation
- Written and Oral Communication
- Attention to Detail
- Collaborate across Multiple Divisions and Organizations
- Complex Problem Solving
- Leadership

Technical Skills Requirements

- Computer Programming
- Statistical Software
- Highway Safety Manual
- Microsoft Office Applications

Education & Work Experience

- Bachelor's degree accepted for most positions with coursework in computer science, GIS, mathematics, transportation engineering/safety, and statistics. An advanced graduate degree is preferred for senior research positions.

Certifications

The Transportation Professional Certification Board (TPCB) offers a Road Safety Professional Certification, which attests to the attainment of a specific level of capability related to transportation safety science knowledge and practice.

Year 5-8

Master's or Doctoral Degree Computer Science, Math/Statistics or Data Science

Years 6-8: Students complete electives and required research thesis or dissertation requirements for the degree.

Year 5: Students complete core and elective courses within their concentration while selecting specialized independent research activities.

Core Courses
Computational Science
Data Mining
Data Analysis
Mathematical Modeling & Simulation
Graphics and Data Visualization

Core Transportation Courses
Transportation Safety
Traffic Simulation & Modeling

Interdisciplinary Research Methods
Experimental Design & Analysis
Naturalistic and Behavioral Data Analysis
Human Factors Research Methods

> Experiential learning includes research, applied analysis work

Year 3-4

Bachelor's Degree in Computer Science, GIS, Math/Statistics or Data Science

Year 4: Students may select electives in specific areas of interest and will fulfill internship or capstone design project requirements. Core courses may include software engineering labs or other applied analysis projects.

Year 3: Students take multidisciplinary courses related to computer programming, database management, analytical methods, data visualization, and statistics.

GE Courses
Science, Social Sciences, Humanities, Arts & Foundational Core Courses

Transportation Safety-Related Courses
Transportation Safety
Human Factors

Data Analytics Courses
Methods for Data Analysis
Experimental Design
Data Structures & Algorithms
Database Systems
Computational Methods

> Experiential learning includes design courses, labs, internships & research

Bachelor's Degree in Progress or Associate's Transfer Degree in Data Science or Related

Year 1-2

Year 1 and 2: Course requirements vary by institution. Students wishing to transfer into a 4-year degree program from a two-year Associate's degree should work with an advisor early on to ensure they take all pre-requisite courses for their intended major.

General Education Courses
Students will develop writing, communication, math, and critical thinking skills.

Major Coursework
Information Systems
Database Management
Network and Security

Data Structures
Computer Programming
Probability and Statistics

> Experiential learning includes design projects, internships, co-ops

High School Diploma or G.E.D.

Computer Science CTE coursework if available.

Year 0

U.S. Department of Transportation
Federal Highway Administration

WEST REGION
**Transportation
Workforce Center**

Experiential Learning & Professional Development Opportunities

Student professional associations provide professional development and networking opportunities to students, bridging coursework to practice. Many associations provide experiential learning opportunities like design or other student competitions; professional conferences and other networking opportunities, as well as student scholarships and other support. In addition, many institutions either require or strongly encourage work-based learning experiences for their students through internships and/or co-ops. Industry and education institutions can work together to ensure that safety-focused experiences and application of safety skills are an important component of these student development experiences. Examples of relevant computer and mathematical experiential learning and professional development sources are provided below:

Highway Safety Data Fellows Program

The Federal Highway Administration and USDOT Secretary's Safety Data Initiative provide a fellowship program to examine safety among the most vulnerable road users including bicyclists and pedestrians.

Strategic Highway Research Program (SHRP)

The Transportation Research Board provides targeted student opportunities to implement and disseminate transportation safety research, such as through its SHRP student paper competition.

National Association of Women Highway Safety Leaders, Inc. (NAWHSL)

NAWHSL provides full-time female college students, interns, or employees with scholarships opportunities to attend the Annual Traffic Safety Leadership Conference.

Traffic Safety Scholars Program

The Traffic Safety Scholars (TSS) Program provides awards of up to $1,000 to undergraduate and graduate students to help defray the cost of attending the Lifesavers Conference on Highway Safety Priorities. This conference provides opportunities to learn about highway safety issues from leading experts and network with the largest gathering of highway safety professionals anywhere in the country.

National Highway Traffic Safety Administration (NHTSA)

The mission of NHTSA is to save lives, prevent injuries, and reduce economic costs due to traffic crashes through education, research, and enforcement. NHTSA provides internship and career opportunities in safety data analysis.

Institute of Electrical and Electronics Engineers (IEEE)

The IEEE Computer Society is the world's leading membership organization dedicated to computer science and technology. Serving more than 60,000 members, the IEEE Computer Society is the trusted information, networking, and career-development source for a global community of technology leaders that includes researchers, educators, software engineers, IT professionals, employers, and students.

Bureau of Transportation Statistics (BTS)

The USDOT Bureau of Transportation Statistics provides data on transportation trends, policy, investments, and research across the US. BTS provides fellowship and internship opportunities for students to become involved in addressing technology and policy issues related to transportation.

American Statistical Association (ASA)

The American Statistical Association student chapters provide opportunities for students to connect with other students, attend conferences, apply for scholarships, and have access to classroom resources, as well as a multitude of statistical publications.

Institute for Operations Research and the Management Sciences (INFORMS)

The Institute for Operations Research and the Management Sciences brings together a wide range of information and resources for students considering or pursuing degrees in analytics and data science.

Data Science Association (DSA)

The purpose of the Data Science Association is to create a social and academic environment for Mathematics, Computer Science, Economics, and Data Science majors. It allows students to make connections to companies who work in the field of Big Data and Analytics. DSA gives students the resources and guidance to make them top candidates while applying for jobs or higher education. Members can participate in committees and conferences and have access to DSA education resources.

Big Data and Analytics Association (BDAA)

The Big Data & Analytics Association is the only undergraduate student organization of its kind, prioritizing the education of its members above all else. Weekly BDAA events, include hands-on workshops in which industry professionals teach members about the hottest topics in data analytics, and case competitions in which members put the skills they have acquired to the test. BDAA is located at The Ohio State University, but many of their resources are online and available to the public.

Association for Computing Machinery (ACM)

ACM, the world's largest educational and scientific computing society, delivers resources that advance computing as a science and a profession. ACM student chapters support professional development activities for computer science students.

Innovative Strategies for Integrating Safety Competencies into Varied Programs of Study

A safety career pathway involves attaining specialized safety competencies within various traditional transportation programs of study. In addition to acquiring academic and technical preparedness within a broader field (e.g. Civil Engineering or Construction), students and incumbent workers on a safety career pathway will pursue research, experiential learning, on-the-job training and other work-based or real-world learning experiences focused on transportation safety. Examples of effective safety integration models are listed that provide curricular and co-curricular value to student safety career preparedness:

Co-Curricular

Transportation Agency/University Research Partnerships

Research partnerships between university faculty and state DOTs are proven sources for safety workforce development when they: 1) are implemented over the long-term; and 2) actively involve faculty and both undergraduate and graduate multi-disciplinary students in the implementation of safety research and project development.

On-Campus DOT Design Units

Many campuses partner with transportation agencies to provide on-campus internship experiences to undergraduate students in roadway design or traffic operations projects. These programs provide students with hands-on design experience and exposure to state DOT standards and practices while building a pipeline into transportation engineering careers.

Safety-Focused Work-Based Learning

Particularly in construction programs, many institutions either require or strongly encourage work-based learning experiences, which can be utilized to attain safety-focused experiences and to apply safety skills in the workplace.

Curricular

Engaged Scholarship

Most universities provide mechanisms to incorporate community projects into student coursework, either through senior design, capstone, or service learning courses. Engagement of transportation organizations with universities to provide safety-focused course-based projects can serve as a powerful student exposure and recruitment tool to safety career pathways. Some universities provide opportunities to scale up these types of engaged scholarship opportunities so that one agency partner can provide multiple projects over the course of an academic year.

Safety-Focused Course-Based Learning

Integration of safety topics and experiential learning into the classroom can be accomplished in various ways, including incorporation of safety-focused case studies and lab exercises into required coursework; and implementation of assignments that demonstrate understanding of safety principles and processes, through development of safety plans, safety data analysis assignments, or implementation of accident investigations or safety audits. Job site visits and field trips have also been identified useful tools for promoting student interest in safety.

Students can design their own externship experience.

Competency-Based Curriculum

A curriculum that meets academic and quality standards, designed and organized by competencies required for jobs and cross-walked with industry skill standards and certifications, can be designed for safety. Job profiling and the use of "SMEs" should be considered to meet the competency needs of employers. The proliferation of industry-driven professional safety certifications can be used to facilitate this process. Programs of this kind may award credit for prior learning, allowing incumbent workers to achieve credentials by demonstrating knowledge and skills developed on-the-job.

Asynchronous Learning

Provide education and training for students and incumbent workers at times and locations convenient to students and employers, rather than instructors or institutions. This may include evenings or weekends, blended or "hybrid" delivery models, and delivery at off-campus locations.

Problem-Based Learning

Problem-based learning provides students with opportunities to solve real life problems, often in environments that replicate the workplace (e.g. design within constraints, working on multidisciplinary teams, etc.). Industry engagement with educators to provide real world problem examples and guidance on project constraints enhances student experience.

Work-Based and Experiential Learning

Incorporate opportunities for "learning-by-doing", including internships, co-op work experience, simulations, and team class projects that are assignments from local employers.