



NATIONAL OCCUPATIONAL RESEARCH AGENDA (NORA)

29 October 2013 Revision
(Member List corrected 7 November 2013)

NATIONAL PUBLIC SAFETY AGENDA FOR OCCUPATIONAL SAFETY AND HEALTH RESEARCH AND PRACTICE IN THE U.S. PUBLIC SAFETY SECTOR

Developed by the NORA Public Safety Sector Council

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INTRODUCTION

National Occupational Research Agenda: Public Safety Sector

In 2009, the Bureau of Labor Statistics (BLS) estimated nearly 2 million career public safety workers were employed in corrections, emergency medical services, fire fighting, and law enforcement. More than 1 million volunteers provide fire fighting and emergency medical services in many locations throughout the country. A variety of occupational hazards potentially affect the health of these workers.

States with Federally-approved Occupational Safety and Health programs provide Survey of Occupational Injuries and Illnesses (SOII) data on government employees to the Bureau of Labor Statistics (BLS). These sparse data are available on occupational injury and illness risks for public safety workers in the US. SOII data are provided by a few States and indicate elevated risks for injuries due to assaults and violent acts for police and corrections employees. Fire fighters experience occupational injuries due to overexertion and overexertion with lifting. Transportation incidents are a leading cause of occupation fatalities for local and state police, as well as fire fighters and wildland fire fighters. Wildland fire fighters also experience injuries for slips, trips and falls, followed by injuries caused by equipment, tools and machinery and cardiac events. Assaults and violent acts are also frequent causes of fatalities for local police, and falls cause many fire fighter deaths.

Effective interventions would reduce injury and fatality risks among public safety workers, especially for transportation incidents. The NORA Public Safety Sector Council has identified the needs for many specific interventions. The National Public Safety Agenda also stresses the need for more complete surveillance data and analysis.

Agenda Development

The NORA Public Safety Sector Council was convened on November 15, 2006 and held additional meetings in May and December 2007. The council examined summaries of the stakeholder input that had been received during Town Hall meetings between December 2005 and December 2006 and the comments that were submitted through the NIOSH website during the same period.

Occupational safety and health surveillance data for public safety workers were reviewed and summarized on the Public Safety Sector website. BLS publishes annual fatality data for all public administration workers but only 24 states and 3 other jurisdictions submit data on public employee occupational injuries and illnesses that would be entered on the OSHA 300 Log. The available data are most reliable for occupational fatalities resulting from traumatic injuries. Significant gaps exist in data for all occupational injuries and illnesses among public safety workers.

The Council decided to group its goals by the public safety sub sectors. At the May 2007 meetings, small groups discussed the current knowledge related to exposures, illnesses, injuries and fatalities in the sub sectors. Gaps in knowledge and intervention opportunities were identified and sets of related goals were drafted. The small group goals were consolidated and the versions of the draft goals were revised. The draft goals

were made available for public comment on February 29, 2008. Two comments emphasized the importance of reproductive health and the goals were modified to include these issues. The council finalized the goals on March 4, 2009. The goals were reviewed and updated by the Council early in 2013. Wildland Fire Fighting has been incorporated into this current agenda document. Although many efforts are ongoing nationwide to advance the goals, available resources do not allow the Council to project full completion of many of the goals in the coming years.

The industry experts, labor representatives, academic investigators and public health practitioners that make up the NORA Public Safety Sector Council identified research goals for the public safety sub-sectors. The goals appear in the following order in this document.

1. Fire Service
2. Law Enforcement
3. Corrections
4. Emergency Medical Services
5. Wildland Fire Fighting

Types of Goals

Strategic Goal - A top-level goal that states the desired improvement of measureable outcomes.

Intermediate Goal – Secondary level goal that states a step or activity that partner organizations and individuals can complete using outputs from research, translation or dissemination goals.

Activity/Output Goal – Identifies the information gap and research mechanism required for achievement of the higher-level intermediate goal.

NORA Public Safety Sector Council

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FIRE SERVICE

The U.S. Census Bureau – Census of Governments data base indicates there are 417,084 career paid fire department employees in the U.S. (1). The National Fire Protection Association (NFPA) data shows that there are 1,100,450 fire fighters from 30,145 local fire departments across the U.S. Of this total 335,050 (31%) are career fire fighters and 756,400 are volunteer fire fighters (2). Both of these estimates include front-line fire fighters, supervisors/managers, fire prevention workers, fire inspectors and investigators. From 2002 to 2012 an average of 91 on-duty fire fighter fatalities per year were reported (2). Over half of these fatalities are from line-of-duty sudden cardiac events with the others being from traumatic injuries (2). Exposures to chemical and physical hazards and agents during these operations may result in increased risks for diseases such as respiratory disease, cardiovascular disease, cancers, and reproductive health disorders.

Departments and agencies conducting wildland fire fighting operations were initially identified under the NORA Agriculture, Forestry and Fishing Sector. In 2013, wildland fire fighting was transitioned into the Public Safety Sector. Wildland fire fighting occupational health and safety research goals have been added to this updated NORA research agenda document (strategic goals 17 and 18).

Strategic Goal 1: Chronic and Acute Disease Reduction – Reduce the incidence of chronic and acute diseases in fire fighters that may be related to occupational exposures such as heat, combustion products and other stressors.

Intermediate Goal 1.1: Health and Communication Documents - Create health communication documents that are based on observed associations between occupational exposures and acute and chronic diseases, including cancer, among fire fighters.

Activity/Output Goal 1.1.1: Smoke and Heat Exposure - Characterize acute cardiovascular effects of exposure to combustion products and heat during fire fighting.

Activity/Output Goal 1.1.2: Disease Risks - Complete epidemiologic analyses of chronic diseases and evaluate relations between disease risks and occupational exposures among fire fighters.

Activity/Output Goal 1.1.3: Early Detection of Cancers and Cardiovascular Disease - Identify and develop biomarker assays of exposures and for early detection of cancers and cardiovascular diseases among fire fighters.

Activity/Output Goal 1.1.4: Cellular Mechanisms of Respiratory Diseases - Identify the cellular mechanisms of occupational respiratory diseases among fire fighters.

Intermediate Goal 1.2: Fire Fighter Exposure Data Collection - Characterize fire fighter exposures and exposure routes such as inhalation and dermal pathways for chemicals and particulates, and develop evidence-based interventions based on field studies.

Activity/Output Goal 1.2.1: Exposure Data Collection - Collect exposure data and document hazard pathways during structural fire fighting and overhaul operations, and vehicle, vegetation and dumpster fires.

Activity/Output Goal 1.2.2: Heat Stress Surveillance - Evaluate existing surveillance programs regarding the collection of heat stress information during fire fighting operations.

Activity/Output Goal 1.2.3: Heat Stress Benchmark Studies - Complete benchmark studies of existing incident management procedures for mitigating the effects of heat stress during fire fighting operations.

Activity/Output Goal 1.2.4: Take-home Toxin Control - Develop a systematic plan for the identification of “take-home” toxin and contamination exposures for the fire service.

Intermediate Goal 1.3: Fire Fighter Exposure Control - Develop better exposure control technologies, work practice and operating procedures for fire fighting operations.

Activity/Output Goal 1.3.1: PPE Limitations Evaluation - Evaluate limitations in current personal protective equipment (PPE) and protective performance enhancements to PPE materials, technologies and equipment.

Activity/Output Goal 1.3.2: Hazard Control - Identify limitations of current engineering controls that are used to reduce hazardous fire fighter exposures.

Activity/Output Goal 1.3.3: Firehouse Exposure Characterization - Characterize firehouse exposures including diesel exhaust, mold, and secondary exposures from contaminated equipment.

Activity/Output Goal 1.3.4: Firehouse Exposure Control - Identify additional technology or work practices to minimize exposures to potentially hazardous materials in fire stations or from contaminated equipment.

Intermediate Goal 1.4: Fire Fighter Medical Surveillance - Create and promote best practice guidelines for medical surveillance systems and wellness programs for fire fighters.

Activity/Output Goal 1.4.1: Medical Surveillance Program - Identify established medical surveillance and wellness programs that include fitness evaluations and injury and illness surveillance systems for fire service personnel.

Activity/Output Goal 1.4.2: Wellness Program Barriers - Examine the cultural and economic barriers to implementing wellness and fitness programs within fire departments.

Intermediate Goal 1.5: Fire Fighter Cardiovascular Disease - Characterize occupational and non-occupational risk factors for cardiovascular disease in fire fighters and identify effective interventions.

Activity/Output Goal 1.5.1: Occupational Stress and Cardiovascular Disease - Characterize the relationship between occupational stressors and cardiovascular disease in fire fighters.

Activity/Output Goal 1.5.2: Work Organization Parameters and Stress - Conduct research studies to evaluate relationships between fire service work organization parameters and perceived stress.

Activity/Output Goal 1.5.3: Biological Mechanism for Cardiovascular Disease and Stress - Investigate biological mechanisms between psychosocial and physical stressors and sub clinical markers of cardiovascular disease.

Intermediate Goals 1.6: Fire Fighter Medical Rehabilitation - Evaluate and improve medical rehabilitation programs for fire fighters and disseminate intervention strategy.

Activity/Output Goal 1.6.1: Successful Medical Rehabilitation Programs - Establish a process to identify critical elements for successful medical rehabilitation programs across fire services.

Activity/Output Goal 1.6.2: Medical Rehabilitation Program Cost Effectiveness - Evaluate cost-effectiveness and efficacy of medical rehabilitation programs for fire fighters.

Strategic Goal 2: Structural Fire Fighting Injury and Fatality Reduction - Reduce injuries and fatalities associated with structural fire fighting operations.

Intermediate Goal 2.1: Injury Surveillance - Improve injury surveillance data collection and identify the mechanisms and occupational settings of injuries sustained during structural fire fighting operations.

Activity/Output Goal 2.1.1: Existing Injury Surveillance Data - Evaluate existing surveillance data for occupational injuries among fire fighters.

Activity/Output Goal 2.1.2: Injury Surveillance System Improvements - Document steps for improvement in these surveillance systems (e.g., accuracy of data collected, inclusion of all relevant variables, and representation of fire fighters in various geographical locations).

Intermediate Goal 2.2: Injury Solutions - Develop safety interventions as directed by injury surveillance and investigative data (e.g., slip, trip, and fall hazards and lifting).

Activity/Output Goal 2.2.1: Injury Solutions Evaluation - Identify and evaluate existing interventions for the leading injury risks.

Intermediate Goal 2.3: Fire Ground Communications - Collaborate with equipment manufacturers to enhance fire ground communication between fire fighters, company officers, safety officers and incident commanders.

Activity/Output Goal 2.3.1: Communication Equipment Limitations - Identify the technological limitations of existing communication equipment during emergency fire ground operations including those that may occur during simultaneous operations with law enforcement and emergency medical services personnel.

Activity/Output Goal 2.3.2: Communication Equipment Testing - Test effective advanced communication technologies.

Intermediate Goal 2.4: Fire Fighter Tracking - Enhance fire fighter safety by development of effective, practical and affordable personal location and tracking technologies and systems.

Activity/Output Goal 2.4.1: Tracking Technology Limitations - Identify the technological limitations of existing locator equipment during emergency fire ground operations.

Intermediate Goal 2.5: Building Collapse - Create and validate technologies, systems and procedures for predicting structural collapse of building types.

Activity/Output Goal 2.5.1: Building Design Collapse Prediction - Identify and evaluate technologies and systems for predicting which building designs are more likely to collapse in a variety of fire conditions.

Strategic Goal 3: Vehicle Related Death and Injury - Reduce the incidence of vehicle-related traumatic injuries and fatalities in fire fighters.

Intermediate Goal 3.1: Seat Belts - Require the use of seat belts by all occupants in moving fire service vehicles and identify limitations of existing restraint technologies.

Activity/Output Goal 3.1.1: Injuries and Fatalities from Seat Belt Non-Compliance - Document extent of injuries and fatalities associated with non-use of seatbelts in fire service vehicles.

Activity/Output Goal 3.1.2: Cultural and Behavior Reasons for Non-Compliance - Determine cultural and behavioral characteristics related to why fire service personnel do not use seatbelts.

Activity/Output Goal 3.1.3: Alternatives to Seat Belts - Complete investigation of technology alternatives to existing seatbelts and explore engineering redesign concepts.

Intermediate Goals 3.2: Unsafe Driving - Evaluate the effectiveness of current fire department policies and practices that have been adopted to reduce fatalities related to high-speed response and unsafe driving.

Activity/Output Goal 3.2.1: Injuries Related to Response - Systematically collect incident information to document and evaluate the extent of injuries and fatalities during response to fire emergencies in career and volunteer departments.

Activity/Output Goal 3.2.2: Training Program Evaluation - Evaluate the effectiveness of interventions such as situational awareness training programs during actual fire service vehicle operation.

Intermediate Goal 3.3: Vehicle Safety Design - Improve fire fighting vehicle safety designs through work with fire service stakeholders and vehicle manufacturers.

Strategic Goal 4: Musculoskeletal Disorders - Reduce the incidence and severity of acute and chronic musculoskeletal disorders (MSDs) and injuries in the fire service.

Intermediate Goal 4.1: Musculoskeletal Disorders Incidence Characterization - Characterize the incidence and prevalence of acute and chronic MSDs among fire fighters.

Activity/Output Goal 4.1.1: Body Positioning During Fire Fighting - Evaluate the relations between acute or sustained exertions and awkward body positions during fire fighting operations and occupational MSDs.

Intermediate Goal 4.2: Musculoskeletal Disorder Prevention - Prepare a business case for prevention of musculoskeletal injuries among fire service personnel.

LAW ENFORCEMENT

The U.S. Census Bureau – Census of Governments data base indicates there are 1,183,765 law enforcement agency employees in the U.S. (1). The National Law Enforcement Officers Memorial Fund estimates there are more than 900,000 sworn law enforcement officers now serving in the U.S. (3a). The leading causes of occupational fatalities among law enforcement personnel are vehicle crashes and homicides (3b). Data on occupational injuries and illnesses among law enforcement personnel is not sufficient to track changes in frequency or severity over time. Work related stress and exposures to biological, chemical and physical agents for law enforcement personnel have not been sufficiently evaluated. These exposures and work related stresses may result in increased risks for diseases such as, but not limited to, cardiovascular disease, cancers and reproductive health disorders.

Strategic Goal 5: Law Enforcement Health and Safety Surveillance - Evaluate information sources collected by partners or stakeholders that may be enhanced or expanded to conduct effective occupational health and safety (H&S) surveillance among law enforcement workers.

Intermediate Goal 5.1: Existing H&S Surveillance Evaluation - Identify and evaluate existing databases that may be used for occupational health and safety surveillance at the Bureau of Labor Statistics, the Department of Justice, workers compensation carriers, retirement and disability programs, and state-based occupational health and safety programs.

Activity/Output Goal 5.1.1: H&S Data Set Collection - Systematically identify, collect and describe the occupational exposure, illness, injury and fatality data sets that exist with law enforcement agencies and other organizations.

Activity/Output Goal 5.1.2: H&S Data Set Analysis - Determine the utility and limitations of individual or combined data sets to evaluate occupational health and safety risks for law enforcement workers.

Activity/Output Goal 5.1.3: H&S Surveillance Data Expansion - Specifically identify gaps in individual or combined data sets for occupational surveillance and develop collaborative agreements with key partners to refine and expand data collection, if necessary.

Intermediate Goal 5.2: H&S Surveillance Best Practices - Establish and evaluate model occupational health and safety surveillance systems for exposures, illnesses, injuries and fatalities among law enforcement workers.

Activity/Output Goal 5.2.1: Suicides Data Collection Workshop - Conduct a workshop to identify procedures to collect information about law enforcement officer suicides that may be used to develop appropriate interventions.

Activity/Output Goal 5.2.2: Prioritized Framework Workshop - Conduct a workshop to develop a prioritized framework for an occupational surveillance system

for cardiovascular and respiratory disease, cancers, musculoskeletal disorders, and mental disorders including substance abuse among law enforcement workers.

Activity/Output Goal 5.2.3: Existing Exposure Evaluation - Systematically collect and evaluate available information on exposures to chemical, physical and biological agents that are associated with law enforcement activities such as clandestine drug site investigation, hazardous material response, suspect or convicted offender contact, weapon firing and crime laboratories to identify the gaps in reliable exposure information.

Activity/Output Goal 5.2.4: Exposure Data Expansion - Identify gaps in knowledge and complete additional data collection to characterize exposures and associated health effects among law enforcement personnel.

Activity/Output Goal 5.2.5: Health and Safety Surveillance Evaluation - Institute and evaluate key components of an occupational health and safety surveillance system with one or more law enforcement agencies and related organizations.

Activity/Output Goal 5.2.6: Needs Assessment - On an ongoing basis, evaluate exposure, illness, injury and fatality surveillance information and identify needs for effective interventions.

Strategic Goal 6: Vehicle Related Death and Injury - Reduce traumatic injuries and fatalities resulting from vehicle collisions involving law enforcement personnel. (Data collected for research under goals 6 and 7 shall be used only to identify and evaluate practices that help ensure public safety, and not for discipline against any individual officer or officers.)

Intermediate Goal 6.1: Seat Belts - Except as necessitated by law enforcement operations, develop research based products to support requirements for the mandatory use of seat belts by all occupants in moving law enforcement vehicles by the development and enforcement of department policies and standard operating procedures.

Activity/Output Goal 6.1.1: Injuries and Fatalities from Seat Belt Non-Compliance - Document the nature of injuries and fatalities and associated event and source information for police vehicle collisions when occupants failed to use seat belts.

Activity/Output Goal 6.1.2: Reasons for Seat Belt Non-compliance - Conduct a field survey to determine why police officers and other law enforcement vehicle occupants fail to use seatbelts.

Activity/Output Goal 6.1.3: Alternatives to Seat Belts - Evaluate alternative engineering designs that overcome reasons that seat belts are not used by police officers and other police car occupants.

Activity/Output Goal 6.1.4: Use of Seat Belts By Individual Agencies - Evaluate use of seatbelts or alternative restraint systems by individual law enforcement agencies.

Intermediate Goal 6.2: Unsafe Driving - Disseminate information on effective policies and practices that have been adopted to reduce law enforcement injuries and fatalities due to risky driving (i.e. high speed, night-time, and poor weather) during pursuit and response calls.

Activity/Output Goal 6.2.1: Unsafe Driving Related Injuries and Fatalities - Document the nature of injuries and fatalities associated with high-speed driving of law enforcement vehicles.

Activity/Output Goal 6.2.2: Unsafe Driving Intervention Evaluation - Evaluate the effectiveness of interventions such as situational awareness and speed management training that address behavioral barriers to compliance.

Activity/Output Goal 6.2.3: Vehicle Operation Recording Systems Evaluation - Evaluate the use of vehicle operation recording systems to evaluate the relationships between vehicle operation parameters and collision severity and consequences.

Activity/Output Goal 6.2.4: High-speed Injuries and Fatalities Tracking Program - Establish an ongoing program to track changes in high-speed vehicular injuries and fatalities in law enforcement personnel.

Intermediate Goal 6.3: Fatigue from Work Schedules in Law Enforcement - Create and utilize data collection systems for evaluation of sleep deprivation and fatigue as factors in law enforcement officer injuries and fatalities.

Activity/Output Goal 6.3.1: Work Schedules and Injuries Data Collection Recommendations - Develop data collection recommendations that will support the analysis of key relations among fatigue, sleep deprivation and vehicle-related injuries and fatalities.

Activity/Output Goal 6.3.2: Field Evaluations of Fatigue - Preliminarily determine the causes and extent of medically-evaluated officer fatigue through field evaluations.

Activity/Output Goal 6.3.3: Fatigue from Work Schedules in Other Industries - Evaluate existing fatigue management and shift-work policies in other industries for possible application to law enforcement.

Activity/Output Goal 6.3.4: Fatigue and Vehicle-Related Injuries - Evaluate the relation between officer or dispatcher fatigue and the frequency and severity of vehicle-related injuries and fatalities.

Activity/Output Goal 6.3.5: Work Schedules and Injury Data Collection and Analysis - Establish partnerships with at least 3 law enforcement agencies to collect fatigue, sleep deprivation and vehicle-related incident data and complete its rigorous statistical analysis to identify and implement effective interventions.

Strategic Goal 7: Injuries and Fatalities Due to Criminal Assaults - Reduce injuries and fatalities in law enforcement personnel from criminal assaults.

Intermediate Goal 7.1: Existing Criminal Assault Surveillance - Create and utilize data systems to determine the frequency and nature of officer injuries and fatalities from criminal assaults.

Activity/Output Goal 7.1.1: Existing Health and Safety Surveillance Evaluation - Evaluate the FBI Law Enforcement Officer Killed and Assaulted and other datasets to estimate frequencies and describe trends associated with use of weapons, other forms of physical assaults, and vehicle-related incidents.

Activity/Output Goal 7.1.2: Causal Factors Identification for Physical Assaults - Determine the leading mechanistic and circumstantial causal factors that are associated with changes in the risks for officer injuries and deaths due to physical assaults.

Activity/Output Goal 7.1.3: Officer Physical Fitness and Criminal Assaults - Evaluate the relation of officer physical fitness to the nature and severity of injuries from criminal assault.

Activity/Output Goal 7.1.4: PPE and Injury Prevention Evaluation - Evaluate the effectiveness of PPE or other injury prevention methods that are used during physical assaults with suspects.

Intermediate Goal 7.2: Assaults Training Curricula Evaluation - Evaluate effectiveness of training curricula that are used to help reduce the risks of law enforcement officer injury or fatality resulting from physical assaults.

Strategic Goal 8: Cardiovascular Disease Disabilities and Fatalities - Reduce the incidence of cardiovascular disease disabilities and fatalities in law enforcement personnel.

Intermediate Goal 8.1: Risk Factors for Cardiovascular Disease - Determine the prevalence and occupational risk factors for cardiovascular disease among law enforcement officers.

Activity/Output Goal 8.1.1: Cardiovascular Deaths Existing Data Sources Evaluation - Evaluate existing data sources for evaluation of line-of-duty cardiovascular deaths in law enforcement officers.

Activity/Output Goal 8.1.2: Stress and Cardiovascular Disease Biomarker Identification and Validation - Develop and validate biomarkers for occupational stress associated with cardiovascular disease among law enforcement officers.

Activity/Output Goal 8.1.3: Occupational Risk Factors and Cardiovascular Disease Etiology - Conduct etiologic studies of occupational risk factors and cardiovascular disease in law enforcement officers.

Activity/Output Goal 8.1.4: Occupational Risk Factors and Cardiovascular Disease Biological Mechanisms - Conduct research on the biological mechanisms involved in the association between risk factors and cardiovascular disease.

Activity/Output Goal 8.1.5: Work Organization Factors - Evaluate the association of work organization factors such as job classification, shift-schedule, and overtime on cardiovascular risk and cardiovascular events.

Intermediate Goal 8.2: Worksite Wellness Evaluation - Evaluate worksite medical appraisal and wellness programs among law enforcement officers and develop and disseminate recommendations for effective program components.

Activity/Output Goal 8.2.1: Worksite Wellness Best Practices - Identify representative wellness programs in use by law enforcement agencies and describe their essential components.

Activity/Output Goal 8.2.2: Worksite Wellness Program Evaluation - Evaluate the effectiveness and economics of existing wellness programs through examination of costs and the level-of-fitness among program participants.

Activity/Output Goal 8.2.3: Injuries Comparison across Police Departments and Wellness Programs - Compare injuries and disabilities related to occupational risk factors across police departments with and without wellness programs.

CORRECTIONS

The U.S. Bureau of Labor Statistics in 2010 estimated there were 493,100 Correction Officers in the U.S. with an average increase of 2,600 Officers over each of the next 10 years (4). The U.S. Census Bureau – Census of Governments database estimates there are 767,296 correctional industry workers in 2011 (1). The majority of these jobs were in state correctional facilities and local jails with some being located at federal prison facilities. Corrections officers have one of the highest rates of nonfatal on-the-job injuries. The work environment can entail physical risks that range from slips, trips and falls, musculoskeletal injuries, puncture and stab wounds from sharp objects, heat and cold stress, and fire hazards and toxic fumes. In 2012 the NIOSH Division of Safety Research, Analysis and Field Evaluations Branch completed a study which describes fatal and non-fatal occupational injuries among U.S. correctional officers (5). From 1999-2008 there were 113 fatalities and an estimated 125,200 non-fatal injuries requiring treatment in emergency departments.

Strategic Goal 9: Injury and Fatality Reduction - Reduce occupational injuries and fatalities in corrections personnel.

Intermediate Goal 9.1: Injury and Fatality Reduction Interventions - Ensure effective interventions are widely utilized to reduce corrections officials' traumatic injuries and deaths from inmate assaults.

Activity/Output Goal 9.1.1: Existing Health and Safety Surveillance Evaluation - Identify and systematically evaluate Institute of Justice, Office of Justice Programs data sets, disability insurance claims and other databases to estimate the frequencies, rates and trends of traumatic injuries and fatalities that result from inmate assaults.

Activity/Output Goal 9.1.2: Causal Factors Identification for Inmate Assaults - Characterize the relations among mechanistic and circumstantial factors for correctional personnel injuries and deaths that result from inmate assaults.

Activity/Output Goal 9.1.3: Injury and Fatality Reduction Training Curricula Evaluation - Evaluate the effectiveness of training curricula that are used to reduce the risks of injury or fatality among corrections personnel.

Activity/Output Goal 9.1.4: Corrections Officer Physical Fitness and Criminal Assault Evaluation - Evaluate the relation of corrections officer physical fitness to the nature and severity of injuries from criminal assault.

Activity/Output Goal 9.1.5: PPE for Inmate Assaults Evaluation - Evaluate the effectiveness of PPE or other injury prevention methods that are used during inmate assaults.

Activity/Output Goal 9.1.6: Assault-Related Mental Health Disorders - Characterize the frequency and nature of psychological and emotional disorders among corrections personnel due to assault-related events.

Intermediate Goal 9.2: Unintentional Injuries Interventions - Recommend effective interventions to reduce the frequency and severity of correctional personnel injuries or deaths from unintentional events.

Activity/Output Goal 9.2.1: Existing H&S Surveillance Evaluation - Evaluate Office of Justice Programs data, and disability, compensation and other databases to determine overall frequencies and severity of injuries including puncture wounds, lacerations, slips/trips/falls, and MSDs.

Activity/Output Goal 9.2.2: Factors Associated with Unintentional Injuries - Characterize factors associated with unintentional injuries such as search techniques and inmate contact for corrections personnel injuries.

Activity/Output Goal 9.2.3: Unintentional Injuries PPE, Tools, Policies and Procedures Evaluation - Evaluate the effectiveness of PPE, tools, policies and procedures in reducing unintentional injuries among corrections personnel.

Activity/Output Goal 9.2.4: Physical Fitness and Unintentional Injuries or Deaths Evaluation - Evaluate the relation between corrections personnel physical fitness and injuries or death from unintentional events including hazardous exposures.

Activity/Output Goal 9.2.5: Psychological Consequences of Unintentional Injuries - Determine psychological consequences of unintentional injuries.

Intermediate Goal 9.3: Aggressive Inmates Behavior - Provide corrections personnel with methods to predict and manage aggressive inmate behavior.

Activity/Output Goal 9.3.1: Aggressive Inmates Policies and Procedures Evaluation - Evaluate the effectiveness of population management policies and procedures for potentially aggressive inmates.

Activity/Output Goal 9.3.2: Attacker Characteristics Identification - Identify the behavioral, psychological, and physical (e.g. posture or facial expressions) characteristics of individuals who are likely to initiate an assault on corrections personnel.

Strategic Goal 10: Illnesses and Injuries from Infectious Diseases - Reduce illnesses and injuries in corrections personnel from infectious disease exposures.

Intermediate Goal 10.1: Infectious Disease Screening and Control for Inmates - Identify and implement methods that increase the effectiveness of infectious disease screening and control programs for inmates.

Activity/Output Goal 10.1.1: Infectious Diseases among Inmates at Intake - Identify the number and frequency of inmates with serious infectious diseases at intake into representative corrections facilities.

Activity/Output Goal 10.1.2: HIPAA Evaluations - Evaluate the impact of limitations imposed by the Health Insurance Portability and Accountability Act (HIPAA) on effective identification and management of serious infectious diseases among new and resident inmate populations.

Activity/Output Goal 10.1.3: Correction Personnel Infectious Diseases Exposure at Intake - Estimate the number and frequency of corrections personnel infections that result from exposures during the admissions process.

Activity/Output Goal 10.1.4: Current Infectious Disease Screening Methods for Inmates - Evaluate the effectiveness of current screening methods for serious infectious diseases and estimate the impact, including costs, of delayed identification of inmate infections.

Activity/Output Goal 10.1.5: Ongoing Periodic Infectious Disease Screening for Inmates - Evaluate the effectiveness of ongoing periodic infectious disease screening programs for resident inmate populations.

Activity/Output Goal 10.1.6: Isolation Units for Inmates - Identify effective designs, use and maintenance of isolation units for inmates with serious infectious diseases in correctional facilities.

Activity/Output Goal 10.1.7: PPE Effectiveness Evaluations - Determine whether PPE or other tools effectively reduce serious infectious disease among corrections personnel and inmates.

Intermediate Goal 10.2: Illnesses and Injuries from Sharps Exposures in Non-Medical Correctional Personnel - Determine the frequencies and types of illnesses and injuries in non-medical corrections personnel from sharps exposures.

Activity/Output Goal 10.2.1: Existing Surveillance Evaluations for Sharps Injuries - Review Office of Justice data, and disability, compensation and other databases to determine overall frequencies and severity of sharps injuries and subsequent illnesses.

Activity/Output Goal 10.2.2: Causal Factors for Correctional Personnel Sharps Injuries - Identify causal factors such as search techniques and inmate contact for correctional personnel sharps injuries.

Activity/Output Goal 10.2.3: Policy and Procedure Evaluation for Sharps Injury Prevention - Evaluate effectiveness of policies and procedures for avoidance of sharps injuries including the barriers to worker acceptance.

Activity/Output Goal 10.2.4: Psychological Consequences of Sharps Injuries - Evaluate the psychological consequences of experiencing a sharps injury among corrections personnel.

Activity/Output Goal 10.2.5: PPE and Alternative Search Methods Evaluation - Evaluate the effectiveness of PPE and alternative search methods in reducing sharps injuries.

Strategic Goal 11: Correction Personnel Stress Factor Reduction - Reduce occupational stressors in corrections personnel.

Intermediate Goal 11.1: Stress Factors and Associated Health Outcomes - Identify and reduce occupational stressors and associated health outcomes related to work factors in corrections personnel.

Activity/Output Goal 11.1.1: Existing Health Outcome and Occupational Stressors Datasets - Systematically evaluate existing data sets for health outcomes that have been associated with occupational stressors in corrections personnel.

Activity/Output Goal 11.1.2: Effects of Bullying and Inadequate Support - Evaluate the effects of bullying and inadequate supervisor and co-worker support among corrections personnel.

Activity/Output Goal 11.1.3: Fatigue and Sleep Disorders Among Corrections Personnel - Investigate the impact of shift work and overtime on job fatigue and sleep disorders among corrections personnel.

Activity/Output Goal 11.1.4: Fatigue From Work Schedules in Other Industries - Evaluate existing fatigue management and shift-work policies in other industries and government agencies for possible application to corrections personnel.

Activity/Output Goal 11.1.5: Mental Health Assessment in Corrections Personnel - Identify frequency and severity of substance abuse, domestic violence, psychological problems, and attempted suicides among corrections personnel.

Activity/Output Goal 11.1.6: Stressors and Adverse Health Effects - Identify possible adverse health effects such as cardiovascular diseases that may be due to the total mental and physical stressors among correctional personnel.

Intermediate Goal 11.2: Stress Factors in Work Environment - Identify and reduce occupational stressors related to the work culture and the physical work environment among corrections personnel.

Activity/Output Goal 11.2.1: Physical Work Environment Related Adverse Health Effects - Evaluate the roles of building design, indoor air quality, and sanitation of the correctional environment in adverse health effects among corrections personnel.

Activity/Output Goal 11.2.2: Work Culture Related Adverse Health Effects - Determine the influence of the prison correctional work culture, hierarchy of controls, and punitive discipline on adverse health effects among corrections personnel.

Intermediate Goal 11.3: Health and Wellness Surveillance Evaluation - Develop guidelines for worksite medical surveillance and wellness programs for correctional personnel.

Activity/Output Goal 11.3.1: Health and Wellness Program Effectiveness - Evaluate the effectiveness of existing worksite medical surveillance and wellness programs in reducing illnesses and injuries.

Activity/Output Goal 11.3.2: **Health and Wellness Best Practices** - Identify the essential components of effective, facility-based wellness programs for corrections institutions.

EMERGENCY MEDICAL SERVICES

Emergency Medical Service is defined as the practice of medicine involving evaluation and management of patients with acute traumatic and medical conditions in an environment outside the hospital (pre-hospital). Emergency medical service personnel may be employed by hospitals, private ambulance services, or public agencies including fire departments. The National Association of State EMS Officials (NASEMSO) estimates a total of 826,111 Emergency Medical Service (EMS) professionals were licensed and credentialed within the United States in 2011 (6). EMS workers are at high risk for occupational injuries but the number of national EMS work related injuries has not been reported. A leading injury event is overexertion with sprains and strains during patient transport. They are also exposed to biological, chemical, and physical agents. These exposures may result in increased risks for acute illnesses and chronic diseases such as cardiovascular disease, cancer and reproductive health disorders. Neither the exposures nor the illnesses of EMTs have been adequately evaluated.

Strategic Goal 12: Vehicle Related Death and Injury - Reduce traumatic injury and fatalities among EMS personnel associated with vehicle crashes.

Intermediate Goal 12.1: Vehicle Training Programs - Create and promulgate training programs to ensure safe operations of all ground vehicles.

Activity/Output Goal 12.1.1: Vehicle Operation Training Effectiveness - Evaluate the effectiveness of EMS vehicle operation training programs and identify essential content.

Intermediate Goal 12.2: Vehicle Safety Design - Improve the designs of all vehicle types used by EMS to decrease the risks of traumatic injuries and fatalities that result from vehicle crashes.

Activity/Output Goal 12.2.1: Vehicle Crash Safety Technology Identification - Develop partnerships between EMS organizations, agencies and equipment manufacturers to identify available technologies that can reduce injury risks for EMS personnel during vehicle crashes.

Intermediate Goal 12.3: Aircraft Safety Design - Create and promulgate programs to ensure safe operations of all EMS aircraft through management and labor organization partnerships.

Strategic Goal 13: Patient Transfer Technology – Reduce traumatic injuries among EMS personnel that occur during movement of patients and equipment.

Intermediate Goal 13.1: Patient Transfer Technology - Ensure that patient transfer methods and equipment technologies reduce traumatic injuries for EMS personnel.

Activity/Output Goal 13.1.1: Training Effectiveness Evaluations - Evaluate the effectiveness of training programs for assessment of possible patient behavioral issues, law enforcement assistance and appropriate equipment selection.

Activity/Output Goal 13.1.2: Bariatric Patient Transfer Technologies - Evaluate low friction, bariatric patient transfer and vertical lift and descent technologies and provide recommendations for further developments.

Strategic Goal 14: EMS Exposure Hazards - Reduce infectious disease and other hazardous exposures to EMS personnel during patient treatment and transport with engineering controls, effective design and use of PPE and proper work practices.

Intermediate Goal 14.1: Infectious Disease Recognition & Response Effectiveness - Ensure that sources of infectious disease are recognized and appropriate precautions taken by EMS personnel.

Intermediate Goal 14.2: Exposure Hazard Study and Best Practices - Evaluate potential exposures of EMS personnel to physical and chemical agents and create best practice guidance to minimize possible health effects from the exposures.

Activity/Output Goal 14.2.1: Exposure Hazard Best Practices - Evaluate potential EMS exposures to cleaning agents, disinfectants, particulate matter, noise and other agents that are associated with emergency medical services tasks in response vehicles and assigned stations.

Intermediate Goal 14.3: Infectious Exposures During Transport - Reduce emergency medical personnel exposures to infectious diseases during ambulance transport of contagious individuals.

Strategic Goal 15: EMS Work Policies - Identify and implement effective policies among EMS agencies regarding work organization factors to reduce related illnesses and injuries.

Intermediate Goal 15.1: EMS Stress Factors - Develop effective guidelines to reduce worker fatigue and occupational stress among EMS personnel.

Activity/Output Goal 15.1.1: Fatigue from Work Schedules in EMS - Identify the extent and severity of adverse health outcomes such as job fatigue and sleep disorders that may be associated with shift work, overtime and other factors among EMS personnel.

Activity/Output Goal 15.1.2: Fatigue from Work Schedules in Other Industries - Evaluate existing fatigue management and shift-work policies in other industries and government agencies for possible application to EMS.

Activity/Output Goal 15.1.3: Mental Health Assessment - Identify frequency and severity of substance abuse, domestic violence, psychological problems and attempted suicides among EMS personnel.

Intermediate Goal 15.2: Health and Wellness Surveillance - Develop guidelines for worksite medical surveillance and wellness programs for EMS personnel.

Activity/Output Goal 15.2.1: Health and Wellness Program Effectiveness - Evaluate the effectiveness of existing worksite medical surveillance and wellness programs in reducing illnesses and injuries.

Activity/Output Goal 15.2.2: Trauma Counseling Program Identification - Identify effective strategies and develop programs that support EMS personnel who witness critical incidents (e.g., traumatic accidents, on-the-job death of coworker).

Activity/Output Goal 15.2.3: Health and Wellness Best Practices - Identify the essential components of effective, facility-based wellness programs for EMS agencies and organizations.

Strategic Goal 16: EMS Health and Safety (H&S) Surveillance - Create an integrated occupational health and safety surveillance data system for Emergency Medical Service (EMS) personnel and evaluate risks for their exposures, illnesses, injuries and fatalities.

Intermediate Goal 16.1: Existing H&S Surveillance Evaluations - Identify and evaluate existing databases that may be used for occupational safety and health surveillance for EMS personnel at the Bureau of Labor Statistics, National Highway Traffic Safety Administration, CDC/NIOSH and state EMS agencies.

Activity/Output Goal 16.1.1: H&S Data Set Collection - Systematically collect occupational exposure, illness, injury and fatality data sets for EMS personnel from existing datasets within federal and state agencies and other organizations.

Activity/Output Goal 16.1.2: On-Going H&S Surveillance Study - Establish ongoing surveillance systems and evaluate trends, emerging issues and intervention needs for EMS.

Intermediate Goal 16.2: On-Going H&S Surveillance Study - Establish ongoing surveillance systems and evaluate trends, emerging issues and intervention needs for EMS.

Activity/Output Goal 16.2.1: On-Going H&S Surveillance Data Collection - Establish methods and responsibilities and develop collaborative agreements with key partners for the ongoing collection and analysis of integrated EMS surveillance data sets.

Activity/Output Goal 16.2.2: On-Going H&S Surveillance Data Analysis - Evaluate trends, emerging issues and intervention needs for EMS exposures, illnesses, injuries, and fatalities, and publish results in peer-reviewed journal articles.

WILDLAND FIRE FIGHTING

Every year, fire fighters respond to approximately 80,000 wildland fires that burn hundreds of thousands of acres (7). These fires are suppressed by personnel from a complex interagency mix of federal, state, tribal and local fire departments with different mandates and legal responsibilities. Additional fire fighting resources include the private sector (e.g., contractors), prisons and the military. The actual number of workers engaged in wildland fire suppression is unknown and varies based on the severity of the fire season and available funding.

This workforce with its high numbers of seasonal, temporary and volunteer workers presents unique challenges to occupational safety and health surveillance, research and intervention. Research to date has focused mainly on energy expenditure, physiologic responses to wildland fire-related work and acute inhalation effects of exposure to smoke and other products of combustion. Research among federal wildland fire fighters indicates that common injury mechanisms include slips, trips and falls, followed by equipment, tools and machinery (8). Leading causes of on-duty death among wildland fire fighters are transportation-related (e.g., motor vehicle, aviation) incidents and cardiac events (9).

Strategic Goal 17: Exposures, Injuries and Illnesses - Reduce incidence of exposures, injuries, and illnesses among wildland fire fighters in all aspects of wildland fire (e.g., wildland fire, prescribed fire and Wildland-Urban Interface).

Intermediate Goal 17.1: Health and Safety Research - Increase awareness of occupational safety and health research involving all aspects of wildland fire.

Activity/Output Goal 17.1.1: Safety and Health Publications and Research - Summarize existing occupational safety and health publications and research related to wildland fire fighting, prescribed fire and/or Wildland-Urban Interface.

Activity/Output Goal 17.1.2: Research Gaps - Identify research gaps and needs.

Activity/Output Goal 17.1.3: Literature Website - Establish a searchable website for literature.

Activity/Output Goal 17.1.4: Stakeholder Listserv - Develop a list of wildland fire service stakeholders who are interested in receiving listserv or website updates or participating in other wildland fire related initiatives.

Intermediate Goal 17.2: Surveillance Systems - Improve existing or develop new surveillance systems to better capture wildland fire-related occupational exposures, injuries and illnesses.

Activity/Output Goal 17.2.1: Existing Surveillance Systems - Identify the surveillance systems and assess their utility, strengths, weaknesses and gaps.

Activity/Output Goal 17.2.2: Surveillance System Improvements - Document steps for improvement of surveillance systems.

Activity/Output Goal 17.2.3: Surveillance Dataset - Develop a minimum standard dataset for surveillance.

Activity/Output Goal 17.2.4: Interagency System Interoperability - Explore interagency system interoperability.

Activity/Output Goal 17.2.5: Partnerships - Develop partnerships, memorandums of understanding or data use agreements necessary to access existing data

Activity/Output Goal 17.2.6: Worker Statistics Data Sources - Identify and assess data sources to determine the numbers and types of workers in the wildland fire service.

Intermediate Goal 17.3: Risk Factors and Interventions - Characterize occupational risk factors for wildland fire-related injuries and illnesses and identify effective interventions. High priority injuries and illnesses include cardiovascular disease, heat-related illness and transportation related incidents.

Activity/Output Goal 17.3.1: Injuries and Illnesses Data Collection - Collect and/or analyze data to determine the extent and type of injuries and illnesses

Activity/Output Goal 17.3.2: Risk Factors - Identify risk factors for occupational related injuries and illnesses.

Activity/Output Goal 17.3.3: Costs - Estimate the cost of occupational injuries and illnesses.

Activity/Output Goal 17.3.4: Interventions - Develop new, or modify existing, interventions to reduce occupational injuries and illnesses.

Activity/Output Goal 17.3.5: Intervention Cost Effectiveness - Evaluate the effectiveness, including cost effectiveness, of implementing new or modified interventions to reduce injuries and illnesses.

Activity/Output Goal 17.3.6: Dissemination - Disseminate information about magnitude, cost, risk factors and interventions for wildland fire-related injuries and illnesses.

Intermediate Goal 17.4: Hazardous Exposure Reduction - Develop or modify existing guidelines and standards to reduce hazardous exposures in the wildland fire service.

Activity/Output Goal 17.4.1: Exposure Data Analysis - Analyze data to determine the extent and types of hazardous exposures.

Activity/Output Goal 17.4.2: Exposure Risk Factors - Identify risk factors for hazardous exposures.

Activity/Output Goal 17.4.3: Exposure Health Costs - Determine the health costs of specific exposures.

Activity/Output Goal 17.4.4: Interventions to Reduce Exposures - Develop new, or modify existing, interventions to reduce hazardous exposures.

Activity/Output Goal 17.4.5: **Intervention Effectiveness** - Determine the effectiveness of new or modified interventions to reduce hazardous exposures.

Activity/Output Goal 17.4.6: **Dissemination** - Disseminate information about the magnitude, cost, risk factors and interventions to reduce hazardous exposures.

Intermediate Goal 17.5: Personal Protective Equipment (PPE) - Improve personal protective equipment (PPE) and engineering control technologies, based on adaptive management processes.

Activity/Output Goal 17.5.1: **PPE Standards, Policies and Procedures** - Identify and document current standards, policies and procedures relating to types and uses of PPE and engineering control technologies (including end of service standards).

Activity/Output Goal 17.5.2: **PPE Research** - Compile research on personal protective equipment and identify research gaps and needs.

Activity/Output Goal 17.5.3: **PPE Limitations** - Characterize and assess limitations in current PPE and engineering control technologies and evaluate their effectiveness.

Activity/Output Goal 17.5.4: **PPE New and Emerging Technologies** - Identify new or emerging technologies pathways, PPE and/or work practices to integrate into existing systems.

Activity/Output Goal 17.5.5: **PPE New and Emerging Technologies Development and Testing** - Develop new or modify existing technology, standards and controls relating to technology and PPE. Ensure that systems/ensemble testing and field testing are incorporated into the process.

Activity/Output Goal 17.5.6: **Dissemination of PPE Information** - Disseminate information about the PPE and engineering controls.

Intermediate Goal 17.6: Electronic Safety and Communications Equipment - Enhance electronic safety equipment (ESE) and communication. Examples of ESE include location/tracking, situational awareness and personal safety and thermal imaging systems.

Activity/Output Goal 17.6.1: **ESE and Communications Standards, Policies and Procedures** - Identify and document current standards, policies and procedures related to types and uses of ESE and communication equipment.

Activity/Output Goal 17.6.2: **ESE and Communications Research** - Compile research on ESE and communication equipment and identify research gaps.

Activity/Output Goal 17.6.3: **ESE and Communications Limitations** - Characterize and assess practical limitations of existing ESE and communication equipment.

Activity/Output goal 17.6.4: **New or Emerging ESE** - Identify new or emerging technologies and pathways to integrate ESE into existing systems.

Activity/Output Goal 17.6.5: **Communications System Enhancements** - Develop or modify communication technologies. Ensure that systems testing and field testing are incorporated into the process.

Activity/Output Goal 17.6.6: Dissemination of ESE and Communication Information - Disseminate information about the new or modified ESE and communication equipment.

Strategic Goal 18: Health and Safety - Improve wildland fire fighter health and safety in all aspects of wildland fire (e.g., wildland fire, prescribed fire and Wildland-Urban Interface).

Intermediate Goal 18.1: Health and Safety (H&S) Program Guidelines and Standards - Identify guidelines and standards to improve wildland fire fighter health and safety programs (e.g., medical fitness-for duty, wellness programs, fitness programs, safety and health training, protective equipment, fire fighting policies and standard operating procedures).

Activity/Output Goal 18.1.1: Agency H&S Guidelines and Standards Variations - Identify, characterize and assess differences in guidelines and standards among various fire fighting agencies.

Activity/Output Goal 18.1.2: Adherence to H&S Guidelines and Standards - Characterize fire departments and agencies awareness of, adherence to and barriers to implementing existing standards and guidelines

Activity/Output Goal 18.1.3: Effectiveness of H&S Guidelines and Standards - Evaluate the effectiveness and economics of existing guidelines and standards.

Activity/Output Goal 18.1.4: Improvements, Modifications and Impacts of H&S Guidelines and Standards - Propose modifications to improve guidelines and standards and develop standardized evaluation criteria to track and assess the impact of these modifications.

Activity/Output Goal 18.1.5: Awareness of H&S Guidelines and Standards - Determine methods to improve awareness of guidelines and standards.

Activity/Output Goal 18.1.6: Dissemination of H&S Guidelines and Standards - Disseminate guidelines and standards.

Intermediate Goal 18.2: Occupational Stress Interventions - Develop guidelines, standards and science-based interventions to reduce occupational stressors related to the work culture and the physical work environment.

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