# KENTUCKY OCCUPATIONAL SAFETY AND HEALTH SURVEILLANCE (KOSHS) PROGRAM

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## List of Abbreviations

AAPCC- American Association of Poison Control Centers
ABLES – Adult Blood Level Epidemiology and Surveillance
AGC – Association of General Contractors
ADD – Area Developmental District
ATA – American Trucking Association
BLS – Bureau of Labor Statistics
CDC- Centers for Disease Prevention and Control
CFOI - Census of Fatal Occupational Injuries
CHFS – Cabinet for Health and Family Services
CRASH – Collision Report Analysis for Safer Highways
CSTE – Council of State and Territorial Epidemiologists
CVC – commercial vehicle collision
CVE – Commercial Vehicle Enforcement
DC – Death Certificate
DEQ- Department of Environmental Quality
DOT – Department of Transportation
DWC – Department of Workers' Claims
ED – Emergency Department
EMS – Emergency Medical Services
ERC – Education and Research Center
FACE – Fatality Assessment and Control Evaluation
FFY – federal fiscal year
FHWA – Federal Highway Administration
FMCSA – Federal Motor Carrier Safety Administration
FHKy- Foundation for a Health Kentucky
FTE – full time employee
GECHS – Governor's Executive Committee for Highway Safety
GIS – Geographical Information Systems
GVWR – Gross Vehicle Weight Rating
HAAP- Handicapped Accessible Accelerator Pedal
IBIS – Indicator-based Information System
IH – Inpatient Hospitalization
KAR- Kentucky Administrative Regulations
KCR – Kentucky Cancer Registry
KDPH – Kentucky Department for Public Health
KIPRC- Kentucky Injury Prevention and Research Center
kNN – kth Nearest Neighbor
KOSHS – Kentucky Occupational Safety and Health Surveillance
KRPPC – Kentucky Regional Poison Control Center
KSP – Kentucky State Police
KTA – Kentucky Trucking Association
KVIPP – Kentucky Violence and Injury Prevention Program
Ky – Kentucky
LFUCG – Lexington Fayette Urban County Government
MOU – memorandum of understanding
MSHA – Mining Safety and Health Administration
MVC – motor vehicle collision

NAICS – North American Industry Classification System
NAWIC – National Association of Women in Construction
NCIPC – National Center for Injury Prevention and Control
NIOSH- National Institute for Occupational Safety and Health
NORA - National Occupational Research Agenda
NSC- National Safety Council
OR- Odds Ratio
OHI – Occupational Health Indicator
OOIDA – Owner-Operator Independent Drivers Association
OMV- Occupational Motor Vehicle
OSHA – Occupational Safety and Health Administration
SIC- Standard Industrial Classification
SOC- Standard Occupational Classification
SOII – Survey of Occupational Injuries and Illnesses
SouthON- Southeastern State Occupational Health Network
TESS – Toxic Exposure Surveillance System
TR – trauma registry
TWH – Total Worker Health
US – United States
WC – workers' compensation
WIT – Women in Trucking
YPLL- Years of Productive Life Lost

**Kentucky Occupational Safety and Health Surveillance (KOSHS) Program Abstract**

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The KOSHS expanded program advanced occupational injury/illness surveillance through 1) improved data sources, collection, quality, and analyses; 2) implemented occupational fatality investigation recommendations; 3) enhanced partnerships and collaborations; 4) targeted dissemination of results; and 5) informed policies and practices. The KOSHS occupational motor vehicle (OMV) injury indicator justified further epidemiological studies on semi truck fires, sleeper berth passengers, and truck driver demographics. The workers' compensation (WC)- based OMV injury indicator identified public- sector solid waste collector drivers and short-haul truck drivers as high injury-risk worker populations. Our published epidemiological study on dataset concordance in drug identification among injured drivers showed that surveillance data from multiple public health datasets is necessary to identify the presence of drugs in injured drivers involved in crashes. A KOSHS published work-related concussion surveillance study estimated the 2011 Kentucky work-related concussion rate was 32/100,000 employed using three data sources, compared to 12/100,000 with WC data alone. External funding was leveraged for OMV injury surveillance quality improvement based on our published work-related traumatic injury study that assessed completeness and accuracy of occupation and industry variables. KOSHS outputs, including 31 fatality reports and 11 hazard alerts were disseminated to 13 industry-specific dissemination lists representing 3,800 companies. KOSHS program staff and partners educated stakeholders on the need for pesticide illness surveillance; acute pesticide-related illness was added as a notifiable disease condition to be reported within 1 business day in 2015 (902 KAR 2:020). KOSHS program staff and the Kentucky Trucking Association (KTA) testified before the Ky Senate Transportation Committee in support of a law passed in 2013 that mandated annual truck driver safety training for commercial carriers registering for interstate and intrastate licenses. Although the law was repealed in April 2015, stakeholders recognize the continued need for available online new driver and commercial vehicle inspector safety training, and KOSHS is collaborating with KTA to develop two driver safety training modules. Due to Ky FACE report #14KY001 "Auto Technician Mistakes Handicapped Accessible Accelerator Pedal (HAAP) for Brake Pedal and Fatally Pins Co-worker", a manufacturer redesigned their HAAP so that the HAAP does not function while the vehicle is being serviced; the employer now requires removal of all handicapped equipment on vehicles before servicing, and desks moved away from the service area. Ky FACE report 13KY042 "A Metal Fabrication and Finishing Foreman Dies after 25 Foot Fall at a Commercial Building Site" recommended general contractors coordinate and stagger subcontractors' work to avoid creating additional hazards, conflict and obstructions. Based on the report recommendations, the construction contractor implemented new policies that require multiple sub-contractor staggered work schedules to avoid schedule conflicts, and require fall protection tie-off at all times. There has been a statistically significant decrease in Ky occupational fatality rates over the last two decades (~0.2 worker deaths/100,000 workers annually). The KOSHS program is meeting its goals of informing market- ready engineering controls, increasing employee safety behavior, enhancing company safety culture, increasing regulatory action based on surveillance data and results, and contributing to decreased occupational fatality rates.

**Kentucky Occupational Safety and Health Surveillance (KOSHS) Program- Overall**

**SIGNIFICANT (KEY) FINDINGS.**

**Selected Collaborations and Partnerships**

*KOSHS program advisory committee.* The KOSHS/Occupational Health Indicator (OHI)/Fatality Assessment and Control Evaluation (FACE) advisory committee met in March 2014 and recommended development of relationships with Ky companies to incorporate worker safety and health into Ky total worker health (TWH™) programs. The KOSHS expanded program implemented this innovative initiative with the Ky Worksite Wellness program and the CDC/National Center for Injury Prevention and Control (NCIPC)-funded Kentucky Violence and Injury Prevention Program (KVIPP) to establish the Ky Total Worker Health program; the Kentucky Injury Prevention and Research Center (KIPRC) became a TWH Affiliate in September 2014. This integration of worker health and safety programs was reported in the May 2014 TWH in Action! Newsletter. KOSHS program staff members have produced presentations and publications on prescription drug abuse prevention in the workplace and will continue to integrate worker safety with health promotion.

*Council of State and Territorial Epidemiologists( CSTE) occupational health workgroup.* KOSHS staff are on the CSTE Occupational Health subcommittee, review abstracts for CSTE meetings, and participate in developing pre-conference sessions. We collaborated with CSTE and Michigan, New Jersey, and California occupational safety and health surveillance programs on templates for occupational health success stories, and we review success story submissions for CSTE website publication.

*SouthON.* The KOSHS program was instrumental in establishing the Southeastern States Occupational Health Network (SouthON) that includes 1) occupational safety and health-funded and unfunded states; 2) NIOSH Education and Research Centers (ERCs); 3) Southeast Agricultural Research Center; 4) worker organizations; 5) NIOSH; and 6) OSHA. Our 4th SouthON meeting was held in April 2015. The Ky OHI program presented a *work-related heat illness indicator* with LA, NC, and FL SouthON states to the NIOSH indicator workgroup for adoption by NIOSH-funded states in 2014, and a multi-state work-related heat illness peer-reviewed publication was accepted for publication in *Amer J Ind Med* in June 2015. Our SouthON conference grant was funded by NIOSH in June 2015 for the July 2015- June 2020 grant cycle.

**TRANSLATION OF FINDINGS.**

**Dissemination of KOSHS Surveillance Results**

Overall KOSHS expanded program outputs (reports, newsletters, hazard alerts, safety alerts, presentations, media releases, tool kits, digital FACE stories, safety training modules, association articles, and peer-reviewed and trade publications) are disseminated by e-mail, occupation- and industry-specific listservs, regular mail, KOSHS website, YouTube, LinkedIn, Facebook, NIOSH FACE and extramural program websites, CSTE website, and the NIOSH clearinghouse. Many hazard alerts and reports are available in English and Spanish. *Selected Peer-Reviewed Publications:* The overall KOSHS program produced 14 peer-reviewed publications during the 2010-2015 funding cycle on surveillance improvement, surveillance of occupational injuries including occupational motor vehicle (OMV) injuries, and worker health. *Selected Presentations:* 1)Transportation injuries, Ky Public Health Assoc, 2011; 2) Leggo my Building O- Commercial vs. Residential Fatalities, Ky Governor's Safety & Health Conf, 2011; 3) Agricultural Machinery Injury Surveillance Using Multiple Data Sources. Int Society for Agric. Health, 2012; Hazard alerts: 1) Arborists die after Falling. 11(3) 2013; 2) Roofing and Construction Workers Killed Due to High Winds. 12(2) 2014; 3) Workers Killed Due to Driver Distraction, 11(2), 2013; and 4) Drivers Killed Due to Tire Failures, 11(1), 2013.

**OUTCOMES/IMPACT.**

**KOSHS Impact on Policies and Intervention Development**

*State law mandating commercial carrier safety training.* KOSHS program staff and the Kentucky Trucking Association (KTA) testified before the Ky Senate Transportation Committee in support of a law passed in 2013 that mandated annual truck driver safety training for commercial carriers registering for interstate and intrastate licenses. The KTA was the primary advocate for the law and approached the KOSHS

program in FY 2015 to develop driver and vehicle inspector safety training in support of the law's mandate. Although the law was repealed in April 2015, the KTA and Midwest Insurance Company recognize the continued need for available online new driver and commercial vehicle inspector safety training. Based on the intent of the repealed law, KOSHS will collaborate with KTA in the upcoming funding cycle to develop two driver safety training modules, and one commercial vehicle inspector online training module. The first driver and inspector modules will explain pre-trip and post-trip commercial vehicle inspections, with interactive user navigation and quizzes. The second driver module, a narrated PowerPoint with quizzes, relates to incident management and provides procedures for truck drivers disabled on the roadside. These DOT Compliance 101 online training modules will be developed in collaboration with KTA and Midwest Insurance and will be available for KTA members and the general public free of charge, and will be updated regularly to reflect quarterly FMCSA Regulation changes.

*Multiple sub-contractor company policy.* Ky FACE report 13KY042 "A Metal Fabrication and Finishing Foreman Dies after 25 Foot Fall at a Commercial Building Site" recommended general contractors coordinate and stagger subcontractors' work to avoid creating additional hazards, conflict and obstructions. The construction contractor implemented new policies that require multiple sub-contractor staggered work schedules to avoid schedule conflicts, and require fall protection tie-off at all times. Other companies responded favorably and indicated their intent to follow the same policies.

*Redesign of Handicapped Accessible Accelerator Pedal.* Based on Ky FACE report #14KY001 "Auto Technician Mistakes Handicapped Accessible Accelerator Pedal for Brake Pedal and Fatally Pins Co-worker," Veigel North America LLC Mobility Products & Design redesigned their Left Foot Gas Pedal Model 3545. The redesigned foot pedal retrofits a vehicle's steering column with a key that disengages the foot pedal when the key is removed to eliminate removal of the handicapped accessible pedal by hand when servicing the vehicle; the redesigned foot pedal was released in June 2015. The manufacturer thanked Ky FACE for their contact and the opportunity for product quality improvement. Based on FACE report recommendations, the employer now requires removal of all handicapped equipment on vehicles before servicing, and desks moved away from the service area.

*Towing*. The Ky FACE program identified three tow truck driver deaths in FFY 2014. A tow truck driver toolkit was developed that contains a digital FACE story, hazard alert, FACE fatality report, safe towing recommendations, a survey, and safe towing resources for company trainings. Nationwide Safety Consulting collaborated, and the toolkit was disseminated to 61 state towing associations, 199 Ky towing companies, and our social media pages. Of the survey responses, 67% said they would use the toolkit for training purposes, and 50% said they would keep the toolkit for future reference.

## KOSHS Program Evaluation

*Evaluation outcomes.* KOSHS expanded program long-term outcomes are to reduce Ky occupational injury morbidity/mortality; decrease worker injury ED and IH rates; & improve workplace safety. The gap between Ky & U.S. occupational morbidity & mortality rates shrank from 1998-2012 (Figure 1).The Ky occupational fatality rate decreased over the last decade but is still above the U.S. rate (Fig 2). The overall KOSHS expanded program has been effective in occupational injury/illness population-based and case-based surveillance; epidemiological analyses; innovative partnerships and collaborations that informed interventions, policies, and practices; and reducing occupational morbidity/mortality rates.

**Figure 1**

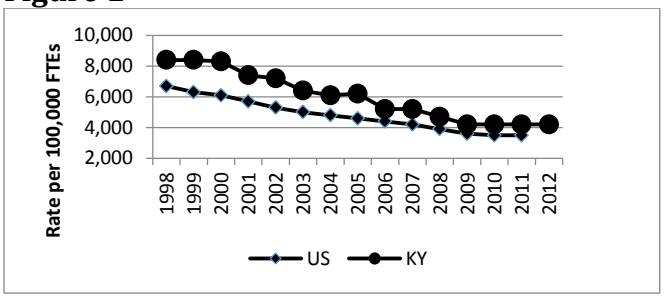
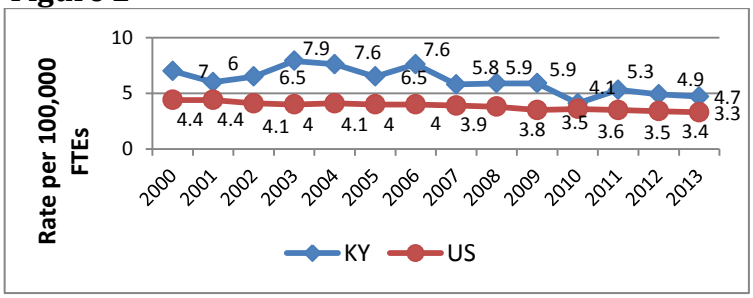



**Figure 2**



**Kentucky Occupational Safety and Health Surveillance Program- OHI/indicators component**
**SIGNIFICANT FINDINGS.**

The KOSHS program improved occupational injury and illness surveillance, identified trends and at-risk industries and occupations, and enhanced partnerships.

*Improved work-related concussion surveillance using multiple data sources.* Studies suggest that the incidence of work-related injuries and illnesses is underestimated due to methodological issues, data timeliness, and reporting incentives. Deterministic linkage of multiple data sources (workers' compensation (WC), emergency department visit (ED), and inpatient hospitalization [IH]) was performed to identify work-related concussions. WC data identified 3 times more than the 70 concussions reported by the Bureau of Labor Statistics (BLS). Using the three data sources, 596 concussions were identified at a rate of 31.8/100,000. Results were presented at the American Public Health Association meeting in 2012, published in *Amer J Ind Med* in 2015, and used to establish a new state-specific indictor.

*Identification of at-risk industries and occupations using trauma registry (TR) data.* TR data analysis identified industries and occupations at highest risk for severe work-related traumatic injuries in an epidemiological study. "Other services'' and construction had the highest number of work-related injury cases. Drugs were detected in 55% of all drug-screened work-related trauma cases. Findings indicated possible elevated drug use or abuse in natural resources and mining, transportation, and construction industry workers, and improved specific drug type identification in positive drug screens of injured workers was recommended. The study was published in 2014 in *J Trauma*, and a new Ky-specific indicator on occupational severe traumatic injuries was developed.

*Trends in Pneumoconiosis Surveillance.* Kentucky is among the top 3 states for pneumoconiosis mortality. An epidemiological study of 2003-2013 pneumoconiosis mortality rates, accepted in *Amer J Ind Med* in June 2015, showed significant linear decreases in pneumoconiosis mortality rates in West Virginia, Pennsylvania, Kentucky, and the U.S. from 2003-2013; Pennsylvania and Kentucky had comparable rates in 2003, but while Pennsylvania rates significantly decreased ~3.0 deaths/million annually, Kentucky rates decreased only 0.5/million annually. It was recommended that coal worker environmental exposure protection be enhanced and pneumoconiosis surveillance improved.

**TRANSLATION OF FINDINGS.**

*Funding Leveraged for Occupational Injury Surveillance Quality Improvement.* Findings from our published OHI study on work-related traumatic injuries by industry leveraged FFY 2014 National Highway Transportation Safety Administration funding for probabilistic linkage of CRASH and TR data to assess completeness and accuracy of occupation and industry variables. The analysis accounts for crash geographic location in relation to the nearest trauma center providing care for the injured as well as transport time to trauma care.

*State law mandating commercial carrier safety training.* KOSHS program staff and the Kentucky Trucking Association (KTA) testified before the Ky Senate Transportation Committee in support of a law passed in 2013 that mandated annual truck driver safety training for commercial carriers registering for interstate and intrastate licenses. The KTA was the primary advocate for the law and approached the KOSHS program in FY 2015 to develop driver and vehicle inspector safety training in support of the law's mandate. Although the law was repealed in April 2015, the KTA and Midwest Insurance Company recognize the continued need for available online new driver and commercial vehicle inspector safety training. Based on the intent of the repealed law, KOSHS will collaborate with KTA in the upcoming funding cycle to develop two driver safety training modules, and one commercial vehicle inspector online training module. The first driver and inspector modules will explain pre-trip and post-trip commercial vehicle inspections, with interactive user navigation and quizzes. The second driver module, a narrated PowerPoint with quizzes, relates to incident management and provides procedures for truck drivers disabled on the roadside. These DOT Compliance 101 online training modules will be developed in collaboration with KTA and Midwest Insurance and will be available for KTA members and the general public free of charge, and will be updated regularly to reflect quarterly FMCSA Regulation changes.

*Pesticide Illness Surveillance*. KOSHS program staff and partners educated stakeholders on the need for pesticide illness surveillance; acute pesticide-related illness was added as a notifiable disease condition to be reported within 1 business day in 2015 (902 KAR 2:020).

**Potential outcomes**.

*Safe Communities.* KIPRC was designated an Affiliate Support Center for the World Health Organization's Safe Communities program and Safe Communities America in 2012. KIPRC staff members provided community injury data to local communities to support their Safe Community accreditation applications.

*NIOSH Total Worker Health (TWH)*. The KOSHS program collaborated with partners to establish the Ky Total Worker Health program. This innovative integration of worker health and safety programs was described in the May 2014 TWH in Action! Newsletter. KIPRC became a TWH Affiliate in September 2014. The KOSHS program produced presentations and publications on prescription drug abuse prevention in the workplace, and OHI staff members were elected to the Ky Worksite Wellness Advisory Board in April 2014, in support of the Kentucky TWH initiative.

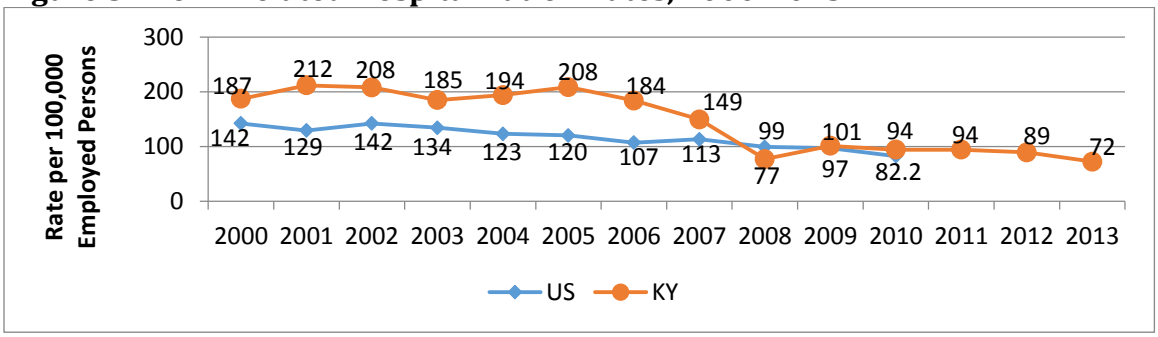
**Intermediate outcomes.**

*SouthON.* The OHI program was instrumental in establishing the Southeastern States Occupational Health Network (SouthON) that includes 1) occupational safety and health-funded and unfunded states; 2) NIOSH Education and Research Centers (ERCs); 3) Southeast Agricultural Research Center; 4) worker organizations; 5) NIOSH; and 6) OSHA. Our 4th SouthON meeting was held in April 2015. The Ky OHI program presented a *work-related heat illness indicator* with LA, NC, and FL SouthON states to the NIOSH indicator workgroup for adoption by NIOSH-funded states in 2014, and a multi-state work-related heat illness peer-reviewed publication was accepted for publication in *Amer J Ind Med* in June 2015. Our SouthON conference grant was funded by NIOSH in June 2015 for the July 2015- June 2020 grant cycle.

**End outcomes.**

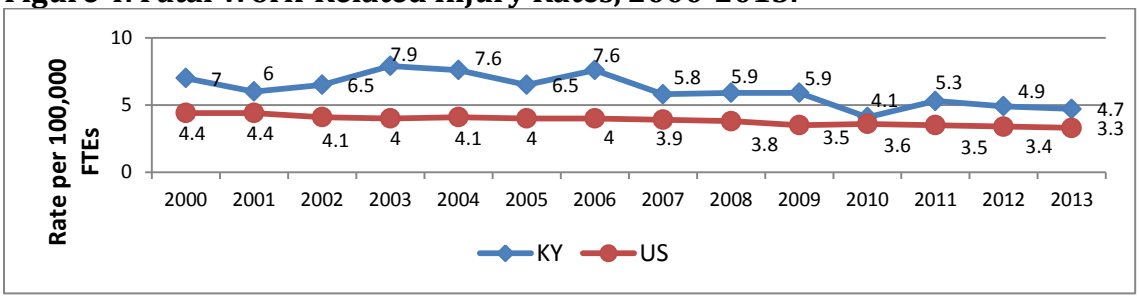
In 2013, there were 1,369 work-related hospitalizations with an annual crude rate of 72/100,000 employed persons age 16 years and older, down 61% from the year 2000 (Figure 3).

**Figure 3. Work-Related Hospitalization Rates, 2000-2013.**




In 2013 there were 86 fatal occupational injuries in Kentucky, a 5% decrease from the reported 91 fatal work-related injuries for 2012. The 2013 Kentucky rate was 4.7/100,000, or 44% above the preliminary 2012 national rate of 3.4/100,000 (Figure 4).

**Figure 4. Fatal Work-Related Injury Rates, 2000-2013.**



**Kentucky Occupational Safety and Health Surveillance Program- Fatality Assessment and Control Evaluation (FACE) component**

**SIGNIFICANT FINDINGS.**

*Investigation of worker fatalities.* From 1994- May 2014, the Ky FACE program conducted 231 fatality investigations (~11/year) and produced 164 final reports: 40 motor vehicle, 23 falls, 74 tractor and logging, and 27 other fatality reports. The root cause was determined in 84% of all fatality reports. FACE reports and surveillance data are the basis for hazard alerts, newsletters, presentations, media releases, and peer-reviewed and non-peer reviewed articles. Fatality reports include recommendations for injury prevention and intervention (behavioral, administrative, and engineering controls) after full consideration of contributing factors.

*Identification of at-risk industries and occupations.* The FACE team collaborated with NIOSH and Nationwide Safety Consulting on a tow truck driver tool kit disseminated in September 2014 that included a digital FACE story and case report. Company responses included "Thanks for doing what you guys do" and "the toolkit made me aware of hazards that I previously hadn't thought of." The tool kit was also featured in Tow Time Magazine in October 2014. Second, report #14KY031- "Factory Manager Bypasses Lockout/ Tag-Out and is Electrocuted" was disseminated to 2,506 subscribers. Employers responded that the report would be posted on a bulletin board, used for training, and distributed to coworkers and those that may benefit from it. One employer added, "Thanks for the work you do."

**TRANSLATION OF FINDINGS.**

*State law mandating commercial carrier safety training.* FACE program staff and the KTA testified before the Ky Senate Transportation Committee in support of a law passed in 2013 that mandated annual truck driver safety training for commercial carriers registering for interstate and intrastate licenses. The KTA approached the FACE program to develop driver and vehicle inspector safety training in support of the law's mandate. Although the law was repealed in April 2015, KTA and Midwest Insurance Co. recognize the continued need for available online new driver and commercial vehicle inspector safety training. Based on the intent of the repealed law, KOSHS will collaborate with KTA in the 2015-2020 funding cycle on the development of two driver safety training modules that will be available to KTA members and the general public free of charge, and will be updated quarterly to reflect FMCSA Regulation changes.

*Multiple Sub-Contractor Company Policy*. Based on Ky FACE report 13KY042 "A Metal Fabrication and Finishing Foreman Dies after 25 Foot Fall at a Commercial Building Site" that recommended general contractors coordinate and stagger various subcontractors' work to prevent creation of additional hazards, conflict and obstructions, the construction contractor implemented a new policy that requires multiple sub-contractor staggered work schedules to avoid subcontractor work schedule conflicts. Also, based on a recommendation that employers ensure employees have access to tie off when working in high areas, the company implemented a procedural policy that requires fall protection tie- off at all times. Other companies responses included: 1) "(we will) Make sure we wear fall protection when working from heights and tie off"; 2) "I will use as a learning tool"; and 3) "Distracted work is as deadly as distracted driving. We will implement a new policy with regards to arguing and frustration on the worksite, ask our employees what their solution would be to arguments on the worksite, and will share this story with them to see if they change their solution".

**Potential outcomes**.

*KY TWH* The FACE program partnered with KIPRC as a NIOSH TWH Affiliate in 2014. FACE staff members produced presentations and publications on workplace prescription drug abuse prevention (e.g., Bunn TL, Bush AM, Slavova, S. 2014. Fatal Drug Overdoses: What Specific Drug Types Were Involved? What Industries and Occupations Were the Decedents Employed In? *J KY Med Assoc*) to support our TWH effort.

*Occupational motor vehicle collision prevention*. A hazard alert entitled "Semi drivers killed due to rear-end collisions" was disseminated to 2,919 FACE subscribers, and was published in the Guardian magazine, Volume 22, Issue 1, 1st quarter, 2015. Evaluation respondents (70%) said the hazard alert raised their awareness of occupational hazards, and 100% said they felt workers would follow the

recommendations. The hazard alert was rated 3.38 for usefulness on a 1-5 scale. Respondent #17 said "I will use the information as a toolbox safety topic. Thanks for sending. It is very enlightening and helps re-enforce programs we already have in place." Another respondent said, "this type of information, whether new or a reminder, is always good to read or be 'seen' by our drivers." A private industry employee responded, "This had a nice presentation. Nice job." A private industry manager said, "The recommendations are standard industry recommendations that we already share with our drivers on a consistent basis. Your material will augment that education program." Second, report #13KY041- "Heavy Equipment Mechanic Dies When an Elevated Dump Truck Tag Axle Pins Him to the Concrete Floor" was disseminated to 75 vehicle mechanic businesses and 2,153 FACE subscribers. An occupational health professional in private industry responded, "I use your reports for teachable moments. Thank you for what you do. Keep up the great work." Third, FACE reports #13KY046, #13KY039, and #14KY007 were published in the National Truckers Association's Truckers Alert magazine in July 2014, October 2014, and June 2015. Last, the KTA published report #13KY039 in its Summer 2014 edition.

**Intermediate outcomes.**

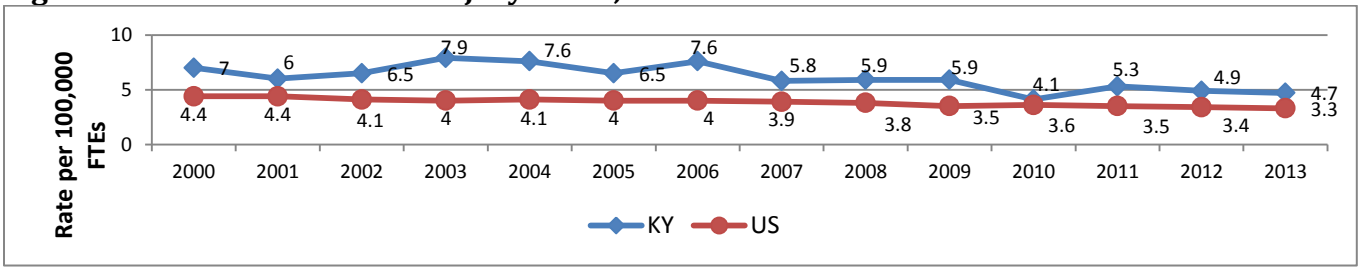
*Equipment redesign*. Based on report #14KY001- "Auto Technician Mistakes Handicapped Accessible Accelerator Pedal for Brake Pedal and Fatally Pins Co-worker", Veigel North America LLC Mobility Products and Design redesigned their product, Left Foot Gas Pedal Model 3545, to retrofit a vehicle's steering column with a key that would disengage the foot pedal and eliminate the need for total removal of the handicapped accessible pedal when the vehicle is serviced. The FACE program was thanked for their report and for providing an opportunity for product quality improvement. In addition to the handicapped pedal redesign, the employer now requires the removal of all handicapped equipment on vehicles before servicing, and desks were moved away from the service area.

*Construction injury prevention*. The National Safety Council highlighted 14KY008 "Hispanic Laborer Killed when Struck by Falling Plywood on a Commercial Construction Site" and 13KY059 "Roofer Dies After Gust of Wind Knocks Him and a Co-Worker Off Roof" in their monthly magazine in April 2015. Based on #14KY008 report recommendations, the employer implemented subcontractor policies: requirements for a net to catch falling debris, use of toe boards on all jobs, and no work performed while workers are laboring above. The company invited the FACE investigator to speak to their workers (n=70) at the national stand down for falls campaign, where pamphlets, post cards and a fall protection knowledge test were requested for future use in their stand-down pre-work meetings. In support of the National Annual Stand-down for Falls campaign, our FACE investigator appeared on NBC television, spoke in a radio talk show, and wrote a University of Kentucky article in April 2015. Second, report #14KY022- "Foreman Falls into Running Auger after Stepping on Door Panel with Broken Door Interlocks" was highlighted in the ASSE *By Design* newsletter in spring 2015 and will be featured in OHS magazine's fall 2015 edition. Third, based on #14KY002- "Construction Flagger Struck and Killed in Two-Lane Highway Work Zone" report recommendation, the employer now requires all flaggers to wear reflective pants and vests. Last, the Institute of Scrap Recycling Industries requested #14KY036 for educational purposes; it was featured in *Scrap* magazine in 2015.

**End outcomes.**

In 2013 there were 86 fatal occupational injuries in Ky, a 5% decrease from the 91 fatal work-related injuries in 2012. The 2013 Ky rate was 4.7/100,000, 42% above the national rate (Figure 5).

**Figure 5. Fatal Work-Related Injury Rates, 2000-2013**



## Section 2 of Final Progress Report

**SCIENTIFIC REPORT.**

**Background.**

In 2007, 5,488 fatal work-related injuries were reported by the Census of Fatal Occupational Injuries (CFOI) (US Bureau of Labor Statistics [BLS], 2009) for a US fatality rate of 3.7/100,000. The estimated total cost for fatal and nonfatal work-related unintentional injuries was $175.3 billion dollars (National Safety Council [NSC], 2009). Included in that amount were wage and productivity losses of $84.1 billion, medical expenses of $35.3 billion, administrative costs of $40.4 billion, and motor-vehicle damage costs of $1.7 billion.

Kentucky ranked as the 14th -worst state for fatal occupational injury rates in 2007, down from the 8th worst in 2004 (John Sestito, NIOSH, personal communication), but still 57% above the national rate (5.8 KY deaths/ 100,000 workers compared to 3.8 US deaths/ 100,000 workers in 2007), and is among the states with the highest nonfatal occupational injury and illness incidence rates (8th worst) (BLS, 2009). The KY nonfatal worker injury rate is 5.2 injuries and illnesses/100 workers compared to a nationwide worker injury rate of 4.2 injuries and illnesses/100 workers (BLS, 2008). KY Fatality Assessment and Control Evaluation (FACE) program data indicate that a total of 1,883 years of potential life were lost (YPLL) in 2007 due to work-related fatal injuries. Lost future productivity attributable to these fatal injuries is an estimated $71 million dollars. In addition, the Kentucky motor vehicle death rate per miles traveled is 8th highest in the nation (Adekoya, 2009). These elevated rates are attributable in part to the concentration of KY workers in higher-risk industry sectors, but nevertheless are clear indications of the need for further work to lower the state's burden of occupational injuries and illnesses.

Kentucky has the 7th highest workers' compensation premium rate in the nation ($2.96 per $100 of payroll) (Department of Consumer & Business Services, Salem, OR, 2009). The highest average workers' claims costs were associated with motor vehicle injuries ($44,853), and falls and slips ($25,228) in 2005-2006 (NSC, 2009). For the same time period, the average total incurred costs per claim by nature of injury were highest for amputations ($41,307) and fracture/crush/dislocation injuries ($31,698). This tremendous economic and social burden clearly supports enhanced surveillance as well as the continued need for targeted injury prevention strategies and interventions in the workplace.

Surveillance indicators of work-related injuries and illnesses show that KY has elevated occupational injury and illness rates compared to the US for a number of surveillance indicators. Kentucky's occupational musculoskeletal disease incidence rate was 38% above the national rate in 2007 (KOSHS Program data). Similarly, the KY pesticide-associated injury and illness rate (2.4 cases per 100,000 full-time employees) was 33% higher than the US rate in the year 2005 (last rate available for the US), and doubled to 4.2 cases per 100,000 workers in 2007 (American Association of Poison Control Centers). Also, the KY pneumoconiosis incidence rate was six times the US rate in the year 2006, (most recent year for which US data are available). The occupation with the highest percentage of employees at risk for occupational morbidity in KY in 2007 was the driver/sales workers and truck driver occupation which was higher than the US (3% for KY *vs*. 2.4% for the US) (BLS).

**Specific Aims.**

The specific aims for the fundamental OHI study were to:

1. Establish and maintain <u>partnerships and collaborations</u> with state partners, agencies, organizations, and other stakeholders. Specific partnerships have been expanded with a) the KY Occupational Safety and Health Administration (KY OSHA) and the KY Department of Workers' Claims (DWC) to present seminars on the value of establishing a worker safety program; and b) the Lexington Fayette Urban County Government (LFUCG) to analyze injuries among Department of Environmental Quality (DEQ) employees. Continued KOSHS program consultation and collaboration with NIOSH will be promoted and KOSHS personnel will actively participate in Centers for Disease Control and Prevention (CDC)/NIOSH grantee meetings, and conference calls.

2. Maintain the KOSHS program advisory committee established in 2006 that partners state and local public health agencies, unions, work-related organizations, companies, insurers, and other community-based stakeholders to target major occupational injury and illness issues specific to Kentucky.
*3.*Maintain comprehensive multi-source population-based surveillance of occupational injuries and illnesses occurring in Kentucky using **26** occupational health indicators including the analysis of limitations and database utility. Tracked indicators include the ***19*** current occupational health indicators (OHIs), ***one*** newly adopted Council of State and Territorial Epidemiologists (CSTE) OHI on work-related low back disorder hospitalizations, and ***one*** proposed CSTE OHI on total occupational poisonings. Five KY-specific indicators include ***three*** current state-specific OHIs and ***two*** new OHIs to be established. The 3 current KY-specific OHIs include the surveillance of occupational motor vehicle collisions using Collision Report and Analysis for Safer Highways (CRASH) and KY DWC data, and occupational falls using DWC data. One new KY-specific OHI to be established is *work-related injuries among state employees* using injury data collected by the KY Personnel Cabinet, Office for Employee Relations. The other new KY-specific OHI will be *work-related emergency department visits* using the state emergency department dataset.
4. Enhance the KOSHS program through a) response to emerging issues (e.g., work-related injuries in the local public sector); b) in-depth analyses, interpretation, and dissemination of occupational injury surveillance data through the use of spatial analysis to determine high risk areas of collisions involving commercial truck drivers; and c) response to data and information requests from stakeholders and the public using an expanded web-based occupational injury data query system.
5. Provide targeted worker and employer groups with a sound evidence basis for improved worker safety by analyzing and disseminating occupational health surveillance data and research results through a) annual reports that contain trends, emerging issues, high-risk occupations and industries, and worker populations; b) newsletters; c) web-based information; d) presentations; e) trade journals and magazines; and g) peer-reviewed publications, for impact at both the state and national levels. Also, an annual report of KOSHS program accomplishments and impact, including lessons learned, will be prepared for NIOSH for public release.
6. Perform a process, impact, and outcome evaluation of the major activities conducted to assess effectiveness and impact of the KOSHS program.

The specific aims for the FACE study were to:
1) Conduct comprehensive and timely multi-source surveillance of *all* occupational fatalities occurring in KY, and to identify opportunities for intervention and prevention activities. The surveillance data will identify potential cases for incident investigation and will be used for intrastate, multi-state, regional, and national (e.g., NIOSH) collaborations.
2) Perform selected case follow-up on-site case investigations within a) the truck transportation sector associated with short-haul and long-haul including motor vehicle collisions and other causes; b) the construction sector including falls; c) the NIOSH-recommended priority areas for investigation (currently machine-, youth-, immigrant worker-, and highway work zone- related fatalities); and d) other industry sectors with worker fatality cases amenable to engineering and/or process changes.
3) Conduct extensive analyses, interpretation, and dissemination of occupational injury and fatality data including: a) the identification and characterization of injuries among long-haul *vs.* short-haul truck drivers; b) an innovative epidemiological study of occupational fatalities involving multiple jobholders; and c) trend analyses of FACE data. The results will be used to develop, recommend or implement, and evaluate intervention and prevention activities.
4) Promote the use of FACE data and findings by others through partnerships and collaborations. Specific partnerships have been expanded with a) KY Occupational Safety and Health Administration (KY OSHA) to analyze FACE data; and b) KY Trucking Association (KTA) to collaborate on a quarterly newsletter that includes a section on the prevention of trucker injuries using FACE data and interventions, and others. Continued collaboration with NIOSH and other FACE states will be promoted and KY FACE personnel will

actively participate in Centers for Disease Control and Prevention (CDC)/NIOSH grantee meetings, FACE meetings, and conference calls.

5) Provide targeted worker and employer groups with a sound evidence basis for improved worker safety by analyzing and disseminating occupational fatality surveillance data and research results through a) annual reports; b) fatality reports; c) hazard alerts; d) newsletters; e) web-based information; f) web-based data query systems; g) presentations; h) trade journals and magazines; i) NIOSH/CDC alerts and Workplace Solutions; and j) peer-reviewed publications, for impact at both the state and national levels.

6) Perform a process, impact, and outcome evaluation of the major activities conducted to assess effectiveness and impact of the FACE program. The FACE advisory committee will be maintained and meets semiannually.

**Methodology for OHI.**

**Specific Aim #1- Establish and Maintain Partnerships and Collaborations With State Partners, Agencies, Organizations, and Other Stakeholders.**

**National, State and Local Agency Partnerships**

KY OSHA KOSHS has established and maintained a working relationship with KY OSHA since 1994. A proposed expanded partnership with KY OSHA (see letters of support) includes:

a. ***New initiative****- Annual analyses of worker amputation, and worker inpatient hospitalization data.* KY OSHA, Division of Compliance, promulgated a reporting regulation in November 2006 that requires reporting in-patient hospitalization of one or more employees and any work-related amputation. KOSHS personnel will analyze KY OSHA electronic data on hospitalizations and amputations yearly. Examples of variables within the electronic data set to be analyzed include standard industrial classification (SIC) codes, number of employees, company ownership type, type of business, job title of injured worker, event type, number of hospitalized injuries, number of fatalities, number of non-hospitalized injuries, and type of event (e.g., from scaffold collapse). The results of these analyses will be provided to KY OSHA, disseminated to affected industries, and used for the development of hazard alerts.

b. ***New initiative-*** *Four half-day seminars presented per year in locations throughout the state.* KY OSHA, KY DWC, and KOSHS personnel will provide four half-day seminars per year at OSHA training locations. KOSHS personnel will begin with our 45 minute presentation on the need for and value of establishing a worker safety program that was developed with the KOSHS advisory committee. KY DWC will then give their 1 hour presentation on workers' compensation. Last, KY OSHA will deliver their 1.5 hour presentation on KY OSHA regulations and the basic elements of a worker safety program. The half-day seminars will target new and established small business owners.

KY Department of Workers' Claims

Our partnership has been expanded with the KY DWC to receive the complete DWC first reports of injury and claims dataset from 1999-2008, and yearly thereafter (see letter of support). Previously, we had only received specific data by request, usually by incident type, injury type, or by industry. Receipt of the full DWC dataset will allow us to monitor emerging trends and risk factors for injuries since injury descriptions are also included.

***New initiative****- The DWC dataset will be explored* by industry (SIC code), occupation (Standard Occupational classification [SOC] code), and cause of injury to identify trends, emerging issues, high-risk industries and occupations, and worker populations.

Lexington Fayette Urban County Government (LFUCG)

***New initiative-*** KOSHS will expand our partnership with the LFUCG Department of Environmental Quality (DEQ) to develop a safety management system for the Division of Water and Air Quality and the Division of Waste Management. DEQ was receiving a quarterly report of injuries from their risk management division but had not performed a quantitative and qualitative analysis of data. The purpose of the safety management system is to identify work-related injuries and at-risk worker populations,

describe trends, educate workers about job hazards, and guide regulatory action. Analysis of vehicle accident claims and Workers' Compensation claims for the years 2003-2008 by KOSHS led to the identification of targeted emphasis areas for worker injury reductions. Increased safety training will address: 1) backing, making turns, and judging clearance; 2) ergonomics evaluation for lifting, picking up, and pulling; 3) the use of nonslip footwear and gloves; 4) hazard awareness training for wind and ice; and 5) entering and exiting the vehicle. *Injury data will now be analyzed quantitatively and qualitatively every year and we will continue to collaborate on strategies to reduce injuries.*

NIOSH and other state health departments (or bona fide agents)

KOSHS will continue collaboration with NIOSH and other funded state health departments (or bona fide agents). KOSHS personnel will actively participate in a kick-off meeting, semiannual grantee meetings, and conference calls. KOSHS personnel will also continue as corresponding members for the development of the NIOSH NORA II Transportation, Warehousing, and Utilities sector agenda and action plan. KOSHS personnel are also members of the occupational health workgroup within the CSTE that meets three times per year. The occupational health workgroup is composed of representatives from state health departments, universities, NIOSH, and other federal agencies.

**General Partnerships**

Foundation for a Healthy Kentucky

***New initiative-*** The Foundation for a Healthy Kentucky (FHKY) was established in 2001 to "address the unmet health care needs of Kentucky, by developing and influencing healthy policy, improving access to care, reducing health risks and disparities and promoting health equity". The FHKY produces *Kentucky Health Facts* which, in their words, is a website that is designed to be a clearinghouse for key local information from various state agencies that collect and report health data, and serves as a portal for users to link back to those state agencies when more specialized data are requested. KOSHS is establishing a new partnership with the FHKY to provide them with data from OHI #1 (non-fatal injuries and illnesses), OHI #2 (work-related hospitalizations), and OHI #3 (fatal work injuries) to be used as indicator data for their *Kentucky Health Facts* website. The website includes data at the state, Area Development District (ADD), and county levels. Since hospitalized occupational injuries and fatalities occur in relatively small numbers, county-level data may not be available for individual years but multiple year data will be accessible to generate county-level statistics. The FHKY will also be an advisory committee member.

***New initiatives***- Truck Transportation Industry Partnerships-

1) An expanded partnership with the KTA is proposed to collaborate on a quarterly newsletter that includes a section on the prevention of trucker injuries using FACE data and interventions .
2) We have maintained our partnership with the KSP to receive both electronic and paper copies of motor vehicle collision reports. To expand this partnership, we will participate in KSP's CVE Division Drivers' Appreciation Days held annually at truck stop rest havens to disseminate fatality reports, hazard alerts, newsletters, and publications.
3) A new partnership has been formed with the Owner-Operator Independent Driver's Association (OOIDA). Information from reports and hazard alerts will be a) used in seminars; b) incorporated into the OOIDA website; and c) used on their radio talk show that airs 7 days a week.
4) We have established partnerships with private trucking companies, organizations, and insurance agencies that utilize our KOSHS and FACE findings and serve as advisory committee members: a) Towne Air Freight; b) ABF Freight; c) Great West Casualty; d) America's Road Team; and e) Women in Trucking Association (WITA) (see letters of support). WITA added a link from their website to the KY FACE website so that women truckers nationwide can access information from our website including reports, hazard alerts, and newsletters.

Construction Industry Partnerships

1) Professional associations: We have established and maintained partnerships with Associated General Contractors (AGC), KY Homebuilders Association, and NAWIC to promote the use of KOSHS and FACE data and reports by the construction industry and to disseminate prevention materials.
2) Corporate sector: We have established partnerships with private construction companies to use our reports and publications; Hall Contracting Co. and Grayhawke Construction Co. also serve as members of our advisory committee.

**Specific Aim #2- Maintain The KOSHS Program Advisory Committee.**

Our KOSHS advisory committee will be maintained and will meet semiannually to discuss KOSHS program effectiveness, new and emerging trends and risk factors, and problems, and to participate in the on-going evaluation of the KOSHS program. The KOSHS program advisory committee was established in May 2006 to foster collaborations and to share resources among the various stakeholders in the state working to improve worker safety and health. KOSHS staff will continue to use a list-serve for communication among stakeholders between meetings.

The KOSHS advisory committee developed a statewide occupational injury prevention strategic plan that was incorporated into the 2010 Kentucky Strategic Plan for Developing Core Capacity for Injury Prevention and Control. The plan recommended many action steps including the provision of KY OSHA education and training resources to KY employers, education of employers on the value of a worker safety program, promotion of partnerships between resource providers and employers, dissemination of occupational injury prevention publications to smaller employers, and provision of baseline surveillance data to inform employers, monitor trends and make state comparisons

With the identified action steps above, the advisory committee provided input on the development of a worker safety program presentation in 2008 that is targeted to new and established small business owners. The presentation includes information on workers' compensation, basic elements of a worker safety plan, implementation of a worker safety plan, and how workers' compensation premiums are impacted by the variation in the quality (or even presence) of a worker safety plan. Factual accounts and statistics are also presented concerning workplace injuries. Since 2008, a link to this presentation has been available on the KY Secretary of State's online One-Stop Business Licensing Program, which provides new business licenses. The presentation will also be used by NAWIC at their chapter meetings. ***New initiative***- As mentioned above in section 5.a.1. on our expanded partnership with KY OSHA, this presentation will be given in four half-day seminars annually at locations statewide in collaboration with KY OSHA and KY DWC. KY OSHA will provide the training rooms at their various training locations throughout the state. KOSHS will develop a flyer advertising the free training sessions and disseminate it to new employers throughout the state using a mailing list of new businesses with names and addresses provided to us by the KY Secretary of State. Once positive responses have been received, meeting locations will be established based on geographical locations with the highest concentrations of respondents. These seminars will be given four times per year for all five years of this proposed study.

Current members of the advisory committee include 1) KY OSHA, Division of Compliance; 2) the KY ABLES program; 3) KY Vital Statistics; 4) Towne Air Freight; 5) KY DWC; 6) Hall Contracting of Kentucky, Inc.; 7) KTA; 8) America's Road Team; 9) FHWA; 10) KDPH; 13) LFUCG; 14) Grayhawke Construction Co.; 15) KY Personnel Cabinet; 16) Foundation for a Healthy Kentucky; 17) Kentucky League of Cities; and 18) others (see letters of support).

The advisory committee will receive statewide occupational injury and illness data analyses results to target specific injury and illness problems, educate the members for the development of effective workplace interventions, and raise awareness. The advisory committee will facilitate the efficient use of limited resources and will serve as a primary conduit for disseminating OHI information and prevention materials.

**Specific Aim #3- Maintain Comprehensive Multi-Source Population-Based Surveillance of Occupational Injuries and Illnesses in KY Using 26 Occupational Health Indicators.**

The KOSHS program seeks to determine the magnitude and distribution of occupational injuries in KY, monitor trends, and reduce the burden of occupational injuries through the development of sector-, industry- and job task-specific interventions. KOSHS staff strive to conduct timely, accurate, and comprehensive surveillance of all KY occupational injuries, perform epidemiologic analyses of injury data, and develop priorities for intervention development based on high-risk worker population surveillance data. These activities support the development and dissemination of information to targeted worker populations and industries so that workers can be aware of high-risk situations that could result in an occupational injury.

The data sources used to identify potential cases are shown in Figure 2 above. Public access resources include BLS SOII, BLS Current Population Survey, Year 2000 US standard population data, US census state population data, National Academy of Social Insurance, CFOI, Bureau of Census County Business Patterns, OSHA annual reports, BLS statistics on covered employers and wages, and professional trade organization data. Authorized resources (permission granted to the KOSHS program to use data) include data from the KY inpatient hospitalization and emergency department discharge set, death certificates, DWC, ABLES, FACE, CRASH, KY Cancer Registry data, and KY Personnel Cabinet data. Authority to use the state and national agency resources is based on specific agreements as well as an authorization provided to KIPRC under contract with the Kentucky Department for Public Health (Kentucky Revised Statutes 211.190).

KOSHS data are analyzed with descriptive and advanced statistics using SAS®. Basic descriptive analysis on data variables is performed to assess data quality, validity, and to describe cases. Frequencies are determined for the datasets to account for any missing values. Routine cross-tabulations are performed to assess relationships between selected variables. Outliers are investigated for accuracy. Non-parametric statistics are run on all non-normally distributed variables, and chi-square and t-tests are performed where appropriate. Results are utilized for quarterly summary reports, annual reports, newsletters, Hazard Alerts, data requests, peer-reviewed and non-peer-reviewed articles and other dissemination avenues.

**Authorized data sources**

Inpatient hospitalization discharge data (OHI #2, #6, #9, #20)

Population-based discharge data are available for the years 2000-2008, and new data are made available to KIPRC every year in June once the calendar year's data are finalized. The cases are inpatients in Kentucky hospitals, including residents of other states.

***New initiative***- A new indicator on work-related low back disorder hospitalizations (OHI #20) was developed and approved as an optional OHI by the CSTE occupational health workgroup in June 2009. KOSHS will begin using this new indicator with 2007 data which will be due to CSTE in June 2010 for the national OHI report. In addition to the national OHI report, this indicator will be used for our annual KY OHI report. Inclusion criteria for the inpatient hospitalization data includes: 1) relevant diagnostic codes (listed in CSTE OHI how-to guide) in any of the first seven diagnosis fields in combination with the relevant surgical procedure code (listed in CSTE OHI how-to guide) in any of the first four procedure fields; 2) primary payer=Workers' Compensation; 3) state of residence=KY; 4) undeduplicated data (no exclusions for deaths, readmissions); 5) discharge during calendar year, not fiscal year; and 6) all cases reported on the discharge file, regardless of length of stay. Exclusions are listed in the CSTE OHI how-to guide. Further exclusion criteria include: 1) age unknown or <16 years old; 2) out-of-state residents and unknown state of residence; and 3) out-of-state hospitalizations. BLS Current Population Survey data will be used as the denominator which is the number of employed persons aged 16 and older. Variables included in the indicator will be race, ethnicity, age, gender, and county for inclusion in the annual KY OHI report.

Kentucky Regional Poison Control Center (KRPCC) data (OHI #11, #21).

KRPCC provides statewide services and is certified as a Regional Poison Center by the American Association of Poison Control Centers (AAPCC). When a call is placed to KRPCC, data are coded and

automatically transferred to the Toxic Exposure Surveillance System (TESS). Data related to *acute work-related pesticide-associated illness and injury* (OHI #11) will continue to be collected and reported using two different methods. The first method will collect data on the annual number of reported work-related pesticide poisoning cases from the AAPCC. The second method will collect the same data from the KRPCC since there may be differences between the two data sources. The KRPCC and AAPCC data will be provided to KIPRC. KRPCC data are available for 2000-2008. Information to be reported will include gender, type of substance, medical outcomes, severity, symptoms, and exposure route.

***New initiative***- Total Occupational Poisonings (OHI #21). In 2005, there were 1019 total occupational poisoning calls and 45 of those were pesticide poisoning cases reported for indicator #11. This means that 974 occupational poisoning cases were not described for the year 2005 alone. A new OHI on total occupational poisonings was proposed to the CSTE occupational workgroup in November 2008. KOSHS will begin to track total occupational poisoning cases with our KY-specific OHI #21 beginning with 2005 data. Data from 2005-2008 is currently available for analysis. Similar to OHI #11, information to be reported will include gender, type of substance, medical outcomes, severity, symptoms, and exposure route, and management site (e.g. home, hospital). KOSHS will work with the CSTE, NIOSH and other funded states who want to use this indicator for their own states and for state, regional, and national reports.

<u>Workers' Claims (DWC) data (OHI #5, #8, #22, #23).</u>

The DWC has agreed to provide KIPRC with the entire DWC data set. Previously, DWC data was only received by KIPRC for the generation of the specific OHIs and upon request for research studies. DWC data will continue to be used to generate OHI #5 (*work-related amputations with days away from work*), and OHI #8 (*carpal tunnel syndrome cases*), and for continued generation of our KY-specific OHIs: a) occupational motor vehicle collisions- first reports of injury and claims filed with DWC by injury year (OHI#22); and b) occupational falls- first reports of injury and claims filed with DWC by injury year (OHI#23). Selection criteria for KY-specific occupational motor vehicle collisions and occupational falls are the applicable IAIABCEDIN injury codes.

***New initiative***- KOSHS will evaluate trends in workers' claims over the years as well as the existence of any specific seasonal trends in the claims by: 1) industry (SIC code); 2) nature of injury; 3) body part injured; 4) percentage disability; 5) percentage impairment; 6) occupation; 7) county; 8) age; 9) gender; and 10) others. The DWC data system will be assessed in terms of data quality (checks for completeness and validity by examining percentage of missing data), and acceptability (timeliness of reporting a case). KOSHS will work with NIOSH and other funded states who want to use DWC data for their own states and for state, regional, and national reports.

<u>Emergency Department Discharge data (OHI #24)</u>

***New initiative***- KY-specific OHI on *work-related ED visits* (OHI #24). A new state specific indicator for work-related emergency department visits (OHI #24) will be developed for our annual KY OHI report using ED discharge data. Collection of KY ED data began in January 2008 so 2008 and 2009 data will be available for our 2010 report (see letters of support). The inclusion criteria for this indicator will be the same as for work-related hospitalizations (OHI #3): 1) payer=DWC; 2) age 16 and older; 3) residence=KY; 4) undeduplicated data (no exclusions for deaths, readmissions); 5) discharge during calendar year, not fiscal year; 6) use all cases reported on the discharge file, regardless of length of stay. Exclusion criteria include: 1) age unknown; 2) out-of-state residents and unknown residence; and 3) out-of-state hospitalizations. This indicator will be used for our annual KY OHI report including variables for race, ethnicity, age, gender, and county. The data will also be provided to the Foundation for a Healthy Kentucky for inclusion on their *Kentucky Health Facts* website, and posted on our website. In addition, KOSHS will work with NIOSH and other funded states' staff who want to use this KY-specific indicator for their own states and for state, regional, and national reports. BLS Current Population Survey data will be used as the denominator, which is the number of employed persons aged 16 and older. Race and ethnicity have recently become available as additional variables within the inpatient hospitalization and ED

datasets so both demographic variables will be explored further. Quality control checks of the ED dataset will include the incomplete population of data fields.

**CRASH data (OHI #25)**

**KY-specific OHI on occupational motor vehicle collision injuries.** *Fatal and nonfatal occupational motor vehicle collisions* is one of our KY-specific worker safety indicators (OHI #25). MVC data are routinely collected on all MVCs occurring in Kentucky (includes residents and non-residents) by the KSP and entered into the Kentucky CRASH database. The CRASH electronic file contains all MVC information but excludes personal identifiers. Data are made available quarterly to KIPRC for analysis. Data are currently available for 1998-June 2009. The inclusion criteria for obtaining occupational fatal and nonfatal MVC data from the CRASH database will be based on: 1) identification as a "commercial vehicle" in the uniform police traffic collision report; 2) unit type: bus, emergency vehicles – in response and not in response, military vehicle, other publicly owned vehicle, railroad train, school bus, taxicab, truck tractor & semi-trailer, truck & trailer, truck – single unit, or truck – other combination; 3) NCIC type: auto carrier, fire truck, asphalt distributor, garbage or refuse, ambulance, loader truck, armored truck, carry-all, chassis and cab, lunch wagon, coach, refrigerated van, concrete mixer, truck trailer /semi, dump, tanker, truck tractor/diesel, truck tractor/gasoline, flatbed or platform, tow truck, flatbed, or utility; and 4) type of cargo carried. KOSHS will work with NIOSH and other funded states' staff who want to use this KY-specific indicator for their own states and for state, regional, and national reports. Occupational motor vehicle fatality rates will be determined using the number of employed persons 16 years of age and older obtained from the BLS Current Population Survey data since the number of licensed occupational drivers in KY cannot be determined.

State employee injury data (OHI #26)

***New initiative****- KY-specific OHI on work-related injuries among state employees.* In September 2009 and annually thereafter, KOSHS will begin receiving 2008 injury data that is routinely collected by the KY Personnel Cabinet, Office for Employee Relations (see letters of support). Injury data will be analyzed and included in our KY-specific annual report as OHI #26. Variables of interest to be analyzed include 1) cabinet name; 2) division; 3) section; 4) type of claim; 5) injury date; 6) injury time; 7) return to work date; 8) date of birth; 9) body part injured; 10) nature of injury; 11) cause of injury; 12) occupation; 13) SIC code (standard industrial classification); 14) county of residence; 15) county of injury; 16) age; 17) gender; 18) race; 19) ethnicity; 20) temporary employee vs. permanent employee; and 21) incident location (e.g., parking lot, building). KOSHS will work with NIOSH and other funded states' staff who want to use this KY-specific indicator for their own states and for state, regional, and national reports. Quality control checks of the state employee dataset will include the incomplete population of data fields. The comptroller's office will be contacted to obtain denominator data for contract and regular employees. The collection of state employee injury data is unique because these data results have the potential to fill gaps in national injury surveillance systems by generating information on the public sector that is not well documented through other sources such as the BLS.

FACE data (OHI #3)

The calculation of *fatal occupational injury deaths and rates* (Indicator #3) will be performed with the CFOI dataset. Additional population-based fatal occupational injury data are available from the FACE dataset, which will be used as supplementary information.

*Special Initiative*- FACE program investigative reports describe the fatal incident as well as the events before and after the incident, and contain prevention recommendations. These reports are available for dissemination to employers and employees for safety training purposes. FACE reports may also be used to identify new and emerging occupational injury risk factors for research. In our **expanded** program, FACE investigations are being focused on truck transportation and construction industry fatalities. To address these areas, partnerships have been expanded with various agencies and organizations (see section 5.a.2. Truck Transportation Industry Partnerships above for details).

Other authorized data sets (OHI #10, #12, #13)

KOSHS will continue to receive electronic death certificate data annually to generate OHI #10- *mortality from or with pneumoconiosis*. In addition, Kentucky Cancer Registry (KCR) will continue to provide data to KOSHS yearly to generate OHI #12- *incidence of malignant mesothelioma*. Third, KOSHS will continue to receive ABLES program data of cases with blood lead levels ≥ 10 µg/dL for the generation of OHI #13- *Elevated adult blood lead level.* Letters of support from all agencies above are included in this application.

**Specific Aim #4. Enhance the KOSHS Program.**

**Response to Emerging Issues.**

***New initiative***- Work-related injuries in the local public sector

KOSHS staff will continue to respond to emerging issues in a timely manner. In May 2009, KOSHS staff were contacted by the LFUCG Department of Environmental Quality (DEQ) to develop a safety management system for the Division of Water and Air Quality and the Division of Waste based on limited and anecdotal evidence of injuries among sanitation workers. DEQ was receiving a quarterly report of injuries from their risk management division but had not performed a quantitative and qualitative analysis of data. KOSHS performed the analysis and based on results, targeted emphasis areas for increased training were established. Yearly quantitative and qualitative analysis of DEQ data will be performed. See section 5.a.1. Lexington Fayette Urban County Government (LFUCG) above.

**Analyses, Interpretation, and Dissemination of Surveillance Data.**

Use of spatial analysis to determine areas of high risk of collisions involving commercial truck drivers

Geographical Information Systems (GIS) can successfully manipulate and display spatial point data (e.g., mapped locations of injuries), map grouped data (e.g., injury rate by county), and contour maps of interpolated values of interest. However, these maps are not sufficient for making statistical inference. In order to better understand and interpret the geographical distribution of a particular type of injury, it is useful to create smoothed injury maps and identify the geographical areas of elevated injury risk. Currently, only few statistical packages have the ability to create smoothed risk maps and none of them have the option to test a hypothesis or construct confidence intervals for the relative risk at a particular geographic location. We have developed a new statistical method for risk identification based on nonparametric k nearest neighbor (kNN) statistics. The method provides a theoretically justified approach for obtaining confidence bounds of the relative risk and critical regions for a given level of significance and power when testing hypotheses about the relative risk without using computationally dependent algorithms. One application of the method on the KY CRASH data set showed that female drivers were more likely to be at fault than male drivers in morning collisions between 7:30am and 9am with a peek around 8:30am (Pavlov et al. 2009).

In another KOSHS study, the kNN method was applied to the CRASH dataset (Slavova et al. 2007) to identify geographical areas within KY where older large truck drivers were at higher risk for at-fault collisions in order to improve our injury prevention education programs. Results showed that older commercial drivers were at higher risk for at-fault collisions in the western and eastern ends of the state, off the interstates. This information was shared with KY CVE to target commercial vehicle enforcement in these areas.

A gap in research needs identified by the Institute of Medicine and National Research Council (2008) review of current and future strategic goals for traumatic injury research at NIOSH was in the prevention of off-road trucking injuries. The committee said, "Other areas of potential opportunity for high-impact research include parking lot and rest area traumatic injuries related to trucking and interstate trucking." ***New initiative-*** The results from the previous study (Slavova et al. 2007) showed that commercial drivers of large trucks were at higher risk for at-fault night collisions in the northern end of the state near two truck stops off interstate I-75 and in western Kentucky, on the highway. The high risk for at-fault collisions at truck stops could be due to increased semi truck congestion, parking beyond current truck capacity and ongoing commercial development at the two interchanges. Further analysis is needed to assess commercial driver injury rates and injury severity in commercial vehicle collisions. The profile of

the night collisions in western KY was different – half of the collisions were single vehicle collisions, and several collisions were due to fatigue and sleepiness. Further investigation of the pattern of collisions and injuries in this area is needed but one possible explanation could be that there were not enough rest areas or truck stops for the commercial drivers to utilize when sleepy or fatigued. Only two truck stops are located in those counties which may be inadequate. These results are the starting point for further investigation of the location, quantity, and quality of parking for large trucks at public rest areas and private truck stops in KY and the profile of collisions and injuries to the commercial truck drivers that are related to proper night rest. Knowing the extent of the problems from the commercial truck driver's safety perspective is important for better planning and coordination of routes, and improving the driver's rest schedule while traveling through KY.

The first focus of the study will be to identify rest areas and truck stops with a high volume of commercial vehicle collisions (CVCs). GIS will be used to display and analyze areas of CVC clusters. The statistical kernel smoothing method (Waller and Gotway, 2004) and the k-th nearest neighbor method will be used to create density maps using latitude/longitude collision coordinates from the CRASH database. For the identified locations with higher concentrations of CVCs we will build local regression models to estimate local regression surfaces of commercial driver collision incidents while accounting for known covariates. Local regression is a modern non-parametric regression approach good for modeling complex processes for which no theoretical models exist. Our goal will be to compute confidence limits for CVCs at particular locations.

The second focus will be to identify the rest areas or truck stops with elevated risk for at-fault commercial driver CVCs. SaTScan™ ( www.satscan.org) software will be used to detect the spatial and space-time clusters of at-fault CVCs and to evaluate if these clusters are statistically significant and in close proximity to rest areas and truck stops. We will use SaTScan's Bernoulli model with cases (commercial drivers at fault) and controls (commercial drivers not at fault) and adjust for covariates like age, gender, type of vehicle, and road type to identify priority areas for injury prevention planning and resource allocation. We will also assess whether there is a seasonal trend or an hourly trend related to injured commercial driver CVCs. Our third focus will be to create a map of the geographical distribution of collisions involving commercial truck drivers that were due to fatigue or falling asleep. We will look for clusters of such collisions and their proximity to rest areas. Based on preliminary research we have a hypothesis that these clusters (if present) will be on parts of highways that do not have enough (if any) rest areas or truck stops for commercial drivers to utilize when sleepy or fatigued. For each area of high risk we will investigate the types of collisions, occurrence of, and severity of injuries.

The results of this study which identifies rest areas and truck stops at highest relative risk for commercial driver injuries will be disseminated to and shared with KY CVE, the GECHS, KY FMCSA, KY FHWA, the KTA, our core trucking company distribution list, OOIDA, and WITA. Also, the study results will be shared with the Kentucky Transportation Cabinet engineering department that could address limited rest areas with commercial vehicle parking capacity, and other engineering problems such as short junctions and inadequate shoulders. The results will also be published in the KMTA newsletter, and in a peer-reviewed publication. Other funded FACE states and NIOSH will receive results of the study which can be used as a model to examine at-fault CVCs in truck stops and rest areas of other states and nationwide.

<u>Expansion of a web-based occupational injury data query system.</u>

An expanded web-based data query system allowing access to worker injury statistics for employers, stakeholders, other states, NIOSH, and other interested parties will be developed. Currently, fatal work injury statistics based on electronic death certificate data are available on the KIPRC website. When the query is performed, both injury numbers and rates (based on the total number of workers in KY) are displayed by cause of death, gender, race, and/or age. Years 1990-2005 data are currently available for query to generate both state-level and county-level statistics. Since occupational fatalities occur in

relatively small numbers, county-level data may not be available for individual years but multiple year data are accessible to generate county-level statistics.

***New initiative-*** KOSHS will develop another web-based query system using linked inpatient hospitalization and DWC data. Years 2000-2006 will be initially available for query and then later years as data become available. Linkage will be performed so that the industry and occupation in which the victim was working when injured is available for query. Variables of interest will be gender, age (grouped for 10 year spans), race, ethnicity (starting with 2008 data), industry, occupation, and external cause of injury. The query system will be developed using the same format as above for the death certificate data. This proposed initiative will be in collaboration with KIPRC's funded core injury grant. No problems or difficulties are expected since KIPRC has experience in developing web-based query systems and data linkage (Bunn *et al.* 2007). These web-based data query systems will contribute to filling the gaps in national surveillance systems for occupational injuries and fatalities by providing easy access to state data. In addition, KOSHS staff are available to respond to specific data requests.

**Specific Aim #5- Analysis and Dissemination of Surveillance Data.**

The information, recommendations, and risk factors identified from surveillance and research will be disseminated for program planning and evaluation, formulate new research hypotheses (CDC, 2001) and to target audiences that will give our publications the greatest impact. The KOSHS program maintains a database of stakeholders in specific industries/occupations for the distribution of reports, hazard alerts, and newsletters, based on the nature of the report (industry, occupation, and cause of injury/death).

There will be targeted outreach to foster implementation of KY state-specific priority area research findings:

1. An annual report containing CSTE-recommended and KY-specific OHIs. The annual report will contain both current year data and historical data, which will be utilized for trend analysis.
2. Transportation industry reports, hazard alerts, and other publications will be disseminated to 4200 long-haul and short-haul trucking employers. They will also be disseminated and discussed in the GECHS, which includes the KSP, CVE, and the KTA. Also on the committee are the KY Transportation Cabinet Deputy Secretary, the Commissioner of Vehicle Regulation, the Commissioner of Highways, the Directors of the Division of Driver Safety, and Division of Traffic Operators, the Highway Safety Operations manager, the FMCSA, the KY Chiefs of Police Association, the Kentucky Sheriff's Association, the KY Board of EMS, and the KY Office of Insurance.
3. Construction surveillance data results, hazard alerts, fatality reports, newsletters and publications will be disseminated to 373 employers on our dissemination list.
4. An annual report of KOSHS program accomplishments and impact, including lessons learned, will be prepared for NIOSH for public release.

KOSHS will continue producing hazard alerts, newsletters, and peer-reviewed publications to be distributed at statewide conferences and meetings such as the Governor's Safety and Health conference and the State Coroner's conferences. These presentations serve to expand our network of notification sources and increase the number of requests for KOSHS and FACE data and presentation materials. Publications will be distributed by direct mail, through our website, and by e-mail. KOSHS will also collaborate with NIOSH on NIOSH/CDC alerts and Workplace Solutions. The dissemination of KOSHS surveillance data and research results will be designed to reach targeted worker populations for impact at both the state and national levels.

Results of KOSHS surveillance analyses will be used in a number of ways. For communication with the media, we will tailor messages to influence positive changes in safety-related behavior. We will develop fact sheets, hazard alerts, newsletters, reports, articles, and other dissemination materials. Reports will be generated that include rate-based comparisons, incidence rates, trends, magnitude of injury and illness, the geographic distribution of occupational injury and illness, injury costs, demographics, occupational and medical characteristics, route of exposure, and other contributors.

With the partnership of industries, associations, governmental agencies, community injury prevention groups, the advisory committee, and the GECHS, KOSHS prevention materials will increase awareness, educate, and create a culture of safety at both the state and national levels. These partnerships will also serve to increase prevention initiatives (R2P), maintain a safety network, continue surveillance, and promote more effective policy strategies.

**Specific Aim #6- Process, impact and outcome evaluation of the KOSHS program.**

KY KOSHS will continue to evaluate the OHIs, and the prevention and dissemination components of the KOSHS program which began in 2005. The evaluation will address the extent to which the KOSHS project is having an impact on reducing occupational injuries and illnesses in KY, evaluate its goals, and assess the project's efficiency. It will be primarily a process, impact, and outcome evaluation resulting in descriptive statistics. The following evaluation activities are proposed:

**OHI Evaluation** KOSHS will continue to evaluate OHIs based on the model proposed by the CSTE:

a. Raised awareness of occupational health: 1) Contact with public health people, academics, health care practitioners, other; 2) News/media coverage and public inquiries; 3) Website hits

b. Improved understanding: 1) Trained people on data sources, indicator generation, issues (own staff or outside of program);2) Identified issues and priorities for the state; and 3) Conducted further analyses/ Led to additional surveillance activity

c. Inspired action: 1) Published, posted indicators data; and 2) Informed intervention or prevention efforts/ Influenced or affected policy

d. Built relationships: 1) Enhanced existing and established new partnerships

e. Improved data quality: 1) Identified data issues/problems; and 2) Improved source data quality

f. National evaluation items: 1) Continued and expanded generation of Indicators / Added new Indicators; and 2) Maintained website, documents/ National partner reaction

**Prevention and Dissemination**

*Process Evaluation:* The process evaluation will document the quantity of reports and hazard alerts that we develop and the quantity of reports and hazard alerts that we disseminate. We will also calculate the number of fatality reports and hazard alerts by distribution route (e-mail, US mail, and fax).

*Impact Evaluation:* We will determine what audiences are receiving the prevention material (e.g. employers, researchers, advocates, regulators, employees) and how they rate them. Self-reported telephone surveys and mailed anonymous reply surveys will be used to determine the quality and utility of materials, and to assess changes in worksite practice based on the publications received. A self-reported phone survey of employers who received KOSHS publications will be conducted approximately 3 months after the receipt of a specific publication. We will ask whether the publication was useful, raised awareness of hazards, provided feasible recommendations, influenced working conditions, made recommendations that supervisors and workers would follow, and was used to change curriculum or training. Web-site visits to our website, prevention materials, and worker safety presentation will also be tallied. We will also calculate the number of citations from our published articles, and the number of users accessing the data query system.

*Outcome Evaluation*: The outcome of chief interest for KOSHS is evidence that reductions in all occupational injuries and illnesses resulted at least in part from dissemination and intervention activities of the KOSHS project. It is important to acknowledge from an epidemiological standpoint that one cannot eliminate the influence of factors outside the KOSHS program that impact occupational injuries/illnesses. For this reason, KY KOSHS will evaluate truck transportation injuries as a primary evaluation outcome of chief interest. The FACE program has conducted numerous activities related to the prevention of transportation fatalities, and also with KOSHS continued emphasis on the prevention of truck transportation industry fatalities, we will perform additional analysis of transportation injury rates and trends. The KOSHS program is conducting numerous activities related to the prevention of truck transportation collisions including participation in the GECHS, the KMTA, and partnerships with the KY CVE. We also staff a booth at the Mid-America Truck Show every year to disseminate prevention

information, and we produce transportation fatality reports. We are involved in community awareness campaigns with KY CVE to distribute prevention information at Drivers' Appreciation Days held annually at truck stop rest havens to disseminate fatality reports, hazard alerts, newsletters, and publications.

**METHODOLOGY FOR FACE.**

**RESEARCH DESIGN AND METHODS**

The following sections set out methods that will be used to achieve the goal of maintaining and expanding a work-related fatality surveillance program using the FACE model, whose primary goal is to "prevent occupational fatalities by identifying industries and workers with high risk for fatal injury, investigating work situations where fatalities occur, and formulating and disseminating prevention strategies to those who can intervene in the workplace" (Higgins *et al.* 2001).

**Specific aim #1- Methods for Surveillance**

The KY FACE program seeks to determine the magnitude and distribution of fatal occupational injuries in Kentucky, monitor trends, and reduce the burden of occupational injuries through the development of sector-, industry- and job task- specific interventions. FACE staff strive to conduct timely, accurate, and comprehensive surveillance of all KY occupational fatalities, perform epidemiologic analyses of fatality data, and investigate selected cases in prioritized areas. These activities support the development and dissemination of information to targeted worker populations and industries so that employers and workers can be aware of high-risk situations that could result in an occupational injury or fatality.

By definition, all decedents are included if they were on the job at death and if the location of the fatal injury was within Kentucky's boundaries. If the fatal work injury occurred outside Kentucky but the death occurred in Kentucky, the case is not included in the dataset. A case may also be considered work-related if the decedent died while performing a work-related task at a site other than the normal workplace.

Sources used to identify potential cases include 27 state online newspapers, radio and television reports, coroner reports, state vital statistics records, the CFOI program located in the Kentucky Department of Labor, the Kentucky CRASH dataset, medical examiner reports, and Mining Safety and Health Administration (MSHA) reports. In addition, a toll-free number is available for stakeholders to notify the FACE program of potential cases. A flow chart of the various components of the FACE Surveillance system is shown in Figure 3 above. FACE surveillance data is compared to CFOI, OSHA fatality reports, and CRASH data monthly to verify and support information received through other sources such as the newspaper. At least 2 sources of information are used to confirm cases. Authority to use the state and national agency resources is based on verbal agreements.

FACE surveillance information is entered into a first report form in the FACE dataset (EpiInfo v. 6.0) that contains 210 data variables. Staff continue to add variables that are of importance to both public health and research communities. These include Standard Industry Classification (SIC), NAICS, SOC, ICD-10 codes (e-codes), self-employed status, health status (e.g., diabetes, heart condition, weight), and specific questions related to motor vehicle collisions, farm incidents, and interpersonal violence issues. Electronic records are secured on the KIPRC local area network and are backed up daily. Data is updated and edited as new information is obtained on a case. The KY FACE program works closely with other states, and NIOSH to facilitate data sharing with the ongoing development of common data input and output formats, and variables.

FACE data is analyzed with descriptive and advanced statistics using EpiInfo, Microsoft Excel, and SAS®. Basic descriptive analysis on all data variables is performed to assess data quality and validity, and to describe cases. Frequencies are determined for the dataset to account for any missing variables. Routine cross-tabulations are performed to assess relationships between selected variables. Continuous variables are recoded to categorical variables (e.g., age groups, etc.) and frequency analysis is completed. Outliers are investigated for accuracy. Non-parametric statistics are run on all non-normally distributed variables and regression analysis, chi-square and t-tests are performed where appropriate. Results are

utilized for quarterly summary reports, annual reports, newsletters, hazard alerts, data requests, peer-reviewed and non-peer reviewed articles and other dissemination avenues.

*New Initiatives:* Since most of the occupational motor vehicle collisions occur in commercial motor vehicles, new innovative variables (which have recently become available in CRASH data) will be established in the FACE database that pertain to commercial vehicles and fleets: 1) commercial vehicle type-- truck tractor (bobtail) vs. combination vs. single; 2) hazardous classification--explosives, gases, flammable liquid, etc.; 3) vehicle configuration: bus vs. truck/trailer vs. bobtail vs. tractor/double, etc.; 4) license class; 5) endorsements-- transport hazardous materials, school bus, tow double or triple tractors, etc.; 6) body type-- cargo tank, flatbed, dump, etc.; 7) interstate vs. intrastate carrier (surrogates for long-haul vs. short-haul); and 8) gross vehicle weight rating (GVWR). Based on our results from Bunn *et al.* (2009) in which drivers 65 years of age and older who travelled with others were less likely to be at fault in a crash, the presence of passengers will also be added as a variable. Data from the investigation of occupational MVC fatalities in the transportation industry complements the surveillance of *fatal and nonfatal occupational motor vehicle collisions* as our state-specific worker safety indicator (Indicator #20) that is included in our *fundamental* grant program. Comprehensive MVC data is routinely collected by the KY State Police (CRASH electronic data and paper reports) and is made available to KIPRC for analysis. Data is currently available for 1998-2009 (first 2 quarters).

Variables related to multiple jobholding will also be added to the FACE database from 1994- present. From 2006- 2007, Kentucky was ranked #2 in its multiple jobholding rate increase (0.8 point increase) compared to other states (Monthly Labor Review, September 2008). The KY multiple jobholding rate increased from 5.6% of total employment in 2006 to 6.4% of total employment in 2007 (18$^{th}$ highest in the nation). Additional variables will be established in the FACE database to document: 1) whether the decedent worked multiple jobs; 2) full-time vs. part-time for both primary and secondary jobs; 3) secondary job industry; and 4) secondary job occupation. The length of time on the job will also be added as a variable in the FACE database.

**Specific aim #2- Methods for On-site Fatality Investigations**

The goal of FACE on-site fatality investigations is to produce narrative reports that thoroughly describe the organizational, behavioral, and environmental factors that contributed to a specific occupational fatality. The framework for the case investigations is based on Haddon's Matrix (Haddon & Baker, 1981) and determines optimal points for intervention development using behavioral, administrative, and engineering controls by separating the fatal incident into the pre-event, event, and post-event phases. Analyses of these factors in the pre-event, event, and post-event phases lead to recommendations for prevention of future similar-nature incidents (Higgins *et al*. 2001).

When the FACE fatality investigator receives initial notification of a worker death falling within the group of targeted categories, basic information is first obtained: victim name, type of fatality, time and location of incident, name, address, employer contact and phone number, name(s) of witness(s), and a short synopsis of the incident. Next, the FACE fatality investigator contacts the county coroner and a site visit is scheduled. The investigator conducts interviews with EMS personnel, witnesses, co-workers, family members, company personnel managers, human resource directors, safety officers, state police, manufacturers, and others. She takes field notes and digital pictures, and collects names and phone numbers from all those interviewed for case follow-up. Multiple source documents such as OSHA, medical examiner, toxicology, and police reports are used and manufacturers, distributors, engineers, organizations, associations, and governmental agencies are consulted to develop recommendations for prevention. Prevention recommendations are aimed at increasing knowledge, changing work practices and procedures, and changing behaviors and attitudes of employers and employees. FACE staff prepare a draft report that includes the organizational, behavioral, and environmental factors that contributed to the fatal incident using the recommended FACE report format. The draft report (with no personal identifiers) is reviewed three times before it is finalized. First, it is circulated internally for comments and revisions. Second, the draft report is sent to a consultant (OSHA, trucking, construction, etc.) for review

(see letters of support) of technical accuracy and feasibility of recommendations. Third, it is sent to NIOSH for complete technical review. Further revisions are then completed and the report is finalized and disseminated. All personal identifiers are removed from the final investigation report to ensure privacy and confidentiality. Out of 175 case investigations initiated from 1994- May 2009, 143 have been completed (82%).

***FACE Investigative Initiative:*** KY FACE will continue to conduct investigations of *MVC and other worker deaths in the truck transportation industry sector including short-haul and long-haul trucking*. Long-haul and short-haul trucking fatalities will be identified using surrogate NAICS industry codes: 1) 484110 and 48422 for *short-haul* which provides trucking within a metropolitan area but may cross state lines and are same-day return; and 2) 48412 and 48423 for *long-haul* which carries goods between metropolitan areas which may cross North American country borders. In addition, construction industry deaths including *falls* (NAICS code 23) will be a state-specific priority for investigation. These state-priority areas of truck transportation industry and construction industry fatalities will be investigated in addition to the NIOSH priority areas for investigation (currently work-related incidents involving machinery, highway work zones, youths, and immigrant workers). Agricultural fatalities were a state-specific priority from 1994-2008; over 120 fatality investigations were performed resulting in 70 tractor-related fatality reports. The primary cause of agricultural fatalities was tractor-related and one-third of the fatalities were due to tractor rollovers (109 tractor rollovers out of 349 total agricultural fatalities). The KY FACE program will continue to promote the use of the rollover protective structures (ROPS) on tractors but will no longer investigate agricultural fatalities since the primary recommendation in the reports was to install a tractor ROPS; there are 28 reports to support this single recommendation. Tractor rollover prevention continues to be a primary research area of interest at the NIOSH-funded Southeast Center for Agricultural Health and Injury Prevention, also located at the University of Kentucky College of Public Health.

MVCs are the leading cause of worker deaths in Kentucky (30%), increasing from 28 in 2001 to 37 in 2007. From 1994-2007, there were 238 transportation industry-specific MVC worker deaths. The transportation industry had the highest occupational fatality number and second highest rate for KY in 2007. Of the 19 truck transportation deaths in 2007, 18 were due to MVCs and one driver was struck by a commercial vehicle. These statistics identify *truck transportation sector-specific worker deaths including short-haul and long-haul trucking* as a state priority area for investigation.

Preliminary work in this area in Kentucky, using CRASH and FACE data, found that the most frequent human factors involved in a KY fatal occupational MVC were driver fatigue/falling asleep and distraction/inattention (Bunn & Struttmann, 2003). In a second retrospective population-based case-control study, sleepiness/fatigue (Odds Ratio [OR]= 21.03), distraction/inattention (OR=3.16), age of 51 years and older (OR=2.94), and nonuse of seat belts (8.21) increased the odds that a commercial vehicle collision would be fatal (Bunn *et al.* 2005). Results from a third recently published study showed that passengers have a protective effect on semi truck drivers aged 65 and older with regard to their involvement in at-fault collisions (Bunn *et al.* 2009). The results of this study will be the topic of the next KMTA quarterly newsletter in September 2009, to be distributed to its 550 member companies in Kentucky and to inform public policy in regard to long-haul trucking performed by solo semi truck drivers vs. team semi truck drivers.

These initial innovative fatality reports and research studies indicate the continued need for more information on employer safety management practices such as safety training, continuing education, loading and unloading, hook and drop, traffic congestion, hours of service per day, and fatigue, in both long-haul and short-haul trucking. Future fatality reports and research studies will address employee issues such as health status, substance abuse, driver medical examination, history of sleep disorders, and other issues such as roadway design, vehicle design, and emergency response on the scene (Hanowski, 1998; Arboleda, 2003).

On-site FACE investigations of truck transportation industry fatalities that cause the highest number of KY worker deaths are fundamental for the development of targeted prevention interventions in the workplace (R2P) (e.g., the development of a fuel shutoff valve by the University of Kentucky engineering department to prevent commercial vehicle fires based on a FACE report). The reports will help define the risk factors for truck transportation fatalities and will be disseminated through 3 different avenues:

1. Truck transportation sector reports will be discussed in the GECHS, that includes the KY State Police Commissioner and Governor's Representative for Highway Safety, the Commissioner for KY CVE, and the KMTA (see letters of support), as well as the director of KIPRC.
2. All truck transportation fatality reports will be disseminated through our database of 4,200 long-haul and short-haul employers and employees in the transportation sector who regularly receive and rely on FACE transportation-related reports and hazard alerts for safety training purposes. The core list is derived from transportation company requests and from the FMCSA SafeStat list of intrastate and interstate commercial carriers.
3. Truck transportation fatality reports will be disseminated to NIOSH and other states through e-mail, and will be disseminated to stakeholders in the advisory committee comprised of the KY OSHA, KY DWC, the KY FMCSA, the KY Chamber of Commerce, KMTA, and others (see letters of support). Reports will also be disseminated to the Owner-Operator Independent Drivers Association (OOIDA) and the Women in Trucking Association.

Data from the investigation of truck transportation fatalities complements our state-specific indicator on *fatal and nonfatal occupational motor vehicle collisions* using CRASH data in our <u>*fundamental*</u> grant. With the investigation of truck transportation fatalities, more effective public policy and employer prevention strategies can be developed and implemented.

The third highest KY occupational fatality number and rate is in the construction industry. In 2007, there were 19 construction industry fatalities: 11 falls, 3 machine-related deaths, 3 MVCs, 1 struck by, and 1 suffocation. These statistics identify *construction industry fatalities including falls* as our second state-specific priority for fatal investigations. A preliminary study by FACE staff on occupational falls (Bunn *et al.* 2007) identified the construction industry as incurring the highest hospitalization and workers' compensation costs for falls. Male construction worker falls were usually from one level to another, and laborers and helpers had longer hospitalization stays as well as higher total charges when the worker fell from one level to another.

The elevated number of construction falls and the initial study on occupational falls indicate the need for additional information on employer safety management practices such as 1) the comparison of OSHA regulations between states when out-of-state companies are performing construction work in Kentucky; 2) the use of personal fall protection; 3) fall protection design; 4) hours worked; 5) length of time on job; 6) safety training and continuing education; and 7) other emerging practices.

The construction fatality reports will be disseminated through a number of avenues:

1) Our core construction industry mailing list of 200 companies derived from construction company requests, the internet, the phone book, and other sources.
2) NAWIC, the KY Homebuilders Association, and AGC.
3) Advisory committee stakeholders, NIOSH, and other states will receive construction fatality reports.

In addition, case fatality investigations will be performed on 1) NIOSH-recommended priority areas for investigation (currently machine-, youth-, immigrant worker-, and highway work zone related fatalities); and 2) other worker fatalities amenable to engineering and/or process changes. The fatality reports will be disseminated to those who can intervene in the workplace such as employers, employees, organizations, associations, community groups, manufacturers, and agencies.

**Specific aim #3- Methods for In-depth Analyses, Interpretation, and Dissemination of Occupational Injury and Fatality Data.**

**<u>Identification and characterization of injuries among long-haul *vs.* short-haul truck drivers</u>**

Heavy and light truck driver fatalities within the truck transportation industry accounted for 16% (n= 907) of all US worker fatalities in 2007 (BLS, 2008). In 2008, total workers' compensation costs increased 2.7% within the transportation and material moving occupation, and 2.2% within the transportation and warehousing industry (BLS, 2008). Employer costs for workers' compensation per hour worked in the trade, transportation and utilities industry were estimated to be $0.50 in September, 2008.

The heavy (gross vehicle weight rating greater than 10,000 pounds) and tractor-trailer truck driving occupation was projected to be one of the fastest growing occupations for employment increases between 2006 and 2016 (BLS, Tomorrow's Jobs, 2007). Employment in heavy truck and tractor-trailer driving is expected to increase by 10.4% over the next eight years. In the year 2006, there were 3,356,000 truck drivers and the number is projected to increase to 3,614,000 by the year 2016 (BLS).

Most of the nonfatal injuries within the truck transportation industry were due to overexertion (62.9 injuries and illnesses per 100 full-time workers), motor vehicle collisions (30.2 injuries and illnesses / 100 full-time workers), falls on the same level (32.4/100), and falls to a lower level (29.1/ 100) in 2007 (BLS, 2008a). Increased injury incidence rates for the truck transportation industry were observed on floors, walkways or ground surfaces (59.7 injuries and illnesses/10,000 full-time workers), and in vehicles (59.6 injuries and illnesses/10,000 full-time workers) (BLS, 2008a).

An Institute of Medicine and National Research Council (2008) review of current and future strategic goals for traumatic injury research at NIOSH suggested that short-haul trucking and interstate driving be specific focus areas for future research within NIOSH's strategic goal #2 for the future, which is to reduce occupational injuries and deaths due to motor vehicles. Little public epidemiological data currently exists on surveillance data and injury rates pertaining to short-haul *vs*. long-haul semi truck drivers in the transportation industry.

***New initiative:*** An innovative descriptive study will be performed to characterize and compare fatal and non-fatal injuries and associated costs between long-haul truck drivers and short-haul truck drivers in the transportation industry sector. The study population will be male and female short-and long-haul truck drivers in the truck transportation industry who are at least 21 years of age and who were injured in KY. Both KY and out-of-state truck drivers will be included in the study since both KY Department of Workers' Claims and KY inpatient hospitalization data include out-of-state residents whose injuries occurred in KY. For the purposes of this study, the surrogate for short-haul will be defined as "local trucking, except storage", which is coded in WC data using Standard Industrial Classification (SIC) code 4212 that "covers establishments primarily engaged in furnishing trucking or transfer services without storage for freight generally weighing more than 100 pounds, in a single municipality, contiguous municipalities, or a municipality and its suburban areas". The "trucking, except local" surrogate for long-haul (SIC code 4213) covers "establishments primarily engaged in furnishing "over-the-road" trucking services or storage services, including household goods either as common carriers or under special or individual contracts or agreements, for freight generally weighing more than 100 pounds. Such operations are principally outside a single municipality, outside one group of contiguous municipalities, or outside a single municipality and its suburban areas". NAICS codes are not available in DWC data so only SIC codes will be used. All truck drivers will be defined as "truck drivers, heavy and light" as coded by DWC using the Standard Occupational Classification (SOC 53-3032 and 53-3033) system.

Kentucky DWC first reports of injury and claims data for years 1998-2007 will be analyzed and will provide information on demographics (age, gender, marital status, etc.; race and ethnicity are not variables within the DWC dataset), nature and cause of injury, workers' claims costs for both the long-haul and short-haul truck driver groups, and cause and costs of injuries by age. In addition, the proportion of indemnity payments to lump-sum injury payments will be calculated to determine if more claims were adjudicated or were settled (McCall *et al.* 2009). Truck driver injury rates (KY only) will be determined by using employment numbers provided by the KY Education and Workforce Development Cabinet based on unemployment insurance data for the denominators by calendar year (Beverly Dearborn, personal communication). Comparisons will be made on median hospitalization costs and

median length of stay between long-haul and short-haul drivers while controlling for known covariates (age, gender, etc.). Injury severity will be measured by 1) percentage disability or impairment between long-haul and short-haul drivers; and 2) Injury Severity Scores (ISS) calculated from ICD-9 CM diagnosis codes using ICDMAP-90 software (Baker, O'Neill, Haddon, & Long, 1974).

The DWC dataset will then be linked with the inpatient hospitalization dataset since KY DWC does not collect data on the medical costs associated with worker injuries. The linked datasets will provide additional information on diagnosis, hospitalization length of stay and hospitalization charges associated with the injuries. The data linkage will be performed using probabilistic data linkage methods and LinkSolv software as previously published by FACE personnel (Bunn *et al.* 2007). Common data linkage variables between the two datasets will be date of birth, gender, date of injury, and hospital admission date. A match cutoff probability of 0.5 will be used because some records may not contain all matched variables due to missing fields. A sample of 200 records will be checked for accuracy of matching and obtain the percentage of false positives. In our previous published study (Bunn *et al.* 2007), only 3% were false positives. Nonparametric one-way analyses of variance tests (Kruskal–Wallis test) will be used to initially assess the differences between long-haul and short-haul drivers for medical costs, length of hospital stay, and injury severity as measured by percentage disability or impairment. The analyses will then be extended to nonparametric analyses of factorial data (SAS™ proc Mixed, anovaf option) in order to account for existing differences between the two groups based on factors like age and gender.

The KY FACE program will collaborate with NIOSH on this study and study results will be disseminated to and shared with KY CVE, the GECHS, KY FMCSA, KY FHWA, the KMTA, our core trucking company distribution list, the Owner-Operator Independent Drivers Association (OOIDA), and the Women in Trucking Association (WITA). Study results will be published in the KMTA newsletter, our FACE the FACTS newsletter, submitted for peer-reviewed publication, and posted on our website. Other funded FACE states and NIOSH will also receive results of the study which can be used as a model to examine injuries and associated costs in long-haul truck drivers vs. short-haul truck drivers in other FACE states.

**Epidemiological study of occupational fatalities involving multiple jobholders**

In May 2009, there were approximately 7,265,000 multiple jobholders in the US workforce, the same percentage (5.2%) of the total workforce as in May 2008 (US Department of Labor). Approximately 54% of the multiple jobholders were employed in a primary job full time, and in a secondary job part time and 25% were employed in both primary and secondary jobs part time. From 2006- 2007, Kentucky experienced the second largest increase in its multiple jobholding rate (0.8 point increase) compared to other states (Monthly Labor Review, September 2008). The KY multiple jobholding rate increased from 5.6% of total employment in 2006 to 6.4% of total employment in 2007 (18th highest in the nation).
***New initiative:*** Typical multiple jobholders in KY include primary jobs like farming, logging, and government work. Three examples of KY multiple jobholder occupational fatalities include: 1) a constable and men's hair stylist who died in a motor vehicle collision performing constable duties; 2) a trucker who died when he was performing landscaping services; and 3) a heavy equipment operator who died while logging. An innovative descriptive study will be performed to identify and characterize KY occupational fatalities among multiple jobholders. The study population will be all decedents who were earning two concurrent sources of income in sufficiently different jobs (full-time or part-time in either or both jobs) and the fatal injury occurred in KY. Both KY and out-of-state workers will be included in the study if they were working at the time of fatal incident and the work was performed in KY. All worker fatalities from 1994-2009 will be included in the study. Industries for the multiple jobholders will be coded using NAICS codes and occupations will be coded by SOC codes. Since some of the multiple jobholders will be employed in the agricultural industry, denominator data based on unemployment insurance data may not be accurate enough to determine fatality rates among multiple jobholders. Our first approach will be to contact the Census Bureau with a special tabulation request, and NIOSH intramural staff will also be consulted regarding the best source to obtain denominator data.

Multiple jobs will be determined through the use of death certificates, newspaper clippings, coroner reports, and OSHA reports. Typically, when a worker dies, the industry and occupation at the time of the worker's death is recorded as the primary industry and occupation. Death certificates will contain the *usual* industry and occupation which will be different from the *primary* industry and occupation for multiple job holders. Also, newspaper clippings, coroner reports, and OSHA reports may contain both primary and usual industries and occupations for multiple jobholder deaths if known. If there are questionable cases of multiple employment, coroners will be consulted since they typically know the details of individual fatality cases.

FACE data will provide information on types of multiple jobs by industry and occupation, demographics (age, gender, marital status, race, ethnicity, country of origin, etc.), external cause of death, and whether the industry in which the victim was working at the time of death was coded as the primary industry on the death certificate. Information will also be collected on time of day, incident type (motor vehicle collision, explosion, machine, etc.), industry by employment status (full *vs.* part-time), and length of time on jobs.

This study may be a KY-specific study or a multi-state collaboration. This proposed study has been discussed before and will be discussed at the first FACE meeting so that all interested FACE states can participate. KY FACE will collaborate with NIOSH on this proposed study and study results will be shared with and disseminated to the affected industries with the greatest number and/or rates for occupational fatalities among multiple jobholders, the KY Chambers of Commerce, the KY DWC, KY OSHA training and education, KY OSHA compliance, other stakeholders, and our advisory committee. Study results will published in our FACE the FACTS newsletter, and will be submitted for peer-reviewed publication.

**Trend analysis of FACE data**

An innovative trend analysis of FACE data will be performed by ethnicity, age, employer's location (in-state/out-of-state), time of day, gender, and type of incident by industry. Years 1994-2008 data (~1925 cases) will be analyzed using SAS. Crude injury rates (if enough cases are identified for stability) for different strata/categories will be calculated and further analyzed with Poisson regression models, adjusting for possible predictors and covariates. Nonlinearity of covariates will be assessed by fitting higher order terms to the model as necessary. If there is evidence of non-linearity, year will be entered into models as a categorical variable. All fatality cases will be industry coded using SIC codes since SIC codes were used from 1992-2002. In 2003, the BLS switched to NAICS codes but the KY FACE program has continued to code cases using both industry coding systems since 2003. Denominator data for KY industry employment numbers by SIC code are available for all years. The units of analysis will be time periods (annual and monthly).

Truck transportation and construction industry fatalities will be primary foci of the KY FACE program. To address these areas, case investigations will be performed, partnerships will be expanded with various agencies and organizations, and reports, and publications will be developed. As we continue to develop reports and other publications, we will monitor trends for fatal occupational injury rates in the truck transportation and construction industries.

Fatal occupational injury rates (annual or monthly) can be viewed as time series data (i.e., as a sequence of observations which are ordered in time). We will use time series methods to analyze KY truck transportation and construction industry fatality rates. Smoothing techniques will be used to eliminate the random fluctuation in the time series data in the truck transportation and construction sectors to uncover the corresponding overall underlying trends. We will then perform analysis of seasonal dependency to identify periodic (monthly, annual) patterns. We will also use some popular regression modeling approaches to do forecasting. Time-series models examine the past behavior of a time series in order to infer something about its future behavior. The models can be used for short term forecasting. The models will be updated as new data become available in order to minimize the number of periods ahead required of the forecast. SAS/ETS analysis software provides graphical visualization for the time series models and will be used to diagnose data patterns and choose appropriate models. Time

series methods assume that errors in the models are correlated, can assess the correlation, and then can adjust for it. Confounders such as the change in ethnic composition in the construction industry over time will be taken into consideration.

The results of the Poisson regression and time series analyses of FACE data including truck transportation and construction industry fatality rates will contribute to FACE program planning, evaluation, and the identification of new and emerging risk factors such as specific age groups affected, and whether the employer is located out of state or in-state. KY FACE will collaborate with NIOSH on this proposed study and study results will be shared with and disseminated to the affected industries.

**Specific aim #4- Methods to promote the use of FACE data and findings by others through partnerships and collaborations.**

Specific innovative working relationships have been established with a number of agencies and organizations to promote the use of FACE data and findings:

General Partnerships

KY FACE has established and maintained a working relationship with KY OSHA since 1994. A proposed expanded partnership with KY OSHA (see letter of support) includes an annual analysis of FACE data by: a) ethnicity; b) age; c) employer's location (in-state / out-of-state); d) length of time on the job; e) time of day; and f) gender to be disseminated to KY OSHA. These analyses will also be used in our annual FACE report.

Partnerships have also been expanded with the KY DWC to receive the complete DWC first reports of injury and claims dataset from 1999-2008, and yearly thereafter (see letters of support). Previously, we had only received specific data by request, usually by incident type, injury type, or by industry. The receipt of the full DWC dataset will allow us to monitor emerging trends and risk factors for injuries since injury descriptions are also included. In addition, KY FACE will continue collaboration with NIOSH and other FACE states. KY FACE personnel will actively participate in a kick-off meeting, semiannual grantee meetings, annual FACE meetings, and conference calls. FACE personnel will also continue as corresponding members for the development of the NORA II Transportation, Warehousing, and Utilities sector agenda and action plan.

Truck Transportation Industry Partnerships

5) An expanded partnership with the KMTA is proposed to collaborate on a quarterly newsletter that includes a section on the prevention of trucker injuries using FACE data and interventions.

6) We have maintained our partnership with the KSP to receive both electronic and paper copies of motor vehicle collision reports. To expand the partnership, we will participating in KSP's CVE Division Drivers' Appreciation Days held annually at truck stop rest havens to disseminate fatality reports, hazard alerts, newsletters, and publications.

7) A new partnership has been formed with OOIDA, a national owner-operator trucking association. Information from reports and hazard alerts will be a) used in seminars; b) incorporated into the OOIDA website; and c) used on their radio talk show that airs 7 days a week.

8) We have established partnerships with private trucking companies, organizations, and insurance agencies that utilize our FACE findings and serve as advisory committee members: a) Towne Air Freight; b) ABF Freight; c) Great West Casualty; d) America's Road Team; and e) Women in Trucking (see letters of support). Women in Trucking added a link from their website to the KY FACE website so that women truckers nationwide can access information including reports, hazard alerts, and newsletters.

Construction Industry Partnerships

1) Professional associations: We have established and maintained partnerships with the AGC, Homebuilders Association, and NAWIC to promote the use of FACE data and reports by the construction industry and to disseminate prevention materials.
2) Corporate sector: We have established partnerships with private construction companies to use our reports and publications; Hall Contracting Co. and Grayhawke Construction Co. also serve as members of our advisory committee.

**Specific aim #5- Methods for analyzing and disseminating occupational surveillance data**

KY FACE will disseminate the information, recommendations, and risk factors identified from surveillance and fatality investigations to the target audiences that will give our publications the greatest impact. KY FACE employs a data/dissemination coordinator 12 hours per week to achieve this goal. Examples of targeted outreach to foster implementation of priority area research findings include:

1. An annual report containing industry, occupation, and cause of death statistics including years of potential life lost and future lost productivity in the major industries. The annual report will contain both current year data and historical data, which will be utilized for trend analysis.
2. Fatality reports sent to all who assisted in the investigation and its preparation, including the employer. KY FACE also maintains a number of stakeholders by industry sector and occupational group for the distribution of reports, hazard alerts, newsletters, and other publications based on the nature of the report (industry, occupation, and cause of death). NIOSH-priority area and state-specific area reports will be distributed to the industry-specific and occupation-specific employers in this manner, as will truck transportation and construction industry fatality reports as stated above in the description of methods for on-site investigations.
3. An expanded web-based data query system allowing access to worker injury statistics for employers, stakeholders, other states, NIOSH, and other interested parties will be developed. Currently, fatal work injury statistics based on electronic death certificate data are available on the KIPRC website. When the query is performed, both injury numbers and rates (based on the total number of workers in KY) are displayed by cause of death, gender, race, and/or age. Years 1990-2005 data are currently available for query to generate both state-level and county-level statistics. Since occupational fatalities occur in relatively small numbers, county-level data may not be available for individual years but multiple year data is accessible to generate county-level statistics.

***New initiative:*** KY FACE will develop another innovative web-based query system using inpatient hospitalization data. Inpatient hospitalization data for years 2000-2006 will be initially available for query and then later years as data become available. Work-relatedness will be determined by workers' compensation recorded as the payer source. Variables of interest will be gender, age (grouped for 10 year spans), race, ethnicity (starting with 2008 data), external cause of injury, and discharge status (fatality is determined by a discharge status of "expired"). The query system will be developed using the same format as above for the death certificate data. This proposed initiative will be in collaboration with KIPRC's funded core injury grant. No problems or difficulties are expected since KIPRC has experience in developing web-based query systems. These web-based data query systems will contribute to filling the gaps in national surveillance systems for occupational injuries and fatalities by providing easy access to state data.

KY FACE will continue producing hazard alerts, newsletters, presentations, peer-reviewed, and non-peer-reviewed (e.g., trade journal) publications to be distributed by direct mail, through our website, and by e-mail. KY FACE will also collaborate with NIOSH on NIOSH/CDC alerts and Workplace Solutions. The dissemination of FACE surveillance data and research results will be designed to reach targeted worker populations for impact at both the state and national levels.

All FACE hazard alerts and some 50 fatality reports have been translated into Spanish. These Spanish language prevention materials aid employers, primarily in the construction and agricultural industries, in the effective safety training of Hispanic workers. All construction industry hazard alerts, and construction industry fatality reports that are described in this proposal will be translated into Spanish.

With the partnership of industries, associations, governmental agencies, community injury prevention groups, the advisory committee, the GECHS, and NIOSH, FACE prevention materials will increase awareness, educate, and create a culture of safety at both the state and national levels. These partnerships will also serve to increase prevention initiatives (R2P), maintain a safety network, continue surveillance, and promote more effective policy strategies.

**Specific aim #6- Methods for FACE program evaluation**

KY FACE will continue evaluation of the surveillance, investigation, and prevention and dissemination components of the FACE program. The additional evaluation endpoints described in this proposal will be useful in determining the long-term impact of the FACE program on the reduction of occupational fatalities. The evaluation will continue to address the extent to which the FACE project is having an impact on reducing occupational fatalities in KY, evaluate its goals, and assess the project's efficiency. It will be primarily a process, impact, and outcome evaluation resulting in descriptive statistics and a quantitative analysis. The following evaluation activities are proposed:

Surveillance

The Updated Guidelines for Evaluating Public Health Surveillance Systems will be used to guide surveillance evaluation (CDC, 2001). Credible evidence will be gathered on:

1) Flexibility- The ability of the system to adapt to the addition of new variables and information fields will be assessed to determine how well the system is responding to new demands and changing information needs. The addition of the multiple job variables will be the test of flexibility.
2) Data quality- Data completeness will be assessed for all variables and missing data analyzed. Accuracy and completeness will be measured by comparing a sample of 25 first reports with death certificate data.
3) Acceptability**-** Agency participation rates and timeliness of reporting of deaths by various agencies to the FACE program will be monitored.
4) Sensitivity/representativeness- Comparisons with the CFOI program will be done routinely as before.
5) Positive predictive value – The percentage of initial reports that are noncases (false positives) or uncertain will be calculated, and all reported cases will be confirmed through multiple sources.
6) Timeliness- The time between a fatal work incident and FACE program notification will be monitored.

Investigations

Investigations will be assessed in several dimensions:

a. The usefulness of case data and interview information gathered from investigations;
b. The costs of investigations, including personnel time and financial resources;
c. The percent of in-scope cases investigated and completed;
d. The number of cases where the root cause of the work fatality was determined; and
e. The time to complete an investigation and the time between initial notification & investigation initiation.

Prevention and Dissemination

*Process Evaluation:* The process evaluation will document the quantity of fatality reports and hazard alerts that we develop and the quantity of reports and hazard alerts that we disseminate. We will also calculate the number of fatality reports and hazard alerts by distribution route (e-mail, US mail, and fax). *Impact Evaluation:* We will determine what audiences are receiving the prevention material (e.g. employers, researchers, advocates, regulators, safety educators, employees) and how they rate them. Self-reported telephone surveys and mailed anonymous reply surveys will be used to determine the quality and utility of materials, and to assess changes in worksite practice based on the report recommendations received. A self-reported phone survey of employers who received FACE reports will be conducted approximately 3 months after the receipt of a specific fatality report. We will ask whether the publication was useful, raised awareness of hazards, provided feasible recommendations, influenced working conditions, made recommendations that supervisors and workers would follow, and was used to change curriculum/training. Web-site visits on our website, prevention materials, and fatality reports will be tallied. We will calculate the number of citations from our published articles, and the number of users accessing the data query system.

*Outcome* – The outcome of chief interest for FACE is evidence that reductions in all occupational fatalities resulted at least in part from dissemination and intervention activities of the FACE project. It is important to acknowledge from an epidemiological standpoint that one cannot eliminate the influence of factors outside the FACE program that impact occupational fatalities. For this reason, KY FACE will evaluate truck transportation injuries as a primary evaluation outcome of chief interest. The FACE program has conducted numerous activities related to the prevention of transportation fatalities, and with our continued emphasis on the prevention of truck transportation industry fatalities, we will perform additional analysis of transportation fatality rates and trends.

Advisory Committee

Our FACE advisory committee will be maintained and will meet semiannually to discuss FACE program effectiveness, new and emerging trends and risk factors, problems, and to participate in the on-going evaluation of the FACE program. Current members of the FACE advisory committee include 1) America's Road Team; 2) KTA; 3) Hall Contracting of KY, Inc.,; 4) KDPH; 5) KY DWC; 6) Towne Air Freight; 7) Grayhawke Construction Company; 8) KY Vital Statistics; 9) KY Office of Health Policy; 10) Safety is my Business, LLC; 11) OSHA, Division of Compliance; 12) KY CFOI; 13) KY FMCSA; 13) GH & Associates; 14) KY FHWA; and 15) others (see letters of support).

**Results and Discussion.**

**A. Establish and Maintain Partnerships and Collaborations With State Partners, Agencies, Organizations, and Other Stakeholders.**

Partnerships and collaborations were established and maintained with a number of organizations, agencies, and universities over the grant cycle. Four multistate publications were published; new memorandums of understanding were signed between KIPRC and the Kentucky Department of Workers' Claims, Kentucky Board of Emergency Medical Services, and the Kentucky State Medical Examiner. KIPRC was designated a Safe Community Affiliate support center in 2012 and became a TWH affiliate in 2014.

B. **Maintain Comprehensive Multi-Source Population-Based Nonfatal and Fatal Surveillance of Occupational Injuries and Illnesses in KY.**

Indicators were analyzed for published epidemiological studies on 1) injuries among public vs. private solid waste collectors; 2) motor vehicle fires; 3) semi truck driver and sleeper berth injuries; 4) worker fatality rates; 5) drug involvement in motor vehicle crashes; 6) work-related low back disorders; and 7) drug overdose deaths. Refined case definitions were developed for the work-related low back pain disorder indicator.

From 1994-2013, Ky FACE recorded 2,357 fatal worker deaths, the largest number in agriculture, forestry, and fishing industry (n=473) followed by transportation (n=433) and construction (n=342). The major cause of Ky worker death was MVCs (30%), Ky FACE's primary research area, and numerous prevention materials were developed and disseminated to reduce occupational MVCs. Other leading causes of Ky worker death were due to struck-bys (n=328) and falls (n=231). Being struck from behind by another vehicle, and tractor cab and trailer ingress/egress falls were leading injury causes in Ky trucking industry workers' claims and truck driver fatalities. Most MVCs (n=525), struck by, and fall deaths were among Ky residents and occurred in the truck transportation (n=363) industry.

The transportation occupation had the highest number of occupational fatalities in 2013 and the 2nd highest occupational fatality rate (38.7 worker deaths/ 100,000 employed), followed by the Construction industry (21.3/100,000). The truck transportation industry and occupation continue to be an innovative Ky FACE program priority focus area because: 1) motor vehicle fatalities on public streets or highways are not reportable to OSHA; 2) Ky FACE has unique access to CRASH and WC electronic data; 3) semi trucks comprise 69% of the Ky occupational motor vehicle fatalities; and 4) Ky FACE has unique partnerships with KTA, Kentucky State Police (KSP), ATA, Owner-Operator Independent Drivers Association (OOIDA), Midwest Insur. & Women in Trucking Association (WITA) for the greatest potential prevention impact within the trucking industry.16

C. **Enhance the KOSHS Program.**

KIPRC developed a web-based query system (IBIS) using inpatient hospitalization and mortality data in 2015. Variables of interest are gender, age (grouped for 10 year spans), race, ethnicity, and external cause of injury. We are currently in the process of adding work-related capability to IBIS. These web-based data query systems will contribute to filling the gaps in national surveillance systems for occupational injuries and fatalities by providing easy access to state data by stakeholders.

D. **Analysis and Dissemination of Surveillance Data.**

Overall KOSHS expanded program outputs (reports, newsletters, hazard alerts, safety alerts, presentations, media releases, tool kits, digital FACE stories, safety training modules, association articles, and peer-reviewed and trade publications) were disseminated by e-mail, occupation- and industry-specific listservs, regular mail, KOSHS website, YouTube, LinkedIn, Facebook, NIOSH FACE and extramural program websites, CSTE website, and the NIOSH clearinghouse. Selected Peer-Reviewed Publications (see biosketches): The overall KOSHS program produced 14 peer-reviewed publications during the 2010-2015 funding cycle on surveillance improvement, surveillance of occupational injuries including occupational MVC injuries, and worker health. Selected Presentations: 1)Transportation injuries, Ky Public Health Assoc, 2011; 2) Leggo my Building O- Commercial vs. Residential Fatalities, Ky Governor's Safety & Health Conf, 2011; 3) Agricultural Machinery Injury Surveillance Using Multiple Data Sources. Int Society for Agric. Health, 2012; Hazard alerts: 1) Arborists die after Falling. 11(3) 2013; 2) Roofing and Construction Workers Killed Due to High Winds. 12(2) 2014; 3) Workers Killed Due to Driver Distraction, 11(2), 2013; and 4) Drivers Killed Due to Tire Failures, 11(1), 2013.

Disseminated KOSHS outputs included fatality reports, newsletters, hazard alerts, videos, presentations, media releases, and peer-reviewed and trade journal publications, that were disseminated through: 1) FACE website; 2) FACE industry and occupation listservs; 3) Twitter; 4) Facebook; 5) National Safety Council (NSC); 6) association newsletters; 7) NIOSH FACE website; 8) NIOSH clearinghouse; 9) YouTube; and 10) LinkedIn. We established 13 industry-specific dissemination lists that directly reach approximately 3,800 companies in Kentucky: 1) KOSHS General List: 2153 subscribers; 2) Road construction: 60 companies; 3) Automotive repair: 55 companies; 4) KOSHS annual report mailing list: 81 subscribers; 5) Arborists list: 180 companies; 6) Construction (general): 252 companies; 7) Manufacturers: 25 companies; 8) Towing: 170 companies; 9) Towing Associations (nationwide): 57 Associations; 10) Trucking: 634 companies/subscribers; 11) Truss manufacturers: 38 companies; 12) Roofing contractors: 48 companies; and 13) Scrap processors: 41 companies.

Selected presentations were: 1) "Transportation injuries", KY Public Health Assoc meeting, 2011; 2) Leggo my Building O- Commercial vs. Residential Fatalities", KY Governor's Safety and Health Conf, 2011; 3) Agricultural Machinery Injury Surveillance Using Multiple Data Sources. Int Society for Agric. Health, 2012; 4) Ky Semi Truck Transportation Fatality Investigations: Contributing Factors. NORA Symposium, 2011; 5) Identifying Workplace Hazards. Associated General Contractors of Kentucky Safety Day conference, 2011; and 6) Occupational Fatalities in the Trucking Industry. Kentucky Motor Transport Association, Louisville, KY. 2014.

Hazard alerts were 1) sent to trade organizations, associations, unions, and employers for incorporation in their safety training programs; 2) included in media data requests; and 3) used by legislators to educate (e.g., an educational strategy to pass the 2013 commercial driver safety training law). Examples of hazard alerts include: 1) Arborists die after Falling. Hazard Alert 11(3) November 2013; 2) Roofing and Construction Workers Killed Due to High Winds. Hazard Alert 12(2) June, 2014; 3) Workers Killed Due to Driver Distraction, Hazard Alert, 11(2), April 2013; and 4) Drivers Killed due to Tire Failures, Hazard Alert, 11(1), February 2013.

Selected publications were: 1) Bunn, TL, Slavova, S, Robertson, M. 2012. Crash and Burn? Vehicle, Collision and Driver Factors that Influence Motor Vehicle Collision Fires. Accid Anal Prev 47:140-145. The publication and press release were also published on the Fleet Owner website and ADS Logistics blog; 2) Bunn, TL, Slavova, S, Robertson, M. 2013. Motor Vehicle Injuries among Semi Truck Drivers and Sleeper Berth Passengers. J Safety Res 44:51-5; 3) Bush AM, McKee SE, Bunn TL. 2013. Multiple jobholder

mortality patterns in Kentucky: An examination of occupational fatalities. Am J Ind Med. 56(8):881-8; 4) Bunn TL, Bush AM, Slavova, S. 2014. Fatal Drug Overdoses: What Specific Drug Types Were Involved? What Industries and Occupations Were the Decedents Employed In? J KY Med Assoc (accepted); and 5) Bush AM, McKee, SE, Bunn, TL. 2013. Multiple Jobholder Mortality Patterns in Ky: An Examination of Occupational Fatalities, Am J Ind Med 56(8):881-8.

**E. Perform Onsite Worker Fatality Investigations**

From 1994- May 2014, the Ky FACE program conducted 231 fatality investigations (~11/year) and produced 164 final reports: 40 motor vehicle, 23 falls, 74 tractors and logging, and 27 other fatality reports. The root cause was determined in 84% of all fatality reports. FACE reports and surveillance data were the basis for hazard alerts, newsletters, presentations, media releases, and peer-reviewed and non-peer reviewed articles. Fatality reports included recommendations for injury prevention and intervention (behavioral, administrative, and engineering controls) after full consideration of contributing factors.

F. **Evaluation of KOSHS program**.

*Engaging stakeholders.* KOSHS established partnerships & MOUs were re-signed with Vital Statistics, Office of Health Policy, & DWC to access DC, ED, IH, & WC data. OHI data quality, analysis, and interpretation were improved collaboratively; stakeholders provided input on data collection, data quality improvement, in-depth indicator analysis, new data sources, on-site investigations, epidemiological analyses, and interventions. Active stakeholder communication was maintained through emails, newsletters, conference calls, and meetings.

*Process evaluation.* We addressed minor state data quality issues with WC, DC, ED, and ABLES data. We performed advanced OHI analysis to estimate work-related injury/illness charges, identify target populations for interventions, and inform policies and practices. *FACE Surveillance System Evaluation* was performed by NIOSH Office of the Director in 2012 for program effectiveness using mixed methods. FACE attributes that fully met objectives were flexibility, data quality, sensitivity, predictive value positive, representativeness, and stability. Recommended improvements included electronic entry of surveillance data sources into the FACE database to eliminate manual entry, social media outreach, and increased FACE awareness by entities involved in FACE investigations. The last two recommendations were met by hiring a FACE communications coordinator and a FACE investigator previously employed by Ky OSHA with extensive stakeholder contacts. We tracked personnel and financial cost of FACE worker fatality investigations, and documented the percentage of in-scope cases investigated and completed. We also documented obstacles to successful investigations, and the number of investigations revealing previously unknown contributing factors. From 1994-2014, 231 investigations were initiated; 164 fatality reports were produced and distributed. Fatality root cause was determined in 84% of cases, investigation cost was ~$3,000, and contact interview time was 3 hours.

*Impact evaluation example.* Research on TR data completeness on drugs present in injured workers leveraged NHTSA funding in FFY 2014 to add new state TR data variables on the presence of specific drugs. Additional NHTSA funding was leveraged for FFY 2015 to improve injured worker industry and occupation variables.

*Evaluation outcomes.* KOSHS expanded program long-term outcomes are to reduce Ky occupational injury morbidity/mortality; decrease worker injury ED and IH rates; & improve workplace safety. The gap between Ky & US occupational morbidity & mortality rates shrank from 1998-2012 (Figure 6).The Ky occupational fatality rate decreased over the last decade but is still above the US rate (Fig 7). The overall KOSHS expanded program has been effective in occupational injury/illness population-based and case-based surveillance; epidemiological analyses; innovative partnerships and collaborations that informed interventions, policies, and practices; and reducing occupational morbidity/mortality rates.

**Figure 6**

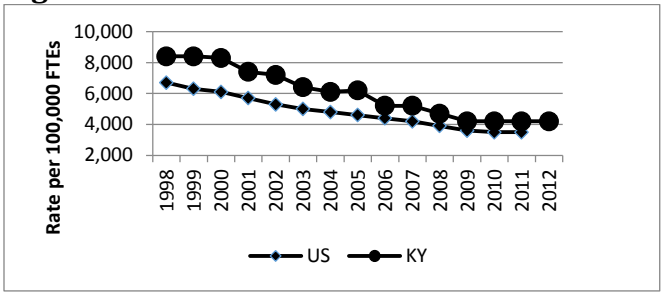
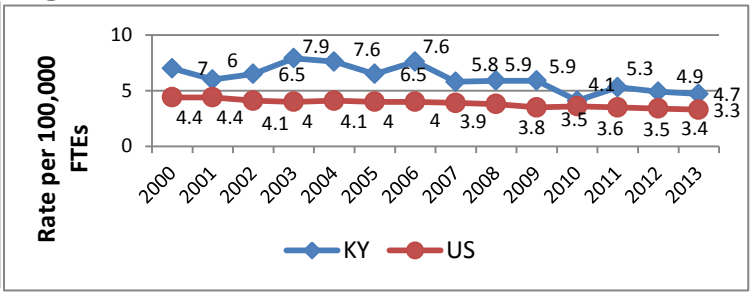



**Figure 7**




**Conclusions.**

The KOSHS expanded program has succeeded with innovative occupational injury/illness surveillance by increasing technical and research capacity to address industry and occupation priority issues, improving surveillance data quality, collaborating extensively, disseminating through social media and other strategies, and developing interventions (e.g., digital FACE stories and tool kits). Epidemiological analyses identified new and emerging injury risk factors and informed state policies (e.g., 2013 mandate for truck driver safety training).

**Inclusion Enrollment Table.** See attached.

**Publications.**


**1)** Green MK, Harrison R: [2011] Occupational Highway Transportation Deaths — United States, 2003—2008. MMWR. April 28, 2011.

**2)** Bunn TL, Slavova S: [2011] Injuries Among Solid Waste Collectors in the Private vs. Public Sector. Waste Manage Res 29(10):1043-52.

**3)** Bunn TL, Slavova S: [2012] Crash and Burn? Vehicle, Collision and Driver Factors that Influence Motor Vehicle Collision Fires. Accid Anal Prev 47:140-145.

**4)** Bunn TL, Slavova S: [2013]. Motor Vehicle Injuries Among Semi Truck Drivers and Sleeper Berth Passengers. J Safety Res. 44:51-5.

**5)** Bush AM, McKee SE: [2013] Multiple Jobholder Mortality Patterns in Kentucky: An Examination of Occupational Fatalities, Am J Ind Med. 56(8):881-8.

**6)** Brinker K, Jacobs T: [2015]. Fatal Work-Related Injuries — Southeastern United States, 2008–2011. Accepted to Workplace Health and Safety.

**7)** Bunn TL, Singleton M: [2013] Concordance of Identified Drugs in Injured Motor Vehicle Drivers Using Linked Motor Vehicle Crash, Emergency Department, and Inpatient Hospitalization Datasets. Traffic Inj Prev 14(7):680-9.

**8)** Slavova S, Bunn TL: [2013] Evaluation of the Occupational Health Indicator for Work-Related Low Back Disorder Hospitalizations and its Potential for Comprehensive Surveillance of Work-Related Low Back Disorders, AIHce, May 2013, Montreal.

**9)** St. Louis T, Ehrlich E: [2014] Proportion of Dermatitis Attributed to Work Exposures in the United States Working Population. AJIM 57(6):653-9.

**10)** Bunn TL, Slavova S: [2014] Work-Related Injuries in a State Trauma Registry by Industry and Presence of Drugs. J Trauma Acute Care Surg 77(2):280-5.

**11)** Bunn TL, Bush AM: [2014] Drug Overdose Deaths by Specific Employment Industry, Occupation, and Drug Type. J KY Med Assoc 112(8):201-211.

**12)** Harduar Morano L, Bunn TL: [2015] Occupational heat-related illness emergency department visits and inpatient hospitalizations in the southeast region, 2007-2011. Am J Ind Med. 2015 Aug 25. doi: 10.1002/ajim.22504.

**13)** Slavova S, Bunn TL: [2015] Work-Related Concussion Surveillance. Am J Ind Med. 58(1):40-45.

**14)** Beggs JA, Slavova, S: [2015] Patterns of pneumoconiosis mortality in Kentucky: Analysis of death certificate data. Am J Ind Med, DOI: 10.1002/ajim.22511

**Data Sets.**
The Kentucky Injury Prevention and Research Center does not have ownership of any of the authorized data resources that were used to perform epidemiological studies such as CRASH, Department of Workers' Claims, emergency department, inpatient hospitalization data, and mortality data. The authorized data resource providers need to be contacted individually by interested users to obtain their data. All published results such as reports, maps, hazard alerts, peer-reviewed and non-peer reviewed publications are available for information sharing on our KOSHS website or by direct request from other researchers or by the general public.

**Other Materials available for other investigators.**
There are no research materials, protocols, software, or other information resulting from the research that are available to be shared with other investigators.

**Inclusion of Gender and Minority Study Subjects.**
*KOSHS overall and OHI.* Data on women were included in the study if they were at least 16 years of age and the injury/illness was occupationally related. Women comprise approximately 48% of the civilian employed population in Kentucky (Bureau of Labor Statistics, 2011 data); therefore, it is estimated that women account for approximately the same proportion of worker injuries and illnesses. No data were excluded from the project due to gender.
*FACE.* Women were included in the project since both genders suffer occupational fatalities. Women comprise approximately 6% of fatal occupational injuries in Kentucky currently under surveillance by the FACE program; therefore, it is expected that the percentage of women remain unchanged. All data collection and analysis were performed on both genders to accomplish the specific aims of the study. No women were excluded from the study unless the fatal injury was not work-related or the fatal work injury occurred outside Kentucky's borders, the same exclusion criteria for men. Women and minorities participated in the project in the same way as all other participants. Since only data on dead subjects were obtained, no subjects were recruited.
*KOSHS fundamental, and OHI.* Data on minorities were included in the project. Minorities comprise ~14% of the civilian employed population in Kentucky in 2012 (Bureau of Labor Statistics, 2012 data); therefore, it is estimated that minorities will account for approximately the same proportion of worker injuries and illnesses. No data were excluded from the project due to race or ethnicity. Data variables examining ethnicity and race were categorized using PHS 398 recommended definitions and standards.
*FACE.* Data on minorities were included in the project. Minorities comprise 10% of the fatal occupational injuries in Kentucky currently under surveillance by the FACE program; therefore, it is expected that the percentage of minorities in this proposed project was unchanged. No data or interviews were excluded from the project due to gender, race, or ethnicity. Women and minorities participated in the project in the same way as all other participants. Data variables examining race and ethnicity were categorized using the PHS 398 recommended definitions and standards.

**Inclusion of Children.**
*KOSHS fundamental, and OHI.* Data on children 16-21 years of age were included in the project. Data was received in the same manner as adult data and was collected by KIPRC as a bona fide agent of the KDPH. Children were included in this project because the occupational safety and health indicators recommended by CSTE and NIOSH for occupational safety and health surveillance include workers 16 years of age and older for numerator and denominator data.
*FACE.* Children under the age of 21 years were included in the project surveillance data if they were working at their time of death. Children comprise approximately 2% of the fatal occupational injuries in Kentucky currently under surveillance by the FACE program; therefore, it is expected that the percentage of children in this proposed project remained unchanged.
Only female and male witnesses 21 years of age and above were interviewed. Children under 21 years of age were not interviewed because of the emotional distress of talking about a fatal incident. This exclusion is included in our current IRB approval for the FACE project.

# Cumulative Inclusion Enrollment Report

**This report format should NOT be used for collecting data from study participants.**

**Study Title:** Kentucky Occupational Safety and Health Surveillance Program

**Comments:**

| Racial Categories | Ethnic Categories | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Not Hispanic or Latino | | | Hispanic or Latino | | | Unknown/Not Reported Ethnicity | | | |
| | Female | Male | Unknown/ Not Reported | Female | Male | Unknown/ Not Reported | Female | Male | Unknown/ Not Reported | |
| American Indian/ Alaska Native | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Asian | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Native Hawaiian or Other Pacific Islander | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Black or African American | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| White | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | **0** |
| More Than One Race | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | **0** |
| Unknown or Not Reported | 0 | 0 | 0 | 0 | 0 | 0 | 85,967 | 173,431 | 259,745 | **519,143** |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **85,967** | **173,431** | **259,745** | **519,143** |

# A story of Impact

## *NIOSH-Funded State FACE Investigation Leads to Safer Handicapped-Accessible Accelerator Pedals*

In 2012, over 157,000 establishments employed 833,919 automotive technicians in the U.S.[1] Auto technicians play an important role in ensuring the safety of our cars. However, technicians encounter a number of dangers in their workplace when dealing with passenger vehicles that range in weight from about 2,200 to 3,300 lbs., depending upon the make and model.[2] Nationally, there were 71 fatal injuries reported in the automotive repair and maintenance industry in 2012.[3] The Kentucky (KY) Fatality Assessment and Control Evaluation (KY FACE) program—funded by the National Institute for Occupational Safety and Health (NIOSH)—investigated a death of a 50-year-old certified master technician who was struck by a car while sitting at a desk in a dealership's service bay.

An auto technician working in the service bay was preparing a vehicle for an oil change when he mistook a handicapped-accessible accelerator pedal for the brake pedal. The handicapped-accessible pedal, which can be removed, had a left foot accelerator made for individuals who have lost the ability to use their right foot. Mistaking the accelerator pedal for the brake

▲ Photo of handicapped-accessible brake and accelerator pedals. Photo courtesy of Kentucky OSHA.

**Relevant Information**

- **Handicapped-accessible equipment** should be removed by auto service technicians before operating the vehicle.
- **Administrative duties and office space** should be performed in an area away from the path of vehicles being serviced.
- **Employee training** and written employer policies about handicapped-accessible equipment removal could prevent future fatalities.

pedal caused the vehicle to strike the victim from behind and pin him against his desk and a wall causing blunt force injuries. After calling 911, an employee with emergency medical technician experience, rushed to the scene, assessed the situation, and covered him to prevent shock until emergency responders arrived. On the way to the hospital, the victim suffered cardiac arrest and died from his injuries.

The KY FACE program investigator evaluated the incident and produced the report "Auto Technician Mistakes Handicapped Accessible Accelerator Pedal for Brake Pedal and Fatally Pins Co-Worker".[4] The report identified two key recommendations to prevent future incidents from occurring: (1) removal of handicapped-accessible equipment prior to operation; and (2) moving office spaces away from car servicing areas.

## Impact

The FACE report was emailed to 45 car dealerships in Kentucky and 11 handicapped-accessible gas pedal manufacturers. Based on the report, Veigel North America LLC Mobility Products & Design redesigned their Left Foot Accelerator, Model 3545, to retrofit a vehicle's steering column with a key switch. When starting a vehicle with the redesigned pedal, the system defaults to a standard, factory pedal. To activate the left accelerator pedal, a driver must turn the key switch on and press the accelerator function switch to the left. This modification eliminates the need to remove the pedal for servicing and prevents unintended drivers from using the left foot accelerator.[5] The redesigned pedal was introduced at the National Mobility Equipment Dealers Conference in February 2015 and is anticipated to be available to the public in June 2015.

Beyond Veigel's modification to the handicapped-accessible pedal, the car dealership where the incident occurred established new employee policies based on the FACE report recommendations. The new policies require employees to remove all accessibility equipment on vehicles before any work is started and perform all administrative duties in an area away from the service area. Taken together, the redesign of the handicapped-accessible gas pedal and establishment of employee policies will aid in the safety of auto technicians.

*Mention of company names or products does not imply endorsement by the National Institute for Occupational Safety and Health.*

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For more information about the National Institute for Occupational Safety and Health (NIOSH) FACE program, visit www.cdc.gov/niosh/face, or the KY FACE program visit www.mc.uky.edu/kiprc/projects/KOSHS/index.html.

For a complete list of references, see www.cdc.gov/niosh/docs/2015-186/.

**SAFER • HEALTHIER • PEOPLE™**

To receive NIOSH documents or more information about occupational safety and health topics, please contact NIOSH.
Telephone: 1–800–cdc–info (1–800–232–4636) | TTY: 1–888–232–6348 | www.cdc.gov/info.
For a monthly update on news at NIOSH, subscribe to NIOSH eNews by visiting www.cdc.gov/niosh/eNews.
DHHS (NIOSH) Publication No. 2015–186.
June, 2015.

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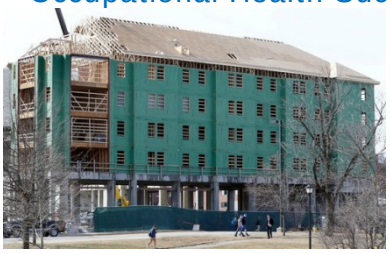
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

# KENTUCKY

Occupational Health Success Stories

## Improving General Contractor and Subcontractor Worker Safety in the Construction Industry



*A 24 year-old Hispanic construction laborer was loading trusses on the ground with his brother-in-law when 27 mph high winds ripped an 8x4 plywood sheet from another laborer's hands off a commercial construction site roof 60 feet above. The co-worker on the roof jumped on the sliding plywood sheet but could not stop it from falling. The wind whipped the falling plywood out 30 feet and down six stories, striking the laborer in the back of the head just below his hard hat.The victim died later that day at the hospital from blunt force injuries to the head. The co-worker's life line prevented him from falling over the edge of the roof with the sliding plywood sheet.*

### The Challenge

According to the U.S. Bureau of Labor Statistics, there were 1.7 nonfatal nonresidential building construction injury cases per 100 full-time workers with days away from work, job transfer, or restriction in Kentucky in the year 2013; the fatal work injury rate in the construction industry was 16.5 fatal injuries per 100,000 full-time equivalent workers, 251% above the 4.7/100,000 overall worker fatality rate in Kentucky.

### The Response

The Kentucky Fatality Assessment and Control Evaluation (FACE) program conducted a fatality investigation of the construction laborer death due to high winds and a falling sheet of plywood. A FACE report (#14KY008) was produced with five injury prevention recommendations related to 1) postponement of overhead work when high winds are present; 2) use of safety nets, toeboards, etc. to protect workers below from falling equipment and materials; 3) physical separation of workers on the ground from overhead hazards; 4) availability of worker safety training for non-English speakers; and 5) regular updating of worker safety training. The final FACE report was disseminated to the employer where the fatal work incident occurred, and to 2,416 other companies.

### The Impact

Based on #14KY008 report recommendations, the employer has now implemented stricter subcontractor policies including requirements for safety nets to catch falling debris, use of toe boards on all roofing jobs, and barring of work on the ground while workers are laboring above. The employer invited the FACE investigator to speak to their workers (n=70) at the National Stand Down for Falls campaign in spring 2015. The employer then requested pamphlets, post cards and a fall protection knowledge test for future use in their Stand Down pre-work meetings.

**For more information, visit the Kentucky Occupational Safety and Health Surveillance website:** http://www.mc.uky.edu/kiprc/projects/KOSHS/index.html.

Form Approved Through 08/31/2015
OMB No. 0925-0002

Department of Health and Human Services

# Final Invention Statement and Certification

*(For Grant or Award)*

DHHS Grant or Award No.

5 U60 OH008483-10

**A.** We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period

07/01/2010 *original effective date* through 06/30/2015 *date of termination*.

**B. Inventions** (Note: If no inventions have been made under the grant or award, insert the word *"NONE"* under Title below.)

| NAME OF INVENTOR | TITLE OF INVENTION | DATE REPORTED TO DHHS |
|---|---|---|
| | NONE | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| *(Use continuation sheet if necessary)* | | |

**C. Signature** — This block ***must*** be signed by an official authorized to sign on behalf of the institution.

Title
Associate Director

Typed Name
Kim C. Carter

Signature
Kim C. Carter

Date
9/17/15

Name and Mailing Address of Institution
University of Kentucky Research Foundation
500 South Limestone, 109 Kinkead Hall
Lexington, KY 40526-0001

# EQUIPMENT INVENTORY LIST AUTHORIZATION/PURCHASE

**Report Date:** 9/18/2015
**Project Title:** Kentucky Occupational Safety and Health Surveillance
**Grantee Name:** University of Kentucky Research Fdtn
**Grants Management Officer:** Ralph Robinson

**Grant Number:** 5 U60OH008483-10
**Project Period:**7/1/2010 to 6/30/2015
**Project Officer:** Steve Inserra
**Grants Specialist:** Brandis Belser

| Description of Item (i.e., pH Meter) | Mfr.[1] (i.e., Fischer) | Serial Number | Quantity | Condition | Location | Purchase Cost | Date Received |
|---|---|---|---|---|---|---|---|
| n/a | n/a | n/a | n/a | | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | | n/a | n/a | n/a |
| n/a | n/a | n/a | n/a | | n/a | n/a | n/a |

[1]Mfr. (Manufacturer)

Property Administrator & PO Disposition Recommendation and Instructions:

| Description of Item (copy from above) | Disposition | Address[1] |
|---|---|---|
| | | Attn: Brandis Belser<br>Centers for Disease Control & Prevention<br>Peachtree Distribution Center<br>3719 North Peachtree Road, #100<br>Chamblee, GA 30341 |
| | | |
| | | |
| | | |

1The CDC Warehouse is the central receiving point for the delivery of all non-hazardous and non-perishable supplies and equipment, CDC – AM – 2004-03, update 2010