Mine Automation and Emerging Technologies Health and Safety Partnership

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National Institute for Occupational Safety and Health

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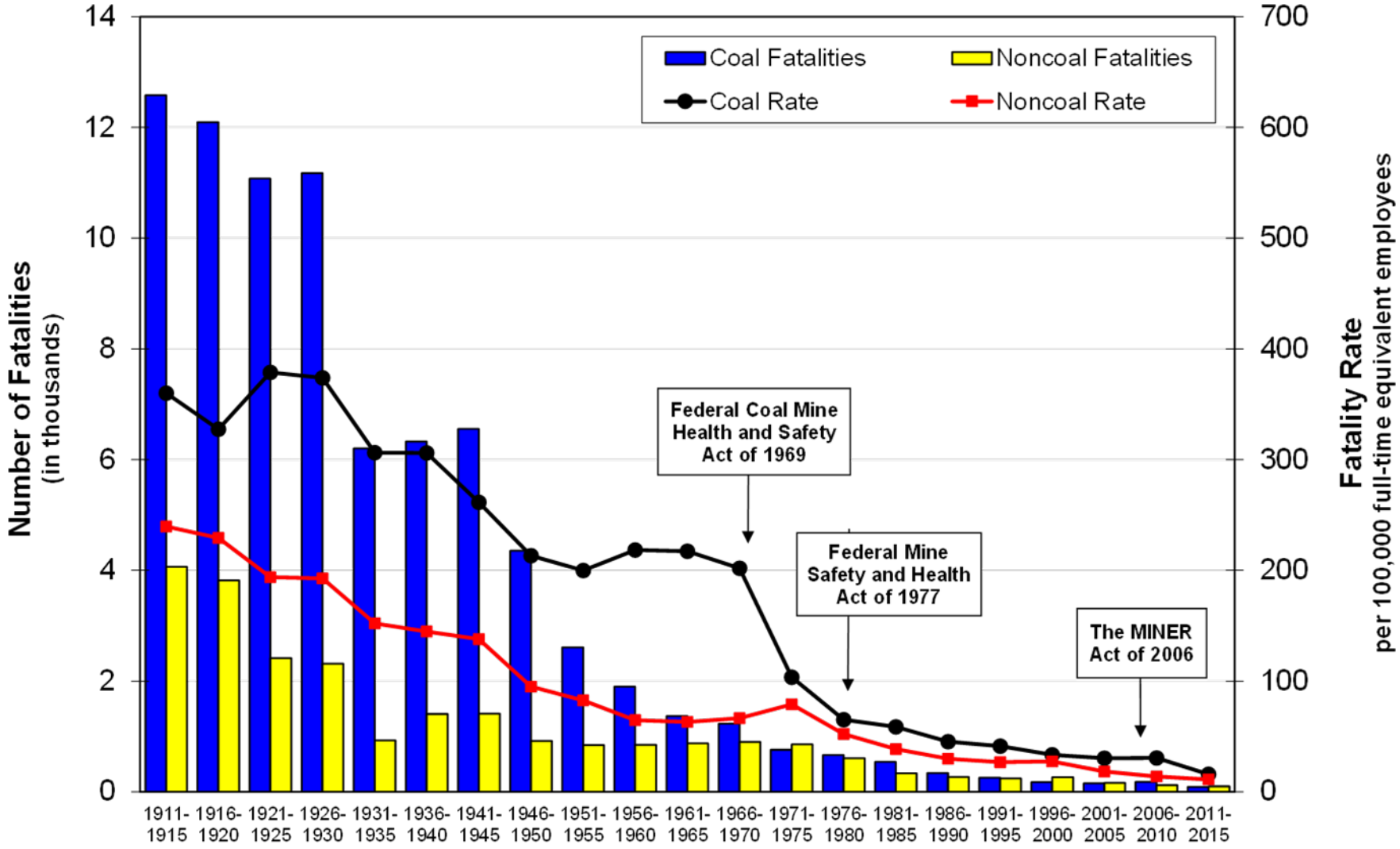
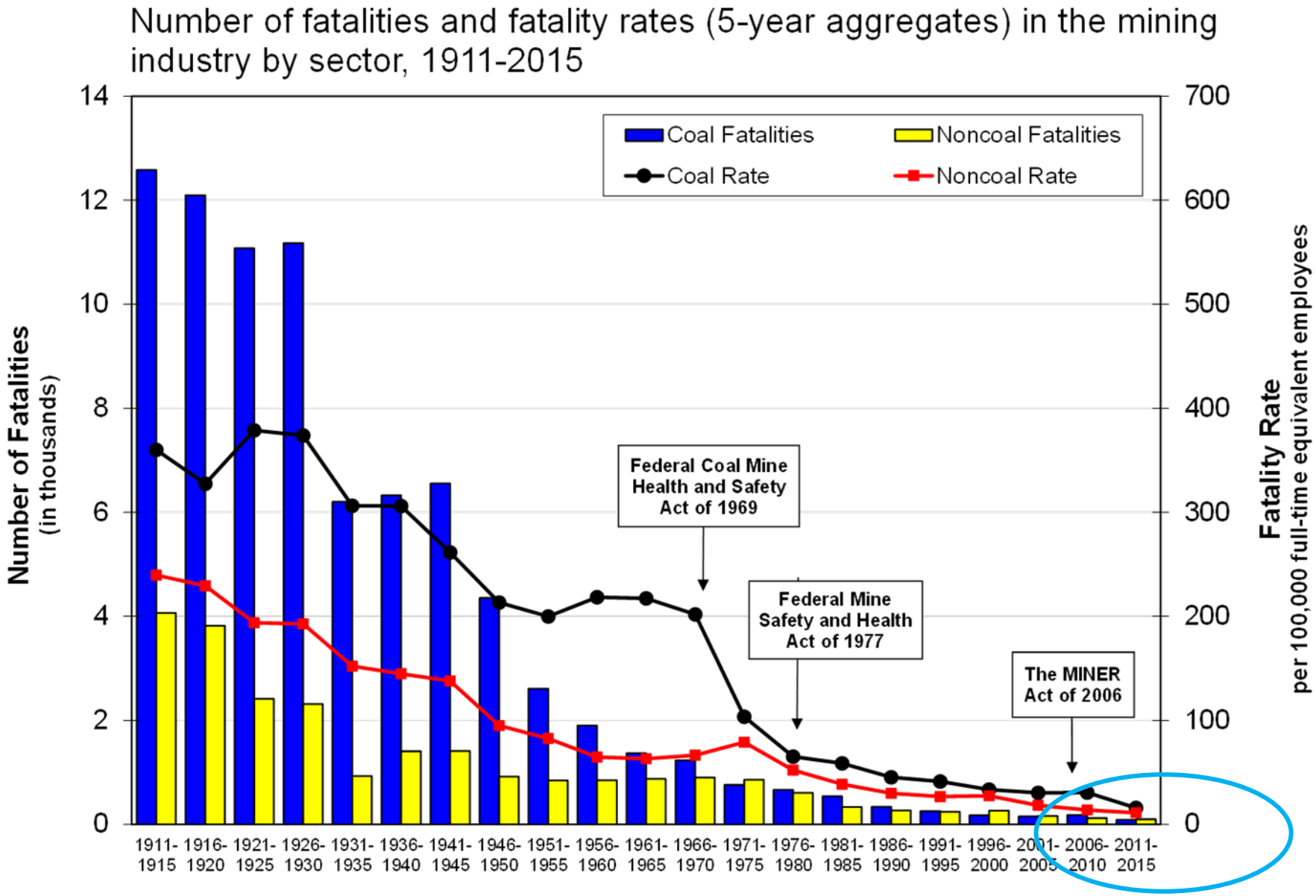
The findings and conclusions in this presentation are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the National Institute for Occupational Safety and Health.

Number of fatalities and fatality rates (5-year aggregates) in the mining industry by sector, 1911-2015



NOTE: Excludes office employees. Noncoal includes metal, nonmetal, stone, and sand & gravel operations. Sand & gravel miners included starting in 1958. Hours for 1911-1923 computed on assumption that weighted average length of workday was 9.36 hours. Full-time equivalent employees (2,000 hours = 1 FTE employee). Data source: USBM and MSHA



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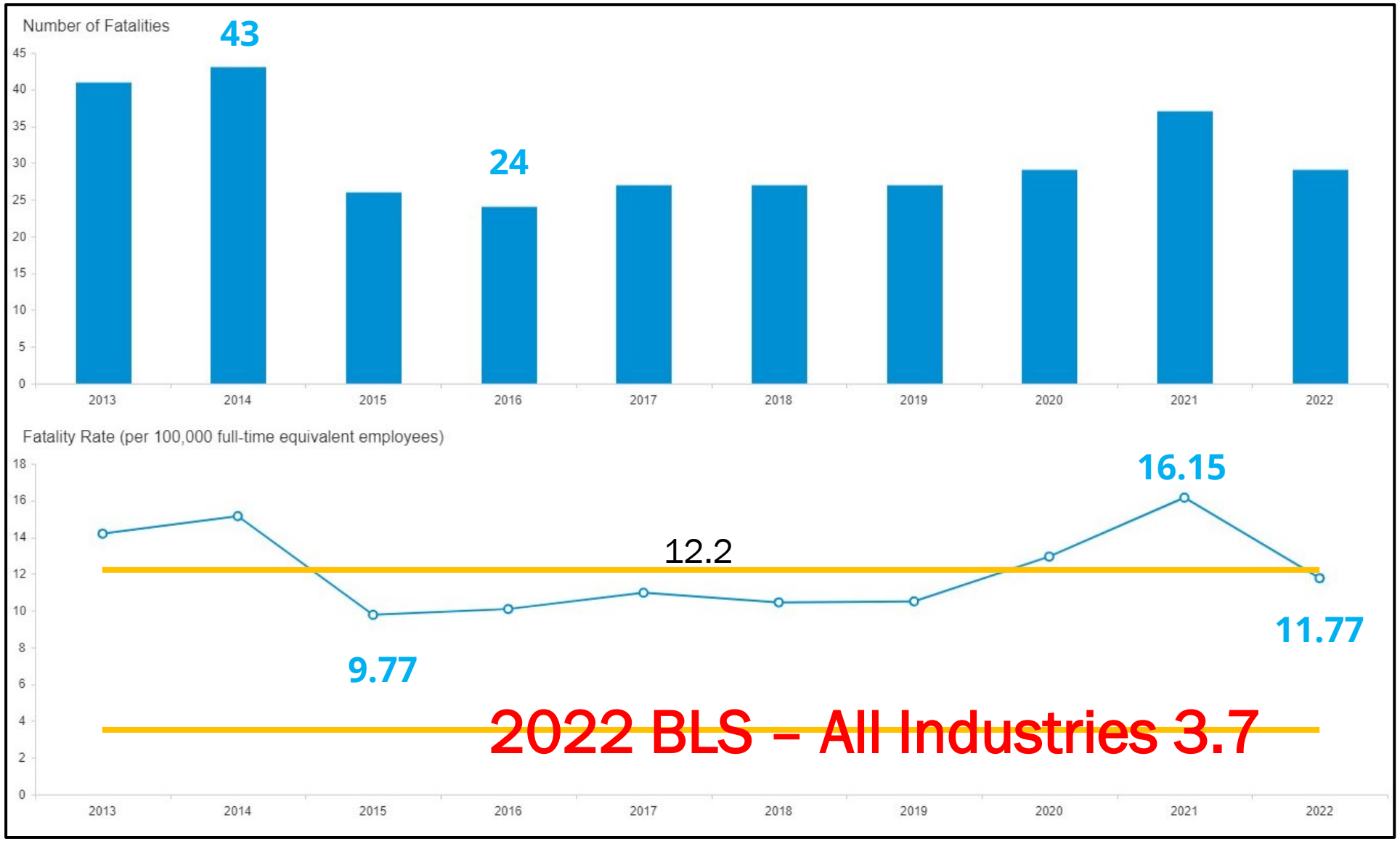
2013-2022 Fatalities All Mining



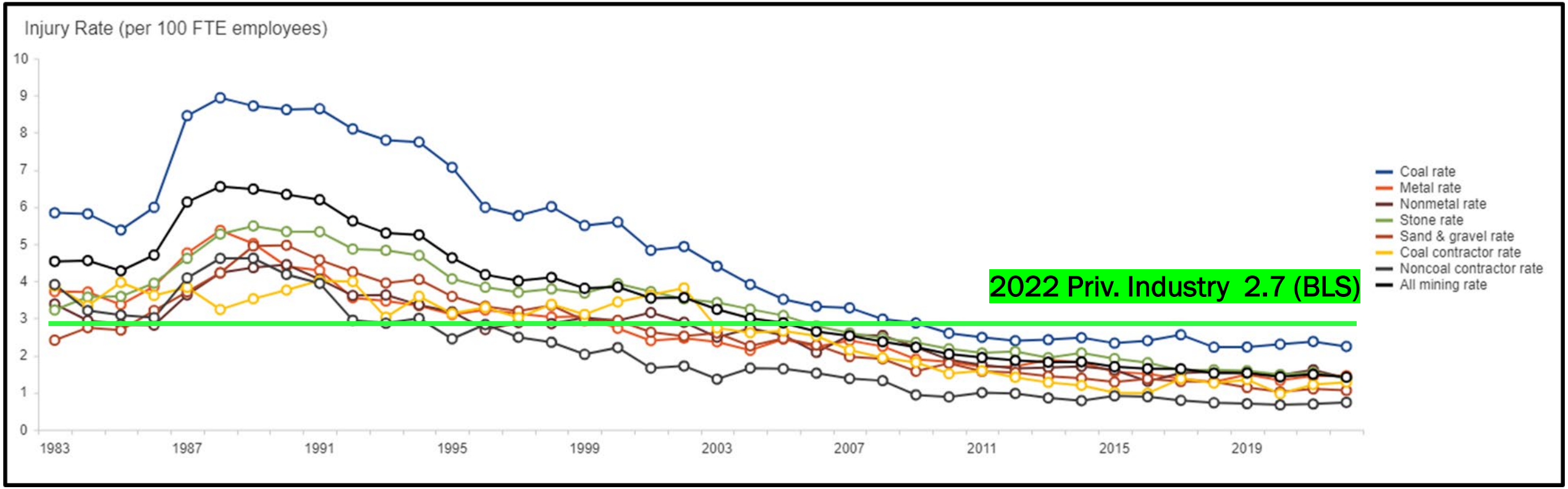
RATES

1966-1970	
Coal	202
Non-coal	67

1996 NIOSH	
Coal	38.9
Non-coal	21.1
Cont.	35.4
All	28.5

2022	
Coal	16.5
Non-coal	9.5
Cont.	13.8
All	11.8

Industry Injury Rate (per 100 FTEs) 1983 – 2022



Occupational respiratory disease and exposures in mining

Coal dust (RCMD)

- 78,620 black lung deaths in 1968-2016
- $48 billion in black lung benefits since 1970 ($200+ million 2021)

Respirable crystalline silica (RCS)

- Mining listed on more (28.1%) silicosis death certificates than other industries

Diesel particulate matter (DPM)

- Linked to lung cancer and other disorders
- 15,000 underground coal miners and 13,000 M/NM miners are exposed

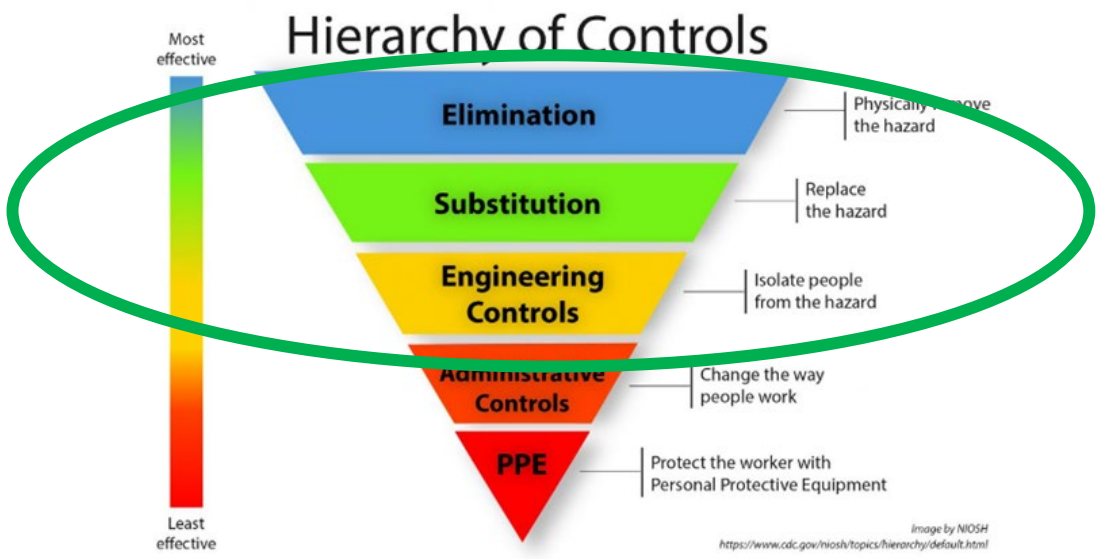
Elongate Mineral Particles (EMP)

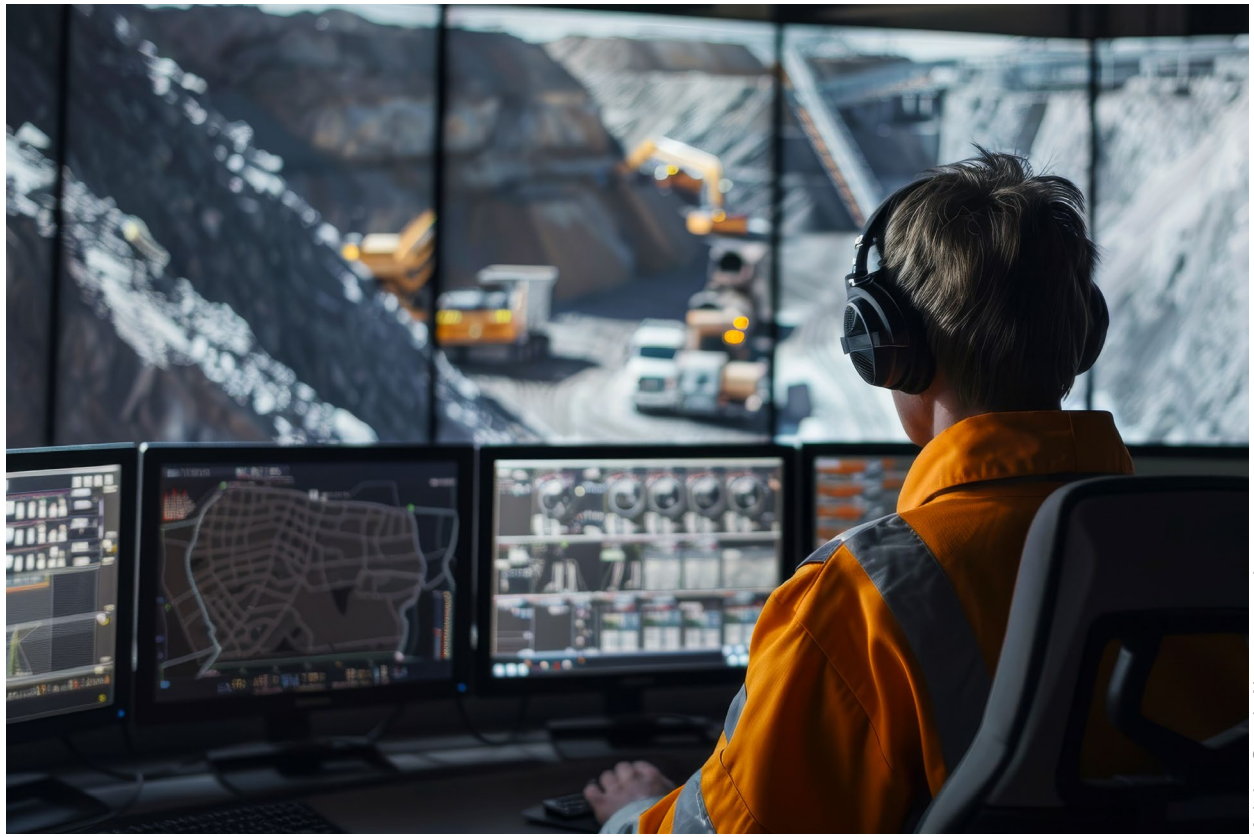
- 10% of M/NM mines from 1979-2015 exceeded the NIOSH REL (0.1 f/cc) for asbestos (NY, MN, CA)

Automation & Emerging Technologies

WORKtoZERO
an nsc program

National Safety Council: To eliminate workplace fatalities by 2050 through the adoption of emerging technology





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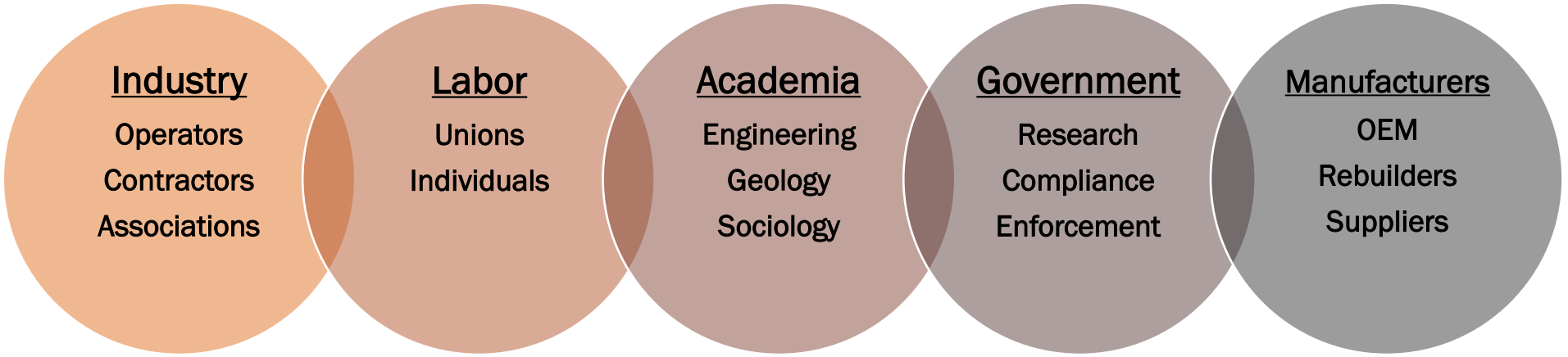
Our Partnership Model for Research

- MSHA-NIOSH Diesel Exhaust Health Effects Partnership
- NIOSH Proximity Detection Partnership (completed)
- NIOSH Refuge Alternative Partnership (completed)
- NIOSH Breathing Air Supply Partnership
- NIOSH Rock Dust Partnership
- NIOSH Automation & Emerging Technologies H&S Partnership
- NIOSH-MSHA Respirable Mine Dust Partnership
- NIOSH Miner Health Partnership
- NIOSH Mine Slope and Subsidence Monitoring Partnership

"Mining research is most effective when it has been done in cooperation with the ultimate users of the research."



Mine Automation and Emerging Technologies Health and Safety Partnership

Mine of the Future: Disruptive Technologies that Impact our Future Mine Worker Health & Safety Research Focus

Authored by: John Sammarco, Jeff Welsh, Miguel Reyes, Todd Ruff, and Carl Sunderman with review and input from the Mine of the Future Workgroup members. February 5, 2018

Mine of the Future Workgroup members (all NIOSH employees except Brackpool who was a contractor):

Carl Brackpool
Gary Buchan
John Burr
Larry Patts
Miguel Reyes
Todd Ruff
John Sammarco
Adam Smith
Carl Sunderman
Jeff Welsh

2018

MSHRAC

Public Workshop
Aurora, CO
Sept. 10-11, 2018

Report and Recommendations for Strategic Research Areas
from the
Metal Mining Automation and Advanced Technologies Workgroup
under the
Mine Safety and Health Advisory Committee, NIOSH-CDC

November 12, 2019

Partnership Meetings

- October 8-9, 2020
- August 17-18, 2021
- September 14-15, 2022
- September 20-21, 2023
- October 10, 2024
- Additional agenda/topic setting meetings

NIOSH Research

- Intramural
  - SMRD
  - PMRD
- Extramural
  - Contracts
    - Broad Agency Announcements
      - Technology BAA
      - University Research BAA
  - Grants
  - Interagency Agreements

New BAA Contracts – Technology

Automation and Emerging Technologies

Contractor	Title
Desert Research Institute	A Lithium-Ion Battery Fire Detection and Suppression System for Mining Applications
Innovative Wireless Technologies, Inc.	Wireless Ventilation Monitors for Improved Mine Safety and Efficiency
University of Kentucky with Francis Enterprises	In-Mine Autonomous Shuttle Car Demonstration
Virginia Tech	Evaluating and Modifying a Back Exoskeleton for Use in Underground Mines

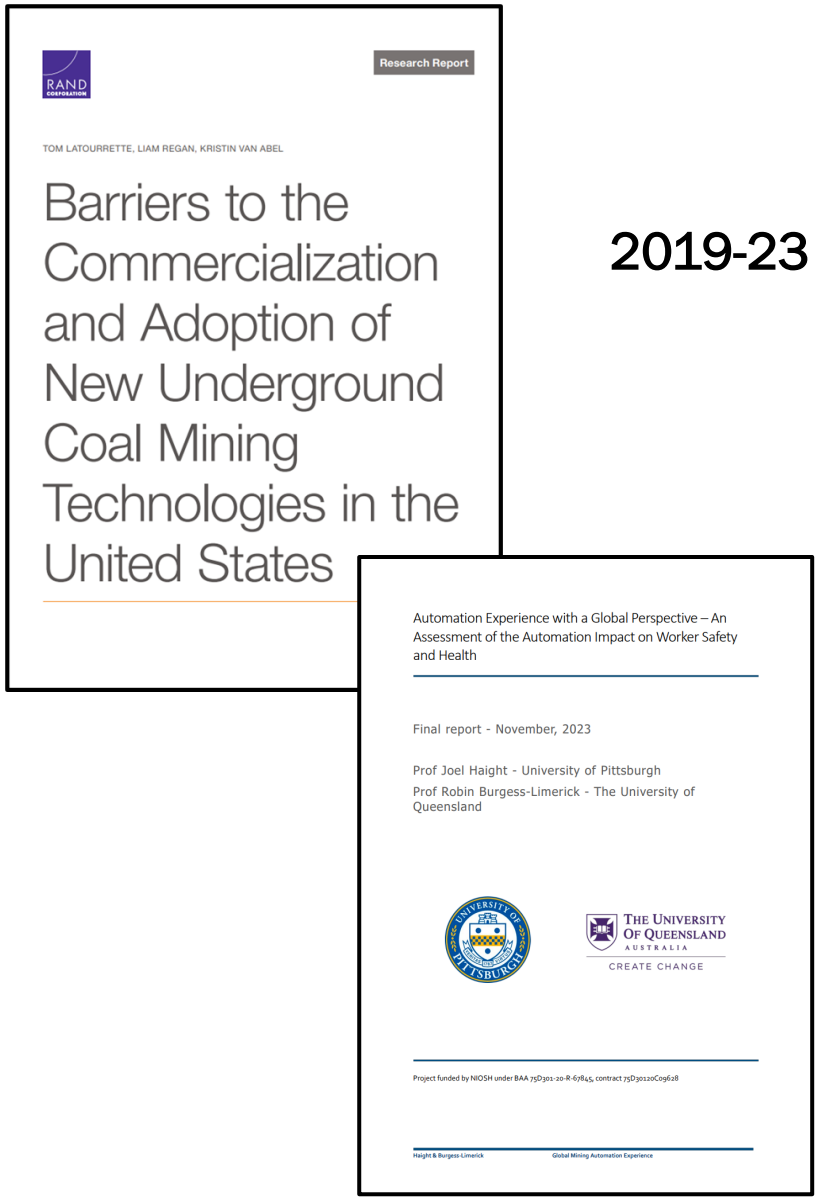
New Contracts – University Research
Contracts Run September 2024-2029

University	Title
Missouri University of Science and Technology	Advancing Mining Safety: The Integration of Smart Development, Fully Automated Monitoring, and AI-Driven Digital Twins for Preventing Accidents and Fatalities in the United States Mining Industry
Pennsylvania State University	Designing a Safe Electrification System for Smart Mines Through Ventilation Modeling, Monitoring, Control, and Training
University of Arizona	Dynamic Mine Planning Capacity Building: Integration of Robust Data into System-Wide Mine, Automation, and Safety Processes

Robotic and Intelligent Mining Technology and Workplace Safety Research Grant

- Congressional intent: *to fund additional research initiatives in automation, robotics, and intelligent mining systems to improve workplace safety and health in U.S. mining operations*.
- Grantee is the Missouri University of Science and Technology Mining and Explosives Engineering Department
- Funding initiated in September 2023, 4-year term
- Collaborative with NIOSH

Understanding the Barriers

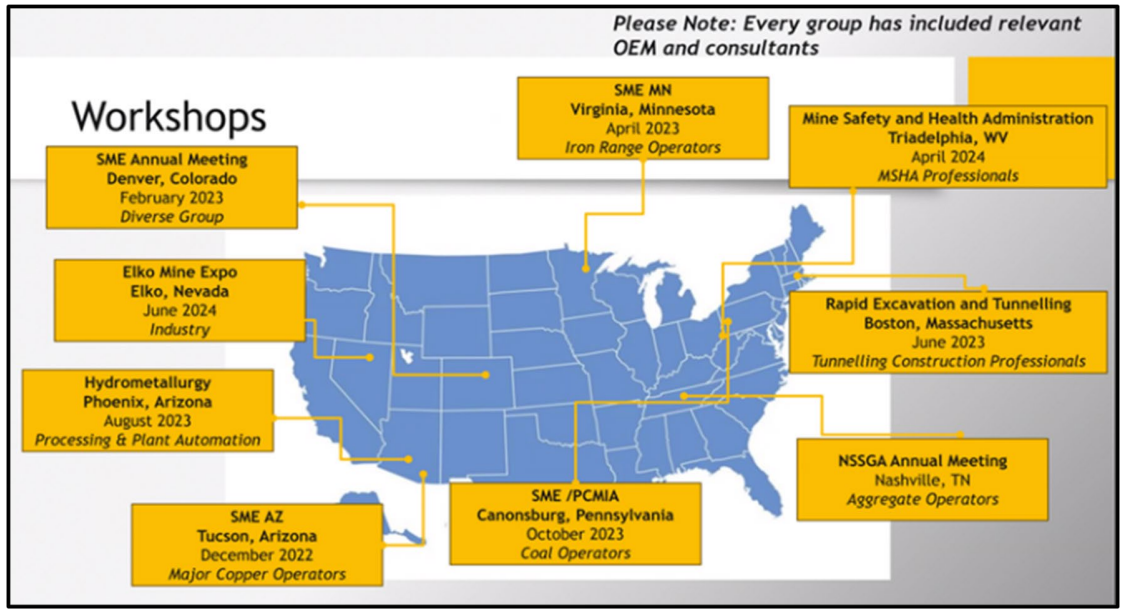


2019-23

2020-23

2022-24

Eliminating Barriers for the Implementation of Automation in the Mining Industry



“Mac” – circa 1950s

Rohmac Microtraxx “Mule”
2014-2016; 2017-2022

NIOSH Mining Program

OMSHR • PMRD • SMRD

www.cdc.gov/NIOSH/mining

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