

#### NIOSH: Global Collaborations and Technical Assistance

LCDR Reed Grimes, MD, MPH, FACOEM

25<sup>th</sup> Week of Occupational Health Medellin, Colombia October 31, 2019 Octubre 30-31 Noviembre 1 Medellín 2019













Transformación Social desde la

**SST** 

XXXIX Congreso de Ergonomía, Higiene, Medicina y Seguridad Ocupacional. 18º Congreso Colombiano de Ergonomía: Perspectivas de la Ergonomía en el Trabajo Actual.

#### **Co-Contributors**

- RADM (ret.) Margaret Kitt
- CAPT Lauralynn McKernan
- CDR Cara Halldin
- LCDR Catherine Beaucham
- Dr. Brian Curwin

#### **Differences: NIOSH and OSHA**

Department of Health and Human Services



Centers for Disease Control and Prevention (CDC)



National Institute for Occupational Safety and Health (NIOSH) **Department of Labor** 



Occupational Safety and Health Administration (OSHA)

#### **NIOSH's Mission**

- To <u>generate</u> new knowledge in the field of occupational safety and health and
- To <u>transfer</u> that knowledge into workplace practice to prevent work-related injury, illness, and death.









<u>Goal 1:</u> Conduct research to reduce worker illness and injury, and to advance worker well-being.

<u>Goal 2:</u> Promote safe and healthy workers through interventions, recommendations and capacity building.

**Goal 3:** Enhance worker safety and health through global collaborations.

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**Goal 3:** Enhance worker safety and health through global collaborations.

- Take a leadership role to share knowledge and best practices.
- Provide workplace illness and injury reduction strategies.

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<u>Goal 2:</u> Promote safe and healthy workers through interventions, recommendations and capacity building.

#### **Goal 3:** Enhance worker safety and health through global collaborations.

- Take a leadership role to share knowledge and best practices.
- Provide workplace illness and injury reduction strategies.
- Build professional capacity to address workplace hazards through information sharing and research experience.

#### **NIOSH Global Partners**

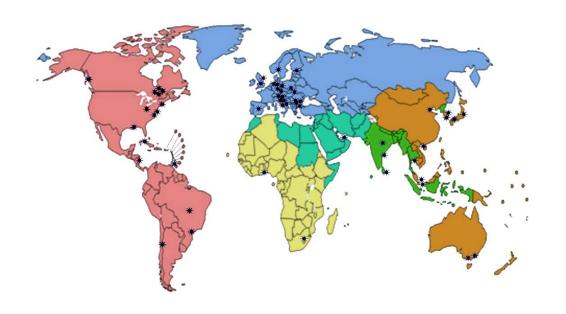
- World Health Organization (WHO)
- International Labour Organization (ILO)
- International Social Security Association (ISSA)
- Occupational Hygiene Training Association (OHTA)
- International Commission on Occupational Health (ICOH)
- International OSH Institutes
- Technical assistance on country level projects







# WHO Collaborating Centers for Occupational Health representing 6 WHO regions <a href="https://www.who.int/occupational-health">www.who.int/occupational-health</a>



NIOSH is a Collaborating Center for Occupational Health within the Pan American Health Organization (PAHO) Region

# NIOSH Terms of Reference as a WHO Collaborating Center (2016-2020)

- In agreement with WHO and PAHO, to provide technical support to national and regional efforts and capacity building for the elimination of silicosis
- To contribute to WHO and PAHO work on strengthening health workers' occupational health and safety
- To contribute to WHO work on strengthening health systems, governance, capacities and service delivery for workers' health
- To contribute to WHO work on protecting health and safety of workers in the preparedness and response to public health emergencies and the implementation of the International Health Regulations
- In agreement with WHO and PAHO to contribute to the implementation of other priorities under Resolution WHA 60.26 "Workers' Health Global Plan of Action" and PAHO plan of action on workers' health

# **2019 PAHO Collaborating Centers Meeting**

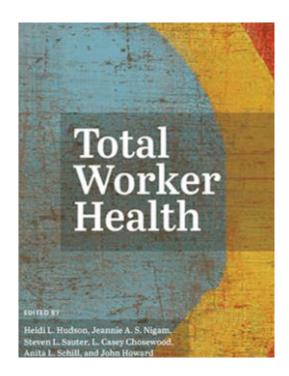


# Contribute to the Implementation Workers' Health Global Plan of Action

Occupational diseases

- Health promotion
  - Total Worker Health®

Training courses



- Taught at the Vietnam National Institute for Occupational and Environmental Health (NIOEH)
- Multidisciplinary team
  - Industrial hygienists (IHs)
  - Ergonomists
  - Physicians
  - PhD scientists



- Focused on the measurement of hazardous substances
- Consisted of:
  - Lectures
  - Case study exercises
  - Industrial hygiene field equipment instruction



- 54 attendees from:
  - Government institutions
  - Academia
  - Industry
- Many students had advanced degrees in theoretical and scientific aspects of IH
- Provided practical learning





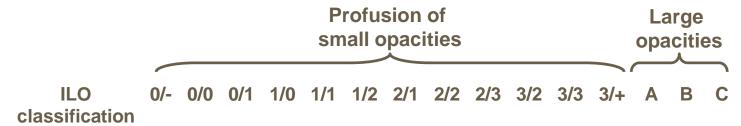
#### **International Labour Organization**

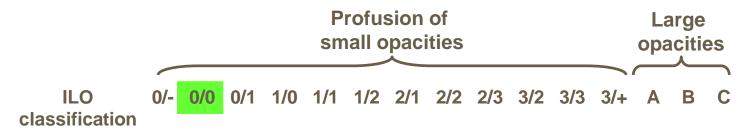
- Serve on advisory committees as the need arises
- ILO Classification of Radiographs of Pneumoconiosis standard images

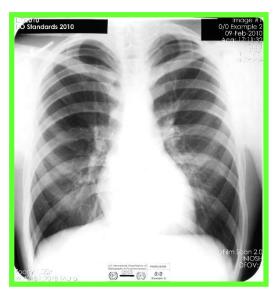


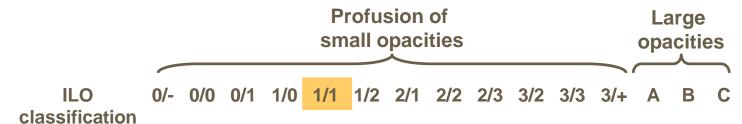
# ILO International Classification of Radiographs of Pneumoconioses

- "A means for describing and recording systematically the radiographic abnormalities in the chest provoked by the inhalation of dusts."
- International Conference on Silicosis, Johannesburg, 1930
  - Modifications/revisions 1950, 1959, 1970, 1980, 2002, 2011
- "Used internationally for epidemiological research, for screening and surveillance of those in dusty occupations, and for clinical purposes. May lead to better international comparability of data concerning the pneumoconioses."
- Object: "to codify radiographic abnormalities of the pneumoconioses in a simple, reproducible manner. Does not define pathological entities nor take into account working capacity. Does not imply legal definitions of pneumoconioses for compensation purposes."

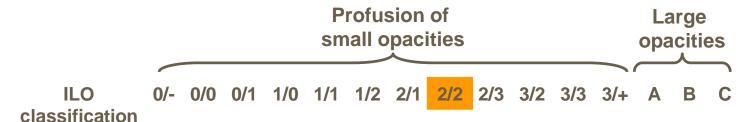




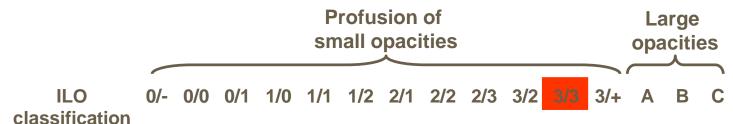




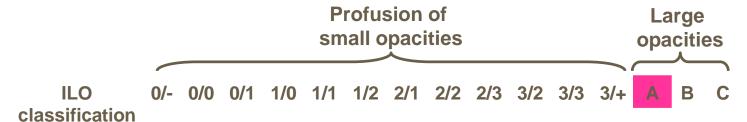


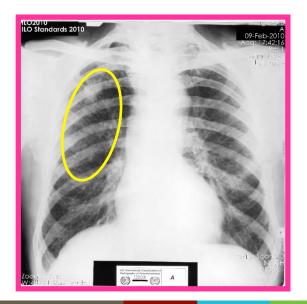


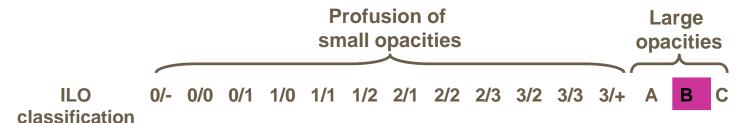


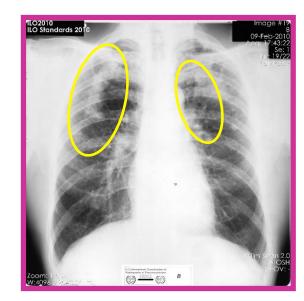


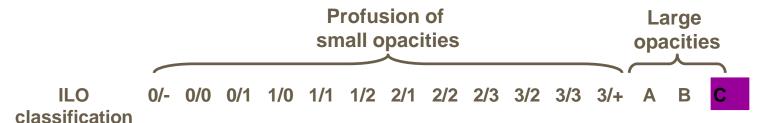






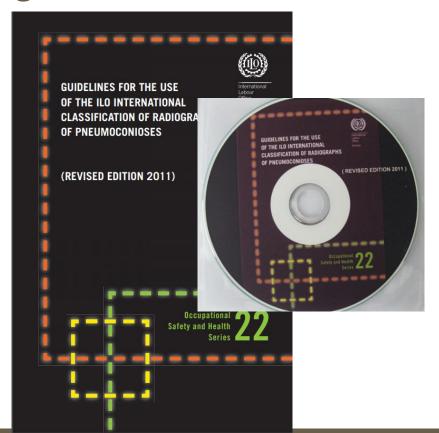


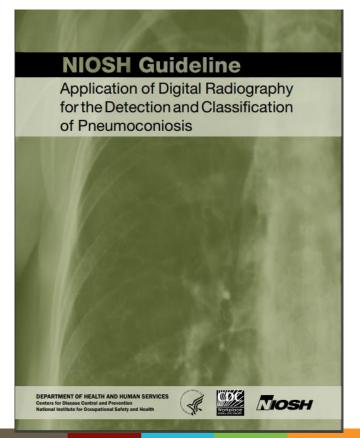






## **Digital Transition Standards and Guidelines**





# **Training and Examination (NIOSH)**

- Digitized syllabus available
  - Can be downloaded at no charge
  - Can be used with regular computer monitors for study purposes
- B-reader examination with *digitized* images
  - Available in Morgantown, WV
  - Provided at international courses
- Developing *Digital* Training Systems
- Will provide B-reader examination with digital images

#### **International Social Security Association**

- Special Commission on Prevention
  - 13 Sections including Research, Information, mining, health services, and transportation
- Vision Zero Campaign at <a href="http://visionzero.global/">http://visionzero.global/</a>
  - Safety. Health. Wellbeing.
    - "Belief that all accidents, diseases and harm at work are preventable"

#### INTERNATIONAL COMMISSION ON OCCUPATIONAL HEALTH (ICOH)

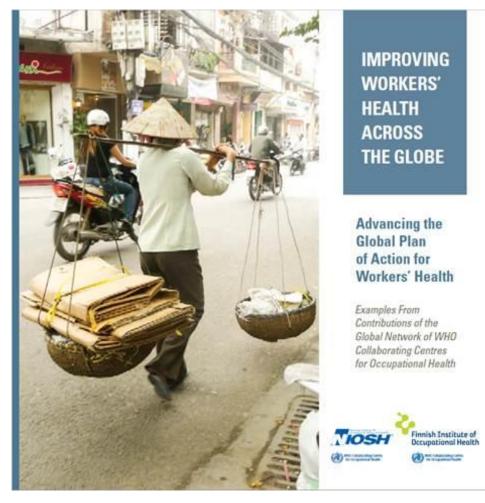
#### www.icohweb.org

- ICOH is the world's leading international scientific society in the field of occupational health with a membership of 2,000 professionals from 93 countries, and many institutional members, including NIOSH
- ICOH has close collaborations with the World Health Organization (WHO) and the International Labor Organization (ILO)
- ICOH has 37 Scientific Committees covering the wide range of OSH topics
   Members can belong to 3 Scientific Committees

#### **ICOH** on Tuberculosis

- United Nations General Assembly (2018) held a unique meeting to address global tuberculosis (TB)
- ICOH was essential in securing the following wording:

"Commit to...implementing primary prevention in high-risk occupations by reducing silica dust exposure in mining, construction and other dusty workplaces, and worker TB surveillance and infection prevention and control in health-care settings"



Joint Project
between NIOSH
and the Finnish
Institute of
Occupational
Health (FIOH)

#### AN INTERVENTION IN THE NUTMEG INDUSTRY

#### Grenada

The nutmeg industry was one of the most significant contributors toward the local economy in Grenada, until the country was devastated by Hurricane Ivan in 2004. A pilot project to revitalize the nutmeg industry, while increasing the health and safety of work, has been initiated by Grenada's St. George's University and



Photo by Dr. Muge Apkinar-Elci

partners. They have evaluated the processing plant hazards, and they built a solar dehydrator in the pilot plant to reduce the heat, dust, and mold of the traditional process. The project offered an occupational health and safety train-the-trainer course for the country's nutmeg workers, which included lectures and practical exercises at the nutmeg processing plant. The project also organized the planting of 2000 nutmeg trees on 40 acres of land-degraded area. In October 2011, after just one year. nutmeg trees had grown and established root systems, flora had increased, and there was an evident reduction in soil run-off. As a result of this collaboration, Grenada anticipates an increase in nutmeg production and an improvement in workers' health. The highlighted success story illustrates how research, in combination with practical interventions, can be carried out to address the widespread consequences of a devastating natural disaster, such as the hurricane in Grenada. This research has brought hope for economic resurgence in the region, and it has identified a practical intervention to manage heat stress in nutmeg industry workers. thus contributing to research efforts in climate change.

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#### PROTECTING HEALTHCARE WORKERS FROM NEEDLESTICK INJURIES

#### Venezuela

In 2007, WHO, the Pan American Health Organization, and NIOSH adapted and translated into Spanish a toolkit for preventing needlestick injuries. The project began in one state with four hospitals anchored within the Dr. Arnoldo Gabaldon Institute of Advanced Studies. Their data indicated that half of the healthcare workers surveyed had suffered at least one needlestick injury in 2006, most of which came from recapping needles after injection. More than 80% of the injuries were never reported. Roughly 35% of healthcare workers in the study were not immunized against hepatitis B. Armed with this knowledge, over the course of 6 years Dr. Maria del Carmen Martinez and her team from Institute of Advanced Studies used the WHO/NIOSH toolkit to greatly reduce occupational needlestick injuries in Venezuela through multiple initiatives:

Training: The Institute of Advanced Studies team conducted intensive training programs at 810 healthcare facilities across the country, educating about 37,400 healthcare workers on



**Above:** Implementation of safety box usage in healthcare centers of the Venezuela Social Security Institute.

safety procedures for protecting themselves against bloodborne pathogen exposure. The Institute of Advanced Studies team built local capacity and facilitated program sustainability by teaching 3,920 healthcare workers to become "super-trainers," who in turn trained 10,500 healthcare workers, and advised the healthcare facilities in their home regions. More than 10,000 copies of the free WHO/NIOSH CD-ROM containing the training program were distributed.

Academia: The Institute of Advanced Studies team incorporated the content of the needlestick prevention pilot program into the public health, occupational health, epidemiology, and nursing curricula in colleges and universities across Venezuela. Thus far, the program has reached about 5,200 graduate and undergraduate students. Sixteen research projects were conducted as part of the theses of master of public health (MPH) students.

Health and Safety Committees: The Institute of Advanced Studies team established 288 health and safety committees in hospitals in Venezuela charged with protecting the health and safety of healthcare workers in their facilities.

Immunization and Post-Exposure Prophylaxis: The Institute of Advanced Studies team immunized 80% of healthcare workers across all 23 of Venezuelan states against hepatitis B and created a mechanism for monitoring the exposures of employees in coordination with the National HIV/AIDS program.

In 2012, surveys indicated that needlestick injuries decreased 52% between 2007 and 2012 at the 810 healthcare and occupational health facilities in Venezuela that participated in the WHO/NIOSH pilot program. The project achieved success for many reasons, including favorable financial and logistical support from the Institute of Advanced Studies, strong government and nongovernment partnerships, the multidisciplinary approach that involved participants from many sectors of the healthcare and occupational health community, and especially the dedication of Dr. Martinez and her stewardship of the program.

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#### EFFORTS MADE TOWARDS ELIMINATING SILICOSIS

#### Chile

PROTECTING HEALTHCARE WORKERS FROM NEED Chile passed its National Plan to Eliminate Silicosis in 2009. The Chilean Institute of Public Health led the preparation for this achievement, with help from partners in Chile and with technical assistance of the U.S. National Institute for Occupational for assessing and controlling silica exposures. This simple sys-Safety and Health (NIOSH), Fundacentro, WHO, International Labour Organization, and the Pan American Health Organization. An accredited laboratory for silica analysis was established at the Institute of Public Health of Chile, which now serves as a

regional resource for analyses and training for South America. Another notable success has been developing simple guidance. "The Qualitative Evaluation of the Risk of Exposure to Silica." tem<sup>[URL10]</sup> for prioritizing risks was developed for four high-risk industries; aggregate crushing, ceramics, tile making, and dental laboratories

Below: A mining engineer takes dust measurements at a Chilean rock quarrying company participating in the effort to control hazardous exposure to silica in the Americas Initiative to Eliminate Silicosis, supporting the WHO/ILO Global Program for the Elimination of Silicosis.



especially the dedication of Dr. Martinez and her stewardship

# Partner collaborations: NIOSH-Occupational Hygiene Training Association

### Occupational Training Hygiene Association (OHTA)

- Informal collaboration between occupational hygiene professionals
- Goal is to foster healthy working environments throughout the world
- International program supported by
  - Many national programs, and
  - International Occupational Hygiene Association (IOHA)
- Between 2010-2016, administered 600 courses in 40 countries



#### **NIOSH-OHTA** partnership

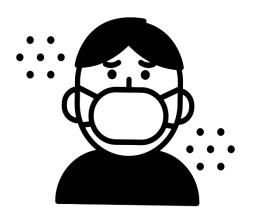
- Common mission to prevent occupational accidents and diseases worldwide
- Partnered to:
  - Develop and enhance education and training
  - Identify opportunities to promote occupational safety & health findings
  - Facilitate dissemination of information in all types of media





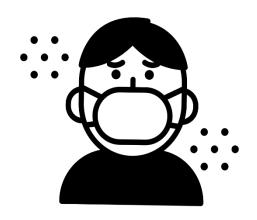


## **Initial NIOSH-OHTA Projects**

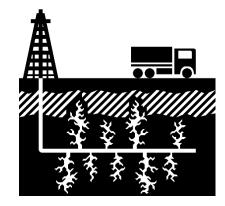


Silica control

## **Initial NIOSH-OHTA Projects**

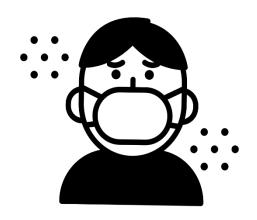


Silica control

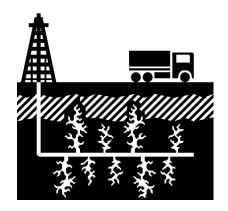


Hazards in the oil & gas industry

### **Initial NIOSH-OHTA Projects**



Silica control



Hazards in the oil & gas industry



Hearing loss and noise

#### Global impact of silica



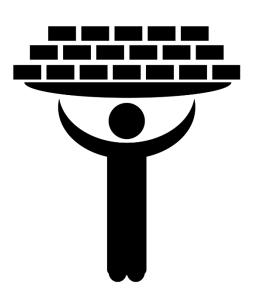


Workers employed in high-risk industries worldwide

#### Global impact of silica

- Exposure occurs across a wide span of industry
  - Construction, mining, etc.
- Exposed workers are often from vulnerable, medically underserved populations
  - Includes over 1 million children
- Results in **preventable** respiratory and nonrespiratory disease





#### **NIOSH-OHTA Silica Team**



NIOSH collaborators

Occupational Medicine physician Government certified industrial hygienist (CIH)

Health communication specialist



OHTA collaborators

Global Industry CIH Non-Governmental Organization CIH

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NIOSH collaborators

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Government certified industrial hygienist (CIH)

Health communication specialist



OHTA collaborators

Global Industry CIH



Non-Governmental Organization CIH

#### Silica project components



Reviewed and provided comment on a pre-developed student manual



#### Silica project components





Reviewed and provided comment on a pre-developed student manual

Designed awareness level training for silica control in global settings

#### Silica project components





Reviewed and provided comment on a pre-developed student manual

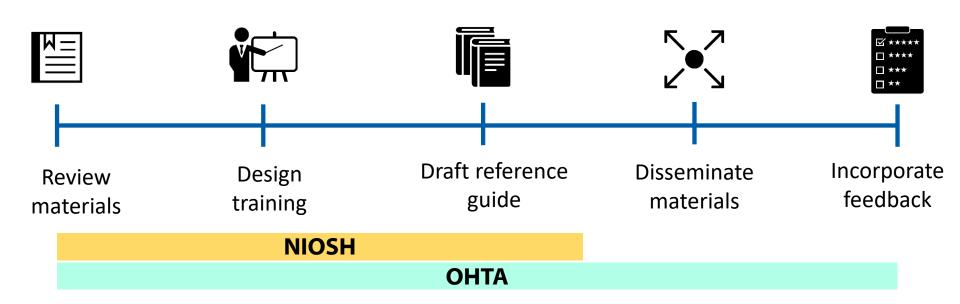
Designed awareness level training for silica control in global settings



Drafted a companion reference guide for instructional materials

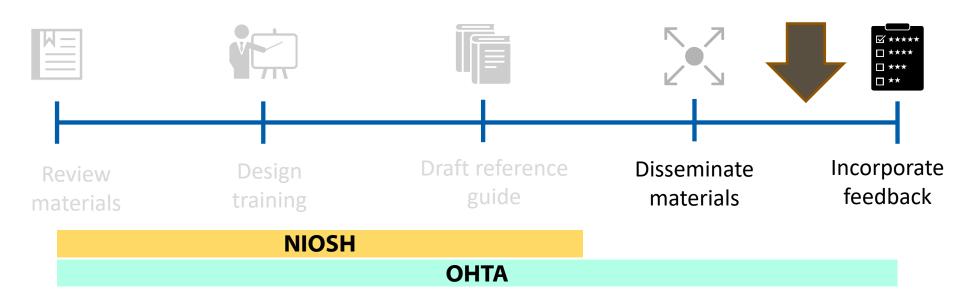
### **Current status of silica project**





### **Current status of silica project**





#### Hazards in the oil & gas industry

- In the United States, over 420,000 workers employed in oil & gas extraction
  - Annual fatality rate six times higher than the rate of all U.S. workers
- NIOSH identified as having expertise not covered in pre-existing modules
  - Perform fatality surveillance
  - Conduct research to identify and control hazards
  - Disseminate public health information





#### **NIOSH-OHTA Oil & Gas Team**



**NIOSH** 

Government CIH

**Contract CIH** 

Epidemiologist

Health communication specialist

+

Private AU occupational hygienist

**OHTA** 

#### **NIOSH-OHTA Oil & Gas Team**



**NIOSH** 

Government CIH

Contract CIH

Epidemiologist

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**OHTA** 



Reviewed pre-existing module and identified gaps in current curriculum



Reviewed pre-existing module and identified gaps in current curriculum



Experts provided suggestions to update materials



Reviewed pre-existing module and identified gaps in current curriculum



Experts provided suggestions to update materials



Vehicle safety



Reviewed pre-existing module and identified gaps in current curriculum



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Silica control



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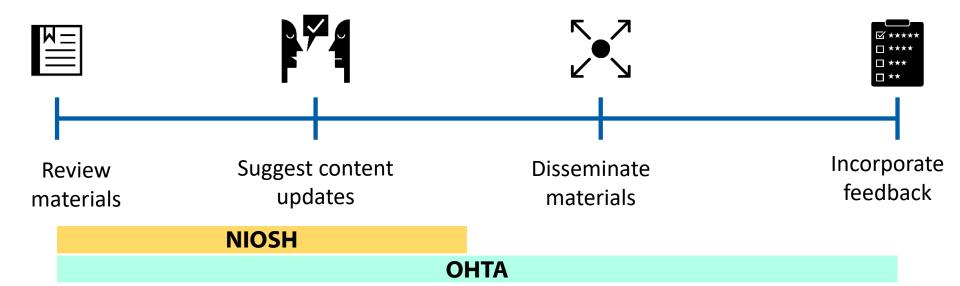
Silica control



Hydrocarbon exposure

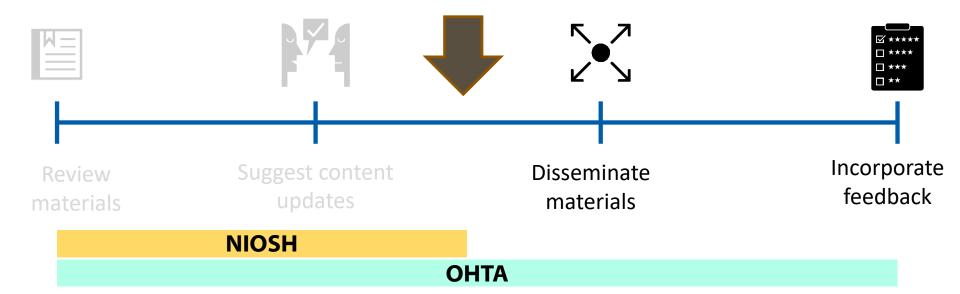
### Current status of oil & gas project





### Current status of oil & gas project







13

- Hearing loss affects approximately 466 million people worldwide
  - Occupational noise is a risk factor in 7 21% of adult-onset hearing loss cases
  - Cause of 4.2 million disability-adjusted life years (DALYs)
- Large proportion is preventable with proper workplace controls



#### **NIOSH-OHTA** hearing loss team



**NIOSH** 

Government PhD Audiologist

OHTA



Private NZ occupational hygienists

Private US CIH Private US CIH / CSP

Private US engineer

Private US engineer





**NIOSH** 



Government PhD Audiologist

**OHTA** 



Private NZ occupational hygienists

Private US CIH

Private US CIH / CSP

Private US engineer

Private US engineer





**NIOSH** 



Government PhD Audiologist

OHTA





Private NZ occupational hygienists

Private US CIH

Private US CIH / CSP

Private US engineer

Private US engineer





**NIOSH** 



Government PhD Audiologist

OHTA







Private NZ occupational hygienists

Private US CIH

Private US CIH / CSP

Private US engineer

Private US engineer







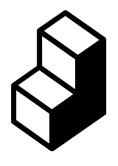
Identified areas for improvement and need to update course with practical materials







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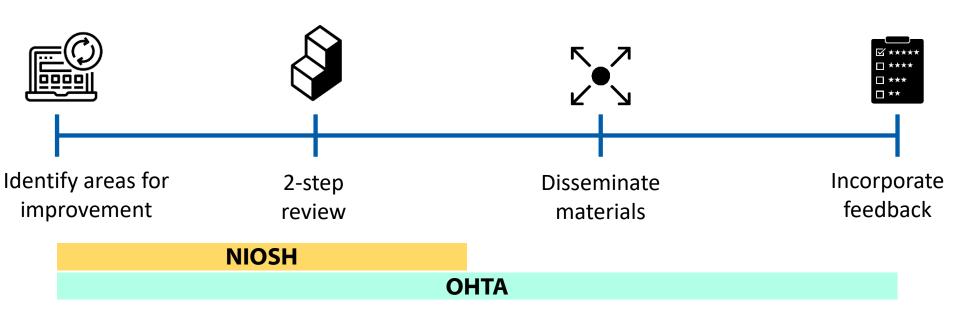


Established and performed a 2-step review process for materials

- Initial review
- Final review and implementation of changes

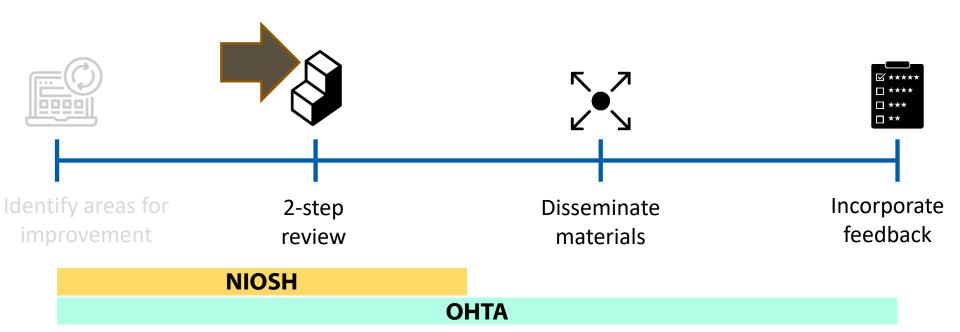
## **Current status of hearing loss project**





# **Current status of hearing loss project**

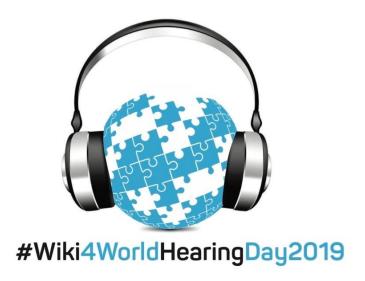




#### **World Hearing Day**

- Aimed to raise global awareness of:
  - Hearing loss and deafness prevention
  - Ear and hearing care
- Supported by:
  - U.S. and foreign gov. agencies
  - World Health Organization
  - Professional societies
  - Academia
- Launched a wiki "edit-a-thon"





#### **Activities and preliminary results**



- Translated hearing health websites into 14 different languages
- Initiated an online platform to capture contributions
- Administered a hands-on workshop

7	90	1.13K	66	74K	2.8M	<b>21</b> <sup>(i)</sup>
Articles Created	Articles Edited	Total Edits	Editors	Words Added	Article Views	Commons Uploads

Last statistics update: 6 months ago

https://outreachdashboard.wmflabs.org/courses/International Society of Audiology/Edit-a-Thon for World Hearing Day 2019

## **Requests for Technical Assistance**

Overview

#### How are technical assistance requests made?

- Direct contact with NIOSH officials
  - Scientific meeting collaborations, etc.

- Requests for assistance through PAHO/WHO
- Involvement of the NIOSH Health Hazard Evaluation (HHE) Program

#### **HHE Program Background**

 Mission: Help employers and employees recognize and control health hazards in their workplace

#### Goals:

- Provide assistance in evaluating new and recurring workplace health hazards
- Raise awareness of new and recurring hazards and preventive measures based on findings



#### **HHE Program**

- Occupational Safety and Health Act of 1970
- Authority in the United States and affiliated territories
- Have participated with International Technical Assistance efforts

#### **Examples of HHEs**

Evaluation of *Coccidioides* Exposures and Coccidioidomycosis Infections among Prison Employees





https://www2a.cdc.gov/hhe/search.asp#searchresults



## **Request for Technical Assistance**

El Salvador

#### El Salvador

Follow-up from a WHOCollaborating Center meeting

 Invited to El Salvador to expand on research of chronic kidney disease

More to come...!!!





14 January 2016

Dr. Margaret Kitt
Deputy Director
National Institute
of Occupational Health and Safety
PAHO/WHO Collaborating Center
for Occupational Health (USA-150)
Building 2400 Room 4411
Atlanta. 6A, 30329

Subject: Request for Technical Assistance for Chronic Kidney Disease of Non-traditional Origin (CKDnT)

Dear Dr. Kitt:

This letter intends to follow up on the agreements made during the meetings held at the Centers of Diseases Control and Prevention in 2015; the Globel Meeting of World Health Organization (WHO) Collaborating Centers on Occupational Health held in Jelu, Korea; and the Pan American Health Organization/Sustainable Development and Health Equity (PAHO/SDE) Meeting held in Montreal, Canada, in 2015.

Continuing PAHO's efforts to provide technical assistance to those Member States affected by the epidemics of CKDnT, we kindly request technical assistance from the National institute of Occupational Health and Safety (RIOSH) to conduct pilot intervention projects aimed to prevent and mitigate CKDnT in El Salvador.

The previous studies supported by NIOSH had great results for improving working conditions and well-being of agricultural workers in the sugar cane industry. Now we would like to advance by increasing coverage for a larger group of agricultural workers with the Water, Rest, Shade and the Work Efficiency (WE) strategies. Findings of NIOSH field work/research would be disseminated and published in the same manner as other NIOSH research, in accordance with NIOSH and PAHO policies.

We thank you for your support and collaboration

Isabella Danel, M.D., M.S Deputy Director

525 23" St. NW. Washington, DC 20037-2895 www.paho.org Tel: 202 974 3000 Fax: 202 974 3663

## Request for Technical Assistance

Zambia

#### Zambia

Central Africa

- Mineral, metal, and gemstone mining is prominent industry
  - Copper
  - Cobalt

 Mining exposures result in many hazardous exposures, including silica



Photo from: https://www.dreamstime.com/

# Developing a Centre of Excellence— Zambia Occupational Health and Safety Institute (OHSI)

- Project funded by World Bank
  - Tackle tuberculosis in Southern Africa's high burden countries
- Mining in Zambia
- Silicosis-TB relationship

- TB and silicosis in Zambia
  - TB prevalence (adults, 15 years +) is 455 per 100,000 population (Kapata, 2016)
  - Silicosis prevalence among Zambian miners is estimated to be 9-22% (unpublished data; OHSI)



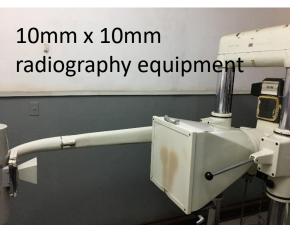








#### **Initial Visit (July 2017)**





Magnifying projection light box used for chest radiograph classification





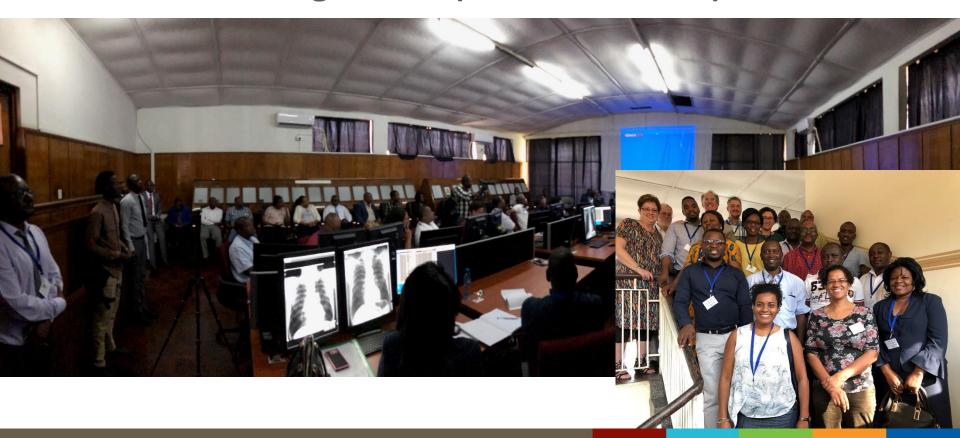
#### Improvement of imaging equipment and training

July 2017





## **B Reader Training Course (November 2018)**



## Request for Technical Assistance

Guyana

#### Guyana

 Northern part of South America, bordered by the Atlantic Ocean, Venezuela, Brazil, and Suriname

Guyana = "Land of waters"





#### **Economics in Guyana**

- Georgetown is the country's capital
  - Population mostly live in the northern coastal region
- Mining and quarrying (including gold) accounts for 15.4% of GDP (2018)
  - Includes artisanal and small-scale gold mining (ASGM)
- Government involvement
  - Guyana Geology and Mines Commission (GGMC)
  - Guyana Gold Board (GGB)

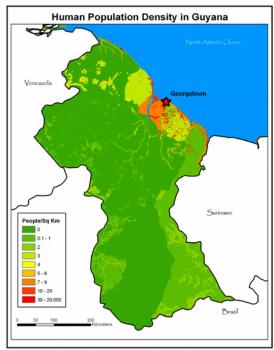


Figure 3.1: Map of human population density in Guyana based on Landscan (2002) data. Guyana's population is highly concentrated along the East Coast of Guyana.

#### **Artisanal and Small-scale Gold Mining (ASGM)**

- Employs 10-15 million miners worldwide
- Supplies up to 15% of the world's gold supply
- Results in the release of more than 1,400 tons of mercury per year
- Present in over 70 countries worldwide

#### Mercury and gold mining

- Elemental mercury routinely used in ASGM
  - Mercury is mixed with gold-containing materials, forming a mercurygold amalgam to bind the gold
  - Amalgam is heat, removing the mercury (in vapor form) from gold
  - Workers exposed to heat vapor, as is the surrounding community









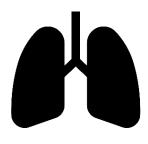
Lung damage



Lung damage



Central nervous system effects



Lung damage



Central nervous system effects



Peripheral nervous system damage



Lung damage



Central nervous system effects



Peripheral nervous system damage



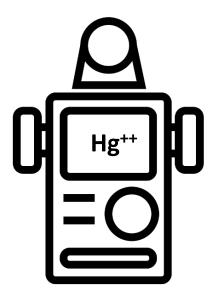
Kidney damage



#### **Technical Assistance Request**

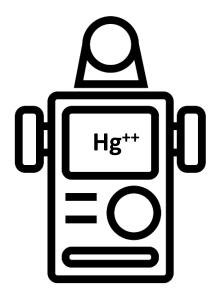
- In April 2018, the Guyana Civil Servants and General Workers Union requested help from the Pan-American Health Organization (PAHO)
- PAHO contacted NIOSH to provide technical assistance
  - GGMC Main complex included gold burning and smelting operations
  - Employees concerned about mercury exposure
  - How did NIOSH respond
    - June 2018: evaluated GGMC Main complex and interim gold burning and smelting facility
    - September 2018: GGMC Main complex, GGB facility assessment

### **Industrial Hygiene Methods**

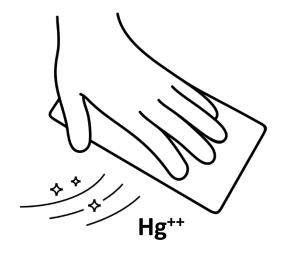


Air monitoring

### **Industrial Hygiene Methods**

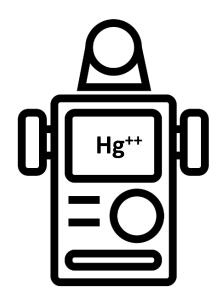


Air monitoring

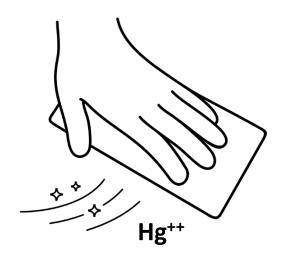


Surface samples

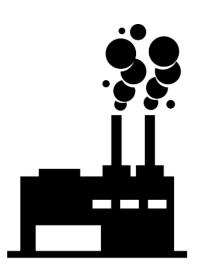
### **Industrial Hygiene Methods**



Air monitoring



Surface samples



Reviewed facility plans

#### **Medical Evaluation Methods**



Interviewed employees

#### **Medical Evaluation Methods**



Interviewed employees



Reviewed blood test results

#### **Medical Evaluation Methods**



Interviewed employees



Reviewed blood test results



Reviewed medical protocols for treatment

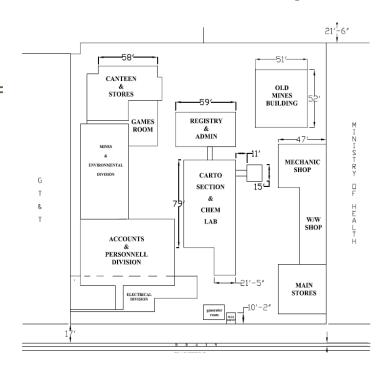
#### Follow-up Ventilation Assessment Methods

- Measured mercury vapor concentrations at GGB, GGMC and other companies in the surrounding area
- Evaluated GGB's new gold burning and smelting facility
  - Measured room supply air velocity at GGB
  - Calculated room air changes per hour
  - Measured hood face velocities
  - Assessed hood extraction effectiveness
  - Evaluated separation distance between exhaust outlet of the scrubber system and the outdoor air intakes

#### **Industrial Hygiene Air Results – GGMC Main Complex**

#### 110 measurements

- Only 4 above detectable range (LOD = 0.003 mg/m³)
- Range 0.003-0.009 mg/m³



### **Surface Wipe Sample Results**

Locations where mercury detected	Locations where mercury not detected	
Inside the burn unit	Legal office advisor's room	
Steering wheel of field vehicle	Land division map room	
Metal case inside the tent	Mines inspectorate	
Mines registry computer	Nurses unit	
Land management office desk		
Human resources desk		
Library window sill		
Audit managers desk		



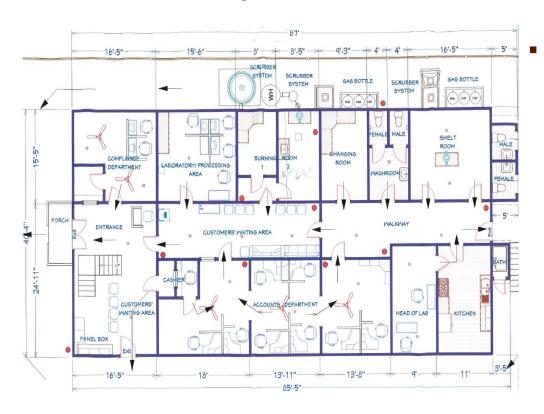
#### Industrial Hygiene Air Results – GGB Interim Facility

- 4 areas (3 rooms, 1 outdoors)
  - Two instruments used for quality assurance
  - NIOSH REL/ACGIH TLV: 0.05 mg/m<sup>3</sup>.
  - NIOSH ceiling: 0.1 mg/m³.

# Table 2. Direct reading instruments at interim gold burning facility

	Instrument 1 (mg/m³)	Instrument 2 (mg/m³)
Manager's office	0.059	0.050
Waiting room	0.177	0.077
Burn room	>0.9999	0.667
Outside building	0.058	0.077

#### **New GGB Layout**



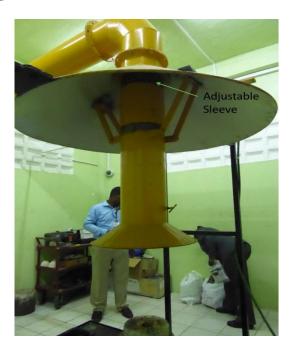
# New GGB facility located in a 2 story building

- 2 burning rooms (1 operational during visit)
- 1 smelting room
- 3 scrubber systems
- Offices located on the second floor
- Building located in the middle of homes/shops

# **Burning/Smelting Hoods and Scrubber System**



Burn hood in gold burning room 2. Photo by NIOSH. The black metal burn hood is sitting on top of a metal table.



Dual canopy smelting hood. Photo by NIOSH.



Scrubber connected to smelting hood. Photo by NIOSH.

#### **Ventilation Hoods Results**

#### Burning hood

- Average face velocity 132 feet per minute with sash open 8.5 inches.
- Average face velocity 98 fpm with sash open 10.25 inches.
- Smoke release showed it effectively captured smoke up to 4 inches.

#### Smelting hood

- Average extraction velocity was 344 fpm (sleeve closed).
- Smoke release showed good capture up to 12 inches from the face (sleeve closed) and 8 inches (sleeve open).

# **Pressurization and Scrubber System Results**

- Burning and smelting rooms
  - Air supplied > air exhausted
  - Smoke release confirmed.
  - These rooms are positive to hallway meaning contaminated air could flow into adjacent customer waiting areas and hall.

#### Scrubber system

- Separation distance between exhaust and outdoor air intakes > 30 feet.
- It is unlikely that air is reentraining mercury vapor from the exhaust.

# **Mercury in Blood Test Results**

- Interviewed 115
   employees, (111 from
   GGMC and 4 from GGB).
  - Lab workers (direct mercury exposure) 6.0 μg/L > non-lab 5.2 μg/L.
  - **Fieldworkers** 8.0 μg/L > non-field work 5.28 μg/L, p=0.03.

Table 3: Blood mercury levels by age and current job tenure of participants, μg/L, n = 115		
Age Range, years	Geometric Mean, μg/L (range)	Two-sample T-Test
18-29	4.81 (<2 – 56)	-
30-39	6.00 (<2 – 27)	p = 0.39
40-49	7.29 (<2 – 25)	p = 0.10
50 and above	5.88 (<2 – 25)	p = 0.40
Current Job		
Tenure, years		
0-<5	5.99 (<2 – 56)	-
5 – <10	4.46 (<2 – 13)	p = 0.16
10 – <15	7.24 (<2 – 27)	p = 0.42
15 and above	8.38 (<2 – 25)	p = 0.12
Total	6.0 (<2 – 56)	-

# **Consideration of Non-Occupational exposures**

#### Fish Intake-can effect blood mercury levels

# High fish intake

- Eating fish more than once per week
- Blood mercury 9.7 μg/L.

#### Low fish intake

- Eating fish less than once per week.
- Blood mercury 5.0 µg/L.

- Fish intake = confounding variable for blood mercury levels.
  - Difference in blood mercury for fieldwork vs non-field work was not significantly higher (p = 0.06).

# **Biological Exposure Index**

This is one of the reasons that ACGIH recommends biological exposure monitoring for elemental mercury in urine, not blood.

# Fish and mercury



Fish with lower levels of mercury:



Salmon



Cod Flounder



Fish with higher levels of mercury:



Marlin





Mackerel



Swordfish Grouper

SOURCE: Biodiversity Research Institute, Gorham

STAFF GRAPHIC | MICHAEL FISHER

# **Medical Interview Results**

- Acute, high level exposures typically result in lung damage
  - Employees did not report respiratory issues



- Chronic exposure typically damages central nervous system and kidneys
  - Few individuals reported being diagnosed with neurologic or kidney problems

## **Medical Treatment**

# Symptomatic (99/115)

 52% of symptomatic employees reported being treated for mercury toxemia

# Non-symptomatic

 44% of asymptomatic employees reported treatment

#### Treatment protocols

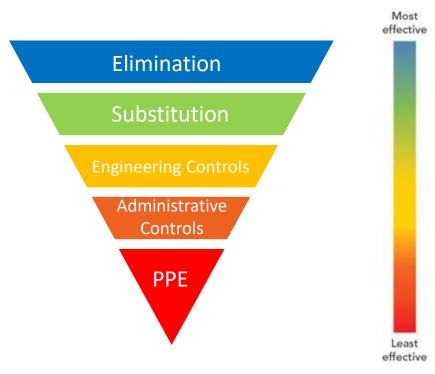
- Phase 1: Herbal, dietary, and vitamin supplements.
- Phase 2: Phase 1 +
   Dimercaptosuccinic acid
   (DMSA).
- treatment regardless of blood mercury levels

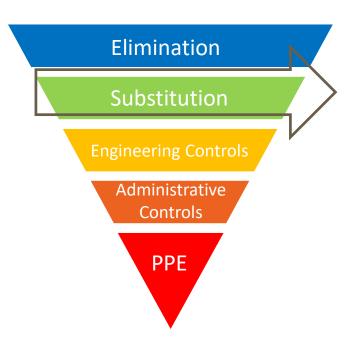
# **Guyana Technical Response Conclusions**

- High mercury vapor levels were measured at the GGB temporary burning and smelting facility
  - Shows that levels could reach or exceed ceiling limits and would likely exceed full shift exposure limits during routine GGB tasks
- Surface wipes positive for mercury in many areas, especially dusty ones
- Employees had higher levels of mercury in their blood than in the general population with accessible data
  - However the degree of workplace contribution vs fish consumption could not be separated

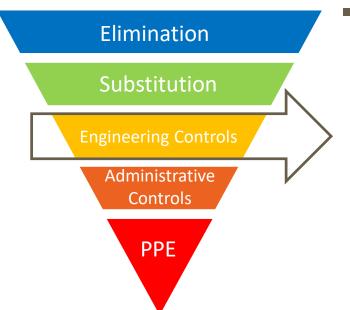
# **Guyana Technical Response Conclusions (continued)**

- Chelation should be based on clear exposure history and objective evidence of exposure
  - Employee and health provider should have a discussion about the risks and side effects of chelation therapy
  - The evidence supporting the use of homeopathic medications and non-vitamin dietary or herbal supplements is lacking and could cause more harm than good.

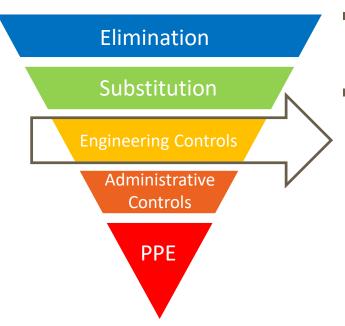




- Use alternative to mercury during amalgamation of gold
  - Borax

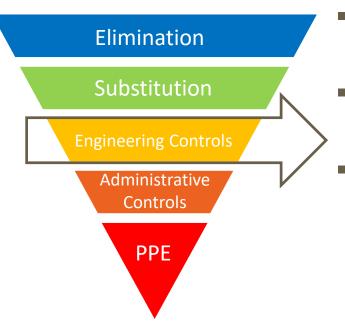


Remove mercury-contaminated items



Remove mercury-contaminated items

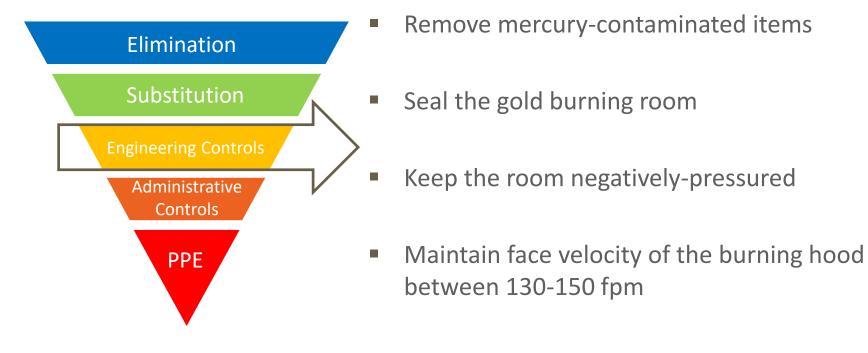
Seal the gold burning room

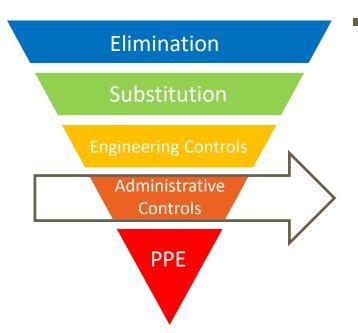


Remove mercury-contaminated items

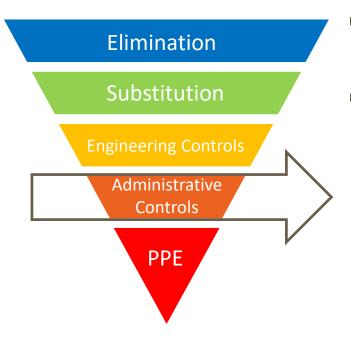
Seal the gold burning room

Keep the room negatively-pressured

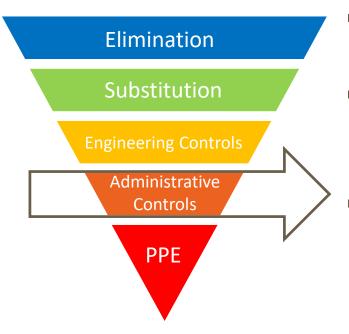




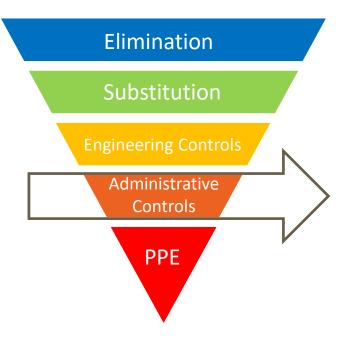
Collect full-shift personal measurements



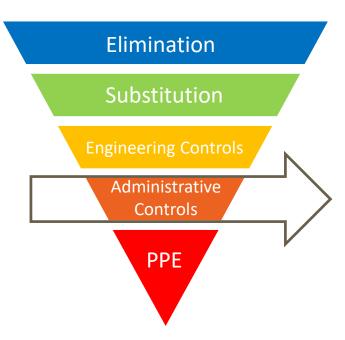
- Collect full-shift personal measurements
- Develop and implement a respiratory protection program



- Collect full-shift personal measurements
- Develop and implement a respiratory protection program
- Implement a medical monitoring program

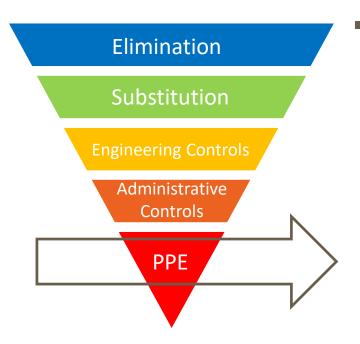


- Collect full-shift personal measurements
- Develop and implement a respiratory protection program
- Implement a medical monitoring program
- Develop standard operating procedures for mercury monitoring and fume hood checks

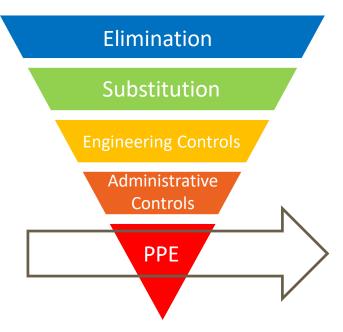


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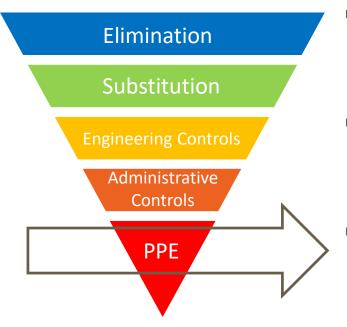
Develop a corrective maintenance program



Ensure proper fit testing, storage, and use of respirators

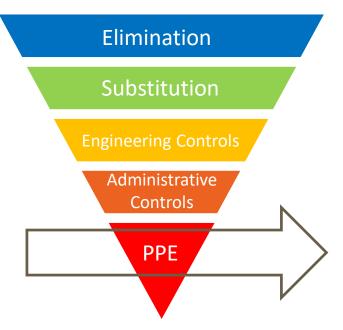


- Ensure proper fit testing, storage, and use of respirators
- Use nitrile gloves under heat resistant gloves to prevent skin contact



Ensure proper fit testing, storage, and use of respirators

- Use nitrile gloves under heat resistant gloves to prevent skin contact
- Wear boot/shoe covers inside burning rooms



Ensure proper fit testing, storage, and use of respirators

- Use nitrile gloves under heat resistant gloves to prevent skin contact
- Wear boot/shoe covers inside burning rooms

Provide washable or disposable coveralls

# Acknowledgements

- PAHO and all partners
- Brian Curwin
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- Maria Strickland
- Marilyn Fingerhut
- John Gibbins
- Douglas Trout
- David Spainhour

# Thank you!

# Questions?

For more information, contact CDC 1-800-CDC-INFO (232-4636) TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

