JOINT TECHNICAL SYMPOSIUM
OCTOBER 10, 2024

CDPH's Occupational Health Branch

Kristin J. Cummings, MD, MPH
Occupational Health Branch
California Department of Public Health

Outline

- Background
  - History of CDPH's Occupational Health Branch (OHB)
  - OHB's Mission and Values
- OHB Activities
  - Lead poisoning
  - Silicosis related to engineered stone
  - Fatal injuries
  - Infectious diseases: Valley fever

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What is occupational health?

Area of public health that focuses on:

- Prevention of work-related injuries and diseases
- Protection and promotion of health of workers
- Improvement of working conditions and environment

Occupational Safety and Health Act
April 28, 1971

"…to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources…."

- Occupational Safety and Health Administration (OSHA)
  - Department of Labor
  - Regulatory authority
- National Institute for Occupational Safety and Health (NIOSH)
  - Department of Health and Human Services
  - Public health/research institute

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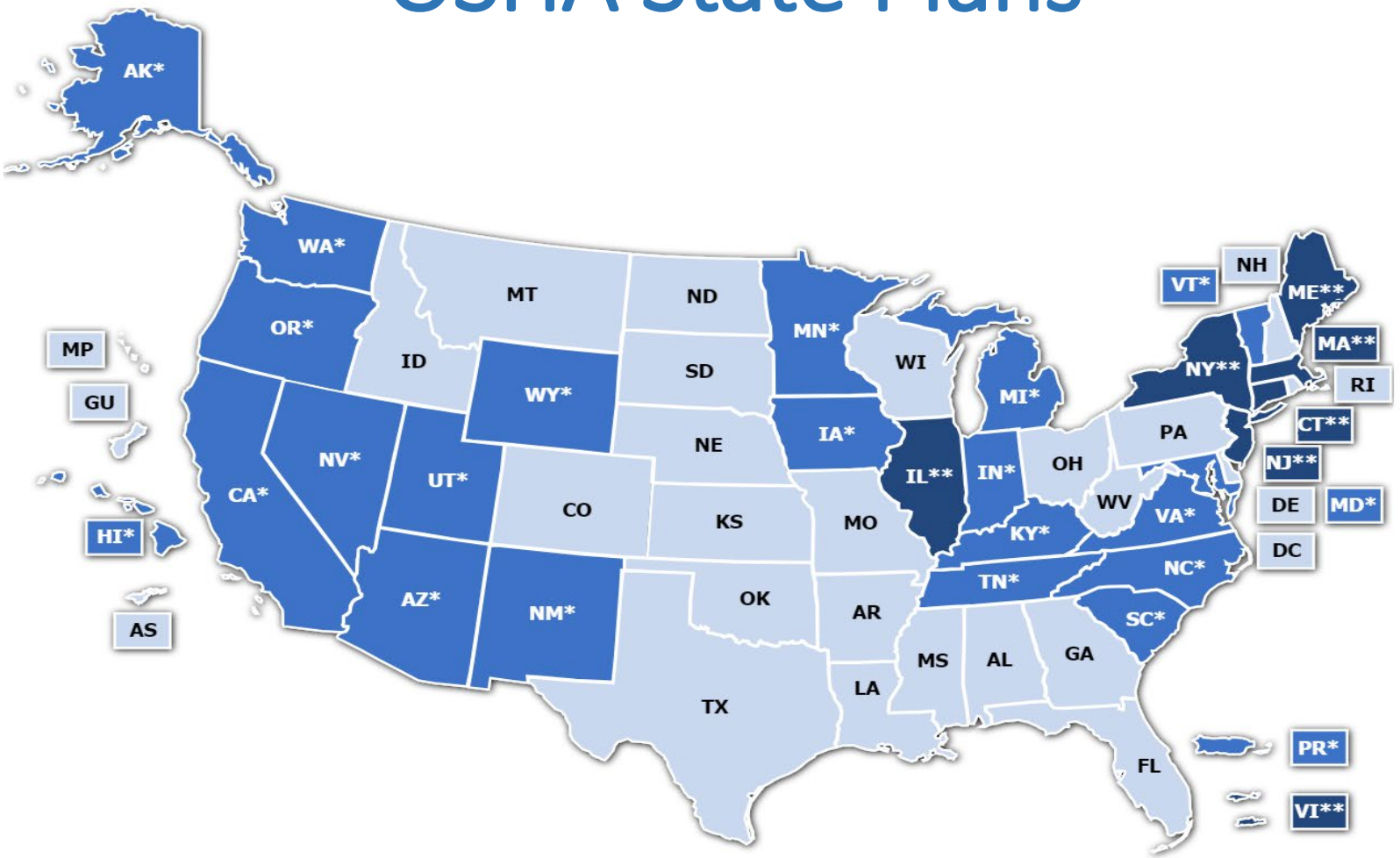
OSHA State Plans



* This state's OSHA-approved State Plan covers private and state/local government workplaces.

** This state's OSHA-approved State Plan covers state/local government workers only.

This state (with no asterisk *) is a federal OSHA state.

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California Occupational Safety and Health Act of 1973

"…enacted for the purpose of assuring safe and healthful working conditions for all California working men and women…"

- Division of Occupational Safety and Health (Cal/OSHA)
  - Develops and enforces standards
- Occupational Safety and Health Standards Board
  - 7 members appointed by Governor
  - Adopts, maintains, and revises standards
- Occupational Safety and Health Appeals Board
  - Resolves disputes arising out of enforcement

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Occidental Chemical Company

- Began operations in 1953
- Located in Lathrop (San Joaquin County)
- Manufactured fertilizers and ammonia
- Manufactured and formulated pesticides
- Mid-1970s: male workers and union concerned about infertility

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THE LANCET, DECEMBER 17, 1977

INFERTILITY IN MALE PESTICIDE WORKERS

DONALD WHORTON
University of California, Berkeley

RONALD M. KRAUSS
Endocrinology Service, Alta Bates Hospital, Berkeley

SUMNER MARSHALL
Department of Urology, Alta Bates Hospital, Berkeley, and University of California, San Francisco

THOMAS H. MILBY
Environmental Health Associates, Berkeley, California, U.S.A.

Summary A number of cases of infertility were discovered among men working in a California pesticide factory. The suspected cause was exposure to the chemical 1,2-dibromo-3-chloropropane (D.B.C.P.). The major effects, seen in 14 of 25 non-vasectomised men, were azoospermia or oligospermia and raised serum-levels of follicle-stimulating hormone and luteinising hormone. No other major abnormalities were detected, and testosterone levels were normal. Although a quantitative estimation of exposure could not be obtained, the observed effects appeared to be related to duration of exposure to D.B.C.P.

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COMPARISON OF NON-VASECTOMISED D.B.C.P. WORKERS WITH VERY LOW (GROUP A) AND NORMAL (GROUP B) SPERM-COUNTS*

Group	No. of subjects	Age (yr)	Exposure (yr)	Sperm-count ($\times 10^6$/ml)	F.S.H. (mI.U./ml)	L.H. (mI.U./ml)	Testosterone (ng/dl)
A	11	32·7±1·6†	8·0 ±1·2‡	0·2±0·1§	11·3±1·8‡	28·4±3·3†	459±35
B	11	26·7±1·2†	0·08±0·02‡	93±18	2·6±0·4‡	14·0±2·8†	463±31

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Dibromochloropropane (DBCP)

- Pesticide used against nematodes that damage pineapples, bananas and other tropical fruits
- Suspected as cause of male infertility at Occidental Chemical Co.
  - Volume of DBCP used at facility
  - Relationship between exposure and sperm count
  - Experimental studies documented testicular toxicity in rodents

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TOXICOLOGY AND APPLIED PHARMACOLOGY 3, 545-559 (1961)

Toxicologic Investigations of 1,2-Dibromo-3-Chloropropane

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California's Response to DBCP

- Right-to-Know Law
  - Hazards of workplace substances
  - Access to personal medical records
- Centers for Occupational and Environmental Health (COEHs)
  - Teaching, research, and service
  - Northern and Southern UC campuses
- Hazard Evaluation System and Information Service (HESIS)
  - Provide early warning about toxic substances
  - Investigate new and unrecognized workplace hazards

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  - Beginning of the Occupational Health Branch

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Occupational Health Branch

- Hazard Evaluation System and Information Service (HESIS)
- Occupational Health Surveillance and Evaluation Program (OHSEP)
- Occupational Lead Poisoning Prevention Program (OLPPP)
- California Safe Cosmetics Program (CSCP)
- Emerging Workplace Hazards Unit (EWHU)

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OHB mission:
Promoting safe and healthy workplaces across California

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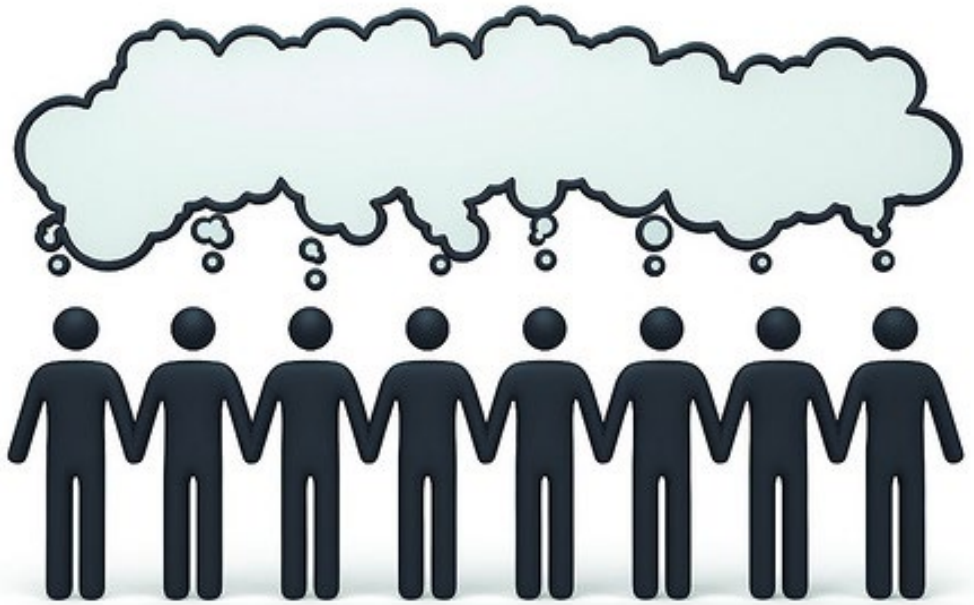
OHB Values

- Utilize & contribute to the science
- Collaborate across disciplines
- Mentor future occupational health workforce
- Partner with others
- Focus on promoting health equity



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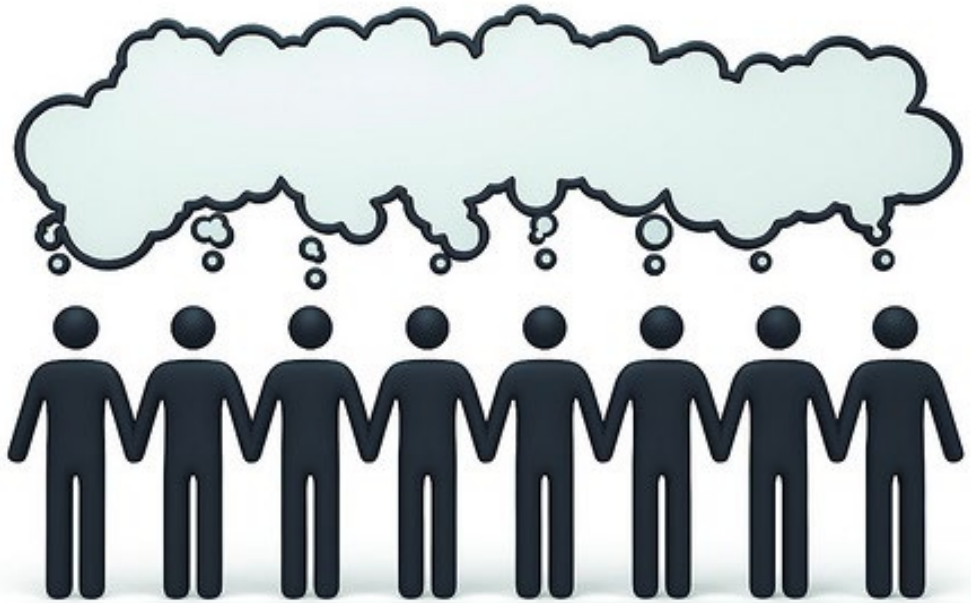

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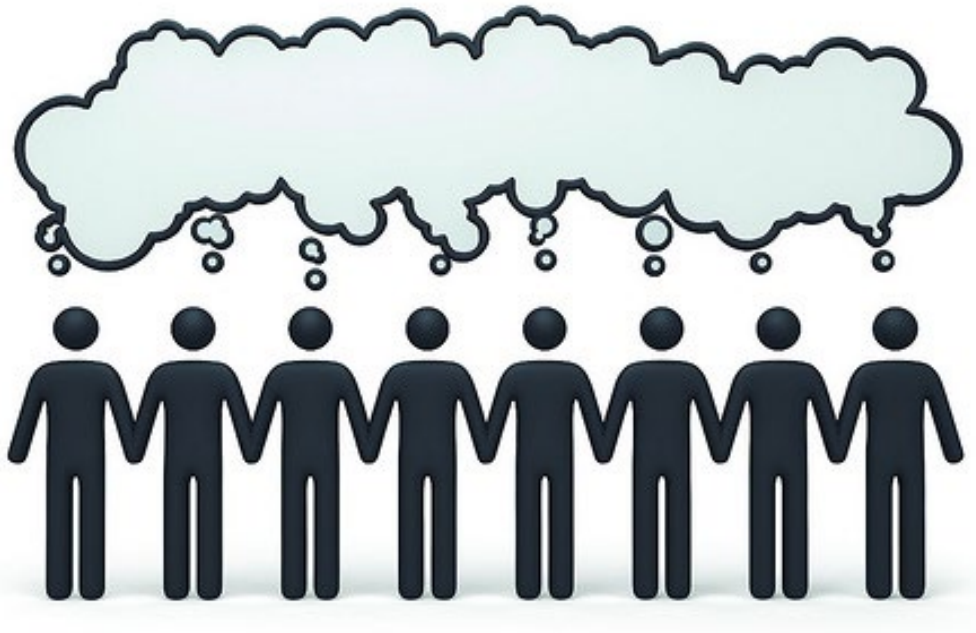

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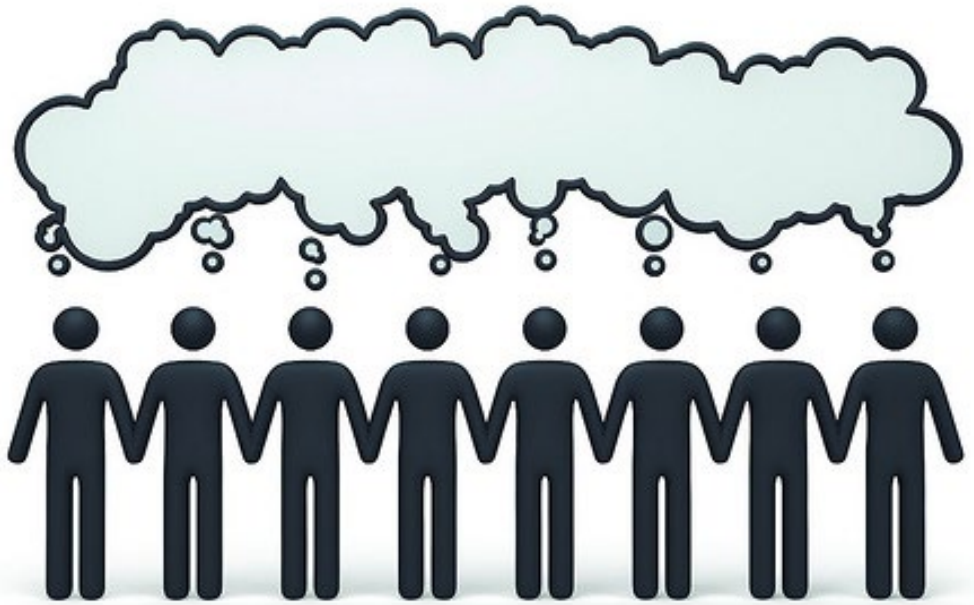

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Lead

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Exposure to high levels of lead can cause severe damage to the brain, blood and kidneys.

Children under six are most at risk from lead poisoning. Even low levels of lead exposure have been found to permanently reduce cognitive ability and cause hyperactivity in children.

ADULTS

Brain
Memory loss, lack of concentration, headaches, irritability, depression.

Body
Fatigue, joint and muscle pain

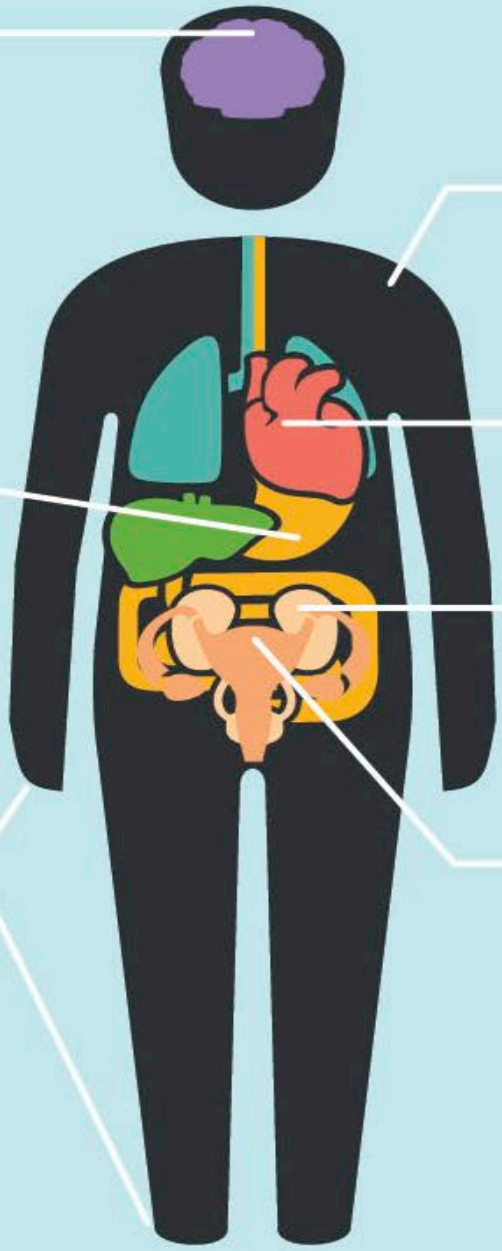
Cardiovascular
High blood pressure

Digestive System
Constipation, nausea and poor appetite

Kidneys
Abnormal function and damage

Nervous System
Damage including numbness and pain in the extremities

Reproductive System
Men: Decreased sex drive and sperm count, and sperm anomalies.
Women: Spontaneous miscarriage



CHILDREN

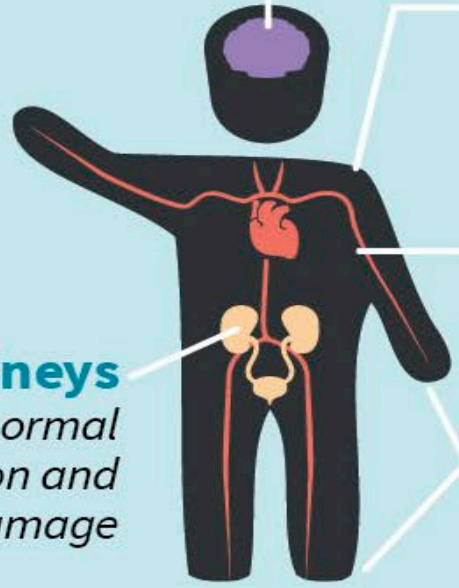
Brain
Behavior problems, lower IQ, hearing loss, learning disabilities

Body
decreased bone and muscle growth

Blood
Anemia

Kidneys
Abnormal function and damage

Nervous System
Damage



Signs & symptoms of lead toxicity

SIGNS	SYMPTOMS
Hypertension	GI discomfort
Low birth weight	Headache
Decreased GFR	Fatigue
Anemia	Insomnia
Low sperm count	Myalgias
	Decreased Libido
	Peripheral neuropathy
	Wrist drop

< 1 µg/dL
Mean

5-19 µg/dL
Hypertension, Renal dysfunction,
Low birth weight,
Spont. abortion

20-39 µg/dL
Start systemic symptoms

> 40 µg/dL Sperm abnormalities,
Neurocognitive deficits

> 80 µg/dL
All symptoms pronounced, Extensor muscle weakness

> 100 µg/dL
Encephalopathy

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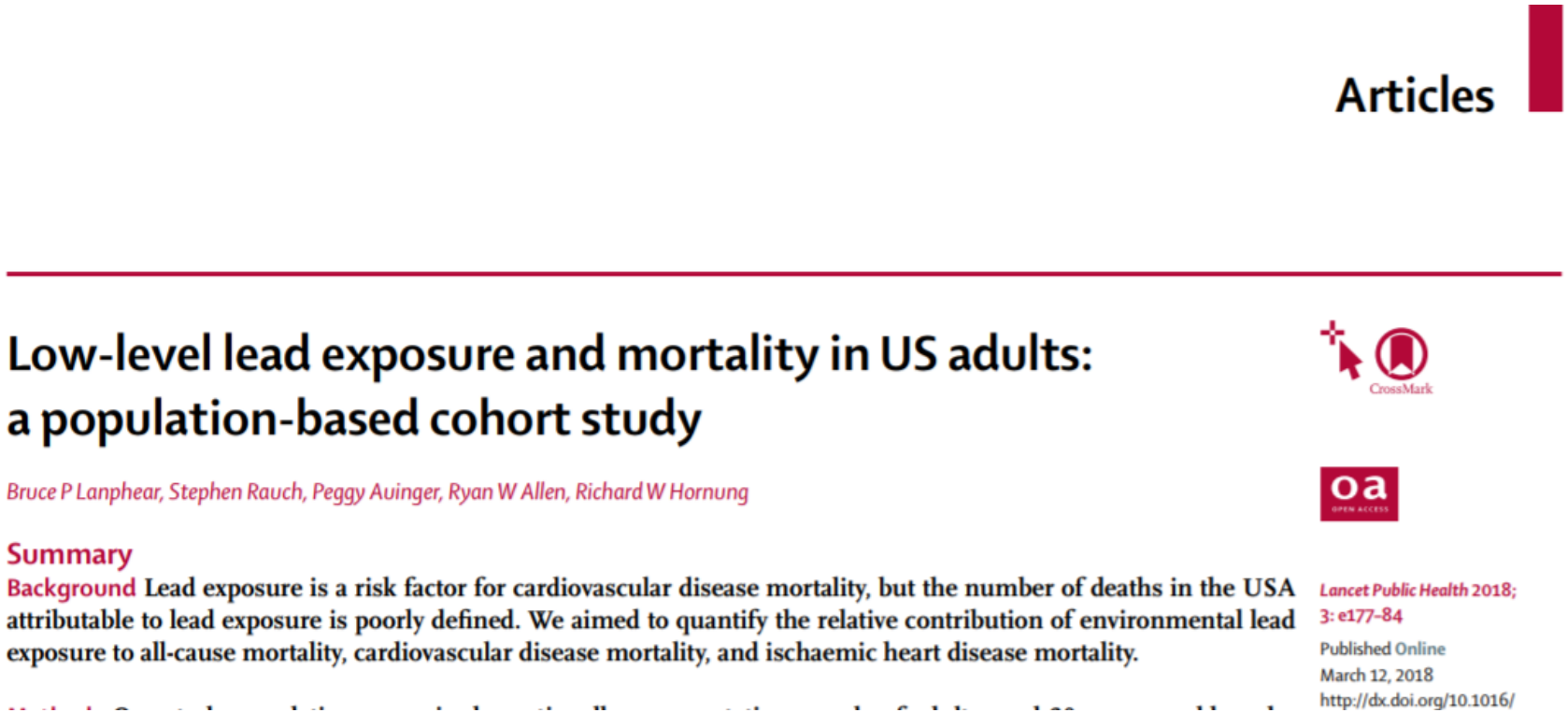
Treatment

- Removal from exposure! + Time
- Chelation rarely used
  - Blood lead 50-99 mcg/dL with significant symptoms
  - Blood lead >100 mcg/dL usually needed
- Oral chelation: Succimer (DMSA) ~ 2 week therapy
- IV chelation: Calcium disodium EDTA ~ 3-5 day therapy

THINK OF LEAD AS A CHRONIC DISEASE, with mortality risk!



Articles

Low-level lead exposure and mortality in US adults: a population-based cohort study

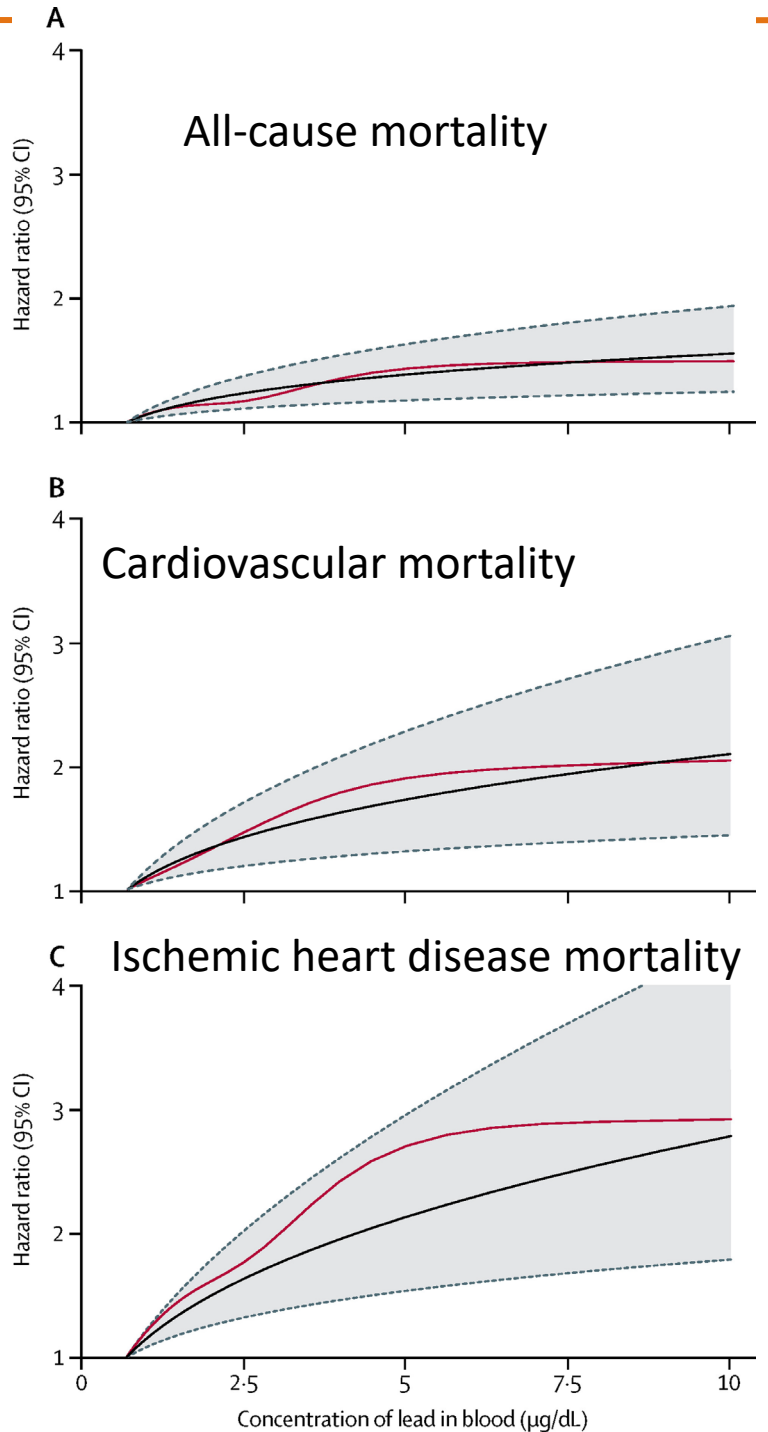
Bruce P Lanphear, Stephen Rauch, Peggy Auinger, Ryan W Allen, Richard W Hornung

Summary

Background Lead exposure is a risk factor for cardiovascular disease mortality, but the number of deaths in the USA attributable to lead exposure is poorly defined. We aimed to quantify the relative contribution of environmental lead exposure to all-cause mortality, cardiovascular disease mortality, and ischaemic heart disease mortality.

Lancet Public Health 2018; 3: e177–84

Published Online March 12, 2018 http://dx.doi.org/10.1016/

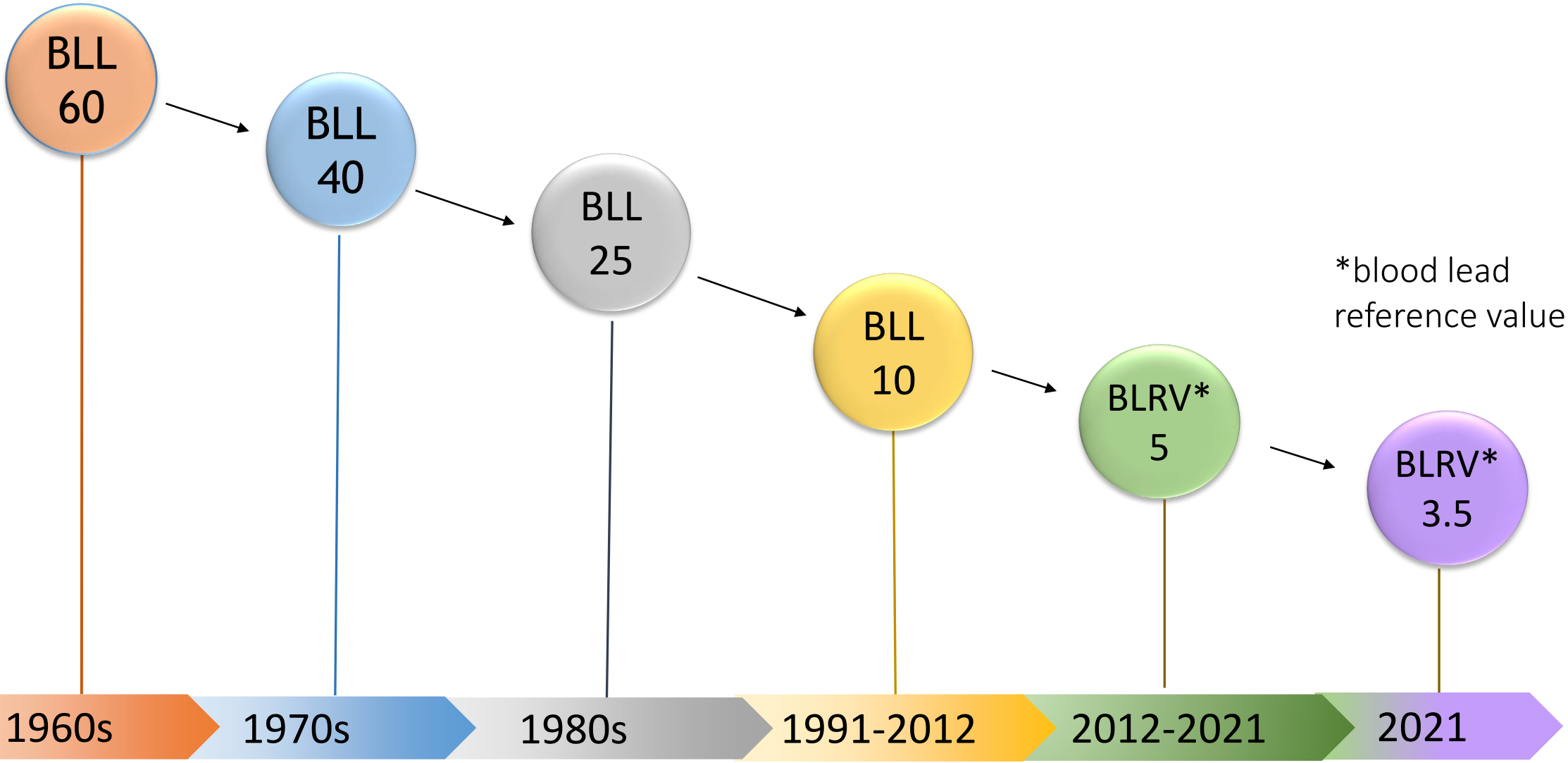


Dose-response curves for concentrations of lead in blood and mortality

Adjusted hazard ratios (black lines) with 95% CIs (hatched lines) and restricted cubic spline (red lines) for (A) all-cause mortality, (B) cardiovascular disease mortality, and (C) ischemic heart disease mortality.

Lanphear et al. *Lancet Pub Health*. 2018

CDC Blood Lead Level (BLL) of Concern (**µg/dL**)



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Among adults with known lead exposures and BLLs of 10 µg/dL or more, ~ 90% had occupational exposure

(https://www.cdc.gov/niosh/lead/data/index.html)

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Work exposures

- Construction: Melt, weld, cast, cut, grind, solder lead-containing metal alloys (brass, bronze, copper), bridge repair, paint blasting/removal
- Recycling: batteries, scrap metal, electronics, cables
- Ceramics glazing
- Battery manufacturing
- Shooting ranges
- Home remodeling (built before 1978)
- Metal radiator repair

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Occupational Lead Poisoning Prevention Program (OLPPP)

- Established in 1991, supported by fees on employers
- Manages the California Occupational Blood Lead Registry
- Investigates work-related lead poisoning cases
- Provides information and technical assistance to employers, workers, physicians, and others
- Conducts projects to prevent and reduce lead poisoning in California workplaces
- Not enforcement

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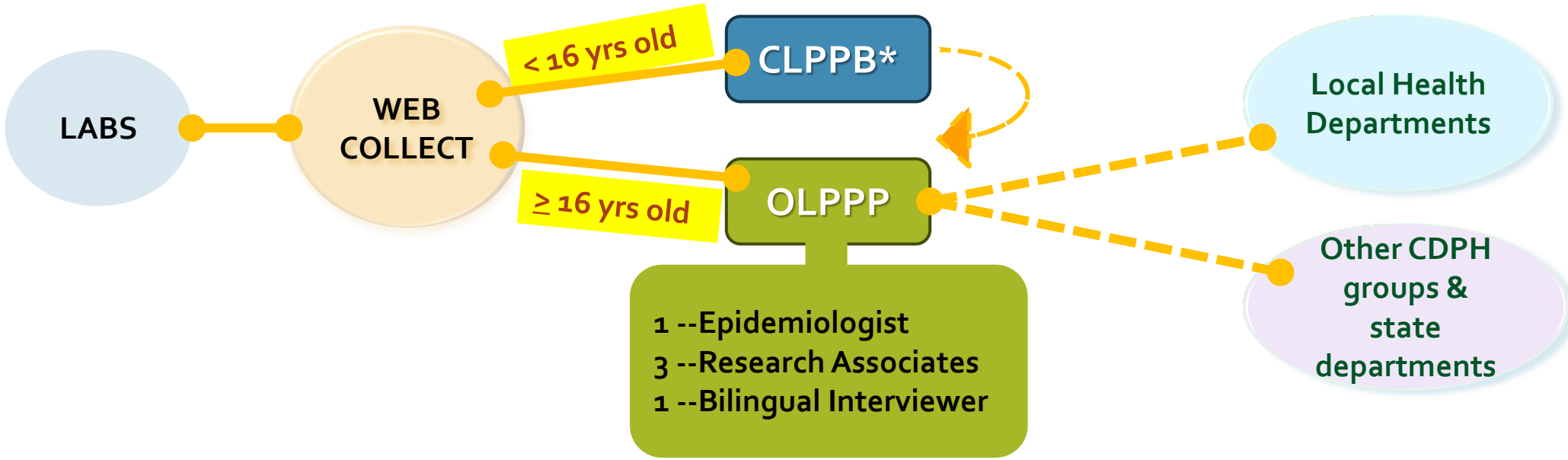
ELVIS = Elevated Lead Visual Information System

**CLPPB = Childhood Lead Poisoning Prevention Branch*

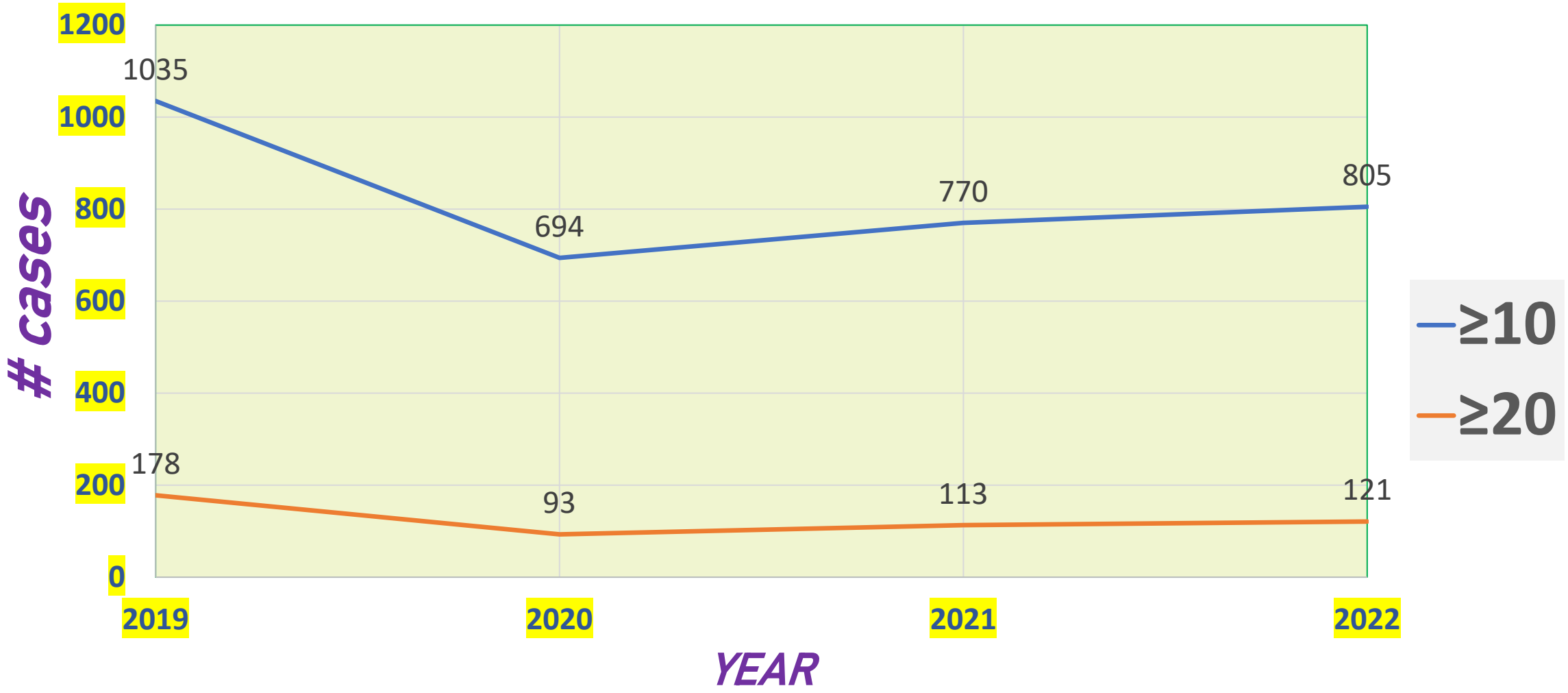


OLPPP receives ~ 60,000 to 70,000 BLL results per year

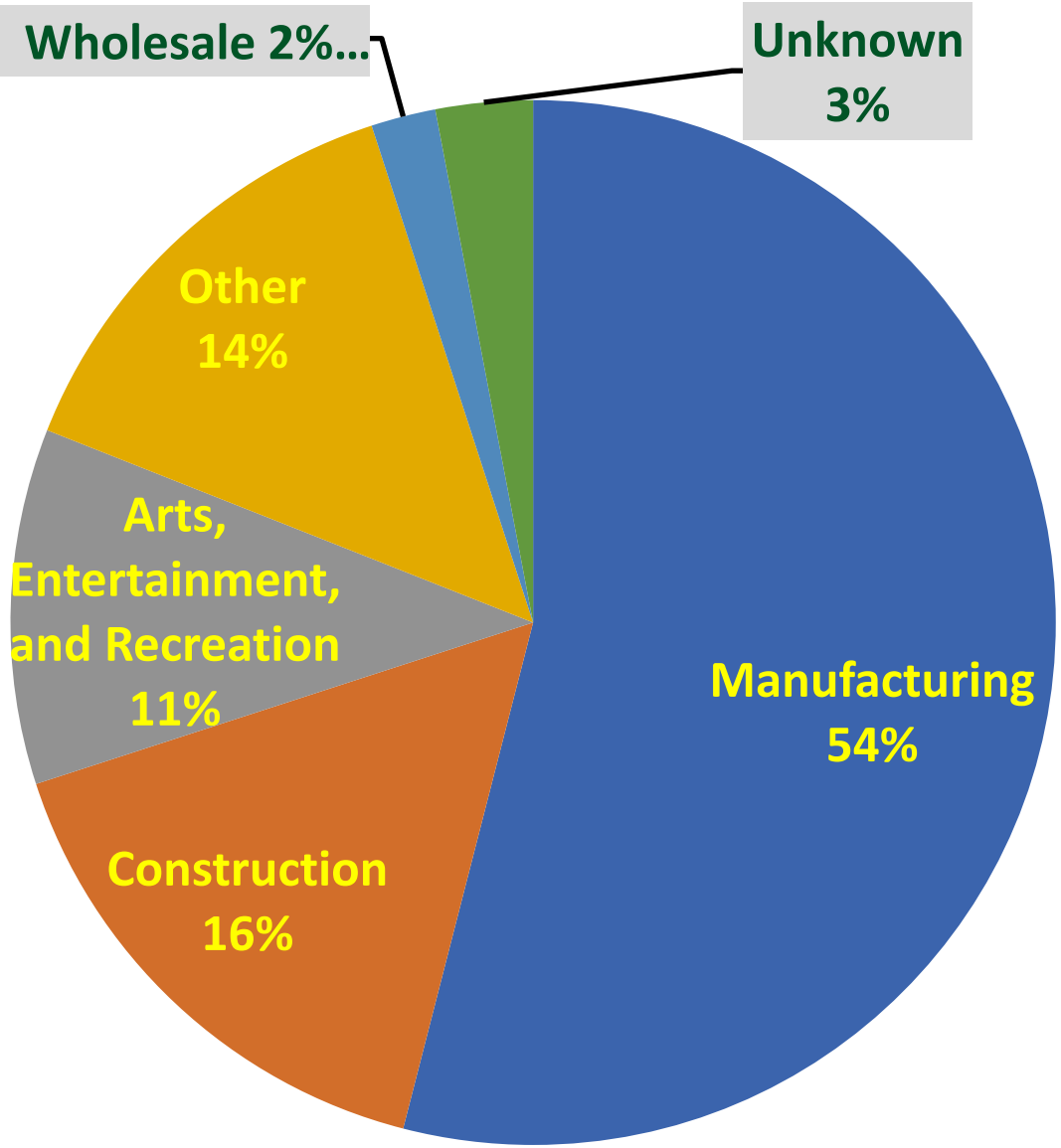
Who are the workers?

- Men! 96-97% of the California Occupational Blood Lead Registry
- Ages 20-59
- Hispanic

Workers with Elevated BLLs, by Year (≥ 10 µg/dL & ≥ 20 µg/dL)



BLLs ≥10 µg/dL, by Industry Sector (2019 – 2022)



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Top 5 Industries BLL ≥20 µg/dL (2020-2024)

Industry	Number of Employers
Firing ranges	**24**
Painting Contractors	10
Remediation Services	10
Police Protection	10
Storage Battery Manufacturing	6

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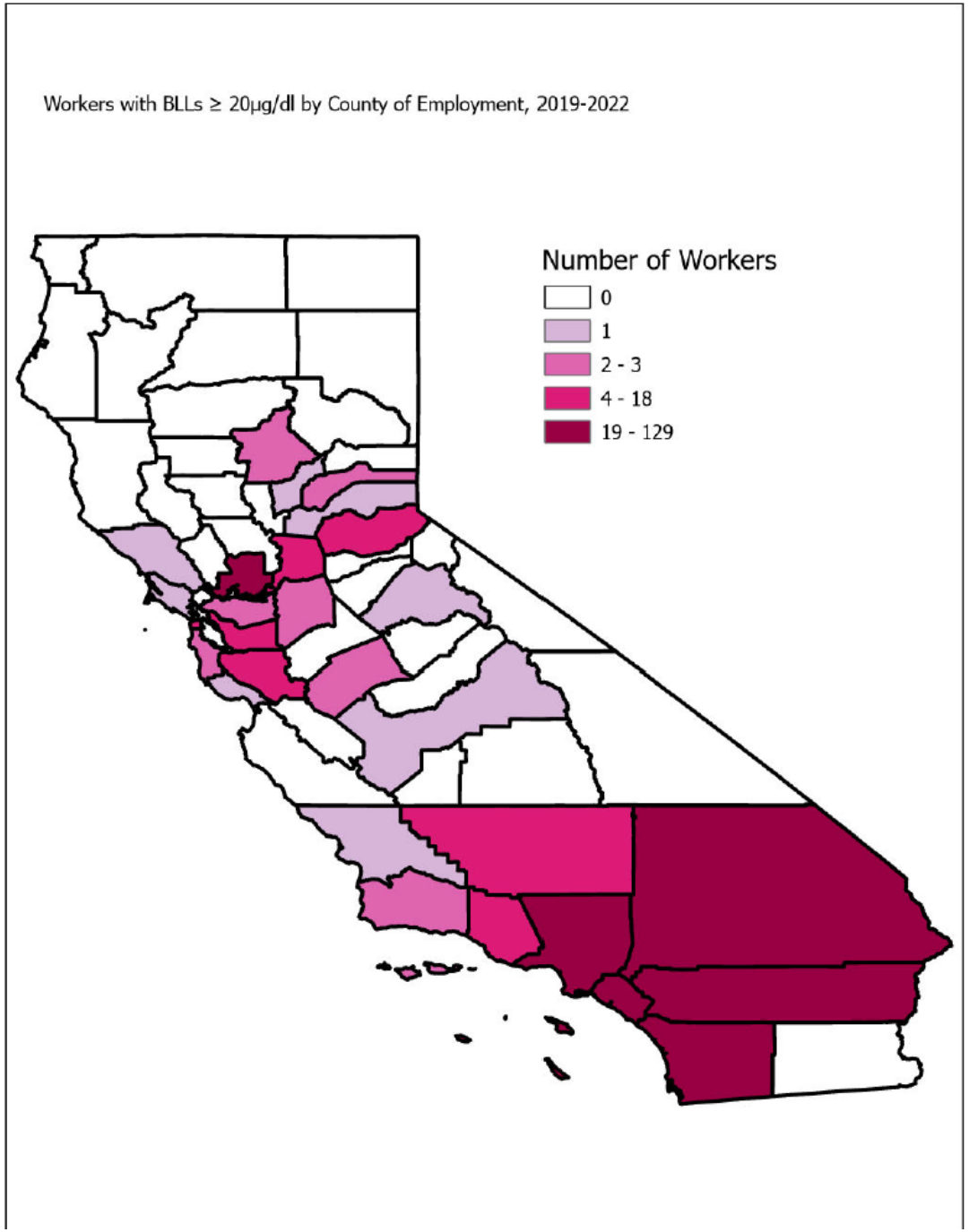
Workers with BLLs ≥ 20µg/dl by County of Employment, 2019-2022
Number of Workers
0
1
2 - 3
4 - 18
19 - 129

Coming soon:
Lead standards amendments

- On February 15th the Cal/OSHA Standards Board voted 5-2 to approve proposed amendments to the lead standards
- Regulations will be effective January 1, 2025
- This was a longstanding OHB priority dating back to more than a decade ago, when OLPPP recommended that Cal/OSHA revise its outdated regulations
- California's workers will be far better protected from lead exposures moving forward

https://www.dir.ca.gov/OSHSB/Lead.html

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Lead Standards Changes - Highlights

- Lower air levels of lead
- More frequent BLL testing
- More effective medical removal protections
- Stricter hygiene requirements regardless of air lead levels
- More stringent training requirements

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Silica

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Silicosis: Old Disease, New Risks

- Silicosis is a severe, incurable lung disease caused by inhaling silica dust particles.
- Engineered stone (artificial stone, quartz), material used for kitchen countertops, contains **especially high levels of silica (>90%).**
- Workers who **cut and grind engineered stone** (stone fabricators) can be exposed to **hazardous levels of silica dust**.

Photo credit: Earl Dotter

https://publichealthwatch.org

Respirable Crystalline Silica (RCS)

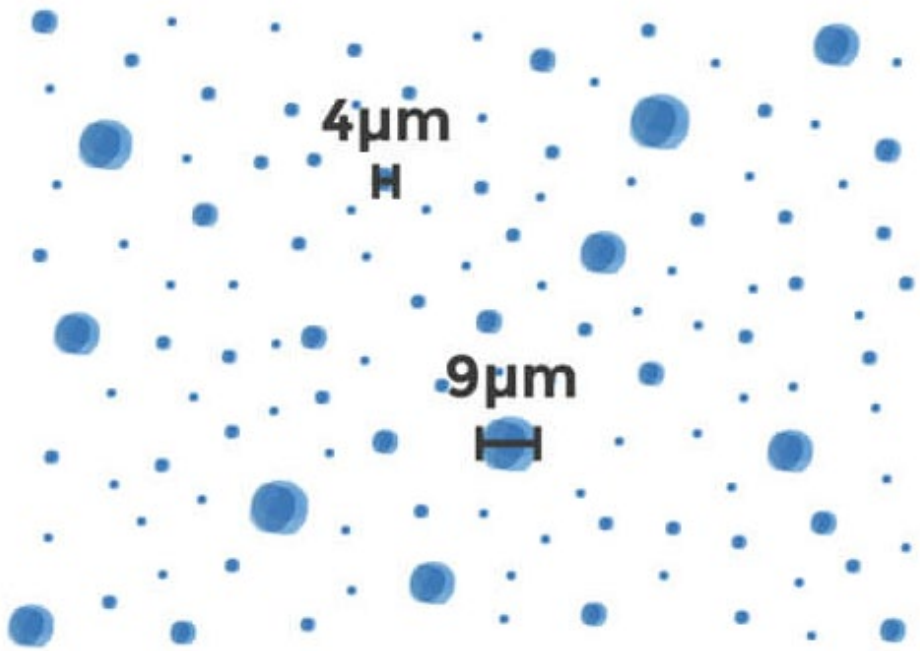
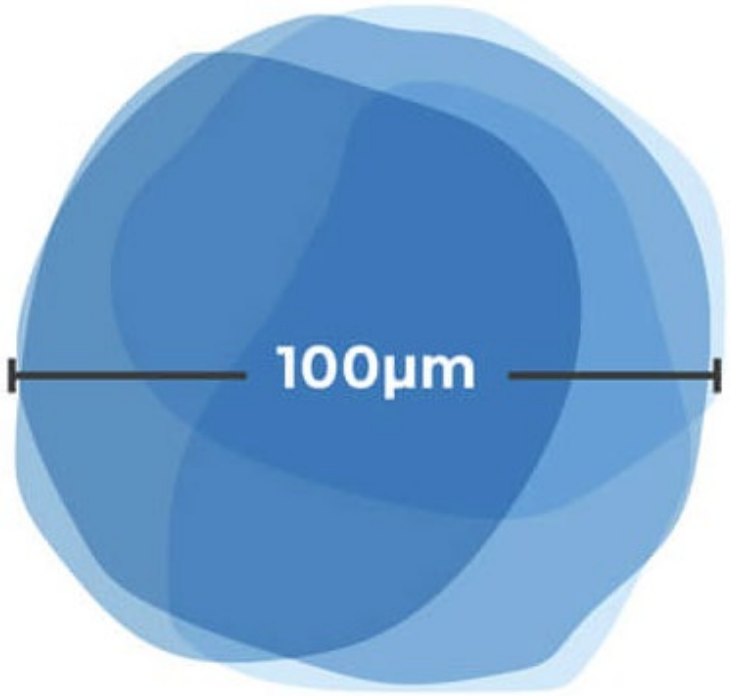


Table Salt



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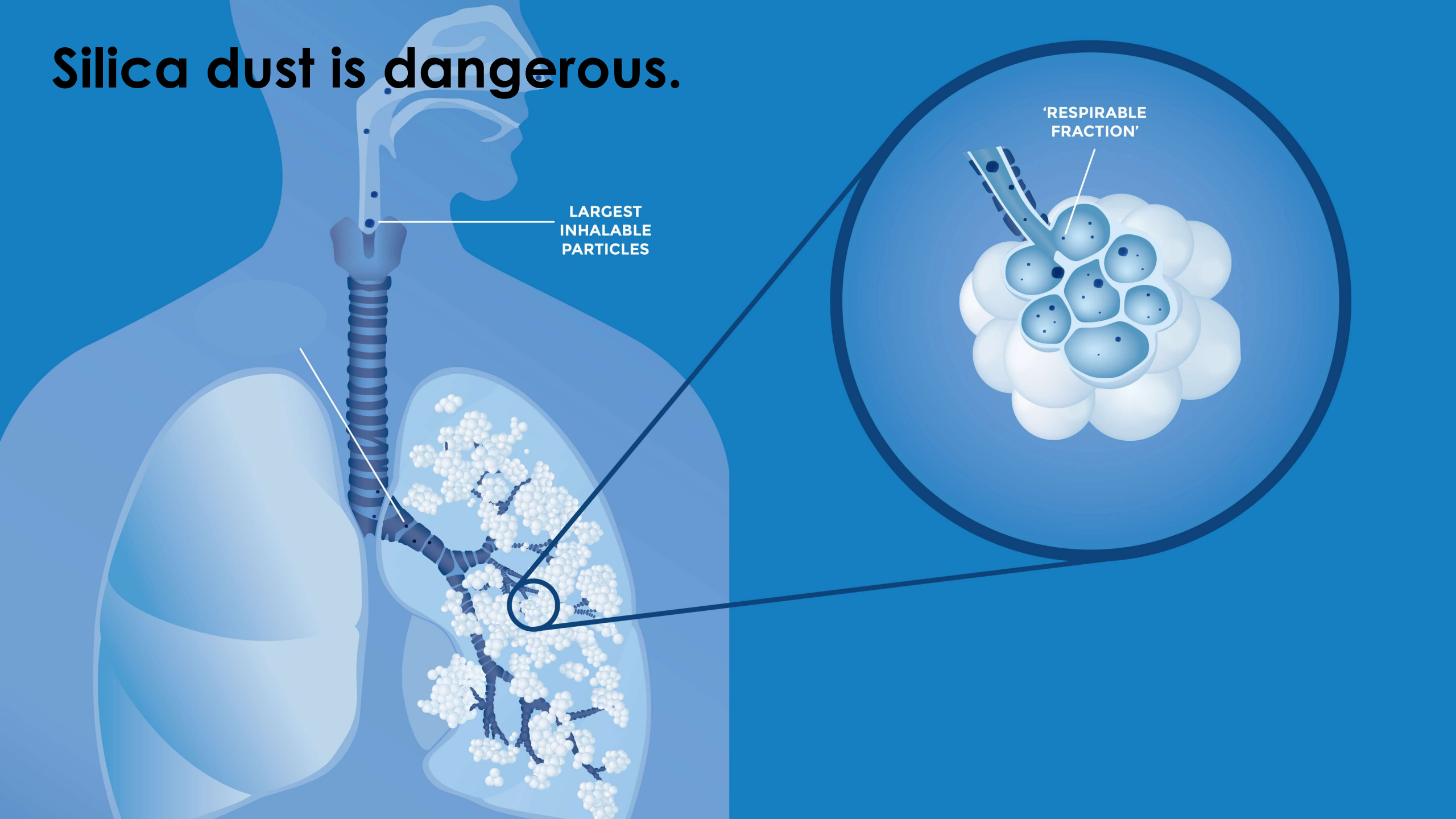
Silica dust is dangerous.



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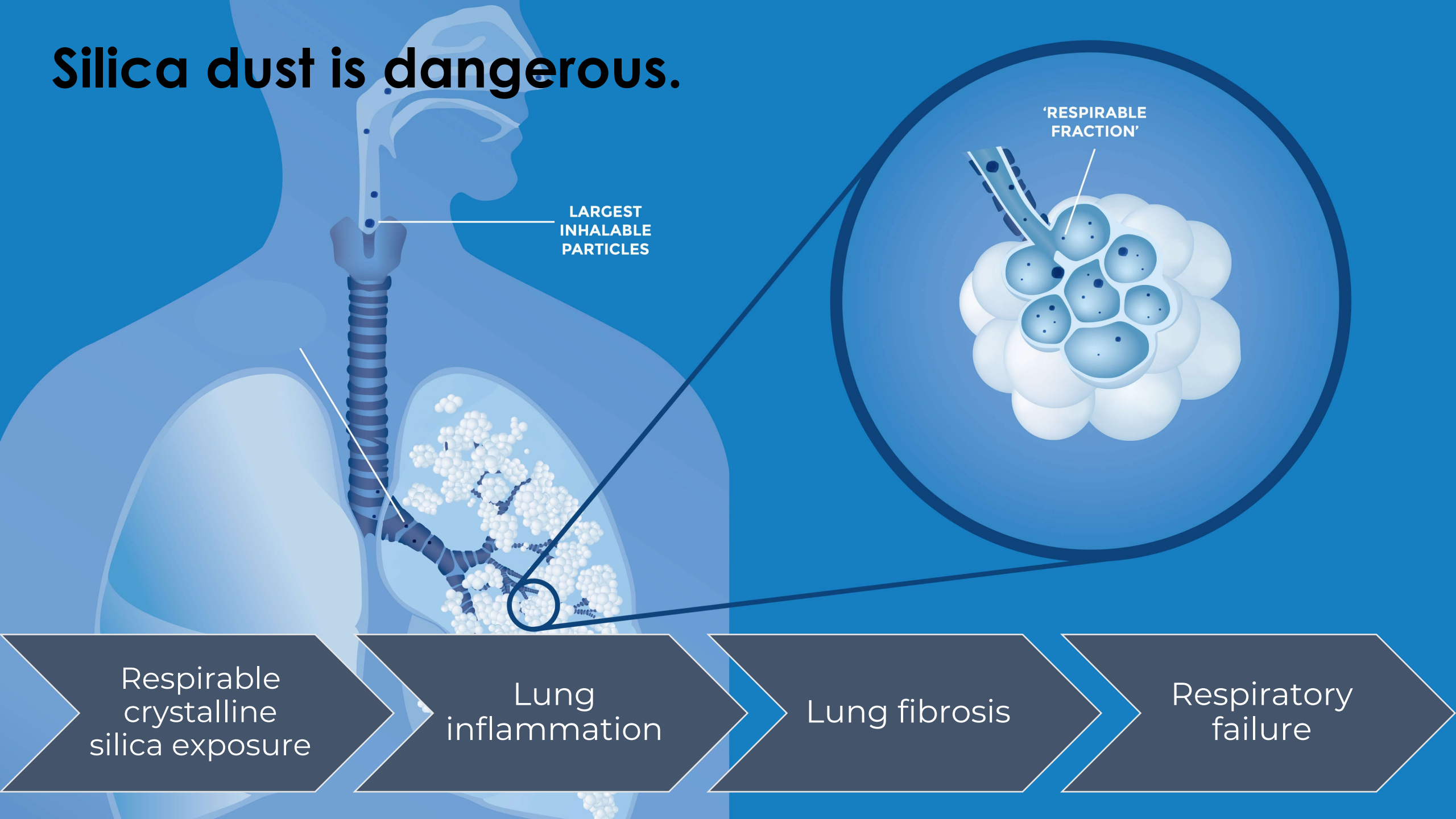


Respirable crystalline silica exposure

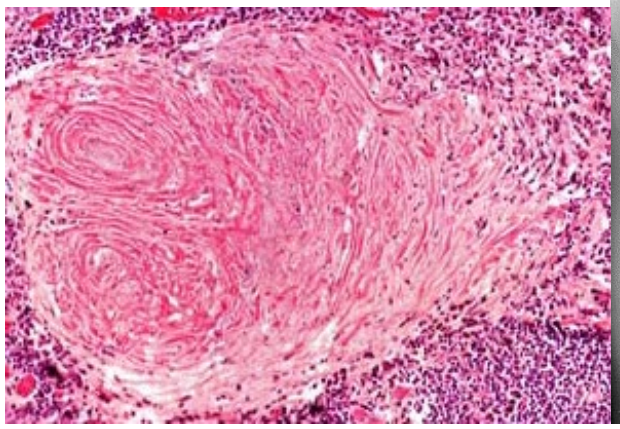
Lung inflammation

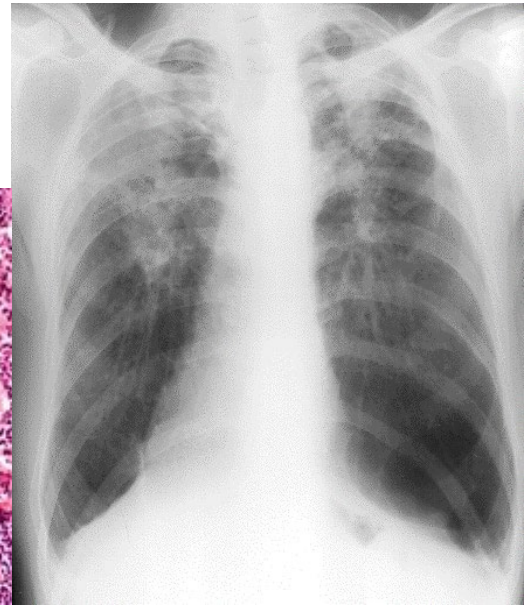
Lung fibrosis

Respiratory failure

Health Effects of Silica

- **Silicosis**
  - Chronic = after 10+ years, lower concentrations
  - Accelerated = after 5-10 years, higher concentrations
  - Acute = after weeks to years, highest concentrations
- **Mycobacterial, fungal infections**
- **Lung cancer, COPD**
- **Autoimmune disease**
- **Chronic kidney disease**





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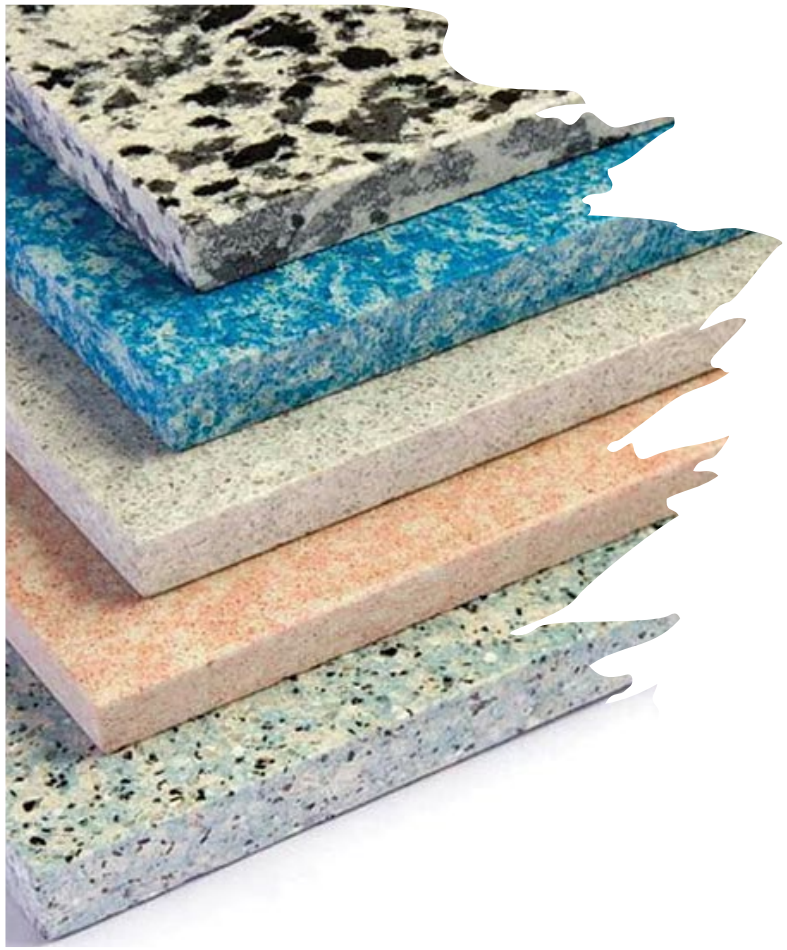
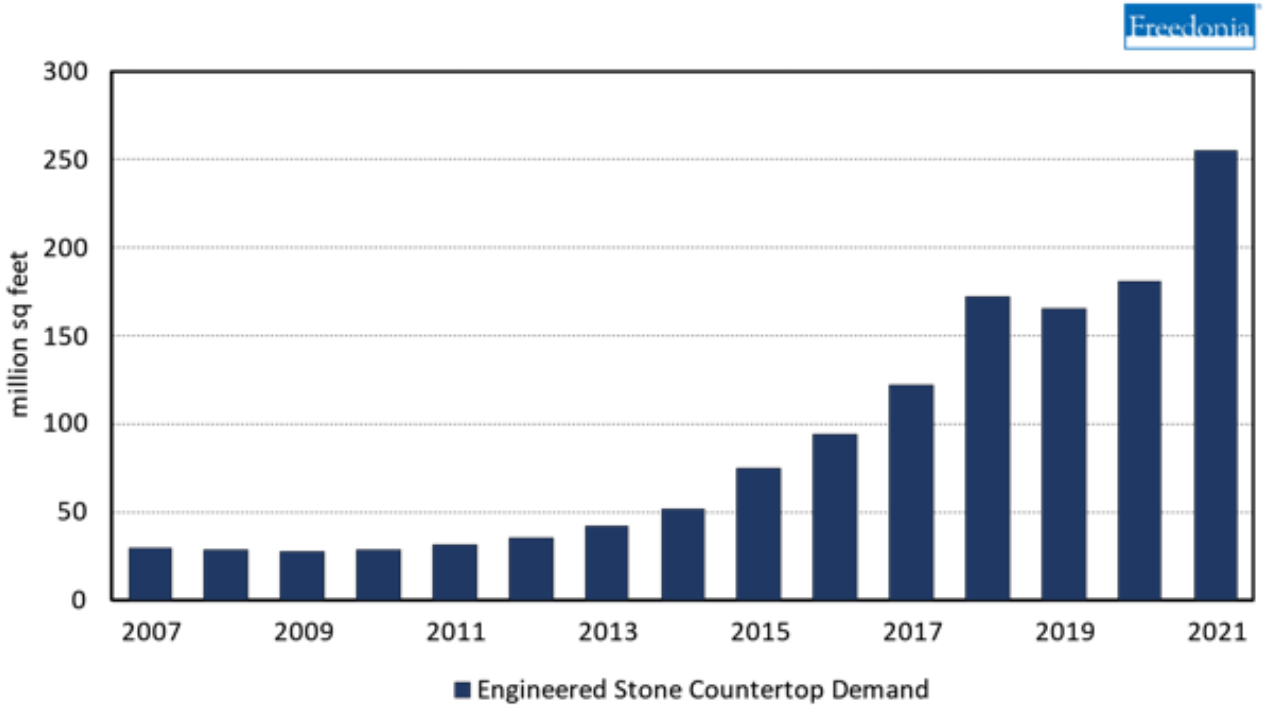
Engineered Stone: Growing Demand



U.S. Engineered Stone Countertop Demand, 2007-2021 (million square feet)



Source: The Freedonia Group

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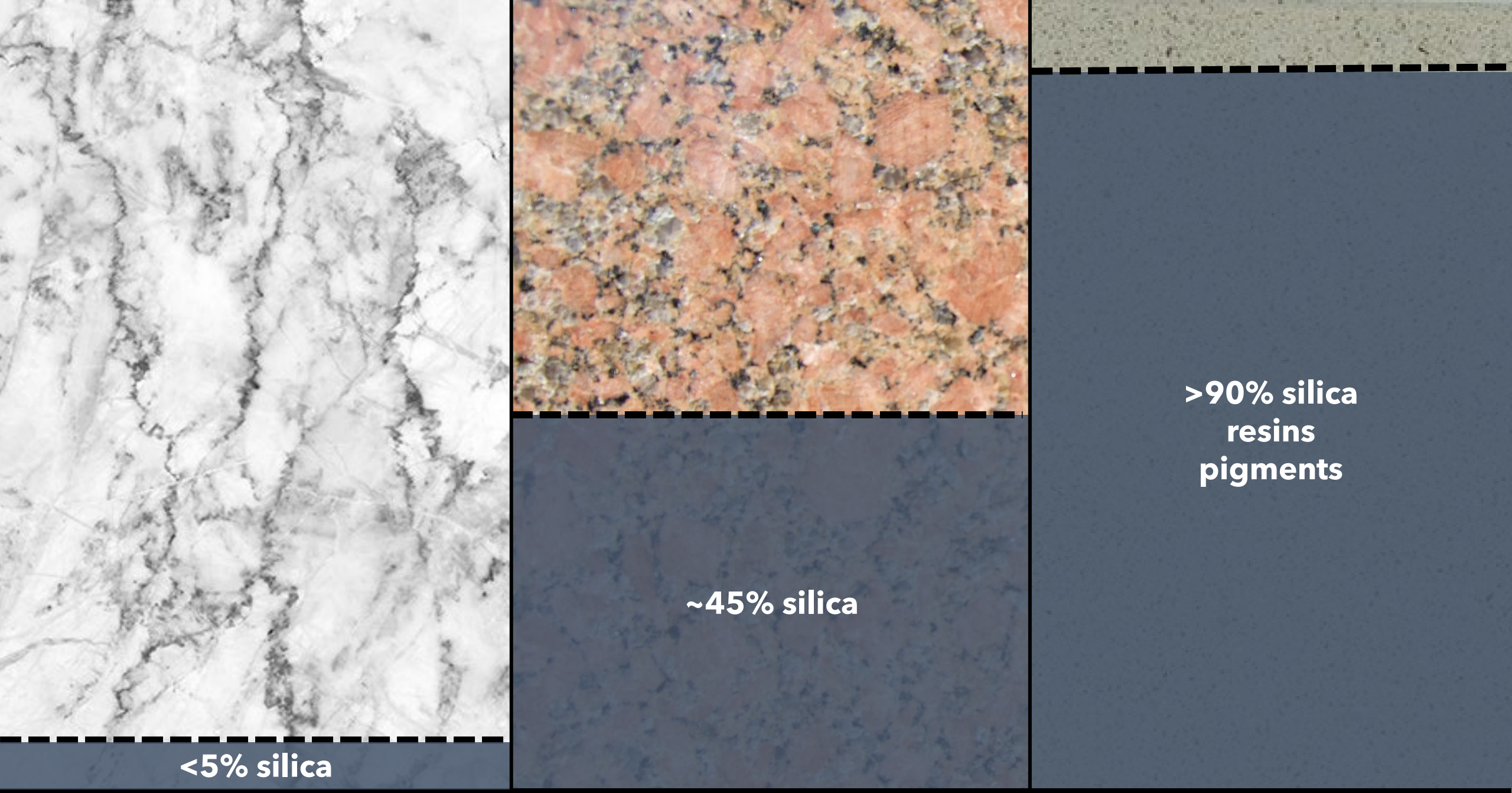
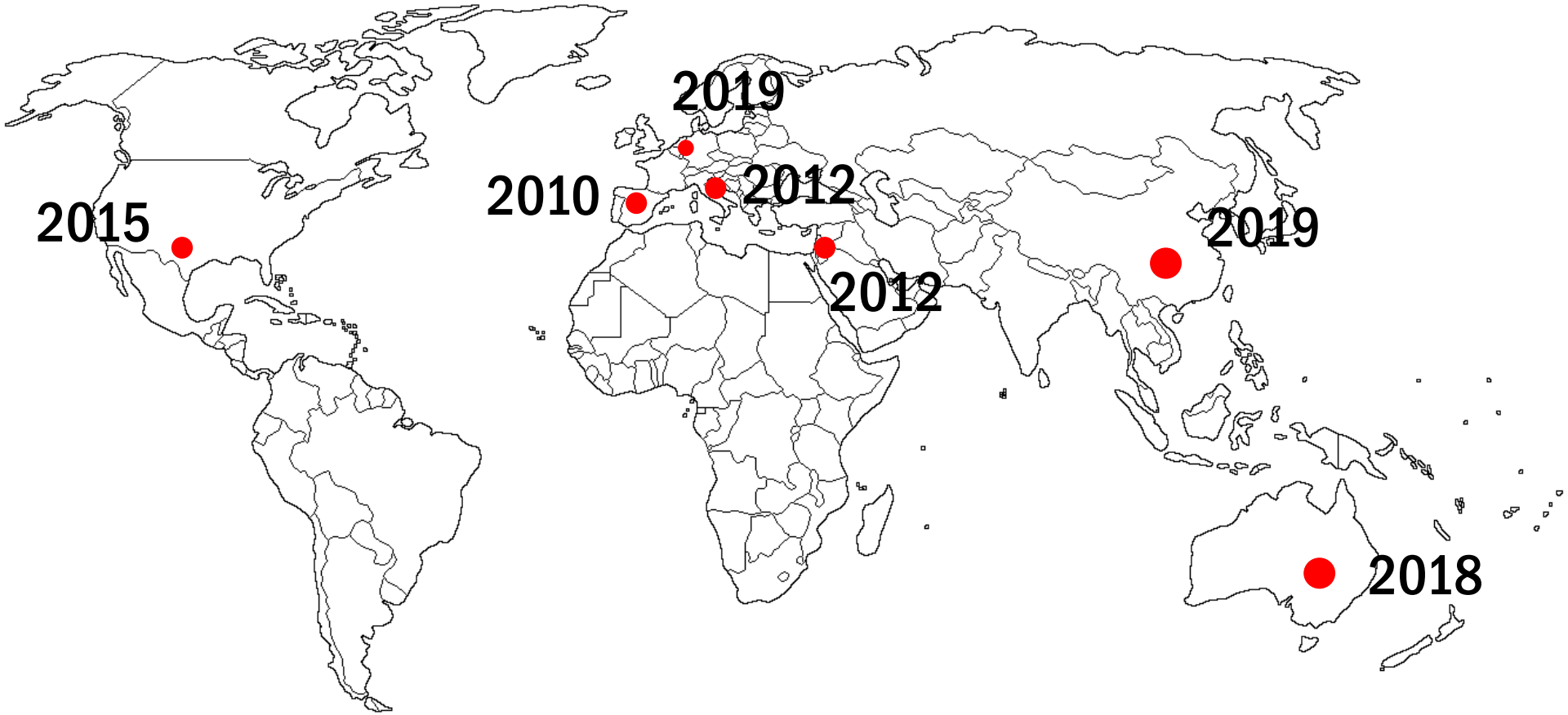

<5% silica
~45% silica
>90% silica
resins
pigments
Marble
Granite
Engineered Stone

Silicosis Related to Engineered Stone



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California Index Case

- **37-year-old man hospitalized with silicosis in 2017**

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California Index Case

- **37-year-old man hospitalized with silicosis in 2017**
  - **2004-2013:** Worked at a countertop fabrication shop

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- **37-year-old man hospitalized with silicosis in 2017**
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  - **2013:** Diagnosed with silicosis

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California Index Case

- **37-year-old man hospitalized with silicosis in 2017**
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  - **2014-2017:** Worsening symptoms, lung function

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California Index Case

- **37-year-old man hospitalized with silicosis in 2017**
  - **2004-2013:** Worked at a countertop fabrication shop
  - **2013:** Diagnosed with silicosis
  - **2014-2017:** Worsening symptoms, lung function
  - **2018:** Ineligible for lung transplant, dies of silicosis

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Workplace Investigation

Hospital discharge records

Investigation with Cal/OSHA

All were Hispanic men
in their 30s at diagnosis.
Two cases were fatal.

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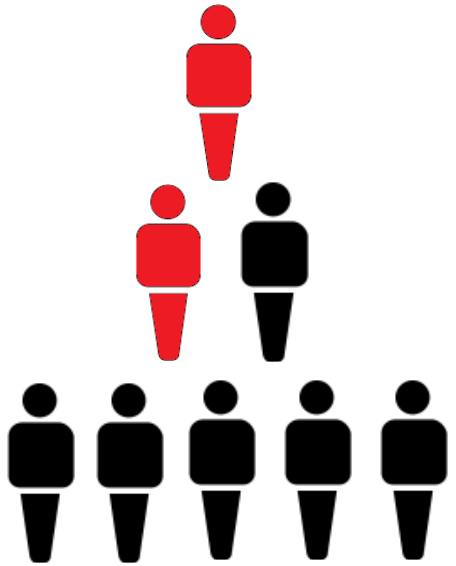
Rose, Heinzerling, et al. *MMWR.* 2019.

Workforce Screening

Silicosis by chest X-ray



12%

Median age of cases detected by screening was 37.

Heinzerling, et al. *AJRCCM.* 2021.

Surveillance Methods

- Tracking silicosis cases in California
  - Hospital data (discharge and emergency)
  - Voluntary provider reporting
  - Electronic case reporting (eCR) using RCKMS*
  - Coming soon: reportable condition
  - NIOSH surveillance case definition

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*Reportable Conditions Knowledge Management System
www.rckms.org

Surveillance Methods

- Tracking silicosis cases in California
  - Hospital data (discharge and emergency)
  - Voluntary provider reporting
  - Electronic case reporting (eCR) using RCKMS*
  - Coming soon: reportable condition
  - NIOSH surveillance case definition
- Enumerating countertop fabrication shops
  - Business database
  - Web searches
  - Outreach

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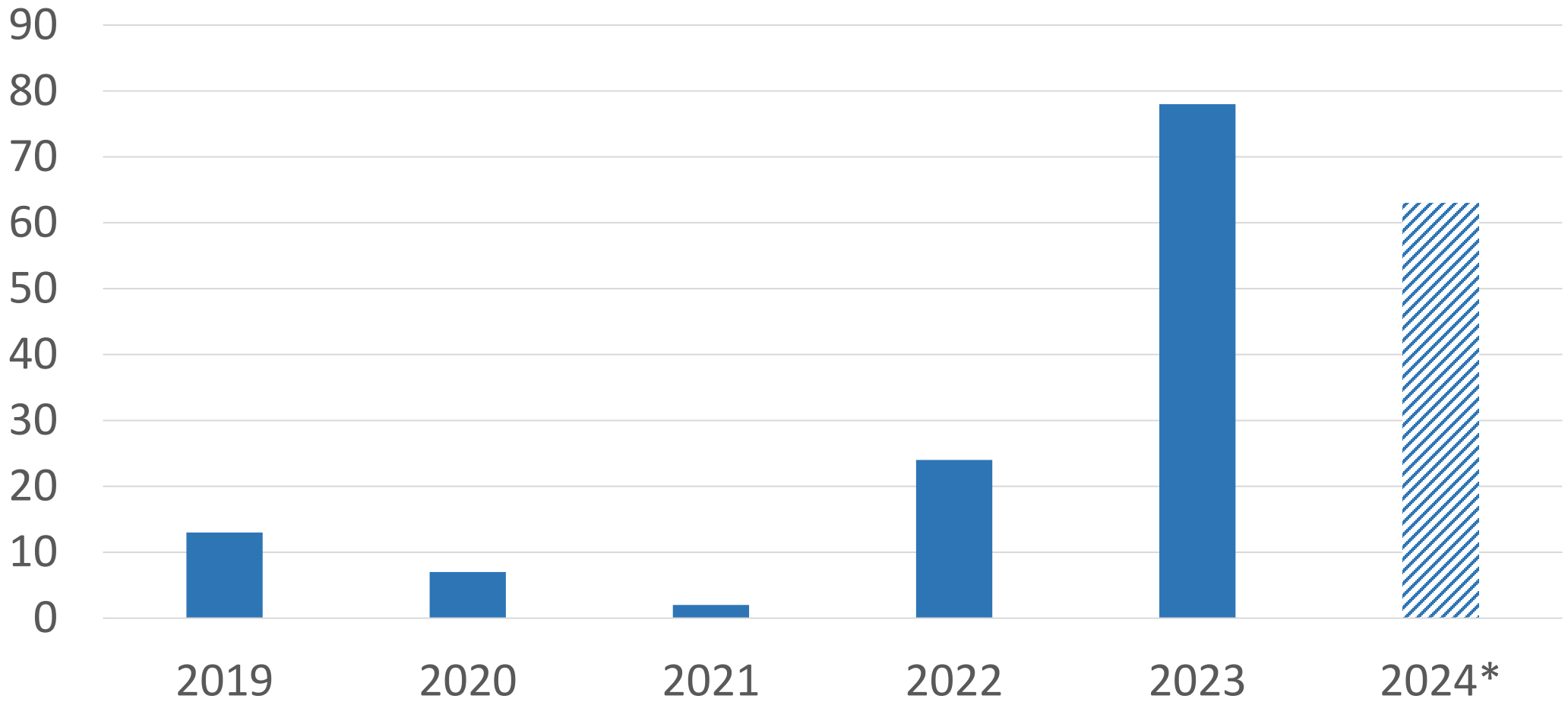
*Reportable Conditions Knowledge Management System
www.rckms.org

Cases Increasing in California



* through 10/4/2024

Year Identified by CDPH

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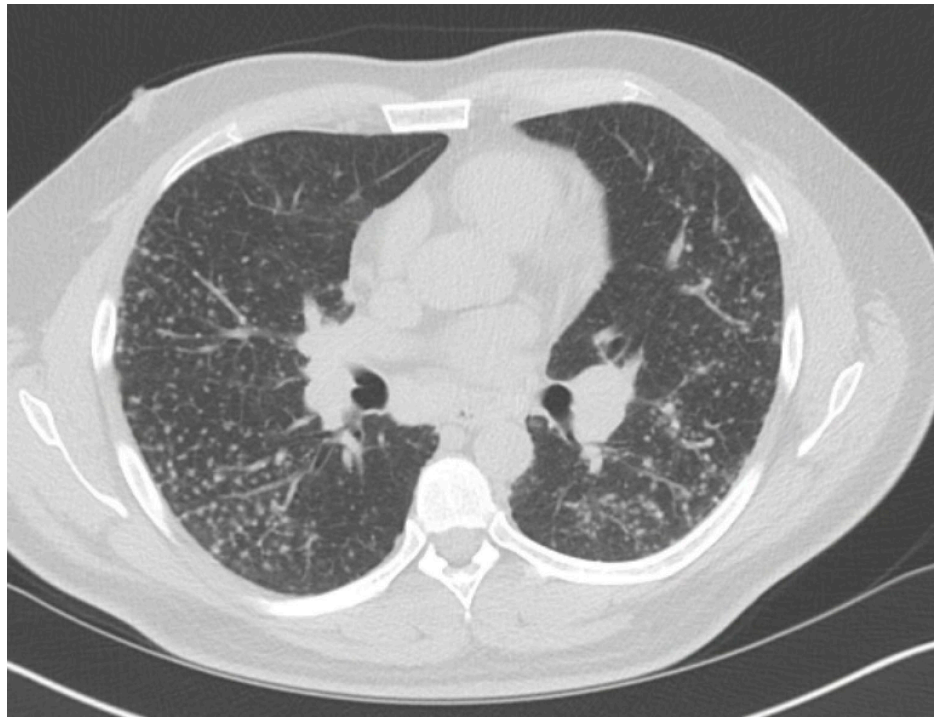
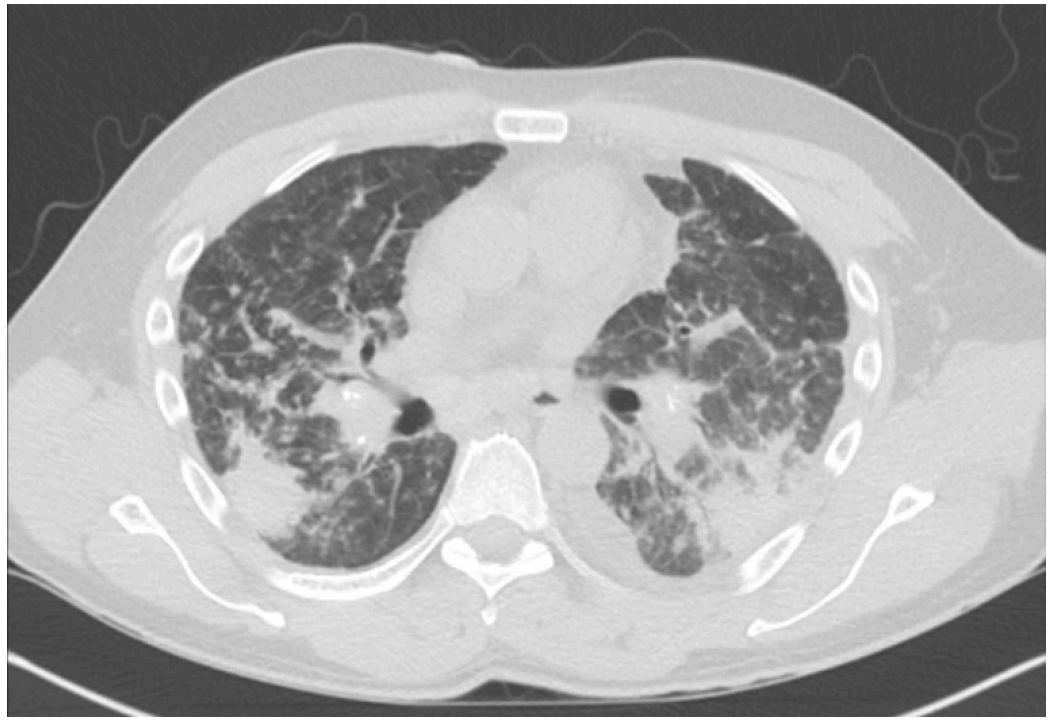
Often presented with advanced disease

Simple: 61%



Complicated: 38%



Fazio et al. *JAMA Int Med*. 2023;183(9):991-998.

Comorbid rheumatologic and infectious diseases

	Overall (N=52) No. (%)
Comorbidities	
Autoimmune Disease	6 (12)
Myositis	1 (2)
Rheumatoid Arthritis	4 (8)
Systemic sclerosis or CREST	1 (2)
Nontuberculous mycobacterial infection	5 (10)
History of Active Pulmonary TB	1 (2)
Other lung disease (COPD/Asthma)	2 (4)

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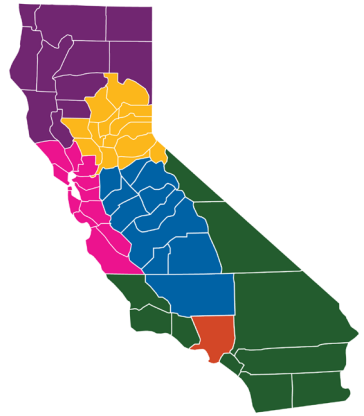
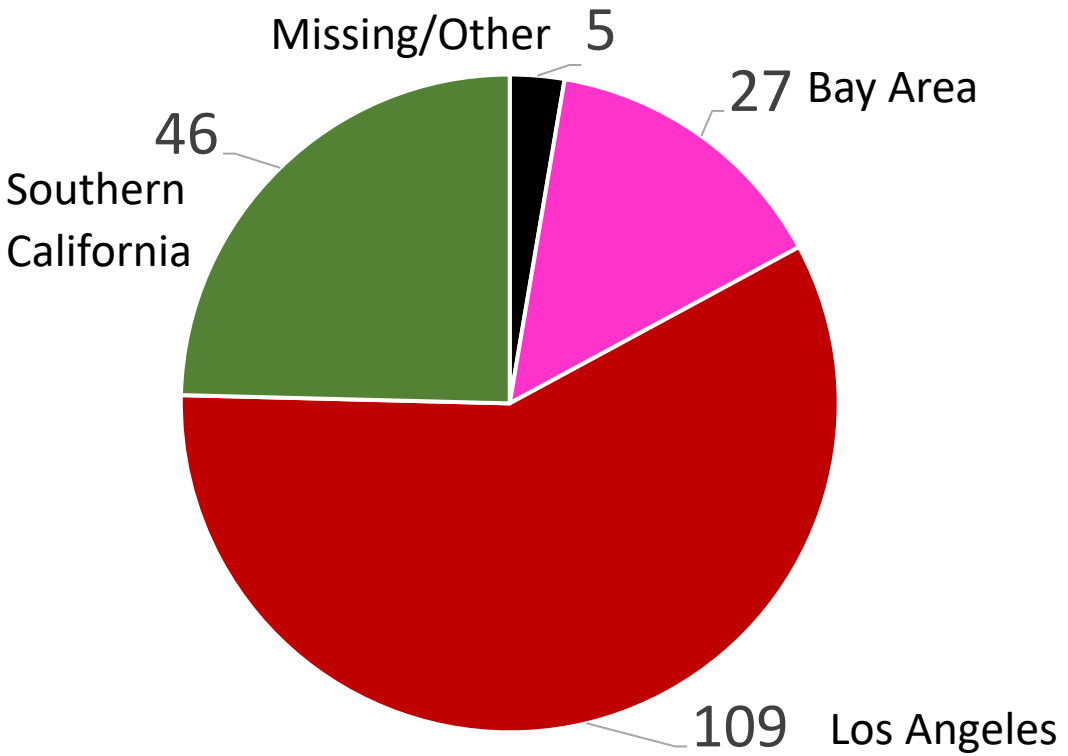
Fazio et al. *JAMA Int Med*. 2023;183(9):991-998.

Young Immigrant Workers Affected



- **187 fabrication workers with silicosis.**
  - Most in their 30s and 40s
  - Almost all immigrants from Mexico & Central America
  - Many under/uninsured
- At least **13 deaths**
- At least **22 lung transplants**



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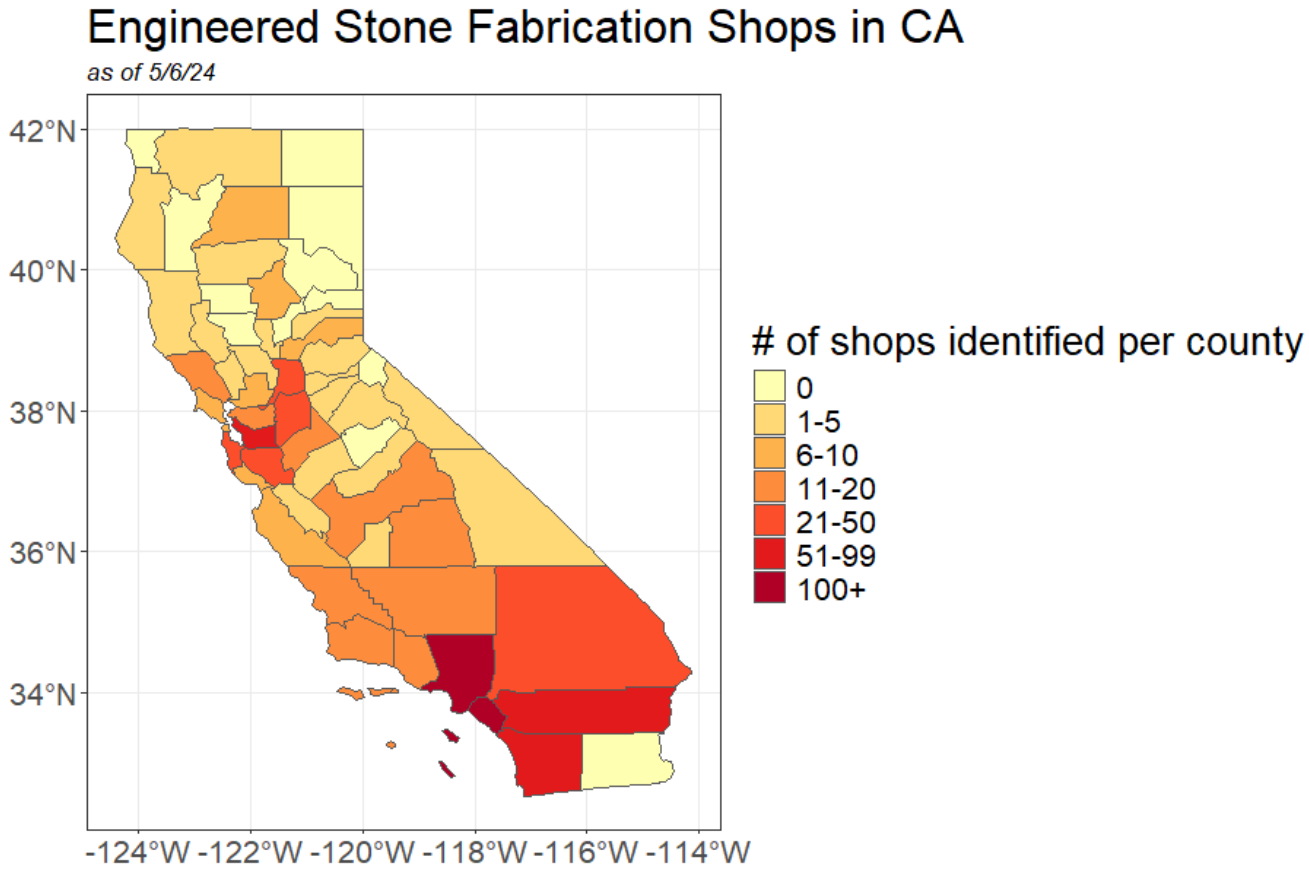
The Tip of an Iceberg?

- >900 shops in CA
- Silicosis prevalence estimates
  - 12% in one CA workplace
  - >20% in Australian screening programs
- Likely many unidentified case



Emergency Temporary Standard (ETS)

- In effect since December 29, 2023
- Introduces new protections for “high exposure trigger tasks”
  - Requires wet methods
  - Prohibits dry cutting, sweeping
  - Requires tight-fitting, full-face, powered air-purifying respirator (PAPR)
- Defines “imminent hazards” and allows Cal/OSHA to issue “order prohibiting use” when imminent hazards present

Photo credit: Chaolong Xi, NIOSH

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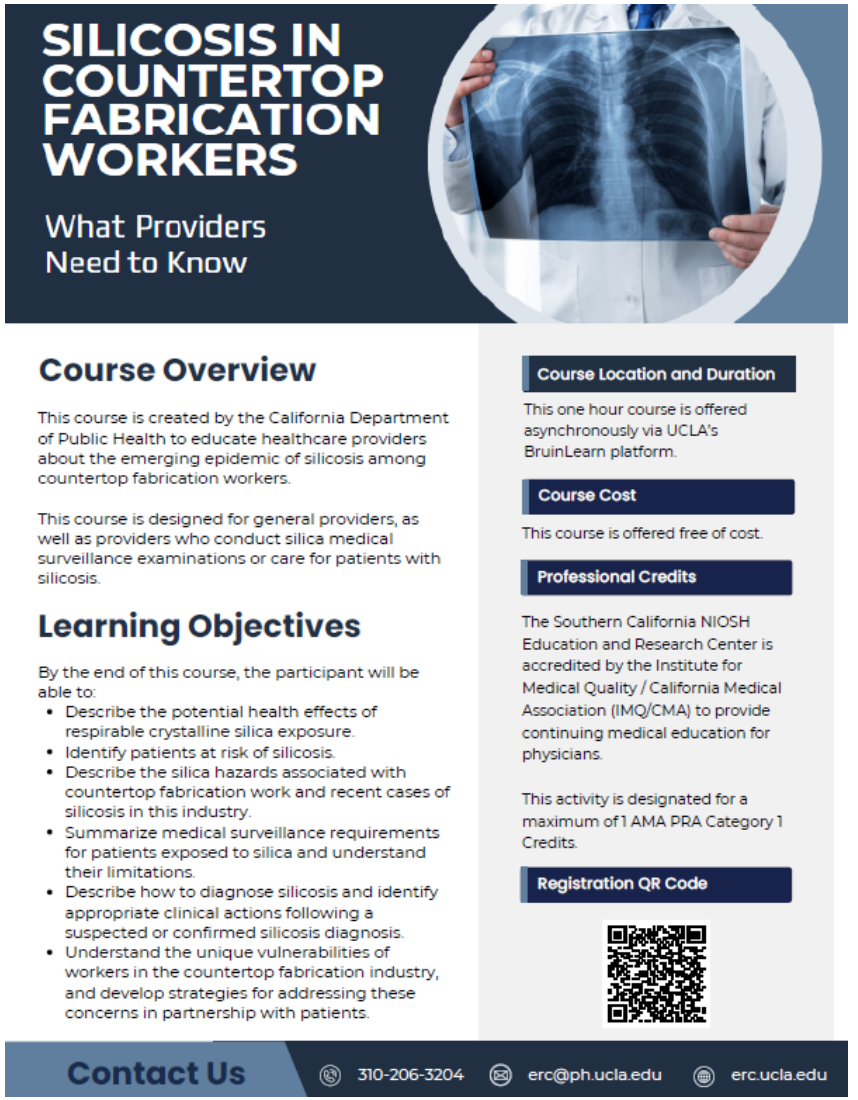
New Continuing Medical Education Course

- Free 1-hour online course
- 1 AMA PRA Category 1 credit
- More info: https://erc.ucla.edu/course/silicosis-in-countertop-fabrication-workers/



Fatal Injuries

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Fatality Assessment & Control Evaluation (FACE) Program

- 400+ workers die from occupational injuries in California each year
- California is one of seven FACE states funded by NIOSH
  - Investigates fatal occupational injuries
  - Identifies contributing factors
  - Provides recommendations that can be implemented
  - Develops prevention materials (fact sheets, tailgate trainings, videos)

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Farm Laborer Struck by a Tomato Harvester

- 21 year-old farm laborer working as sorter on tomato harvester
- First time doing this work; overnight shift
- Found unresponsive in field
- Cause of death: multiple blunt force injuries

Contributing Factors

- Operators and crew were not wearing appropriate reflective clothing
- Failure of supervisory personnel to inspect equipment and conduct a safety meeting at the beginning of the shift
- Inadequate communication between operator and crew on outset and during shift
- Inadequate training and instruction related to harvester equipment safety
- Inadequate lighting/illumination of the work area for night operations

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Recommendations

- Provide all employees working at night with appropriate reflective clothing
- Supervisors should inspect equipment and conduct a safety meeting at the beginning of the shift
- Develop SOP that include a system of communication between operator and crew, and accounting for personnel
- Provide training and instruction on harvester equipment safety
- Install high-intensity LED lighting on all tomato harvesters
- Improve visibility for harvester operators (windshield wipers, side mirrors, wired remote cameras)

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Palm Tree Trimming

Worker Drownings

Solar Installation

Wood Chippers

Landscaping & Tree Trimming

Firefighting

www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/FACE/Pages/FACE.aspx

Infectious Diseases

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Work-Related Infections

- Valley fever (Coccidioidomycosis)
- COVID-19
- Mpox
- Legionella
- Avian influenza

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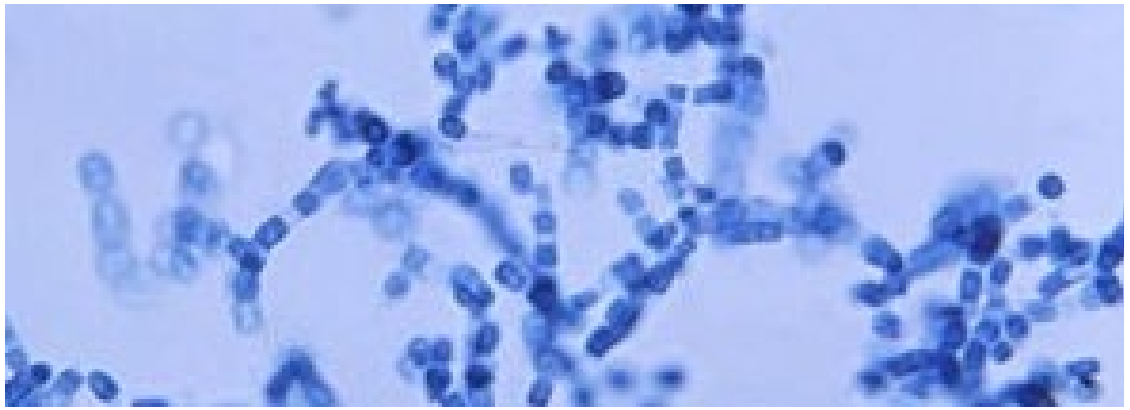
What is Valley fever?

An infection caused by inhaling spores of the *Coccidioides* fungus



Illness also known as “coccidioidomycosis” or “cocci”

https://www.cdc.gov/fungal/diseases/coccidioidomycosis/index.html

https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx

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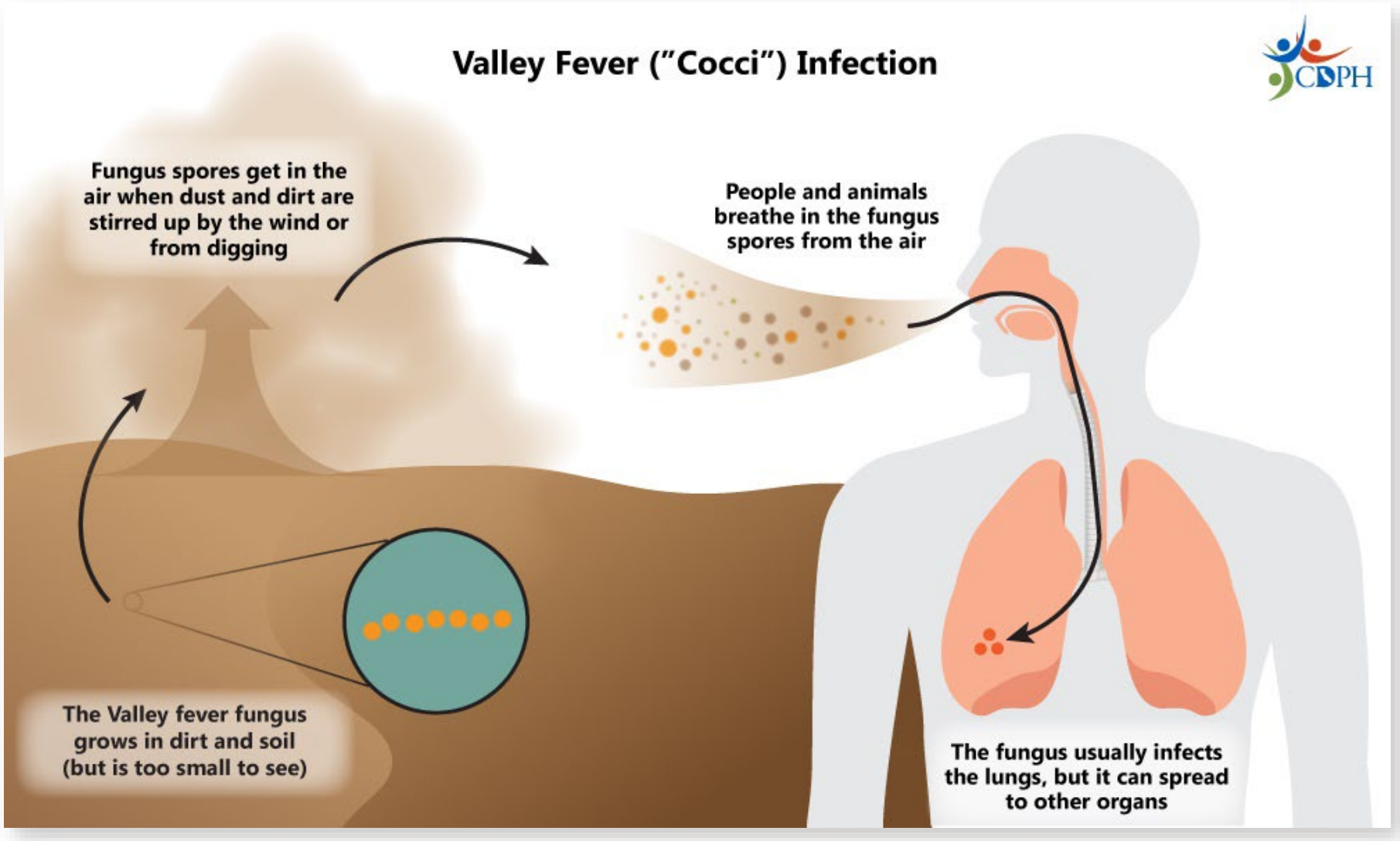
Exposure



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Clinical features of Valley fever

- Onset 7-21 days after exposure
- Respiratory: localized pneumonia or diffuse pulmonary disease
- Systemic: Fever, night sweats, weight loss, fatigue
- Immunological: rash, symmetric arthralgias
- Extrapulmonary: skin, osteoarticular, vertebral, meningitis
- Can be severe, chronic, and even fatal

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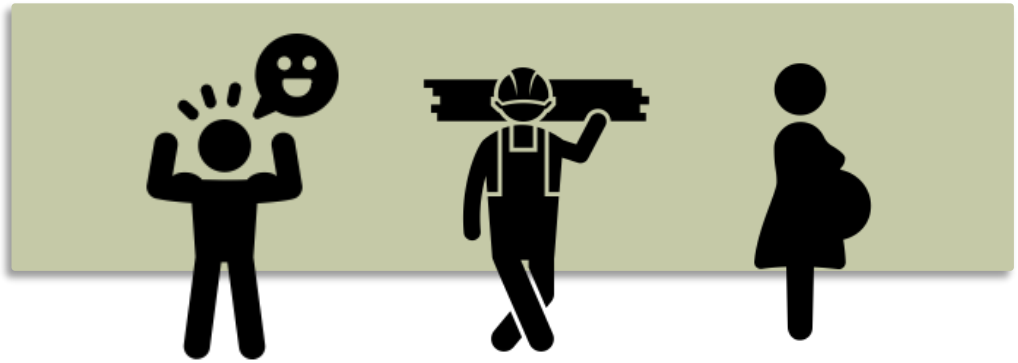
Who is at risk?

- Anyone who breathes in the fungus can get infected—even young, healthy people
- Increased risk of severe disease
  - Black and Filipino persons
  - Pregnancy
  - People with diabetes or immunosuppression
  - People ≥60 years old
- Increased risk of exposure
  - Outdoor workers



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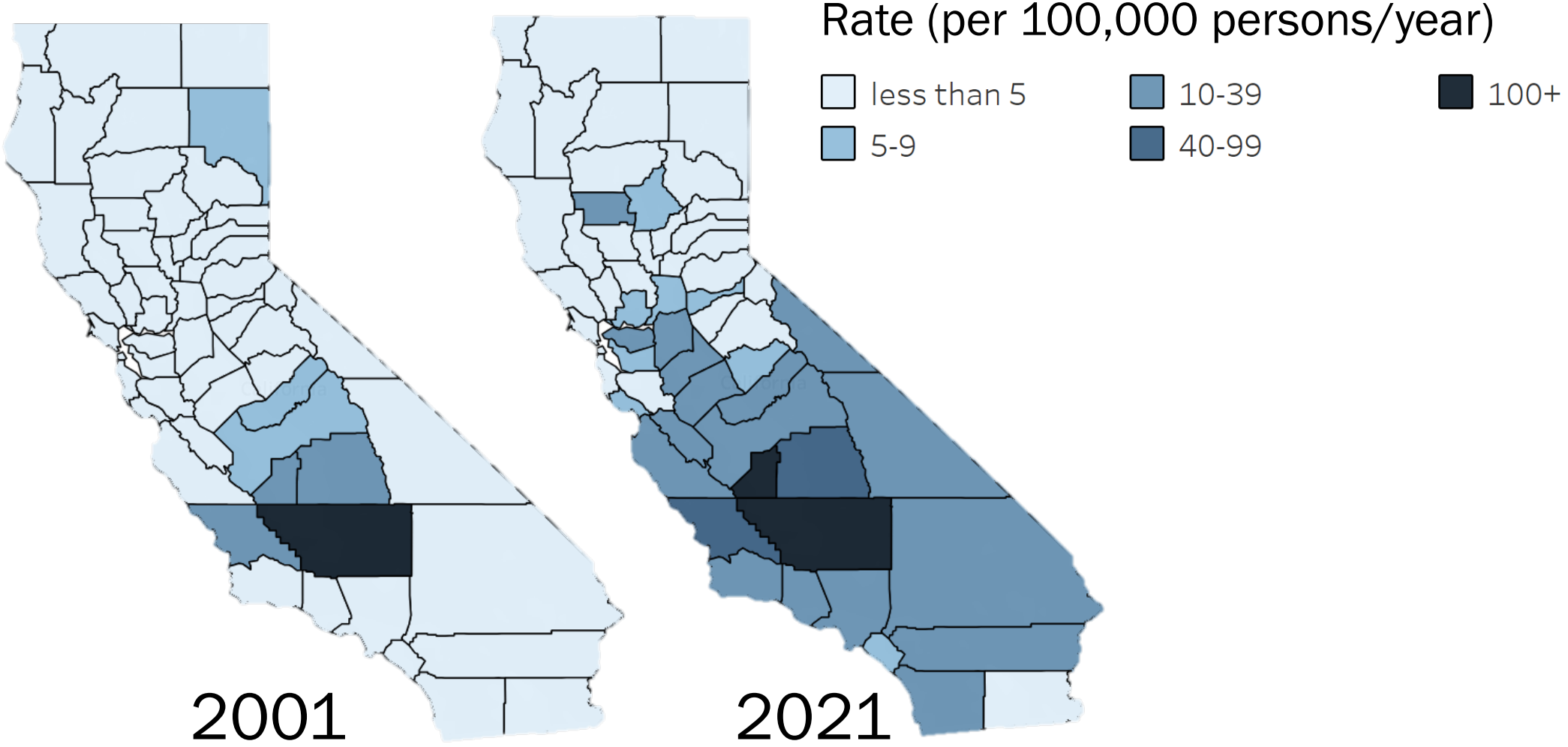
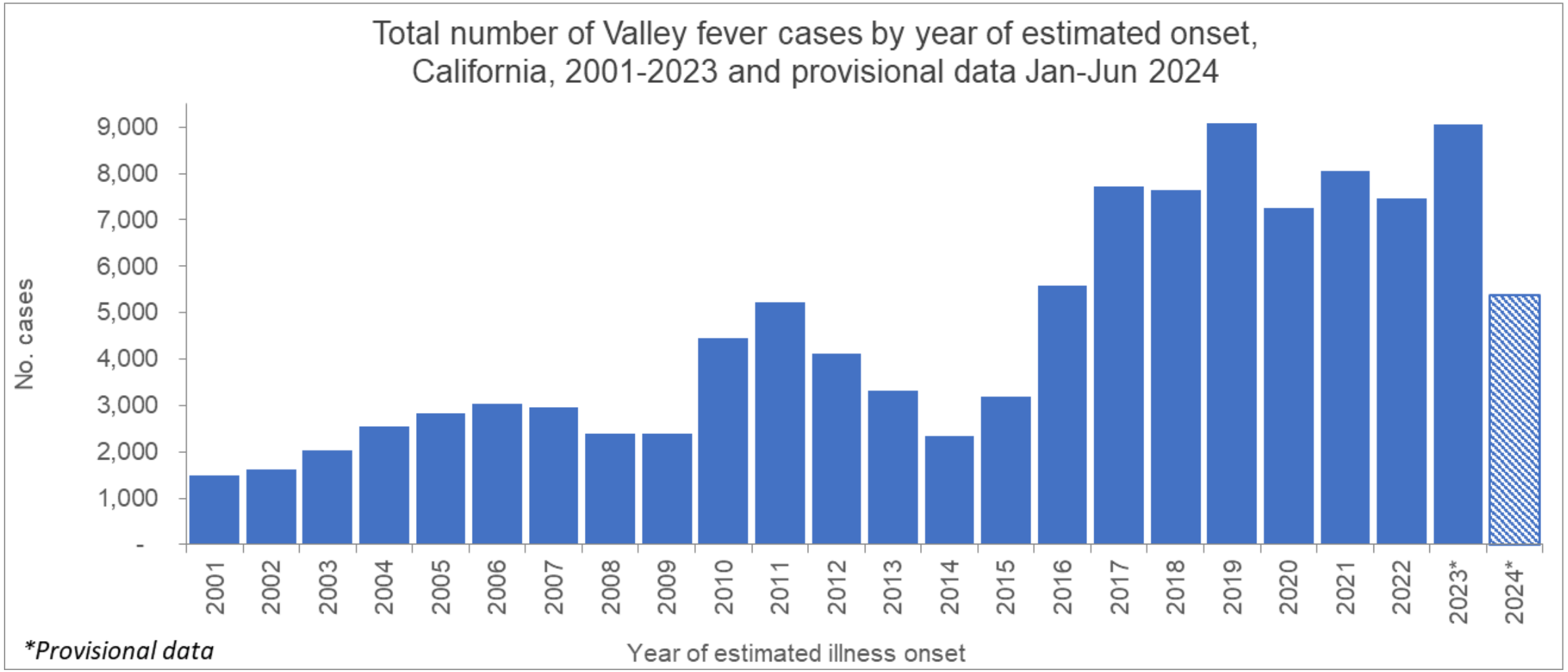
Expanding rates in California



https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/ValleyFeverDashboard.aspx


Total number of Valley fever cases by year of estimated onset, California, 2001-2023 and provisional data Jan-Jun 2024
No. cases
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023*
2024*
*Provisional data
Year of estimated illness onset

Valley fever is an occupational disease

Workers disturbing soil or exposed to dust in areas where Valley fever is common are at highest risk

- Construction workers
- Archeologists
- Wildland firefighters
- Military personnel
- Mining, quarrying, oil & gas extraction jobs
- Agricultural workers

https://www.cdc.gov/niosh/topics/valleyfever/risk.html

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Hierarchy of controls

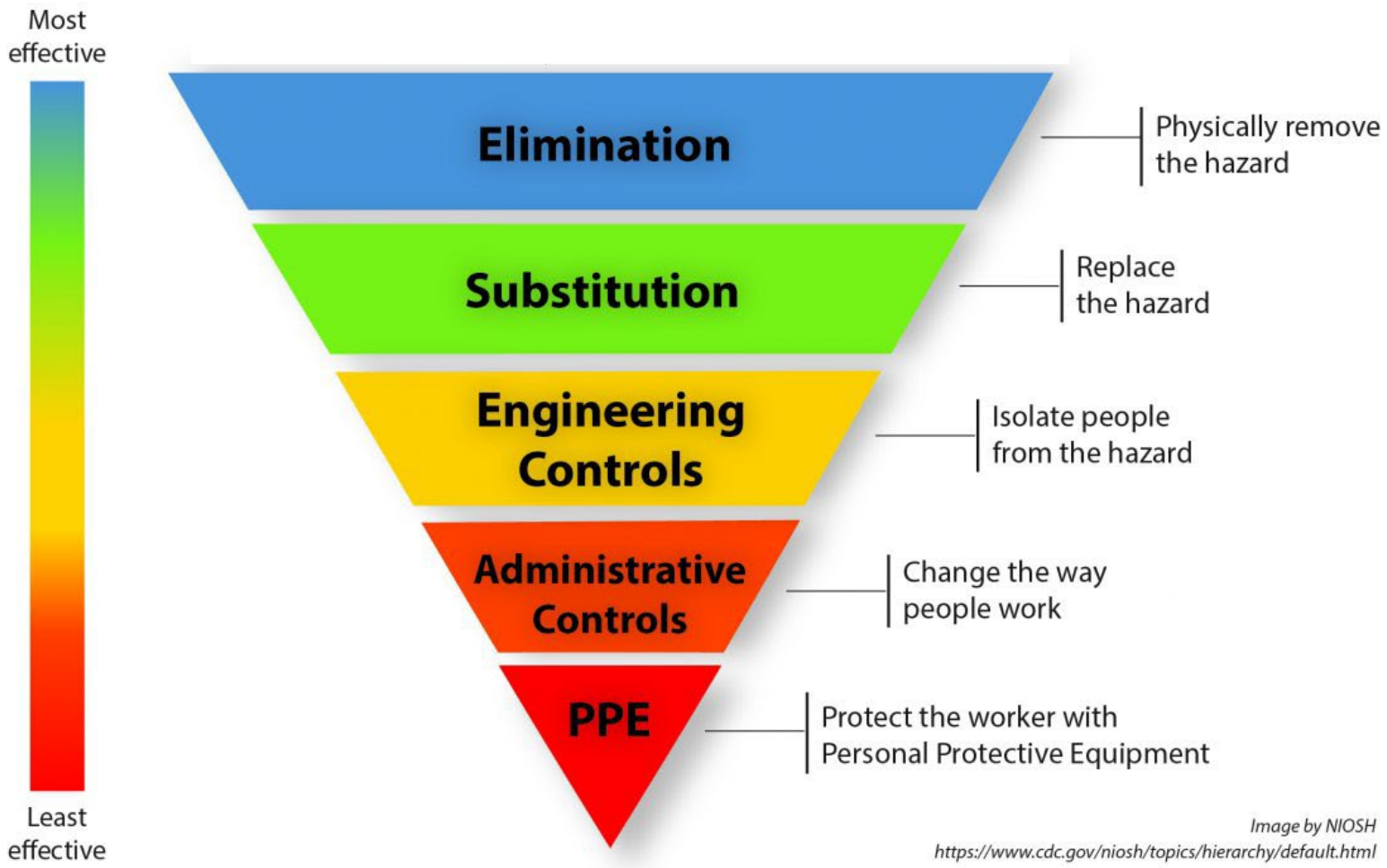

Image by NIOSH
https://www.cdc.gov/niosh/topics/hierarchy/default.html

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Use job design to minimize soil disturbance

- Avoid digging if possible
- Reduce grading
- Maintain vegetation

Photo credit: First Solar. Wiring is installed in above-ground trays instead of below-ground trenches

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Limit dust generation

Photo Credit: California Department of Public Health, Occupational Health Branch

- Wet soil before and while digging
- Cover bare soil (tarps, vegetation, etc.)
- Stay upwind of digging

Use enclosed cabs to protect operators

- HEPA or MERV-16 or higher filtration
- Positively pressured
- Air conditioned
- Windows closed
- 2-way radio
- Wet-clean inside cabs

Photo credit: Pixabay.com

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Take action when dust cannot be controlled

- Have rules for stopping work for excess dust or wind
- Monitor conditions
- Move indoors or into vehicles with HEPA-filtered A/C
- Don respirators quickly if conditions get worse

Photo credit: iStock

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CDPH work-related Valley fever resources

- Fact sheet—Preventing work-related coccidioidomycosis (Valley fever)
- Webinar—Preventing Valley fever in outdoor workers
- Webinar—Preventing Valley fever in construction workers
- Training guide—VALLEY FEVER: Tailgate training guide for California construction workers
- Training guide—Preventing work-related Valley fever in wildland firefighting

https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/Pages/Cocci.aspx

Contact CDPH Occupational Health Branch

- Toxic chemicals
  - Workplace Hazard Helpline: (866) 282-5516
- Lead
  - Lead in the Workplace Information Line: 510-620-5740
  - Email: OLPPP-Registry@cdph.ca.gov
- Silica
  - Email: silicosis@cdph.ca.gov
- FACE Program
  - Email: face@cdph.ca.gov
- Occupational Health Watch Newsletter
  - https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/Pages/OHWArchive.aspx#

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Acknowledgments

Christina Armatas
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Gail Cooksey
Jennifer Flattery
Bob Harrison
Amy Heizerling
Barbara Materna
Laura Styles
Ximena Vergara
Jason Wilken

OHB is hiring!

- Industrial Hygienist (https://recruiting2.ultipro.com/PUB1001PUBH/JobBoard/6705aa07-0bcb-4660-ad1b-2fda952becc7/OpportunityDetail?opportunityId=9d920e21-9899-44ce-a467-179643ce0187)
- Research Scientist II (Physical/Engineering Science)
- Research Scientist III (Epidemiology/Biostatistics)
- Research Data Analyst II

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Questions?

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