

Methylene chloride: It's toxic to human health

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Case # 1 – Occupational Fatality

- In 2015, a 30 year old worker was refinishing a bathtub using a paint stripper
- Two hours later, he was found unconscious, slumped over the bathtub.
- Resuscitation efforts were unsuccessful
- Post-mortem toxicology screening results were positive for:
 - Methylene chloride
 - Carboxyhemoglobin 14%
- The Occupational Safety and Health Administration (OSHA) investigated this fatality case and found that the methylene chloride levels measured inside the bathtub and in a bag containing rags that the worker had used exceeded OSHA standards
- The employer was cited and fined \$25,000

Case # 2 – Consumer Fatality

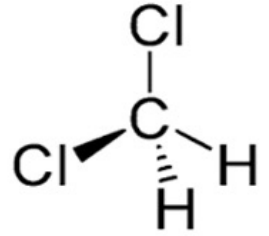
"It all ended on February 12, 2018. When I came home from work, I found Joshua slumped over. He was already gone. Nearby was a can of paint stripper that he had been using to refinish the fork of his BMX bike".

-Lauren Atkins, mother of the decedent (31 year old)

Case # 3 – Non-Fatal Poisoning

- In 2019, 72 year old woman was found at home obtunded and cyanotic w/ agonal breathing
- EMS found half empty container of paint stripper
- EMS administered intranasal naloxone 4mg to no effect
- EMS then proceeded with oral intubation
- MSDS revealed the paint stripper contained 60-100% of methylene chloride and 7-13% of methanol

What is methylene chloride?



Volatile, chlorinated hydrocarbon and colorless solvent

- Found in DIY materials sold at your local hardware store: paint strippers, metals cleaners, pesticides, aerosol containers
- Common occupational exposure

Classified as a likely carcinogen from the International Research on Cancer (IARC)

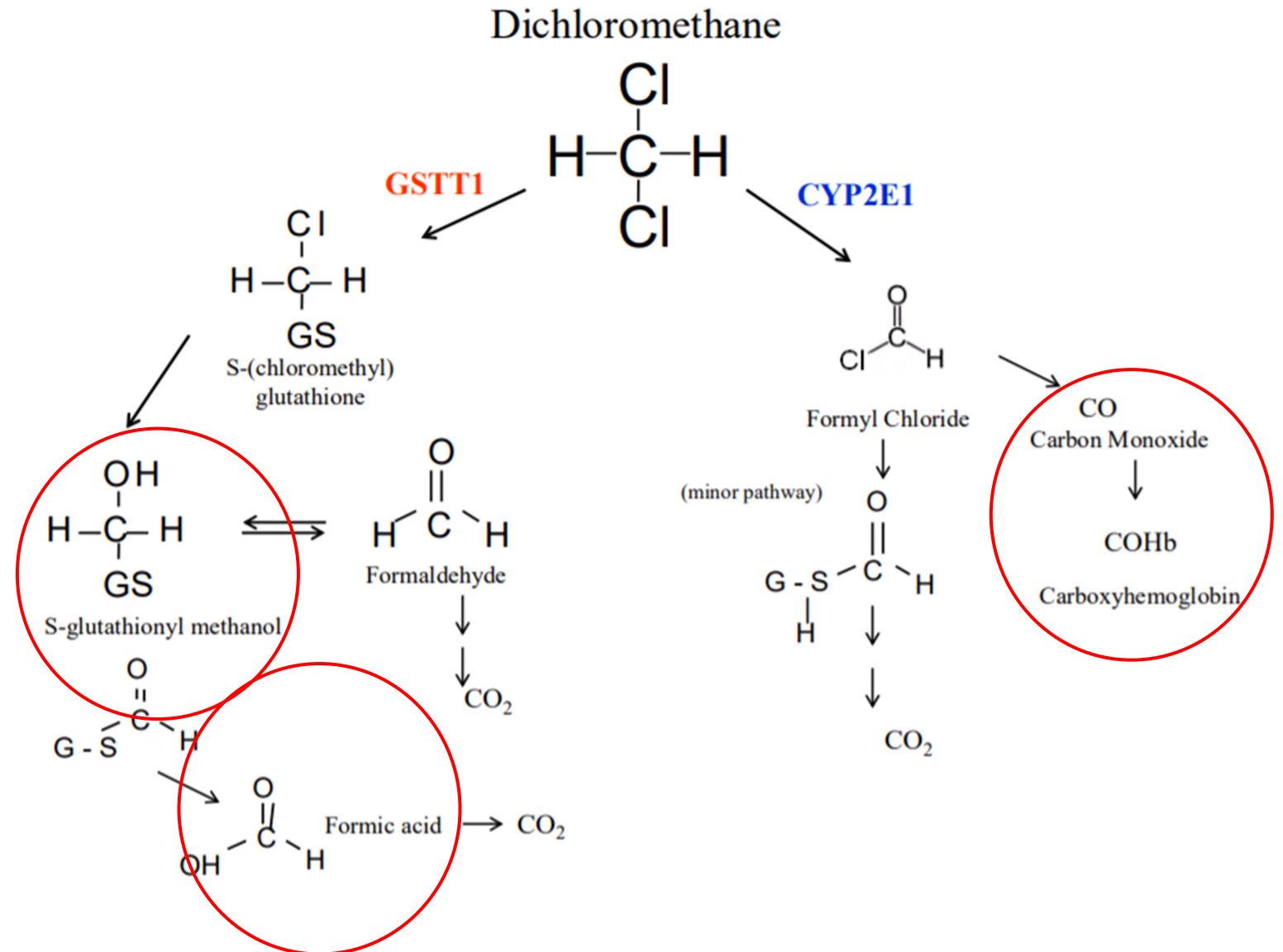
- Associated with cholangiocarcinoma and non-Hodgkin lymphoma

Symptoms of acute exposures are non-specific but deadly

- Range from mucous membrane irritation, nausea, and headache to respiratory depression, CNS depression and cardiac arrest
- Fun fact: used to be an anesthesia/sedative drug back in the day

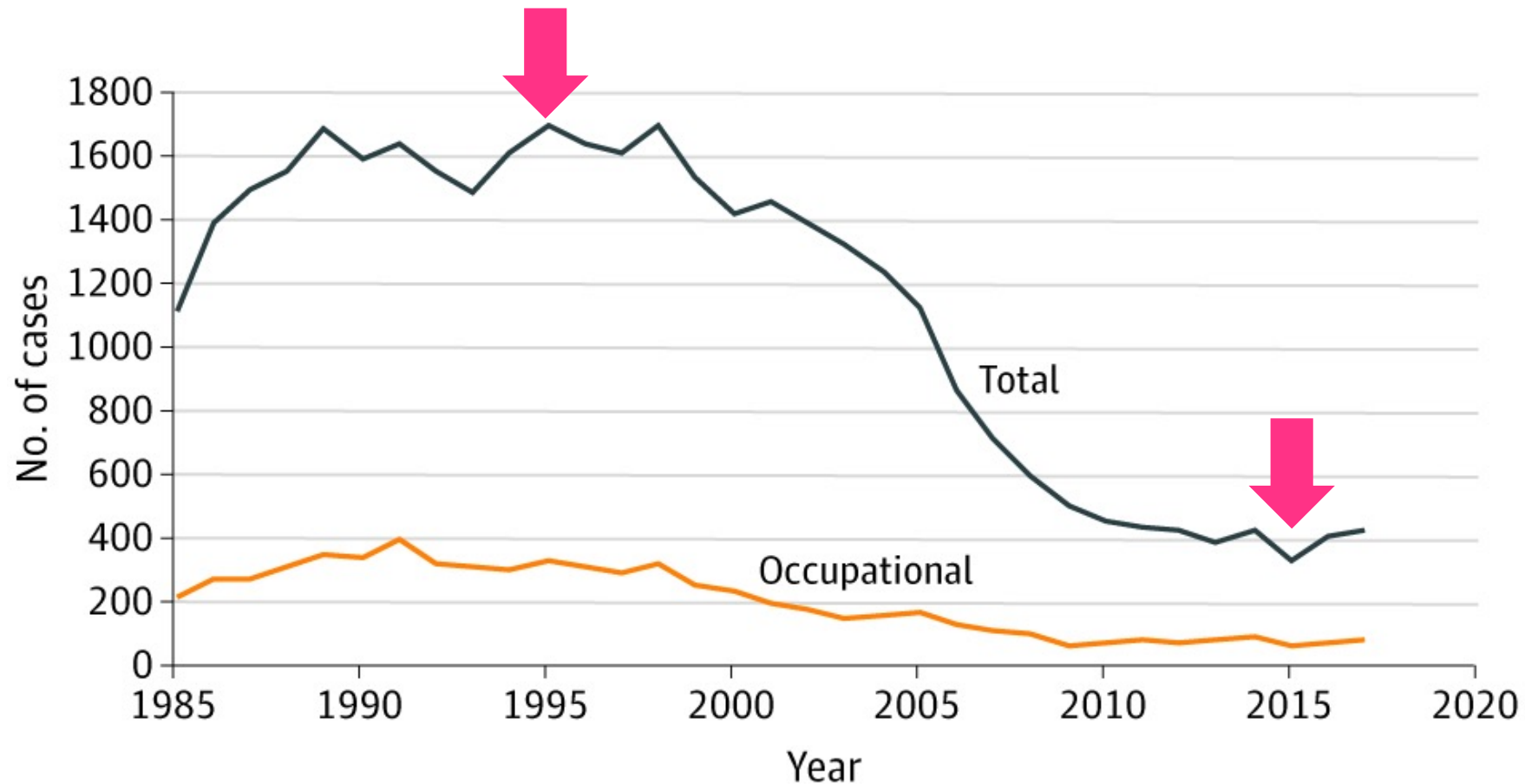
The Toxicology of Methylene Chloride

- Methylene chloride ultimately forms carbon monoxide in the body!
- Methylene chloride toxicity is frequently accompanied with methanol poisoning.



Calls to the Poison Center over time

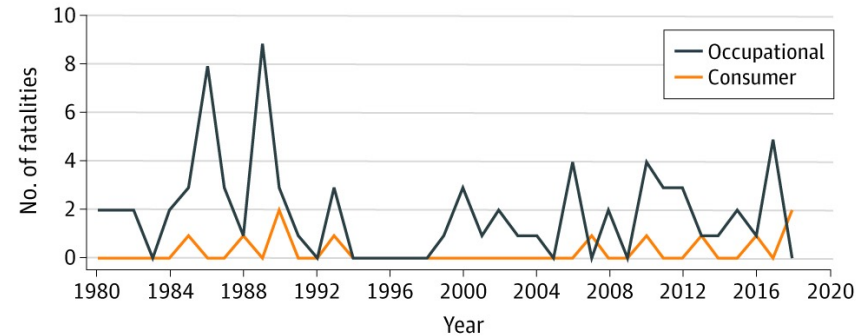
- From 1985 to 2017, the AAPCC documented 37 201 nonfatal methylene chloride cases, including 6589 occupational cases.
- The annual number of reported nonfatal cases peaked at 1701 cases in 1995.
- Subsequently, the annual number of cases decreased and reached a plateau level of about 408 cases a year between 2010 and 2017, including about 73 occupational cases.



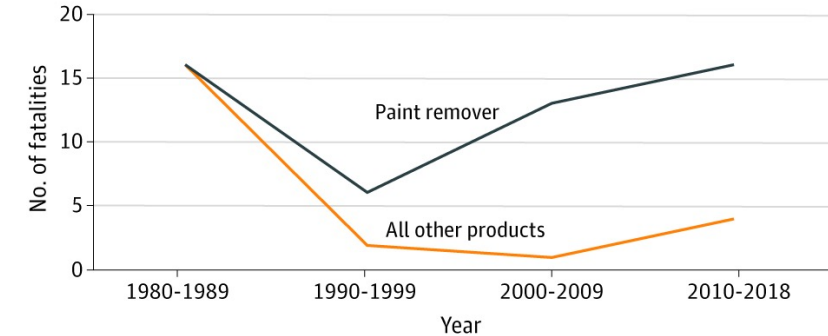
Fatalities over Time

- Between 1980 and 2018, we identified and analyzed 85 unique methylene chloride–related fatalities in the US.
- Of the fatalities, 75 (94%) were in men. For the 70 cases with available information, the median (interquartile range) age of the decedents was 31 (24-46) years.
- Of the fatalities, 74 (87%) were occupational, of which OSHA investigated 55 (74%). In 5 cases, the worker had a prior on-the-job poisoning incident.

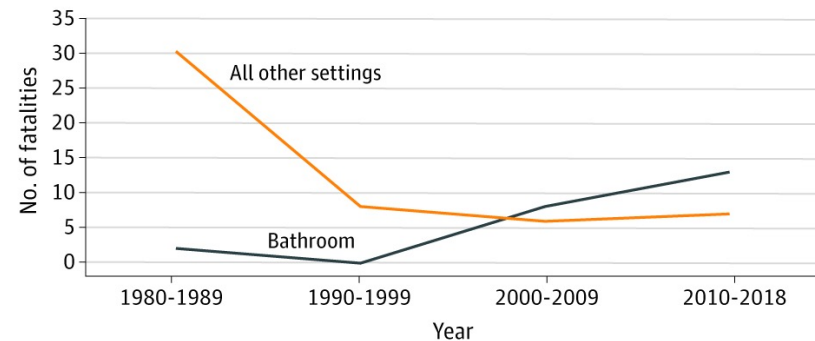
A Occupational and consumer fatalities



B Occupational fatalities with use of paint remover and other products

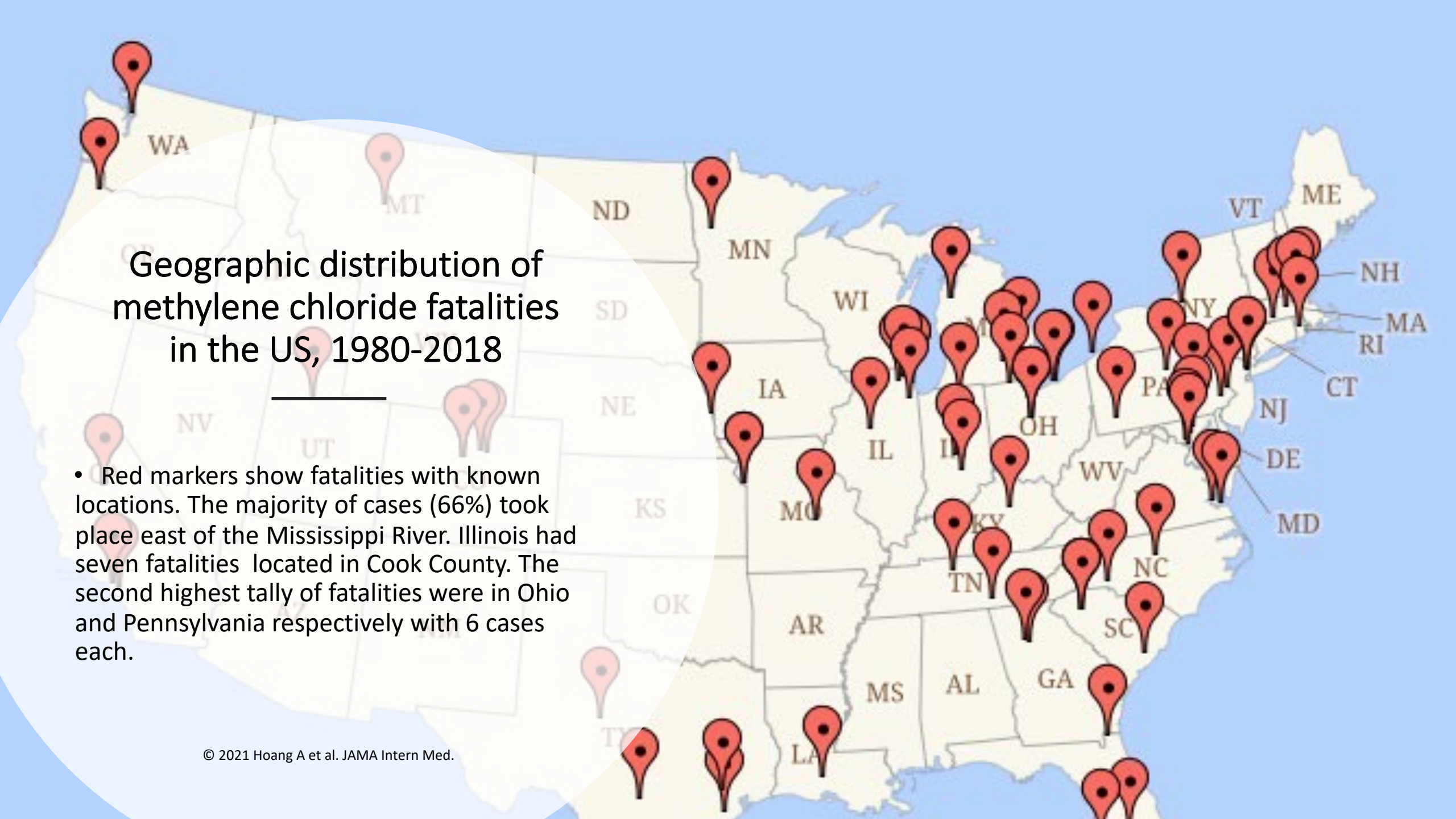


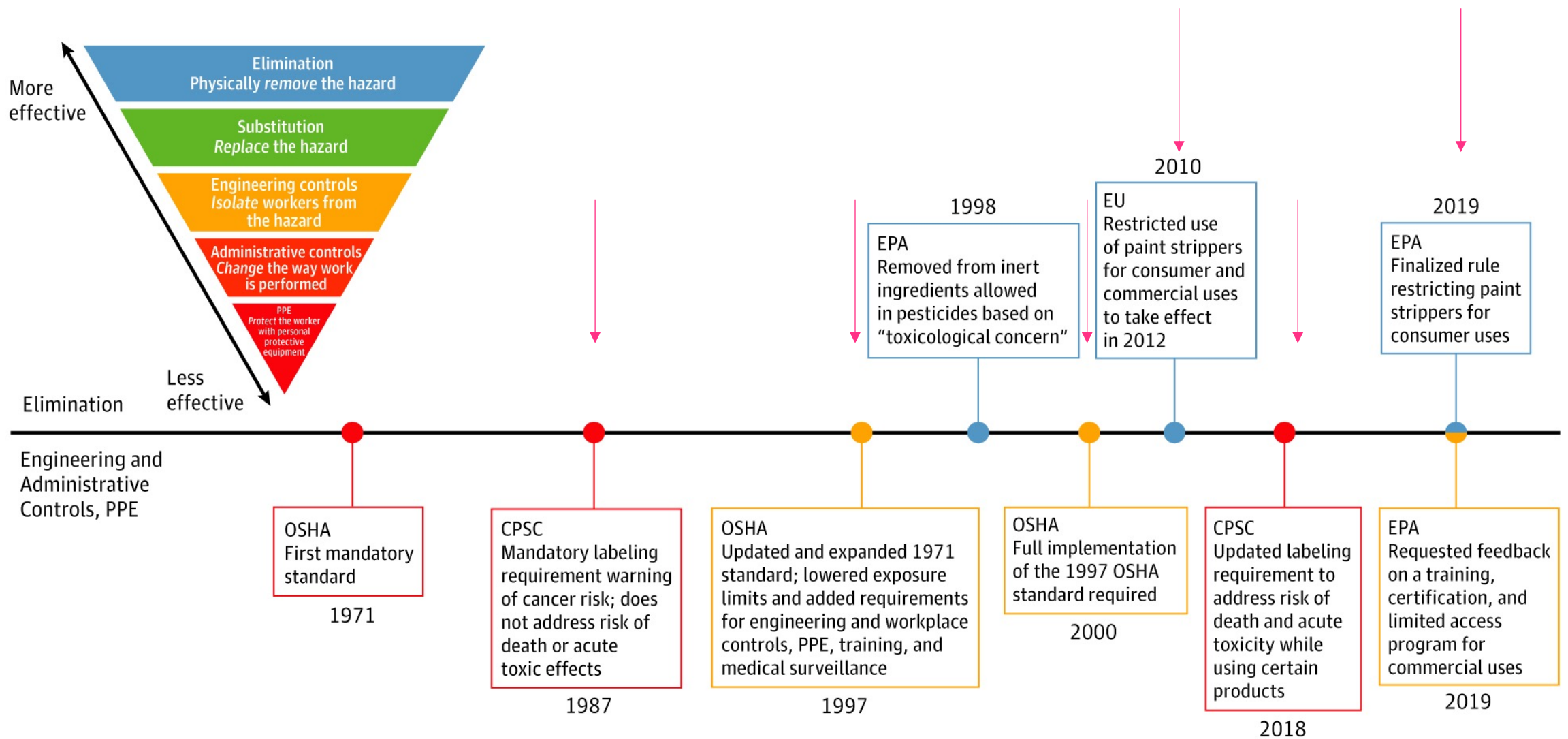
C Occupational fatalities in bathrooms and other settings



Geographic distribution of methylene chloride fatalities in the US, 1980-2018

- Red markers show fatalities with known locations. The majority of cases (66%) took place east of the Mississippi River. Illinois had seven fatalities located in Cook County. The second highest tally of fatalities were in Ohio and Pennsylvania respectively with 6 cases each.







THANK YOU



Table. Selected Characteristics of 85 Methylene Chloride–Related Fatalities Identified in the United States, 1980-2018^a

Characteristic	No. (%)		
	Occupational fatalities (n = 74)	Consumer fatalities (n = 11)	Fatalities with autopsy reports available (n = 23)
Sex			
Total No. reported	69	11	23
Male	65 (94)	10 (91)	21 (91)
Female	4 (6)	1 (9)	2 (9)
Race/ethnicity			
Total No. reported	40	7	23
White	26 (65)	5 (72)	14 (61)
Hispanic	8 (20)	1 (14)	5 (22)
Black	6 (15)	1 (14)	4 (17)
Age			
Total No. reported	59	11	23
Median (IQR), y	31 (24-42)	45 (28-52)	37 (29-52)
Mean (SD), y	34 (13)	41 (18)	39 (13)
Range, y	18-64	14-80	20-62
Year of fatality			
Total No. reported	74	11	23
1980-1989	32 (43)	2 (18)	NA
1990-1999	8 (11)	3 (27)	NA
2000-2009	14 (19)	1 (9)	8 (35)
2010-2018	20 (27)	5 (46)	15 (65)
Product used			
Total No. reported	67	11	23
Paint stripper	52 (78)	8 (73)	23 (100)
Cleaning/degreasing solvent	12 (18)	1 (9)	NA
Adhesive/sealant	3 (4)	2 (18)	NA
Setting of incident			
Total No. reported	67	10	23
Bathroom	23 (34)	3 (30)	19 (82)
Industrial equipment	20 (30)	NA	2 (9)
Floor (nonbathroom)	4 (6)	1 (10)	2 (9)
Carpet	3 (4)	1 (10)	NA
Furniture	7 (11)	1 (10)	NA
Bystander on site ^b	3 (4)	NA	NA
Accidental ingestion	NA	1 (10)	NA
Other ^c	7 (11)	3 (30)	NA
Respirator use			
Total No. reported	36	4	21
No respirator used	20 (56)	2 (50)	13 (62)
Respirator used but not NIOSH approved	16 (44)	2 (50)	8 (38)

Abbreviations: IQR, interquartile range; NA, not applicable; NIOSH, National Institute for Occupational Safety and Health.

^a See eTable 2 in the [Supplement](#) for individual cases.

^b In 3 cases, the decedents did not use the products themselves but entered a room where vapors lingered after methylene chloride product use.

^c Other known fatality settings included working on cars, sheds, shutters, and trailers, or being at