



Global Environmental Health



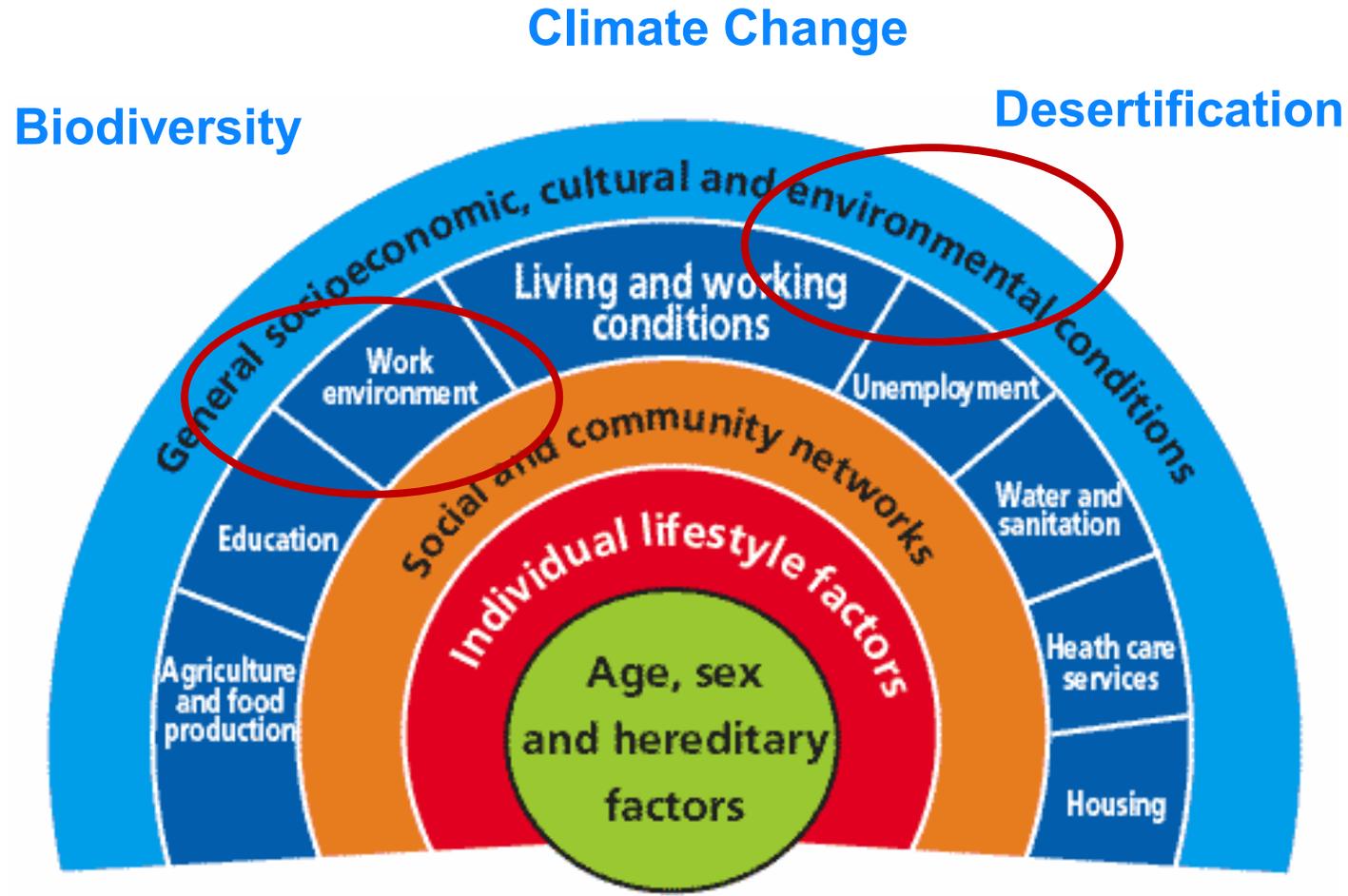
World Health Organization

WHO Definition of Health – since 1948

Health is *“a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.”*

World Health Organization (WHO) – United Nations (UN) agency that specializes in health, 1948

Determinants of Health



1. Income and social status
2. Social support
3. Education
4. Employment
5. Physical environments
6. Biology and genetics
7. Early life
8. Lifestyle habits
9. Health systems and services

Dahlgren G, Whitehead M. *Policies and strategies to promote social equity in health*. Copenhagen: World Health Organization, 1992.

What is Environmental Health?

A branch of public health concerned with all aspects of the *natural* and *built* environment that may affect human health.

- *addresses* all physical, chemical, and biological factors *external to* a person
- encompasses *assessment* and *control* of those environmental factors that can potentially affect health
- targeted towards *preventing* disease and creating *health-supportive* environments.

Environmental Health Problems

- **~ 22% of the global disease burden and 23% of all deaths** can be attributed to environmental factors (WHO 2012).
- During the 21st century, global public health will depend more than ever before on **how we manage and respond to global environmental change** (WHO 2011).
- **'Environmentally-mediated' disease burden is much higher in developing countries**, except for certain non-communicable diseases
- **Infant death rate** from environmental causes 12 times higher in developing countries.
- The health of children under five, and to a lesser extent up to 10, and that of adults between 50 and 75 years is **most affected** by the environment.
- In children, the environment's contribution to infectious and parasitic diseases, neonatal and nutritional diseases and injuries is very prominent.
- In older adults, the fraction of noncommunicable diseases (NCDs) caused by the environment becomes more important, and that for injuries remains constant but significant.

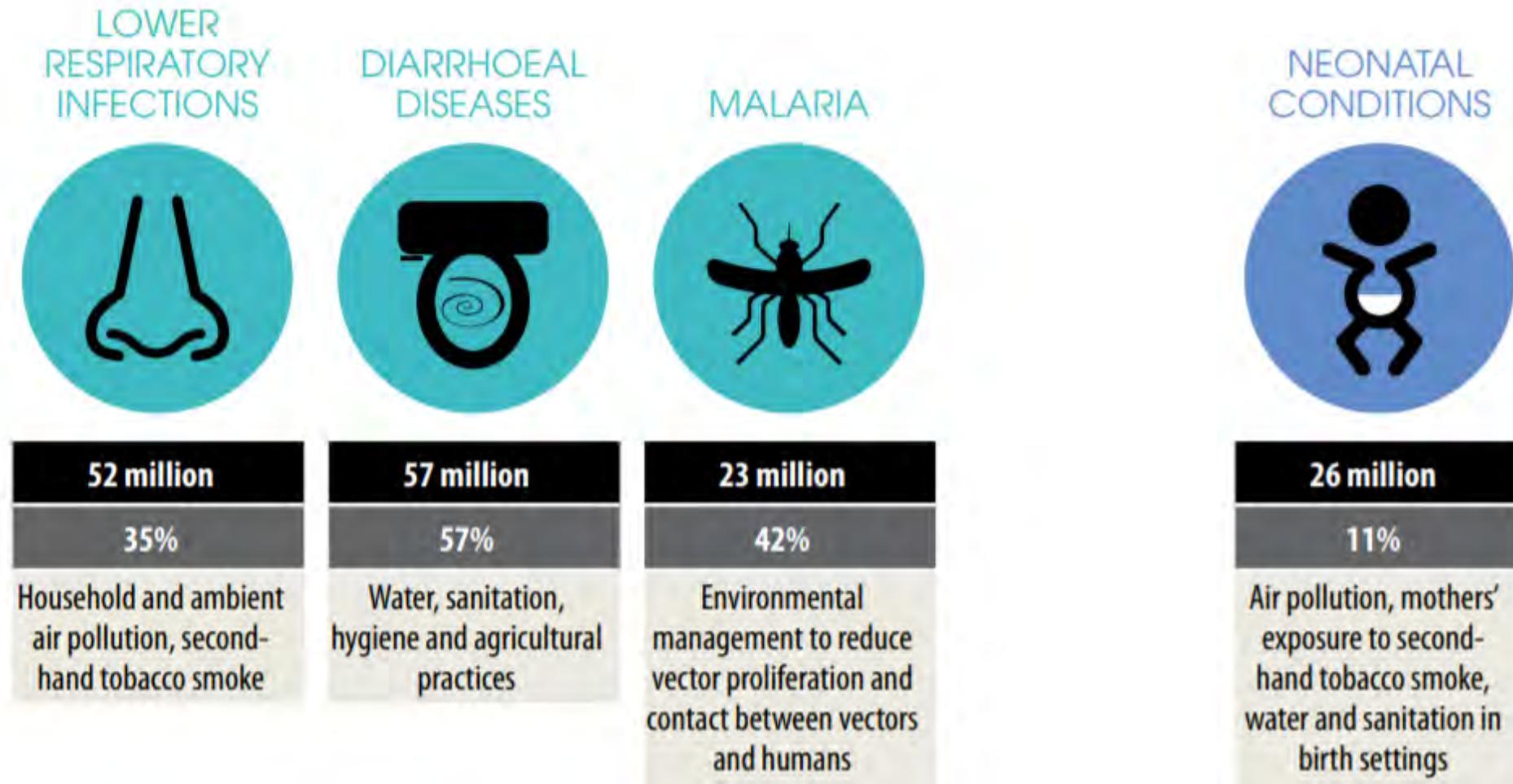
Figure ES5. Fraction of disease burden attributable to the environment by country, 2012

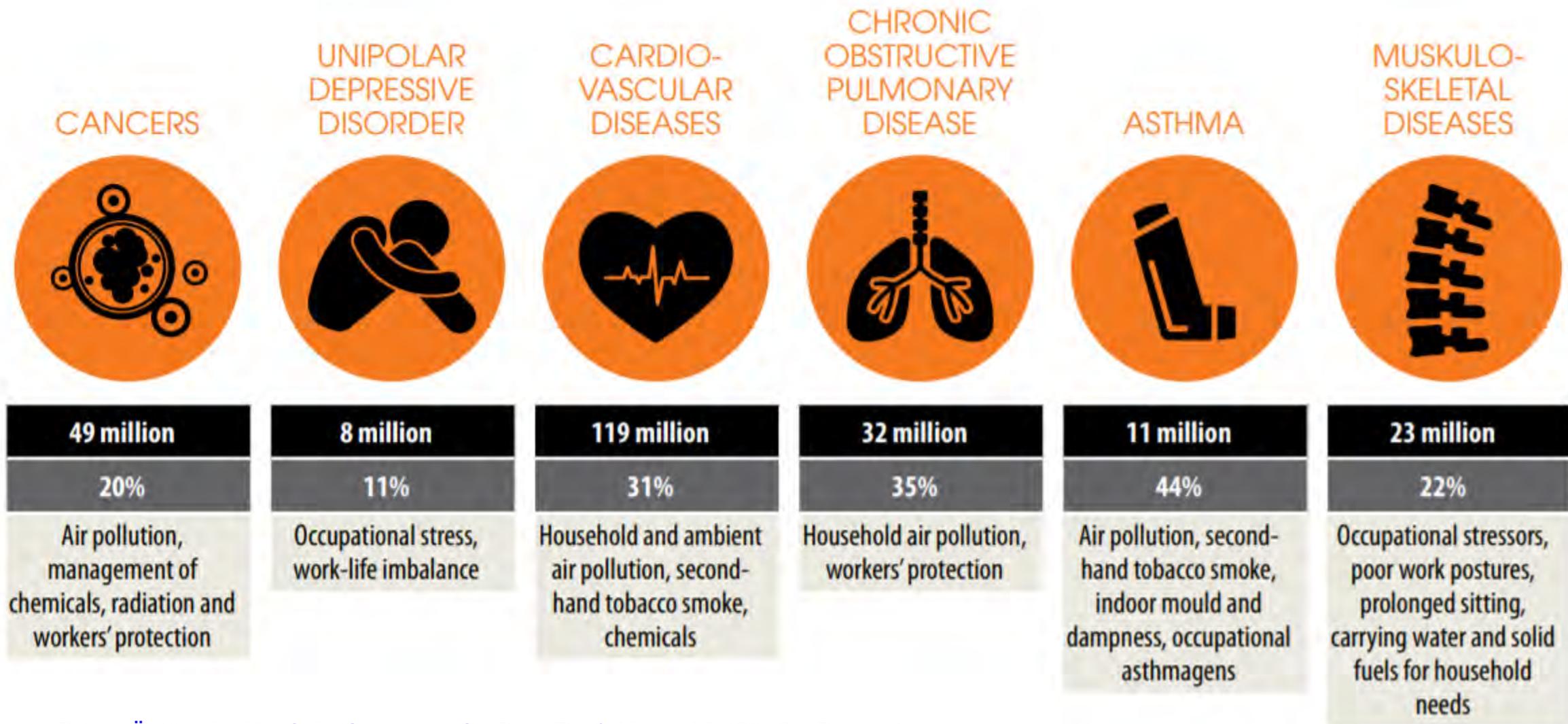


Figure ES2. Diseases with the highest preventable disease burden from environmental risks, in disability-adjusted life years (DALYs) – a combined measure of years of life lost due to mortality and years of life lived with disability, 2012

- DALYs due to preventable environmental risks
- Proportion of disease attributable to the environment
- Main areas of environmental action to prevent disease

Prüss-Üstün, A., Wolf, J., Corvalán, C., Bos, R., & Neira, M. (2016). *Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks*. World Health Organization.





Prüss-Üstün, A., Wolf, J., Corvalán, C., Bos, R., & Neira, M. (2016). *Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks*. World Health Organization.

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UNINTENTIONAL INJURIES (OTHER THAN ROAD TRAFFIC)



74 million

50%

Home, community and work safety

ROAD TRAFFIC INJURIES



31 million

39%

Road design, traffic system environments, land-use planning

SELF HARM

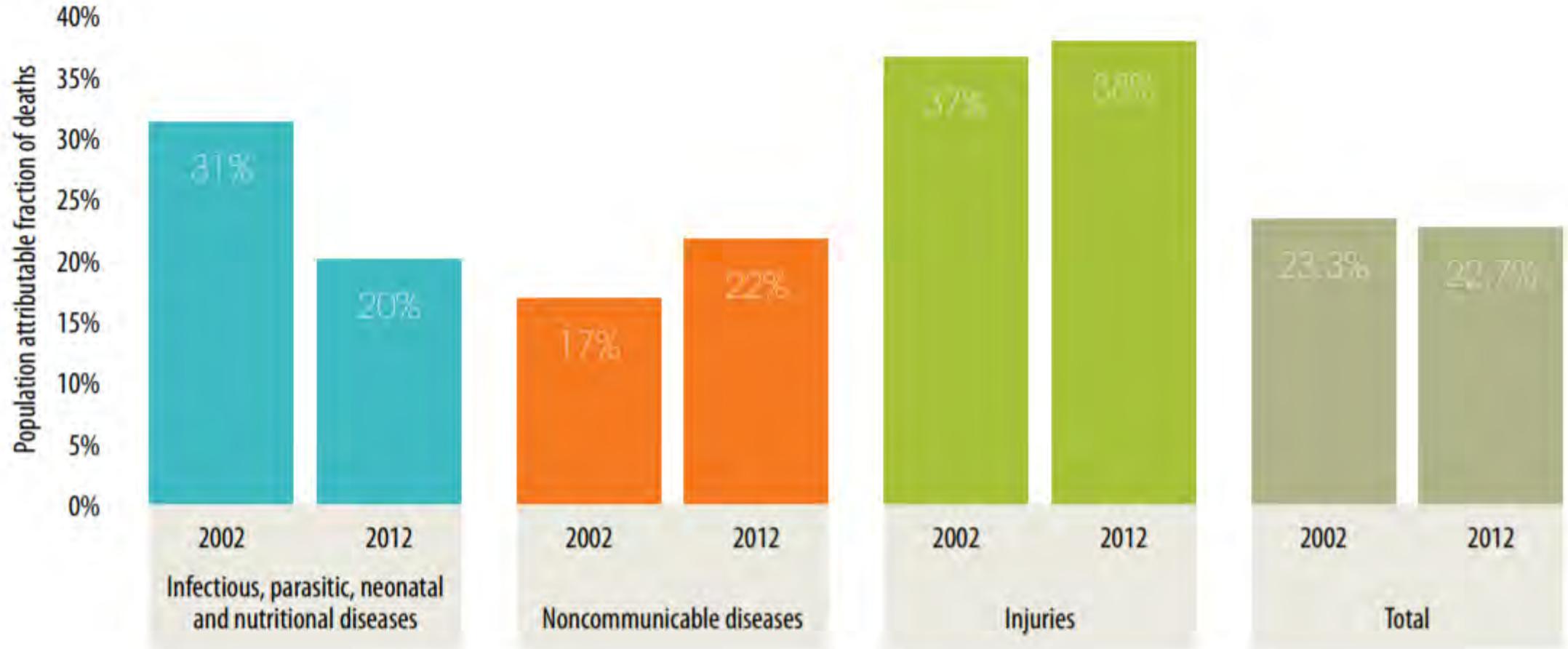


8 million

21%

Management of chemicals, access to firearms

Figure ES6. Trend in the fraction of deaths attributable to the environment by disease group, 2002–2012



Basic Environmental Health is...

Clean air

Safe and sufficient water

Safe and adequate food

Safe and peaceful settlements

Stable global environment



DAMAGING THE PLANET DAMAGES HUMAN HEALTH



CLIMATE CHANGE

If unchecked climate change related impacts could cause an extra

250,000

deaths per year

between 2030 and 2050¹

BIODIVERSITY LOSS



Overfishing together with increasing acidity and other environmental changes threaten fish supplies



UNDER NUTRITION

Millions of people are at risk of under nutrition due to the combined effects of

climate change and other environmental changes



WATER USE

By 2050 over

40%

of the world's population could be living in areas under severe water stress



SOIL DEGRADATION

This leads to a loss of

1-2

million hectares of agricultural land per annum

These environmental threats could also exacerbate each other

•Sarah Whitmee, Andy Haines, Chris Beyrer, Frederick Boltz, Anthony G Capon, Braulio Ferreira de Souza Dias, Alex Ezeh, Howard Frumkin, Peng Gong, Peter Head, Richard Horton, Georgina M Mace, Robert Marten, Samuel S Myers, Sania Nishtar, Steven A Osofsky, Subhrendu K Pattanayak, Montira J Pongsiri, Cristina Romanelli, Agnes Soucat, Jeanette Vega, Derek Yach. [Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation-Lancet Commission on planetary health](https://doi.org/10.1016/S0140-6736(15)60901-1). *The Lancet*. DOI: 10.1016/S0140-6736(15)60901-1

Environmental Health Hazards

Hazard

Exposure that may adversely affect health



Potential of an environmental agent to harm health

Risk

Probability (likelihood) of that a hazard will cause a specific bodily injury to any person



Hazard results in risk *only* if there is exposure

Types of Environmental Health Hazards

- Biological
- Chemical
- Physical
- Psychosocial



Biological Hazards

- Bacteria
- Viruses
- Parasites
- Fungi



Anopheles stephensi, the urban vector of malaria in south Asia takes a blood meal. Different mosquito species transmitting a number of diseases breed in man-made environments. This makes environmental management an important component of vector control.

Credit: CDC/Jim Gathany

Each year, 16 400 hepatitis C and 65 600 hepatitis B infections occur in health workers as a result of injuries by contaminated sharp objects.



Intensive care nurse prepares for a procedure in a provincial hospital in Viet Nam.

Chemical Hazards

- Air pollutants
- Toxic metals
- Solvents
- Pesticides

In the year 2000, about 800 000 children were affected by lead exposure, leading to lower IQ and potential mild mental retardation.



A child directly exposed to tailpipe emissions from an automobile, which may heighten environmental exposure to lead in countries where leaded gasoline has not yet been phased out.



Farmworker in Asia exposed to pesticides while spraying crops without any protective gear.

Physical Hazards

- Radiation
- Temperature
- Noise

Melanomas are linked to excessive UV exposure, yet we continue to deplete the ozone layer and fail to use personal protection.



Encouraging children in Australia to wear hats on the beach as part of the national SLIP SLAP SLOP campaign to increase awareness about health risks arising from excessive exposure to the sun's rays.

Credit: Mark Edwards/Still Pictures



Psychosocial Hazards

- Stress
- Lifestyle
- Unemployment
- Discrimination



world

Asia's success comes at a cost for its workers



A trader at the Malaysia Stock Exchange in Kuala Lumpur taking a nap. The AIA Vitality Healthiest Workplace survey shows that about half of employees in Hong Kong, Singapore, and Malaysia have reported problems with sleep. Photo: AFP

PUBLISHED: 6:00 PM, SEPTEMBER 16, 2017
UPDATED: 9:28 PM, SEPTEMBER 16, 2017

LONDON — Economists have long marvelled at the Asian economic miracle, but such productivity is coming at a much higher cost than they might realise, a survey across four nations in the region shows.

The AIA Vitality Healthiest Workplace research found that in Hong Kong, the average amount of time lost per employee per year because of absence and presenteeism (when employees turn up to work but are unproductive) amounted to nearly 71 days — two to three months' worth of lost time. Employees in Malaysia and Singapore lost an average of 66 and 54 days, respectively. This compares with 45 days in Australia but only 30 days in the United Kingdom.

"The most striking factor was the high level of mental health issues and the stigma associated with them," says Mr Christian van Stolk, home affairs and social policy research head at Rand Europe, the research consultancy that analysed the data collected in Asia and compared them with data from the Britain's Healthiest Workplace survey. "The other trend was the very high number of days lost to productivity: people are working very hard but to no effect, while doing harm to themselves."

In Hong Kong and Malaysia, about 12 per cent of respondents reported symptoms of depression — around double the proportion in Australia, Singapore and the UK. Meanwhile, rates of bullying in the workplace in Hong Kong, Malaysia and Singapore were almost three times the UK's level of 6.6 per cent.

Contaminant is ...

- A substance that is harmful to human health or the environment
- Source:
 - Man-made (Anthropogenic) Sources
 - Natural sources

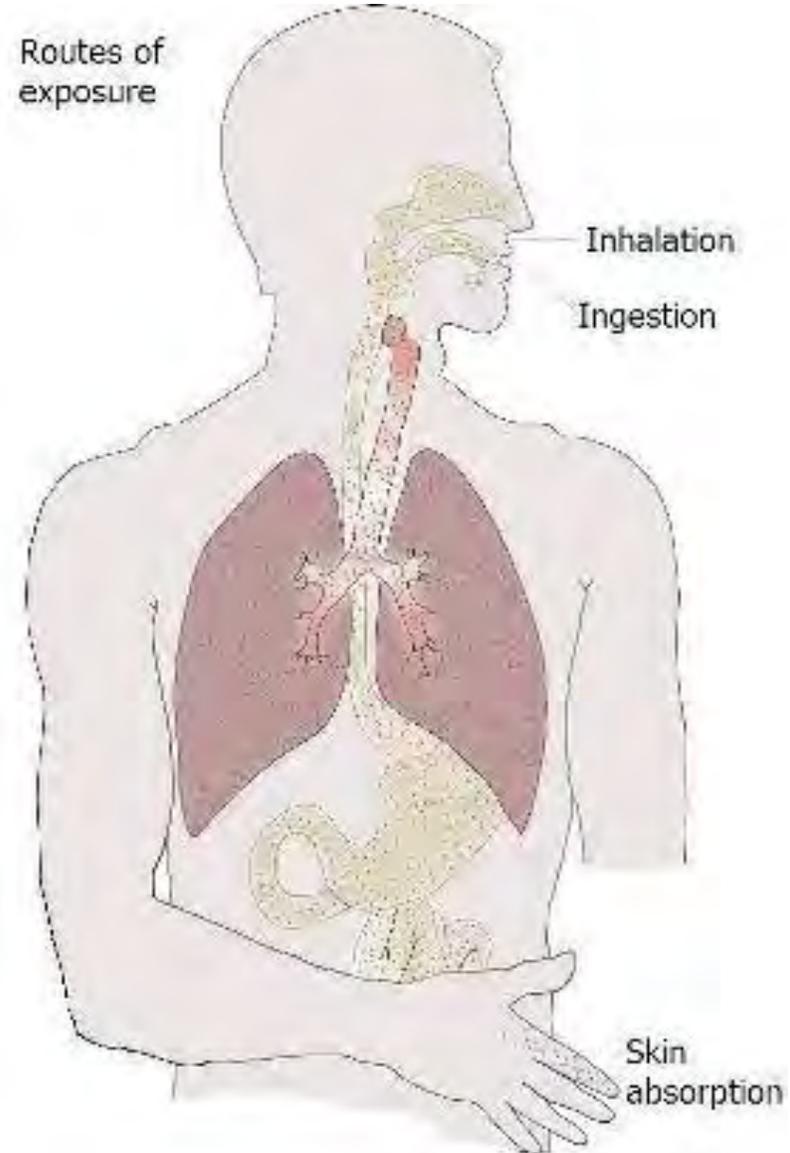
Sources of Man-Made Environmental Contamination

- Industry
 - Manufacturing
 - Mining and metal smelting
 - Milling of pulp and paper
- Mobile sources
 - Gas and diesel engines
- Energy and food production
 - Burning of oil, coal and wood
 - Agriculture – pesticides, fertilizers



Routes of Exposure to Environmental Health Hazards

- Inhalation
- Ingestion
- Direct contact



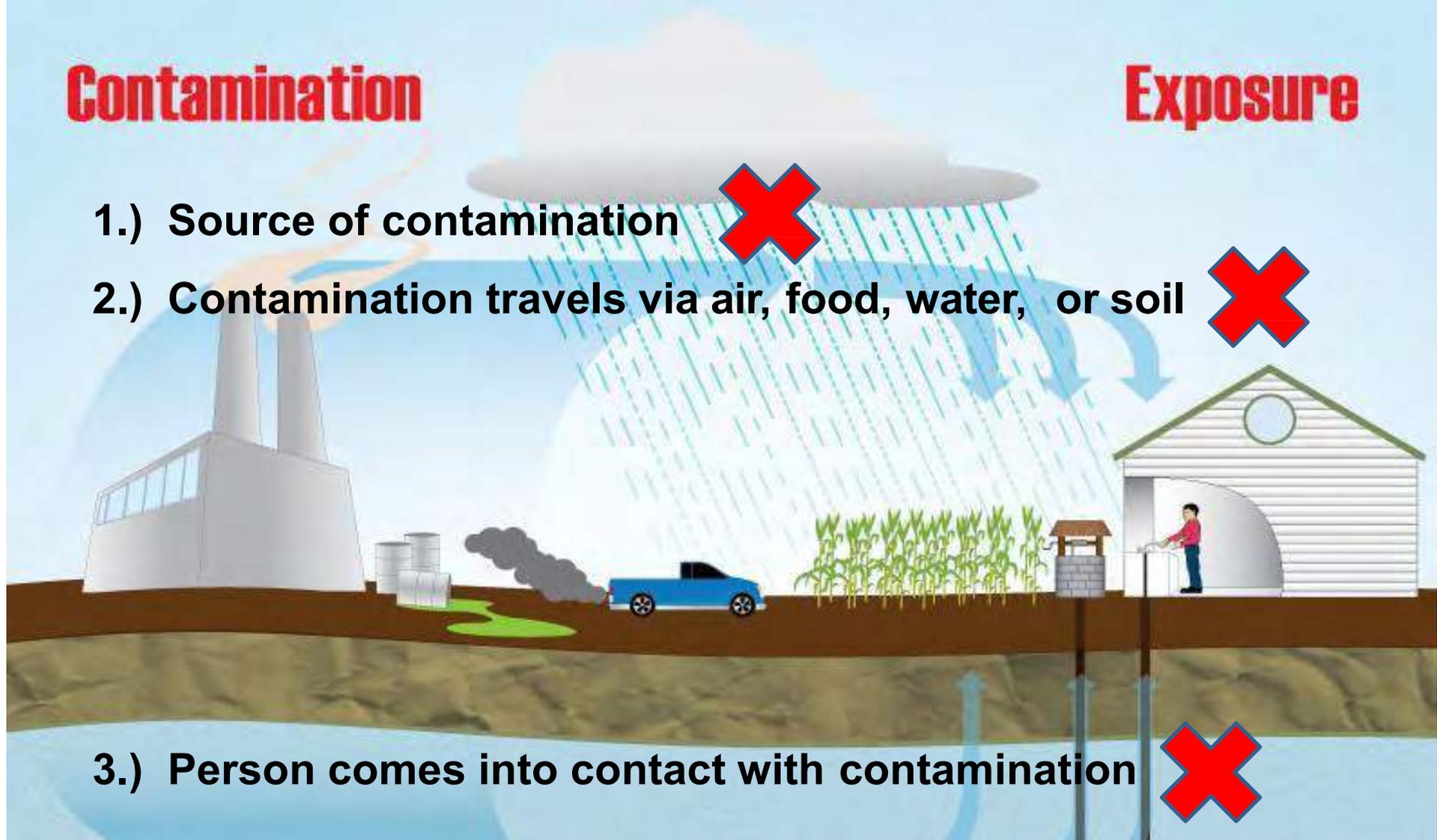
Contamination

Exposure

- 1.) Source of contamination
- 2.) Contamination travels via air, food, water, or soil

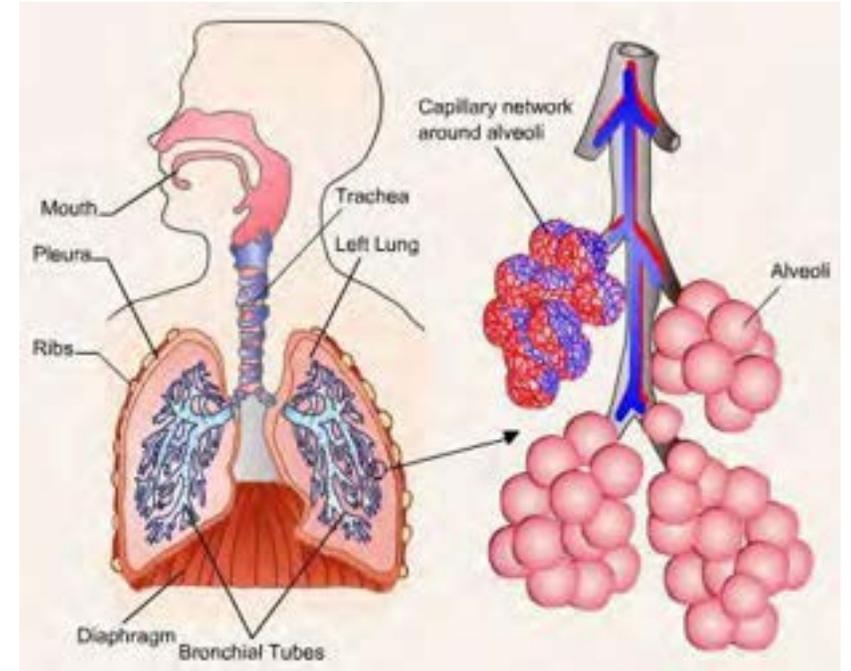
- 3.) Person comes into contact with contamination

- 4.) Contamination enters the body by inhalation, ingestion or direct contact



Inhalation

- Contaminants that enter the lungs can have:
 - direct effect on the lung or
 - Been absorbed into the bloodstream
- Contaminants that enter the body by inhalation:
 - Gases
 - Vapors
 - Aerosols
 - Particles
 - Fibers (such as asbestos)
- This is the most common route for ***environmental and occupational exposure***.



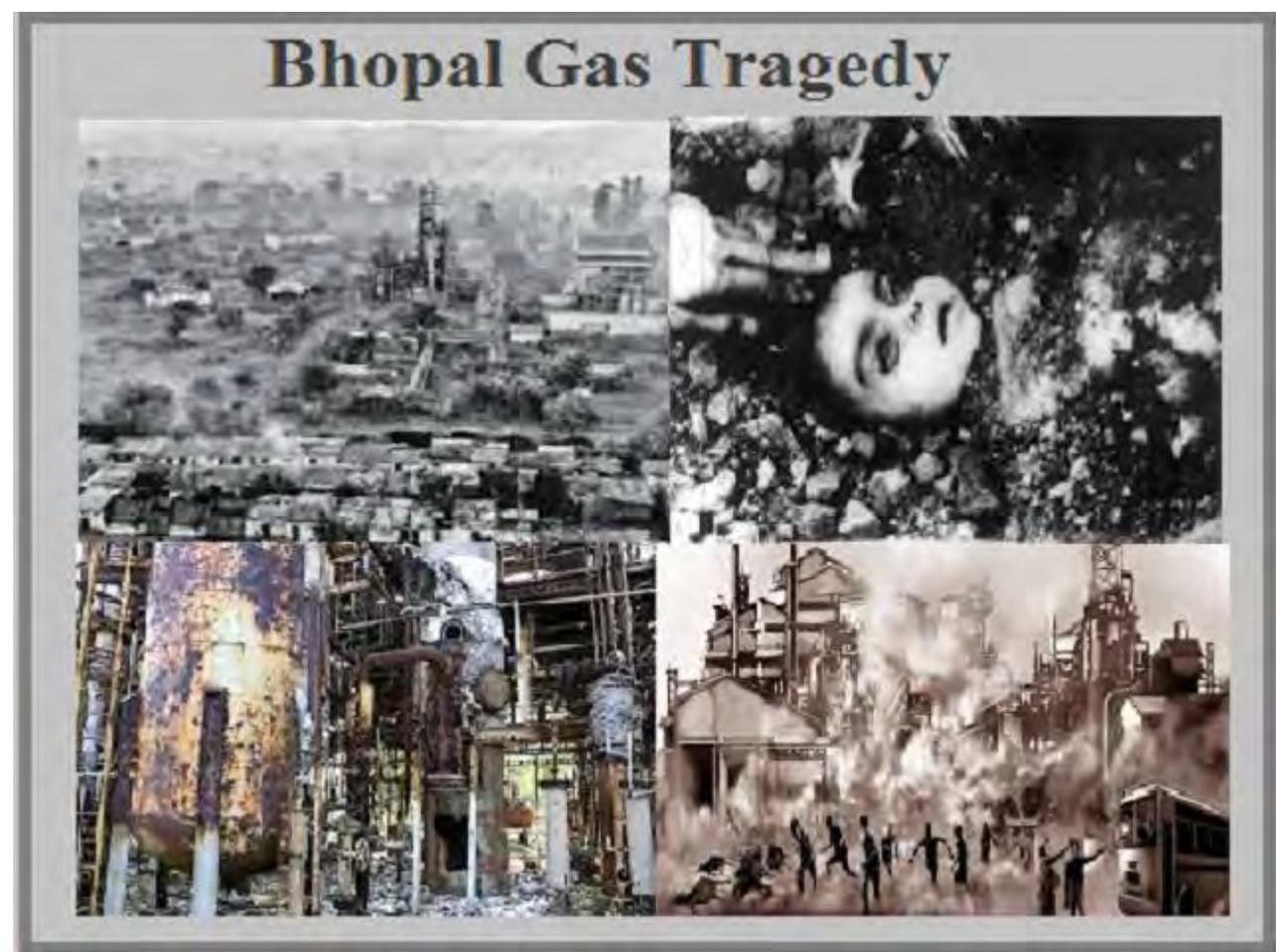
Bhopal gas tragedy 1984



Image Source: <https://bit.ly/2FUiaOv>

<https://www.britannica.com/event/Bhopal-disaster>

<https://www.theguardian.com/cities/2019/dec/08/bhopals-tragedy-has-not-stopped-the-urban-disaster-still-claiming-lives-35-years-on>



<https://www.jagranjosh.com/general-knowledge/bhopal-gas-tragedy-1575289409-1>

'Bhopal's tragedy has not stopped': the urban disaster still claiming lives 35 years on



54 treated in hospital after inhaling leaked chlorine gas at SAFRA club

SINGAPORE : 28 people were sent to hospital with breathing difficulties after gas leaked from a plant room in SAFRA's Mount Faber Clubhouse.

The Health Ministry says 26 others sought treatment from the hospitals on their own.

A total of 14 were admitted, 25 under observation and 15 were discharged.

Some 500 people, including both staff and guests, were evacuated when the leak was detected at about 11am on Saturday -CNA

SAFRA Mount Faber reopens, but swimming pools remain closed

...Of the 54 people who received treatment for breathing difficulties, only one remain hospitalised for observation - a child at the KK Women's and Children's Hospital.

Fumes drifted out from the plant room to the rest of the clubhouse.

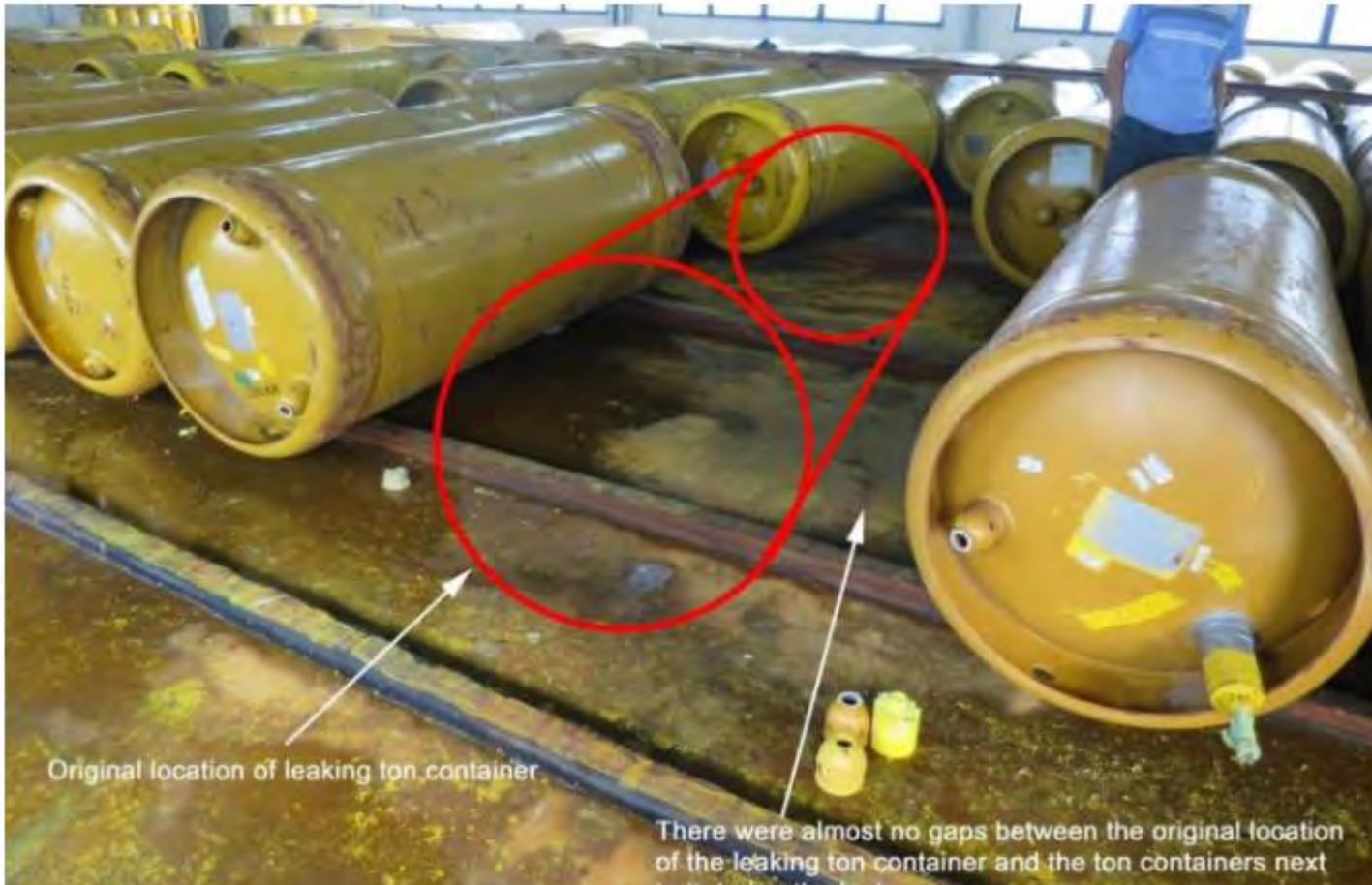
A contractor had mistakenly mixed Sodium Hydrochloride, or liquid chlorine, with hypochloric acid, causing a chemical reaction -CNA



11 July 2005

Chemical company fined \$200k over chlorine leak

7 taken to hospital in 2016 incident as firm failed to take reasonable safety measures



<https://www.tnp.sg/news/singapore/scdf-officer-chlorine-gas-leak-it-felt-movie>

the newspaper NEWS ENTERTAINMENT LIFESTYLE RACING

POPULAR: COURT & CRIME | Food & Drink

SINGAPORE

SCDF officer at chlorine gas leak: 'It felt like a movie'

This article is more than 12 months old

On Sunday, seven people were taken to hospital after a chlorine gas leak in Tuas. CYNTHIA CHOO (chooxc@sph.com.sg) speaks to the SCDF team which plugged the leak, and tries on a Hazmat suit

Cynthia Choo
Sep 19, 2016 10:38 am

When Singapore Civil Defence Force (SCDF) second warrant officer (2WO) Zui Faizal, 34

Ingestion

- Food or drinks may have contaminants on or in them
- Contaminants are absorbed by the digestive system

2015 infections after eating raw fish linked to little-known, highly infectious strain of GBS bacteria: Researchers



CR 1 of 2 Hawker stall owners were banned from selling raw freshwater fish after an outbreak of blood poisoning caused by a highly infectious bacteria strain in 2015. PHOTO: THE IRIS

<https://www.straitstimes.com/singapore/health/bacteria-in-raw-fish-that-infected-over-160-in-2015-a-public-health-threat#:~:text=SINGAPORE%20in%202015%2C%20highly,dishes%20containing%20raw%20freshwater%20fish.>

4-year-old's death from eating tainted food a misadventure, says coroner



A four-year-old boy died four days after eating contaminated food bought from a food stall at a food court, a coroner's court heard. — ST PHOTO: S. SIVAKUMAR

Spize food poisoning: Number of cases hits 81

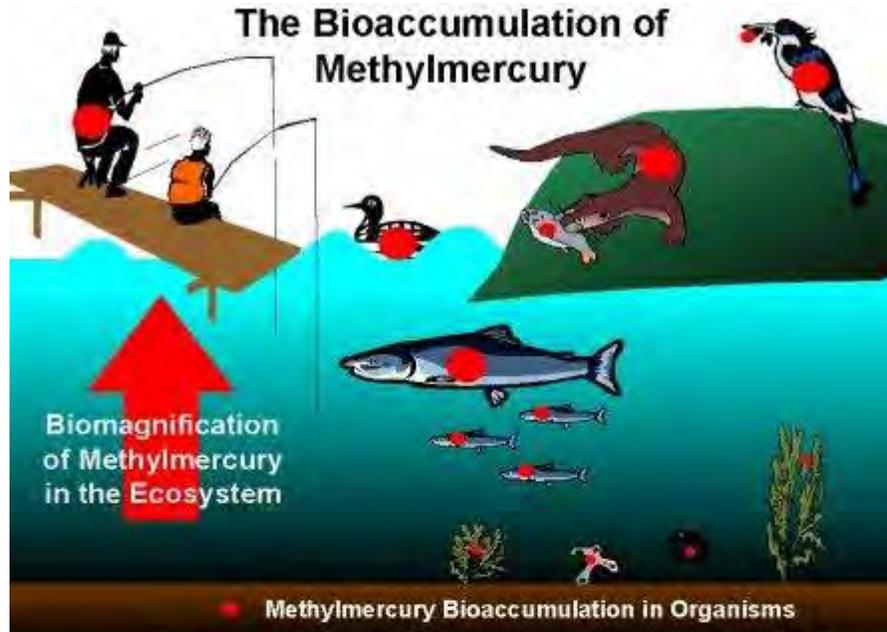


Spize's Blueberry Scone has been associated with food poisoning. At least 81 cases were reported. — ST PHOTO: ALPHACON



<https://www.bu.edu/sustainability/minamata-disease/#:~:text=Minamata%20disease%2C%20sometimes%20referred%20to,damage%20to%20hearing%20and%20speech.>

Minamata Disease

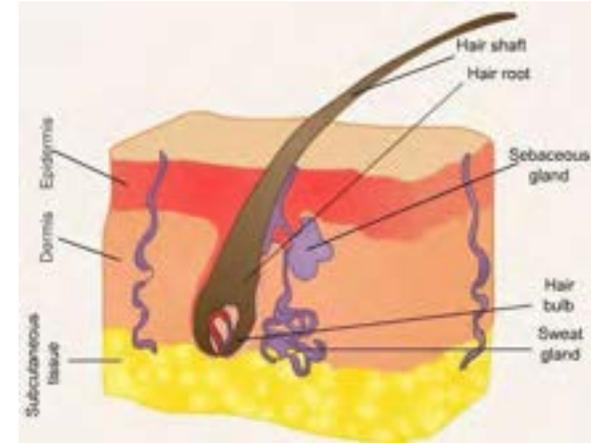


Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1986).



Direct Contact

- Contact with skin (dermal)
- Contaminants enter the bloodstream through the pores, or cuts in the skin to irritate the skin



Dioxin (Agent Orange) – Chloracne



Chloracne on the face and neck of herbicide production worker



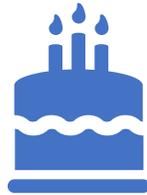
The **Seveso Italy accident** of 10 July 1976, exposed a large population to **2,3,7,8-tetrachlorodibenzo-p-dioxin** (TCDD or simply dioxin).

The accident resulted, mostly among children, in one of the largest ever-reported outbreaks of chloracne.

Major Environmental Contaminations



Air



Food



Water



Soil

Selected Major "Environmental Disease" Outbreaks

Location and year	Environmental hazard	Type of disease	Number affected
London, UK 1952	Severe air-pollution with sulphur dioxide and suspended particulate matter (SPM)	Increase in heart and lung disease manifestations	3,000 deaths, many others ill
Toyama, Japan 1950s	Cadmium in rice	Kidney and bone disease ("Itai-itai disease")	200 with severe disease, many more with slight effects
Minamata, Japan 1956	Methylmercury in fish	Neurological disease ("Minimata disease")	200 with severe disease, 2,000 suspected
USA cities 1960s-70s	Lead in paint	Anaemia, behavioural and mental effects	Many thousands
Iraq 1972	Methylmercury in seed grains	Neurological disease	500 deaths, 6,500 hospitalized
Bhopal, India 1985	Methylisocyanate	Acute lung disease	2,000 deaths, 200,000 poisoned
California, USA 1985	Carbamate pesticide in watermelons	Gastrointestinal, skeletal, muscle, autonomic and central nervous system effects (Carbamate illness)	1,376 reported cases of illness resulting from consumption, 17 severely ill
Chernobyl, USSR 1986	Iodine-134, Caesium-134 and -137 from a reactor explosion	Radiation illness (including increases in cancer and thyroid diseases in children)	300 injured, 28 died within 3 months, more than 600 cases of thyroid cancer
Peru , 1991	Cholera epidemic	Cholera	139 deaths, many thousand ill

Outdoor Air Pollution

- ❑ Main source:
man-made (Anthropogenic)
- ❑ Other: **natural** sources, e.g forest fires and volcanoes

Health effects:

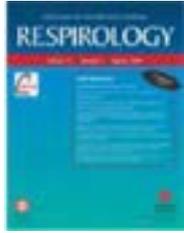
- eyes, nose and throat irritations
- effects on lungs, hearts, brain





Transboundary Air Pollution

2006 Southeast Asian Haze



GENERAL LECTURE

Impact to lung health of haze from forest fires: The Singapore experience

SHANTA CHRISTINA EMMANUEL

Family Health Service, Ministry of Health, Singapore

Impact to lung health of haze from forest fires: The Singapore experience

EMMANUEL SC *Respirology* 2000; 5: 175–182

Objective: From late July to the beginning of October 1997, countries of Southeast Asia experienced severe smoke haze pollution from uncontrolled forest fires mainly in the Indonesian states of Kalimantan and Sumatra. In Singapore, the impact of the 1997 haze was felt in the period from the end of August to the first week of November 1997 as a result of prevailing winds.

Methodology: The Ministry of the Environment monitors ambient air quality by a country-wide telemetric air quality monitoring and management network, with 15 stations located throughout the island, linked via a public telephone network to a central control station at the Environment Building. The monitoring methods used are the United States Environmental Protection Agency (USEPA) reference methods. The Pollutant Standards Index (PSI) developed by the USEPA is used for the reporting of daily air pollution concentrations. Intervals on the PSI scale are related to the potential health effects of the daily measured concentrations of the five major air pollutants: sulfur dioxide, particulate matter (PM₁₀), nitrogen dioxide, ozone and carbon monoxide. Public sector health facilities which come under the Ministry of Health, have computerized patient care systems which enable the routine ongoing surveillance of disease conditions for the period of the haze. Attention during the period of the haze was focused on conditions related to health effects of the haze. Data sources for the monitoring of the lung health effects of the haze included morbidity from public sector outpatient care facilities, accidents and emergency departments, public sector inpatient care facilities and national mortality data.

Results: Findings from the health impact of the haze showed that there was a 30% increase in outpatient attendance for haze-related conditions. An increase in PM₁₀ levels from 50 µg/m³ to 150 µg/m³ was significantly associated with increases of 12% of upper respiratory tract illness, 19% asthma and 26% rhinitis. Supplementary findings from scanning the electron microscopic sizing of the haze particles showed that 94% of the particles in the haze were below 2.5 µm in diameter. This was consistent with emissions from combustion sources originating over 500 km from Singapore. This has been of some concern because particles smaller than 2.5 µm in diameter can easily bypass normal body defence metabolism and penetrate deeply into the alveoli of the lungs. During the same period, there was also an increase in accident and emergency attendance for haze-related conditions. There was no significant increase in hospital admissions or in mortality.

Conclusion: The present study found that the health effects from the 1997 smoke haze in Singapore were generally mild.

Key words: forest fire, haze, pollution, Singapore.

Abstract

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Indoor air pollution in developing countries:

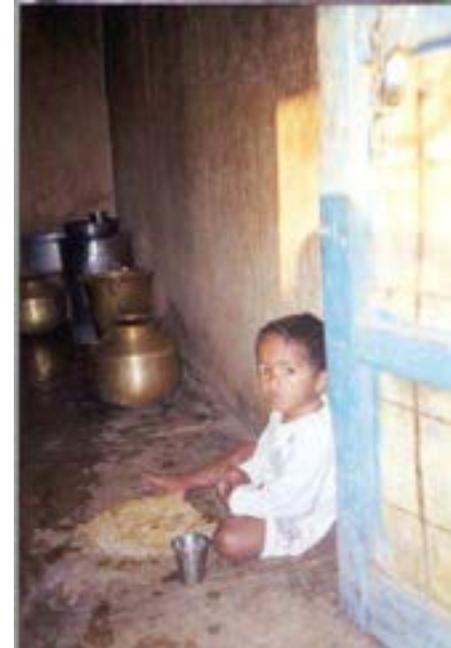
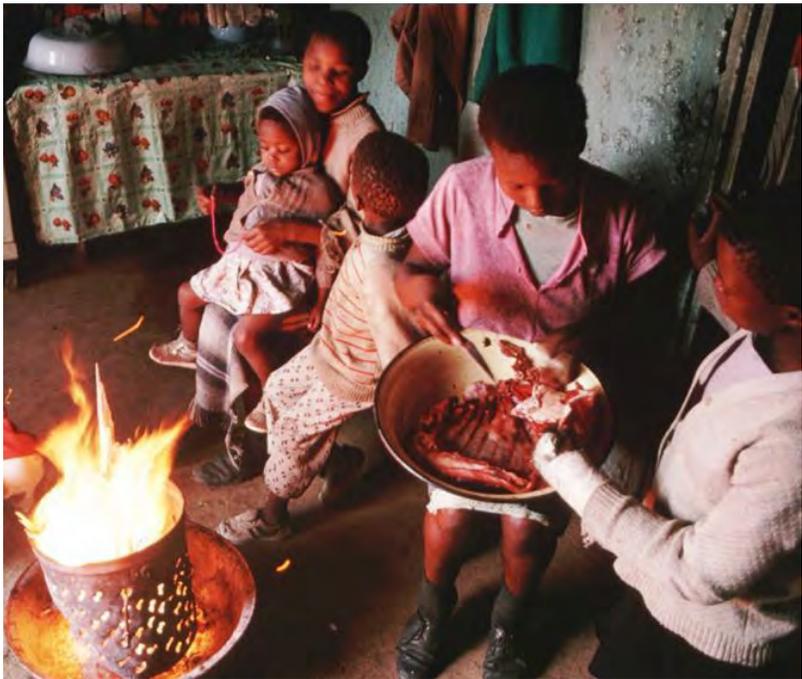
A major Public Health and Environmental challenge





Smoke in the home from cooking by burning wood, charcoal, dung, crop waste

- With little or no ventilation
- **Soot and carbon monoxide**



Smoke – “The Killer in the Kitchen”: Indoor Air Pollution

WHO World Health Report 2004

- Indoor smoke causes pneumonia and other respiratory infections
- biggest killer of children under five years of age
- kills ~one million children a year



Indoor Air Pollution: Developed Countries

Second hand smoke (SHS) exposure

- Single biggest source and the most dangerous indoor air pollutant in **developed countries**
 - Containing > 4000 dangerous chemicals
 - Causes eye, nose, and throat irritation
- SHS classified as a **carcinogen** by EPA and IARC
- Only acceptable response is to **eliminate** exposure in all work and public places, as well as domestic environments



Cancer risk higher with long, regular exposure: Study

YEARS of breathing in smoke from the daily burning of incense at home could increase one's risk of respiratory tract cancers, a new study by Singapore scientists has found out.

Compared to those who do not light up joss sticks or coils of incense, those who do so over long hours for more than 40 years are 70 per cent more likely to contract cancers in the upper respiratory tract, said Associate Professor Koh Woon Puay of the National University of Singapore (NUS).

These include cancers of the nose or sinuses, tongue, mouth and windpipe.

The finding is from the Singapore Chinese Health Study of more than 61,000 ethnic Chinese living here and aged between 45 and 74.

Conducted by NUS' department of community, occupational and family medicine, the study

started out in 1993, when the subjects were cancer-free.

They were asked how often they burned incense at home and for how long - only for part of the day or 24/7.

Prof Koh said that, among the participants tracked from 1993 till 2005, 325 developed cancer of the upper respiratory tract.

The researchers also weighed other factors such as the subjects' diets, drinking habits and whether they were smokers.

Prof Koh said: "We found that among non-smokers who used incense during the day or at all times, the increased risk was three times that of smokers."

The results of the study, believed to be the first such investigation into incense and the risk of cancer, will be published in the Oct 1 issue of *Cancer*, a peer-reviewed journal of the American Cancer Society.

The use of incense is essential in many Asian religious and spiritual ceremonies.

Mr Chung Kwang Tong, secretary-general of the Taoist Federation Youth Group in Singapore, explained that for Taoists, the smoke from incense is a way of communicating with the deities.

It is recommended that incense be offered twice a day, at dawn and at dusk.

Prof Koh noted that incense is usually made from fragrant plants such as sandalwood, jasmine and essential oils. It is the burning of these materials that produces particles and cancer-causing substances.

In an enclosed space like an HDB flat, the amount of smoke and particles released by incense would be much higher than if the incense was burned outdoors, she added.

Another pattern which emerged from the study was that the risk of cancer from this source was higher among women, who spent more time at home than men.

Prof Koh said that since incense is used largely by the Chinese and "breathing in the smoke is often involuntary, it is important to advise people to reduce being exposed" to it.

Apart from that, further studies are needed to find out if different types of incense carry different degrees of cancer risk, she said.

NUS News

Home > Highlights > Frying linked to dangerous fumes

Frying linked to dangerous fumes

Published: 27 August 2015 Category: Highlights



Frequent cooking using frying methods could lead to increased exposure to potential cancer-causing chemicals, according to a new study.

While cigarette smoking remains the primary cause of lung cancer, the disease is unusually common among female non-smokers in Southeastern Asia, including the Chinese population in Singapore. Professor Koh Woon Puay from the Saw Swee Hock School of Public Health (SSHSPh) and the Duke-NUS Graduate Medical School, together with a team of US investigators, recently published a study looking into the phenomenon and its relation to cooking.

One hypothesis is that fumes generated from Chinese-style cooking, typically frying with a wok, may be a risk factor for lung cancer. The heated oil used in wok cooking, including the common techniques of stir frying and deep frying meat, produces vapours which contain a variety of potentially mutagenic and carcinogenic compounds. Women do most of the cooking in traditional Chinese households, including in Singapore. Examining this hypothesis, the study found that Singapore Chinese women who regularly cooked at home displayed elevated levels of potential toxicants and carcinogens in their urine, indicating a possible exposure to such substances found in fumes produced during cooking.



FOOD FOR THOUGHT: Frequent cooking with a wok leads to "significantly increased levels" of substances which can attack a person's DNA. TNP FILE PHOTO

Published on Aug 23, 2015

Cooking fumes behind some cancer cases?

NG JUN SEN

MADAM Tay, in her 50s, has early stage lung cancer. But the online trader has never touched a cigarette in her life.

Neither have her family members, including her parents and an aunt, who live with her in a flat in Tampines.

"My neighbours don't smoke. I hardly go out. I don't even keep an altar at home," says Madam Tay in Mandarin. She says she has little exposure to second-hand smoke.

What she does a lot of, however, is cook. She declines to give her full name for privacy reasons.

Now, a recent study suggests that cooking food may have contributed to Madam Tay's condition.

Video

This plugin is vulnerable and should be updated.
[Activate Adobe Flash](#)
[Check for updates...](#)

Human sorority with wildlife | Top rest stops on Japan's Enryu Island | New Miss Universe returns to Philippines

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Water Pollution

- Harmful substances:
- enter the water when rain or water washes them into rivers, lakes, streams, or the ground
- “dumped” into water
- **Impacts:**
 - Drinking water
 - Food chain
 - Human and aquatic life



Water Pollution

- 80% of all diseases and over 1/3 of deaths in **developing countries** caused by contaminated water
- Estimated 1.4 billions have no access to safe drinking water



Avoid swimming at Pasir Ris beach for a year as water is unclean: NEA

THE National Environment Agency (NEA) on Wednesday advised the public not to swim at Pasir Ris beach for a year as the water is not clean.

The water there carries a high level of *Enterococcus* - a bacteria found in faeces.

Wed, Jul 30, 2008 The Straits Times



Soil/ Land Contamination

- Pressure on agriculture and food production as both population and per capita demand increase
- Agriculture can pollute land with pesticides, nitrate-rich fertilizers, slurry from livestock
- Polluted soil:
 - Affect the **food** and the **water** spread through the **air** as **dust particles**



Soil Land Contamination

- Contaminated land is a problem in industrialized countries from former factories, power stations
 - can leave waste e.g. heavy metals
- Developing countries
 - sometimes used for **dumping**



Plastic pollution

http://www.ted.com/talks/capt_charles_moore_on_the_seas_of_plastic.html



Food Contamination

ABC NEWS

Three dead, 6,200 sick in China milk scandal

Posted Wed Sep 17, 2008 1:01pm AEST

Updated Wed Sep 17, 2008 2:29pm AEST



Toll rises...China has launched a nationwide probe into all baby milk powders. (Reuters)

Bhalla V et al. Melamine nephrotoxicity: an emerging epidemic in an era of globalization; *Kidney International* (2009) 75, 774–779

WORLD TAIWAN

'Gutter Oil' Scandal Raises Food-Safety Fears Once Again in Greater China

Elizabeth Barber | Sept 3, 2014



Potentially harmful oil may have been used in pastries sold by popular bakery chain and also 7-Eleven

A Taiwanese food-safety scare has spread to Hong Kong with the revelation that the city's biggest bakery chain, as well as branches of 7-Eleven and Starbucks, may have been selling pastries made with so-called gutter oil.

The Hong Kong-based *South China Morning Post* reports that the popular breakfast staple known as pineapple buns, offered in branches of Maxim's Cakes and 7-Eleven, as well two specialty Starbucks outlets, could have been made with gutter oil — a potentially harmful blend of oil extracted from food waste, offal and the byproducts of tanneries.



A man buys a cake from Maxim's Cakes in Mongkok, Hong Kong, in this file photo from Dec. 18, 2008



Environmental health interventions what can you do?

Hierarchy of Control



Advantages of Environmental Interventions

1. Preventing disease before it arises- *eliminates associated health-care treatment costs.*
2. Generally **more sustainable** (*i.e. achieving a longer-term impact on health, as compared to medical treatment*).
3. Often the **most equitable** option, *generating benefits across broad groups or populations.*

Examples of Environmental Health Interventions: Lead

- Used in petrol, paints, batteries
- Many known adverse health effects
 - – Children especially susceptible:
 - Impairment of brain development
- Leaded petrol phased out in many countries between 1990 to 2000
- Mental retardation due to lead exposures estimated to be **~30 X** higher in regions where leaded petrol still used



Air pollution: Any effective control measures?

-
- **Engineering control:** Emissions reduction for air pollutants
 - Stationary source
 - Mobile source
 - **Administrative controls:** Legislation
 - Personal protective equipment- impractical

Ozone air quality during the 2008 Beijing Olympics: Effectiveness of emission restrictions

Ozone air quality during the 2008 Beijing Olympics: effectiveness of emission restrictions

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Abstract. A series of aggressive measures was launched by the Chinese government to reduce pollutant emissions from Beijing and surrounding areas during the Olympic Games. Observations at Miyun, a rural site 100 km downwind of the Beijing urban center, show significant decreases in concentrations of O_3 , CO, NO_y , and SO_2 during August 2008, relative to August 2006–2007. The mean daytime mixing ratio of O_3 was lower by about 15 ppbv, reduced to 50 ppbv, in August 2008. The relative reductions in daytime SO_2 , CO, and NO_y were 61%, 25%, and 21%, respectively. Changes in SO_2 and in species correlations from 2007 to 2008 indicate that emissions of SO_2 , CO, and NO_x were reduced at least by 60%, 32%, and 36%, respectively, during the Olympics. Analysis of meteorological conditions and interpretation of observations using a chemical transport model suggest that although the day-to-day variability in ozone is driven mostly by meteorology, the reduction in emissions of ozone precursors associated with the Olympic Games had a significant contribution to the observed decrease in O_3 during August 2008, accounting for 80% of the O_3 reduction for the month as a whole and 45% during the Olympics Period (8–24 August). The model predicts that emission restrictions such as those implemented during the Olympics can affect O_3 far beyond the Beijing urban area, resulting in reductions in boundary layer O_3 of 2–10 ppbv over a large region of the North China Plain and Northeastern China.



The Measures Adopted in Singapore in Controlling Air Pollution

-
- Minimising emissions at source
 - Stringent **legislation and enforcement** to control air pollution
 - Proper land use planning and judicious siting of pollutive industries away from population centres
 - Promoting cleaner energy and energy efficiency
 - (e.g. green vehicles, use of compressed natural gas (CNG), renewable energy source, energy efficient buildings, etc)

Minimising Emissions at Source

Stationary sources

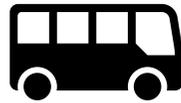
- Promoting clean industries.
- Incorporating pollution control considerations in land-use planning and siting of factories.
- Regulating and monitoring emissions from industries.

Mobile sources

- Setting and updating emission standards for new vehicles.
- Promoting green vehicles.
- Testing and monitoring of emissions from existing vehicles.

What can you do?

- Bus
- Bicycle
- MRT
- Walk

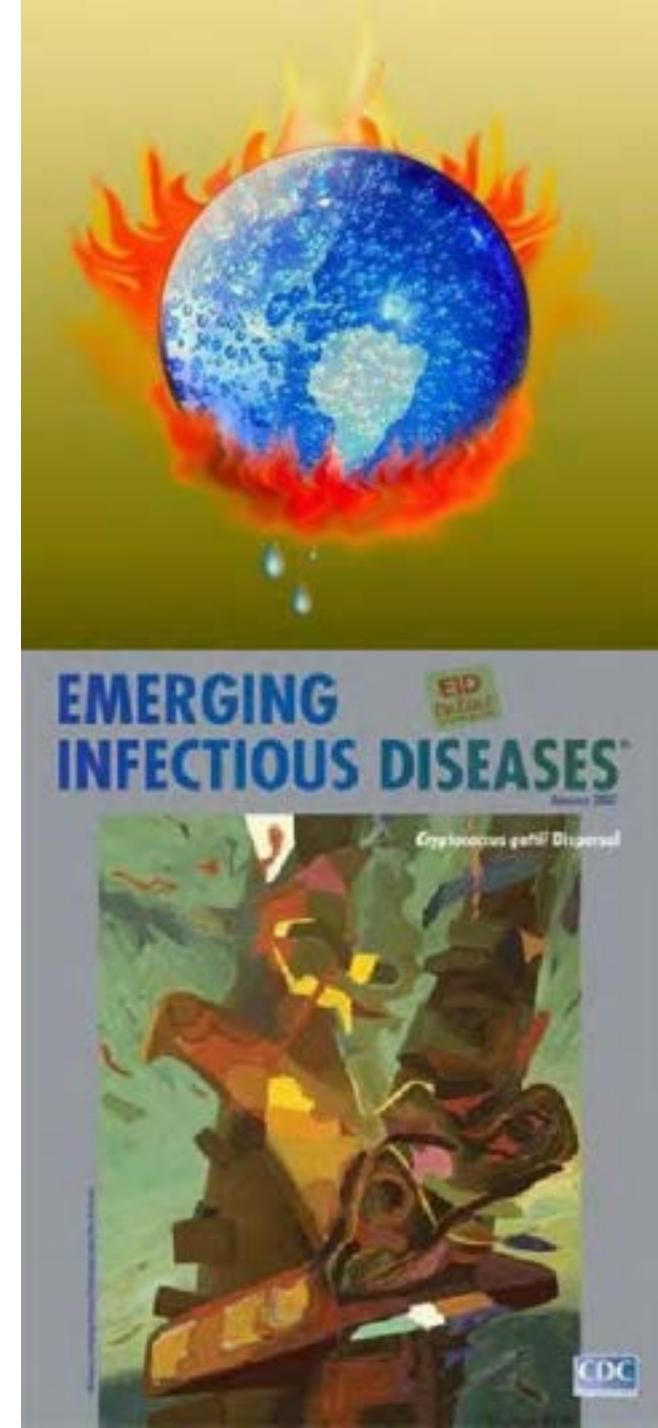


What can you do?



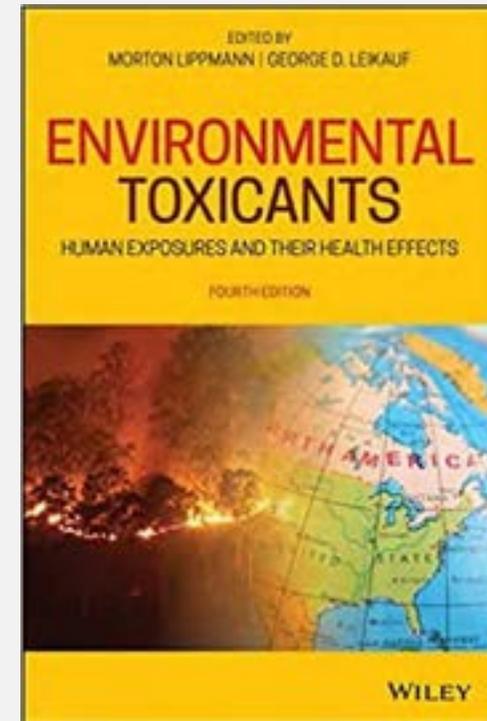
Environmental Health Challenges

- Climate change – Global warming, sea level rise, greenhouse gas, etc
- Trans-boundary pollution
- Threat of emerging infectious diseases from the environment



Environmental Health Challenges

- Chronic low-level exposure to environmental toxicants e.g. chemicals, heavy metals, pesticides
- Increasingly built environment
- Work environment, e.g. is open concept workspace healthy?



Public health effects from the major components of global climate change

