Magnitude of the problem:
Major environmental and occupational risk factors related to cancer.
Prioritizing primary prevention

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What is Environment?

"The environment is everything that isn't me."

Albert Einstein.

"The environment is all the physical, chemical and biological factors external to the human host, and all related behaviours, but excluding those natural environments that cannot reasonably be modified."

This definition excludes behaviour and life style not related to environment, as well as behaviour related to the social and cultural environment, genetics, and parts of the “unmodifiable” natural environment.
Impact of environment on health

- How much disease could be prevented by modifying the environment?

Current evidence = 24%

- What is the modifiable environment?
  - Pollution
  - Ionizing radiation, UV and EMF
  - Occupational risks
  - Built environment (incl. housing, land use, roads)
  - Agricultural methods, irrigation schemes
  - Man-made climate change, ecosystem change
  - Related behaviour (e.g. handwashing)

Largest environmental contributions to global disease (by disease)

<table>
<thead>
<tr>
<th>Disease</th>
<th>% of total burden of disease (in DALYs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>14%</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>10%</td>
</tr>
<tr>
<td>Intentional injuries</td>
<td>8%</td>
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<tr>
<td>Perinatal conditions</td>
<td>6%</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>5%</td>
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<tr>
<td>Childbirth-related diseases</td>
<td>5%</td>
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<tr>
<td>Malnutrition</td>
<td>4%</td>
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<tr>
<td>Diarrhoea</td>
<td>4%</td>
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<tr>
<td>Unintentional injuries</td>
<td>3%</td>
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<tr>
<td>Neurovascular disease</td>
<td>3%</td>
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<tr>
<td>Malaria</td>
<td>2%</td>
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<tr>
<td>Respiratory infections</td>
<td>2%</td>
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<tr>
<td>Maternal deaths</td>
<td>1%</td>
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<tr>
<td>NCDs</td>
<td>1%</td>
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<tr>
<td>Intentional injuries</td>
<td>0%</td>
</tr>
<tr>
<td>Malignant</td>
<td>0%</td>
</tr>
<tr>
<td>Non-environmental</td>
<td>0%</td>
</tr>
</tbody>
</table>

World Health Organization
Global burden of cancer

- 12.7 millions new cases in 2008
- 7.6 millions of deaths in 2008
- 63% of all cancer deaths in low- and middle-income countries
  
  World Cancer Report. IARC, 2008

- At least 1/3 of all cancers are preventable

- About 1/5 of all cancers attributable to the environment
  (including work settings) = 1.3 million of deaths in 2004
  "Preventing disease through healthy environments". WHO, 2006

Non-communicable diseases

- Overall rise in expenditure on health is the increasing prevalence and rising treatment costs for chronic conditions.
- Environmental risk factors are known to contribute significantly in half of the major chronic conditions driving rising expenditures.

Contribution to Medicare Spending Growth

<table>
<thead>
<tr>
<th>Condition</th>
<th>1997-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Mellitus</td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis, Other Joint Disorders</td>
<td></td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td></td>
</tr>
<tr>
<td>Kidney Disease</td>
<td></td>
</tr>
<tr>
<td>Trauma Related Disorder</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
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<tr>
<td>Mental Disorders</td>
<td></td>
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<tr>
<td>Cancer</td>
<td></td>
</tr>
<tr>
<td>COPD, Asthma</td>
<td></td>
</tr>
<tr>
<td>Heart Conditions</td>
<td></td>
</tr>
</tbody>
</table>

Source: Chronic Conditions Account For Rise In Medicare Spending From 1997 To 2006, Health Affairs 26, no. 4, 2010
Primary prevention

Health determinants versus spending

Very little is spent on primary prevention despite huge potential to reduce the growth in health expenditures.

Factors influencing health: 
- Environment
- Tobacco
- Physical inactivity
- Alcohol
- Unsafe sex
- Other

World-wide health expenditures: US $ 5.3 Trillion

Prevention: 0%

Treatment & Overhead

Source: Estimated from OECD, WHO, and Prevention Institute data

Environmental and occupational risks assessment

- Expert surveys estimate the total disease burden attributable to the environment (including work settings) to amount to about 19% of cancer burden = 1.3 million of deaths in 2004

  "Preventing disease through healthy environments", WHO, 2006

- At least 550,000 deaths or 7% of all cancers are due to the environment (rigorous assessments)

  WHO Global Health Risks", WHO, 2009
Environmental and occupational risks assessment

- This rigorously assessed disease burden estimates cover only a fraction of carcinogens and exposures

"WHO Global Health Risks", WHO, 2009

Chemicals
Asbestos

**PROBLEM**
- Exposure to asbestos caused 41,000 lung cancer deaths and 59,000 deaths caused by mesothelioma in 2004.
- Asbestos is the most important occupational carcinogen

**SOLUTION**
- Stop using all forms of asbestos; stimulating asbestos replacement with safer substitutes.

Arsenic

**PROBLEM**
- Exposure to arsenic caused 3,700 lung, bladder and skin cancer deaths in Bangladesh alone.
- The main source of environmental exposure is through drinking water

**SOLUTION**
- Applying arsenic removal technologies (physical, chemical and biological techniques)
Occupational exposures

PROBLEM

- 8 selected occupational carcinogens and probable carcinogens (arsenic, asbestos, beryllium, cadmium, chromium, diesel exhaust, nickel and silica) caused 111,000 lung cancer deaths in 2004.

- Occupational leukaemogens (including benzene and ethylene oxide, and ionizing radiation) caused 7400 deaths by leukaemia.

SOLUTION

- Regulations for substitution and phasing out of replaceable processes or carcinogenic chemicals; workers must be provided with personal protective equipment, etc.
Ionizing radiation
Radon

PROBLEM

• Exposure to radon caused between 70,000-220,000 of all lung cancer deaths.

• Radon is the primary cause of lung cancer among non-smokers

SOLUTION

• Increasing ventilation in enclosed spaces where radon accumulates; establishing national reference levels, identifying geographical areas (radon maps), etc.

Medical exposure

COUNTERTHINK

Which button do I push? Usually we just push 'em both.

Kindly provided by Dr. Van Deventer
Exposure to UV caused 60,000 deaths in 2000 (48,000 were melanomas and 12,000 basal and squamous skin carcinomas).

The use of tanning beds has been recently classified as carcinogenic to humans.

**SOLUTION**

Ban of the use of sunbeds under 18s has already come into force in Scotland and is moving forward in other places.

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**Non-ionizing radiation**

**UV and sunbeds**

**PROBLEM**

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**SOLUTION**

- Ban of the use of sunbeds under 18s has already come into force in Scotland and is moving forward in other places.

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**Electromagnetic fields**

**PROBLEM**

- There is no strong evidence so far for a possible association between exposure to electromagnetic fields and cancer.
- There is a high public concern about the use of mobile phones and its relation to cancer development.

**SOLUTION**

- The possible effects of long-term heavy use of mobile phones require further investigation.
Outdoor air pollution

PROBLEM

• Exposure to outdoor air pollution in cities caused for 108,000 lung cancer deaths in 2004.

• Some of the largest contributors to urban outdoor air pollution are industry, power generation, and transport.

SOLUTION

• Improvements in urban planning and public transport (i.e. pedestrian friendly, clean rapid transit, cycling lanes), stronger emissions controls for motor vehicles and regulations for industry (i.e. scrubbers) have also been shown to improve air quality and health.
Indoor air pollution

PROBLEM

• Exposure to indoor air pollution caused 36,000 lung cancer deaths in 2004.

• The largest contributor to indoor air pollution is the use of traditional fuels and stoves for cooking however similar health effects are seen from inefficient heating & lighting in the home.

SOLUTION

• Improved solid fuel cookstoves with chimneys, and cleaner fuels have shown to be successful at reducing the risk for lung cancer, and other respiratory diseases (i.e. childhood pneumonia), as well have the potential for improving outdoor air quality.
Second Hand Smoke Exposure

**PROBLEM**

- Exposure to second hand tobacco smoke caused 21,000 lung cancer deaths in 2004.
- Cigarette smoking in homes, restaurants, other work and public places exposes adults and children to significant levels of air pollutants, including carcinogens.

**SOLUTION**

- Policies designed to eliminate cigarette smoking in work and public settings have been shown to be effective measures for reducing exposure to second-hand smoke.
Global differences

Environmental hazards are not the same everywhere.

Environmental hazards are not the same to everyone.

Risk assessment:
- Hazard identification
- Hazard characterization (dose-response assessment)
- Exposure assessment
- Risk characterization

Develop and evaluate interventions

Implementation
- Scaling up effective policies

Communication
- Public concern
It took 50 years...

1944: Smoker = Glamour

1950, firsts epidemiological studies demonstrating smoking as the main cause of the most common cancers

1969: Smoker = Villain

1969, cigarette advertising on television and radio banned in US

2010: Motion Picture Association of America included smoking as a factor in rating movies

2003, 192 Member States of the WHO unanimously adopted the Global Framework Convention on Tobacco Control

Only 26 countries (8.8% of the world's population) have comprehensive national bans on tobacco advertising, promotion and sponsorship.

27% of the world's population live in countries that do not ban free distribution of tobacco products.

…..how long will this take?
Primary prevention

- Population-wide, proactive upstream preventive actions
- Primary Prevention
- Secondary
  - Clinical preventive services
- Tertiary
  - Treatment & rehabilitation

Examples:
- Stop use of asbestos
- Eliminating indoor smoke

Primary prevention means unhealthy condition never occurs

Public Health
- Radon
- UV
- EMF
- X-rays

Public Concern
- EMF
- X-rays
- UV
- Radon

Kindly provided by Dr. Van Deventer
<table>
<thead>
<tr>
<th>RISKS</th>
<th>Science</th>
<th>Raise awareness</th>
<th>Policies Recommendation Opportunities</th>
<th>Legislation</th>
<th>Advocacy</th>
<th>Implementation</th>
<th>Public concern</th>
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<tbody>
<tr>
<td>Asbestos</td>
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<td>Other Chemicals</td>
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<td>Occupational Health</td>
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<tr>
<td>Ionizing Radiation (medical exposure)</td>
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<tr>
<td>UV and tanning beds</td>
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<td>EMF</td>
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Overall objective
To develop a policy framework for the primary prevention of environmental and occupational cancers and further mobilize public health and scientific communities and civil society towards that end.

Specific objectives

A. Review key policy options and environmental interventions that have proven successful for the primary prevention of selected cancers.

B. Identify gaps in and means to promote existing interventions in scientific, social mobilization, policy, legislation and communication arenas.

C. Promote innovative approaches to strengthen primary prevention of environmental and occupational cancers.
Expected outcomes following the conference

• **Set of policy options and effective interventions** for the primary prevention of selected causes of cancer.

• **Key messages to the media and the public** to raise awareness about the environmental and occupational causes of cancer.

• **Establishment of a coordinated network of institutions** for primary prevention of environment-related cancer, involving scientific experts, professional societies, NGOs, academic and governmental institutions, media and others.

• **Release and dissemination of a collective “Call to Action”** for the primary prevention of cancer.

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Thank you!