The future of cancer prevention: setting realistic goals and timeframe

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“We cannot treat our way out of the cancer problem”

A balanced and integrated approach to prevention, early detection and treatment is required
Cancer control is a complex challenge

Because cancer is a highly heterogeneous disease:

- in occurrence
- in causes
- in biology
- in treatment

This calls for national cancer control plans which are integrated with NCD control but reflect national or regional priorities.
Cancer control is a dynamic challenge

- Overall number of cancers is projected to markedly increase, especially in low and middle-income countries
- The types of cancer which are common change in line with human development (e.g. increases in colorectal and breast and decreases in cervix and stomach)
Primary cancer prevention

- Around half of cancers could be prevented by applying the knowledge we have;
- The majority of cancers have a lifestyle or environmental cause, so the potential for prevention is much higher


See http://www.iarc.fr/
# Primary cancer prevention – global priorities

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>Implement WHO Framework Convention on Tobacco Control: taxation; bans on advertising; regulation on smoking in public places; counter the introduction into low and middle-income countries</td>
</tr>
<tr>
<td>Infections</td>
<td>HBV and HPV vaccination; <em>H. pylori</em> eradication (?); Avoid contaminated injections; treatment of HBV and HCV chronic carriers increasingly possible</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Avoid harmful use of alcohol; increase awareness; taxation and regulation</td>
</tr>
<tr>
<td>Physical inactivity and weight control</td>
<td>Increase physical activity and improve weight control; major area where research is needed to provide evidence-base for preventive interventions</td>
</tr>
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## Primary cancer prevention – global priorities

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<tr>
<td>Radiation</td>
<td>Avoid excessive sun exposure and indoor tanning; avoid excessive medical diagnosis, including in children; awareness and remediation of indoor radon levels</td>
</tr>
<tr>
<td>Environment</td>
<td>Address naturally occurring (arsenic, aflatoxins) or man-made (e.g. air pollution) carcinogens through regulatory and other control measures</td>
</tr>
<tr>
<td>Occupation</td>
<td>Occupational health; counter risks of “exporting” at-risk occupational exposures to low and middle-income countries</td>
</tr>
<tr>
<td>Reproductive factors and hormones</td>
<td>Limit use of HRT; Breastfeeding reduces mother’s cancer risk</td>
</tr>
<tr>
<td>Healthy diet</td>
<td>Eat plenty of whole grains, pulses, vegetables and fruits. Limit high-calorie foods; avoid sugary drinks, processed meat; limit red meat and foods high in salt.</td>
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</tbody>
</table>
Cancers where aetiology is (largely) unknown

<table>
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<tr>
<th>Organ sites</th>
<th>Estimated annual no. new cases worldwide</th>
<th>Percent global cancer burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>1,100,000</td>
<td>7.9</td>
</tr>
<tr>
<td>Lymphoma and Leukaemia</td>
<td>850,000</td>
<td>6.0</td>
</tr>
<tr>
<td>Kidney</td>
<td>340,000</td>
<td>2.4</td>
</tr>
<tr>
<td>Pancreas</td>
<td>340,000</td>
<td>2.4</td>
</tr>
<tr>
<td>Thyroid</td>
<td>300,000</td>
<td>2.1</td>
</tr>
<tr>
<td>Brain</td>
<td>260,000</td>
<td>1.8</td>
</tr>
<tr>
<td>Colorectal</td>
<td>1,400,000</td>
<td>9.7</td>
</tr>
</tbody>
</table>
Two-way Translational Cancer Research

Basic Science

Population
Causes and Prevention
Risk factors
Specific molecular alterations
Prognosis
Patient
Personalized treatment

Laboratory Methodologies
- genomics
- transcriptomics
- epigenomics
- proteomics
- metabolomics

Wild CP (2012) Int. J. Epidemiol, 41: 24-32
Cancer causation – clues from genomics
(Scelo et al., Nature Comm. 5: 5135, 2014)

Mutation patterns from WGS of 95 conventional renal cell cancers:

High A>T mutation rates in Romanian cases – Mutation distributions:

Typical signature of Aristolochic acid induced mutations:
- Known in TP53 for rare urothelial cancers
- Established genome wide in mouse fibroblasts

First study to implicate an unanticipated environmental factor through analysis of genomic data
Major potential for disease prevention

- Czech Rep. (N=29)
- Russia (N=23)
- UK (N=29)
- Romania (N=14)
Secondary prevention – global priorities

- **Breast cancer**: mammography; clinical breast examination; breast awareness
- **Cervical cancer**: cytology; HPV DNA testing; visual inspection with acetic acid
- **Colorectal cancer**: FOBT, sigmoidoscopy, colonoscopy
- **Oral cancer**: visual inspection; in high incidence regions (e.g. east Asia) among high risk groups

The prime importance of quality-assured, national programmes

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Prevention works but takes time – lung and cervix

**Lung, men**

- Belarus
- USA*
- UK, England
- Norway
- Finland

**Cervix uteri**

- Uganda*
- Lithuania
- India*
- Norway
- UK, England
- Finland

* USA (SEER 9)

*: India (Chennai and Mumbai), Uganda (Kampala)
The need for implementation research

- Moving from the demonstration of efficacious in trials to effectiveness in programmes
- Integrating research and health services development – building-in capacity
Research funding – the need for a different model

- Research on prevention is under-funded (2-3% in Australia, Canada and UK), yet vital to cancer control
- Relatively little private sector interest in prevention research
- Governments need independent, policy-relevant research (e.g. on diet)
- Public research funding needs to be directed to prevention, otherwise knowledge gaps will remain
- An international research coordination is required
We have a duty of care to the patients of today and to the populations of tomorrow