Environmental Risk Factors

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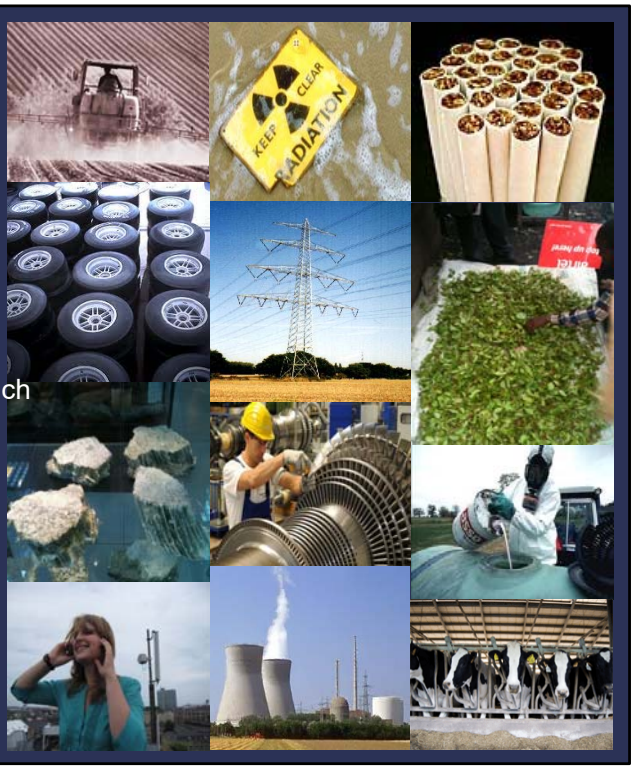
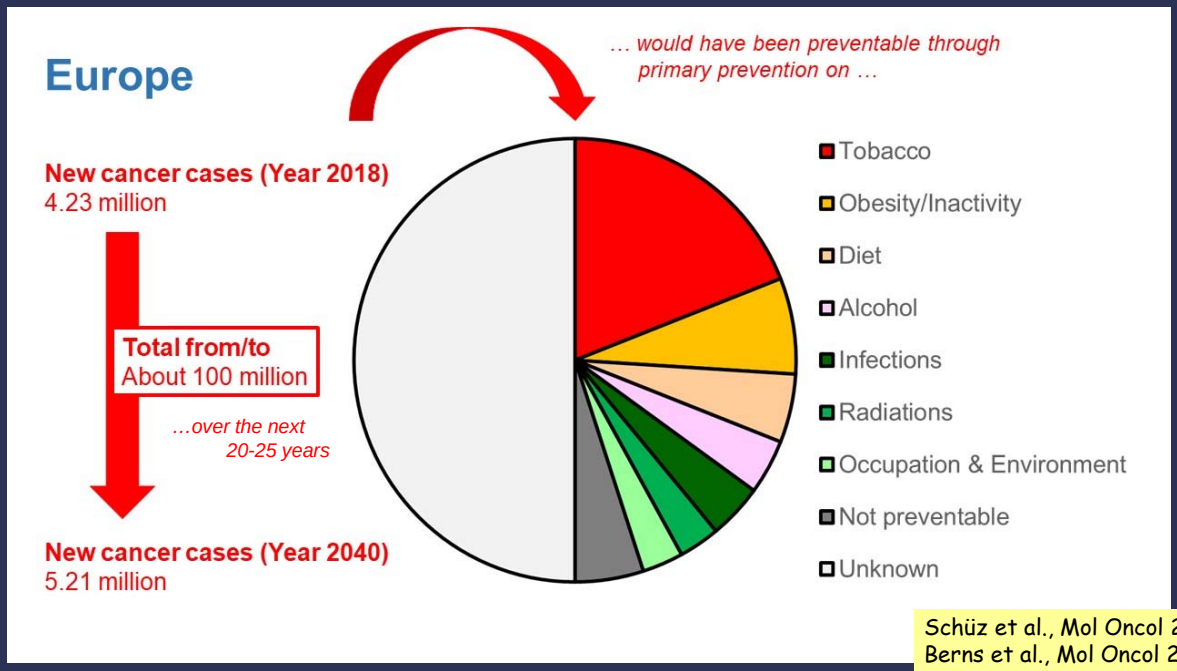


International Agency for Research on Cancer
World Health Organization

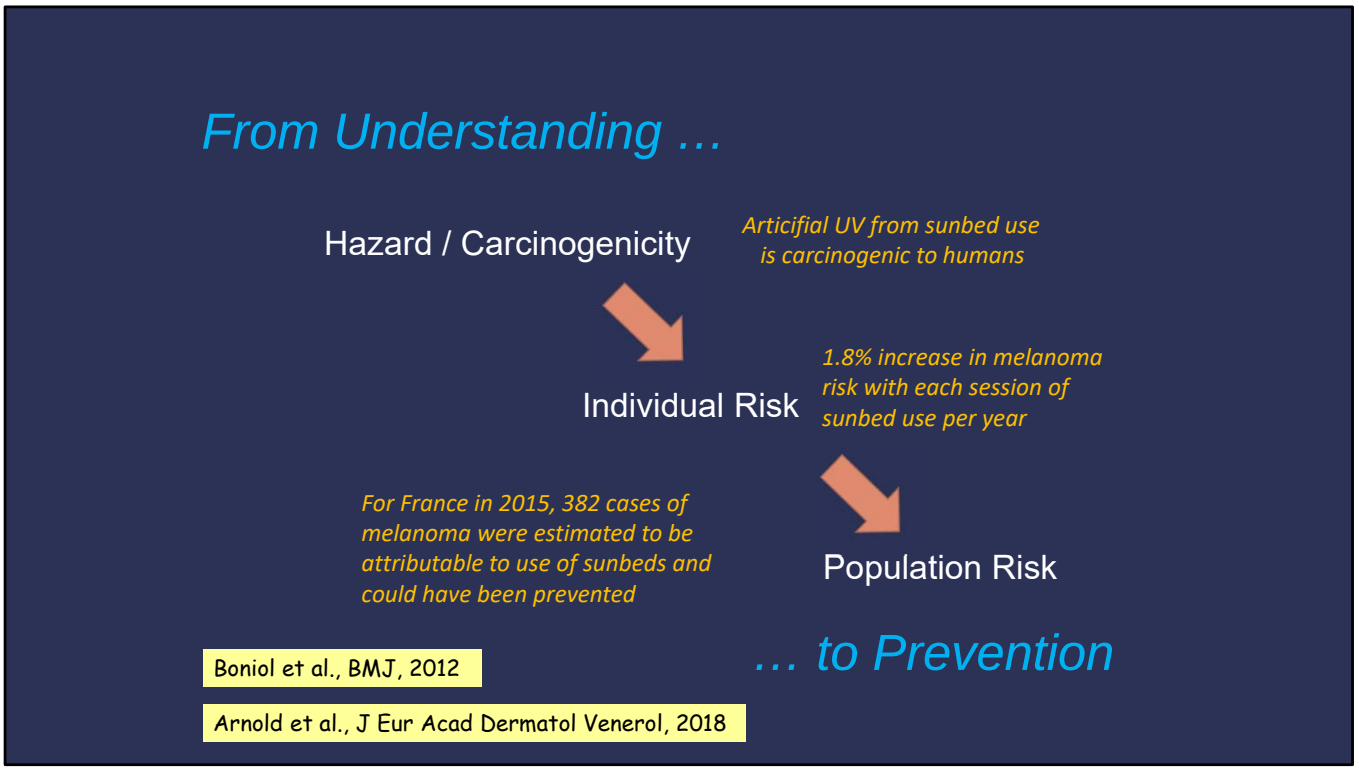
The need for cancer prevention in Europe



Schüz et al., Mol Oncol 2019
Berns et al., Mol Oncol 2020

In the next 20-25 years Europe (UN definition) will experience 100 million new cancer patients. Treatment resources will not suffice to address this cancer epidemic but primary and secondary prevention must be strengthened to prevent cancer before it occurs or detect it at early stages of pre-cancer or cancer. For 50% of the cancer burden the causes have been identified and more than 40% are due to modifiable risk factors. Tobacco and unhealthy lifestyle (unhealthy body weight, unhealthy diet, lack of physical activity, alcohol consumption) cause about one third of today‘s cancer burden Europe. Environmental factors including occupational exposures and radiations account for about one tenth. For some cancers the causes are known but not preventable, including those of genetic origin or due to natural exposures that can be reduced but not eliminated. For about half of the cancer burden the causes are unknown which endorses the need for continued research into the causes of cancer.

On the pathway from understanding the cause of cancer to its prevention, the „risk“ is looked at on three levels. The first step is to identify whether a substance causes cancer, called hazard identification. Ideally, research comes up with a yes or no to this question, but in reality for very many substances the jury is still out – indeed a scientific proof of „no“ is not really possible, but at one stage the residual risk would be so small that investigating the substance further is discontinued. For substances causing cancer in the next step one is interested in how large the risk is for the individual, where for the vast majority of substances scientific studies show an increasing risk with increasing exposure to the substance. Finally, the population risk can be estimated by combining the individual risks with how many people in the population are exposed to the substance at the various levels of exposure.

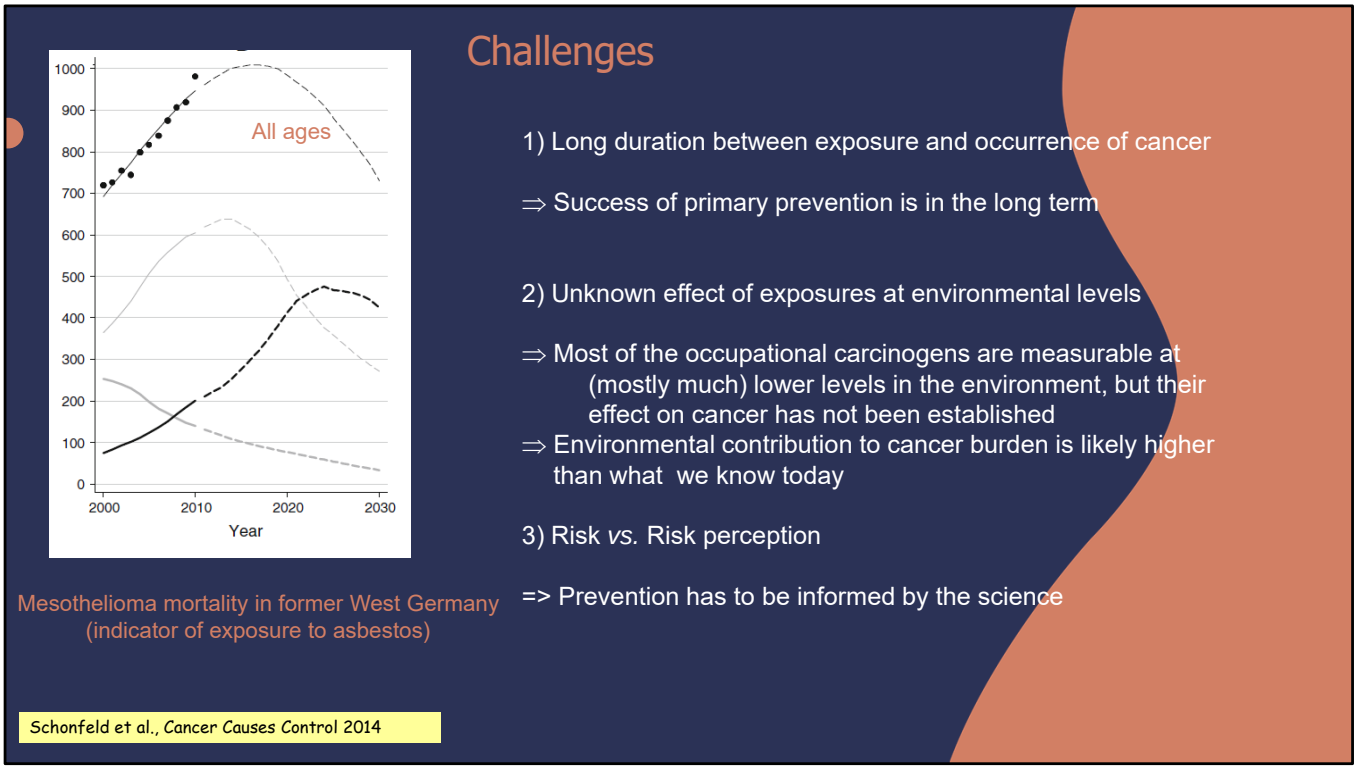


Example: Artificial ultraviolet (UV) radiation from sunbed use is known to cause cancer and the mechanisis quite well understood. Epidemiological studies show an increase in the risk of skin melanoma for the individual of 1.8% with each session of sunbed use per year, i.e. about a doubling with weekly sessions. Applied to France and taking into account the sunbed use of French people, leads to an estimate that 382 skin melanoma cases per year could be avoided if exposure to artificial UV would be stopped.

Preventable cancers in Europe (related to environment)

Exposure	Related cancer burden in Europe	
Occupation	~3-4%	~60 occupational hazards identified to be carcinogenic many in specialized occupations so the related population cancer burden is low asbestos still responsible for ~50% of occupational cancer Interventions: regulatory frameworks and compliance with worker protection Vast majority appears to be preventable
Ultraviolet (UV) radiation	~2-3%	Mainly due to leisure sun-seeking behaviour Avoid sunbed use except if for medical reasons Interventions: Prevention campaigns well defined Cancer burden can be significantly reduced but not eliminated
Radon	~1%	Main reason of natural ionizing radiation exposure but exposure differs greatly within and across countries Intervention: Mitigation measures to reduce domestic exposure Cancer burden can be reduced but not eliminated
Medical radiation	~1%	Intervention: dose optimisation, but not possible in emergencies Risk-benefit decision remains with treating physician
Ambient air pollution	~1%	Many particles known to be carcinogenic Today's burden reflects pollution levels of 10-20 years ago Intervention: prevention on population / Society level needed
Other pollutants/radiations	Small	Need for more research at low dose levels of exposures Exposures acting locally (clustering, e.g. from nuclear accidents)

The table shows for the environmental factors scientifically established to cause cancer the estimated % of today's cancer burden in Europe as well as some coments of what falls into this category and which interventions are known to work. For ambient air pollution it is estimated that it causes around 1% of the current cancer burden, for which one has to keep in mind that the cancer burden of today reflects the exposure of 10 to several decades ago. This delay may even be longer, as in the case of UV where the exposure during childhood and adolescence is considered more important for the subsequent melanoma risk than adult exposure, yet the cancer occurs in adulthood. Although the contribution from other pollutants is small, this has to be seen in regard to half of the cancer burden not being scientifically explained today. Especially for low exposure levels as normally experienced in the general populations the science is often ambiguous.



The long duration until primary prevention shows to be effective on population level should not be used to delay any implemention of prevention measures that have been shown to work. In this example, deaths from mesothelioma increased up to the year 2020 based on asbestos exposures from mainly before the 1990s, so the benefit of prevention overall shows three decades after the ban. For many other substances it may go somewhat faster, but primary prevention is always an essential investment in the long term. Pre-cautionary measures especially for environmental exposure levels for which the science is not definitive still need to be informed by the science, to use resources wisely.

Conclusions

- Of Europe‘s cancer burden of today, about 10% of cancer are known to be due to the environment (including occupation, radiation (mostly natural)), with about 1% known to be due to environmental contaminants/pollutants (including ambient air pollution)
- For about 50% of cancers we have not established the causes and therefore the environmental contribution is likely to turn out to be higher
- This applies especially to low environmental levels of substances for which the science of today is not sufficient to guide interventions other than pre-cautionary measures
- Planetary health: Environmental cancer prevention using synergies with environmental protection and sustainable food & energy production
- Interventions known to be effective need to be implemented immediately

Here are the conclusions.