Time for a European initiative for research to prevent cancer:

A manifesto for Cancer Prevention Europe (CPE)

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Abstract

A landmark resolution on cancer prevention and control was adopted by Member States at the World Health Assembly 2017, noting that "risk reduction has the potential to prevent around half of all cancers" and urging "to promote cancer research to improve the evidence base for cancer prevention and control". Public health oriented strategies for cancer prevention and their optimal application in effective real-life programmes will be vital to circumvent the dramatic health and economic implications of a strategy and healthcare expenditure based primarily on cancer treatment. The inter-disciplinary nature of cancer prevention stretches from the sub-microscopic study of cancer pathways through to the supra-macroscopic analysis of the "causes of the causes", encompassing socio-economic and environmental factors. Research is required to provide new evidence-based preventive interventions and to understand the factors that hamper their implementation within health care systems and in the community. Successful implementation of cancer prevention requires long-term vision, a dedicated research agenda and funding, sustainable infrastructure and cooperation between countries and programmes. In order to develop world class prevention research in Europe that translates into effective cancer prevention guidelines and policies, we report on the creation of Cancer Prevention Europe. This international and multidisciplinary consortium of research institutes, organisations and networks of excellence with a common mission of reducing cancer morbidity and mortality in European populations through prevention, brings together different fields of expertise, from laboratory science through to policy research, as well as dissemination of the best evidence, the best quality indicators and the best practices used.

Keywords

Cancer prevention, translational research, Europe, multidisciplinary, population-level, collaborative research, health promotion, knowledge hub

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Background

The cancer burden in the forty countries of Europe is projected to increase from around 3.6 million cases and 1.8 million deaths in 2015 to 4.3 million cases and 2.3 million deaths in 2035 entirely as a result of population aging and growth [1]. This represents an overall increase of around 20%, and translates to an additional 716,000 cases and 474,000 deaths each year (Table 1) [1]. Further increases are also likely to come with changing prevalence of exposure to underlying risk factors, especially tobacco, alcohol, an unhealthy diet, obesity and sedentary lifestyles. The changes will not be spread equally throughout Europe, with variations dependent on the prevalence of risk factors, demographic change and the level of development of health services screening and therapeutic options, among other parameters. Specific additional challenges within Europe will be posed by factors such as the general influx of migrants [2] and by country specific factors such as the dramatic scale of alcohol consumption in some countries [3].

The increasing number of cancer patients and survivors (all of whom require long-term care), coupled with the spiralling costs of therapeutic interventions means that governments cannot rely on treatment as their only response to the cancer problem [4]. It is undeniably important that the latest understanding of the molecular basis of cancer translates through to more effective treatment and clinical services will undoubtedly need to be strengthened to face the projected increased number of cancer patients. However, for health system sustainability these efforts need to be complemented by a renewed focus on prevention of cancer and detection of pre-malignant lesions. The economics of cancer treatment within rapidly ageing populations do not make for cost effective cancer control policies unless aligned to public health orientated strategies for evidence-based cancer prevention. The considerable physical, social and psychological morbidities associated with most cancer treatments also weigh heavily in favour of prevention rather than cure.

Although estimates on the overall preventability of cancer vary [5, 6], there is broad agreement that the proportion of cancers that could be prevented on the basis of current knowledge would be around 30-40% in westernised countries - if current understanding of risk and protective factors was translated into effective primary prevention [7-9]. Identification of additional modifiable risk factors would increase this prevention potential. Cancer screening and other approaches to early detection of pre-malignant lesions can also contribute to reduce cancer incidence and mortality while the potential benefits of preventive medicines (for example with aspirin) [10] would, if realised, increase the preventive fraction still further.

Cancer prevention strategies are not without challenges in implementation, but the potential gains are striking. The dramatic declines in lung and cervical cancer incidence and mortality in many European countries following decreases in smoking and the implementation of screening, respectively, are evidence of the power of successful prevention. In contrast, the absence of decline in these two cancer types in other countries can be said to represent failures in the effective implementation of prevention. Figure 1 shows, for example, that the mortality rate for lung cancer among UK men, aged 30-79 years, peaked in the early 1970s at a level around 160 *per* 100,000 *per annum* and has since dramatically declined. In contrast, it was not until two decades later that the peak mortality rate was reached in Poland and this can

partly be attributed to the later commencement of the effective prevention of tobacco exposure through national control policy measures. In the UK, the first TV advertisement bans and health warnings on cigarette packs appeared in the early 1960s [14]. Such initial measures were not taken until the late 1980s in Poland [15].

The potential to expand preventive interventions remains large and the evidence base for a number of individual level measures has been summarised in the new edition of the European Code against Cancer (http://cancer-code-europe.iarc.fr/index.php/en/) [16]. Apart from tobacco control, the main pillars for primary cancer prevention are usually summarised as interventions to reduce obesity, alcohol consumption, and excess sun exposure together with the promotion of physical exercise and a healthy diet. Control of environmental and workplace carcinogens and immunisation against human papilloma virus (HPV) and hepatitis B virus infections represent other key areas for intervention (Figure 2). For all these factors, there is often a lack of clarity on or commitment to implement optimum strategies to bring about the required changes through behavioural change or policy and regulatory measures.

Although cancer has a number of highly specific risk factors (e.g. HPV infection), many are shared with other common diseases notably cardiovascular disease, diabetes and chronic respiratory disease. Successful prevention of cancer will, therefore, have a significant impact on all of these non-communicable diseases (NCDs) and contribute to the UN/WHO "25 by 25" target of a 25% reduction in premature deaths from NCDs by 2025 [18]. For example, alcohol consumption is estimated to be an attributable factor for over 244,000 cases of cancer in Europe each year (Figures 3a and 3b) but interventions to reduce alcohol consumption would also provide substantial benefits in terms of reduced morbidity and mortality from, among others, cardiovascular disease, liver disease, and accidental injuries [22].

Cancer is also a disease that has encouraged proliferation of interventions promoted for the purposes of prevention that have either been unsupported (or unaddressed) by relevant epidemiological (or mechanistic) evidence or for which the magnitude of any effect would be insignificant. Many such examples are dietary in origin (e.g. many dietary supplements and/or "superfoods") although others are not (e.g. over-diagnosis and over-treatment of small papillary thyroid cancers) [23]. An important component of any comprehensive prevention strategy is also to make information available regarding interventions that are of no or uncertain benefit.

The scope of cancer prevention

There are multiple, often complementary, targets for cancer prevention. Prevention can be undertaken at several levels: from primary to secondary to tertiary prevention.

Primary cancer prevention includes reducing exposure to risk factors, through legislation, regulation, education and behavioural change e.g. targeting tobacco smoking, alcohol consumption, physical inactivity and obesity alongside avoiding or minimising exposure to known carcinogens in the workplace, home and environment and vaccinating against oncogenic viruses. Primary prevention involving removal of carcinogenic exposures can have the advantage of bringing benefit not just to the current generation but also future generations.

Primary prevention may also include interventions with preventive medicines (also often referred to as chemoprevention) with, for example, selective estrogen receptor modulators (tamoxifen, raloxifene) and aromatase inhibitors (exemestane, anastrozole) for women at high-risk of breast cancer [24] as well as aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) for colorectal cancer prevention [10].

Secondary cancer prevention includes cancer screening, detection of pre-malignant lesions and medical prevention to arrest or reverse the carcinogenic process. Effective cancer screening is available for cervix, breast and colorectal cancers when implemented on a population level and following established European quality assurance guidelines [25, 26]. Avoidance of unnecessary treatment and improved cost-effectiveness of screening may come through identification of high-risk sub-groups within the population, including through the use of biomarkers. The use of topical diclofenac and other interventions for prevention of skin cancer in patients with actinic keratosis could also be considered as secondary prevention [27].

Tertiary cancer prevention aims to prevent disease recurrence and improve prognosis/survival in already diagnosed cancer patients. It can include medical prevention but may increasingly focus on exposures previously considered in relation to primary prevention (e.g. smoking cessation and increased physical activity). For example, in both breast and colorectal cancer, physical activity decreases the risk of developing the disease and higher levels of physical activity are also associated with improved survival [28].

Conceptually, cancer prevention must be considered not only in relation to the natural history of the disease but also to the target population to which it is applied i.e. in relation to **population stratification**. Prevention can stretch from the whole population through to a few specific individuals, depending on the degree to which application of the preventive intervention is stratified. For example, the banning of smoking in public places is a primary prevention measure covering the whole population whereas control of a carcinogenic occupational chemical may benefit a relatively small workforce. Breast cancer screening sees the population stratified to include only women within a specified age-range. Other interventions may be based on prior biomedical information. For example, aspirin may be used among the (relatively) few individuals previously diagnosed with colon polyps or with defined genetic conditions such as Lynch syndrome and Familial Adenomatous Polyposis. Regular clinical examinations, medical prevention agents and elective surgery may be targeted to individuals from families affected by high penetrance genes predisposing to cancer, e.g. BRCA1 and BRCA2 [29].

Cancer prevention research

Identifying the causes of different cancers provides the foundation for cancer prevention. While much is known, major causes remain undiscovered for many types of cancer including several considered relatively common, such as prostate and ovarian cancers (Figure 2). Research should also include a consideration of life-course exposures including specific windows of vulnerability (e.g. early in life, pregnancy, etc). The variation in exposure profiles and cancer patterns across Europe can provide

valuable opportunities for trans-national studies of aetiology as demonstrated by the 30-year old EPIC study [30].

Estimating the preventability of cancer requires both assessment of the extent and evolution of the cancer burden in different populations (through high quality cancer registry information) and information on the prevalence and level of exposure to cancer risk (or protective) factors. Surveillance data on such risk factors is required within and across different populations, including monitoring changes over time. Both for research on causes and for estimation of exposures, it is increasingly important that population-based research resources, including those open to biomarker analyses, are established and maintained. The creation of the biobank infrastructure in Europe (BBMRI-ERIC) [31] is a good example of recently established shared resources which can underpin population-based cancer research.

Where carcinogenic exposures have been identified and quantified (including environmental, behavioural and workplace exposures), strategies are required to reduce or remove exposures; this implies translating knowledge on causes through to interventions which are effective, and implementing these interventions.

Research is also required to evaluate potential new preventive interventions (e.g. new policies, screening modalities or agents for medical prevention) and their optimal application to, and effect on, individuals or sub-groups within populations. The risks of unnecessary treatments, for example over-diagnosis in relation to screening programmes, also need to be addressed. For medicines in clinical use repurposed for prevention, e.g. aspirin and tamoxifen, there can be a lack of interest from pharmaceutical companies in the research required for their re-emergence under the umbrella of preventive medicines either because of the cost of long-term safety assessment studies or because of the lack of profitability of off-patent drugs.

A common and critical barrier to successful prevention is an inability to translate from randomized trials of efficacy to effectiveness in real-life programmes. It is vital to understand the factors which help and hinder the implementation of evidence-based preventive interventions within health care systems and in the community. Modern methods of communication employing e-learning, multimedia channels and social media are needed to support implementation at the individual or population level and merit research evaluation as to their effectiveness. Implementation of a preventive intervention also requires ongoing monitoring and evaluation and should be an integral part of preventive programmes, including continuous assessment of real-life cost-effectiveness. In many instances, promoting systems that will allow the prevention efforts themselves to have a continuous, evidence-based incremental optimization may be the most effective strategy. Such incremental improvements are likely to be significantly furthered by the launch of international networks of excellence for observing and disseminating the best evidence, the best quality indicators and the best practices used.

For all elements of an integrated cancer prevention research programme, effective and well-resourced population-based cancer registration systems will be required. This is an essential requirement both to define the size and scale of the problem and to monitor the impact of interventions. Modern cancer registries will also need to contain appropriate identifiers and be fully integrated into national information systems so

that data linkages can be formed with both research datasets and routine health and other information sources. This will, in turn, require robust solutions to address questions of data security and confidentiality and ethical considerations regarding patient choice and patient integrity.

Integration of cancer prevention research with translational cancer research

Cancer prevention is entering an exciting period. Advances in basic science are beginning to permeate prevention, opening new opportunities. As a consequence, the inter-disciplinary nature of cancer prevention is coming to prominence. Advances in cancer biology are beginning to underpin progress in cancer registration (through changes in molecular classification of tumours) and studies of causes, prevention, early detection, diagnosis and treatment. The common soil of molecular science promises a bridge from the population to the clinic and is thus fundamental to an overall integrated strategy of prevention, early detection and treatment of cancer in Europe. This "two-way translational cancer research" [32] provides added value by drawing advances in cancer biology into both the clinic and the population settings.

There are many areas where the molecular sciences can inform cancer prevention. Examples include mutation spectra in tumours providing fresh hypotheses about risk factors, patterns of gene expression or metabolite profiles being used to characterise environmental exposures and genetic markers allowing causes of cancer to be identified within susceptible sub-groups of the population [7, 33]. One of the most interesting possibilities is whether the over-treatment associated with some cancer screening procedures may be circumvented by biomarkers, indicating pre-cancerous lesions with higher or lower propensity to progress to malignancy [34]. This is both a scientific and a policy issue with dramatic implications for the health of Europeans and for healthcare expenditure. A typical example is prostate cancer and the development of new biomarkers to avoid the current problems of over-treatment following a positive prostate specific antigen test. Unfortunately, unlike cardiovascular disease (e.g. cholesterol levels) or diabetes (e.g. hyperglycemia), well-validated, non-invasive cancer biomarkers which indicate early stage disease requiring treatment are currently lacking. This is proving to be a significant barrier to progress in prevention research. Validation of surrogate biomarkers can render these as powerful research tools, e.g. as with using mammographic density reduction as a marker of tamoxifen effect [35] but there are relatively few equivalent examples.

While emphasizing the fresh opportunities that may come from cancer biology, it must be stressed that the inter-disciplinary nature of cancer prevention stretches not only down into the sub-microscopic but up into the supra-macroscopic by addressing the "causes of the causes". This involves socio-economic and environmental factors such as poverty, lack of education, the built environment, climate and transport [36]. It is vital that the public health orientation of cancer prevention is not lost by focusing on ever smaller target populations in what has been termed "precision prevention" [37]. Equally, just as cancer risk factors impact on different sectors of the community to differing extents depending on income, education, race and gender, so do prevention policies and their implementation. A strong emphasis must be placed on addressing the challenges of policy across sectors at sub-national, national and international levels.

The community for cancer prevention

Institutional infrastructure for disease prevention tends to be fragmented at all levels (local, national and international). There are very few exemplars of "prevention centres" analogous to primary, secondary or tertiary care centres. Likewise there are few centres of research excellence in prevention unlike the many world class cancer treatment centres in Europe (as in the Comprehensive Cancer Centres or their equivalents seen in most European countries). International collaborative consortia (e.g. the European Organisation for Research and Treatment of Cancer - EORTC) are the norm in the employment of clinical trials in development of new treatments. The absence of such consortia in the field of prevention inhibits the development of world class prevention research.

Prevention is also different from treatment in terms of organisational responsibility, public perception and culture. Within any jurisdiction, it is usually relatively clear who has political responsibility for health care (Government Ministry of Health or equivalent), who should undertake it (health professionals), where it should be carried out (hospitals, primary care centres) and how to assess outcomes (do sick people get better?). While this is an over- simplification, all of these parameters are considerably more complicated for prevention. This, in turn, complicates research structurally (who is responsible for ensuring that high-quality prevention research is carried out?) and methodologically (it needs to be population-based, with long time lags before outcomes become evident).

Cancer prevention research and assembly of the evidence-base to underpin preventive interventions depends on experts from many disciplines and domains including epidemiology, public health, cancer registries, clinical science, general practice, health services, health psychology, economics, social sciences, statistics, implementation science, high-technology education and e-learning, as well as the basic and applied laboratory sciences. Many of these disciplines are to be found, for example, in institutes of public health, universities and government departments in addition to those within the cancer treatment and care settings. Certainly the approaches and disciplines needed for cancer prevention require broad communities of healthcare and research professionals to be assembled.

Successful coordination of cancer prevention requires long-term vision, a dedicated research agenda and funding for such research. It also requires a sustainable infrastructure and cooperation between countries and programmes to fill gaps in the evidence-base for prevention, to avoid common pitfalls in implementation and to share capacity for research training and quality improvement.

The political context for cancer prevention

Since the UN General Assembly high-level meeting on NCDs in New York in 2011 [18], governments have become sensitized to the importance of cancer, cardiovascular disease, diabetes and chronic respiratory diseases as a major burden on health and economic development in the coming decades. The emphasis has been on shared risk factors and preventive interventions or treatments to achieve the "25 by 25" target [18].

The World Health Organization-led global response to the challenge of NCDs, including cancer, entails a strong emphasis on population-level prevention and low cost treatment of early stage disease (e.g. anti-hypertensive drugs, HPV vaccination, cervical cancer screening, etc.) [38]. In contrast, a majority of recent investment in combating cancer, including in Europe, has been dedicated to developing highly specialised, tailored approaches to new treatments based on the molecular genetics of an individual tumour (precision medicine), requiring referral to specialist tertiary centres. This partly reflects the exciting opportunities consequent to advances in cancer biology but also the greater financial incentives linked to development of new chemotherapeutic agents.

This apparent dichotomy between the cancer control approaches identified and promoted by government in the context of the NCD agenda and those currently prioritised in practice drives the simple concept of bringing these together in a "twin-track" approach (prevention and treatment) to enable effective cancer control in Europe. This approach is required if national governments are to achieve sustainable health care in the 21st century. In broadening the agenda for cancer control in this way, it becomes evident that success will only come through a cross-sectorial approach, stretching beyond health to encompass areas such as social inequalities, environment, transport, workplace etc. Health must be embedded in all policies.

The Member States of the World Health Organization at the World Health Assembly 2017 acknowledged the particular challenges and approaches in relation to cancer compared to other NCDs by adoption of a landmark resolution on cancer prevention and control [39]. The resolution noted that "risk reduction has the potential to prevent around half of all cancers" and emphasized the importance of implementing primary prevention and early detection in addition to evaluation and follow-up using population-based cancer registries. The resolution also urged countries "to promote cancer research to improve the evidence base for cancer prevention and control, including research on health outcomes, quality of life and cost-effectiveness".

The science of cancer prevention offers an opportunity to draw together a number of relevant activities at the level of the European Commission (EC), where important investments are already being made and added value can be envisaged. For example, there are a number of investments in large collaborative research studies e.g. on the exposome (e.g. HELIX in exposomics [40]) and other areas of environment, nutrition and health of direct relevance to cancer prevention. Equally there are important investments in research infrastructure, such as biobanks (e.g. the European infrastructure BBMRI-ERIC [31], the developing countries biobanking network BCNet [41] and the international biobanking society ISBER [42] etc.) and large population-based cohort studies of chronic diseases (e.g. BBMRI-LPC [43]), which provide platforms for research on cancer prevention. There is a major opportunity to bring cancer prevention into the future research agenda within DG Research and Innovation to meet the needs of Member States in relation to cancer control, in liaison with DG Health and the EC Steering Group on Health Promotion, Disease Prevention and Management of Non Communicable Diseases.

A new structure for cancer prevention research in Europe

To deal with these multiple challenges and opportunities facing cancer prevention research in Europe we propose the creation of a consortium of organisations focused on prevention, tentatively entitled: Cancer Prevention Europe (CPE) with a mission to reduce morbidity and mortality from cancer in European populations through prevention and earlier diagnosis of the disease. This will be accomplished through research into how the evidence base for optimal implementation of known preventive strategies can be extended, by dissemination of established best practices in prevention, by facilitating the translation of innovative research into effective cancer prevention guidelines and policies, and by furthering research into the identification of novel preventive strategies and targets.

CPE will be broad in scope covering a spectrum of research from behavioural science and policy research through to development of novel medical preventive agents. Assessment of the cost-effectiveness of different interventions, in relation to costs of treatment, care and productivity loss will be a core component of the initiative. Primary, secondary and tertiary prevention will be encompassed and emphasis will also be placed on the research evaluation and advocacy dimensions of the prevention agenda.

The CPE ambition is to transform the current landscape through the creation of a multidisciplinary consortium of research institutes and organisations within Europe dedicated to cancer prevention. It would seek to facilitate innovative world class research capable of translation into effective cancer prevention guidelines and policies at national and international level. CPE will offer an integrated infrastructure capable of assuring high quality research and each CPE partner institution will bring specific fields of expertise in cancer prevention research as well as in dissemination and informing policy and practice.

The agenda for CPE would include (1) research into optimising the implementation of known preventive strategies, (2) dissemination and research translation to inform policy and practice and (3) the identification of novel targets for prevention. Specific research activities for CPE could include the following areas: cancer registration; cancer aetiology (including recurrence); development and evaluation of preventive interventions (primary, secondary, tertiary); health economics and implementation research to enhance the effectiveness of intervention programmes. These would be supported by a range of platforms, networks and infrastructures and draw together a wide network of partners. Training and capacity building would be integral to the initiative.

The conduct of prevention research and the collation of information on cancer prevention would be translated through to an evidence-base on which cancer control policy could be based.

Inherent to the philosophy of CPE would be the sharing of resources (including existing research platforms, such as cancer registries, screening registries, clinical databases and biospecimen repositories etc), the sharing of data (establishing multicentre, trans-national research projects to provide sufficient statistical power to identify modest-size effects and making use of multidisciplinary approaches); and by the creation of a central repository in Europe of information pertinent to cancer prevention (a European Knowledge Hub on Cancer Prevention). Suitable and

acceptable legal frameworks would be established within CPE to permit information exchange, to monitor regulations and to highlight potential and actual barriers to progress through any implemented legislation.

There are a number of large prospective cohort studies in Europe, both in adults and children/adolescents, which permit the study of the causes of cancer and other NCDs throughout the life-course. Often the maintenance of these research platforms nationally is difficult and failure to identify long-term support jeopardizes the potential benefits. A good example is the 30 or so cohorts which were a part of the EC-financed BBMRI-LPC [43], including a total of around 2 million participants and comprising large datasets on exposures, clinical outcomes as well as associated biobanks, the latter of which in turn cooperate through the EU-funded infrastructure BBMRI-ERIC [31].

Both population cohort data and biospecimens offer major research platforms for understanding the causes and prevention of cancer. There are other studies of different design e.g. multi-centre case-control studies, randomized clinical or community-based trials, and the evaluation of natural experiments within or between countries which offer additional opportunities for prevention research. Bringing together such platforms and new initiatives under a co-ordinated prevention agenda would bring major added-value to future and past EC research investment; in contrast, to abandon these now would result in a failure to realize the benefits of prior investments.

The development of an alliance of organizations focused on cancer prevention would provide a focal point for reflection on professional training and career development within the context of a network of leading institutions, resulting in fellowships, courses, PhD programmes etc. This would be particularly valuable in the area of cancer prevention which involves different disciplines and where no simple career pathway is evident.

The proposed CPE Knowledge Hub would provide policy-makers access to data on cancer burden, risk factor prevalence, attributable fraction of cancers associated with known risk factors and effective preventive interventions. The evidence-base would not stop at identifying risk factors or potential interventions but would evaluate the effectiveness of preventive interventions supported by legislation, regulation and other policy initiatives in the context of broader assessments.

This exercise should not duplicate existing efforts in collating data from these different domains but, where possible, would draw upon existing resources and work in cooperation, providing links, where applicable, to existing sources of information. In parallel, recognized leadership in cancer prevention in Europe would serve as a reliable resource both for collating but also interpreting the scientific evidence-base for prevention and making this available to the EU and national policymakers. International cooperation would provide such evidence in an independent, autonomous manner.

The outlook of CPE would be designed to complement parallel initiatives on treatment, such as the recently established Cancer Core Europe [44]. Indeed there are many areas of overlap in relation to methodology (e.g. laboratory, epidemiology, biostatistics and bioinformatics), platforms (e.g. equipment, biobanks and database

linkage) and opportunities to build on the understanding of underlying mechanisms of carcinogenesis for translational research both to the clinic and population settings. There are many potential benefits in having a "twin-track" approach to research into prevention and treatment, jointly planned and developed in order to provide a truly comprehensive approach to cancer control. Notwithstanding, prevention research has been consistently under-resourced such that public funding needs to be increased and focused in this area.

Creation of Cancer Prevention Europe

CPE has initially been established as a core group of eight "Member" institutes [Cancer Research UK, London, UK; Danish Cancer Society, Copenhagen, Denmark; European Institute of Oncology, Milan, Italy; German Cancer Research Centre, Heidelberg, Germany; Imperial College London, London, UK; Karolinska Institute, Stockholm, Sweden; UK Therapeutic Cancer Prevention Network, Leicester, UK; World Cancer Research Fund International, London, UK/Wereld Kanker Onderzoek Fonds, Amsterdam, The Netherlands], each committed to make an annual financial contribution within a formal Consortium Agreement together with a secretariat hosted by the International Agency for Research on Cancer, Lyon, France. The consortium funding will be used to appoint a senior Co-ordinating Scientific Officer with administrative support and an operating budget. This commitment will allow a focal point to co-ordinate development of the CPE priority actions within a 5-year Strategic Plan, including definition of the possible instruments to provide sustainability, the key partnerships and relevant stakeholders. The CPE Consortium also includes the Maria Sklodowska-Curie Institute - Oncology Centre, Warsaw, Poland as an Associate Member.

CPE will undertake the following actions to give shape and direction to the alliance in the first phase and to contribute to delivery of the proposed Strategic Plan:

1. Propose an agenda for future cancer prevention research activity at a European level through advocacy within relevant EU bodies, EU member states, non-EU European countries, professional organisations, cancer and public health institutes, research sponsors, charities and patient groups.

2. Provide overviews and guidance on the "state of the art" regarding cancer prevention, on research currently in progress within Europe and on research priorities for the future.

3. Develop and define pan-European high-quality research projects involving the participation of CPE and other partners and where added value is provided through international, multicentre collaboration.

4. Positively influence investment in cancer prevention research from the EU, governmental bodies and NGOs.

5. Establish a European Knowledge Hub on Cancer Prevention to promote rapid dissemination of best practice in cancer prevention, expansion of evidence

evaluation activities and definition of unanswered questions requiring research investment.

Other European Institutes or organisations who are committed to collaborative research in cancer prevention and are interested in becoming affiliated with CPE are invited to contact the Secretariat at cpe@iarc.fr.

Conclusion

An international consortium to launch, evaluate and incrementally improve evidence-based prevention strategies within Europe will further the prospects for ensuring populations have access to and benefit from the effective cancer prevention to which they are entitled.

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TABLES AND FIGURES

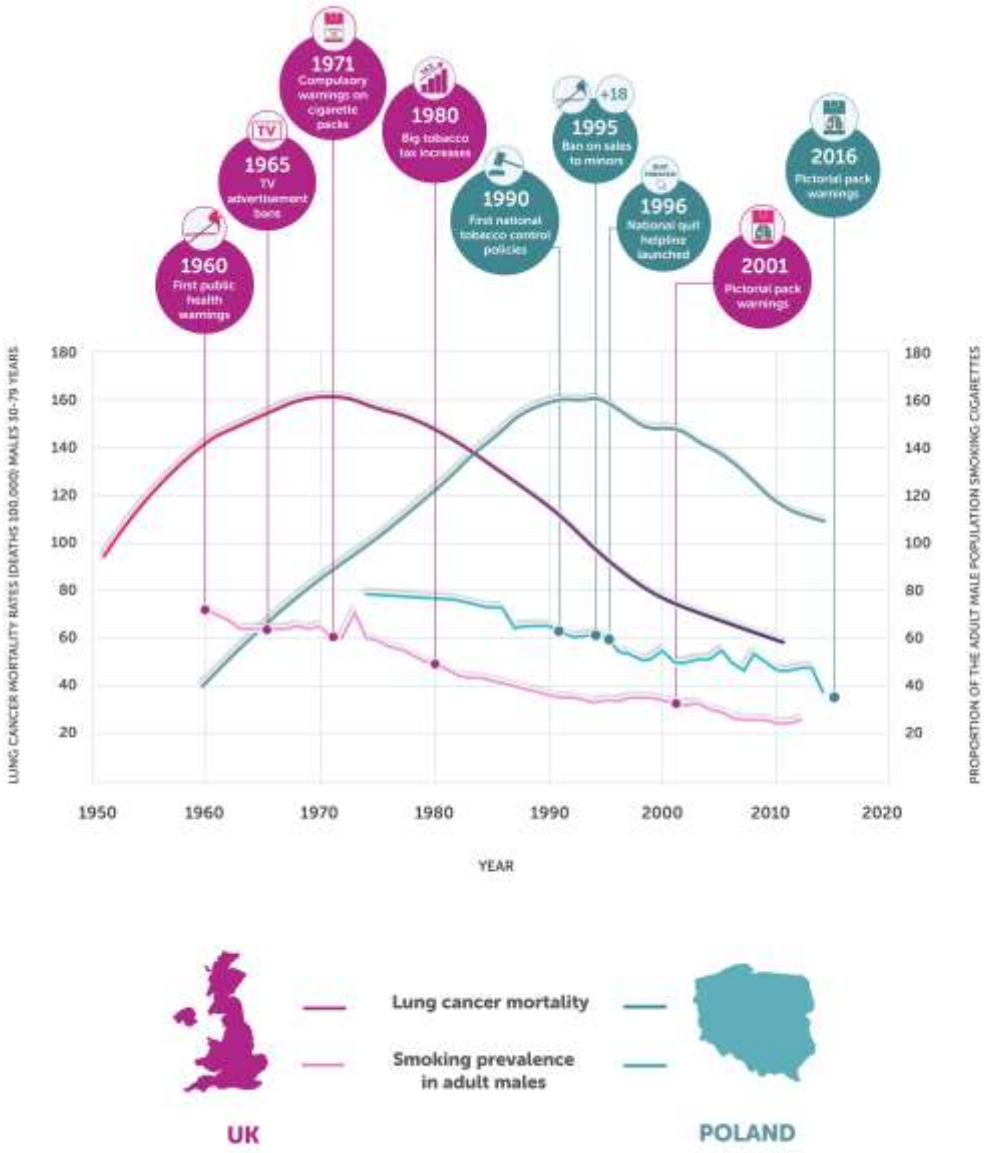
Table 1

Estimated number (millions) of new cases and deaths and percent increase for all cancers (excluding non-melanoma skin cancer) for 2015 and 2035 by sex in Europe.

	2015		2035	
	New cases	Deaths	New cases (% increase)	Deaths (% increase)
Males	1.9	1.0	2.4 (26%)	1.3 (30%)
Females	1.7	0.8	1.9 (12%)	1.0 (25%)
All	**3.6**	**1.8**	**4.3 (19%)**	**2.3 (28%)**

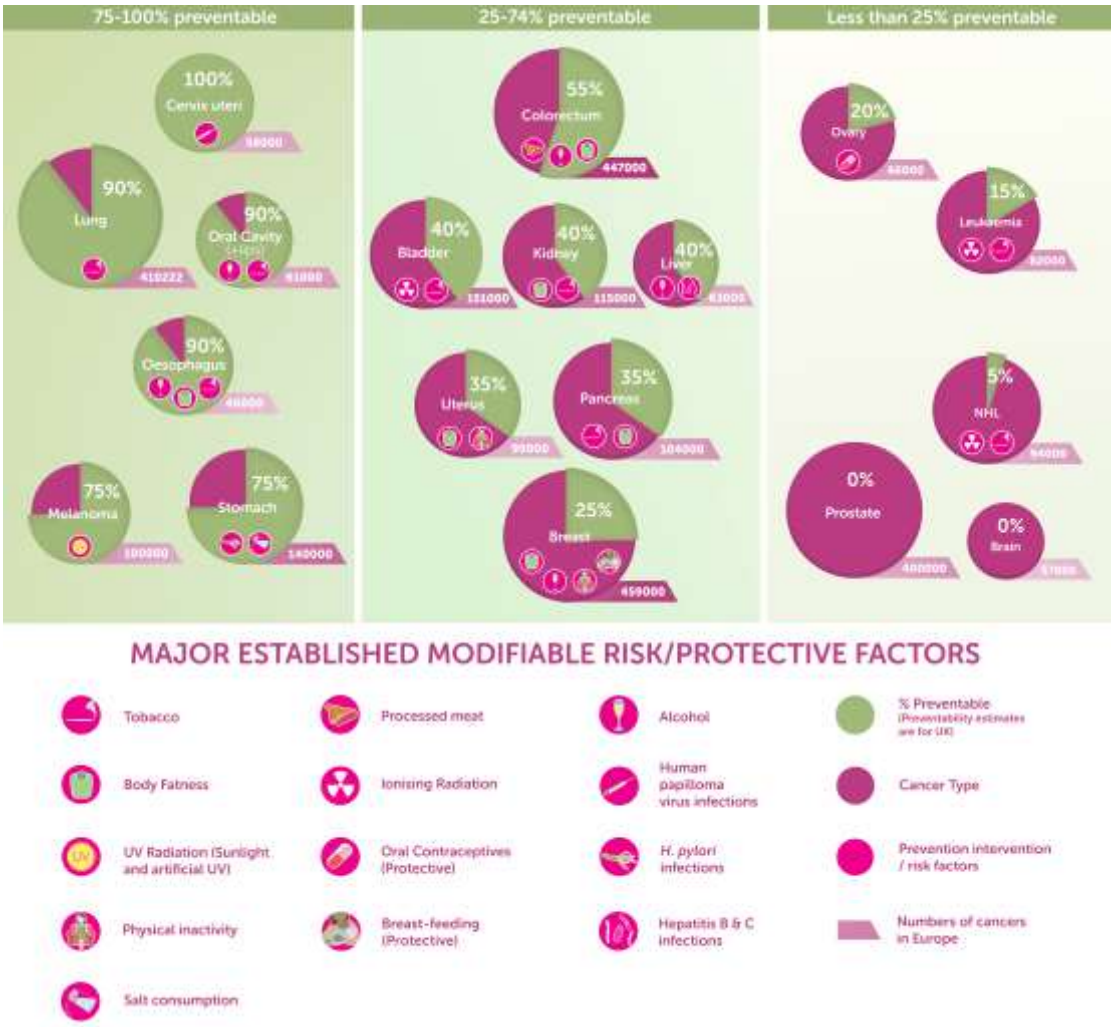
Source: [1]

Figure 1. Male lung cancer mortality rates in the UK (1950-2013) and Poland (1960-2013) and selected tobacco control interventions in the two countries.



Sources: Mortality data [11]; Smoking prevalence in the UK [12]; Smoking prevalence Poland [13]; Interventions [14, 15]

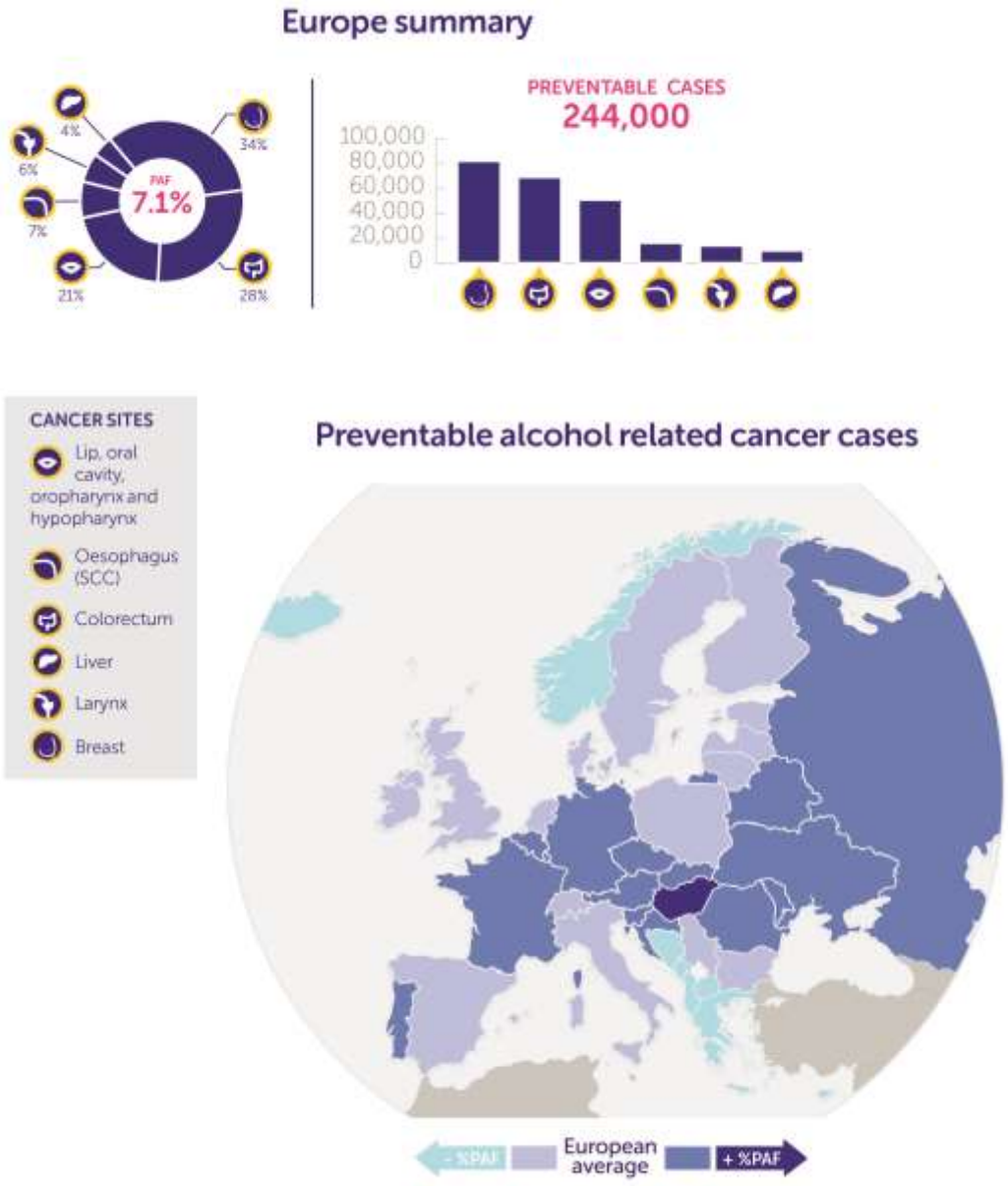
Figure 2. Most common cancers in Europe: estimated incidence for 2012 and proportion potentially preventable from changes in currently established risk and protective factors.



Sources: Incidence data [1]; Risk factor attributable fractions [17]

Figure 3a. Cancer caused by alcohol in Europe: proportions of all cancers and number of cancers that could be prevented by alcohol control.

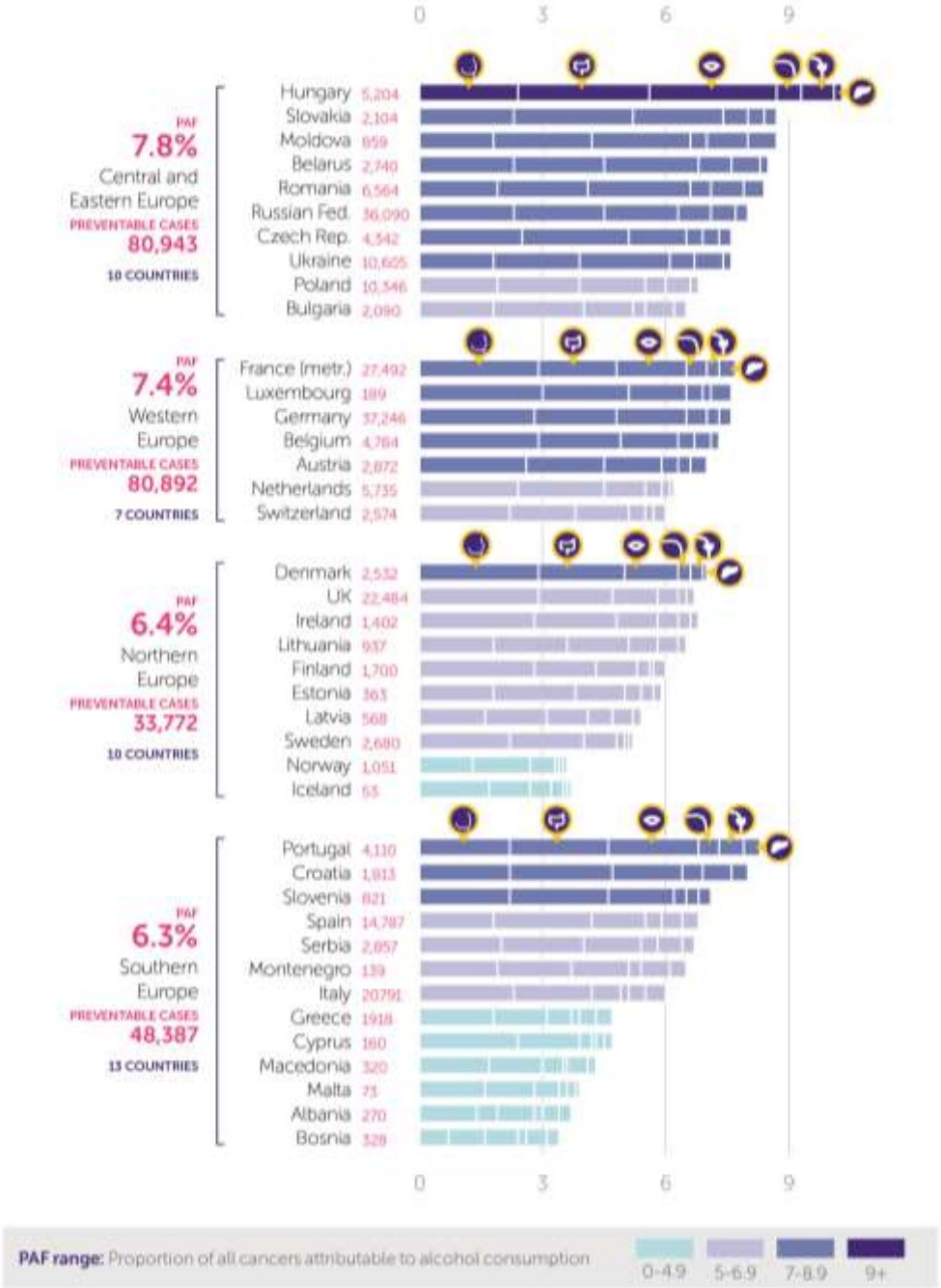
The 7.1% of all cancer cases in Europe attributable to alcohol consist predominantly of cancers of the breast, colorectum and lip, oral cavity, oropharynx and hypopharynx, but also cancers of the oesophagus, larynx and liver.



Sources: Incidence data [1]; Adult per capita consumption of alcohol for 2000 [19]; Risk estimates [20]; Methodology [21]

Figure 3b. Cancer caused by alcohol in Europe: country summaries

The charts below show, for each country in Europe, the percentage of all cancers attributable to alcohol consumption (the population attributable fraction or PAF) and, adjacent to each country name, the number of new cases this represents each year.



Sources: Incidence data [1]; Adult per capita consumption of alcohol for 2000 [19]; Risk estimates [20]; Methodology [21]