Age-dependent risk and lifetime risk of developing cancer in Switzerland

Jeanne Six, Matthias Lorez, Francesco Galli, Volker Arndt
National Institute for Cancer Epidemiology and Registration (NICER), c/o University of Zurich

Introduction

The Swiss population has grown from 6.5 million in 1989 to over 8 million in 2015 [1]. Demographic expansion can be attributed to a longer life expectancy, or a decline in mortality, as well as a net migration gain [2]. As the population is aging, and age is known to be strongly related to the risk of cancer [3], the number of cancer patients is expected to grow in the coming years [4].

Cancer incidence statistics are conventionally displayed using rates, namely the number of newly diagnosed cases within a population at risk that has been observed for a certain period of time. To provide an alternative perspective on the cancer situation in Switzerland, this article presents less often used statistical endpoints: the risk of developing cancer from birth until a certain age, or within an individual's whole lifespan, and the risk of developing cancer within the next 10 years of life after a specific age. The lifetime risk is defined as the percentage of individuals developing cancer at least once in their lifetime [5]. The risk of developing cancer within the next 10 years is the proportion of the population developing cancer within 10 years after a specific age, provided these individuals are cancer-free at the index age [6]. Such measures are derived from cancer incidence rates, as well as from overall mortality rates, i.e. taking into account age- and sex-specific risks of dying before any cancer diagnosis occurs [7, 8]. It is important to note that the estimated risks only account for the mean population and exclude individual differences in lifestyle factors, such as smoking, diet and physical activity, or environmental exposures to carcinogens.

In this article, the risk of developing cancer is presented for breast, prostate, lung, colorectal cancer and melanoma. These are the five most common cancers in Switzerland, accounting for more than half of all cancer cases [9]. The article intends to provide the reader with alternative statistical estimations enabling personal evaluation of cancer risk depending on sex and age, with the aim of facilitating the perception and understanding of cancer risks.

Methods

Study population

This study is based on the National Core Dataset (NCD), managed by the National Institute for Cancer Epidemiology and Registration (NICER) for the purpose of national cancer monitoring in Switzerland [9] and it includes cancer diagnoses for the calendar years 2009-2013, registered in 13 Swiss cantonal and regional registries. The following cantons contributed for the whole diagnosis period: Geneva, Neuchâtel, Jura, Zurich, St. Gallen, Appenzell Ausserrhoden and Appenzell Innerrhoden, Valais, Graubünden, Glarus, Ticino and Fribourg. The following cantons contributed partially to the incidence period: Lucerne (2010-2013), Uri (2011-2013), Obwalden (2011-2013), Nidwalden (2011-2013), Zug (2011-2013), Thurgau (2012-2013), Aargau (2013), Basel-Stadt and Basel-Landschaft (2009-2011) and Vaud (2009-2012). The selected cases were all invasive cancers with ICD-10 codes C00 to C97, except C44 (non-melanotic skin cancer). The data of the 13 registries covered 67% of the Swiss population. The number of expected cases for the entire Swiss population was estimated using the observed numbers by 5-year age group, sex and diagnosis year. Cancer mortality data was provided by the Swiss Federal Statistical Office [10].

Statistical analysis

Incidence rates

Age-specific rates per 100'000 person-years (py) were calculated for the study period 2009-2013. The age-specific number of cancer cases observed and estimated within the 5-year periods was divided by the 5-year age-specific risk populations. Calculation of proportion of cancer according to age and type, as well as ranking of cancer types were based on incidence counts.

Lifetime risk and risk of developing cancer within the next 10 years

We computed probabilities of developing cancer at specific ages, as well as the lifetime risk for all cancer types combined and for the five most common cancer types in men and women. Cancer incidence, all-cause mortality as well as adequate risk population by age and sex for each cancer type in Switzerland were used to calculate the probability of developing cancer within an age class. To be included in the calculations, the individuals had to be alive and cancer-free at the beginning of the age class. The analysis was conducted with the software «DevCan» and provided cancer risk estimates stratified by 18 age intervals (0-5, 5-10, 10-15, …, 80-85, >85) [7, 8], [11-13]. The method used has advantages over other methods for lifetime risk calculation (e.g. «Current Probability» [14]) as it relies on competing-risks methodology to estimate age-dependent probabilities of cancer occurrence [15]. Nevertheless, since the possibility of multiple primary tumours per patient was not excluded, there is a slight overestimation of risk for groups with relatively frequent multiple primaries, namely the categories «all cancer types», «other cancer types» and breast cancer [16].

Tab. 1. Comparison of different cancer types among men and women: incident cases (2009-2013), cancer distribution, lifetime risk, ordered by descending lifetime risk.

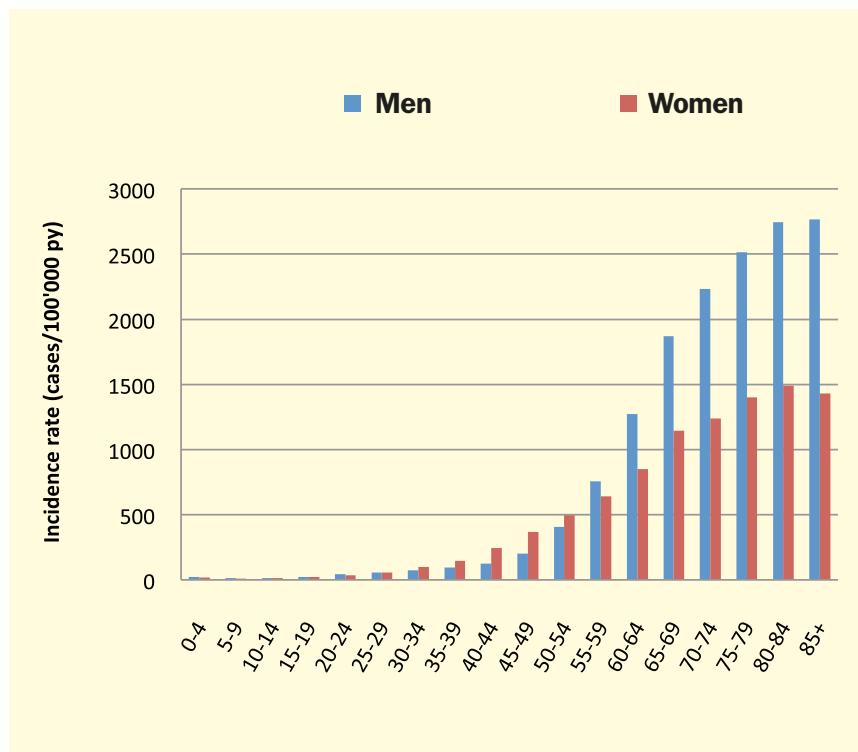| Cancer type	Average number of cases per year		Cancer distribution (%)		Lifetime Risk (%)		Lifetime risk (odds)	
	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
Breast (women)	--	5861	--	32.7	--	13.1	--	1/8
Prostate	6182	--	29.2	--	16	--	1/6	--
Lung, Bronchus, Trachea	2525	1570	11.9	8.7	6.7	3.8	1/15	1/26
Colon, rectum	2349	1839	11.1	10.3	6.6	4.7	1/15	1/21
Melanoma	1313	1209	6.2	6.6	3.2	2.6	1/31	1/38
Bladder	874	276	4.1	2.0	2.6	0.7	1/38	1/143
Corpus Uteri	--	900	--	5.0	--	2.1	--	1/48
Non-Hodgkin Lymphoma	810	686	3.8	3.7	2.1	1.7	1/48	1/59
Oral Cavity & Pharynx	765	341	3.6	1.9	1.8	0.8	1/56	1/125
Pancreas	613	640	2.9	3.4	1.7	1.7	1/59	1/59
Liver & Intrahepatic Bile Ducts	573	214	2.7	1.3	1.6	0.6	1/62	1/167
Kidney	608	290	2.9	1.7	1.5	0.7	1/67	1/143
Stomach	551	322	2.6	1.8	1.5	0.8	1/67	1/125
Leukemia	556	413	2.6	2.3	1.4	1	1/71	1/100
Ovary	--	590	--	3.3	--	1.4	--	1/71
Thyroid	195	514	0.9	2.9	0.4	1.1	1/250	1/91
Cervix Uteri	--	255	--	1.4	--	0.5	--	1/200
Testis	427	--	2.0	--	0.8	--	1/125	--
Brain & Central Nervous System	361	256	1.7	1.0	0.8	0.6	1/125	1/167
Multiple Myeloma	309	248	1.5	1.3	0.8	0.6	1/125	1/167
All Cancer	21203	18048	100	100	54.9	42.6	1/2	1/2

Fig. 1. Age-specific rates per 100'000 person-years (py) for all cancer combined in Switzerland, based on incident cases 2009-2013.
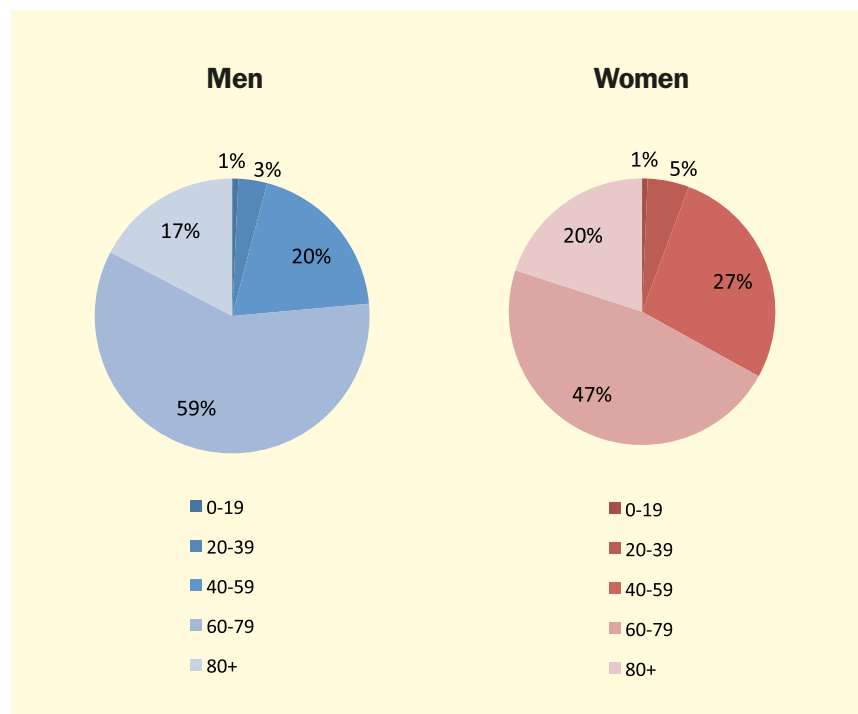

Fig. 2. Distribution of cancer by age in men and women (incidence period 2009-2013). Total numbers of incident cases were 106'013 in men and 90'239 in women, respectively.

Results

Each year, more than 39'000 men and women in Switzerland are diagnosed with cancer. During lifetime, one out of two Swiss develops cancer (**Tab. 1**, bottom row). Risk of developing cancer depends on several factors. In this article we explore three of them: age, sex and cancer type.

Cancer incidence rates and frequency distribution by sex and age

The rate at which cancer develops increases steeply with age among both sexes (**Fig. 1**). **Figure 2** shows the relative frequency of cancer cases by age and sex. Only a small percentage of cancer cases occurs before the age of 40 (4% of all cancer cases in men, and 6% in women). More than 75% (men) and 67% (women) of all cancer cases occur after the age of 60.

Cancer frequency distribution by sex and type

The most frequent cancers are prostate (29%) among men and breast (32%) among women (**Fig. 3**). Next in relative frequency are colorectal cancer, melanoma and lung cancer, which account for 58% of all cancers for both sexes. «Other types» include all other cancers without the four more frequent cancer types for each sex. Lung cancer is more frequent among men (**Fig. 3**).

Cancer type frequency ranking by age and sex

The frequency ranking of cancer types depends on age and sex (**Fig. 4**). At an early age (0-19 years) leukaemia and brain cancer are the most frequent types regardless of the sex. At later age, cancer types differ in the ranking according to sex. In women breast cancer is the most frequent from age 20 until end of life and is especially predominant at age 40-59 (45% of all cancer cases) (**Fig. 4**). In men, prostate cancer is the most frequent, however, it is only predominant in the
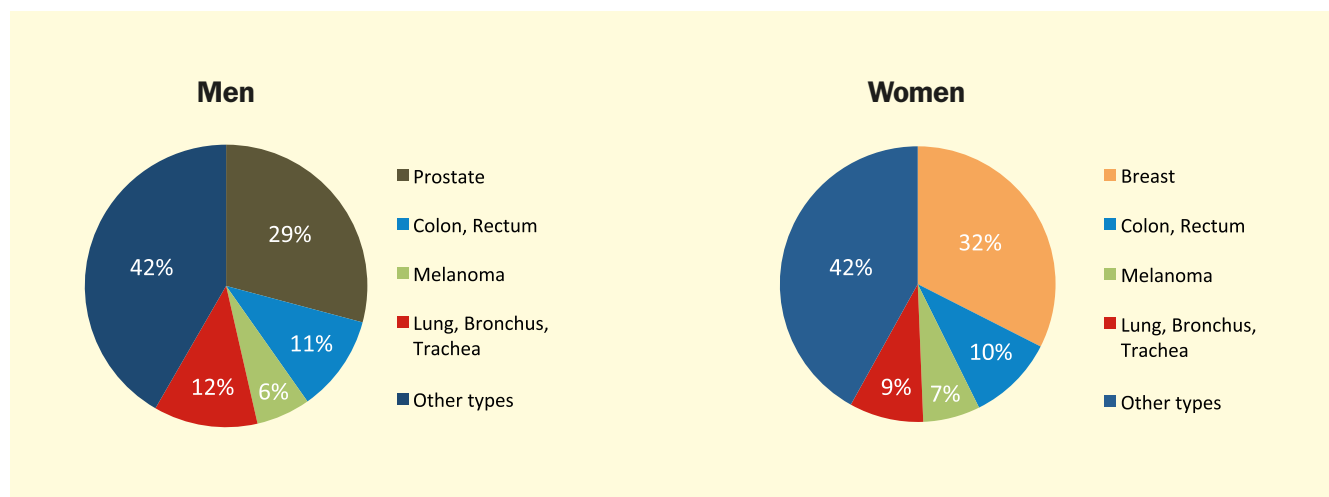
Fig. 3. Distribution of cancer types among men and women (incidence period 2009-2013). The total number of incident cases was 106'013 in men and 90'239 in women, respectively.
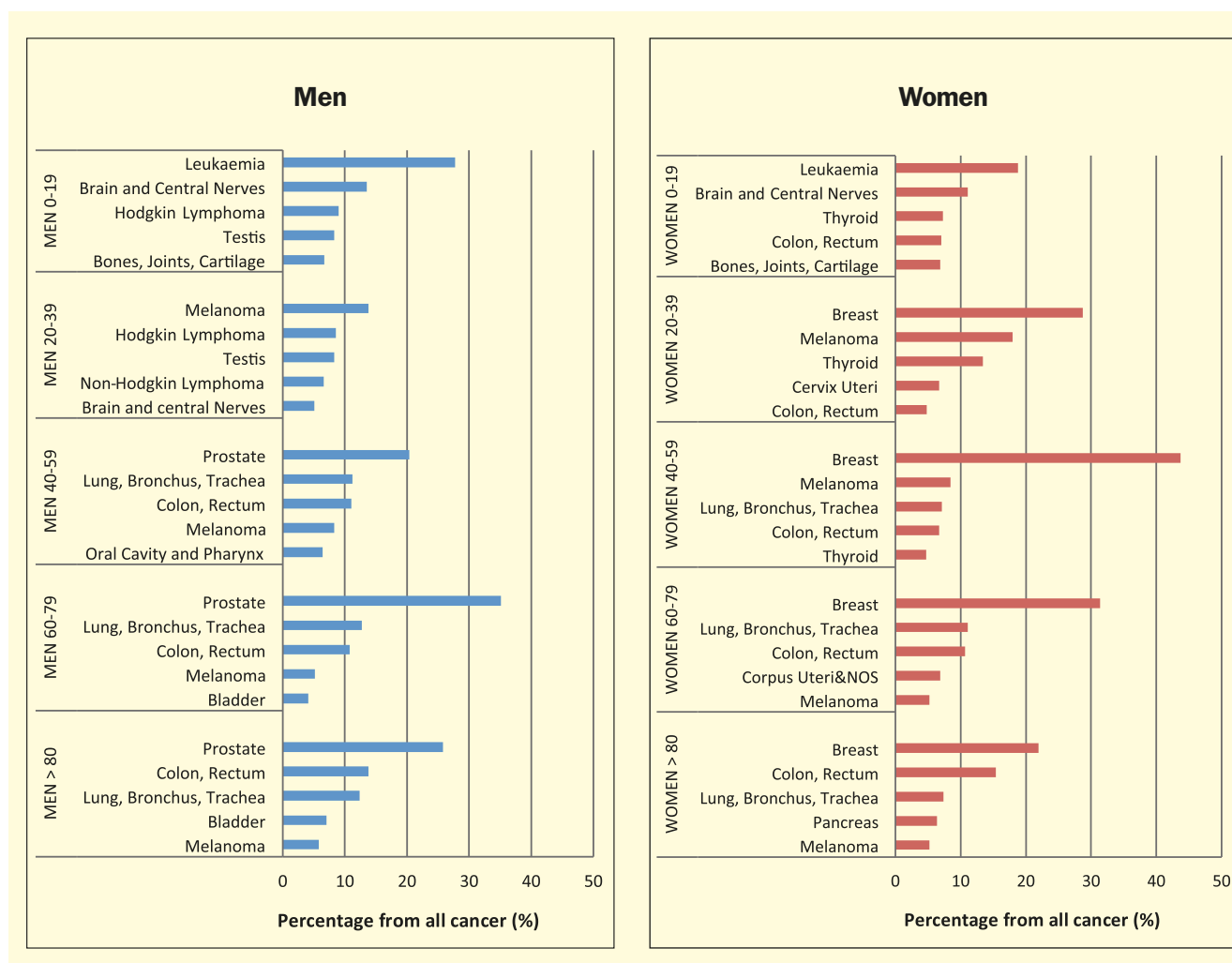

Fig. 4. Ranking of the five most frequent cancer types according to age among men and women (incidence period 2009-2013).

Cumulative risk by age for most frequent cancer sites, men

Age x (yrs)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	>85
All cancer	0.1	0.2	0.3	0.4	0.6	0.9	1.2	1.7	2.4	3.4	5.5	9.2	15.1	23.1	31.9	40.6	47.7	54.9
Melanoma	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.5	1.9	2.4	2.8	3.2
Lung cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.9	1.6	2.6	3.8	4.9	5.9	6.7
Colorectal cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.5	0.9	1.5	2.3	3.2	4.4	5.3	6.4
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	1.7	3.8	6.8	9.8	12.3	14.1	16.0
Other types	0.1	0.2	0.3	0.4	0.5	0.8	1.1	1.4	1.8	2.4	3.5	5.0	7.2	9.9	13.2	16.6	19.6	22.7

Cumulative risk by age for most frequent cancer sites, women

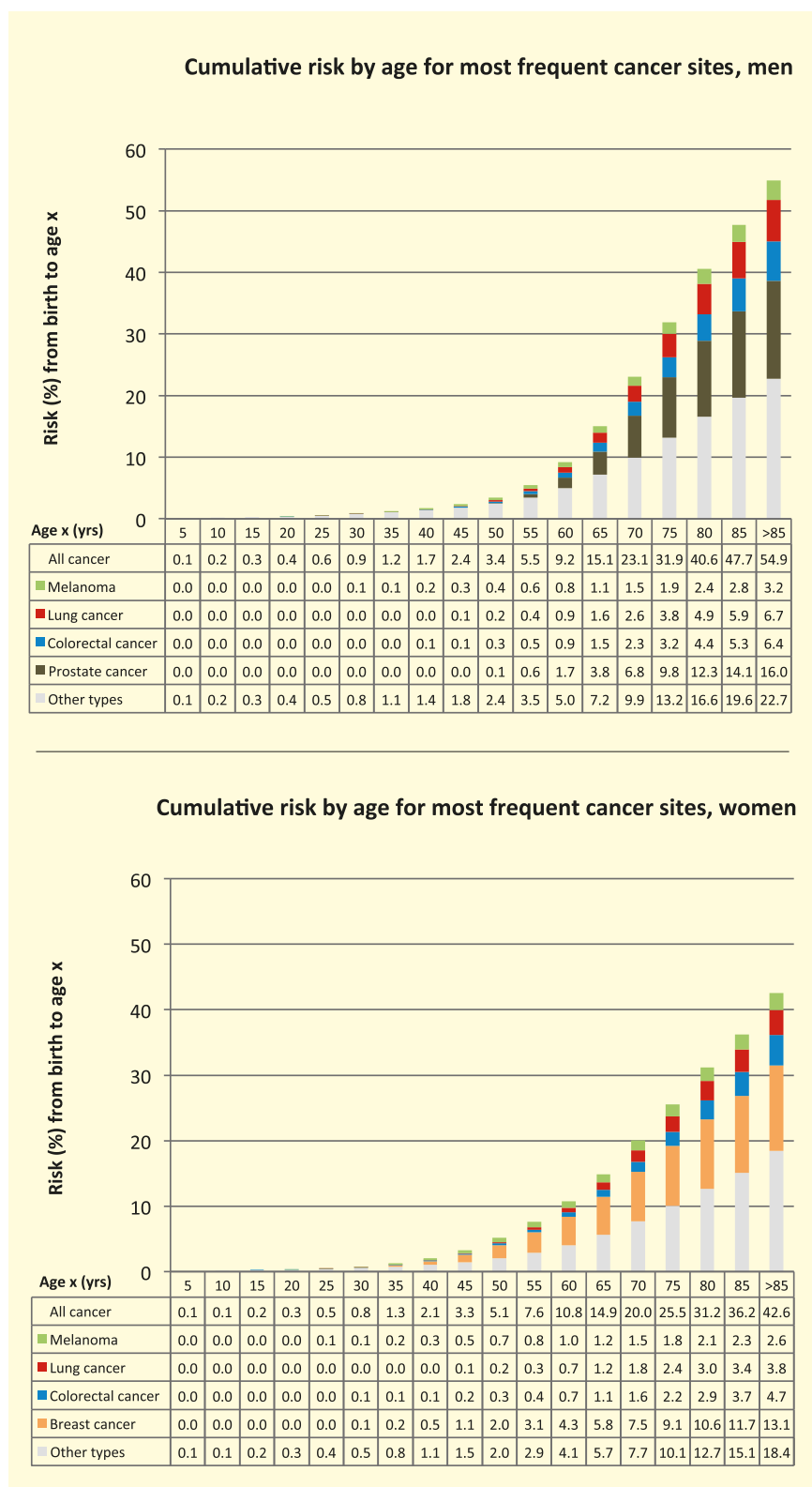| Age x (yrs)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	>85
All cancer	0.1	0.1	0.2	0.3	0.5	0.8	1.3	2.1	3.3	5.1	7.6	10.8	14.9	20.0	25.5	31.2	36.2	42.6
Melanoma	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.5	1.8	2.1	2.3	2.6
Lung cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.7	1.2	1.8	2.4	3.0	3.4	3.8
Colorectal cancer	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.7	1.1	1.6	2.2	2.9	3.7	4.7
Breast cancer	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.1	2.0	3.1	4.3	5.8	7.5	9.1	10.6	11.7	13.1
Other types	0.1	0.1	0.2	0.3	0.4	0.5	0.8	1.1	1.5	2.0	2.9	4.1	5.7	7.7	10.1	12.7	15.1	18.4

Fig. 5. Cumulative risk among men (top panel) and women (bottom panel) of developing cancer from birth until age x, derived from incidence period 2009-2013. «Other types» account for all cancer except melanoma, lung, colorectal and breast/prostate cancer.

ranking after age 40. Lung cancer is the fifth most common cancer in both sexes after the age 40. Pancreatic cancer is more frequent in women than in men and thyroid cancer is one of the five most frequent cancers only among women.

Lifetime and cumulative cancer risk

Figure 5 shows the cumulative risk by age for the most frequent cancer types. Cumulative risk is the risk of developing cancer from birth until a specific age. For example, men have 3.8% risk of developing prostate cancer until the age of 65. That is, out of 100 men, approximately 4 will develop prostate cancer before turning 65. The prostate cancer risk until end of life (age >85 years), i.e. the lifetime risk, is 16%. «All cancer» shows the risk for an individual to develop any cancer from birth until age 5, 10, 15… >85.

Overall lifetime risk among women is slightly higher than among men for all ages until age 65, but substantially lower thereafter. Lifetime risk to develop any cancer amounts to 55% among men and 43% among women. Prostate, breast, lung, colorectal cancers and melanoma, the most frequently occurring cancers, have a combined lifetime risk of 33% among men and 24% among women (**Tab. 1** and **Fig. 5**). In contrast, the lifetime risk of developing testicular and brain cancer is rare and affects mainly younger persons (**Fig. 5** and **Tab. 1**).

Risk of developing cancer in the next 10 years

Figure 6 illustrates the risk of developing cancer 10 years after age x. Individuals at age x are considered alive and free of the cancer in question. Taking breast cancer as an example, women aged 35 have 0.9% risk of developing breast cancer until age 45 and 3.8% risk from age 55 to 65. Men have almost a two-fold higher risk to develop cancer within the following 10 years if 75 and older, compared to

women. Risk to develop melanoma in the 10 years following age 75 is twice as high among men (1.2%) as among women (0.6%). Lung cancer risk from age 75 to 85 is almost three times higher among men (2.9%) compared with women (1.2%). From age 45 to 55 and 55 to 65, the risk of developing colorectal cancer doubles in both men and women. Although the risk to develop a specific cancer is almost always less than 10%, the risk to develop any cancer within the next 10 years is substantial. For instance, men and women at age 65-69 are facing a risk of 21.6% and 13.0% to develop cancer within the next 10 years, respectively. The pertinent risks for men and women aged 80-84 are 35.6% and 19.9%, respectively.

Discussion

We assessed three different factors influencing risk of developing cancer: age, sex and cancer type. Lifestyle factors, such as smoking, diet or alcohol consumption as well as extrinsic exposures were not investigated. Political stakeholders at all levels of government are making use of public health data, often in the form of indicators like incidence or mortality rates. The public perception of risk is different from the perception among medical experts and often risks are overestimated among lay people [17, 18]. By offering alternative ways to present cancer risk we hope to facilitate decision-making processes in public health politics. Risk perception and its outcome have been investigated in several studies and concluded that communication of cancer risk affects the attendance of screening programs [19, 20].

To avoid misconception on risk perception, it is useful to put cancer risk into context by comparisons with other common diseases, such as dementia or diabetes. At age 45, the risk of developing dementia until the end

Risk of developing cancer in the next 10 years, by age, men

Risk of developing cancer, 10 years after age x (%)

Age x (yrs)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
All cancer	0.2	0.2	0.2	0.3	0.5	0.7	0.9	1.1	1.8	3.3	6.2	10.6	16.2	21.6	25.9	28.9	35.6	29.6
Melanoma	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.8	1.0	1.1	1.2	1.3	1.0
Lung cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.7	1.2	1.9	2.4	2.8	2.9	2.9	2.0
Colorectal cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.1	1.5	2.0	2.6	2.9	3.4	2.6
Prostate cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	1.6	3.4	5.6	7.1	7.1	6.4	6.9	5.2
Other types	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.8	1.1	1.7	2.8	4.3	6.4	9.1	12.3	15.5	21.1	18.9

Risk of developing cancer in the next 10 years, by age, women

Risk of developing cancer, 10 years after age x (%)

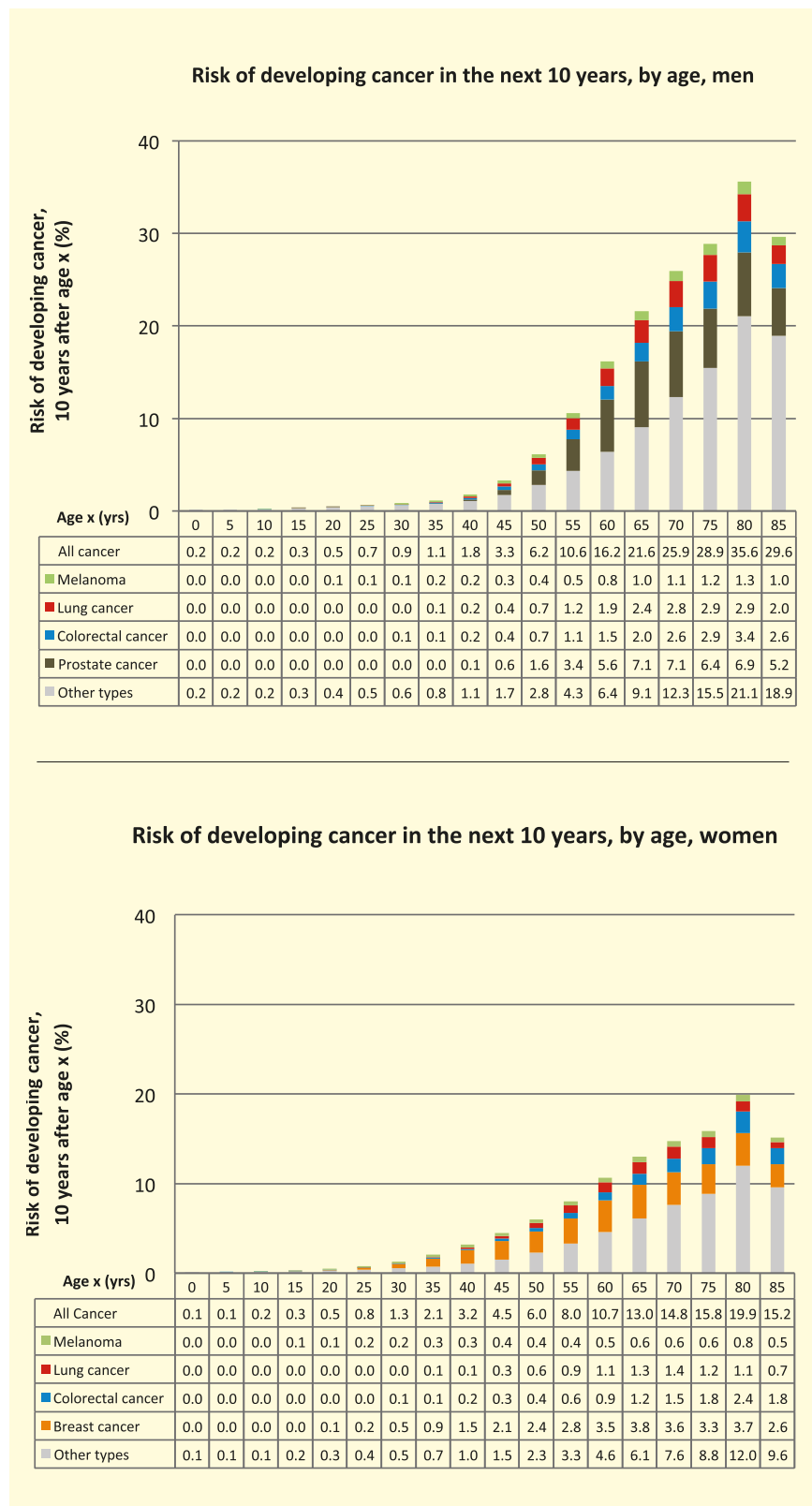| Age x (yrs)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
All Cancer	0.1	0.1	0.2	0.3	0.5	0.8	1.3	2.1	3.2	4.5	6.0	8.0	10.7	13.0	14.8	15.8	19.9	15.2
Melanoma	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.8	0.5
Lung cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.6	0.9	1.1	1.3	1.4	1.2	1.1	0.7
Colorectal cancer	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.6	0.9	1.2	1.5	1.8	2.4	1.8
Breast cancer	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.9	1.5	2.1	2.4	2.8	3.5	3.8	3.6	3.3	3.7	2.6
Other types	0.1	0.1	0.1	0.2	0.3	0.4	0.5	0.7	1.0	1.5	2.3	3.3	4.6	6.1	7.6	8.8	12.0	9.6

Fig. 6. Risk of developing cancer 10 years after age x, being alive and free of cancer until age x in men (top panel) and in women (bottom panel), derived from incidence period 2009-2013.

of life is 1 in 5 (20%) for women and 1 in 10 (10%) for men in the US [21], while the risk of developing type-2 diabetes after age 45 is 31% in the Netherlands, for individuals with normal glucose levels at the index age [22]. In comparison, men at age 45 have a 52.5% (i.e. 54.9% - 2.4%) risk of developing cancer of any type until the end of life, and women 39.3% (i.e. 42.6% - 3.3%) (**Fig. 5**). Thus, cancer risk remains high also in comparison with other common diseases.

Comparison with German data

To our knowledge, only few European countries have published on the risk of developing cancer within the next 10 years. In Germany (incidence years 2011/2012) similar observations about lifetime risk of developing any cancer are reported: 51% for men and 43% for women in Germany [23] versus 55% for men and 43% for women in Switzerland. Only slight differences occurred at the age 75 for the risk of developing any cancer within the next 10 years: 28.9% for Swiss men versus 27.4% for German men and 15.8% Swiss women versus 16.3% for German women. However, the most frequent cancers in Germany are different from those in Switzerland and include: prostate, lung, colorectal and bladder cancers among men. Breast, colorectal, lung and corpus uteri cancer are among the most frequent cancers among German women. Melanoma is not part of the five most frequent cancers in Germany and the risk of developing melanoma in the 10 years following age 75 is almost twice as high in Swiss men (1.2%) compared with German men (0.7%). Higher risk in Switzerland may be attributed in part to a higher ultraviolet (UV) exposure of the Swiss population. First, as UV exposure increases with altitude, Swiss inhabitants of the mountainous areas are frequently exposed to high UV amounts. Secondly, a large proportion of the Swiss population frequently travels to tropical countries, increasing their exposure to UV [24, 25]. Differences in diagnostic diligence are unlikely to explain the observed pattern, as melanoma screening has been established in Germany in 2008. Classic studies comparing age-standardized incidence rates among countries also classify Switzerland among the top three countries with the highest number of melanoma cases [26].

The risk of developing prostate cancer is 16% in Switzerland and 13% in Germany, while the risk of developing colorectal cancer is slightly higher in German women compared with Switzerland (5.7% among German women, versus 4.7% in Switzerland; corresponding values among men: 6.9% versus 6.4%) [23]. Basic health insurance covers colorectal cancer screening (fecal occult blood test and/or colonoscopy) since more than a decade in Germany, but only since recent times in Switzerland (1.7.2013, [27]). This possibly contributes to the observed difference in risk of colorectal cancer.

Limitations

In this study, only age and sex were taken into account for the calculation of risk, excluding environmental, genetic, lifestyle and other factors. In addition, our estimation assumes that age-specific mortality and incidence rates will remain stable in the coming years. Furthermore, the method estimates the risk of getting cancer in cancer-free individuals. Since we have not excluded second or higher primary diagnoses in individual patients, this led to a slight overestimation of the risk to develop cancer.

Conclusion

In summary, our data showed that the risk of developing cancer varies upon, inter alia, individual's age, sex and cancer type. While the youngest portion of the population is more at risk of developing testis, leukemia, brain or thyroid cancer, the oldest part of the population is more at risk for breast, colorectal and lung cancers. There are significant differences in the risk of developing cancer among men and women, especially at older age. The Swiss population has a very high risk of melanoma in comparison with other countries. The underlying cause for the increase in melanoma diagnoses should be investigated, as well as effective preventive measures. Practitioners should provide patients and their relatives with easily understandable and accessible information about the risk of developing cancer in order to prevent risk misconception.

References

1. Swiss Federal Statistical Office. Bilan de la populaiton résidente permanente. 2016. [Online]. Available: https://www.bfs.admin.ch/bfs/fr/home/statistiques/population/effectif-evolution/population.assetdetail.159571.html. [Accessed: 12-Dec-2016].
2. WHO Regional Office for Europe. Demographic change , life expectancy and mortality trends in Europe : fact sheet. pp. 2009–2010, 2012 [Online]. Available: http://data.euro.who.int/hfadb. [Accessed: 13-May-2017].
3. National Cancer Institute. Cancer risk factors and protective factors. [Online]. Available: https://www.cancer.gov/about-cancer/causes-prevention/risk/age. [Accessed: 13-May-2017].
4. Rapiti E, Guarnori S, Pastoors B, et al. Planning for the future: cancer incidence projections in Switzerland up to 2019. BMC Public Health 14: 102, 2014.
5. Kamo KI, Katanoda K, Matsuda T, et al. Lifetime and age-conditional probabilities of developing or dying of cancer in Japan. Jpn J Clin Oncol 38: 571–576, 2008.
6. Merrill RM. Measuring the Projected Public Health Impact of Lung Cancer Through Lifetime and Age-Conditional Risk Estimates. Ann Epidemiol 10: 88–96, 2000.
7. Fay MP. Estimating age conditional probability of developing disease from surveillance data. Popul Health Metr 2: 6, 2004.
8. Fay MP, Pfeiffer R, Cronin KA, et al. Age-conditional probabilities of developing cancer. Stat Med 22: 1837–1848, 2003.

9. National Institute for Cancer Epidemiology and Registration (NICER). [Online]. Available: http://www.nicer.org/. [Accessed: 09-Nov-2016].

10. Bevnat. BEVNAT BFS-Sektion Demografie und Migration. [Online]. Available: https://www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung/erhebungen/bevnat.html. [Accessed: 31-Aug-2015].

11. Joy M. Age-conditional Risk of Developing cancer. [Online]. Available: http://documentslide.com/documents/comprehensive-project-by-melissa-joy-background-information-on-probability.html. [Accessed: 15-Nov-2016].

12. National Cancer Institute. Probability of Developing or Dying of Cancer - Surveillance Research Program. [Online]. Available: https://surveillance.cancer.gov/devcan/. [Accessed: 09-Nov-2016].

13. Kurian AW, Fish K, Shema SJ, and Clarke CA. Lifetime risks of specific breast cancer subtypes among women in four racial/ethnic groups. Breast Cancer Res 12: R99, 2010.

14. Cashman R, Goldberg ID, Levin ML, et al. The probability of developing cancer. J Natl Cancer Inst 17: 155–173, 1956.

15. National Cancer institute. DevCan-Probability of Developing or Dying of Cancer. [Online]. Available: https://surveillance.cancer.gov/devcan/. [Accessed: 29-Jun-2017].

16. Cancer Research UK. Lifetime risk and age-specific risk calculation. [Online]. Available: http://cc.bingj.com/cache.aspx?q=cancer+overestimation+of+lifetime+risk&d=45373297-09549698&mkt=fr-CH&setlang=fr-FR&w=4Y-BBILeFLkPVukWe8AC61jKIpLyCjw6#heading-Eight. [Accessed: 27-Jun-2017].

17. Klein WMP and Stefanek ME. Cancer risk elicitation and communication: lessons from the psychology of risk perception. CA Cancer J Clin 57: 147–167, 2007.

18. Slovic P. Perception of risk. Science 236: 280–285, 1987.

19. Kim SE, Pérez-Stable EJ, Wong S, et al. Association between cancer risk perception and screening behavior among diverse women. Arch Intern Med 168: 728–734, 2008.

20. Park S, Cochrane BB, Koh SB, and Chung C. Comparison of Breast Cancer Risk Estimations, Risk Perception, and Screening Behaviors in Obese Rural Korean Women. Oncol Nurs Forum 38: E394–E401, 2011.

21. Chêne G, Beiser A, Au R, et al. Gender and incidence of dementia in the Framingham Heart Study from mid-adult life. Alzheimer's Dement 11: 310–320, 2015.

22. Ligthart S, van Herpt T, Leening M, et al. Lifetime risk of developing impaired glucose metabolism and eventual progression from prediabetes to type 2 diabetes: a prospective cohort study. Lancet Diabetes Endocrinol 4: 44–51, 2016.

23. Kaatsch P, Spix C, and Hentschel S. Krebs in Deutschland 2011/2012. Gesundheitsberichterstattung des Bundes, 2015.

24. Vienneau D, De Hoogh K, Hauri D, et al. Effects of Radon and UV Exposure on Skin Cancer Mortality in Switzerland. Environmental Health Perspectives DOI:10.1289/EHP825, 2017.

25. Bühler S, Rüegg R, Steffen R, et al. A profile of travelers - An analysis from a large Swiss travel clinic. J Travel Med 21: 324–331, 2014.

26. Ferlay J, Soerjomataram I, Ervik M, et al. Globocan 2012, Cancer Incidence and Mortality Worldwide: IARC CancerBase No.11, 2012. [Online]. Available: http://globocan.iarc.fr/old/summary_table_site-html.asp?selection=16120&title=Melanoma+of+skin&sex=0&type=0&window=1&africa=1&america=2&asia=3&europe=4&oceania=5&build=6&sort=3&submit= Execute. [Accessed: 27-Jun-2017].

27. Verordnung des Eidgenössische Departement des Innern (EDI) vom 29. September 1995 über Leistungen in der obligatorischen Krankenpflegeversicherung (Krankenpflege-Leistungsverordnung, KLV). [Online]. Available: https://www.admin.ch/opc/de/classified-compilation/19950275/201707010000/832.112.31.pdf [Accessed: 13-Jul-2017].

Correspondence:
Matthias Lorez, PhD MAS
Foundation National Institute for Cancer Epidemiology and Registration (NICER)
c/o University of Zürich
Hirschengraben 82, CH-8001 Zürich
matthias.lorez@nicer.org