

Sponsored lecture by MSD (Main Session 1)

Lung Cancer Epidemiology in Switzerland

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Palazzo Congressi Lugano

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Lung Cancer Disease Burden

Incidence/Mortality



Rank 5 of all causes of death
 Most common cancer diagnosis and cancer cause of death:
 2.1 Million new cases, 1.8 Million deaths¹ annually



Lung cancer	Males	Females
Diagnoses ²	2,500 (rank 2)	1,800 (rank 3)
Deaths ²	2,000 (rank 1)	1,300 (rank 2)
Lifetime Disease Risk ^{3,4}	7% (Smoker 15%) (Non-Smoker 2%)	4% (Smoker 11%) (Non-Smoker 1%)
Lifetime Death Risk ⁵	6%	3%

Sources:

1 IARC, WHO. GLOBOCAN 2018.

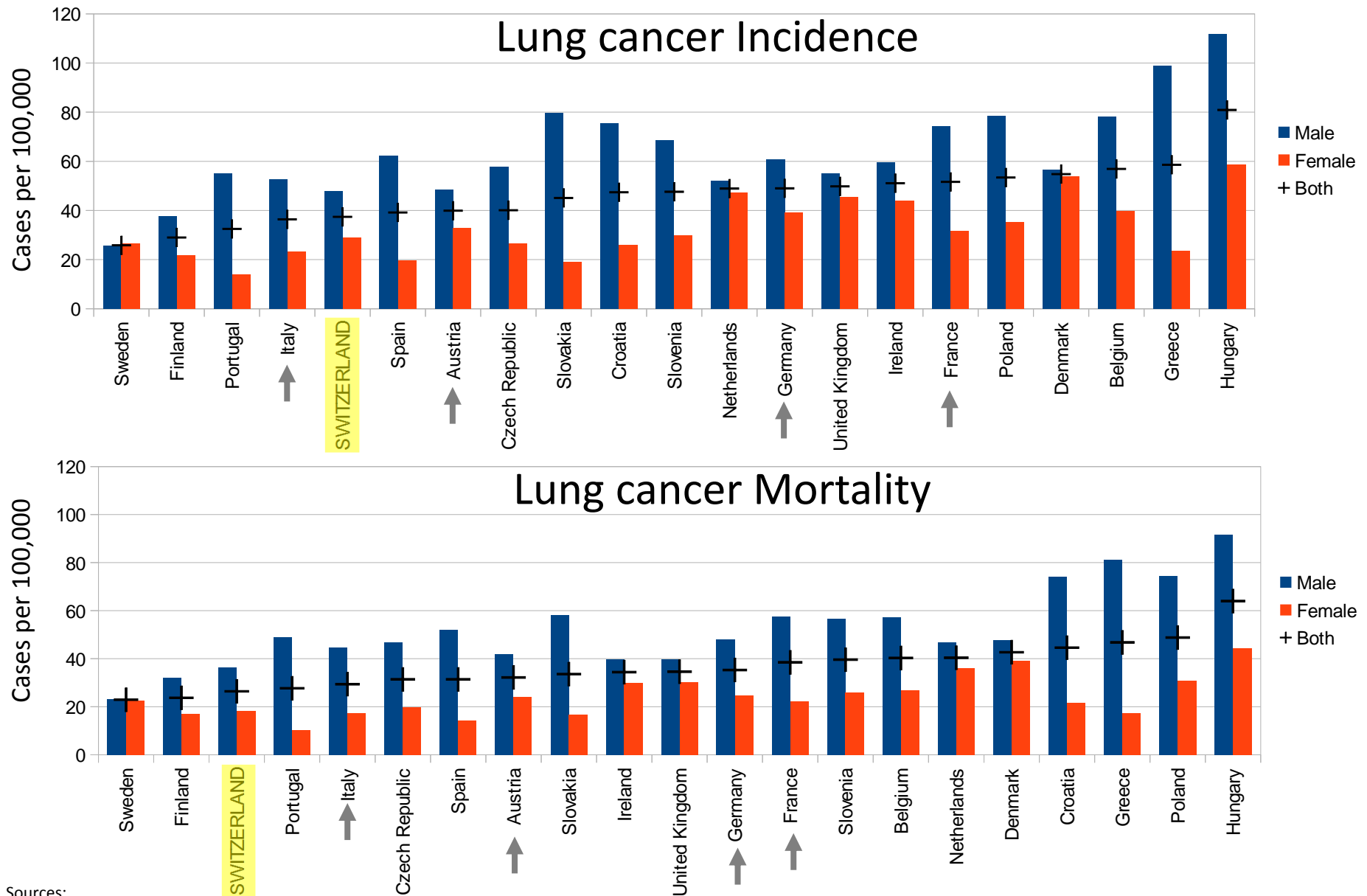
2 Estimate for 2015. NICER (2018).

3 Six et al. (2017). Age-dependent risk and lifetime risk of developing cancer in Switzerland. *SCB* **37(3)**, 284-291.

4 Bruder et al. (2018). Estimating lifetime and 10-year risk of lung cancer. *Preventive Medicine Reports* **11**, 125-130.

5 FSO NICER SCCR Swiss Cancer Report 2015.

Age-standardized Rates in Europe

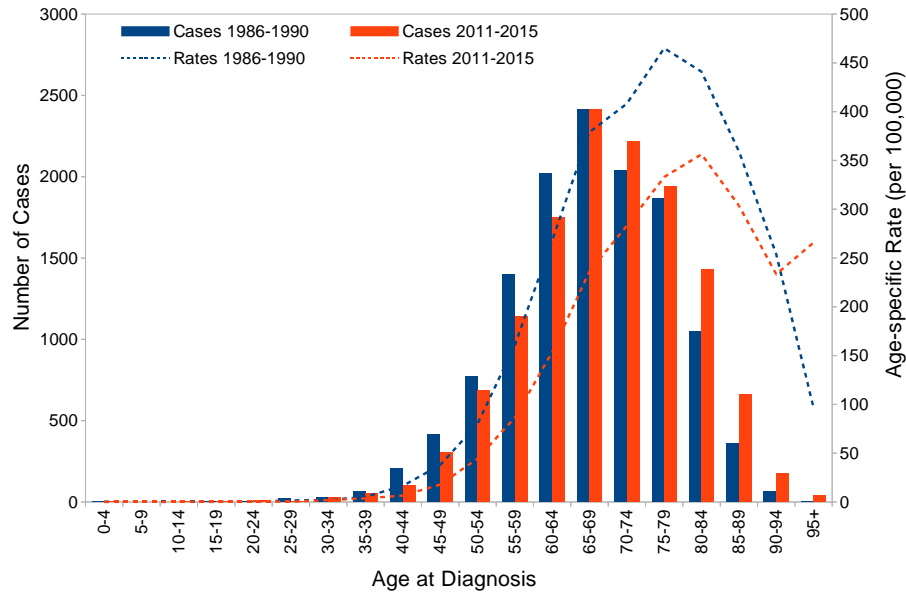


Sources:
ECIS - European Cancer Information System. Incidence and mortality estimates 2018.
NICER (2018). Incidence and mortality estimates 2015.

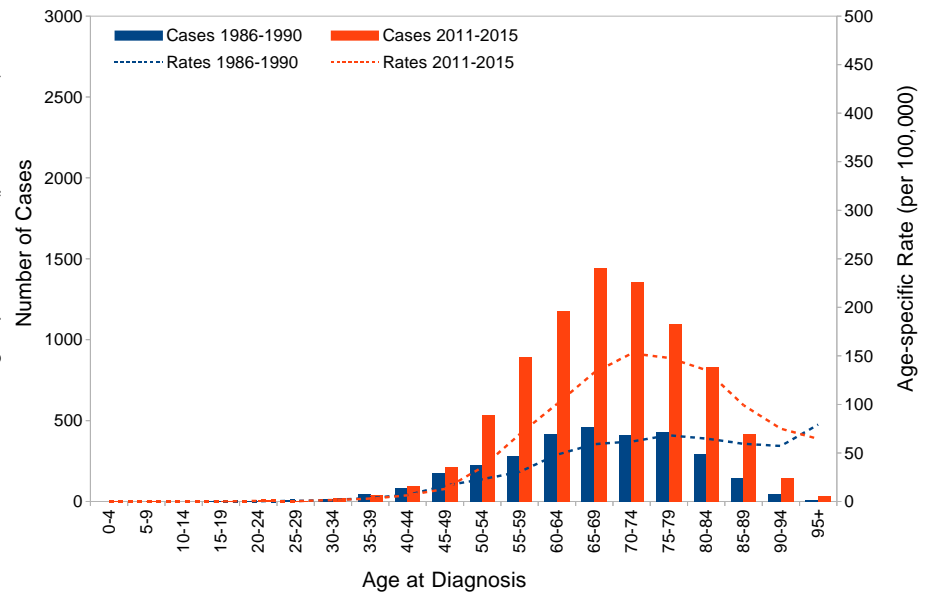


Lung cancer Incidence

Counts and Rates in Males



Counts and Rates in Females



25 y diagnosis period

	1986-1990	2011-2015	
Total cases (extrapolated)	12,800	13,000	↑
Age-stand. Rate	77.5	49.2	↓
Median Age	67.5	70.0	↑

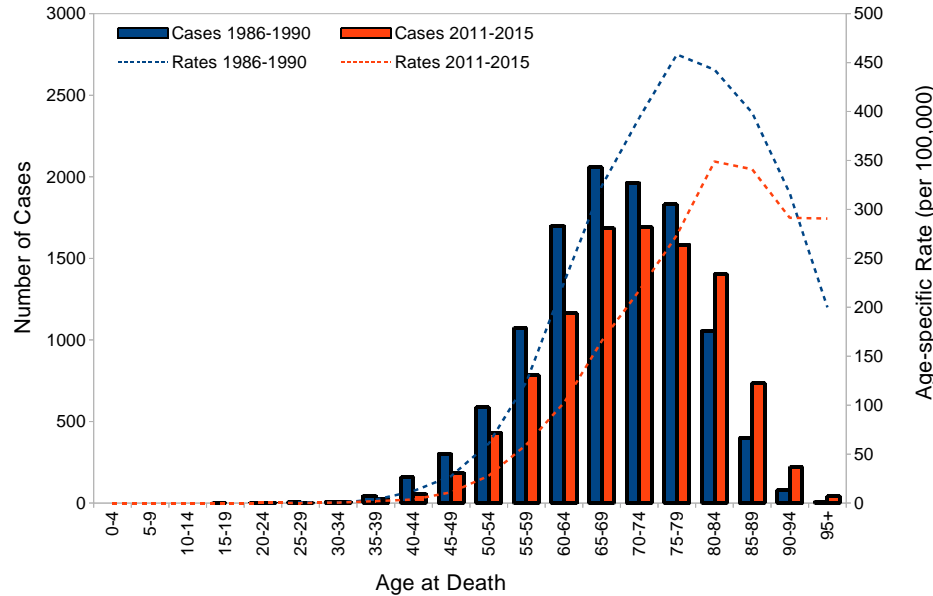
25 y diagnosis period

	1986-1990	2011-2015	
Total cases (extrapolated)	3,100	8,300	↑
Age-stand. Rate	14.7	28.5	↑
Median Age	68.0	69.0	↑

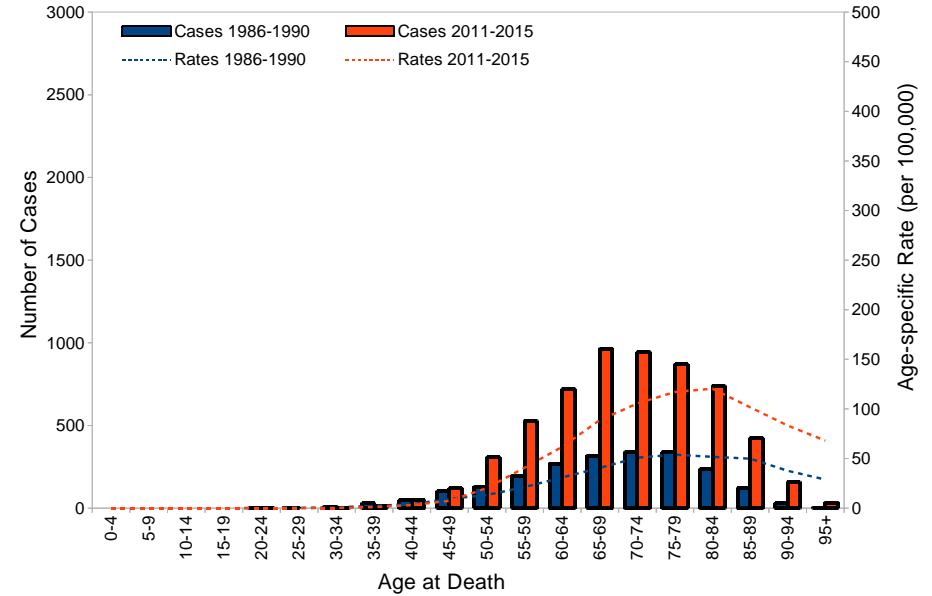


Lung cancer Mortality

Counts and Rates in Males



Counts and Rates in Females



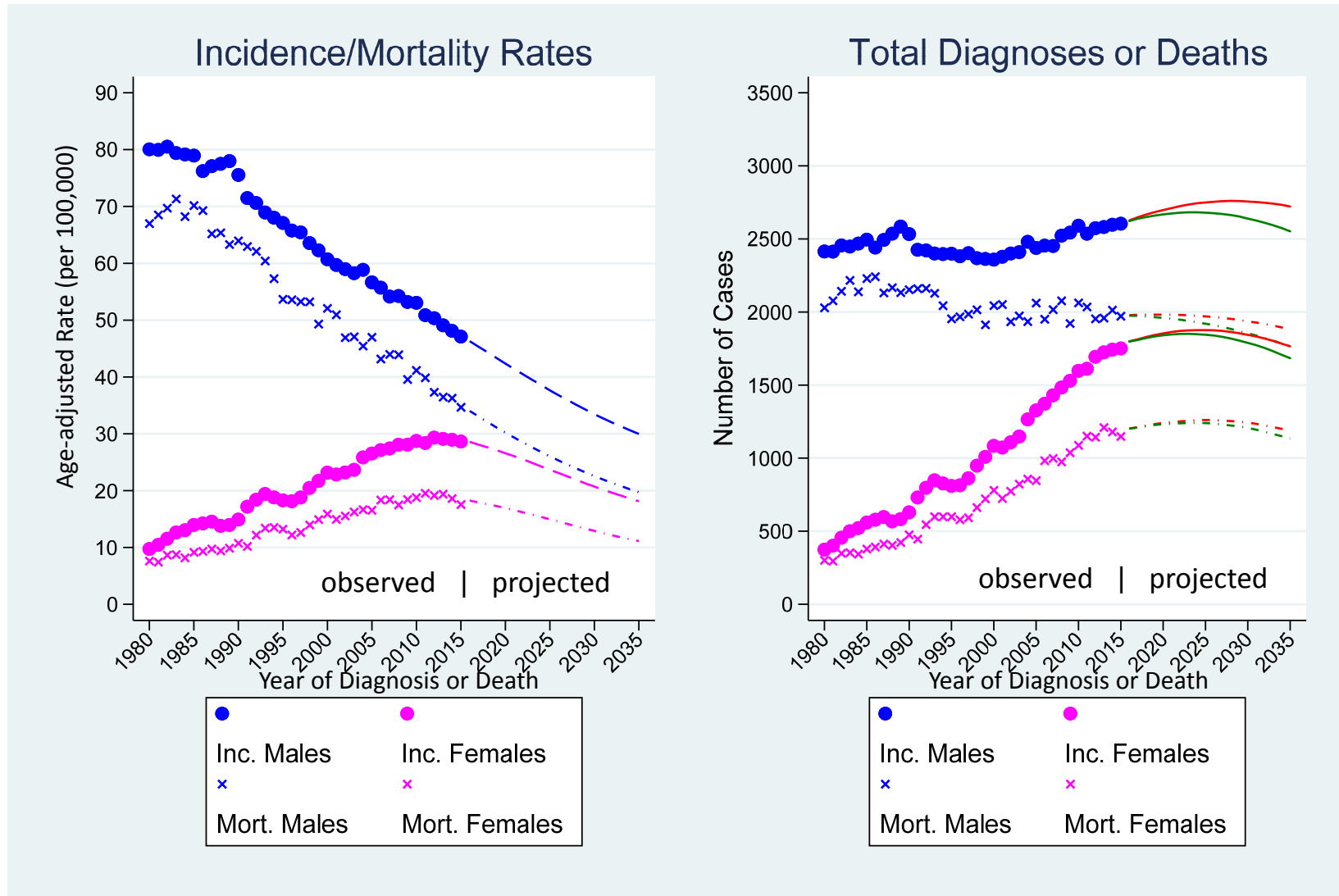
	Death periods		
	1986-1990	2011-2015	
Total cases	11,300	10,000	↓
Age-stand. Rate	68.1	37.2	↓
Median Age	69.3	71.4	↑

	Death periods		
	1986-1990	2011-2015	
Total cases	2,200	5,900	↑
Age-stand. Rate	10.1	19.0	↑
Median Age	70.2	70.6	↑

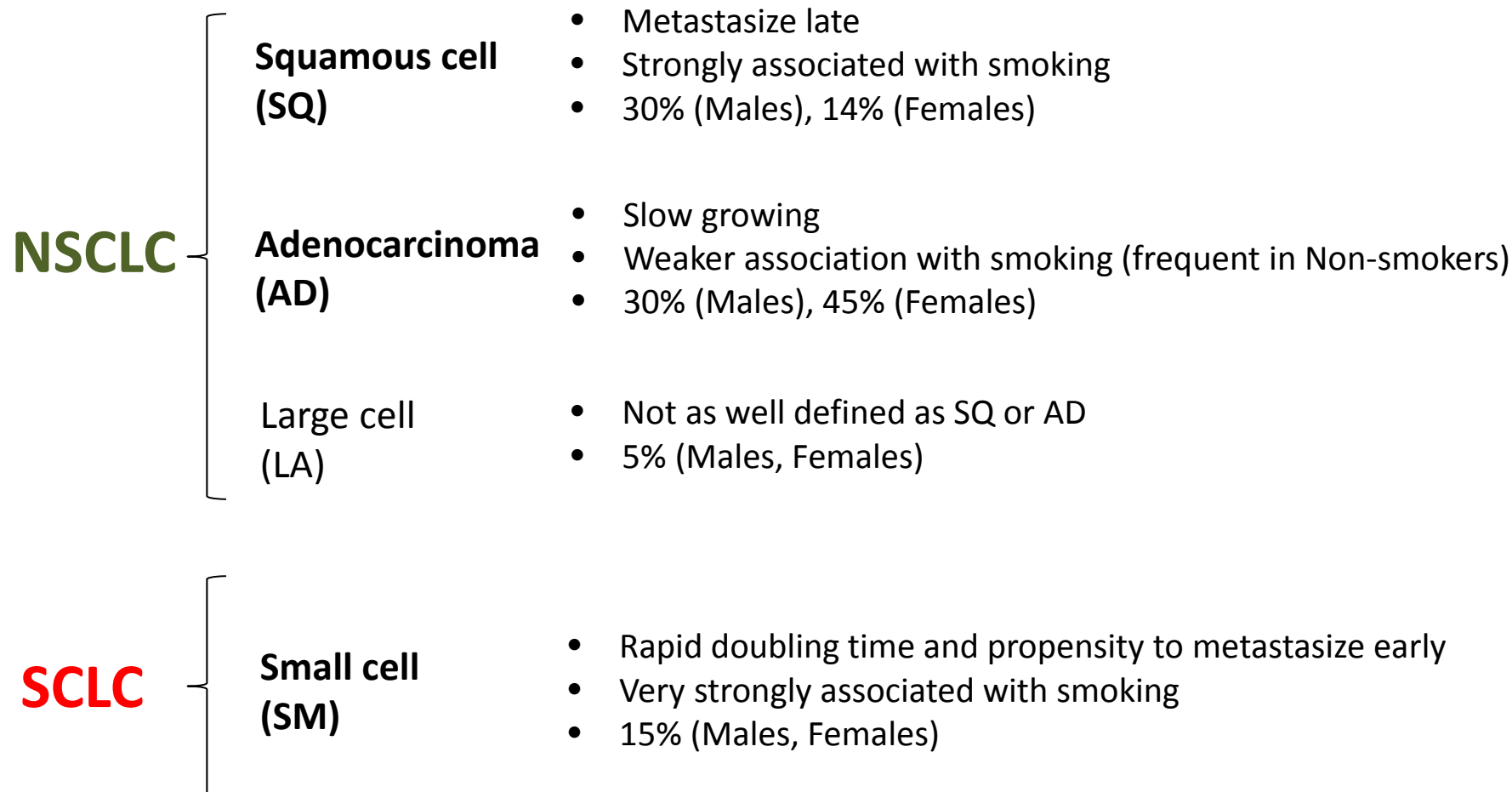


Lung cancer Incidence/Mortality Trends

Projection: Age-Period-Cohort Modeling

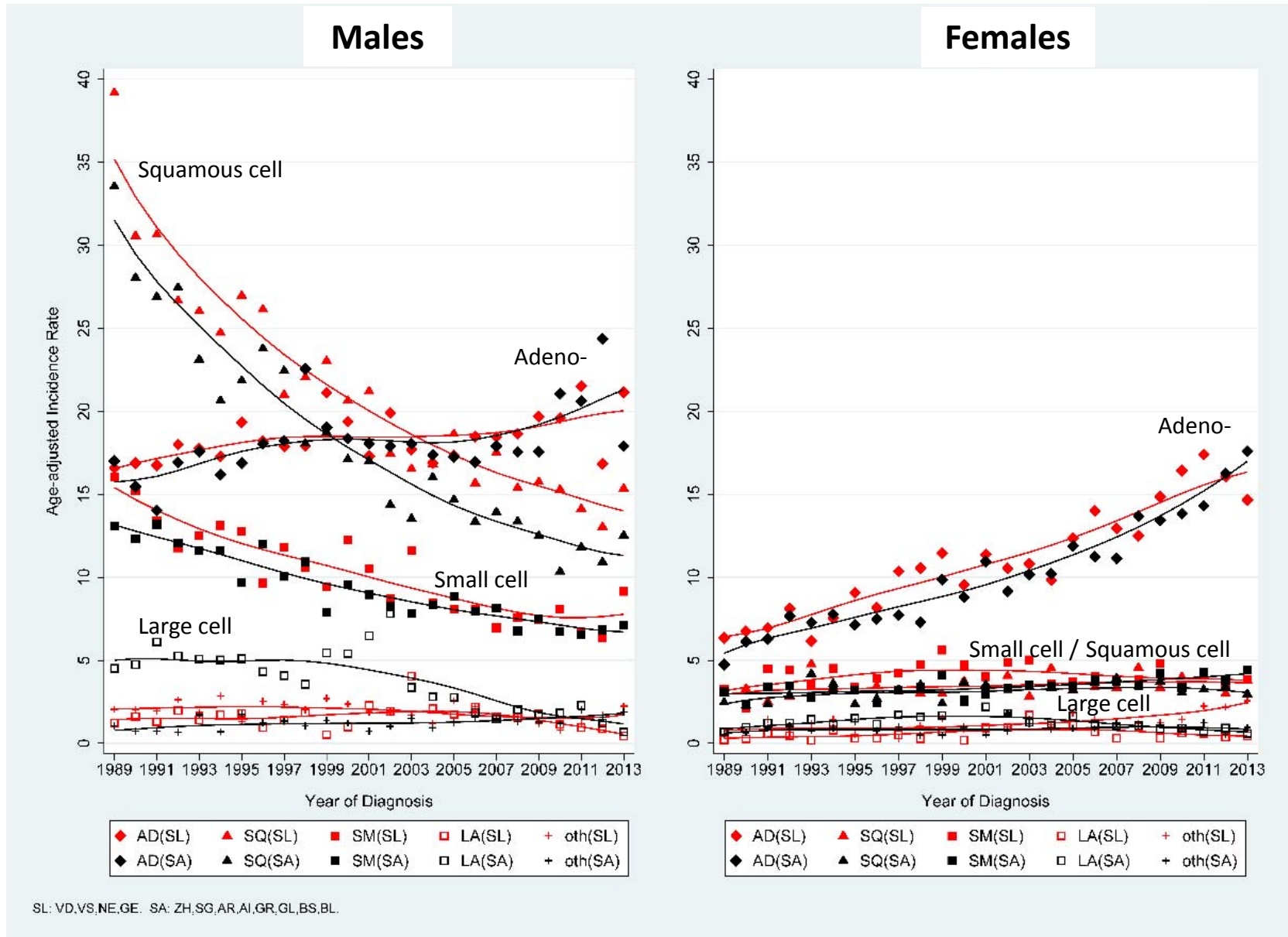


Main Lung Carcinoma Subtypes



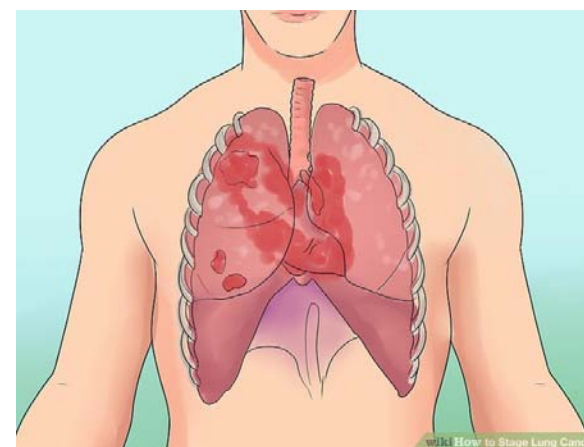
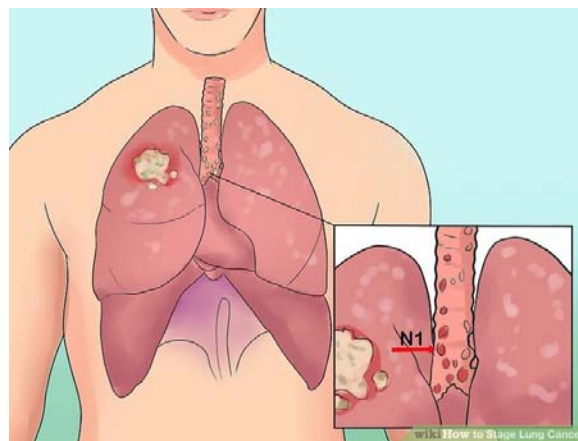


Subtype-specific Incidence Trends



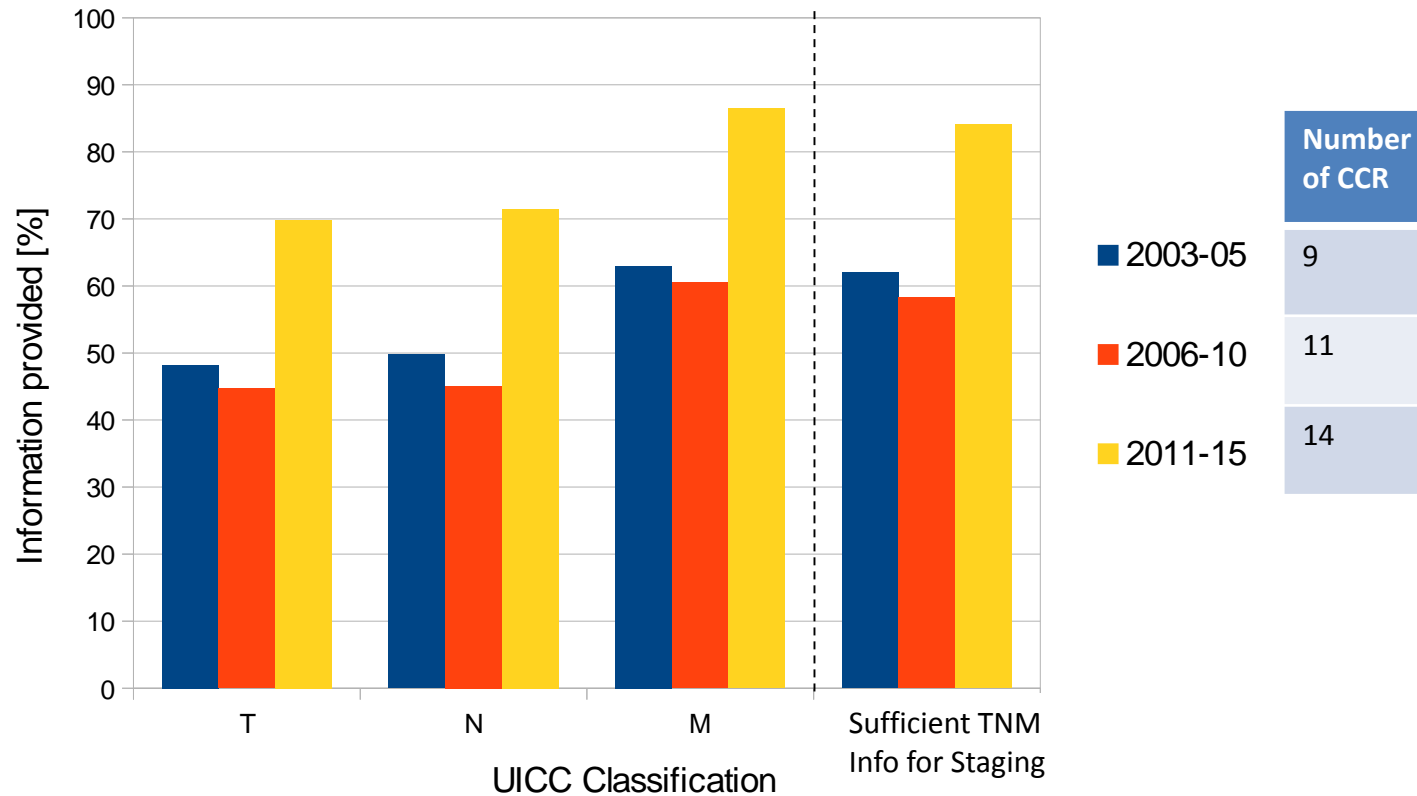
Source:
Lorez et al. (2017). *Swiss Cancer Bulletin* **37(2)**, 179-185.

Lung Cancer Stages Distribution/Trend





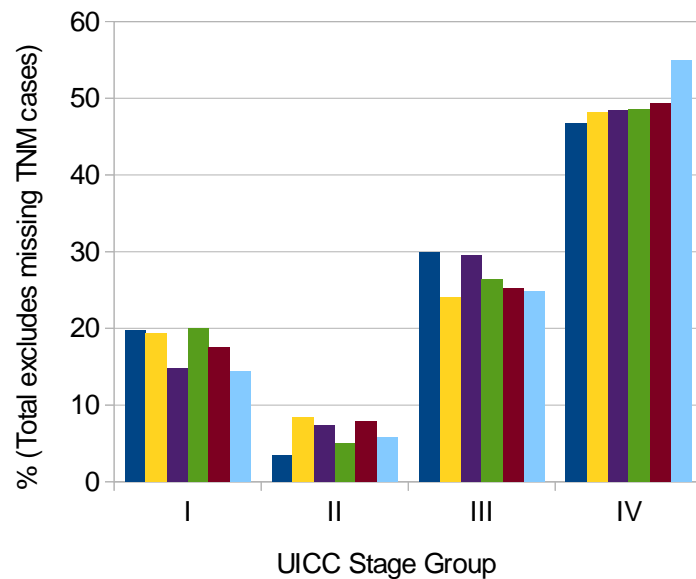
Data Quality improves: Increasing % Cases with Information on Stage





Stage Distribution by Country

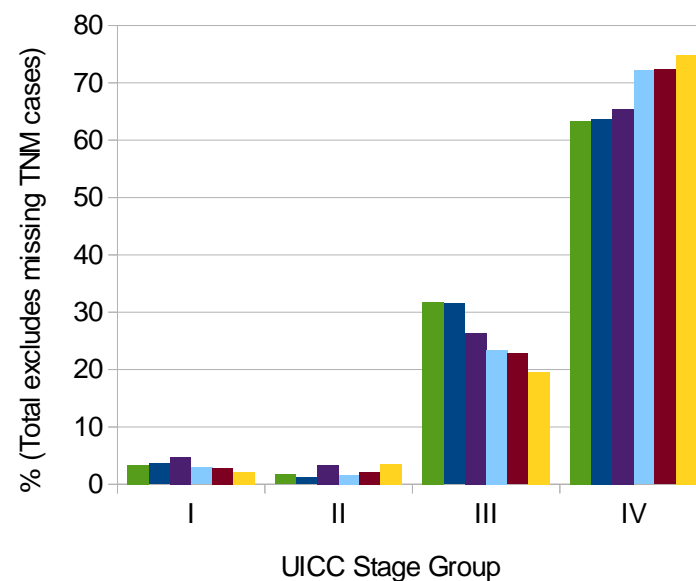
NSCLC



- Sweden
- Switzerland
- UK
- Canada
- Germany ←
- Denmark

Diagnosis period	Missing Stage
2004-2007	5.8 %
2003-2015	9.4 %
2004-2007	30.3 %
2004-2007	5.6 %
2000-2014	14.7 %
2004-2007	11.2 %

SCLC



- Canada
- Sweden
- UK
- Denmark
- Germany ←
- Switzerland

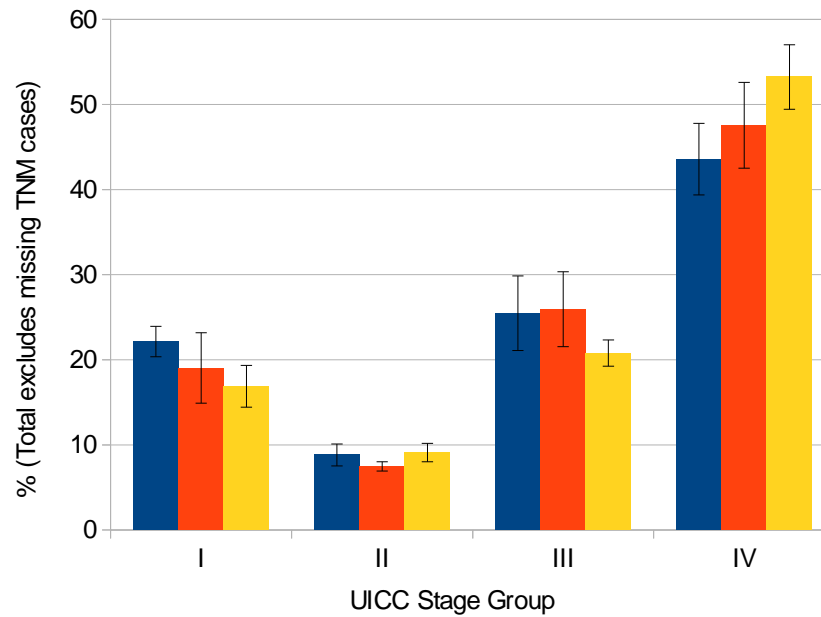
Diagnosis period	Missing Stage
2004-2007	2.1 %
2004-2007	4.6 %
2004-2007	38.4 %
2004-2007	8.2 %
2000-2014	18 %
2003-2015	16.4 %

Sources:
 SWE, UK, CAN, DEN: Walters et al. (2013). *Thorax*, 1-14.
 GER: Versorgungssituation beim Lungenkarzinom in Deutschland (2016).
 CH: NICER (2018)



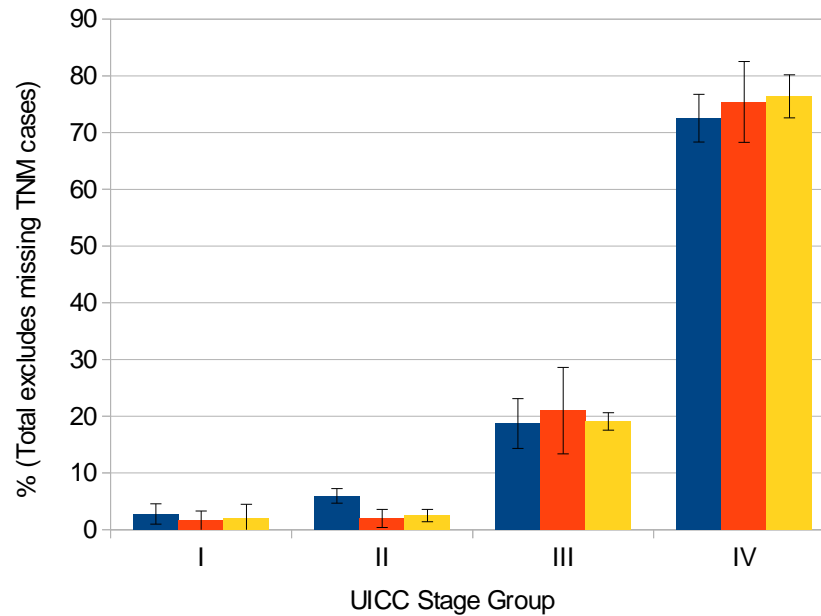
Stage Distribution Trends

NSCLC



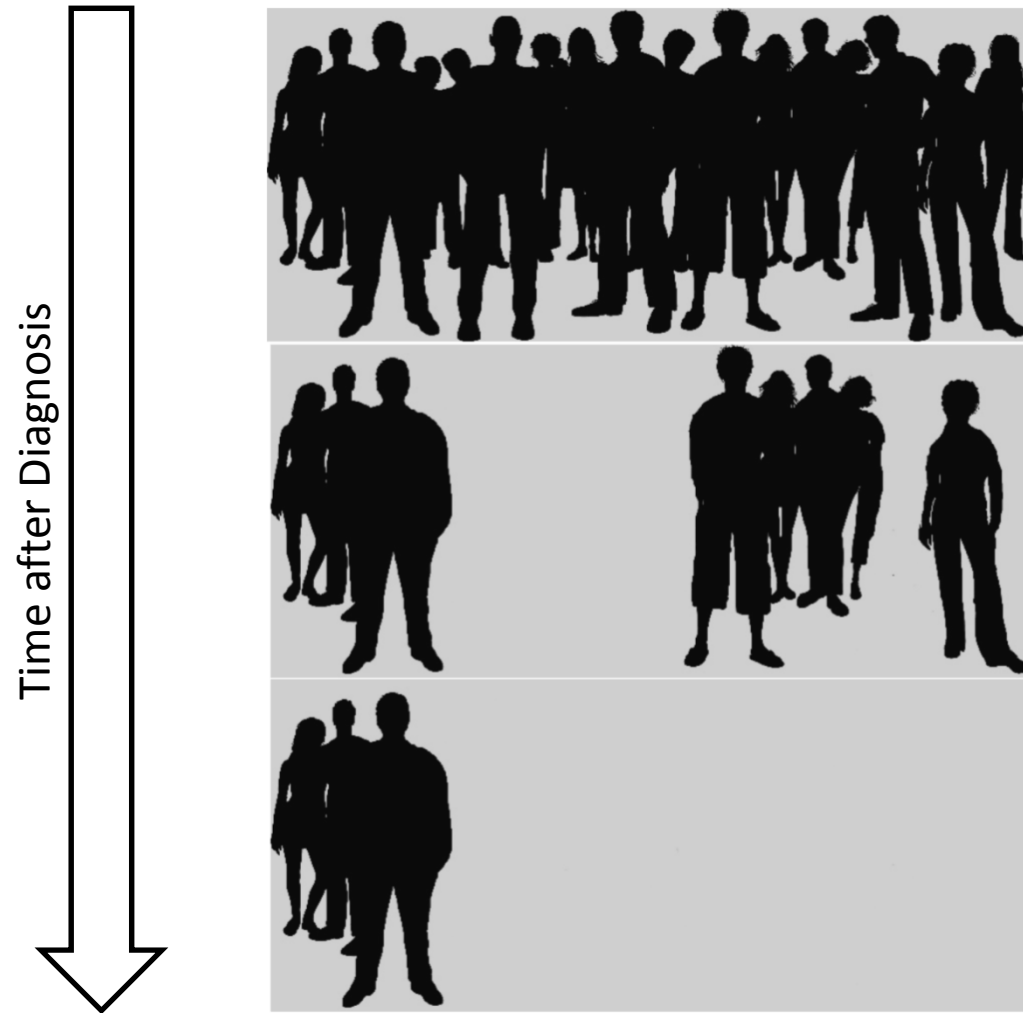
N Cases	% missing TNM	Number of CCR
2,745	15.4	5 of 9
2,537	8.4	4 of 11
9,016	4.1	10 of 14

SCLC



N Cases	% missing TNM	Number of CCR
544	25.3	5 of 9
470	17.1	4 of 11
1,665	6.7	10 of 14

Lung Cancer Survival



Measuring Cancer Survival

Method	Cause-specific Survival	Relative Survival
Study context	Clinical	Population-based
Survival proportion	$(N_{\text{Pat}} - \text{observed cancer deaths}) / N_{\text{pat}}$	$\frac{(N_{\text{Pat}} - \text{observed deaths}) / N_{\text{Pat}}}{(N_{\text{Non-Pat}} - \text{expected deaths}) / N_{\text{Non-Pat}}}$
Advantage	Simple	No need to decide cod*
Disadvantage	Potential misclassification of cod*	Potential bias in estimation of expected survival

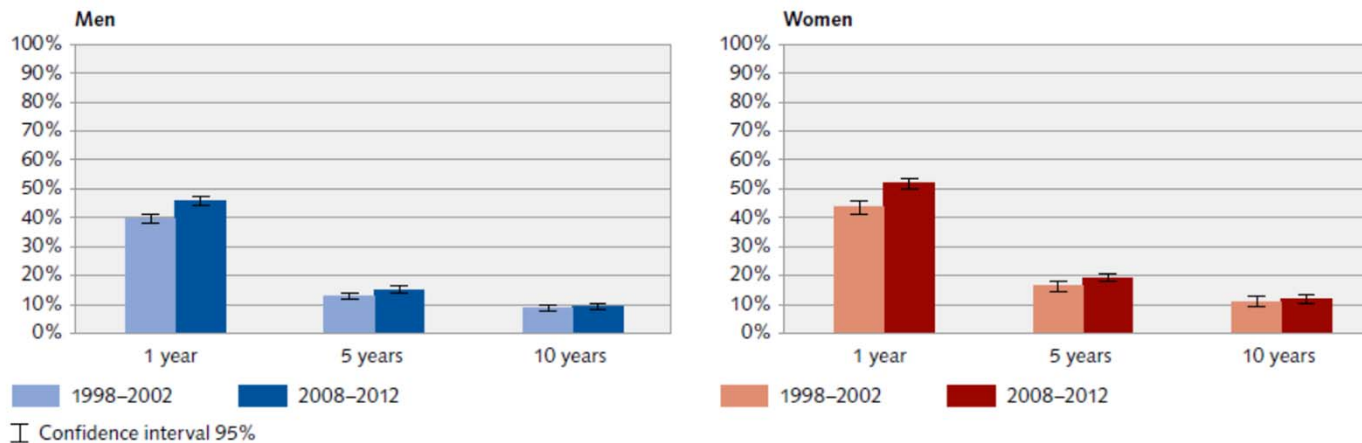
*cause of death

Relative Survival in CH and Europe



Lung cancer: Relative survival rate after 1, 5 and 10 years

G 4.8.5

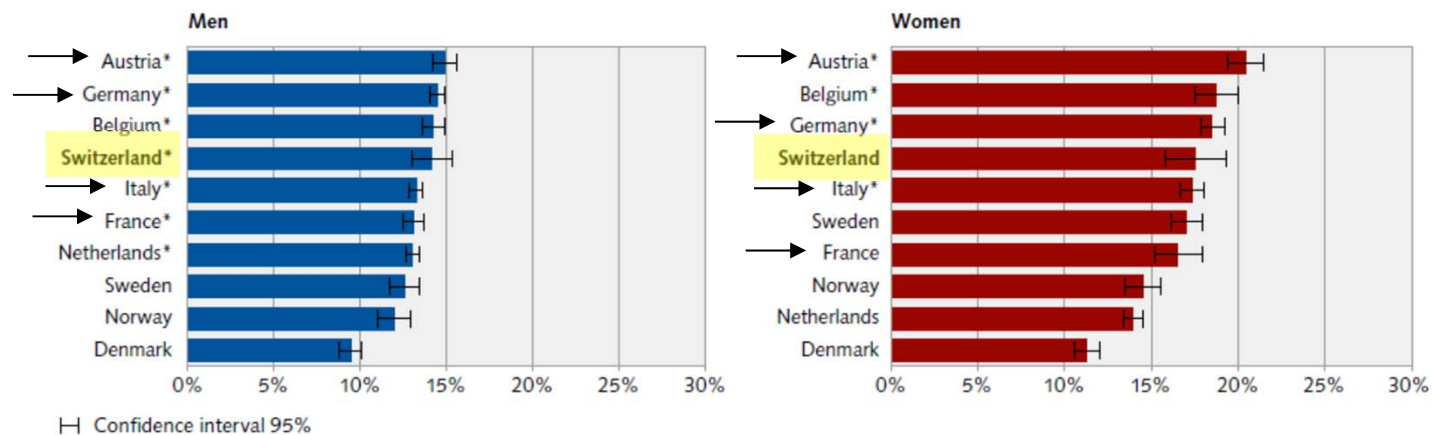


Source: NICER

© FSO, Neuchâtel 2016

Lung cancer: Relative 5-year survival rates in international comparison, 2000-2007

G 4.8.6



* According to the source, the calculated survival rate is exceptionally high with the result that there may be a problem with data collection in this country. Data for Belgium, Germany, France, Italy and Switzerland are based on regional data which do not cover the whole country.

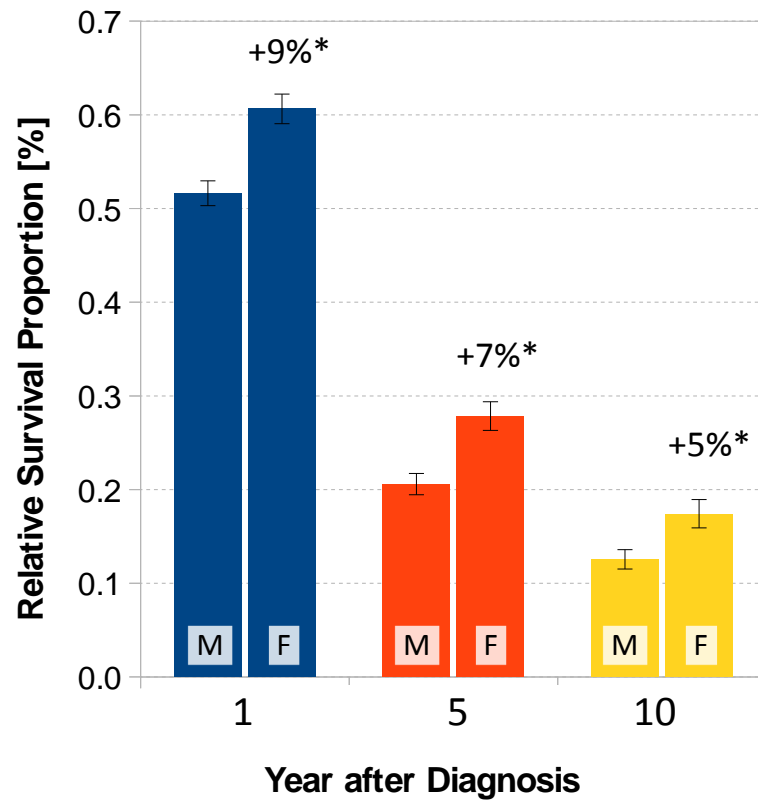
Source: EURO-CARE-5 Database - Survival Analysis 2000-2007

© FSO, Neuchâtel 2016

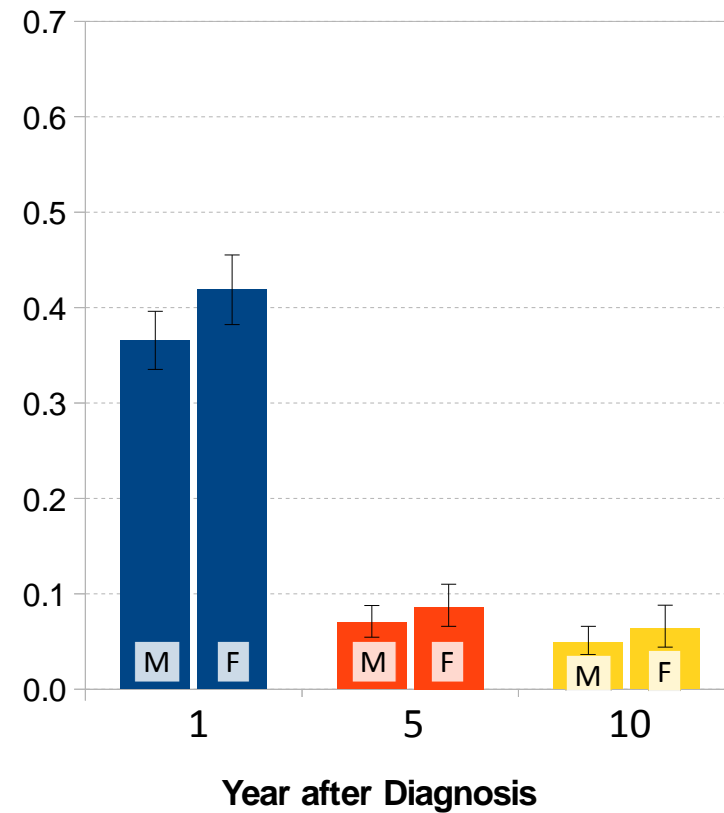


Relative Survival by Sex and Histology

NSCLC

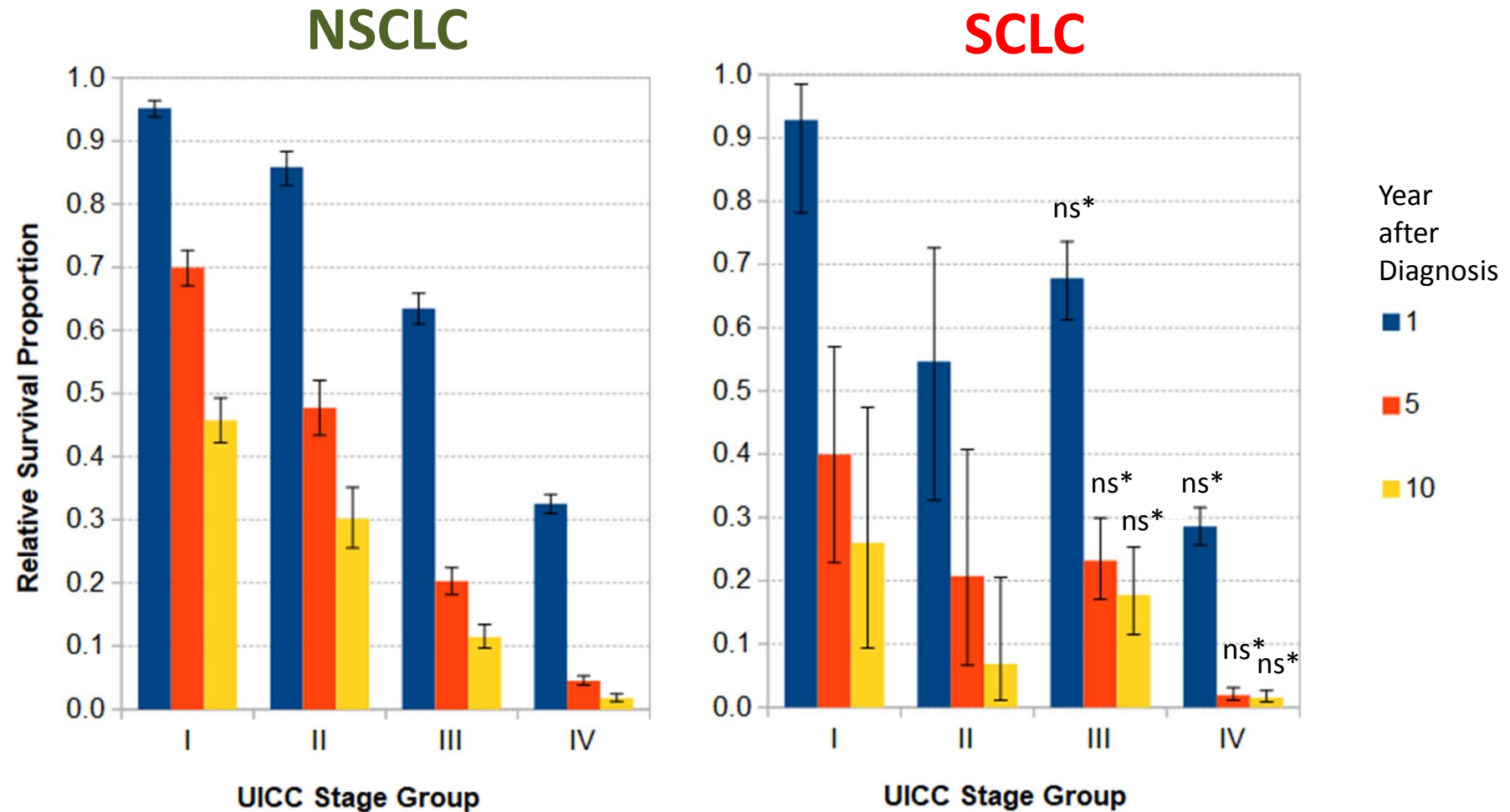


SCLC





Relative Survival by Stage and Histology



*not significant
SCLC vs NSCLC

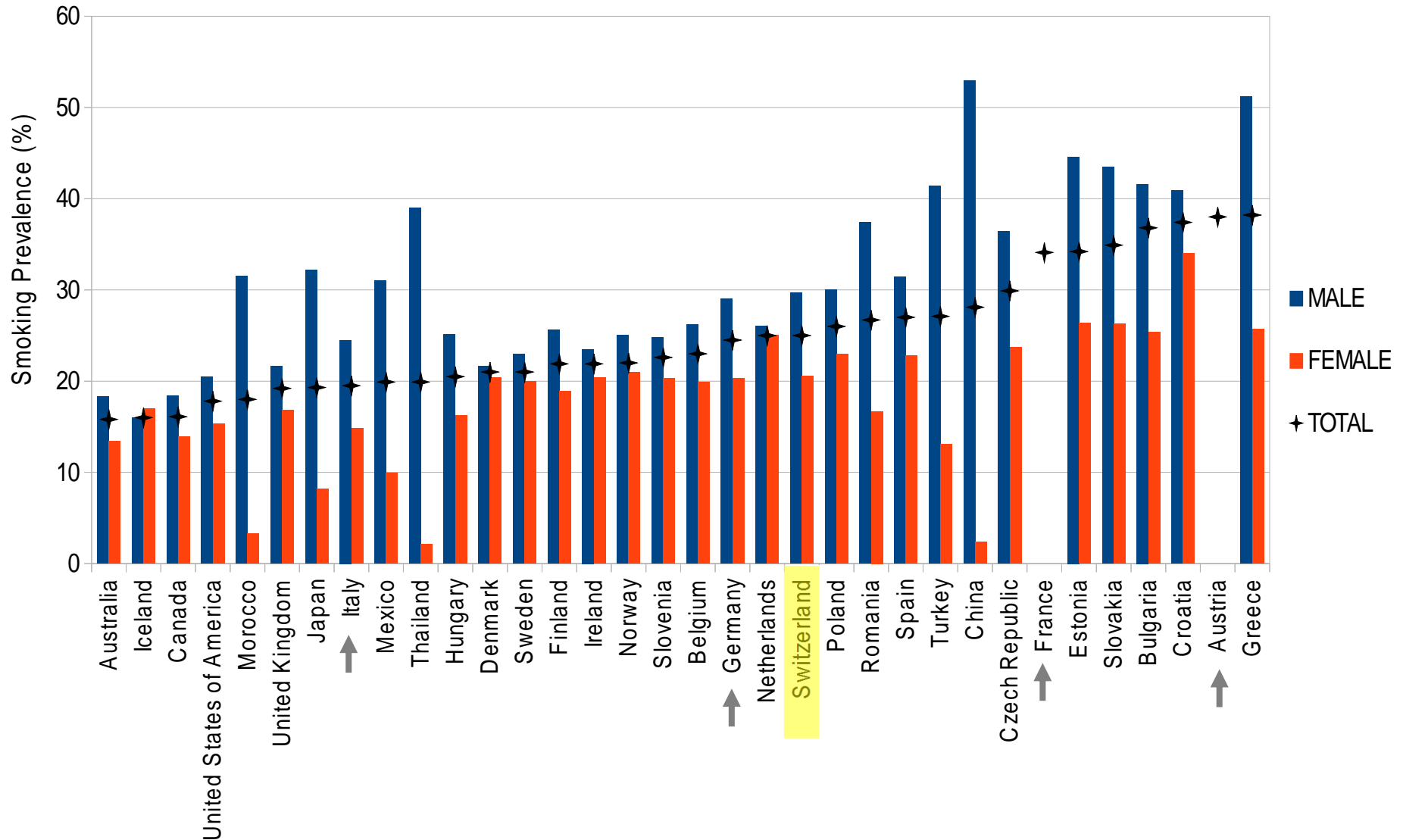
Prevention: Risk Factor Smoking





Worldwide Smoking Prevalence

Surveys conducted 2010-2014



Source:
WHO report on the global tobacco epidemic, 2015: raising taxes on tobacco.



Size of the Problem

- Cigarettes consumed¹: 12 bn (2012) – 11 bn (2015)
- Smoking-attributable Deaths in Switzerland:
N= 7,400² - 9,000³ or 12²-15³% in 2007 [worldwide 6 million WHO 2012]
[18²-22³% (Males) and 7²-9³% (Females)] [≈1/2 of male and 1/3 of female smoker/former -]
40% cancer, 40% CVD, 20% COPD (2012)
- Estimated 3-400,000 suffer from smoking-related disease¹
- Societal costs in 2007⁴: 10 bn CHF (direct+indirect) [Tax return 2.3 bn CHF (2013)]

Prevention (key control measures)

- «Bundesgesetz zum Schutz vor Passivrauchen» in 2010
- 2nd lowest rank for affordability of tobacco products⁵
- Lowest rank for advertising bans⁵

Sources:

1 Jakob et al. (2017). *Swiss Med Wkly*. **147**, w14437.

2 Federal Statistical Office (2009). Smoking-attributable mortality in Switzerland.

3 Maag et al. (2013). *Nicotine & Tobacco Research* **15**, 1588-1597.

4 Bundesamt für Gesundheit. Wieser et al. (2010). Synthesebericht-Ökonomische Evaluation von Präventionsmassnahmen in der Schweiz.

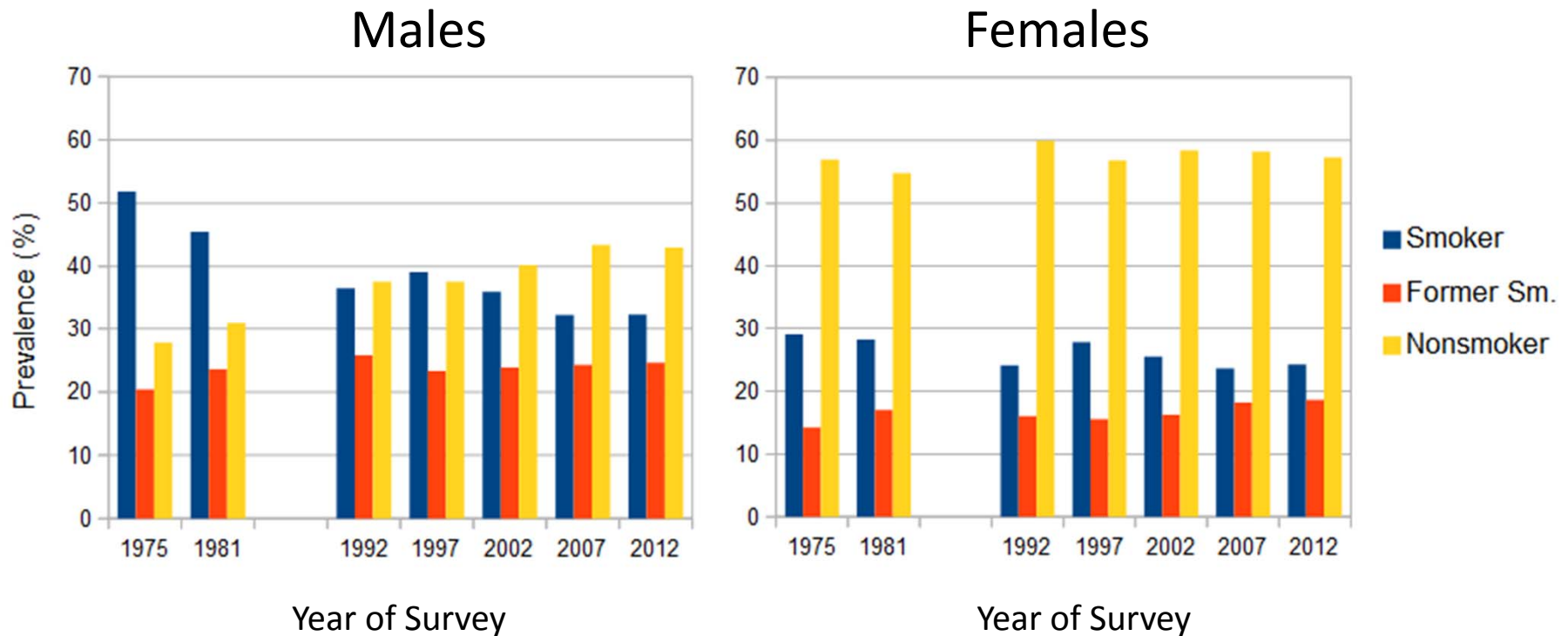
5 Joossens et al. (2014). The Tobacco Control Scale 2013 in Europe. Association of European Cancer Leagues.



Smoking Prevalence Trends

National representative Surveys:

- Schweizerische Fachstelle für Alkohol- und andere Drogenprobleme¹ (1975, 1981)
- Swiss Health Survey² (1992, 1997, 2002, 2007, 2012)



Sources:

1 Abelin and Müller (1983). Trend der Rauchgewohnheiten in der Schweiz 1975-1981. *Sozial- und Preventivmedizin* **28**, 185-195.

2 Bundesamt für Statistik (2012). Schweizerische Gesundheitsbefragung.



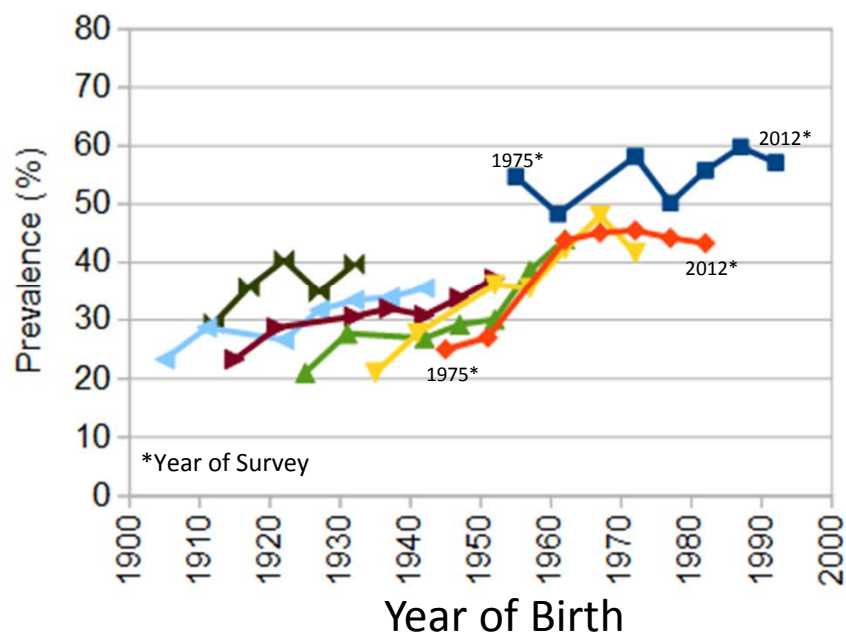
Smoking Prevalence Trends

National representative Surveys:

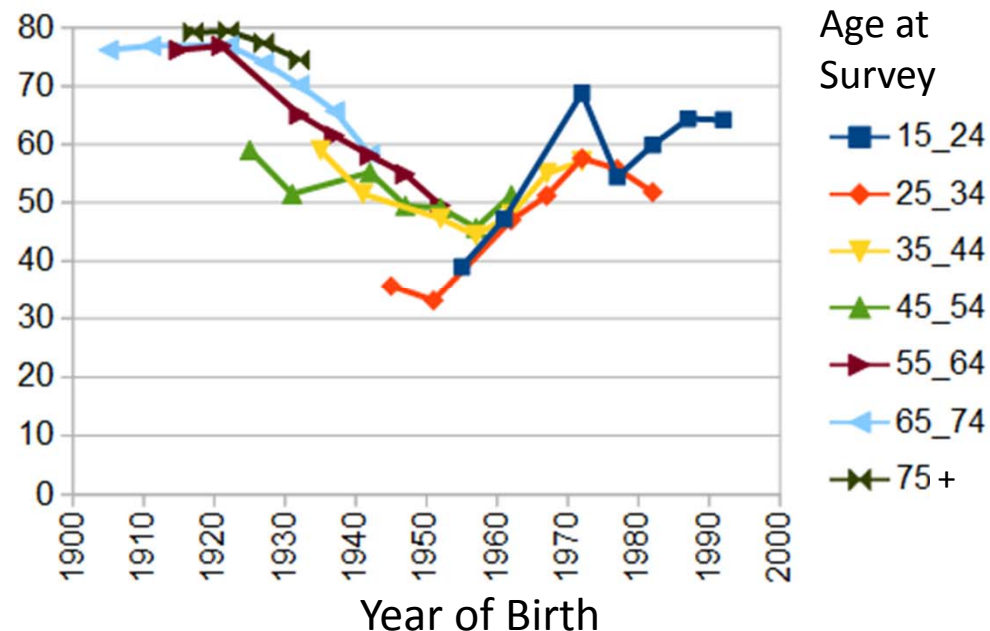
- Schweizerische Fachstelle für Alkohol- und andere Drogenprobleme¹ (1975, 1981)
- Swiss Health Survey² (1992, 1997, 2002, 2007, 2012)

Birth Cohort Effects

Male non-smokers



Female non-smokers



Sources:

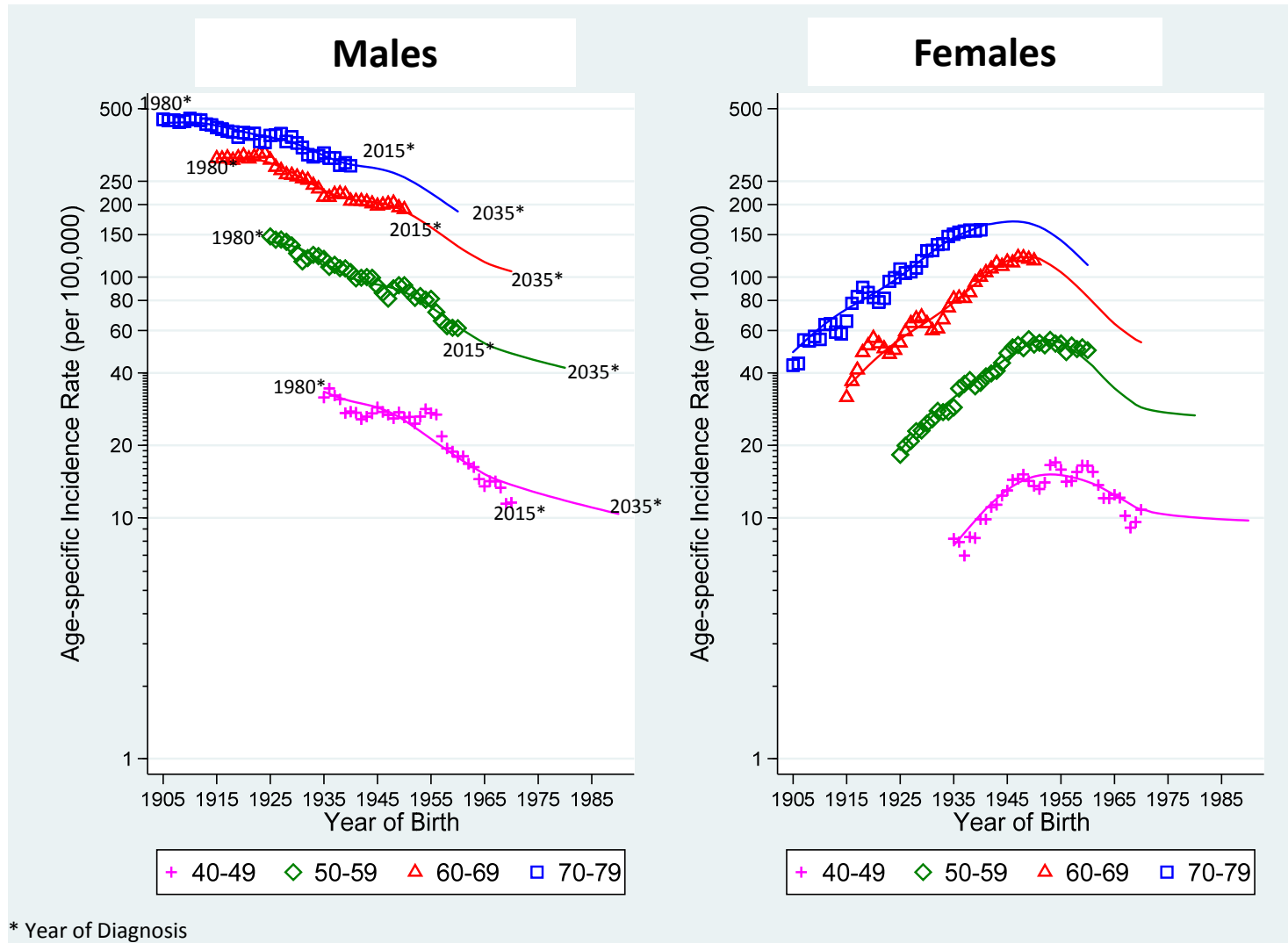
1 Abelin and Müller (1983). Trend der Rauchgewohnheiten in der Schweiz 1975-1981. *Sozial- und Preventivmedizin* **28**, 185-195.

2 Bundesamt für Statistik (2012). Schweizerische Gesundheitsbefragung.



Age-specific Incidence Trends¹

Projection: Age-Period-Cohort Modeling



Source:

1 Lorez et al. (2017). *Swiss Cancer Bulletin* **37(2)**, 179-185.

2 Riedel Lewis et al. (2014). *Cancer* **120**, 2883-92.



LDCT Lung Cancer Screening

Largest Lung Cancer Screening Trials

US NLST (2002-2004) results (2011)¹

- >50,000 smokers; age 55-74, >30 pack-years
- 3 screening rounds at annual intervals (LDCT vs chest x-ray)
- Work-up based on nodule diameter
- 17% reduction in lung cancer deaths (2.5 per 1,000 vs 3.0 per 1,000)

NELSON (2003-2006) results reported at World Conference on Lung Cancer 2018²

- >15,000 smokers; age 50–75, ≥15(10) cig./day for at least 25(30) years
- 4 screening rounds (1,2,4,6.5 years) (LDCT vs no screen)
- Work-up based on nodule volume and volume doubling
- 26% reduction in lung cancer deaths (in Males)

Sources:

1 National Lung Screening Trial Research Team (2011). *N Engl J Med* 4;365(5):395-409

2 WCLC Press Release – Harry De Konning. September 25, 2018



Lung Cancer Screening Model

Objectives of the study

- To model individual complete (birth to death) life histories of people born 1935-1965 in Switzerland
- To estimate the impact of LDCT screening on the number of lung cancer deaths prevented and on the number of life years gained
- To estimate the cost per life years gained
- To explore the impact of different screening scenarios on these outcomes

Yuki Tomonaga, Kevin ten Haaf, Thomas Frauenfelder, Malcom Kohler, Roger D. Kouyos, Mohaned Shilaih, Matthias Lorez, Harry J de Koning, Matthias Schwenkglenks, Milo Puhan (2018). Cost-effectiveness of low-dose CT screening for lung cancer in a European country with high prevalence of smoking-A modelling study. *Lung Cancer* **121**, 61-69.



Lung Cancer Screening Model

Costs and life-years gained vs. no screening

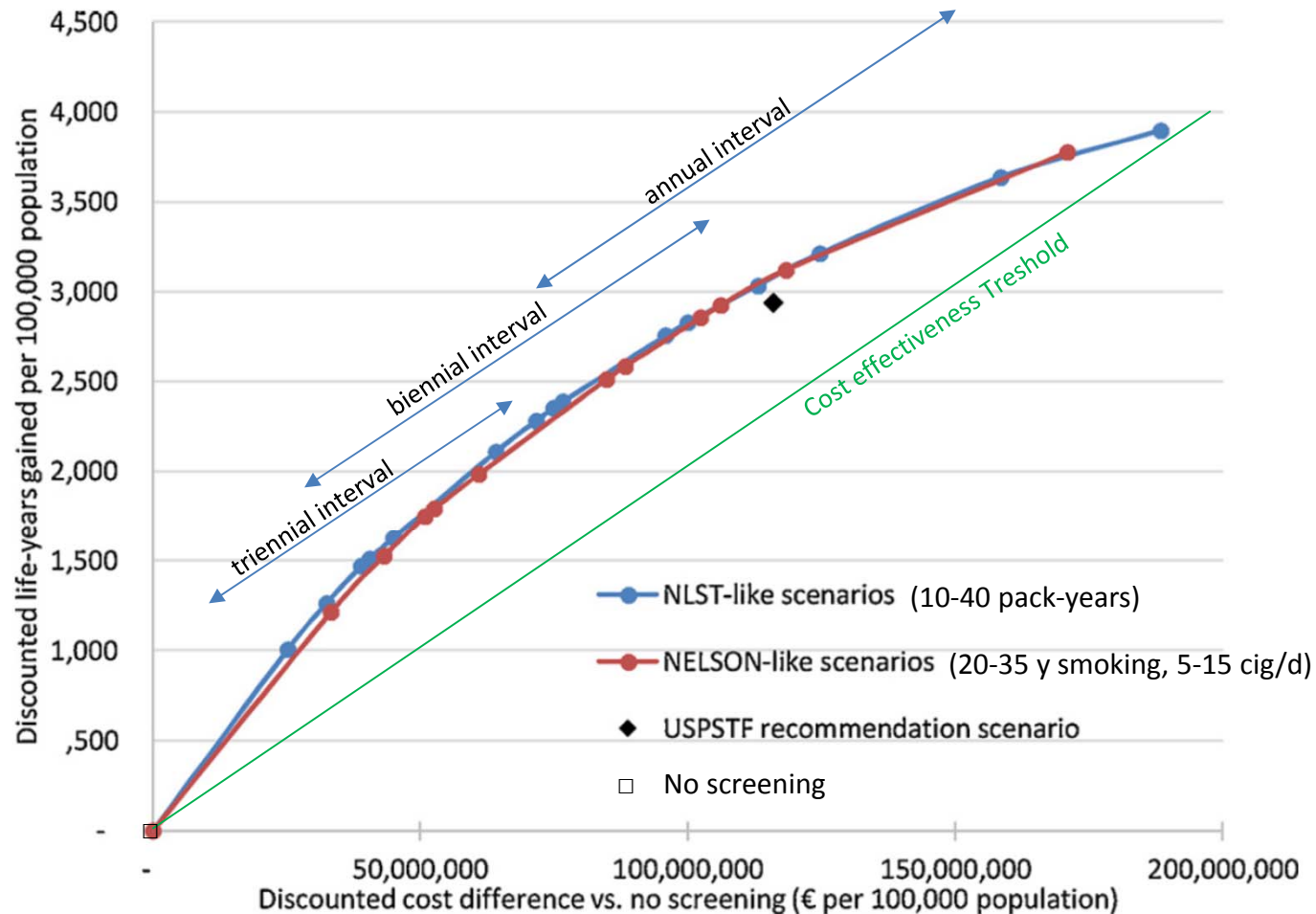


Fig. 2. Costs and life-years gained of the scenarios on the efficiency frontier. Results are presented per 100,000 individuals alive in 2015. (adapted)



Lung Cancer Screening Model

Conclusion of the study

- LDCT screening may be cost-effective in Switzerland
- The most cost-effective scenarios reduced lung cancer mortality by 6-15% while increasing incidence of lung cancer by 2-6%

But:

- Costs would be considerable: affordability
- Cost-effectiveness must be considered in the context of competing interventions, particularly smoking cessation

The new KRG/KRV: Organization of Cancer Registration in Switzerland





**March 2016: Cancer Registration Law
«Krebsregistrierungsgesetz» (KRG)**

**April 2018: Cancer Registration Ordinance
«Krebsregistrierungsverordnung» (KRV)**

Entering into force: 1.1.2020

What is new?

Swiss-wide, mandatory reporting by hospitals and physicians

Uniform framework legislation on top of cantonal regulations

Unique patient ID number (AHVN13)

Veto right for patients

Improved quality assessment for 1st treatment complex (type, goal, outcome, metastases/recurrences)



Lung Cancer Epidemiology in Switzerland

Take home messages

- 4,300 lung cancer diagnoses / 3,300 deaths annually
- Median age at diagnosis increases (Males > Females)
- Males: Cancer rates drop, but counts remain stable
- Females : Cancer rates stabilize, counts still increase (until ≈2030?)
- Adenocarcinoma predominates also in Males
- SCLC survival disadvantage mainly due to stage distribution
- Non-smoker prevalence low-point and peak risk for birth cohort ≈1955 in Females
- LDCT screening may be cost-effective
- New Cancer Registration Law: 1.1.2020

Acknowledgements

Cantonal Cancer Registries

Diagnosis Data

Francesco Galli (NICER)

Survival analyses

Swiss Federal Statistical Office

Mortality data

Yuki Tomonaga (EBPI University Zurich)

LDCT screening modeling

Swiss Federal Office of Public Health

Funding

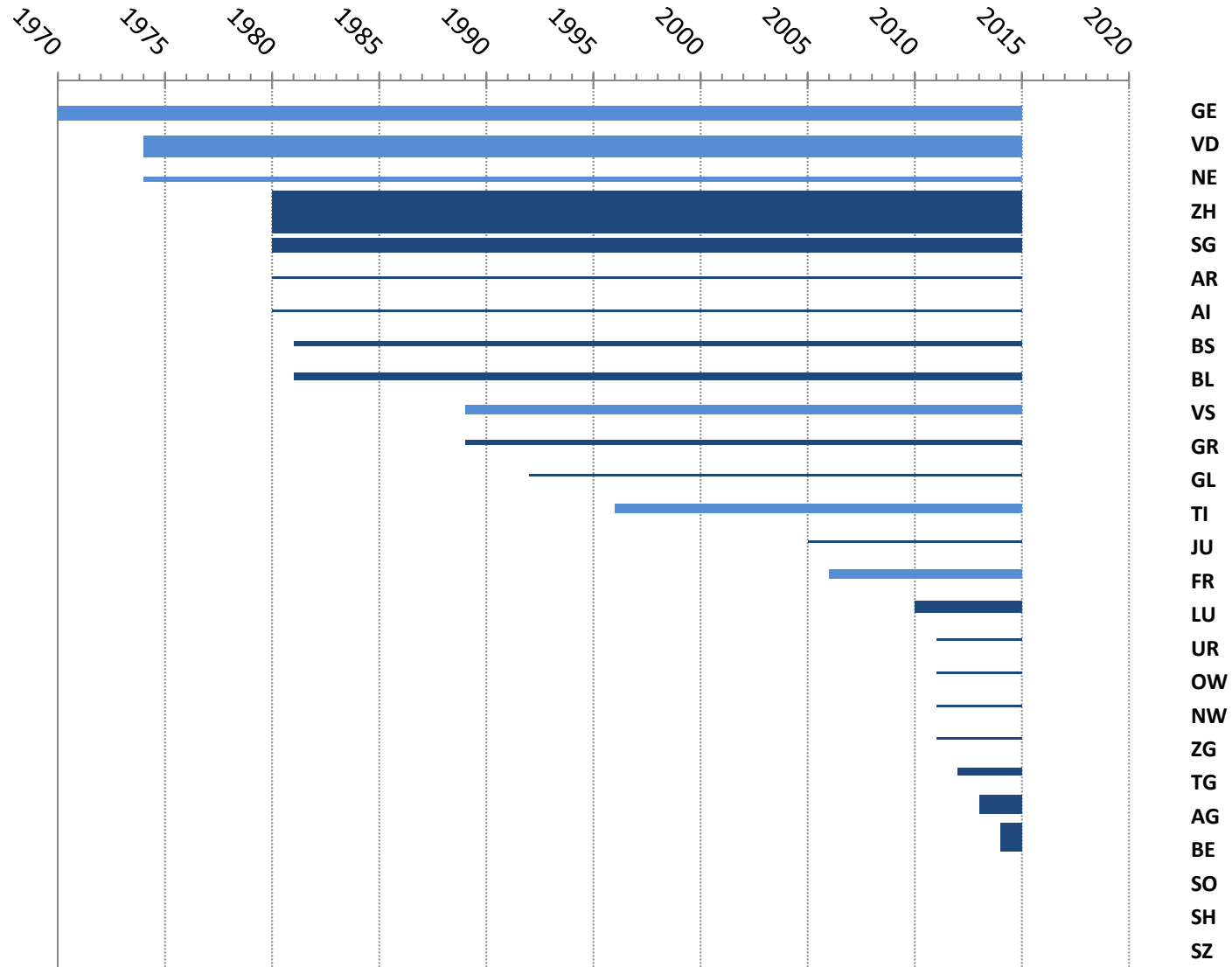
**Many thanks for
your attention!**

Other slides



Progression of Cancer Registration in Switzerland

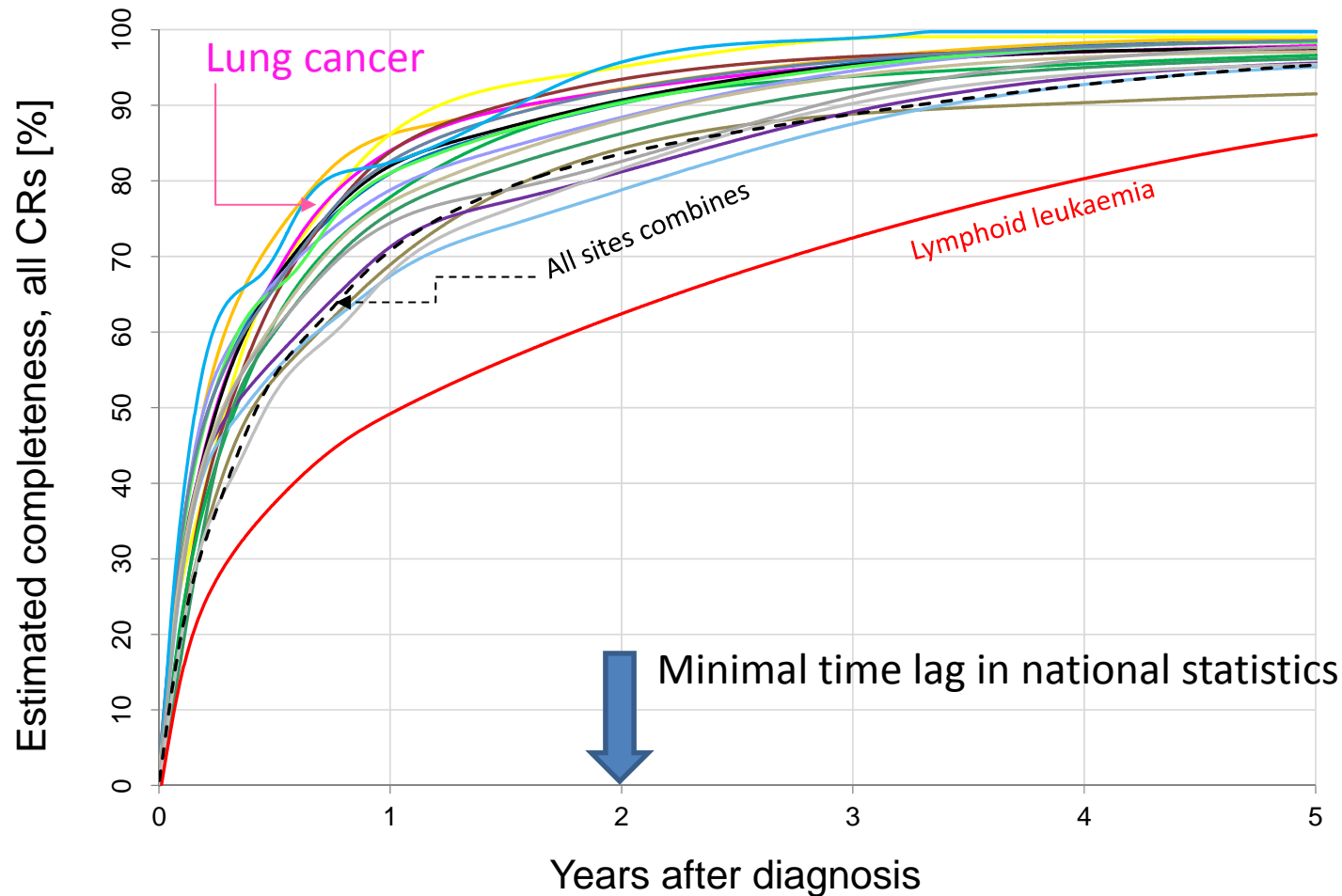
National Cancer Dataset: Situation Start_2018





Why is the NCD not more up-to-date?

Quantitative estimation of case ascertainment by cancer site (Flow-Method, pooled CR data):



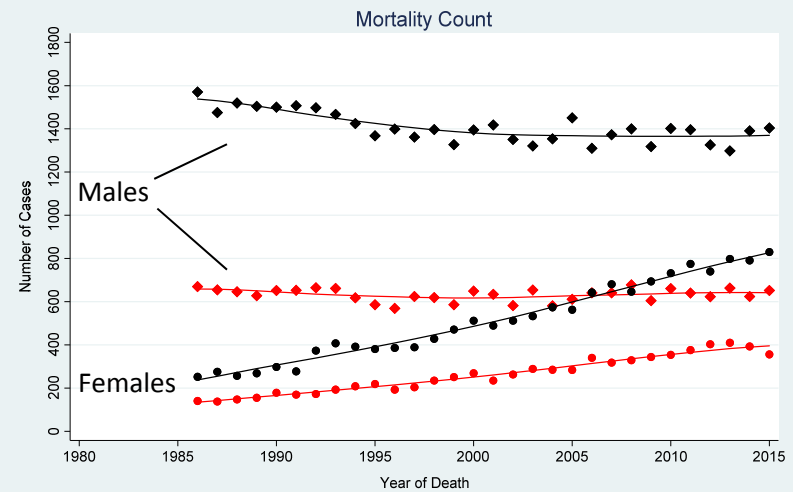
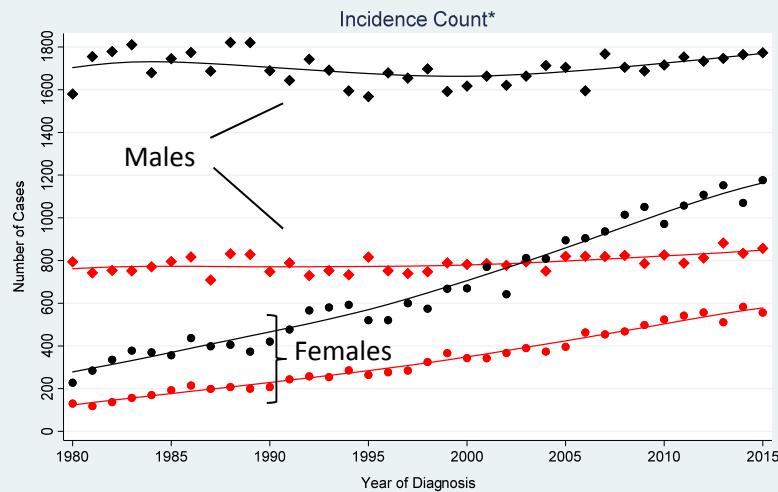
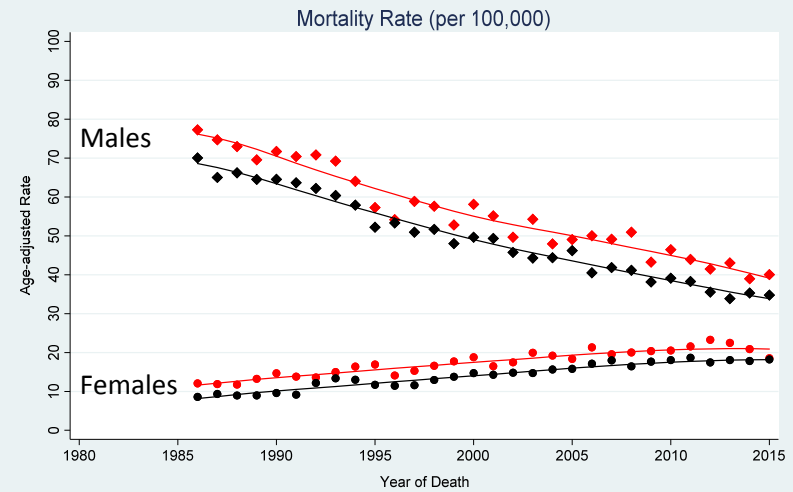
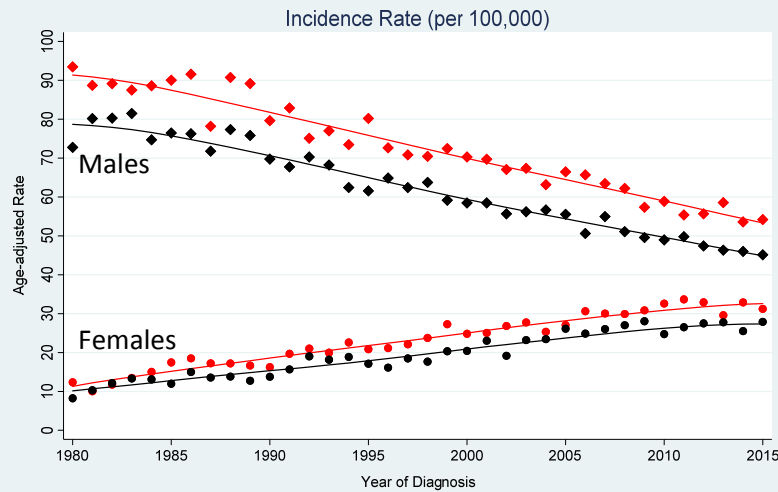
Source:

Lopez et al. (2017). Evaluation of Completeness of Case Ascertainment in Swiss Cancer Registration. *EJCP* 26, 139-146. [Years of incidence 2006 to 2011]



Lung cancer Trends by Language Region

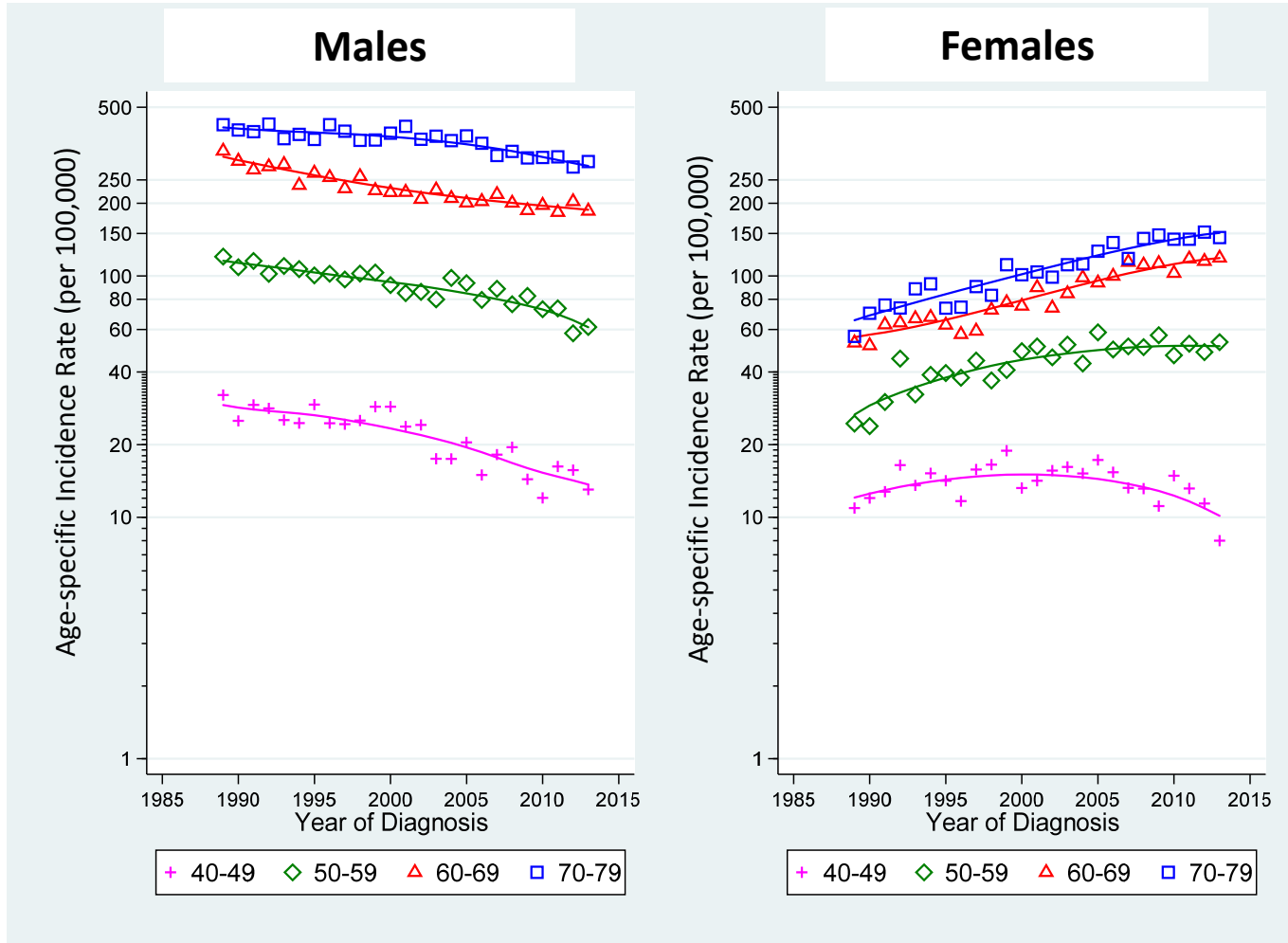
French/Italian speaking German speaking



* Extrapolated counts

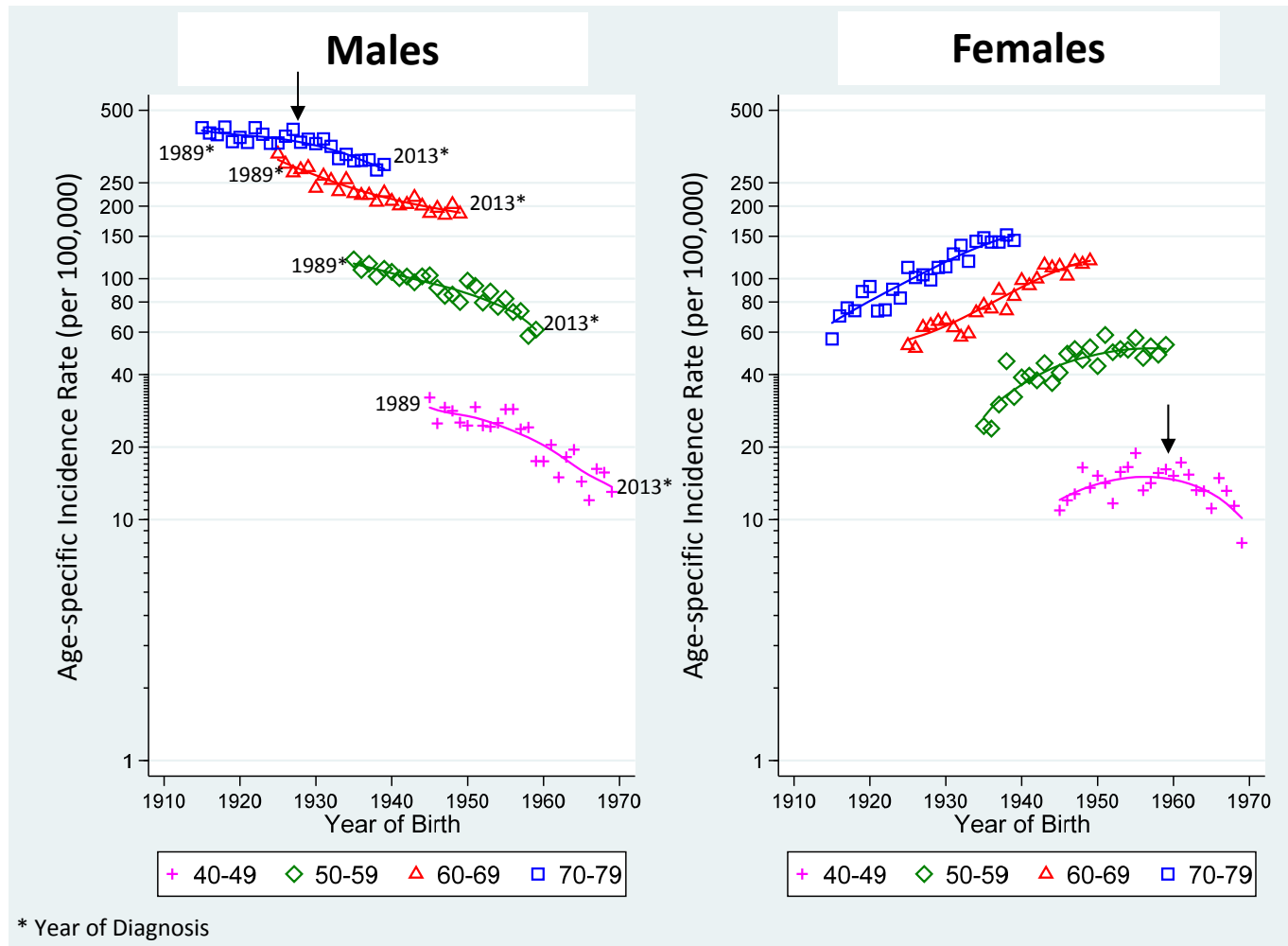


Age-specific Incidence Trends By Time of Diagnosis: Period effects





Age-specific Incidence Trends By Time of Birth: Cohort effects¹



Source:

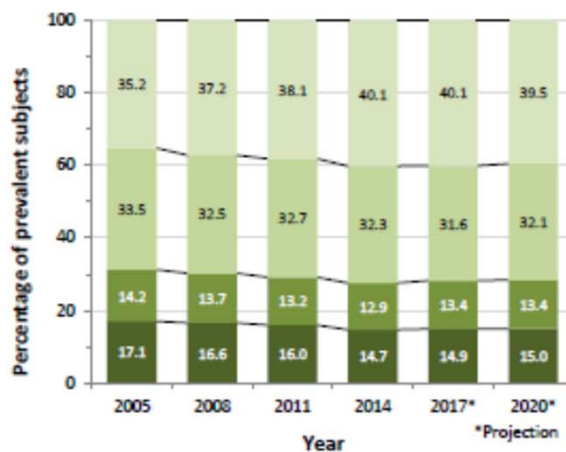
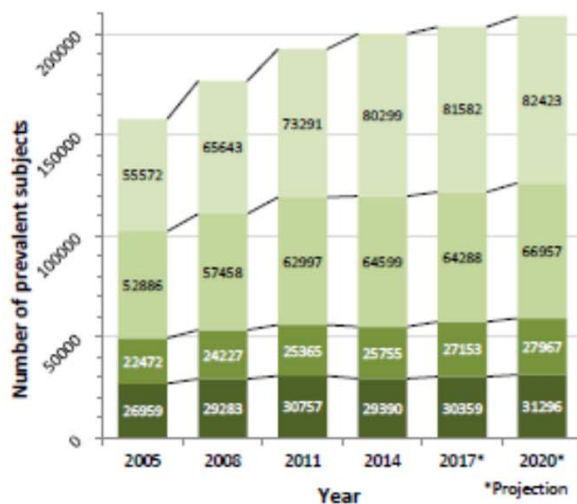
1 Lorez et al. (2017). *Swiss Cancer Bulletin* **37(2)**, 179-185.

2 Riedel Lewis et al. (2014). *Cancer* **120**, 2883-92.

Prevalence Trends

All cancer types, except non-melanotic skin cancer
 C00 - C43,C45 - C97

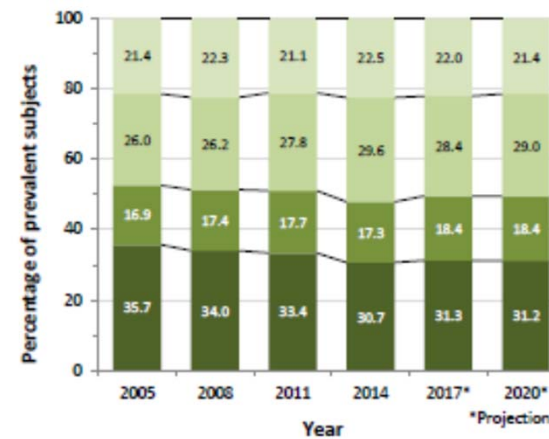
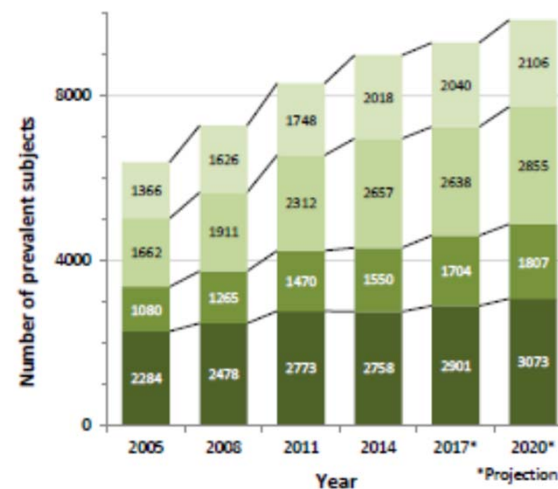
Both sexes



Years since Diagnosis ■ 0-1 ■ 1-2 ■ 2-5 ■ 5-10

Bronchus, lung and trachea
 C33 - C34

Both sexes



Years since Diagnosis ■ 0-1 ■ 1-2 ■ 2-5 ■ 5-10

Source:
 Lorez et al. (2017). *Swiss Cancer Bulletin* **38(1)**, 86-93.

NICER Background & Legal Basis

Independent foundation

Established in 2007 by **Oncosuisse** and the **Swiss Association of Cancer Registries**

Associated with the University of Zurich

Funding:

Swiss Federal Office of Public Health (SFOPH, BAG)

Swiss Cancer Research (KFS)

NICER Vision & Mission

Acts as national coordination centre

Harmonizes the work of the cantonal cancer registries

Provides quality assurance

Aggregates cancer data

Analyses the data on a national level

Promotes epidemiological cancer research