



**25 January 2016 : Occupational hazards and diseases:
Promoting knowledge exchange between trade unions,
researchers, public health and occupational health stakeholders
European Trade Union Institute (ETUI); Bruxelles**

NOCCA

**On behalf of the NOCCA study group
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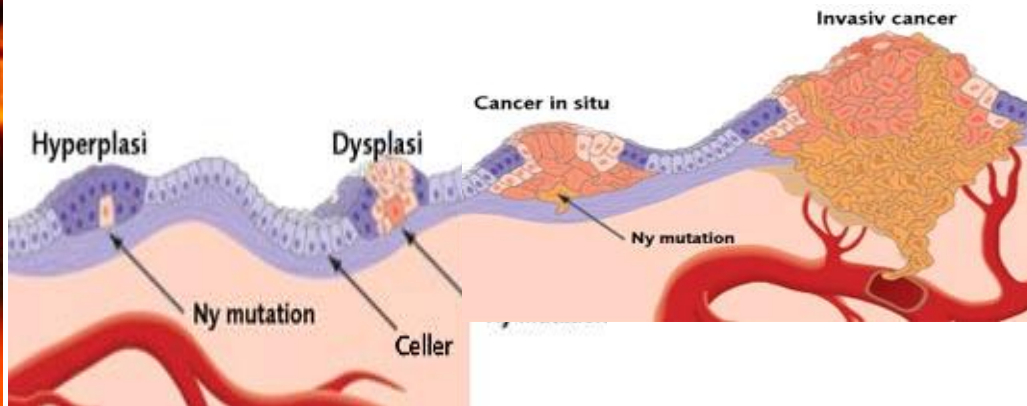
What is NOCCA?

- Nordic Occupational Cancer Study (NOCCA)
- The study includes up to 45 years of cancer incidence data by occupational category for the Nordic populations. The study covers the 15 million people aged 30-64 years in the 1960, 1970, 1980/1981 and/or 1990 censuses in Denmark, Finland, Iceland, Norway and Sweden, and the 2.8 million incident cancer cases diagnosed in these people in a follow-up until about 2005



Why NOCCA?

- Occupational and other exposures may cause cancer
- But cancer is a disease developing over many years
- Therefore, it is necessary to link data to detect an association





How is NOCCA made?



Census data:

Denmark: 1970

Finland: 1970, 1980, 1990

Iceland; 1980

Norway: 1960, 1970, 1980

Sweden: 1960, 1970, 1980, 1990

LINK: Personal Identification Number, e.g. DDMMYY-CXXS



Cancer incidence data:

Denmark: 1971-2003

Finland: 1971-2005

Iceland: 1981-2003

Norway: 1960-2003

Sweden: 1960-2003

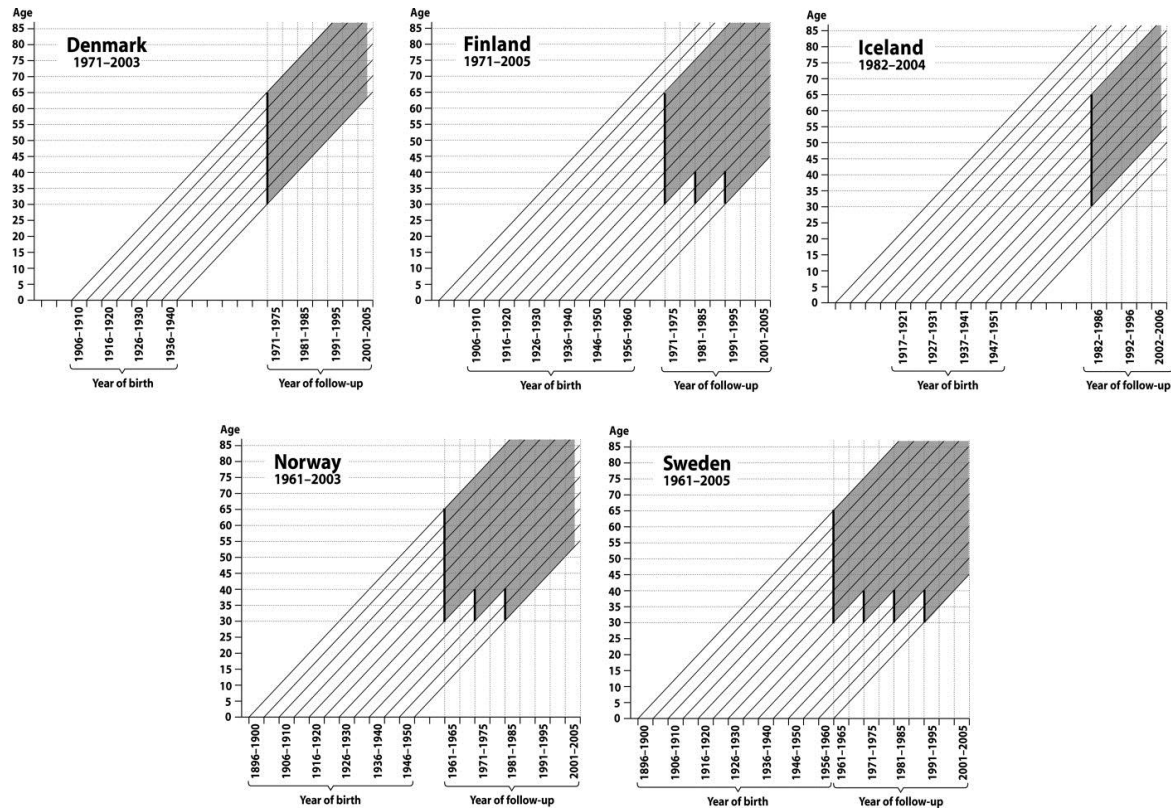


Figure 11. Time windows of follow-up of the study cohort defined by year of birth and age, by country. Bold vertical lines indicate time of baseline census used for allocation of the occupational category.



NOCCA standard table

Observed number of cancer cases

Standardized Incidence Ratio

- more than 1 if excess risk
 - 1 if average risk
- less than 1 if deficit risk

All countries together

No	Occupational category	Denmark		Finland		Iceland		Norway		Sweden		Total		
		Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	95% CI
1	Technical workers, etc	74	0.44	78	0.49	1	1.16	43	0.47	290	0.66	486	0.56	0.52—0.62
2	Laboratory assistants	1	0.30	3	0.81	[0.17]	0.00	3	0.62	2	1.51	9	0.68	0.31—1.28
3	Physicians	1	0.07	[8.94]	0.00	[0.38]	0.00	5	0.37	10	0.52	16	0.28	0.16—0.46
16	Farmers	621	1.56	952	1.53	10	2.18	578	1.45	978	1.68	3 139	1.57	1.51—1.62
17	Gardeners	69	1.25	120	1.53	[0.15]	0.00	133	1.44	355	1.76	677	1.58	1.47—1.71
18	Fishermen	57	3.33	14	1.79	1	0.51	232	1.92	80	3.65	384	2.27	2.05—2.51
19	Forestry workers	18	2.22	124	1.35	[0.02]	0.00	114	1.58	189	1.29	445	1.40	1.27—1.53

Occupational group

95% Confidence Interval
Statistical certainty



Use of NOCCA

- NOCCA can be used to three ways:
- To find associations already known – this is a way to verify that the data base works
- To follow-up on new leads reported in the literature
- To find associations that are not already known – this is a way to find clues to carcinogenic exposures



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Things we know

Sunlight exposure is a risk factor for lip cancer

Occupation	SIR	95% CI
Technical worker	0.56	0.52-0.62
Clerical worker	0.52	0.45-0.59
Shop worker	0.52	0.47-0.62
Farmer	1.57	1.51-1.62
Fisherman	2.27	2.05-2.51
Construction worker	1.54	1.43-1.65



Things we know

Asbestos is a risk factor for pleural mesothelioma

Occupation	SIR	95% CI
Clerical worker	0.70	0.59-0.82
Farmer	0.24	0.21-0.28
Fisherman	0.44	0.29-0.68
Construction worker	1.42	1.26-1.60
Plumber	4.74	4.18-5.38
Mechanic	2.02	1.88-2.16



Things we know

Wood dust is a risk factor for nasal cancer

Occupation	SIR/RR	95% CI
Teacher	0.69	0.53-0.89
Farmer	0.81	0.72-0.90
Construction worker	1.24	1.05-1.47
Wood worker	1.84	1.66-2.04
Wood dust: no	1	
0.1-9.9 mg/m ³ -years	1.63	0.85-3.11
≥10 mg/m ³ -years	1.57	0.98-2.52

Pukkala et al, 2009; Siew et al, 2012 (Finland only)



Things we know

Active and passive smoking are risk factors for lung cancer

Occupation	SIR	95% CI
Teachers	0.49	0.47-0.51
Farmer	0.56	0.55-0.57
Gardeners	0.68	0.66-0.71
Tobacco worker	1.79	1.43-2.21
Cook	1.56	1.44-1.68
Waiter	1.90	1.75-2.05

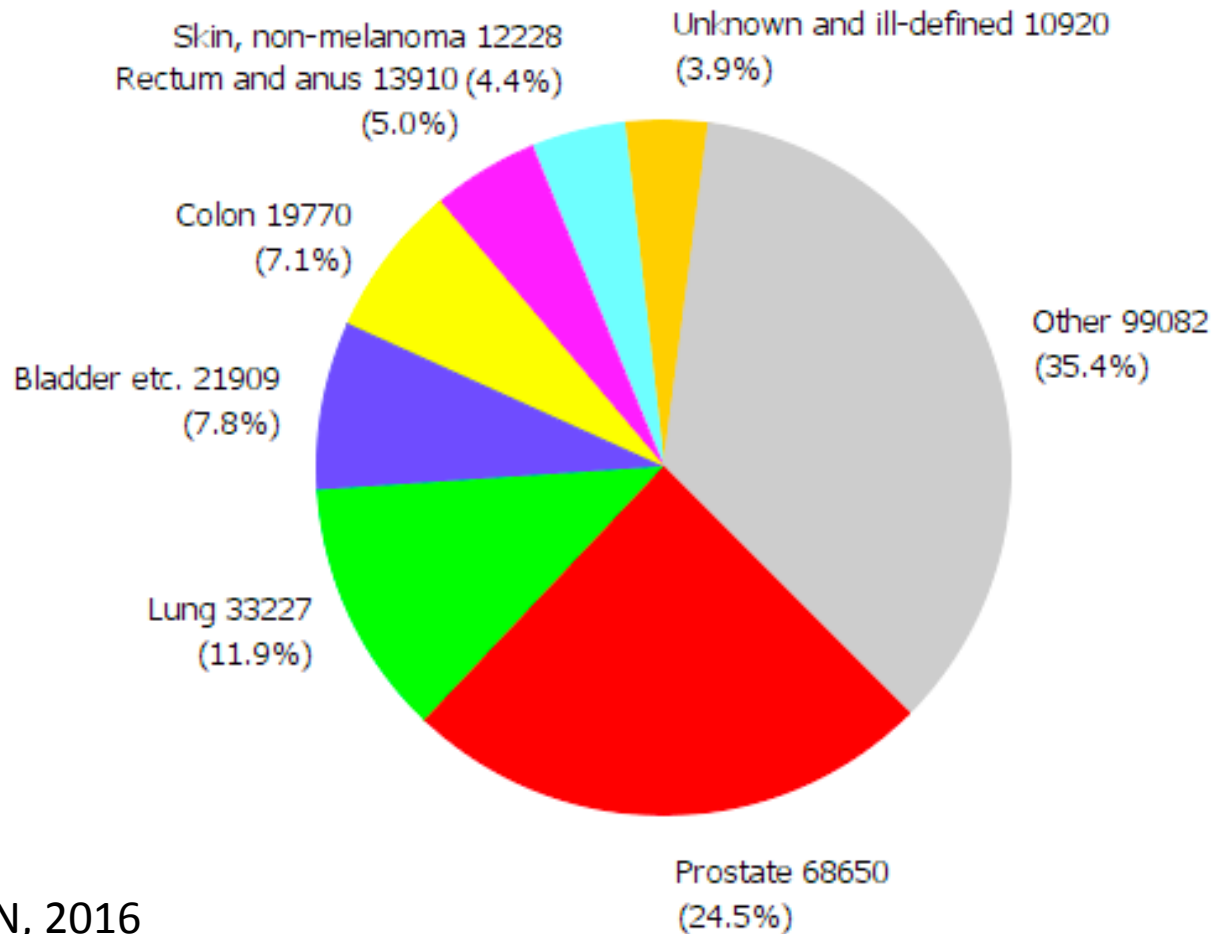


Things we know

Alcohol consumption is a risk factors for liver cancer

Occupation	SIR	95% CI
Teachers	0.69	0.61-0.78
Farmer	0.47	0.45-0.50
Gardeners	0.66	0.59-0.73
Beverage worker	2.50	1.85-3.31
Cook	2.60	2.09-3.19
Waiter	4.22	3.47-5.13

Cancer diseases occur with very different frequencies in 1990s



NORDCAN, 2016

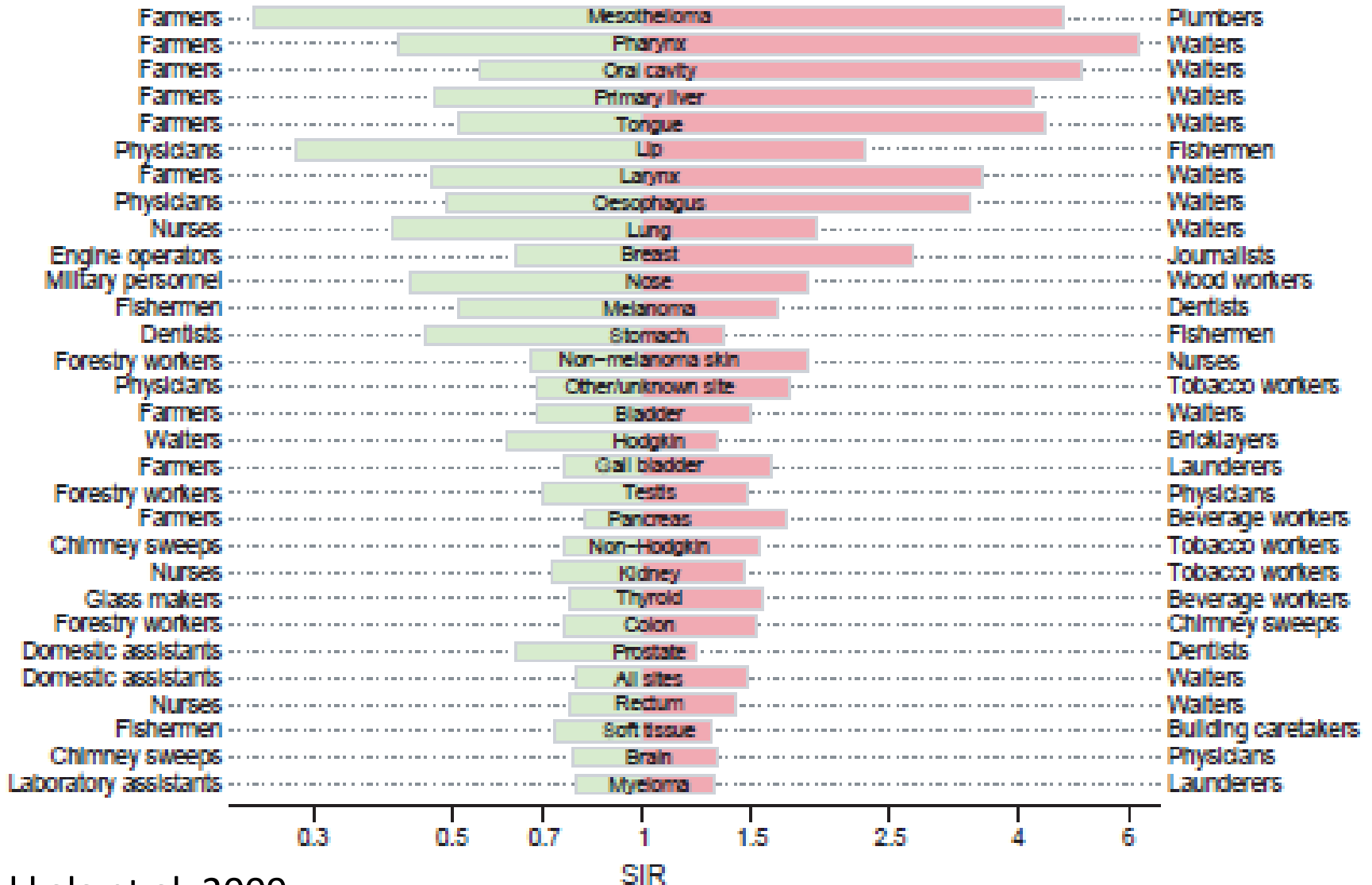
So, occupations with a high risk of frequent cancers have a overall high cancer risk

Waiters have almost the double risk of cancer as compared with farmers

Occupation	SIR	95% CI
Farmer	0.83	0.82-0.83
Forestry worker	0.84	0.83-0.85
Teacher	0.88	0.87-0.89
Tobacco worker	1.23	1.10-1.37
Beverage worker	1.27	1.21-1.33
Waiter	1.48	1.43-1.54

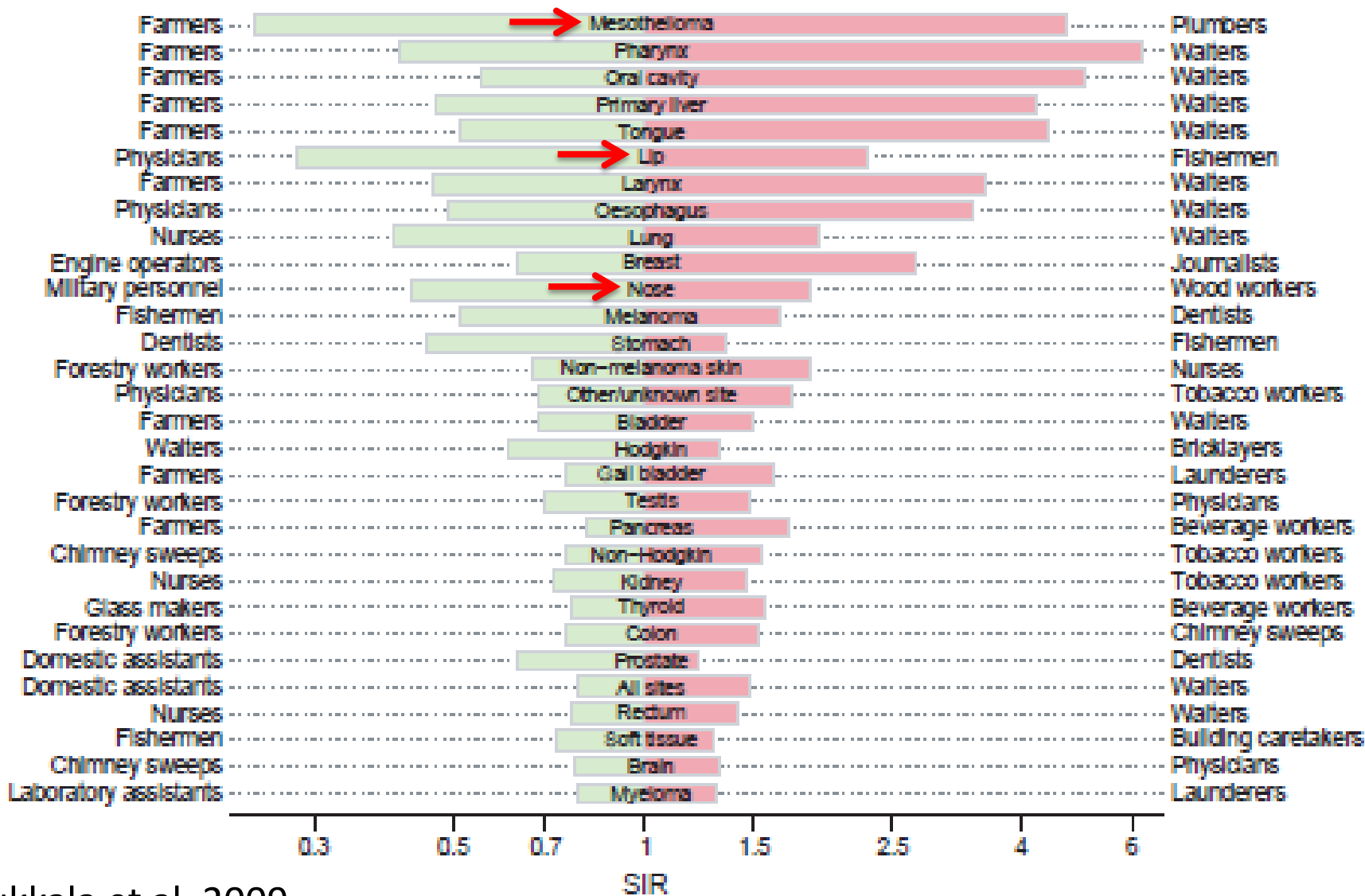
Socially discriminating cancers

Men



Socially discriminating cancers

Men





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Follow-up of news

- 11 cases of cholangiocarcinoma were observed in workers from offset colour proof-printing section of small printing company in Osaka, Japan
- All patients exposed to 1,2-dichloropropane (1,2-DCP) for 7-17 years and diagnosed with cholangiocarcinoma 7-20 years after first exposure
- 10 patients also exposed to dichloromethane (DCM) for 1-13 years
- 5 cases intrahepatic bile duct
- 6 cases extrahepatic bile duct

Kumagai et al, 2013



Follow-up of news

Cholangiocarcinoma in male printers in NOCCA

Cancer site	SIR	95% CI
All	1.35	1.14-1.60
Intrahepatic only	2.34	1.45-3.57
Extrahepatic only	1.13	0.85-1.48

Vlaanderen et al, 2013

So, the Japanese finding was seen also in printers from the Nordic countries.

Known exposures: dichloromethane,
1,1,1-trichloroethane, toluene.

Exposure to 1,2-dichloropropane not studied



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Generating clues

Cancer risk in firefighters

Cancer site	SIR	95% CI
All	1.06	1.02-1.11
Prostate	1.13	1.05-1.22
Non-melanoma skin	1.33	1.10-1.59

Pukkala et al, 2014

This pattern was consistent across the Nordic countries



Generating clues

Cancer risk in firefighters

Age-group years	Prostate		Non-melanona skin	
	SIR	95% CI	SIR	95% CI
30-49	2.59	1.34-4.52	0.80	0.22-2.04
50-69	1.16	1.04-1.30	1.28	0.91-1.76
70+	1.09	0.98-1.21	1.40	1.10-1.76

An excess risk of prostate cancer below the age of 50 years is an exceptional cancer pattern

Moreover, this pattern was confirmed in other cohorts

Prostate cancer in firefighters

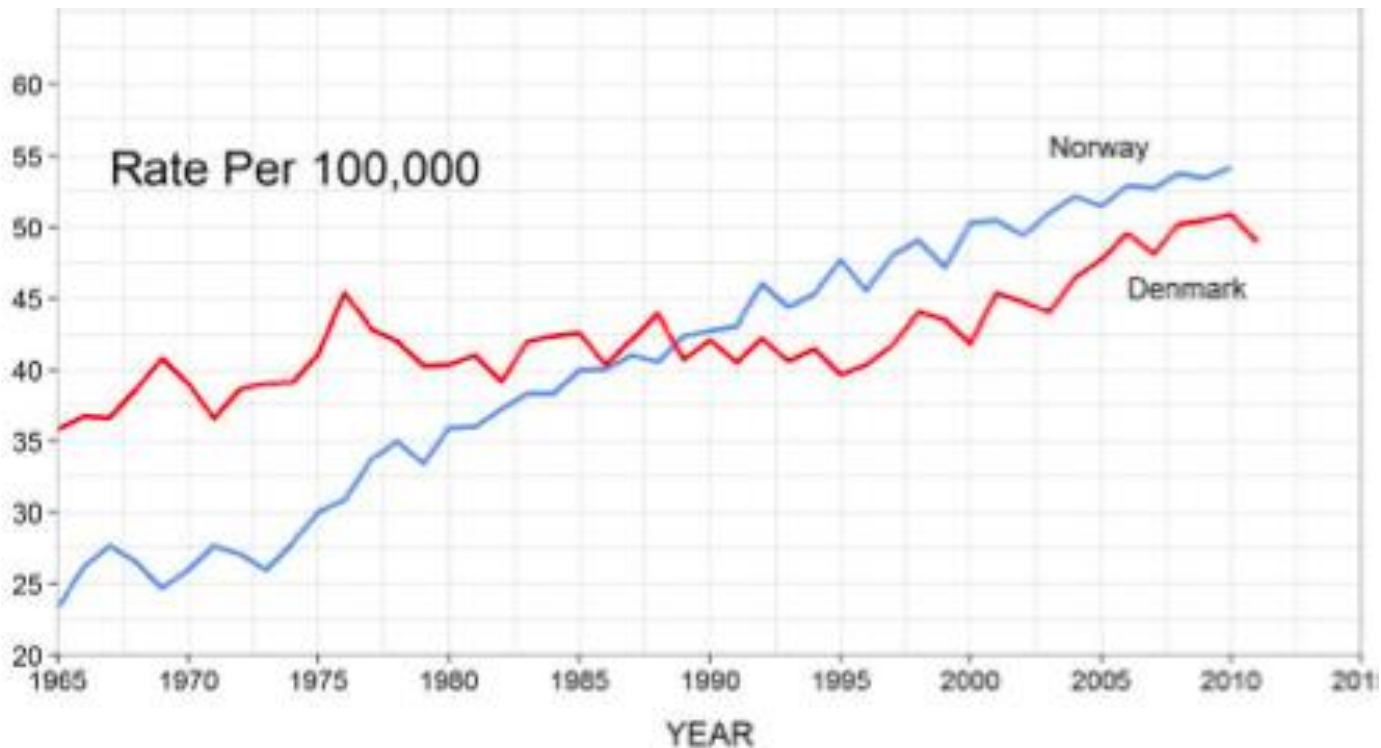
Age-group years	All ages		30-49 years	
	SIR	95% CI	SIR	95% CI
NOCCA	1.13	1.05-1.22	2.59	1.34-4.52
LeMaster et al, 2006, review	1.28	1.15-1.43	NA	NA
Daniels et al, 2013	1.03	0.98-1.09	2.04	1.43-2.82

An in-depth study is underway in Denmark,
Johnni Hansen, personal communication, 2016

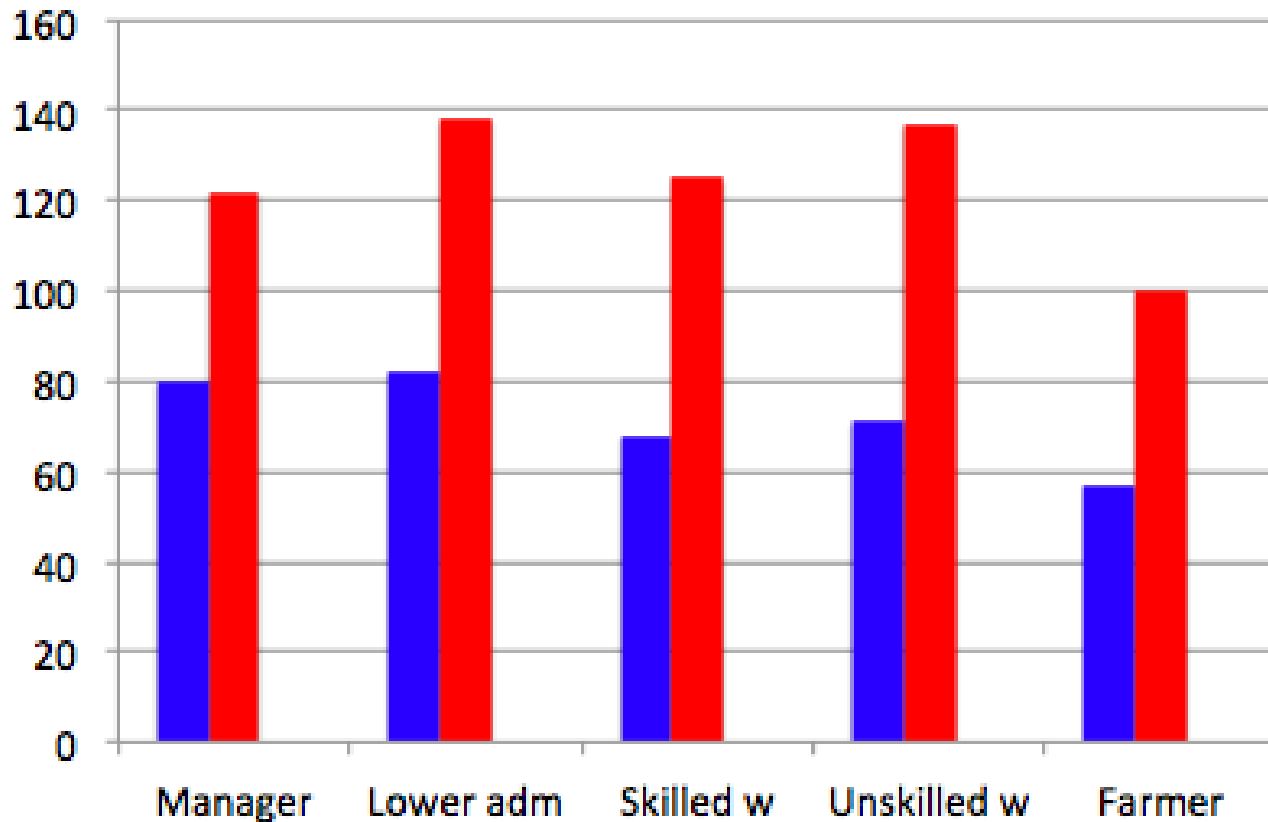


Generating clues

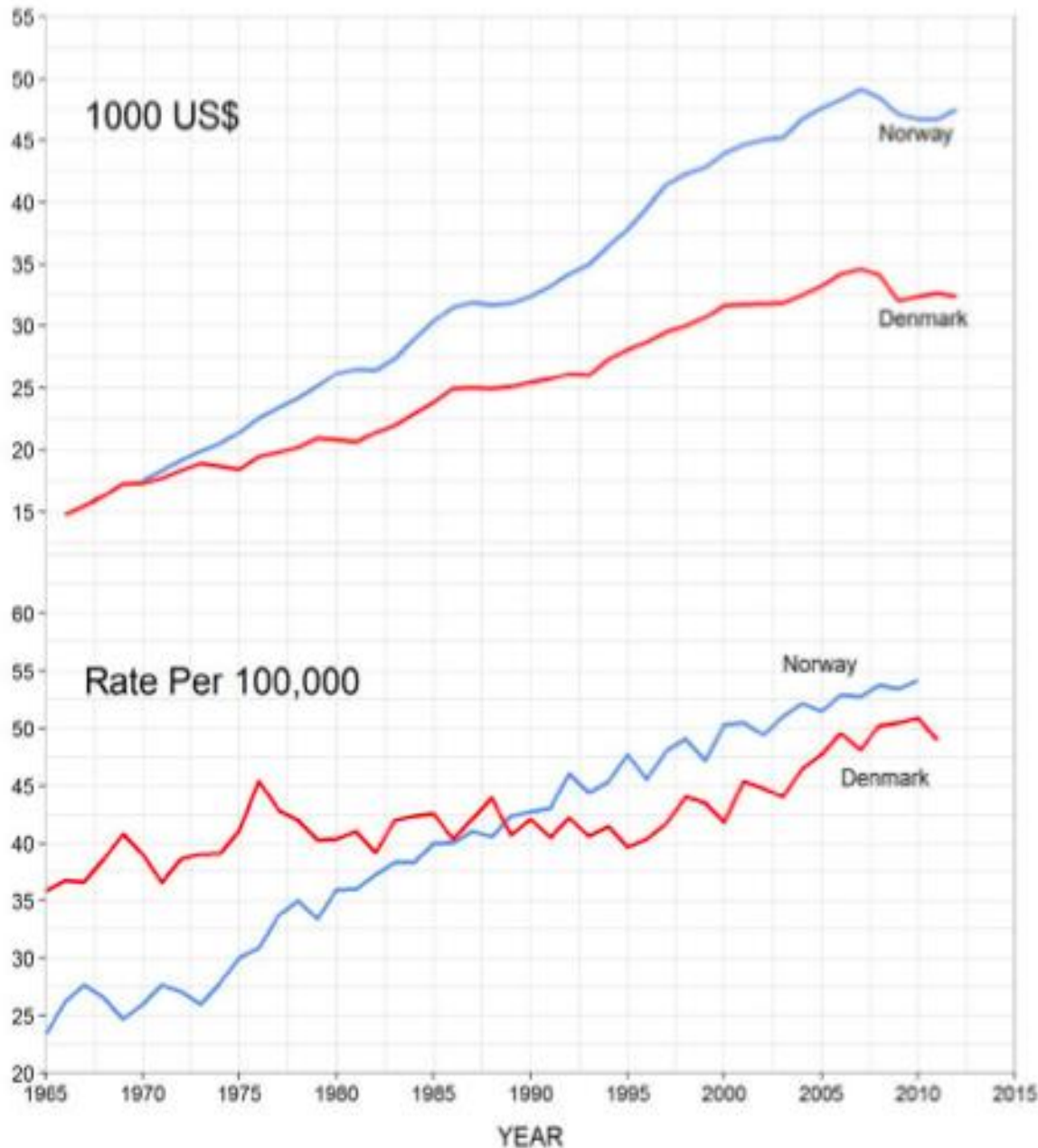
Colon cancer used to be more frequent in Denmark than in Norway, but in 1985 this pattern changed



Colon cancer incidence in Norwegian men before and after the cross-over with Denmark



Lynge et al, 2015



The rapid increase in wealth in Norway was followed by a rapid increase in colon cancer incidence

The rate almost doubled for unskilled workers

While colon cancer used to be most common in the upper classes, this pattern has now changed



Limitations

- NOCCA has as illustrated many strengths, but also some limitations should be mentioned
- The cancer pattern reflects working conditions of the past – inevitable in all cancer epidemiology
- Better tool for assessing risks in men than in women



Thank you

- NOCCA-group:
- Epidemiology-team: Eero Pukkala, Jan Ivar Martinsen, Elsebeth Lyng, Pär Sparèn, Laufey Tryggvadottir, Elisabete Weiderpass, Kristina Kjærheim
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- Read more about NOCCA:
<http://astra.cancer.fi/NOCCA/>