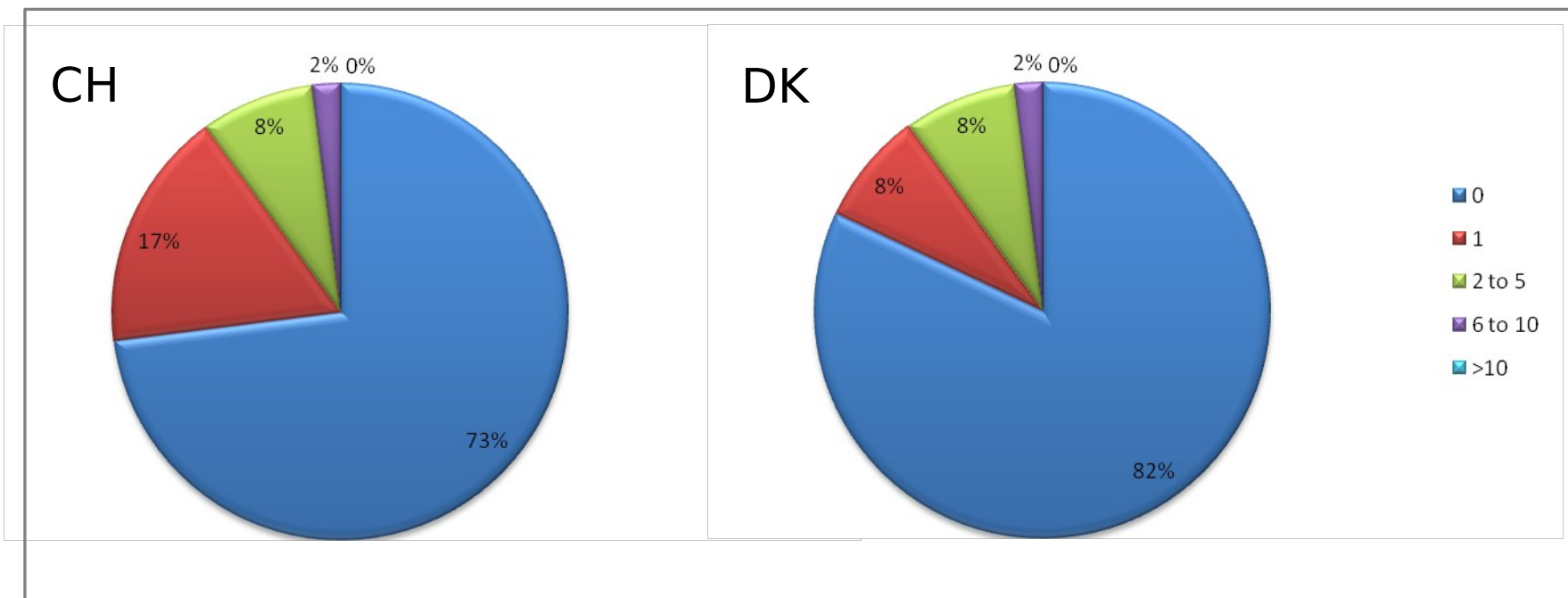




# Assessing age & sex distribution

Training course: Population doses for countries without national surveys

## Percentage of population undergoing medical X-ray examinations



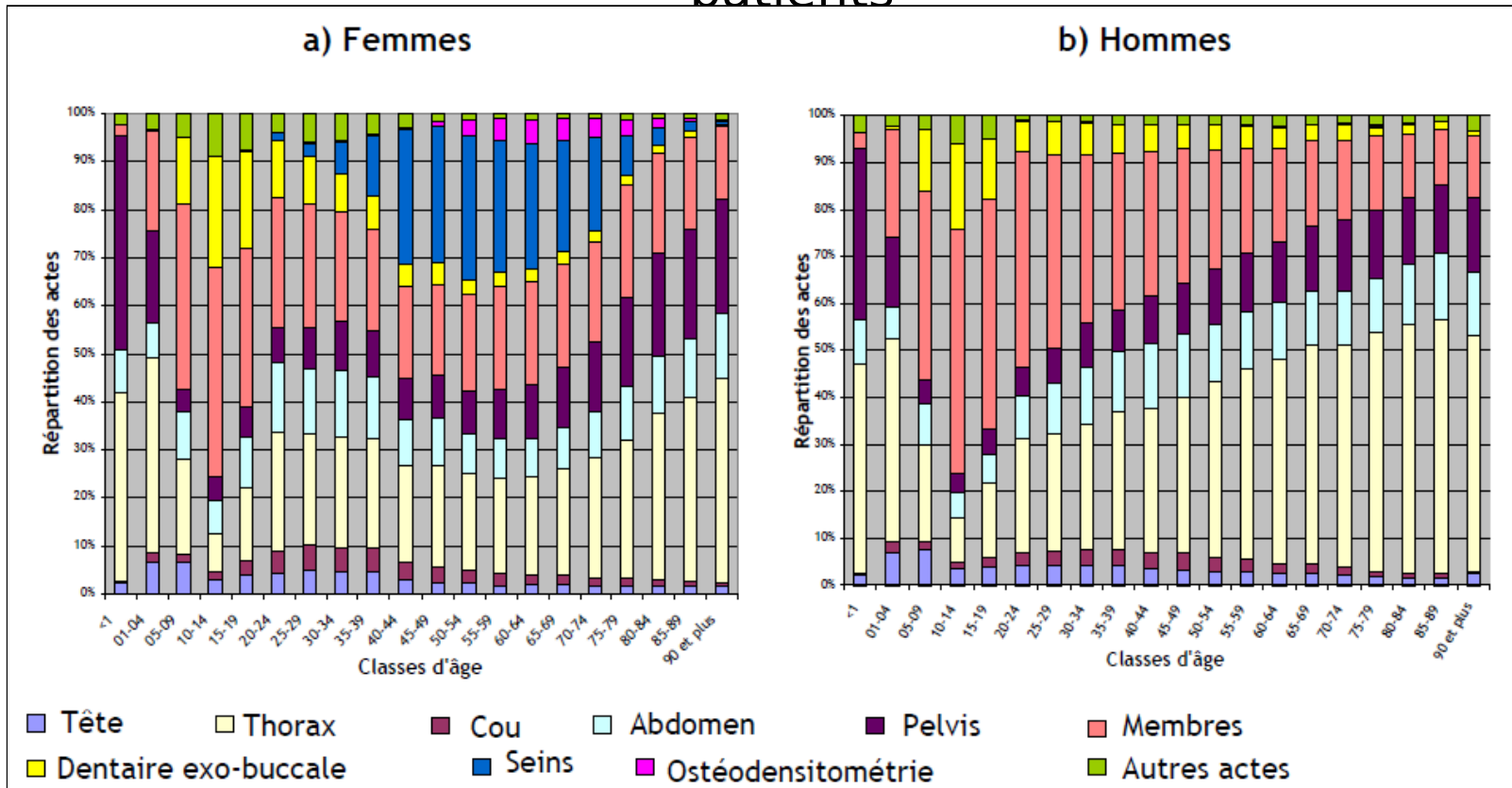
Aroua et al. Number of X-ray examinations performed on pediatric and geriatric patients compared with adult patients *Radiat Prot Dosimetry*. 2007;123:402-8

EC European Guidance on Estimating Population Doses from Medical X-Ray Procedures, *Radiation Protection N° 154*



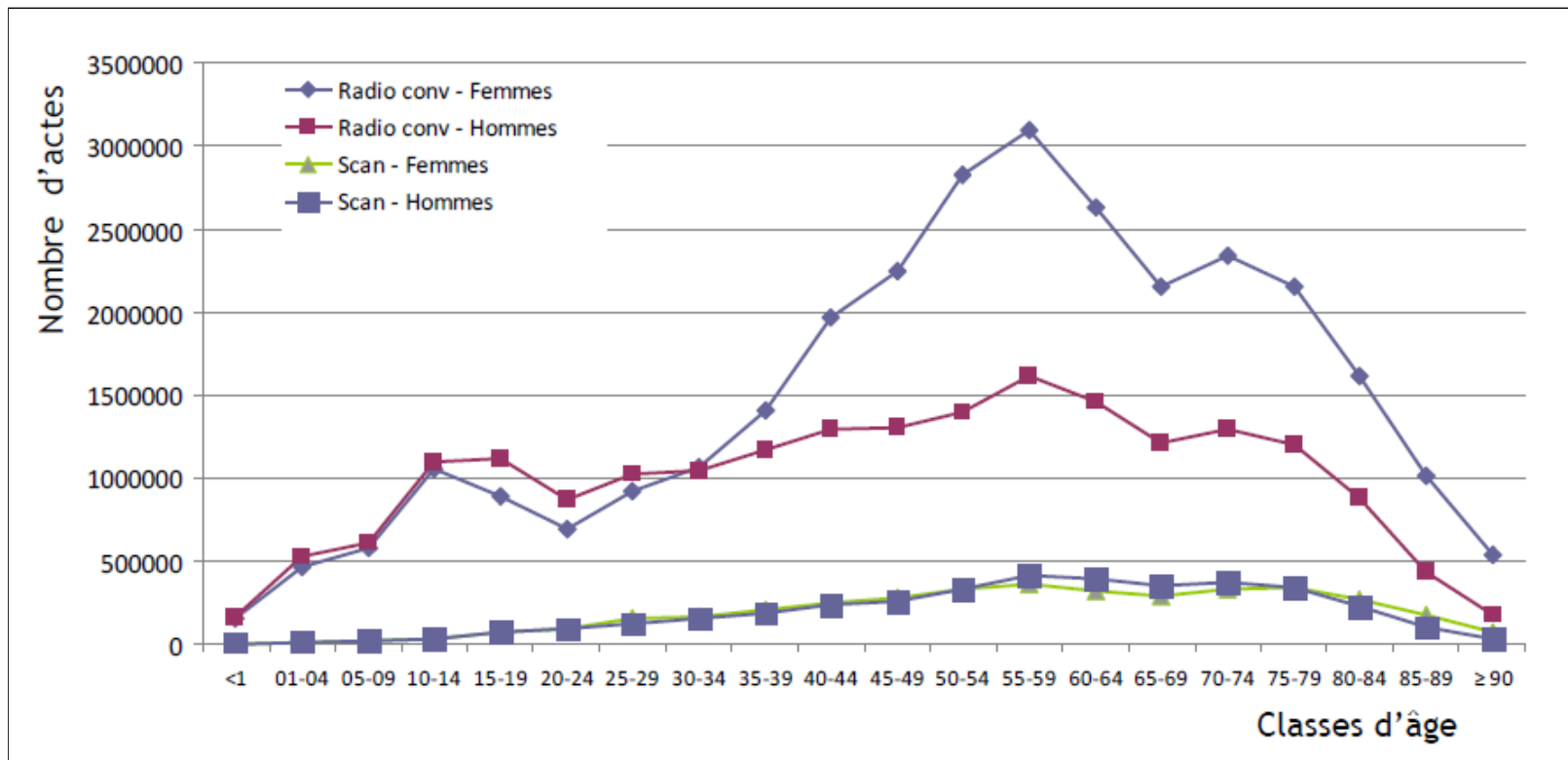
# France

## Distribution of conventional radiology examinations according to anatomical region for female and male patients



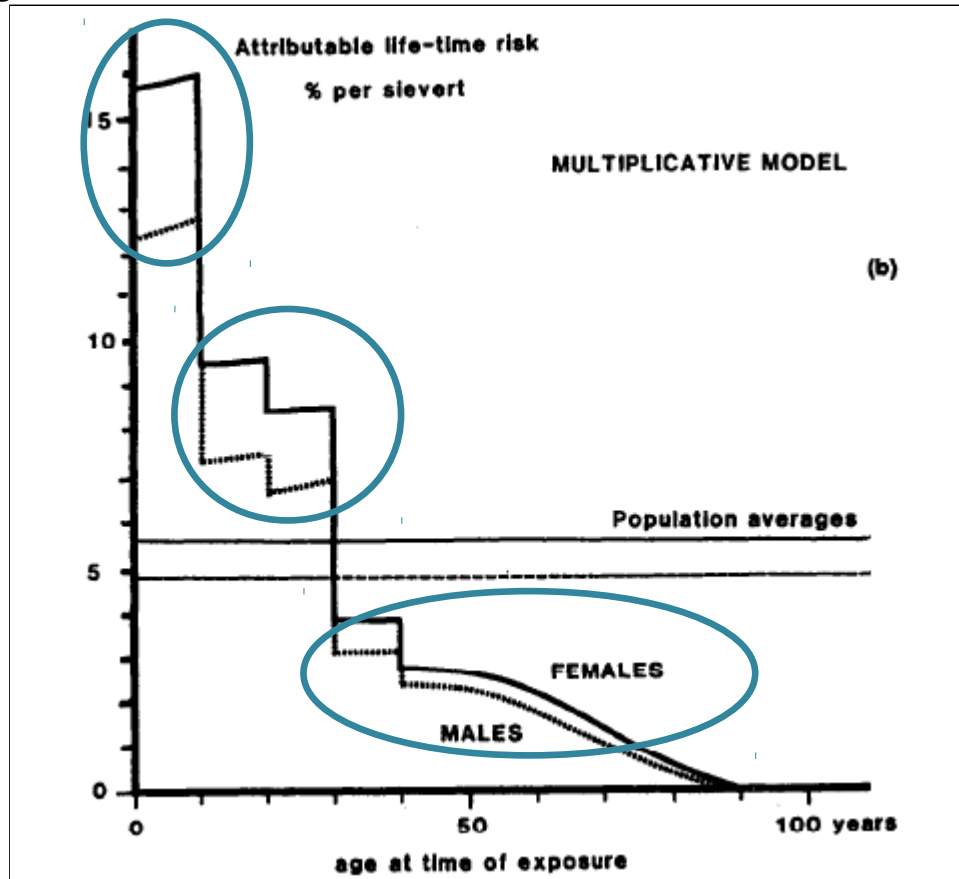
# France

Distribution of conventional radiology and CT examinations according to patient age and sex





Lifetime attributable risk from a single small dose at various ages at the time of exposure according to ICRP 60



Lifetime attributable risk from a single small dose at various ages at the time of exposure according to ICRP 60/73



Age (y)	Risk
0-9	3
10-60	1
>60	0.3



Collective  
dose ?

# Switzerland

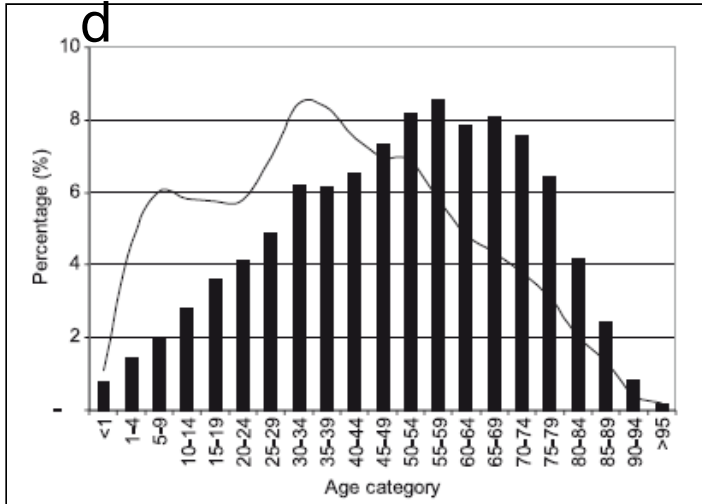


Figure 1. Patient age profile (histograms) related to all radiological modalities (average age of 50). The age profile of the Swiss general population is shown in solid line; with a corresponding average age of 39.

# Denmark

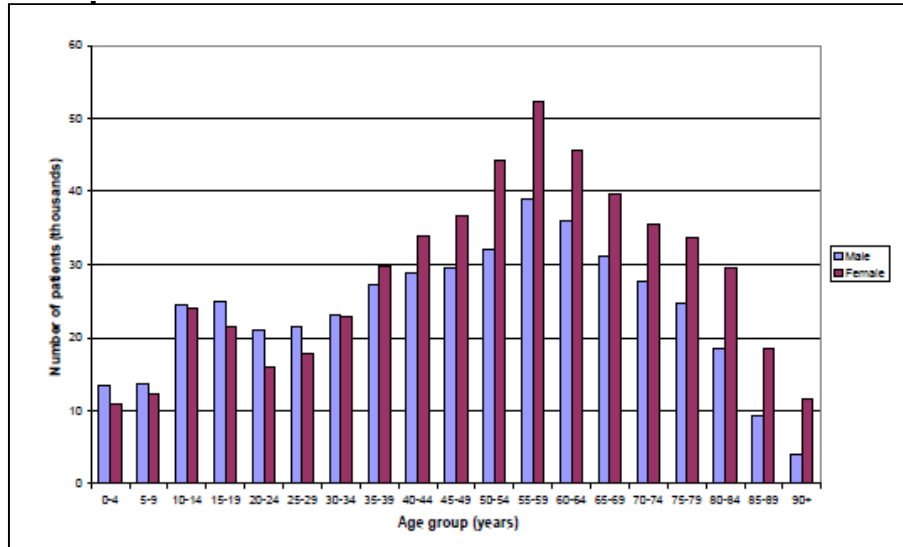


Figure 1: Numbers of patients in the Danish population having one or more x-ray examinations in 2004 as function of age and sex

*Ideally*, the age and sex distribution in each country:

- Should be determined by a representative survey of national practice
  
- Should be presented in five year age bins for each sex
  - General age groups:
    - Pediatric patients
    - Adults
    - Geriatric patients
  - UNSCEAR age groups:
    - 0-15 years
    - 16-40 years
    - >40 years

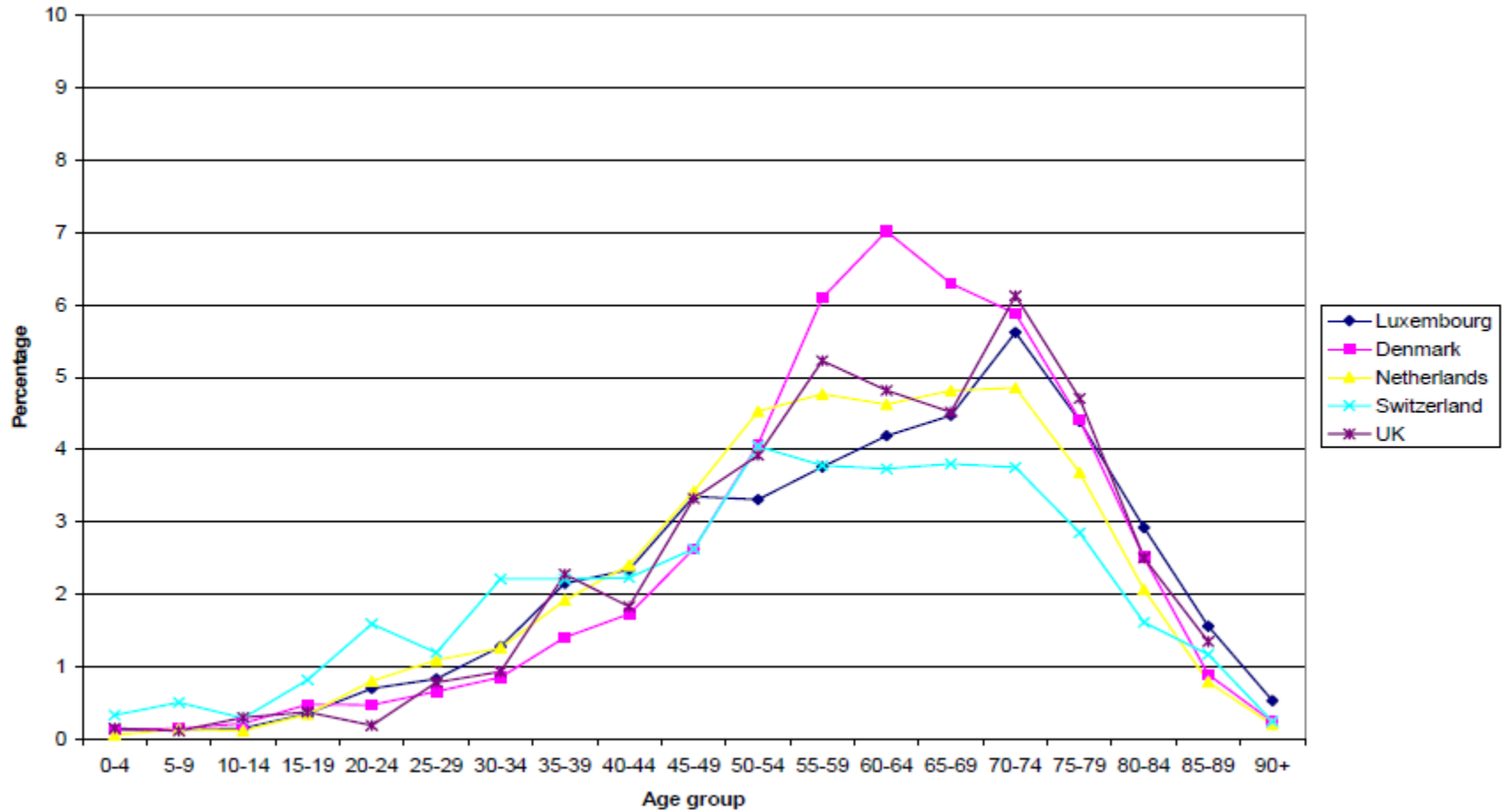


- Easy only for some countries with large available statistics, such as Denmark, France etc.
- Difficulties of conducting surveys:
  - Time consuming for survey participants
  - High probability of refusal
  - Introduction of errors
- Special surveys
- EC Radiation Protection No154

## EC Radiation Protection No154:

- Based on distributions based on five European countries (LU, DK, NE, CH, UK)
- Five-year age bands (0...90+)
- Male & female patients
- Radiographic examinations
- Fluoroscopy & interventional procedures
- CT examinations

**Figure 8: Age distributions for CT chest exams on females from 5 countries**

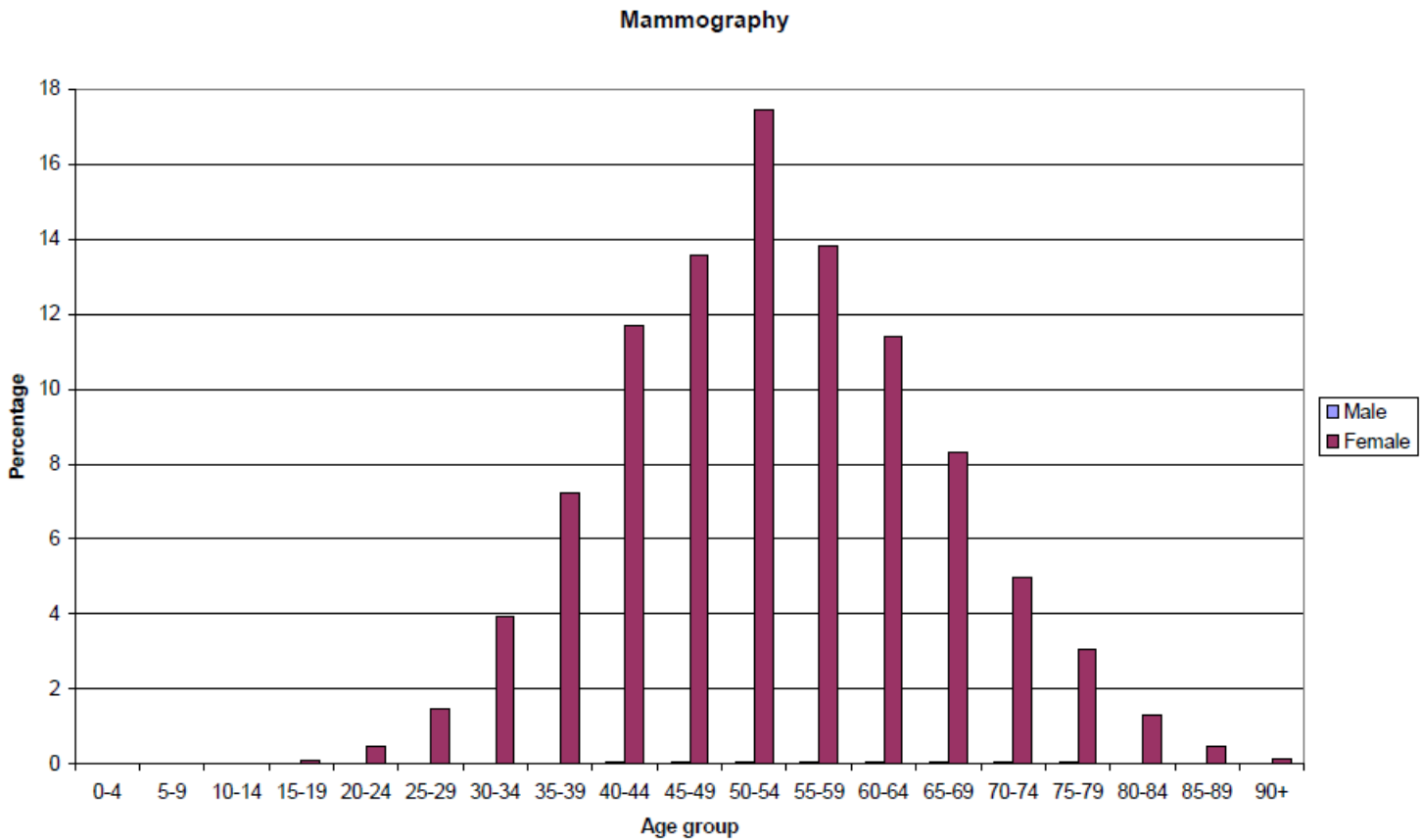




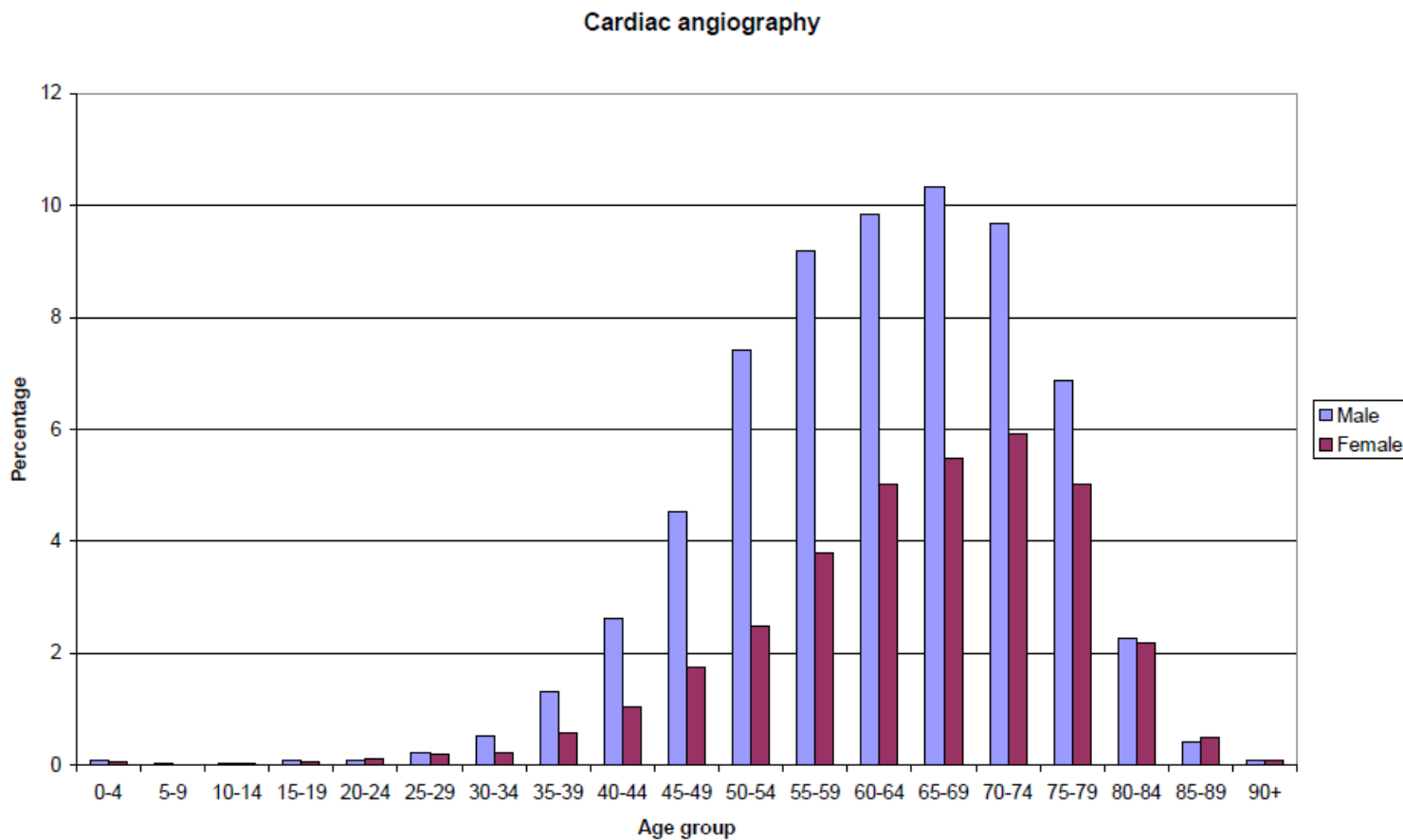
**TABLE A3.1: Averaged European age/sex distributions (percentage) for radiographic examinations**

Age band	Chest		Cervical spine		Thoracic spine		Lumbar spine		Mammo		Abdomen		Pelvis	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
0-4	1.82	2.30	0.23	0.41	0.20	0.30	0.21	0.23	0.00	0.00	2.27	2.82	2.10	1.39
5-9	0.44	0.55	0.41	0.55	0.76	0.56	0.38	0.32	0.01	0.00	1.02	1.18	0.68	1.11
10-14	0.37	0.42	0.93	0.93	2.16	1.65	1.25	0.92	0.00	0.00	0.97	0.97	0.78	1.07
15-19	0.62	0.78	2.22	1.97	2.76	3.06	1.81	1.74	0.11	0.01	1.46	0.94	0.96	1.10
20-24	0.87	1.05	3.51	2.98	2.55	2.77	1.80	2.03	0.46	0.02	2.01	1.27	0.79	1.12
25-29	1.15	1.38	3.82	3.28	2.66	3.09	2.47	2.58	1.47	0.02	2.21	1.85	1.17	1.23
30-34	1.55	1.80	4.40	3.50	3.06	3.56	3.29	3.57	3.95	0.03	2.68	2.49	1.45	1.50
35-39	1.79	2.14	4.82	3.97	3.27	3.68	3.94	4.03	7.25	0.03	2.76	2.81	1.72	1.81
40-44	2.19	2.47	5.66	3.94	3.62	3.27	4.21	3.83	11.69	0.04	2.84	2.95	2.08	1.89
45-49	2.64	3.05	5.96	4.07	3.82	3.08	4.67	3.65	13.57	0.05	2.92	3.15	2.67	2.11
50-54	3.26	3.85	5.94	4.36	4.29	3.17	5.02	3.97	17.44	0.06	3.22	3.72	3.53	2.83
55-59	3.57	4.67	5.41	3.85	4.49	2.91	4.75	3.42	13.84	0.06	3.11	3.67	4.07	3.14
60-64	3.91	5.25	3.75	2.64	4.02	2.24	4.21	2.85	11.40	0.06	3.17	3.92	4.59	3.35
65-69	4.42	5.81	3.15	2.12	4.31	2.15	4.36	2.48	8.32	0.06	3.45	4.25	5.71	3.41
70-74	5.15	6.25	2.75	1.64	4.98	2.02	4.74	2.41	4.99	0.05	3.99	4.40	6.87	3.67
75-79	5.23	5.39	2.19	1.21	4.83	1.93	4.50	2.04	3.04	0.04	4.10	3.91	7.43	3.16
80-84	4.25	3.24	1.40	0.69	3.71	1.18	3.36	1.26	1.30	0.02	3.99	2.66	6.77	2.34
85-89	2.66	1.65	0.71	0.27	2.06	0.65	2.06	0.59	0.47	0.01	3.00	1.54	5.01	1.37
90+	1.43	0.60	0.25	0.11	0.99	0.22	0.81	0.22	0.12	0.00	1.62	0.70	3.25	0.76
Total	47.3	52.7	57.5	42.5	58.5	41.5	57.8	42.2	99.4	0.57	50.8	49.2	61.6	38.4

# Typical European age/sex distribution for mammography



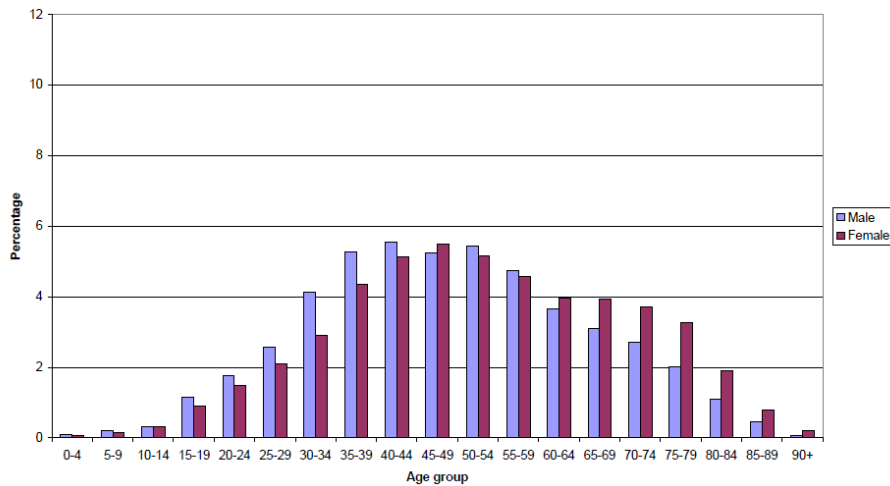
# Typical European age/sex distribution for CA



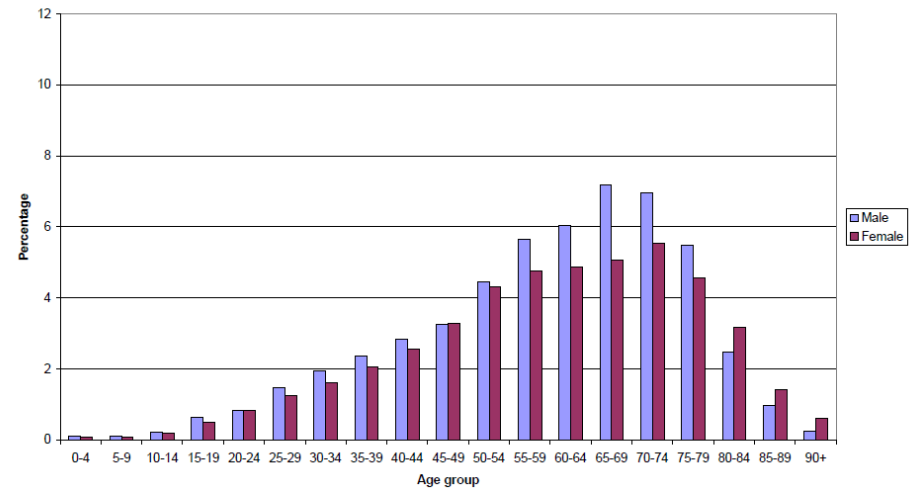


# DDM2 typical European age/sex distribution for CT spine and abdomen

CT spine

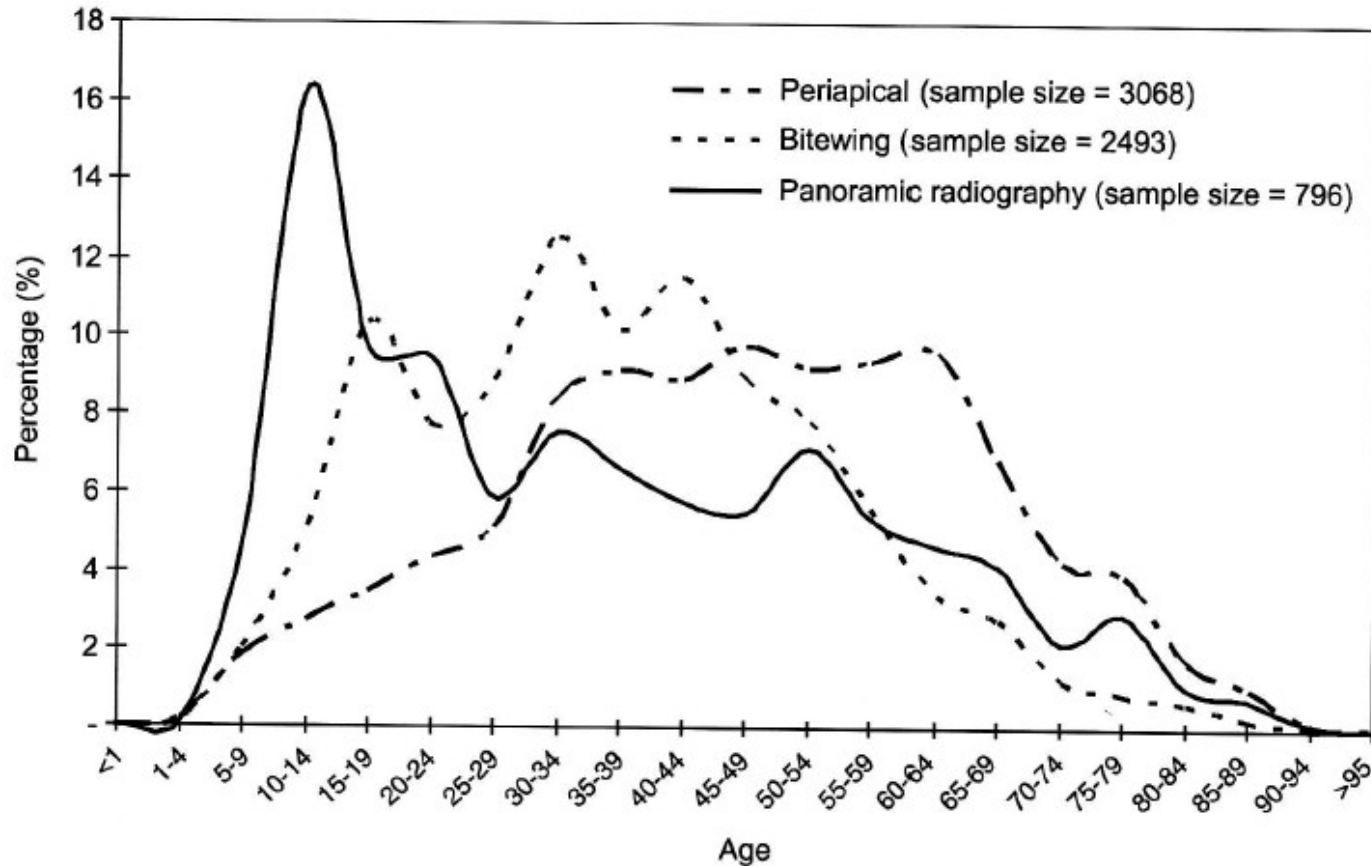


CT abdomen





## Swiss age distribution for dental examinations





**Warning:** population demographics may differ markedly from country

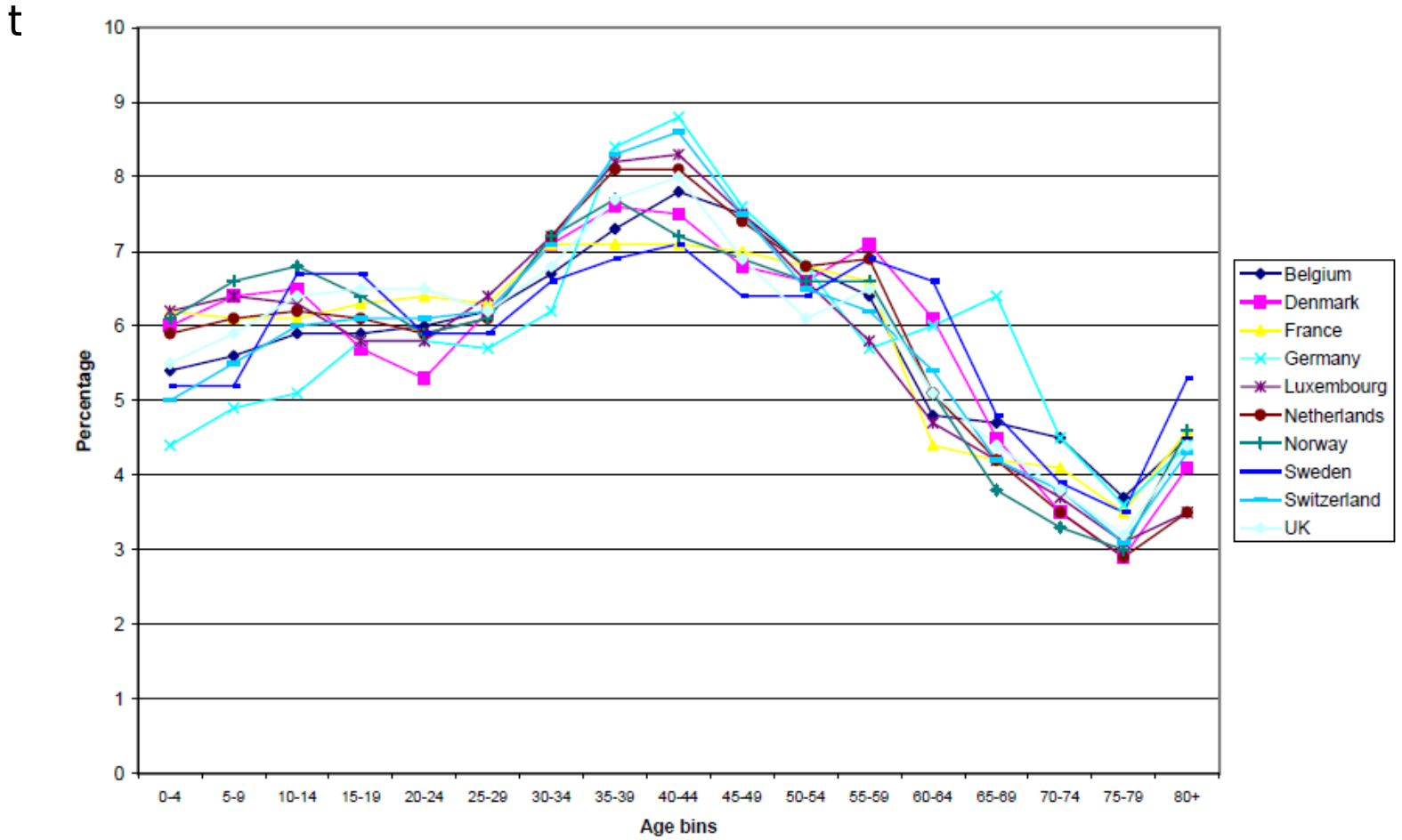


Figure 9: Population age distributions in the ten DOSE DATAMED countries (2005)



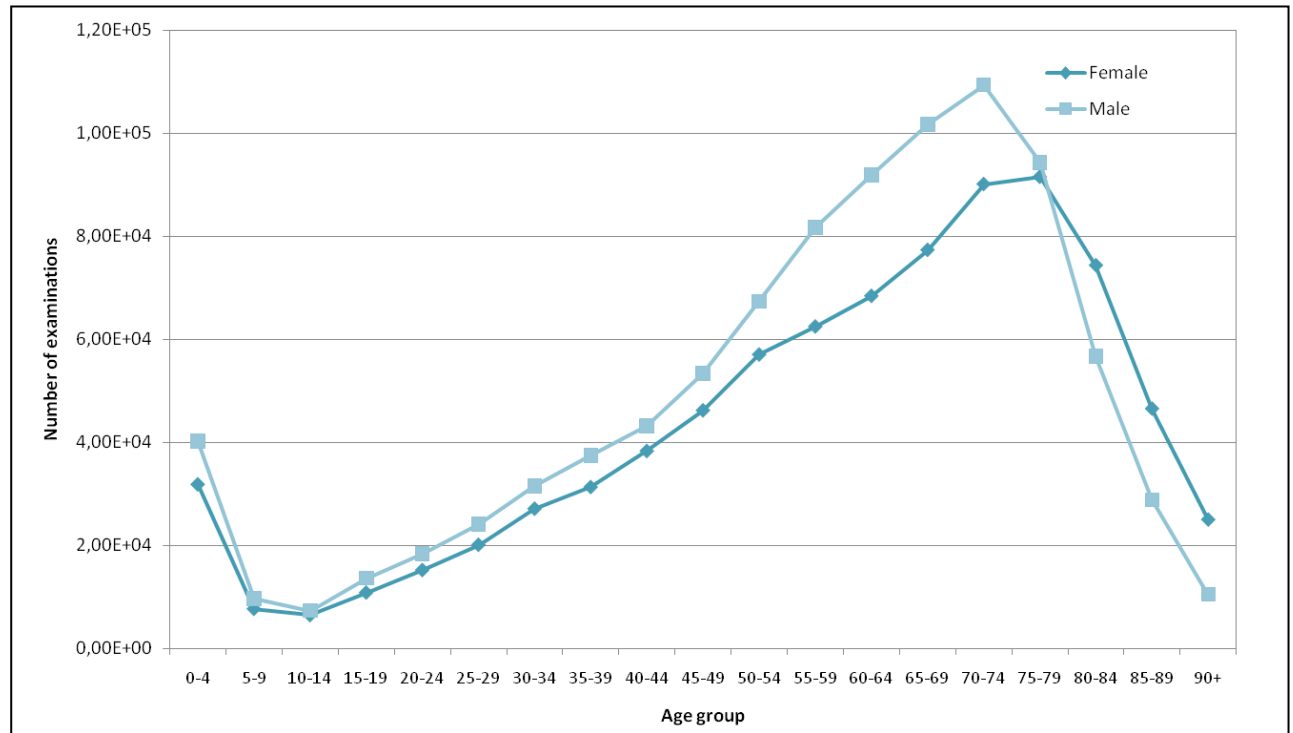
# Age distribution



Number of chest examinations in 2008 in CH:

**1.75·106**

Age band	Chest	
	F	M
0-4	1.82	2.30
5-9	0.44	0.55
10-14	0.37	0.42
15-19	0.62	0.78
20-24	0.87	1.05
25-29	1.15	1.38
30-34	1.55	1.80
35-39	1.79	2.14
40-44	2.19	2.47
45-49	2.64	3.05
50-54	3.26	3.85
55-59	3.57	4.67
60-64	3.91	5.25
65-69	4.42	5.81
70-74	5.15	6.25
75-79	5.23	5.39
80-84	4.25	3.24
85-89	2.66	1.65
90+	1.43	0.60
Total	47.3	52.7



F: 8.28·105 exams/year

M: 9.22·105 exams/year



# Collective

dose ?

- Effective dose for chest radiography: **0.05 mSv**
- Number of examinations in 2008 in CH: **1.75·10<sup>6</sup>**

Age band	Chest	
	F	M
0-4	1.82	2.30
5-9	0.44	0.55
10-14	0.37	0.42
15-19	0.62	0.78
20-24	0.87	1.05
25-29	1.15	1.38
30-34	1.55	1.80
35-39	1.79	2.14
40-44	2.19	2.47
45-49	2.64	3.05
50-54	3.26	3.85
55-59	3.57	4.67
60-64	3.91	5.25
65-69	4.42	5.81
70-74	5.15	6.25
75-79	5.23	5.39
80-84	4.25	3.24
85-89	2.66	1.65
90+	1.43	0.60
Total	47.3	52.7

Effective dose: **88 man·Sv**



Age (y)	% Patients	S	Srisk
0-9	5	8.94·10 <sup>4</sup>	4.52·10 <sup>3</sup>
11-59	40	6.93·10 <sup>5</sup>	3.50·10 <sup>4</sup>
>60	55	9.67·10 <sup>5</sup>	4.88·10 <sup>4</sup>

Age (y)	Risk
0-9	3
11-59	1
>60	0.3



- New collective effective dose: **63 man·Sv**
- Difference: **-28%**

## **Take home message for age and sex distribution**

- Number of examination performed during a certain period – obtained by population survey
- Examination distribution according to age & sex, if possible
- Population distribution of our country – comparison with European countries
- EC Radiation Protection No154



***Thank you for your attention!***