

Welcome to the

Spring symposium radiology
23/04/2016

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Section Head Health Protection

FANC ● **AFCN**

federaal agentschap voor nucleaire controle
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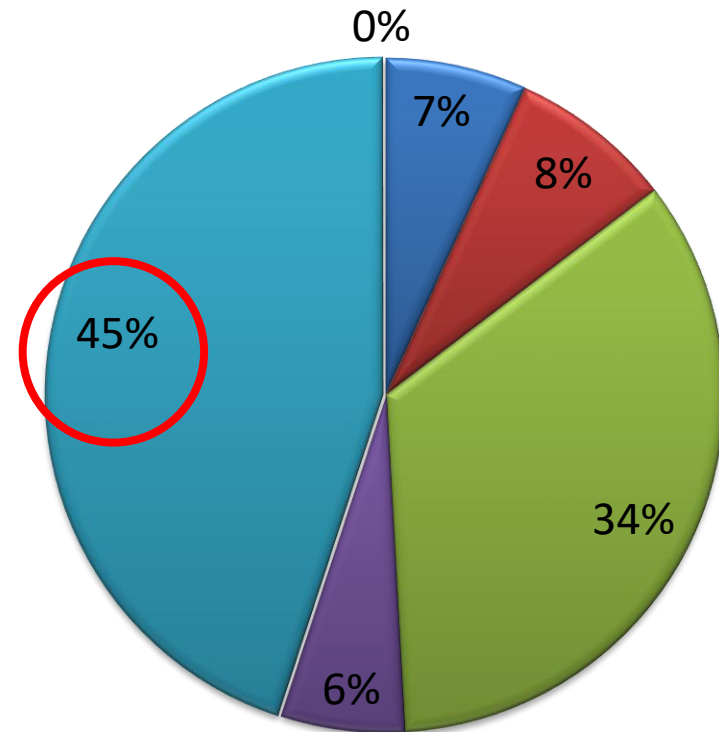
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Radiation protection: Does it concern us ?

Exposure to ionising radiation in Belgium

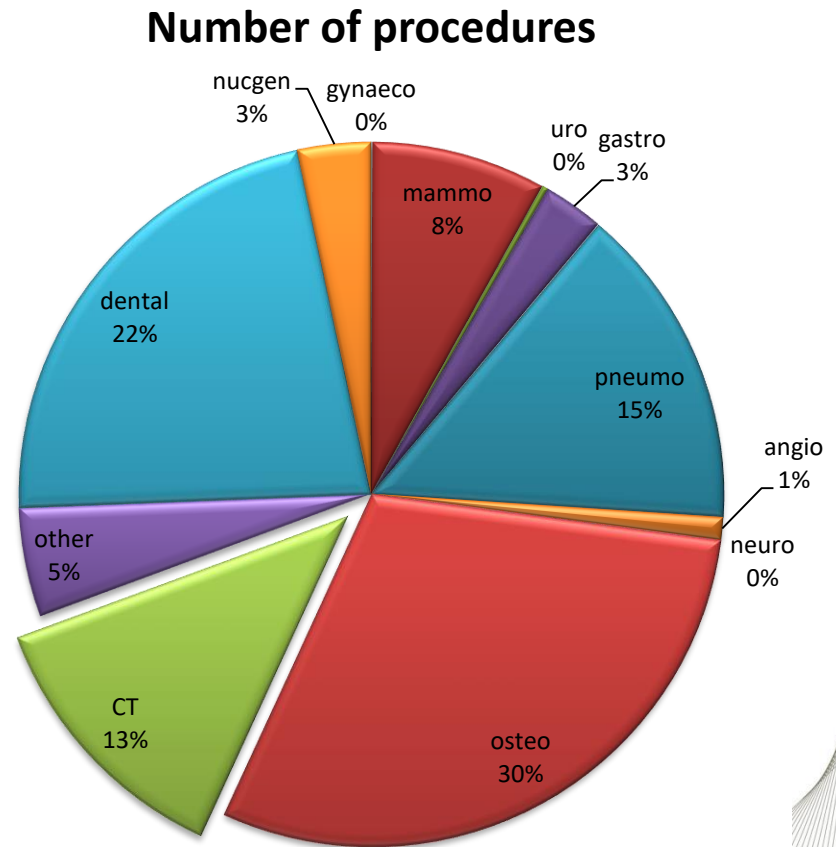
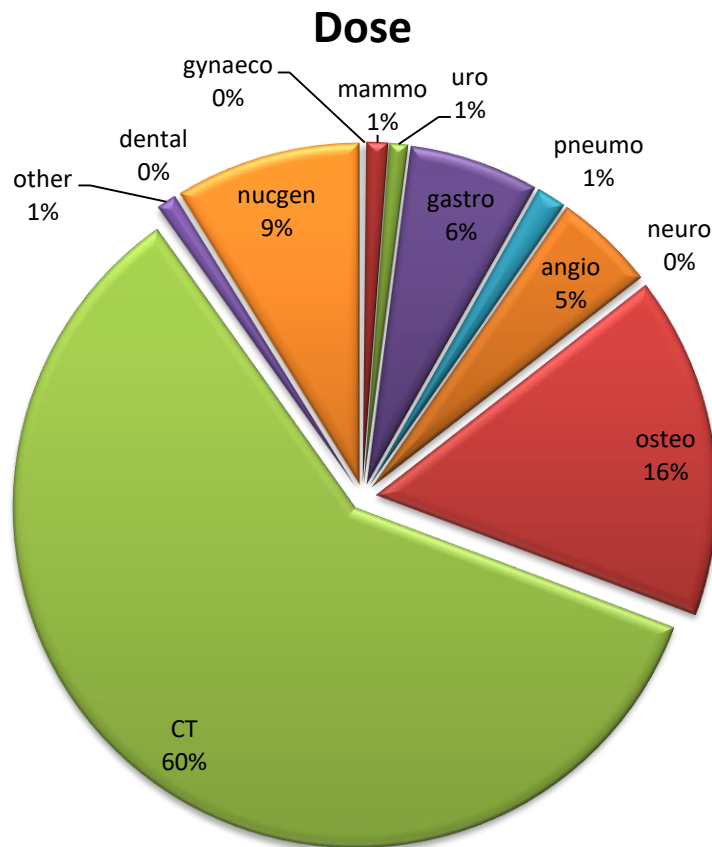
The mean exposure to ionising radiation in Belgium is **5,1 mSv per year**.

- **Cosmos**: 0,3 mSv/year
- **Terrestrial radiation** : 0,4 mSv/year
- **Internal exposure by inhalation of natural radionuclides**: 1,8 mSv/year
- **Internal exposure by ingestion of natural radionuclides**: 0,3 mSv/year
- **Medical applications** : 2,3 mSv/year



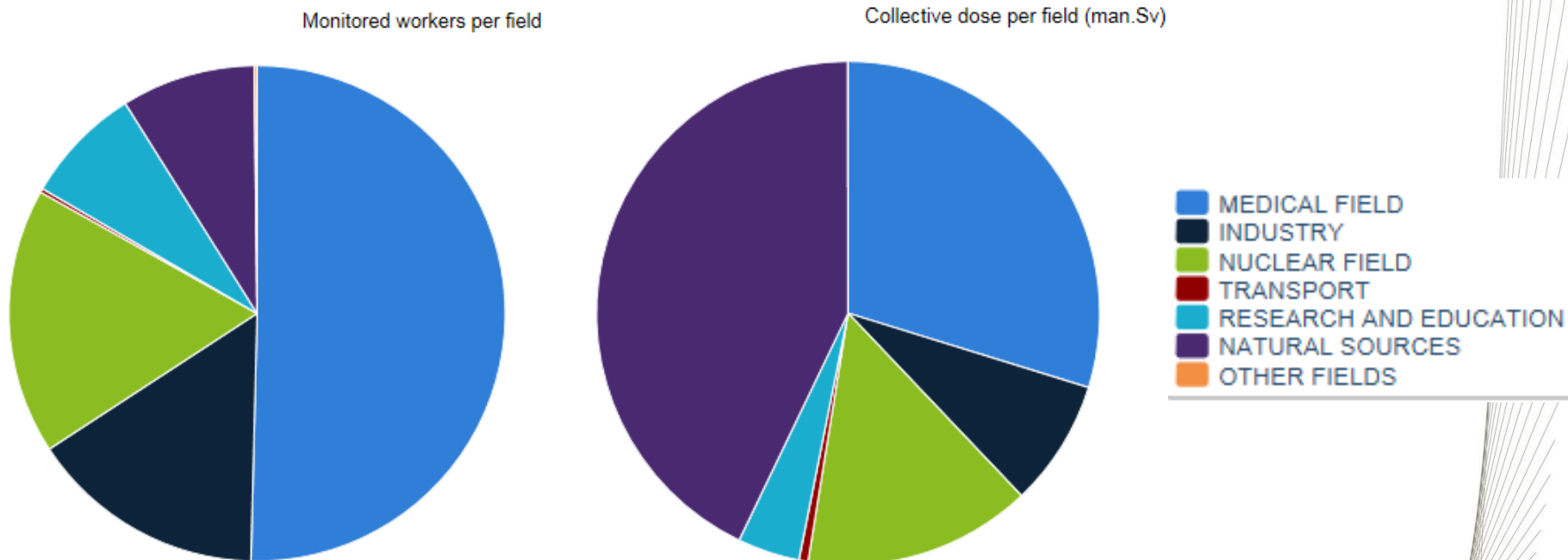
Contribution of medical exposures

Important **dose contribution** due to **CT**



Professional exposure

Belgium (2013): 35 303 monitored workers



<http://esorex-platform.org>:

European dose statistics of exposed workers

Professional exposure

Professional exposure (data of 2013)

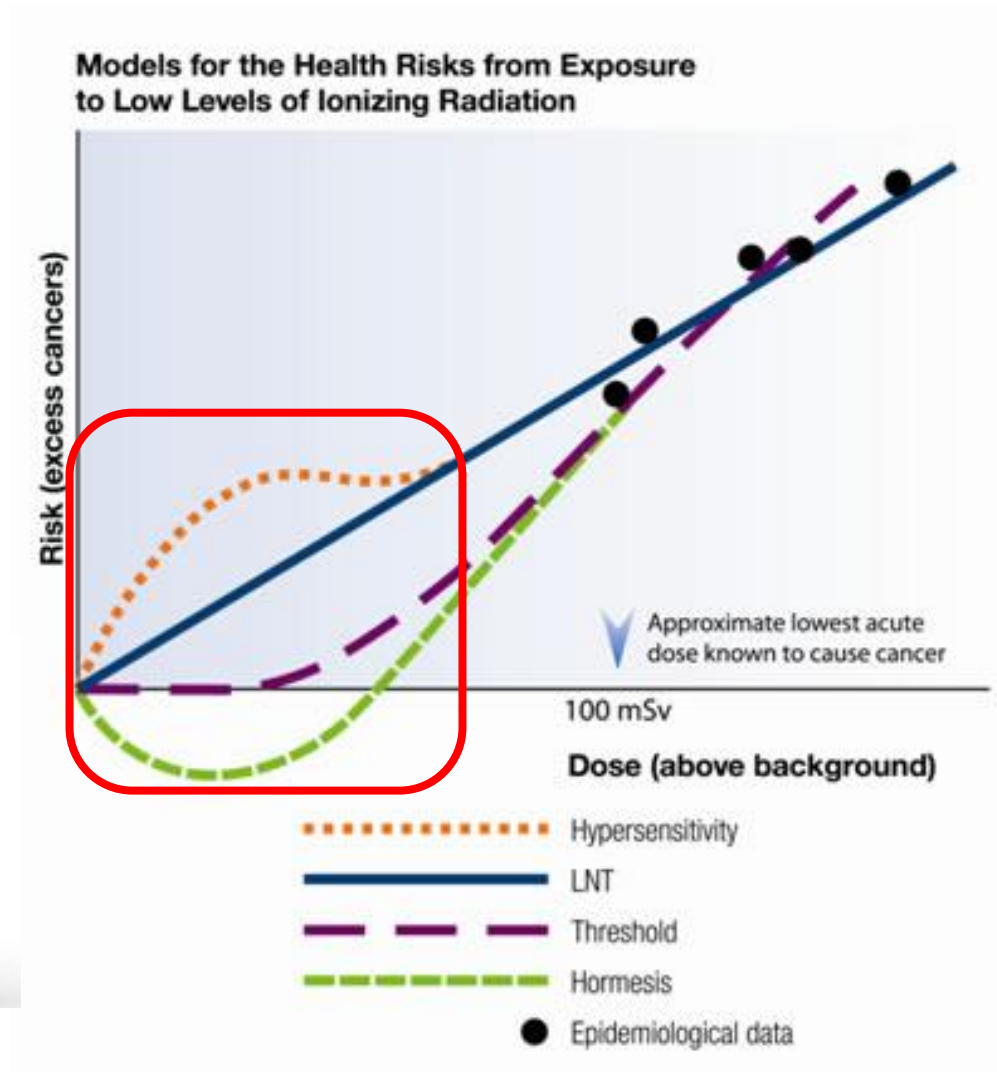
- Per “monitored” worker: $E_{\text{mon}} = 0,16 \text{ mSv}$
- Per worker with a measurable dose : $E_{\text{mes}} = 0,49 \text{ mSv}$

Number of workers	$E < \text{RL}$	$\text{RL} \leq E < 1 \text{ mSv}$	$1 \text{ mSv} \leq E < 5 \text{ mSv}$	$5 \text{ mSv} \leq E < 10 \text{ mSv}$	$10 \text{ mSv} \leq E < 15 \text{ mSv}$	$15 \text{ mSv} \leq E < 20 \text{ mSv}$	$20 \text{ mSv} \leq E$
All sectors	22914	10993	1262	121	12	1	0
Medical sector	12681	5709	550	66	12	1	0

Cardiology and interventional radiology


Health effects of low dose

Cancer risk, cardiovascular detriment, cataract ...



RESEARCH

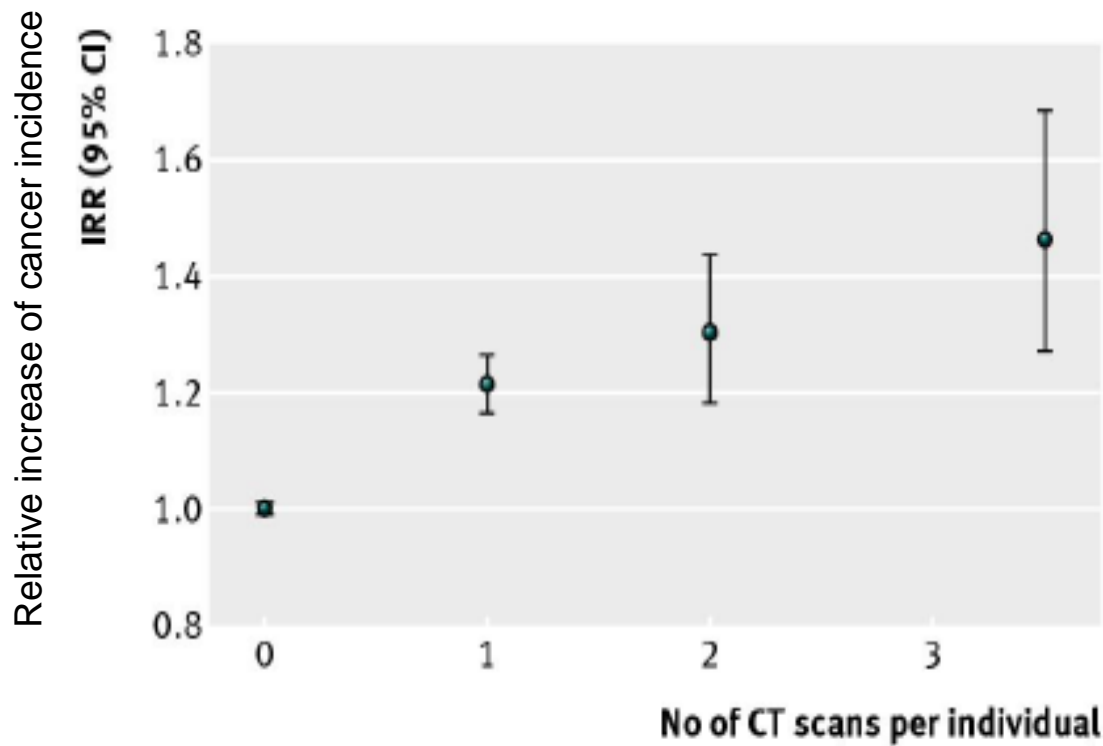
Cancer risk in 680 000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians

 OPEN ACCESS

John D Mathews *epidemiologist*¹, Anna V Forsythe *research officer*¹, Zoe Brady *medical physicist*^{1,2}, Martin W Butler *data analyst*³, Stacy K Goergen *radiologist*⁴, Graham B Byrnes *statistician*⁵, Graham G Giles *epidemiologist*⁶, Anthony B Wallace *medical physicist*⁷, Philip R Anderson *epidemiologist*^{8,9}, Tenniel A Guiver *data analyst*⁸, Paul McGale *statistician*¹⁰, Timothy M Cain *radiologist*¹¹, James G Dowty *research fellow*¹, Adrian C Bickerstaffe *computer scientist*¹, Sarah C Darby *statistician*¹⁰

Results:

cancer incidence \sim number of CT-scans



+ age correlation :
Risk increase higher for younger children

+ location correlation :
Strong correlation between location scan and location cancer

Fig 2 Incidence rate ratios (IRR) for all types of cancers in exposed versus unexposed individuals based on a one year lag period, by the number of CT scans. The IRR increased by 0.16 (95% confidence interval 0.13 to 0.19) for each additional CT scan, calculated after stratification for age, sex, and year of birth ($\chi^2=131.4$ and $P<0.001$ for trend). If unexposed people were excluded, the trend remained significant ($\chi^2=5.79$ and $P=0.02$ for trend). The average number of scans among individuals exposed to three or more scans was 3.5. (Web figure A shows corresponding results based on lag periods of five and 10 years)

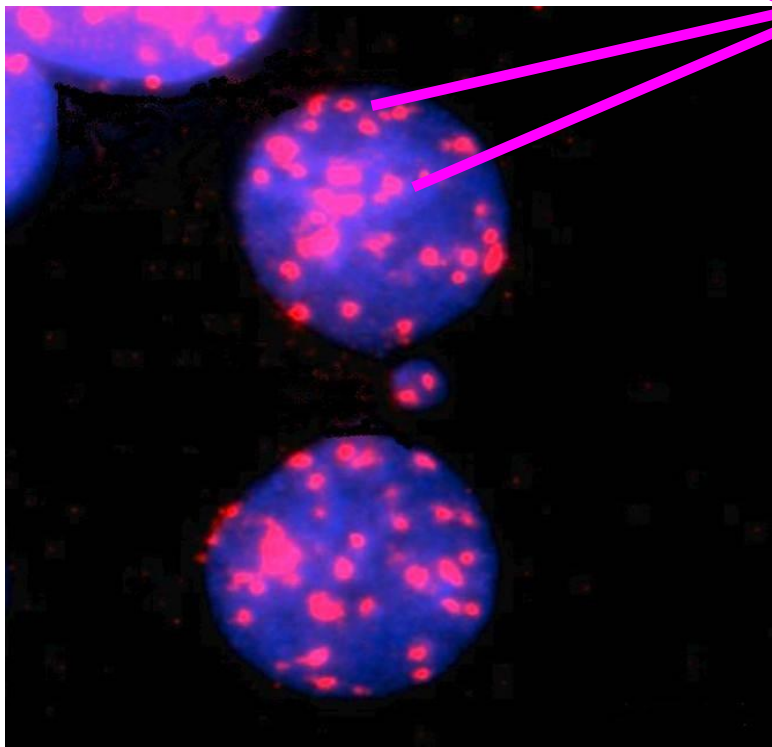
γ -H2AX foci as in vivo effect biomarker in children emphasize the importance to minimize x-ray doses in paediatric CT imaging.

Vandevoorde C¹, Franck C, Bacher K, Breysem L, Smet MH, Ernst C, De Backer A, Van De Moortele K, Smeets P, Thierens H.

Circulation. 2009 Nov 10;120(19):1903-9. doi: 10.1161/CIRCULATIONAHA.109.880385. Epub 2009 Oct 26.

gamma-H2AX foci as a biomarker for patient X-ray exposure in pediatric cardiac catheterization: are we underestimating radiation risks?

Beels L¹, Bacher K, De Wolf D, Werbrouck J, Thierens H. **UGent (Medische Basiswetenschappen)**



γ -H2AX foci
= double strand breaks in
DNA after CT-examination in
children

Cathlab: pediatric patients
show more double strand
breaks than expected



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Volume 2, No. 7, e276–e281, July 2015

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Articles

Ionising radiation and risk of death from leukaemia and lymphoma in radiation-monitored workers (INWORKS): an international cohort study

Dr Klervi Leuraud, PhD  , David B Richardson, PhD, Prof Elisabeth Cardis, PhD, Robert D Daniels, PhD, Michael Gillies, MSc, Jacqueline A O'Hagan, HNC, Ghassan B Hamra, PhD, Richard Haylock, PhD, Dominique Laurier, PhD, Monika Moissonnier, BSc, Mary K Schubauer-Berigan, PhD, Isabelle Thierry-Chef, PhD, Ausrele Kesminiene, MD

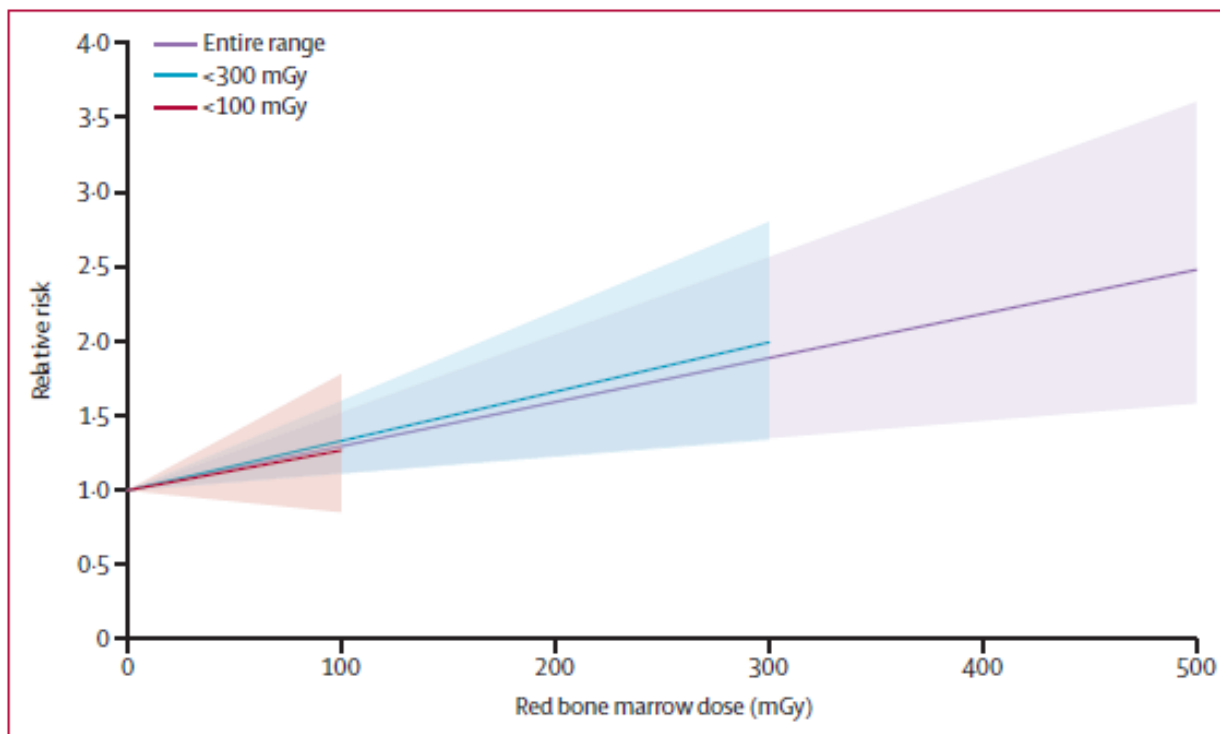


Figure: Relative risk of leukaemia excluding chronic lymphocytic leukaemia associated with 2-year lagged cumulative red bone marrow dose

The lines are the fitted linear dose-response model and the shading represents the 90% CIs.

Cohort (nuclear workers) followed for 27 years.
Cumulative professional dose during career :
average 15,9 mSv (range 0 - 1217 mSv)

Programme

- 9h45 *Introduction* Dr. Sc. An Fremout (FANC)
- 10h00 *Safety culture in radiological departments* Dr. Sc. Katrien Van Slambrouck (FANC)
- 10h30 *Justified medical imaging* Dr. Patrik Aerts (BSR – OLV Aalst)
- 11h00 *Pauze*
- 11h30 *Dose management systems: effects on daily practice* Dr. Frédéric Alexis (CMSE Namur)
- 12h00 *Strategy 'Right Dose & teamplay'* Mr. Ivo Driesser (UNAMEC – Siemens Healthcare GmbH Digital Health Services)

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Rules of the game



- A certificate of attendance will be sent to you
- Don't forget to **sign out** when you leave !

- Auditorium
- Coffee break : cafetaria



- Timing
- Questions

