

# Exposure of the French population to ionising radiation related to medical diagnosis in 2012

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In 2014, the **Institut de radioprotection et de sûreté Nucléaire (IRSN)** published its third report on the exposure of the French population to ionising radiation in relation to medical diagnosis in 2012. This report updates the previous edition from 2007. It analyses exposure according to the imaging modality (conventional radiology, dental radiology, nuclear medicine and CT), the anatomical region explored, and the age and sex of the patient. The evolution of the medical exposure of the population between 2007 and 2012 is studied.

## Sources of data

The main national health insurance company provided IRSN with detailed data on all examinations performed on a representative sample of about 1% of the French population (about 600,000 people). Public hospitals and private practitioners were included.

An average effective dose was calculated for each type of procedure, using principally:

- » Patient doses collected annually by IRSN from public hospitals and private practitioners to update the French diagnostic reference levels (DRLs); in 2012 IRSN received data from 23% of the professionals in conventional radiology and from 58% in CT
- » Technical parameters (kV, mAs, pitch, etc.) recommended by the French professional societies (SFR for radiology and CT)

PCXMC© and CTEXPO© software was used to calculate the average effective doses, using ICRP103 tissue weighting factors.

## Main results

The average number of procedures per 1,000 inhabitants increased by 6% between 2007 and 2012 (Tab. 1), mainly due to CT scans and dental x-rays (Fig. 1). CT scans represent about 10% of the procedures and more than 70% of the effective dose, as compared to 58% in 2007. The individual number of procedures increases with age and is different between men and women (Fig. 2 and Fig. 3).

Tab. 1: Diagnostic procedures using IR in France in 2007 and 2012

Number	2007	2012
total	74.6 million	81.8 million
per 1,000 inhabitants (averaged)	1,170	1,247

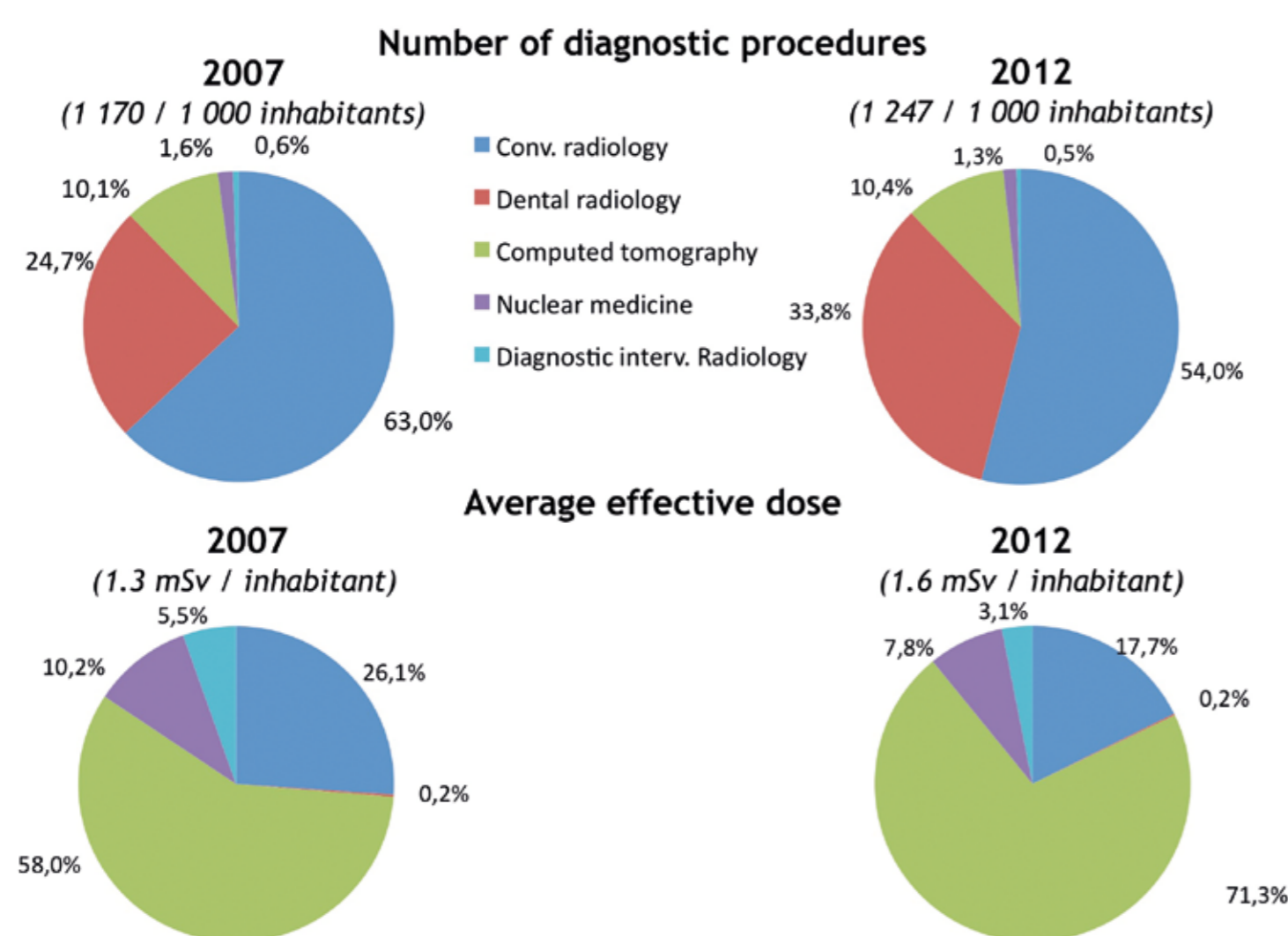


Fig. 1: Diagnostic procedures and effective doses in France in 2007 and 2012

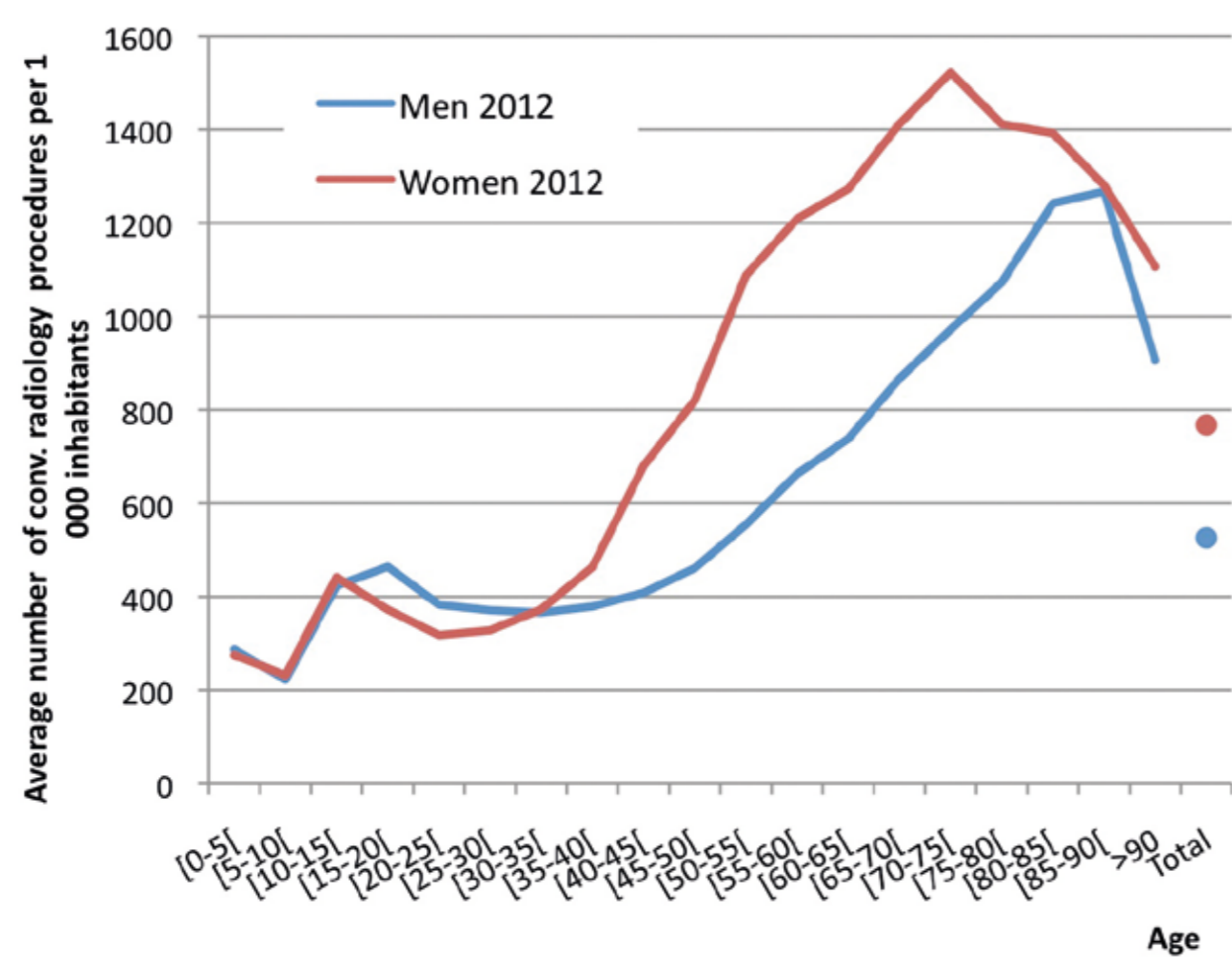


Fig. 2: Average number of conventional radiology procedures per 1,000 inhabitants in 2012

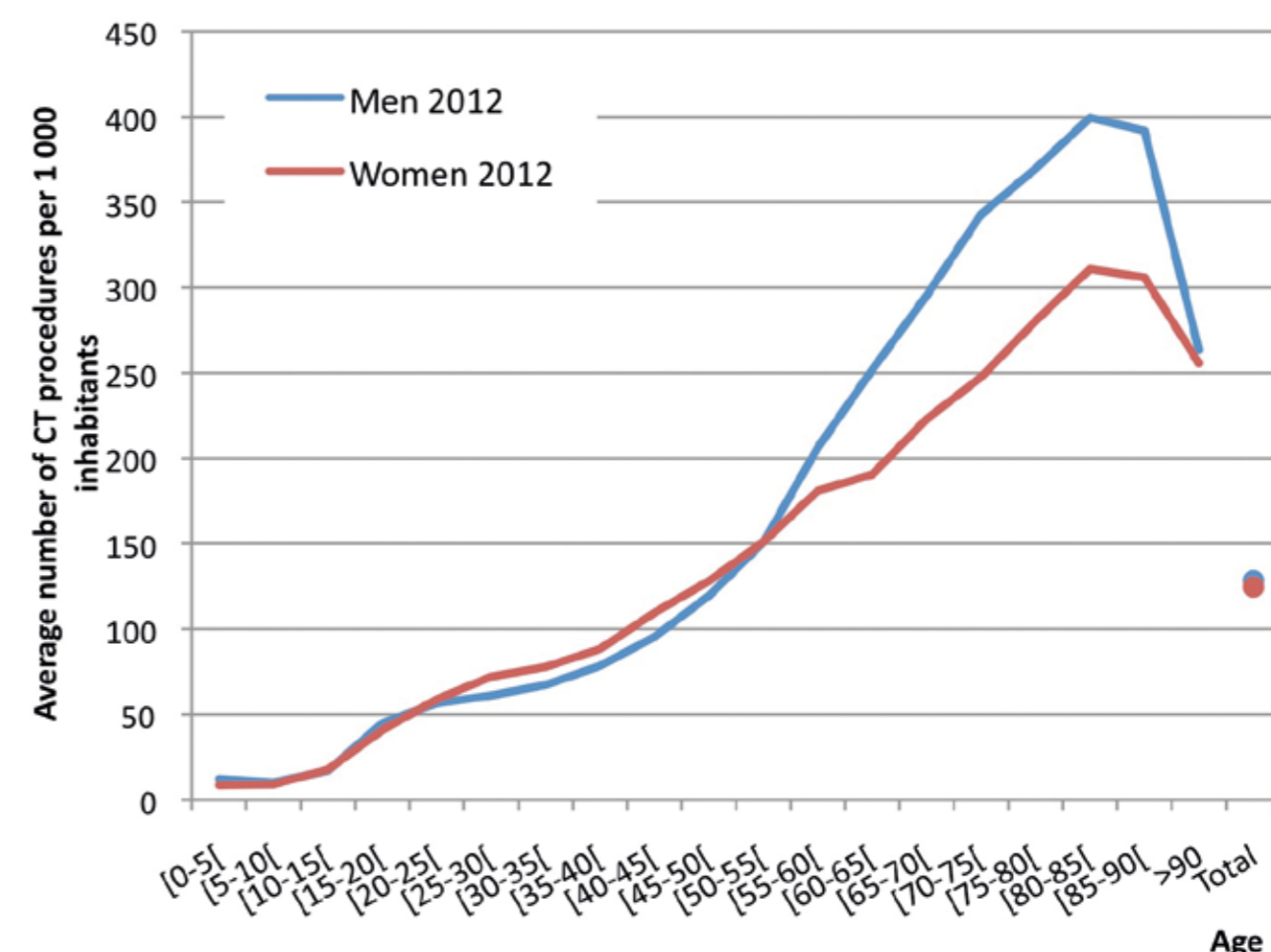


Fig. 3: Average number of CT procedures per 1,000 inhabitants in 2012

Medical diagnosis in France leads to an average effective dose equal to approximately 1.6 millisievert (mSv) per year per individual in 2012 (Fig. 1). The 20% increase between 2007 and 2012 is mainly due to:

- » An increase of about 12% in the number of CT scans, mostly exposing chest, abdomen and pelvis (i.e. the most radiosensitive organs)
- » Better knowledge in relation to practices and delivered doses by CT scans

Approximately 44% of the population underwent at least one medical exam using ionising radiation in 2012, the percentage of patients concerned increases with age (Fig. 4). Individual exposure accumulated over the year is very diverse and less than 1 mSv per year for 77% of the whole French population.

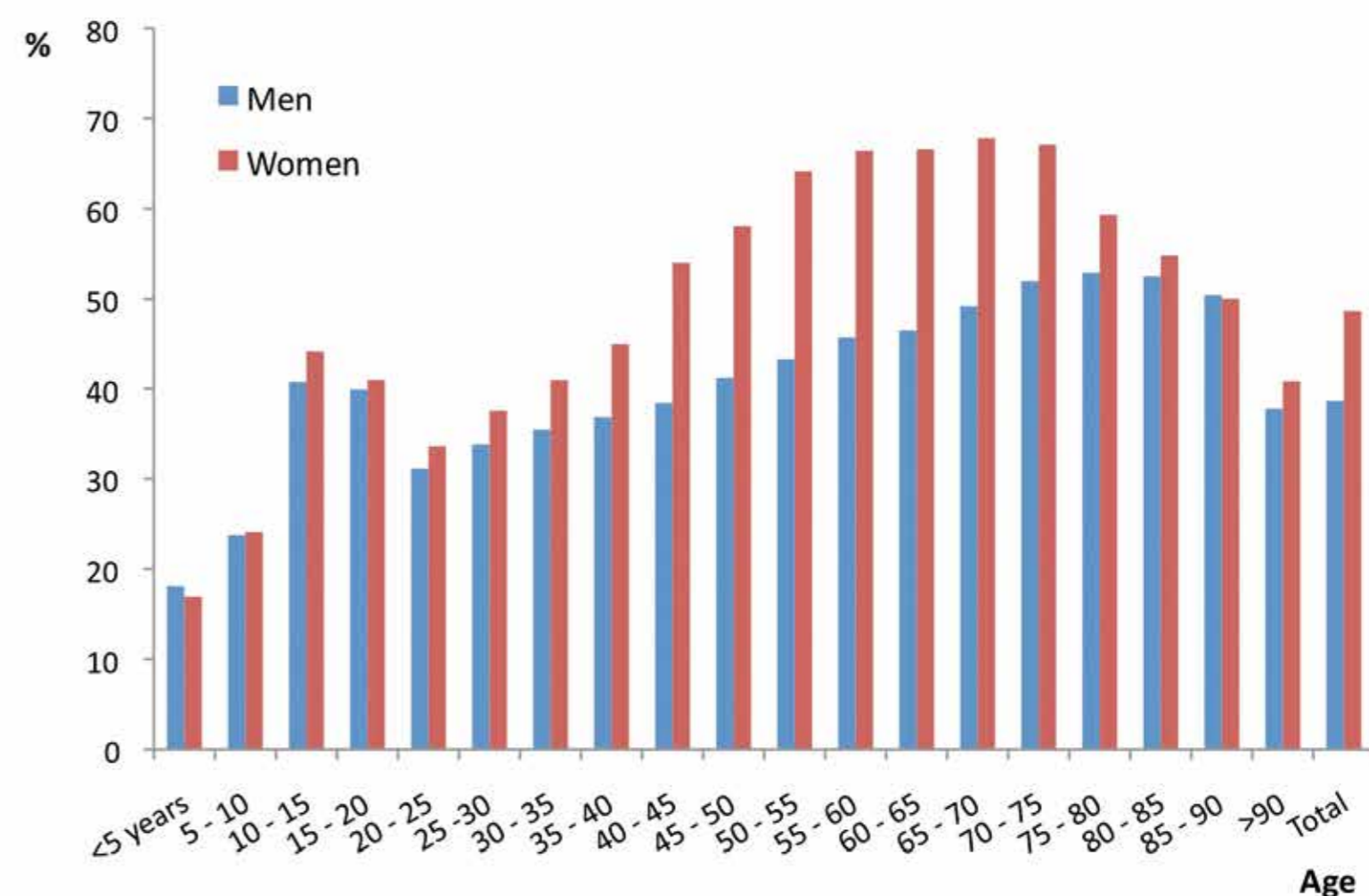


Fig. 4: Percentage of French people undergoing at least one procedure in 2012

## Conclusions

The exposure of the French population to ionising radiation in relation to medical diagnosis increased by approximately 20% between 2007 and 2012. The French value (1.6 mSv/year/inhabitant in average) remains among the higher average values in Europe.

One should never forget that medical imaging has a great positive impact on the quality of patient care. However, the 2014 IRSN report raises the questions of justification (especially for CT and dental x-rays) and harmonisation of practices and doses in medical imaging.

The report is available on the IRSN website

[http://www.irsn.fr/FR/expertise/rapports\\_expertise/Documents/radioprotection/IRSN-PRP-HOM-2014-6\\_Exposition-France-rayonnements-diagnostic-medical-2012.pdf](http://www.irsn.fr/FR/expertise/rapports_expertise/Documents/radioprotection/IRSN-PRP-HOM-2014-6_Exposition-France-rayonnements-diagnostic-medical-2012.pdf)

## References

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