



HAL
open science

Reconstruction of the radiological component of the exposome in the CONSTANCES cohort: first step of the CORALE project

Justine Sauce, Sophie Ancelet, Corinne Mandin, Philippe Renaud, Jean-Michel Métivier, Abdulhamid Chaikh, Eric Blanchardon, David Broggio, Claire Greau, Caroline Vignaud, et al.

► To cite this version:

Justine Sauce, Sophie Ancelet, Corinne Mandin, Philippe Renaud, Jean-Michel Métivier, et al.. Reconstruction of the radiological component of the exposome in the CONSTANCES cohort: first step of the CORALE project. ISEE Europe Young and Early Career Conference 2024, International Society for Environmental Epidemiology (ISEE), Jun 2024, Rennes, France. irsn-04607518v1

HAL Id: irsn-04607518

<https://irsn.hal.science/irsn-04607518v1>

Submitted on 10 Jun 2024 (v1), last revised 12 Jun 2024 (v2)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

RECONSTRUCTION OF THE RADIOLOGICAL COMPONENT OF THE EXPOSOME IN THE CONSTANCES COHORT: FIRST STEP OF THE CORALE PROJECT

Justine Sauce¹, Sophie Ancelet¹, Corinne Mandin¹, Philippe Renaud², Jean-Michel Métivier², Abdulhamid Chaik¹, Eric Blanchardon¹, David Broggio¹, Claire Gréau¹, Caroline Vignaud¹, Marie-Odile Bernier¹, Enora Cléro¹, Marcel Goldberg³, Christelle Huet¹, Stéphane Le Got³, Emeline Lequy³, Aurélie Isambert¹, Afi Henryoh¹, Géraldine Ielsch¹, Célian Michel¹, Choisie Mukakalisa¹, Mireille Cœuret-Pellicer³, Hervé Roy¹, Céline Ribet³, Lionel Saey², Marie Zins³, Olivier Laurent¹.

1. Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PSE-SANTE/SESANE/LEPID, PSE-SANTE/SER/UEM, PSE-ENV/SERPEN/BERAP, PSE-SANTE/SDOS/LEDI, PSE-ENV/SERPEN/BERAD, PSE-SANTE/SDOS/LDRIF, PSE-SANTE/SER/BASEP F-92260, Fontenay-aux-Roses, France

2. Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PSE-ENV, PSE-ENV/SERPEN/LEREN F-13115, Saint-Paul-Lez-Durance, France

3. UMS 011 Inserm/UVSQ/U Paris Cité/U Paris Saclay "Cohortes épidémiologiques en population", Villejuif, France.

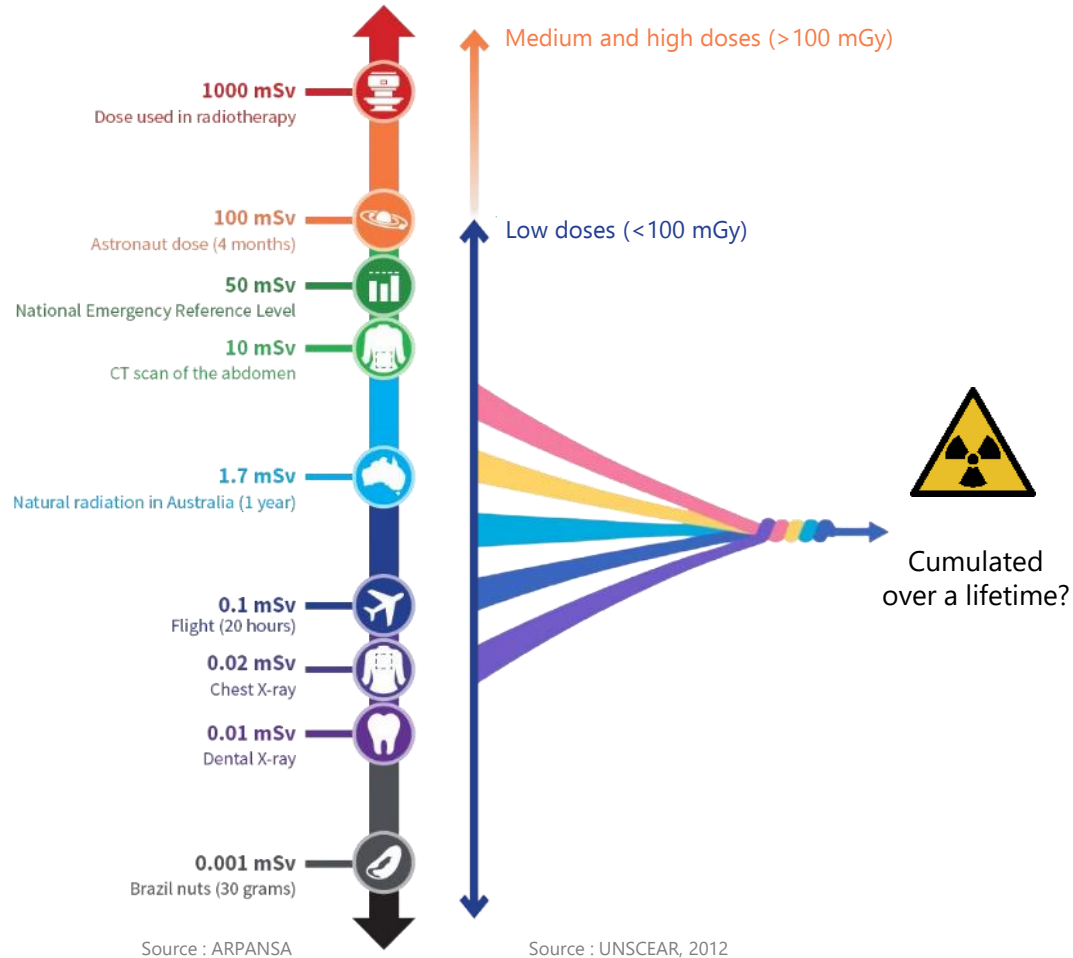
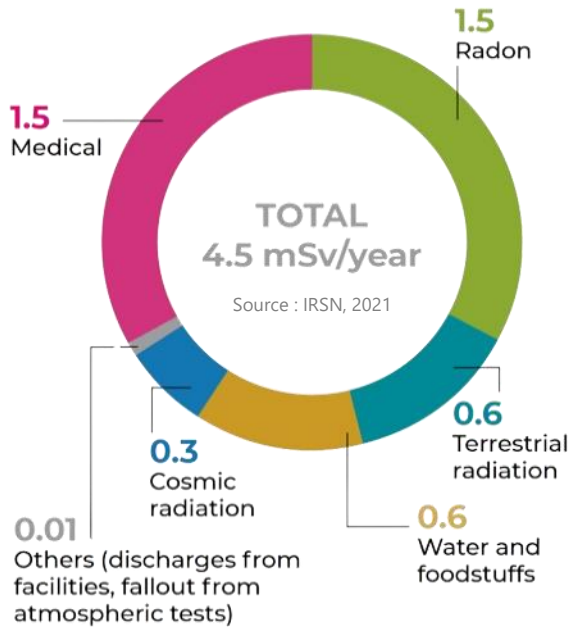
ISEE Europe Young and Early Career Conference 2024 – Speed Talk
from 5th to 7th June 2024

RADIOLOGICAL EXPOSOME



IONISING RADIATION (IR) IN OUR DAILY LIFE

AVERAGE ANNUAL EXPOSURE TO IR OF THE FRENCH POPULATION, BROKEN DOWN BY VARIOUS SOURCES



DIFFERENT SOURCES OF IR AND ASSOCIATED DOSE VALUES

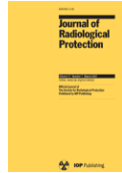
STATE OF THE ART



LOW DOSES EFFECTS



Official journal of the Society for Radiological Protection



Journal of Radiological Protection

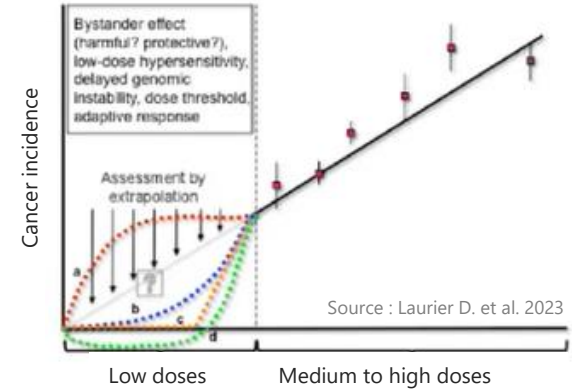
OPINION ARTICLE • OPEN ACCESS

The scientific basis for the use of the linear no-threshold (LNT) model at low doses and dose rates in radiological protection

Dominique Laurier^{2,1}, Yann Billand¹, Dmitry Klokov¹ and Klervi Leuraud¹

Published 29 June 2023 • © 2023 The Author(s). Published on behalf of the Society for Radiological Protection by IOP Publishing Ltd

Graph 1. Linear-Non-Threshold (LNT) model



AGE AT EXPOSURE



Fetus in the womb



Baby/Infant (birth – 1 year)



Toddler (1 – 3 years)



Preschooler (3 – 5 years)



Primary School Boy (5 – 12 years)



Adolescent/ Teenager (13 – 19 years)



Adult (36 – 55 years)



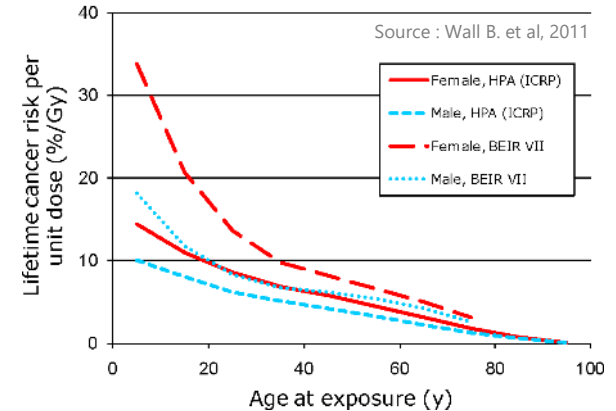
Old Person (65+ years)

Childhood

Adolescence

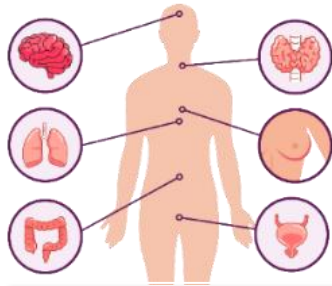
Adulthood

Graph 2. Radiation Risks from Medical X-ray Examinations as a Function of the Age and Sex of the Patient



CORALE PROJECT

FIRST STEP OF THE CORALE PROJECT

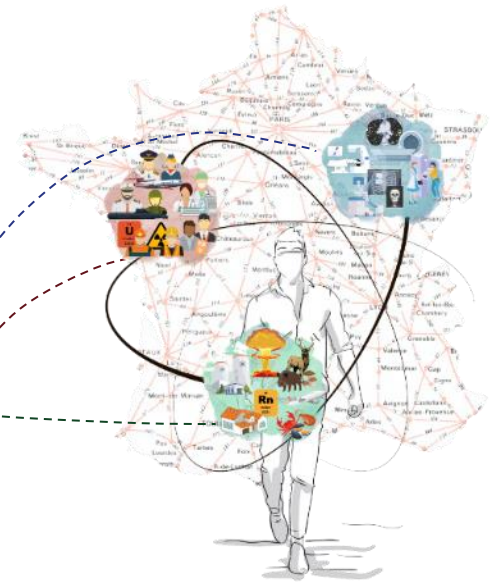


Estimate radioactivity doses received by 6 organs from :

Medical exposure —
(CT scans, X rays, Nuclear Medicine, Radiotherapy...)

Occupational exposure —

Environmental exposure —
(Radon, cosmic and terrestrial radiation, fallout from Chernobyl and atmospheric tests...)



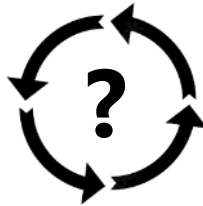
OBJECTIVE



CHRONIC DISEASES



CUMULATED
ORGAN DOSES
(LIFETIME)



ALCOHOL



TOBACCO

STATISTICAL APPROACH

- Survival models, latent variable models
- Bayesian regression mixture models



Environmental Science
& Technology

Statistical Approaches to Study Exposome-Health Associations in the Context of Repeated Exposure Data: A Simulation Study

Charline Warembourg¹, Augusto Anguita-Ruiz^{2,3}, Valérie Siroux⁴, Rémy Slama⁴,
Martine Vrijheid^{2,5,6}, Lorenzo Richiardi⁷, Xavier Basagaña^{2,5,6}

Affiliations + expand

PMID: 37844068 PMID: PMC10621661 DOI: 10.1021/acs.est.3c04805

MATERIALS AND METHODS

75,000 individuals



CROSS-REFERENCING

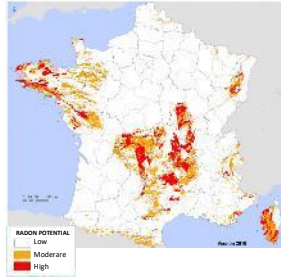
Environmental

Medical

Occupational



Figure 1. Map of radon potential in France.

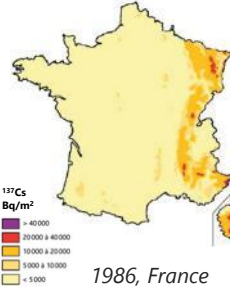


Source : IRSN

Figure 2. Map of cosmic rays in France.



Figure 3. Map of Cs-137 fallout from Chernobyl.



SNDS
Système national des données de santé

After 2007



IRSN [SISERI]
INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE



CORALE QUESTIONNAIRE

~ 40,000 responses out of 75,000

RESIDENTIAL HISTORY AND COMPLEMENTS

LIFESTYLE HABITS

MEDICAL HISTORY BEFORE 2007

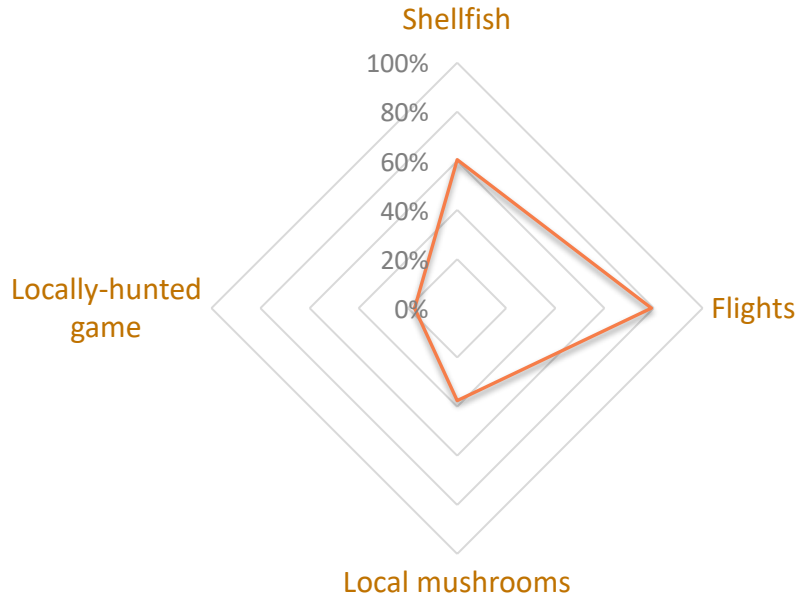


RADIOLOGICAL EXPOSOME

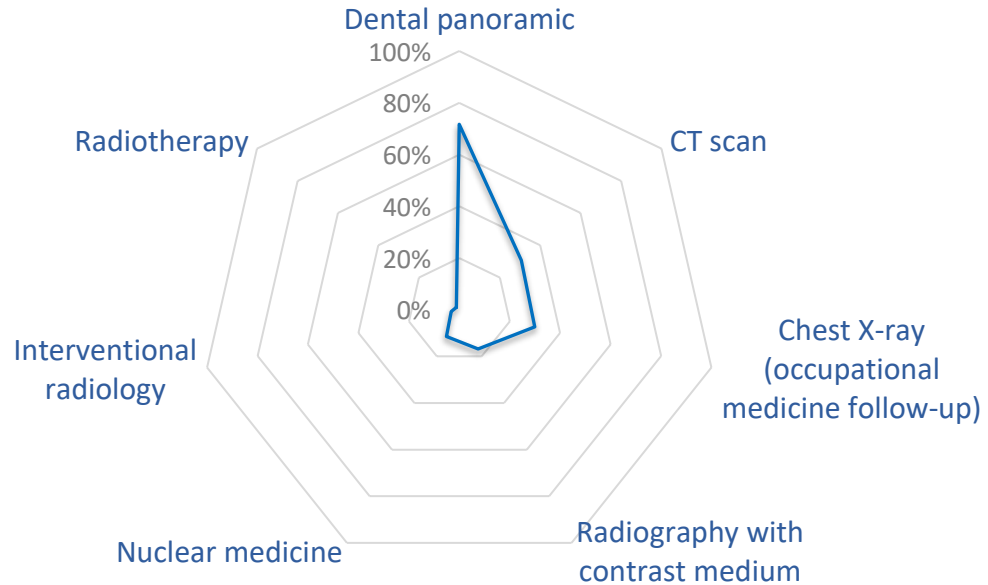


SO, WHAT ARE THE LIFESTYLE HABITS AND EXAMINATIONS UNDERGONE BY THE RESPONDENTS?

Graph 3. Percentage of participants who have consumed (depending on the type of food) or taken a plane at least once in their lives.



Graph 4. Percentage of participants having undergone at least one medical procedure, before 2007.



THANK YOU ALL FOR YOUR ATTENTION!

ST7 - Exposome and urban exposures



Whether medical, environmental, or occupational, what if we considered all these sources of ionising radiation as a whole, rather than separately, when looking at their potential impact on human health?

Justine Sauce

Want to know more?



June 7



14:30-15:30



Amphi



ISEE Young Rennes
June 5-7, 2024



CONSTANCES

**radiological
component of
the exposome.**
CORALE PROJECT