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CHILDHOOD CT SCANS AND CANCER RISKS ESTIMATES: AN UPDATE OF THE FRENCH CT COHORT

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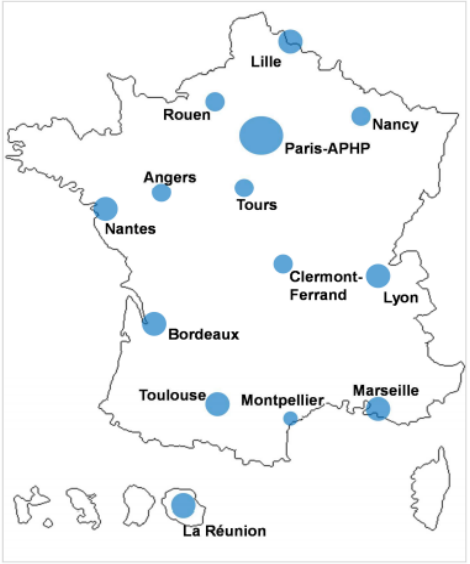
MEMBRE DE ETSON

The French CT cohort



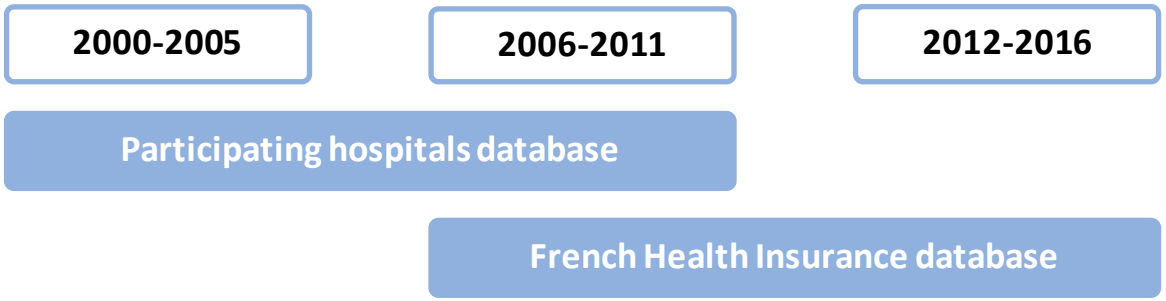
- Inclusion of patients who:
  - Received at least one CT scan
  - Before the age of 10 years
  - Between 2000 and 2011
  - In one of the 21 participating university hospitals.

- First analysis [Childhood CT scans and cancer risk: impact of predisposing factors for cancer on the risk estimates, Journy et al., 2016]:
  - No evidence of significant increased risks of central nervous system (CNS) tumours and leukaemia due to CT x-rays dose.
  - Similar risk estimates with or without exclusion of patients having cancer predisposing factors (PF) from the analysis.

Update of the cohort

- Update of the cohort to increase the statistical power:
  - 40,000 new patients with reported vital status
  - 5 additional years of follow-up.

- Improved exposure assessment with the French Health Insurance database:



Study population and CT scans exposure

100 560 PATIENTS FOLLOWED UNTIL 2016 (EXCLUSION PERIOD OF 2 YEARS)

Mean age at inclusion (1st CT): 3 years

Mean follow-up: 9 years

Patients with PF: 3%

75 cases of CNS tumours, 39 cases of leukaemia and 41 cases of lymphoma

EXPOSURE BETWEEN 2000 AND 2016

Patients with one CT scan: 73%

Children with CT scans performed outside the participating hospitals between 2006 and 2011: 5%

Children with CT scans after 2011: 8%

Mean cumulative absorbed doses: 28 mGy to the brain and 10 mGy to the red bone marrow (RBM)

Data analysis

A Cox model to evaluate the relationship between cumulative absorbed organ dose and cancer incidence (CNS tumours, leukaemia and lymphoma):

- Follow-up until the first cancer, the death, the 18th birthday or 31st December 2016.
- Instantaneous hazard rate of cancer incidence of patient i at age t:

$$h_i(t;\beta,\gamma) = h_o(t).exp(\beta X_i^{cum}(t) + \gamma S_i)$$

- $h_o(t)$: baseline instantaneous hazard rate at age t.
- $X_i^{cum}(t)$: cumulative X-ray absorbed organ dose of patient i at age t, lagged by 5 years for CNS tumours (brain dose) and 2 years for leukaemia and lymphoma (RBM dose).
- $exp(\beta)$: instantaneous hazard ratio (HR) associated with a 10 mGy increment of cumulative absorbed dose.
- S_i: gender of patient i.
- Models fitted to the cohort and to the restricted subcohorts of patients with and without PF.

CNS tumours, leukaemia and lymphoma HR estimates

CNS TUMOURS

Patients	All	Without PF	With PF
Cases	75	50	25
HR (CI 95%)	1.06 (1.02 ; 1.09)	1.05 (1.01 ; 1.09)	1.03 (0.96 ; 1.12)

LEUKAEMIA

Patients	All	Without PF	With PF
Cases	39	35	4
HR (CI 95%)	1.16 (1.07 ; 1.26)	1.17 (1.09 ; 1.26)	0.27 (0.02 ; 3.49)

LYMPHOMA

Patients	All	Without PF	With PF
Cases	41	26	15
HR (CI 95%)	0.89 (0.61 ; 1.30)	0.96 (0.63 ; 1.45)	0.70 (0.36 ; 1.36)

For a 10 mGy increment of cumulative organ dose.

Discussion

- Increased statistical power of the French CT cohort compared to the previous analysis.
- Identification of CT scans performed after the initial inclusion period and outside the participating hospitals → HRs estimates were not impacted by the inclusion of these additional CTs.

- Organ doses estimates affected by some sources of uncertainty (variations from the protocol and from the morphology of the anthropomorphic phantom…).
- Cancer diagnoses only available until the 18th birthday → A cohort of patients treated from a cancer in France is being developed from the French Health Insurance database.

Thank you for your attention!