

# MONITORING OF POSSIBLE HEALTH EFFECTS OF LIVING IN THE VICINITY OF NUCLEAR SITES IN BELGIUM II

## CHILDHOOD LEUKEMIA INCIDENCE

### Summary

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#### INTRODUCTION

At the end of 2007, the German KiKK-study [1,2] on childhood cancer gave rise to a worldwide public concern about the possible health risks associated with living in the vicinity of nuclear power plants. In August 2008, a radiological incident happened at the Institute for Radio-Elements situated in the nuclear site of Fleurus. In response, the Belgian Minister of Social Affairs and Public Health commissioned a study to assess, by means of an epidemiological study at the national level, the possible health risks for populations living in proximity of nuclear power plants or other facilities that can be at the origin of a release of radioactive material. The Minister's request was first discussed in a multidisciplinary think tank. One of the conclusions was that the study should be considered as a first approach to study possible health risks of living in the vicinity of nuclear sites in Belgium. The results of this study were published in 2012 [3]. No higher incidence<sup>1</sup> of thyroid cancer was observed around the nuclear power plants of Doel and Tihange. It was impossible to draw any scientific conclusions for the Belgian territory around the French power plant of Chooz because of instability of the results due to the small population size. For the nuclear sites of Mol-Dessel and Fleurus, a slightly higher incidence of thyroid cancer as compared to the regional average was observed, but similar and higher incidences were also seen at other locations without nuclear sites. Close to the site of Mol-Dessel, the incidence of childhood acute

leukemia was higher than expected on the basis of the national average value, but this observation was based on a very low number of cases.

The present study is the follow-up thereof, requested on behalf of the Belgian Federal Parliament and follows the recommendations formulated in 2012:

- “To repeat the epidemiological monitoring within five years, since by that time more cancer data will have become available.”
- “To make health data available at smaller geographical level.”

The present study is carried out by the Consortium Sciensano (ex-Scientific Institute of Public Health), the Federal Agency for Nuclear Control, and the Belgian Cancer Registry.

#### EPIDEMIOLOGICAL STUDY

The present study has an ecological design and investigates the possible health risks for populations living around the major nuclear installations: the nuclear power plants of Doel and Tihange and the nuclear sites of Fleurus and Mol-Dessel. Both in Fleurus and in Mol-Dessel, there is a combination of industrial and research activities in the nuclear sector. The study particularly focuses on acute leukemia incidence in children (<15 years); the analyses on thyroid cancer incidence were presented in the first part of this report [4].

A large variety of radioactive substances can induce leukemia to occur. Due to its relatively short latency period, leukemia is the cancer one would expect to show up first after exposure to

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<sup>1</sup> Incidence: number of new cancer cases in a population within a specified period of time.

ionizing radiation and children can develop leukemia even more rapidly, due to their higher sensitivity. For these reasons, childhood leukemia is the health outcome that has been studied by far the most around nuclear sites.

More specifically, the present study has investigated whether the incidence of childhood acute leukemia, the most common type of leukemia in children, is higher than expected in the vicinity of the nuclear sites. In a second phase, the study investigated whether there was evidence for a gradient in the occurrence of these cancers with increasing surrogate exposures from the nuclear sites. To this purpose, surrogate exposure was defined, subsequently based on (i) distance to the nuclear site, (ii) wind direction frequency and (iii) hypothetical radioactive discharge estimates. The present study was performed at the level of the statistical sector. Information on statistical sectors is available in the data coming from the InterMutualistic Agency that are more reliable from 2006 onward. As a consequence, the present study covered the years 2006 to 2016.

No evidence was found for a higher incidence of cases of childhood acute leukemia near the nuclear power plants of Doel and Tihange. Regarding the industrial and research nuclear sites, no evidence for a higher incidence was observed around Fleurus. In the close vicinity of Mol-Dessel, a higher incidence of childhood acute leukemia was observed and there was an indication for a gradient in childhood acute leukemia incidence with the different types of surrogate exposures considered in the 20 km area around the site (decreasing distance, increasing wind direction frequency and increasing exposure to estimated hypothetical radioactive discharges).

The current study was performed at the level of the statistical sector. The statistical sector is the smallest basic areal unit defined by the Belgian statistical office and for which cancer cases and population data are available. Compared to the previous study at the commune level, such analysis reduces misclassification of the exposure and ecological bias due to smaller within-area variation of the exposure, but ecological fallacy cannot be excluded. Although an ecological study design allows for providing some answers to the public concern of whether there is or might be an increased occurrence of a given disease around a potential pollution source, this study is inherently descriptive. An ecological study does not allow to draw

conclusions with regard to any possible causal relationships. Neither does this type of study allow any conclusion at the individual level.

## CONCLUSIONS

The possible influence of living in the vicinity of the Belgian nuclear sites has been investigated through a close collaboration between the Federal Agency for Nuclear Control, the Belgian Cancer Registry and Sciensano.

No evidence was found for a higher incidence of cases of childhood acute leukemia around the nuclear sites of Doel, Tihange or Fleurus. In the close vicinity of Mol-Dessel, a higher incidence of childhood acute leukemia was observed and there was an indication for a gradient in childhood acute leukemia incidence with the different surrogate exposures considered in the 20 km area around the site.

It needs to be stressed that these results are based on a small number of cases. Moreover, ecological studies are descriptive and as such do not allow inferring causal relationships on the origin of variations in incidence. Neither do they provide information at the individual level.

- [1] Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M. Leukaemia in young children living in the vicinity of German nuclear power plants. *Int J Cancer* 2008;122:721–6. <https://doi.org/10.1002/ijc.23330> [doi].
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- [3] Bollaerts K, Fierens S, Simons K, Francart J, Poffijn A, Sonck M, et al. Monitoring of Possible Health Effects of Living in the Vicinity of Nuclear Sites in Belgium. Brussels: Belgian Institute of Public Health; 2012.
- [4] Demoury C, De Schutter H, Faes C, Carbonnelle S, Van Damne N, Van Bladel L, et al. Monitoring of possible health effects of living in the vicinity of nuclear sites in Belgium II. Part A: Thyroid cancer incidence. Brussels: 2019. <https://doi.org/D/2019/14.440/7>.

The full report is available upon request: please contact [nucabel2@sciensano.be](mailto:nucabel2@sciensano.be).