

# Feasibility study to centralize French occupational blood lead levels

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## Background

French regulatory limit for occupational blood lead levels (BLL) is 400 µg/L for men and 300 µg/L for women and require worker removal from the workstation if a single blood lead concentration exceeds those BLLs.

In French general population, BLLs geometric mean for adults is 26 µg/L with 1.7% of BLLs ≥100 µg/L which can be considered as elevated (threshold for children lead poisoning) (1).

About 115,000 French employees are potentially exposed to lead (2). According to French labour regulation those workers are regularly monitored for BLL during occupational health visit (3). However, no data gathering occupational BLLs are currently available at a national level in France.

The Department of Occupational Health of the French Institute for Public Health Surveillance (Institut de veille sanitaire, InVS) was requested by the Ministries of Health and Work to establish an occupational BLLs surveillance system.

## Objectives

The main objective of this system is to centralize all BLLs prescribed by occupational physicians in a national database to document lead impregnation of French employees and identify patterns and trends in occupational BLLs. These data will provide information:

- to identify high risk occupations, workplaces and industries and direct prevention strategies;
- to discuss the relevance of reducing the regulatory BLL for women of childbearing age;
- to develop occupational exposure assessment tools (job-exposure matrix).

## Methods

In a first place, a pilot study to assess the feasibility of collecting occupational BLLs was initiated in September 2012, for one year, in two French regions: Ile-de-France and Nord-Pas-de-Calais (representing around 18,000 workers potentially exposed to lead according to SUMER 2010 survey).

All employees monitored for BLL during their occupational health consultation were concerned and around 2,300 occupational physicians have been solicited to participate to our study (figure 1).

For each BLL prescription, practitioners were asked to fill and send to InVS a brief form including employee's identification, occupational information, company characteristics and BLL result (table 1).

InVS assigned a unique anonymous ID number to each worker to account for multiple BLLs and registered data. Occupational information is encoded according to French occupational classification (PCS 2003) and economic activities classification (NAF 2008).

TABLEAU 1	FORM VARIABLES DESCRIPTION
PATIENT INFORMATION	
Surname (3 first letters)	Text
First name	Text
Birth date	DD/MM/YYYY
Sex	1 = Male / 2 = Female
Occupation department	Numeric
Economic activities classification (NAF 2008)	Text
Company status	1 = Private company / 2 = Public company
Subcontracting company	1 = Yes / 2 = No
Company workforce	1 = ≤9 / 2 = 10-49 / 3 = 50-499 / 4 = ≥500
Occupation	Text
Company economic activity	Text
Job description	Text
Qualification level	1 = Maneuver or semi-skilled worker 2 = Skilled or highly-skilled workers or shop technician 3 = Foreman 4 = Manager or deputy manager 5 = Technician, designer, sales representative 6 = Teacher, social worker, nurse and other public service staff (category B) 7 = Engineer or executive staff 8 = Professor or public service staff (category A) 9 = Office worker, commercial employee, service agent, health care assistant, nannies, public service staff (category C or D) 0 = Other
Employee status	1 = Permanent contract 2 = Fixed-term contract 3 = Temporary
Dosage context	1 = Systematic monitoring 2 = Exceptional monitoring (incident, ...)
OCCUPATIONAL PRACTITIONER INFORMATION	
Surname	Text
Medical unit	Text
Address	Text
Telephone number	Text
BLL prescription date	DD/MM/YYYY
Previous BLL prescription date	DD/MM/YYYY
BLL INFORMATION	
Measuring laboratory name	Text
Laboratory Address	Text
BLL measurement date	DD/MM/YYYY
BLL measure	Numeric
BLL unit of measurement	1 = µg/L / 2 = µmol/L

## Results

On July 2013, nearly 1,800 questionnaires have been received, 1,316 have already been registered in the database concerning 1,202 employees. The presented results concern only registered data. For workers with more than one BLL, only the highest was included in the analysis.

Questionnaires have been sent by 52 occupational physicians and concerned 1,147 men (95%) and 55 women (5%) with a mean age of 41 years.

**BLLs geometric mean was 83.6 µg/L** (86.9 µg/L for men and 37.7 µg/L for women), ie. 3 times higher than in French adult general population. **BLLs ≥100 µg/L were observed for approximately half the employees versus 1.7% in general population. BLLs >400 µg/L were reported for 13 men (1.1%) and BLLs >300 µg/L for 1 woman (1.8%).**

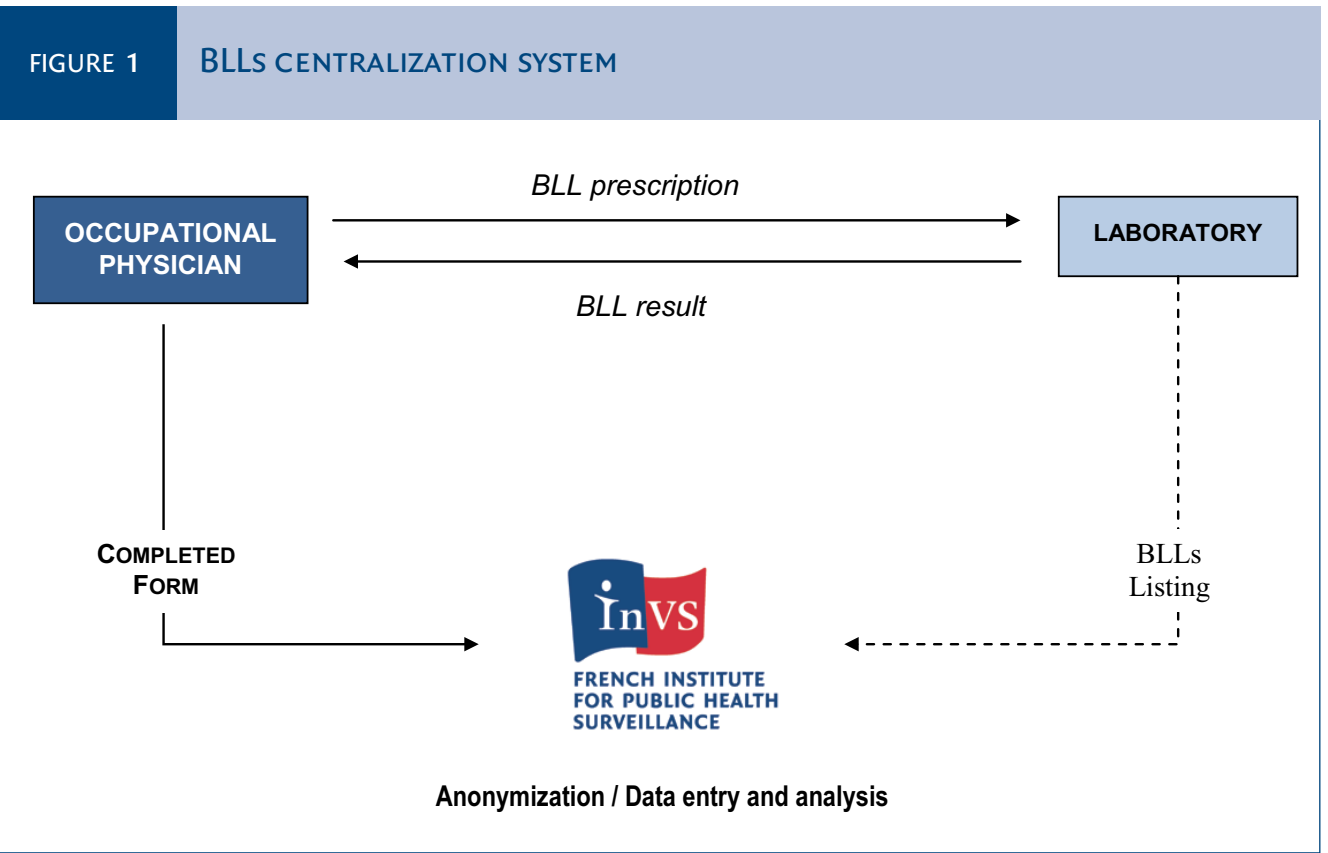
The majority of workers with elevated BLL were employed in the following industry sectors: manufacture of electrical equipment, manufacture of basic metals, manufacture of other non-metallic mineral products, repair and installation of machinery and equipment.

## Discussion/conclusion

The pilot study tested the feedback of the experimental protocol and explored the feasibility to use individual BLL to monitor lead exposure of French employees and to follow the trend of BLLs.

The next step is to extend this system across the country and reach a systematic registering of BLLs in working population. A careful thought should be conducted to identify potential ways of improving the centralization.

This system will allow to estimate BLL averages among employees according to their occupational activity (occupation and company economic activity) in France and will enable to discuss current recommendation and regulation, especially with regard to certain situations of work, age or gender.



## References

- (1) Fréry N, Saoudi A, Garnier R, Zeghnoun A, Falq G, Guldner L. Exposure of the French population to environmental pollutants – Environmental components of the French National Survey on Nutrition and Health – Initial results. Saint-Maurice (Fra): French Institute for Public Health Surveillance, september 2010, 12 p.
- (2) Sumer 2010 survey, DARES – preliminary data analysis, InVS.
- (3) Labour Code – Art. R4412-160

