Exposure to carcinogens at work – results from the Belgian PROBE study and its policy impact.

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BE Federal Public Service Employment, Labour and Social Dialogue

PROBE study

Assessing the exposure of Belgian workers to dangerous chemicals by means of sentinel surveillance.

FEDERAL PUBLIC SERVICE EMPLOYMENT,
LABOUR AND SOCIAL DIALOGUE

PROBE study

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Availability of exposure data

CAD art. 4.1,3rd point: The employer has to take the level, type and duration of exposure into consideration for the risk assessment.
CAD art. 10.3: Health and exposure records have to contain a summary of the results of the health surveillance and of any monitoring data representative of the exposure of the worker.
CMD art. 5.5 When using a carcinogen or mutagen, the employer shall … (e) use existing appropriate procedures for the measurement of carcinogens or mutagens, in particular for the early detection of abnormal exposures.

- Internal Services for Prevention and Protection at work (ISPP) (10% of all workers).
- External Services for Prevention and Protection at Work (ESPP) (90 % of all workers).

> Mandatory reporting of exposure data on a wide range of substance(s) (groups) in their annual reports.

Quality of exposure data

- The quality of exposure data from ESPP annual reports is insufficient to draw reliable conclusions about the exposure of Belgian workers to chemical substances.
- Registration by ISPPs is more detailed, but less quantitative; compromising representativeness.
- Recommendation: registration of exposure data should be standardized as much as possible, performed meticulously, continuously and with a clear objective.

Selection of substances

Solvents

Chlorinated hydrocarbons
trichloroethylene, perchloroethylene, methylenechloride, 1,2-dichloroethane, chloroform

Aromatic hydrocarbons
benzene, toluene

Ketones
methyl-iso-butylketone (MIBK)

Other organic compounds
formaldehyde

Dust
Wood dust, RCS, powder coating materials

Fibers
asbestos, refractory ceramic fibers

Fumes
welding fumes, diesel engine emission

Isocyanates
MDI, HDI, TDI

Metals
cadmium, lead, beryllium

Sentinel surveillance

A relatively fast way to collect reliable epidemiological data.

Sentinel surveillance network

- occupational physicians (preselected, voluntary basis, representative sample),
- preparatory training,
- well-defined period,
- well-defined objective,
- performed during the routine medical surveillance.

Establishing the network: recruitment

target: 80 occupational physicians from ESPPs and 10 from ISPPs

64 OPs were initially recruited (6.4% of the total BE OP population). Volunteers were asked to complete an online module at first (explanation of the project; short questionnaire for the OP; e-learning module: background information about the selected chemicals).

59 completed the online module (92% response), and 47 (6 ISPP, 41 ESPP) performed the actual survey (73 % response) = 4.7% of the OP population.

Those 47 OPs can be considered a reasonable representation of the total BE OP population (except for the geographical distribution).

Comparison with SUMER: 21.5% (1994), 32% (2003), 42.9% (2010) of the total FR OP population.

Data collection

- Participating OPs were sent 21 links to the web survey (1 test version and 20 versions to be completed).
  - brief explanation of the investigation for the worker
  - informed consent for the worker
  - questionnaire on exposure to a selection of chemicals

- To ensure that the recruitment of workers is as random as possible, OPs are asked to perform the interview with the 5th and/or 10th and/or 15th…. worker who undergoes the medical surveillance on that particular day.

- Questionnaire on exposure to a selection of chemicals:
  - administrative data (of the worker and of the company) and
  - exposure data (the duration and level of exposure, use of protective equipment)

Data collection

Substance: X

Exposure during the previous week: y/n

Duration (h/week): <2, 2-10, 10-20, >20, not known (report reason).

Level (exposure of general population or detection limit and OEL as reference points): very minor, minor, high, very high, not known (report reason).

Based on: measurement (report type)/estimation (report basis).

Collective protection equipment: none, ventilation, local aspiration, flowhood, closed system, other.

Personal protection equipment: none, skin, respiration, eyes.

Data collection: results

- 47 occupational physicians …
- who completed on average 14 questionnaires (per OP) …
- covered a total of 666 workers in 303 companies.

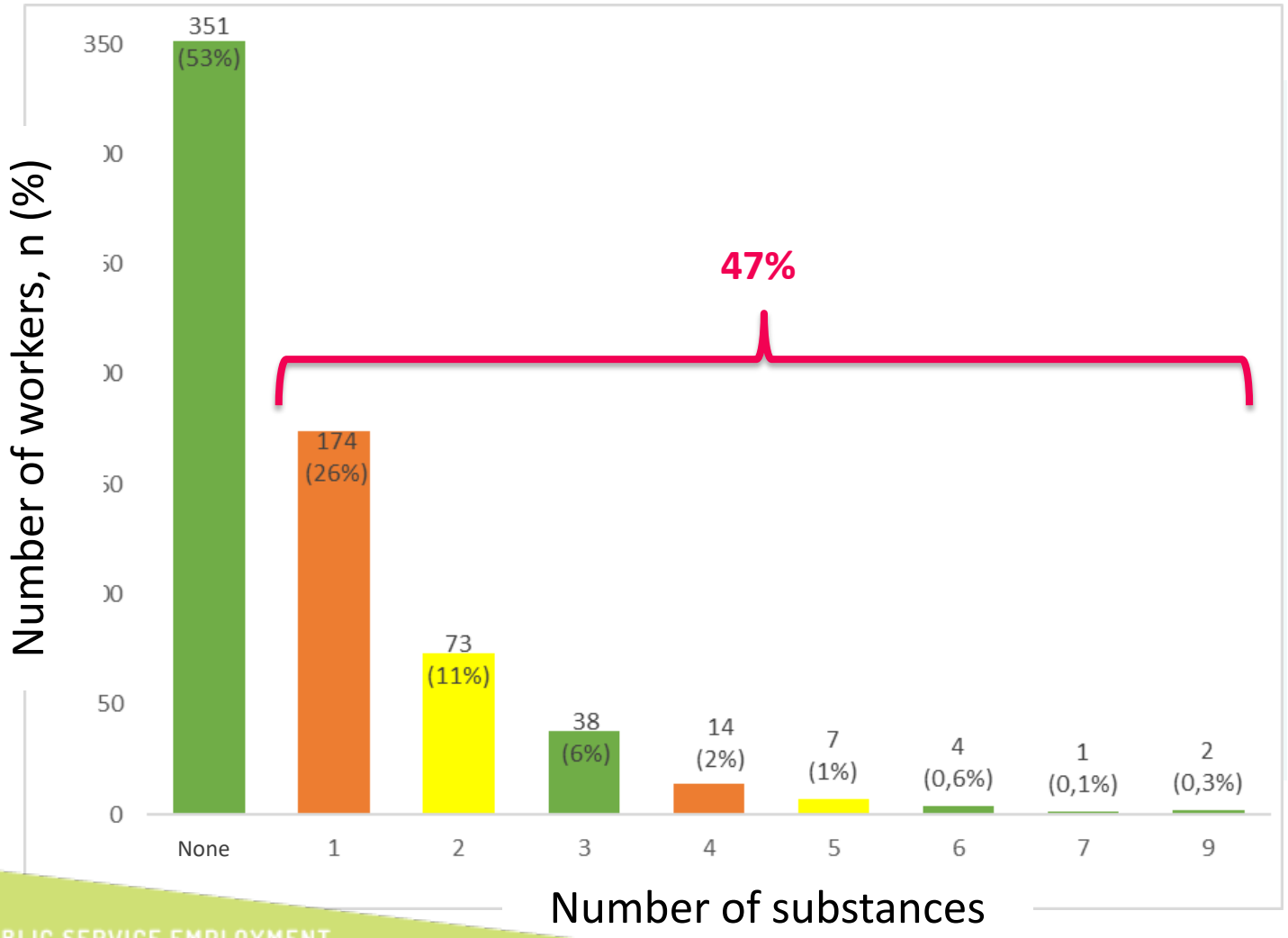
Comparison with FR SUMER (2010): 2400 OPs, 53,940 workers, on average 22 questionnaires per OP.

Results: data on workers / companies

	Participating workers N=666
Gender, n (%)	504 (76) male, 162 (24) female
Age (yr), mean (SD), range	42 (±11), 17 – 71
seniority, n (%) < 1 yr 1 - 3 yr 3 - 10 yr ≥ 10 yr	 97 (14) 86 (13) 152 (23) 331 (50)
employment %: full-time, n (%), part-time, n (%) mean employment % of part-time workers (SD), range	561 (84), 105 (16) 65 (±19) , 10-95

Results: data on workers / companies

Results: data on exposure



Results: data on exposure

Chemical agent	# workers, n (%)
diesel engine emission	91 (14)
welding fumes	77 (12)
toluene	67 (10)
wood dust	60 (9)
benzene	44 (7)
RCS	40 (6)
formaldehyde	26 (4)
asbestos	26 (4)
lead and -compounds	23 (3)

	# exposed workers, n (%)
	total: 315
Gender	
Male	227 (88)
Female	38 (12)
Age category	
< 25	15 (5)
25 - 29	39 (12.5)
30 - 39	89 (28)
40 - 49	77 (24.5)
≥ 50	95 (30)

Comparison to SUMER (2010): majority male, young workers

Results: data on exposure

	# exposed workers, n (%)
	total: 315
Main function	
construction	40 (12)
services to companies	3 (1)
product handling, product storage, logistics	31 (10)
trade & sales	3 (1)
installation, repair, technical maintenance	66 (21)
R&D	16 (5)
production, manufacturing	98 (31)
cleaning, domestic cleaning, security	9 (3)
care	15 (5)
others	34 (11)

Comparison SUMER (2010): maintenance, construction

Results: data on exposure

	# exposed workers, n (%)
	total: 315
Seniority	
< 1 yr	36 (11)
1 - 3 yr	37 (12)
3 - 10 yr	82 (26)
≥ 10 yr	160 (51)

Size of the company	# exposed workers / total # workers %
>200 workers	40
51-200 workers	49
21-50 workers	62
6-20 workers	60
<6 workers	51

Comparison SUMER (2010): Pred. small enterprises <10 workers

Results: lack of preventive measures: no CPM, no PPE

Chemical agent	% of workers with no CPM and no PPE		
	PROBE	SUMER 2003	SUMER 2010
diesel engine emission	54	42	32
welding fumes	8		
toluene	12		
wood dust	32	22	10
benzene	16		
RCS	20	22	7
formaldehyde	15	10	5
asbestos	19	20	10
lead and -compounds	9	20	5

Results: exposure to RCS

Exposure parameter		# workers, n (%)
	< 2h	13 (32.5)
	2h-10h	16 (40)
Duration	10h-20h	4 (10)
	≥ 20h	7 (17.5)
	not known	0 (0)
	very minor	12 (30)
	minor	22 (55)
Level (*)	high	6 (15)
	very high	0 (0)
	not known	0 (0)

(*)
very minor: slightly increased relative to the exposure level of the general population or relative to the detection limit;
minor: less than 50% of the OEL;
high:- approximately 50% of the OEL;
very high: more than 50% of the OEL.
37 levels were estimated, 3 measured.

Results: exposure to RCS

Prevention measures		Number of workers, n (%)
Collective protection measures	None	17 (42.5)
	Ventilation	17 (42.5)
	Local aspiration	8 (20)
	Flowhood	1 (2.5)
	Closed system	2 (5)
	Other	4 (10)
Personal protection measures	None	17 (42.5)
	Dermal	9 (22.5)
	Respiratory	20 (50)
	Ocular	14 (35)

8 workers (20%) had no collective protection measures and used no PPE's

Exposure parameter		# workers with no CPM and no PPE, n (%)
	< 2h	5 (62.5)
	2h-10h	1 (12,5)
Duration	10h-20h	0 (0)
	≥ 20h	2 (25)
	not known	0 (0)
	very minor	2 (25)
	minor	4 (50)
Level (*)	high	2 (25)
	very high	0 (0)
	not known	0 (0)

Results: workers exposed to RCS

		# workers, n (%)
function	construction	12 (30)
	product handling, product storage, logistics	3 (7.5)
	R&D	4 (10)
	production, manufacturing	13 (32.5)
	installation, repair, technical maintenance	7 (17.5)
	others	1 (2.5)
Gender	male	39 (98.5)
	female	1 (1.5)
Age	< 25	2 (5)
	25 -29	4 (10)
	30-39	7 (17.5)
	40-49	19 (47.5)
	> 50	8 (20)

Functions mentionned in individual questionnaires:

manipulating concrete, machine operator, maintenance worker, process operator, project engineer, grinder, welder, woodworker, bricklayer, electrician, dentist, PhD researcher, construction worker, painter, warehouse worker, stonemason, bargee, drilling expert, prevention consultant, soil sampler.

Conclusion

The sentinel surveillance approach used in this project can be considered a good method to get a more accurate picture of the exposure of Belgian employees to chemicals, provided some adjustments and adaptations to the current methodology are made.

- Points that need further attention:
  - fine-tuning of the questionnaire
  - training of the participating occupational physicians.
  - expanding the network (representativeness)

Conclusion

Strengths of the approach:

- Through a limited sentinel surveillance network a considerably larger amount of workers can be reached.
- A large amount of data can be obtained in a relatively short period of time.
- Occupational physicians have the medical and technical expertise, knowledge of the companies and the activities of the employees.

Limitations of the approach:

- Participation adds to the workload of the occupational physicians.
- Knowledge about the precise level of exposure is lacking.
  - estimations can be subjective,
  - measurement results depend on several parameters,
  - some OELs are outdated,
  - for some chemicals no OEL is defined.

Policy recommendations

- Expanding the sentinel surveillance network to improve random sampling.
- Repeating the surveillance regularly to determine trends and follow-up after corrective actions.
- Tasks of occupational physicians: providing time to participate in scientific research.
- Imposing more measurements, and collaborating with I/E-SPP to gather reliable exposure data.

Reference

PROBE studie: Onderzoek naar de blootstelling van de Belgische werknemers aan gevaarlijke chemische producten via peilpraktijken.

Etude PROBE: Recherche sur l'exposition des travailleurs belges aux produits chimiques dangereux par enquête.

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7. SPMT-ARISTA

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http://www.werk.belgie.be/moduleDefault.aspx?id=45207 (NL)

http://www.emploi.belgique.be/moduleDefault.aspx?id=45207 (FR)

Thank you for your attention!