

# Use of Disinfectants among Nurses in Health Care Facilities and its Association with Type II Diabetes

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# Introduction

- Disinfectants is a wide class of chemicals that are widely used in hospitals and general healthcare facilities to inactivate microorganisms on surfaces or inanimate objects.
- The frequency of disinfection tasks in hospitals is increasing during the last years (Quinn et al., 2015).
- Nurses represent a large in number occupational group in the healthcare sector, worldwide, being systematically exposed to disinfectants and other cleaning chemicals, including numerous volatile organic compounds (LeBouf et al., 2014).
- A suite of respiratory symptoms at the workplace have been linked with disinfectant exposures (Quinn et al., 2015).

Quinn, M.M., CIHa P.K., Henneberger, 2015, American Journal of Infection Control, 43: 424-434.

LeBouf, RF, M Virji, R Saito, PK Henneberger, N Simcox, and A.B. Stefaniak, 2014. Occup Environ Med. 71: 642–650.

# Objectives

- To assess occupational exposures of active and past nurses from the CONSTANCES cohort
- To explore possible links between occupational exposures, and prediabetes and/or type 2 diabetes (T2D) status of nurses

# Study design and data

- Cross-sectional study (baseline)
- Using only females (very small number of male nurses)
- Baseline data
  - Variable selection: October 2016
    - Anthropometrics, demographics, lifestyle factors, medical history with regards to T2D and other relevant conditions (i.e. hypertension), the complete exposure and professional history

# Data analysis workflow

- Selection of nurses from the professional schedule and the exposures datasets using the string “INFIRM” or “IMFIRM”
  - Exclusion of incoherent entries from the professional schedule dataset
  - Estimation of the total period a participant was a nurse was, taking into account inconsistencies and missing data
- Grouping of participants as active or non-active nurses (occupation status)
- Grouping of participants based on the fasting glucose status
  - >7.0mmol/L : T2D
  - 5.6 and 6.9mmol/L: impaired fasting glucose (IFG) (prediabetes status)\*\*
- Exclusion of T2D cases because of small number for the analysis
- Estimation of the diabetes risk score\*
- Recoding of the “other exposures” --- exposures to other chemicals or solvents
  - Use of disinfectants
  - Participation in chemotherapy-related activities

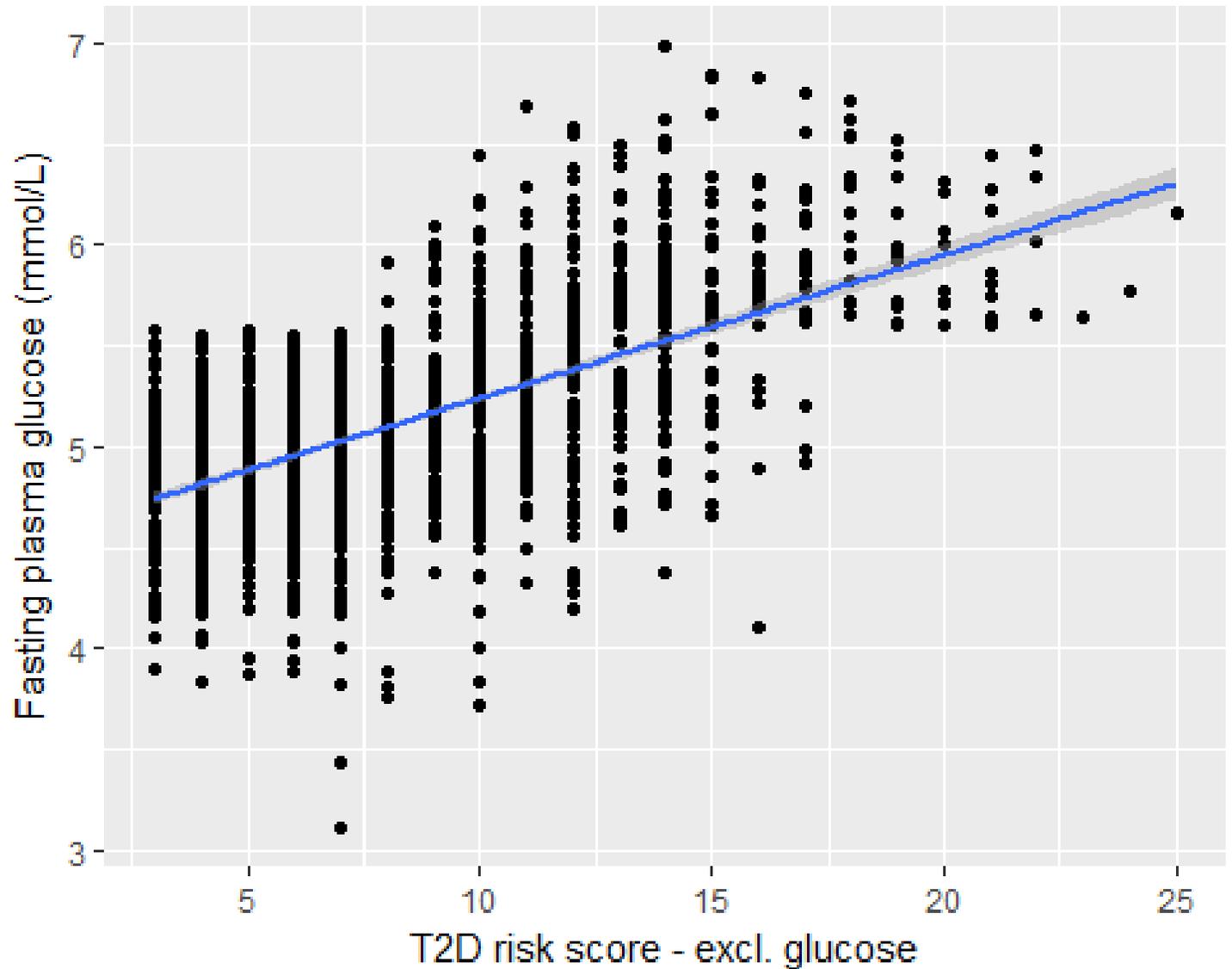
\*Based on age, BMI, waist circumference, physical activity, consumption of fruits, vegetables, hypertension medication, high blood glucose, history of diabetes

\*\*Cut-off of the American Diabetes Association

# Descriptives (Demographics, anthropometrics, clinical measurements)

	Nurses occupational status				Fasting plasma glucose (mmol/L)		
	Overall	Active	Non Active	p	<5.6	>=5.6	p
n	1848	1397	451		1562	286	
Age (mean (sd))	48.85 (12.76)	44.69 (11.28)	61.71 (7.38)	<0.01	47.44 (12.87)	56.52 (8.89)	<0.01
BMI (kg/m <sup>2</sup> , mean (sd))	24.39 (4.47)	24.13 (4.41)	25.21 (4.59)	<0.01	23.96 (4.20)	26.74 (5.19)	<0.01
Weight (kg, mean (sd))	64.68 (12.28)	64.56 (12.27)	65.07 (12.33)	0.44	63.68 (11.49)	70.19 (14.80)	<0.01
Height (cm, mean (sd))	162.89 (6.12)	163.58 (6.10)	160.76 (5.67)	<0.01	163.06 (6.08)	161.99 (6.29)	0.01
Waist-to-hip ratio (mean (sd))	0.80 (0.07)	0.79 (0.07)	0.83 (0.08)	<0.01	0.79 (0.07)	0.84 (0.07)	<0.01

- Correlation between the fasting plasma glucose levels and the diabetes risk score estimated excluding the glucose levels
- Spearman coefficient: 0.49



# Exposure to disinfectants and chemotherapy-related activities

		Occupational status			Fasting plasma glucose		
	Overall	Active	Non Active	P	< 5.6 mmol/L	≥ 5.6 mmol/L	p
	1848	1397	451		1562	286	
<b>Exposure to disinfectants (based on Formaldehyde and Other chemicals) (%)</b>							
<b>Disinfectant Use</b>	200 (10.8)	160 (11.5)	40 (8.9)	0.15	180 (11.5)	20 (7.0)	0.03
<b>No Disinfectant Use</b>	1648 (89.2)	1237 (88.5)	411 (91.1)		1382 (88.5)	266 (93.0)	
<b>Exposure to chemotherapy</b>							
<b>Chemotherapy-related exposure activities</b>	80 (4.3)	63 (4.5)	17 (3.8)	0.59	71 (4.5)	9 (3.1)	0.36
<b>No exposures to chemotherapy activities</b>	1768 (95.7)	1334 (95.5)	434 (96.2)		1491 (95.5)	277 (96.9)	

Exploratory univariable logistic regression results (Odds ratios for being above 5.6 mmol/L fasting blood glucose)

General characteristics	Overall		
	OR	95% CI	p
Age (years)	1.07	1.06 – 1.09	<0.001
BMI (kg/m <sup>2</sup> )	1.13	1.10 – 1.16	<0.001
Creatinine (μmol/L)	0.99	0.98 – 1.01	0.27
Gamma GT (U/L)	1.01	1.01 – 1.02	<0.001
Alanine transaminase (U/L)	1.03	1.02 – 1.04	<0.001
Smoking (pack years)	1.03	1.02 – 1.04	<0.001
Being an active nurse	0.39	0.30 – 0.51	<0.001

Exposures	Overall		
	OR	95% CI	p
Disinfectant use (Yes/No)	0.58	0.35 – 0.91	0.02
Disinfectant use (years)	0.98	0.95 – 1.01	0.22
Chemotherapy-related exposures (Yes/No)	0.68	0.31 – 1.31	0.29
Chemotherapy-related exposures (years)	0.98	0.92 – 1.03	0.51
Years being a nurse	1.03	1.02 – 1.04	<0.001
Work and travel times requiring you			
- To go to bed after midnight at least 50 days per year - A03 (years)	1.04	1.02 – 1.06	<0.001
- To get up before 5am at least 50 days per year - A04 (years)	1.04	1.02 – 1.06	<0.001
- To not to sleep at night at least 50 days per year - A05 (years)	1.02	1.00 – 1.04	<0.02
Daily work time of more than 10 hours at least 50 days per year - A06 (years)	1.03	1.02 – 1.05	<0.001
Work more than one in two Saturdays during the year - A07 (years)	1.02	1.01 – 1.04	<0.001
Work more than one in two Sundays during the year - A08 (years)	1.02	1.00 – 1.03	0.02
Having/had less than 48 consecutive hours of rest week - A09 (years)	1.03	1.01 – 1.05	0.00
Alternating shift-based job - A11 (years)	1.04	1.02 – 1.05	<0.001
Infectious risk at work - E23 (years)	1.04	1.03 – 1.05	<0.001
Exposure to radiation (X-rays, gamma rays) - F25 (years)	1.03	1.01 – 1.05	0.01

# Limitations

- Grouping the exposures and estimating the years of exposure as a proxy of exposure burden can lead to misclassification
- Identifying disinfectants in the absence of specific questions
- Correlation between exposures in the occupational settings need to be accounted for

# Perspectives

- At the time data were extracted for this project, jobs were not coded and JEMs not available, leading to imprecise evaluation and misclassification of exposures
- Currently job histories are being coded (about 50,000 already coded) and we are planning to implement existing job-exposure matrices\* and job-task-exposure matrices\*\* allowing for a better evaluation of exposures

\*Matg  n   (DST-SP France), CANJEM (U Montr  al)

\*\*Quinot et al. Occup Environ Med, 2017

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