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# **Association between occupational exposures and gestational hypertension, preeclampsia, and gestational diabetes in Sweden, 1994-2012**

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# Background

- Some studies have shown that exposure to air pollution at the residential level is associated with an increased risk of pregnancy-induced hypertension, preeclampsia and diabetes.
- Limited data on airborne occupational exposures during pregnancy and maternal morbidity.

## Purpose

- To identify whether occupational exposures to dust, gases, fumes, and particles are associated with gestational hypertension, preeclampsia, or gestational diabetes.



## Methods: Sample

- Nationwide cohort of pregnant women
- Medical Birth Register
  - Data collected as part of routine visit with midwife throughout pregnancy
- To be included in this study
  - Singleton pregnancy
  - Working and have provided an occupation during week 10 visit
  - Nonworking occupations, e.g. student, homemaker were excluded
  - Children born between 1994 and 2012

## Methods: Exposure

- Swedish Job Exposure Matrix
  - Adapted from Finnish Information System on Occupational Exposure (FINJEM) to Swedish conditions
  - Exposures in 10 year intervals, beginning in 1955
  - Two time periods of interest: 1995-2004 and 2005-2014
  
- Agents measured:
  - Inorganic: asbestos, silica, lead, iron, nickel, chrome, concrete/stone, other inorganic
  - Organic: wood, animal, paper, textile, flour, oil mist, cooking fumes, other organic
  - Combustion: asphalt, diesel, benzo(a)pyrene, polycyclic aromatic hydrocarbons (PAH), other combustion
  - Welding fumes

		Oorganiskt damm														Organiskt damm															
NY matriskodning NY		stora		stora		stora		stora		stora		stora		stora		stora		stora		stora		stora		stora		små					
NYK 83		asbest		kvarts quar		bly pb		järn fe		nickel ni		krom cr		sten/b etong		övr oorg o		trädam m		djurda mm		papper sdam		textild amm		mjölda mm		oljedi mma/ m			
		fiber/cm		mg/m3		umol/l		mg/m3		ug/m3		ug/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3			
nyk		P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
751	Verkstadsmekaniker					8	0.60	90	0.10	40	2.50	60	15.00															80	0.50		
752	Maskinmontörer, hopsättare m.fl.	1	0.10					40	0.35	35	1.00	20	1.50																		
753	Maskin- och motorreparatörer m.fl.	2	0.01					40	0.15	33	1.20	33	1.00															20	0.22		
754	Tunnplåtslagare							50	0.50	25	2.70	25	3.48																		
755	Rörarbetare	1	0.10					50	0.08	10	0.80	10	0.40	30	0.05																
756	Svetsare, gasskärare m.fl.							70	1.30	25	15.00	25	20.00																		
757	Grovplåtslagare, stålkonstruktionsmont örer							90	1.00	25	2.70	25	3.48																		
758	Metalliserare m.fl.							46	0.03	45	12.00	60	10.00																		
759	Övriga med verkstads- och byggnadsmetallarbete							25	0.50	15	1.20	15	3.00																		
761	Elmontörer	2	0.01											30	0.05																
764	Telereparatörer och elektronikreparatörer, montörer																														

Iron=0.50 x 0.08  
Iron=0.04 mg/m3

## Methods: Exposure

- During week 10 interview each woman reported:
  - Employment status: full-time, part-time, not working
  - Occupation
- Occupations were cleaned and given AMSYK codes, which were then converted to NYK83 codes
- Divided exposure into three categories: inorganic, organic, combustion
  - Calculated aggregate exposure for inorganic and organic agents
    - Inorganic: sum of iron, concrete/stone, other inorganic only

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		fiber/cm		mg/m3		umol/l		mg/m3		ug/m3		ug/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3		mg/m3			
nyk		P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
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- Divided exposure into three categories: inorganic, organic, combustion
  - Calculated aggregate exposure for inorganic and organic agents
    - Inorganic: sum of iron, concrete/stone, other inorganic only
    - Divided into unexposed, low (< median), and high (median and above)
  - Welding fumes were kept separate

## Methods: Outcome

- Three outcomes from the Medical Birth Register:
  - Gestational hypertension
    - ICD-9 codes: '642', '642A', '642B', '642C', and '642D'
    - ICD-10 codes: 'O13', 'O139', 'O169'
  - Preeclampsia
    - ICD-9 codes: '642E', '642F', and '642H'
    - ICD-10 codes: 'O119', 'O14', 'O140', 'O141', and 'O142'
  - Gestational diabetes
    - ICD-9 codes: '648A'
    - ICD-10 codes: 'O244' and 'O249'



# Methods: Confounders and Analyses

- Confounders:
  - Medical Birth Register: age, smoking, country of birth, parity, employment status
  - LISA: education and marital status
  - Noise JEM: noise
  
- Main Analyses:
  - Crude and adjusted logistic regression on the 3 outcomes for the following exposures:
    - Inorganic, organic, combustion, welding fumes (any exposure vs none)
    - Inorganic and organic sum
  
- Sensitivity Analyses
  - First pregnancy only and full-time workers

# Preliminary Results

- Final Sample:
  - Excluding those who did not work or were missing occupation
    - 995,843 mother-child pairs
  - After excluding missing information on covariates
    - 915,712 mother-child pairs
- Gestational hypertension: 8,881 cases
- Preeclampsia: 27,580 cases
- Gestational diabetes: 7,078 cases

## Preliminary Results

Table 1: Adjusted\* ORs (95% CI); based on 915,712 working pregnant women

	Gestational Hypertension	Preeclampsia	Gestational Diabetes
<b>Inorganic</b>			
Yes (Any)	0.91 (0.79, 1.05)	0.96 (0.89, 1.04)	0.90 (0.76, 1.06)
<b>Organic</b>			
Yes (Any)	0.97 (0.88, 1.06)	0.98 (0.93, 1.03)	1.10 (1.00, 1.21)
<b>Combustion</b>			
Yes (Any)	0.83 (0.72, 0.95)	0.90 (0.84, 0.97)	0.83 (0.71, 0.96)
<b>Welding Fumes</b>			
Yes (Any)	0.92 (0.67, 1.27)	1.04 (0.88, 1.23)	1.04 (0.76, 1.41)
<b>Inorganic Sum<sup>a</sup></b>			
Low vs Unexposed	0.80 (0.63, 1.03)	0.89 (0.78, 1.03)	0.78 (0.57, 1.05)
High vs Unexposed	1.02 (0.81, 1.28)	1.11 (0.99, 1.25)	1.17 (0.93, 1.47)
<b>Organic Sum<sup>b</sup></b>			
Low vs Unexposed	0.92 (0.81, 1.03)	0.92 (0.86, 0.98)	1.03 (0.91, 1.17)
High vs Unexposed	1.03 (0.92, 1.16)	1.05 (0.98, 1.12)	1.16 (1.03, 1.30)

\*Adjusted for: age, smoking, education, marital status, country of birth, parity, noise

<sup>a</sup> Sum of: iron, concrete/stone, other inorganic

<sup>b</sup> Sum of: wood, animal, paper, textile, flour, oil mist, cooking fumes, other organic

## Preliminary Results

Table 2: Adjusted ORs (95% CI); based on 293,231 first-time pregnant women working full-time

	Gestational Hypertension	Preeclampsia	Gestational Diabetes
<b>Inorganic</b>			
Yes (Any)	0.99 (0.80, 1.21)	0.99 (0.89, 1.10)	1.12 (0.85, 1.47)
<b>Organic</b>			
Yes (Any)	0.89 (0.77, 1.04)	0.98 (0.90, 1.05)	1.13 (0.93, 1.37)
<b>Combustion</b>			
Yes (Any)	0.85 (0.69, 1.04)	0.90 (0.81, 0.99)	0.89 (0.67, 1.16)
<b>Welding Fumes</b>			
Yes (Any)	0.85 (0.50, 1.44)	1.05 (0.83, 1.33)	1.75 (1.07, 2.86)
<b>Inorganic Sum<sup>a</sup></b>			
Low vs Unexposed	0.79 (0.56, 1.12)	1.01 (0.85, 1.20)	1.02 (0.65, 1.60)
High vs Unexposed	1.17 (0.84, 1.65)	1.09 (0.92, 1.30)	1.66 (1.13, 2.44)
<b>Organic Sum<sup>b</sup></b>			
Low vs Unexposed	0.83 (0.68, 1.01)	0.95 (0.87, 1.04)	1.06 (0.83, 1.36)
High vs Unexposed	0.98 (0.80, 1.21)	1.00 (0.91, 1.11)	1.21 (0.95, 1.36)

\*Adjusted for: age, smoking, education, marital status, country of birth, noise

<sup>a</sup> Sum of: iron, concrete/stone, other inorganic

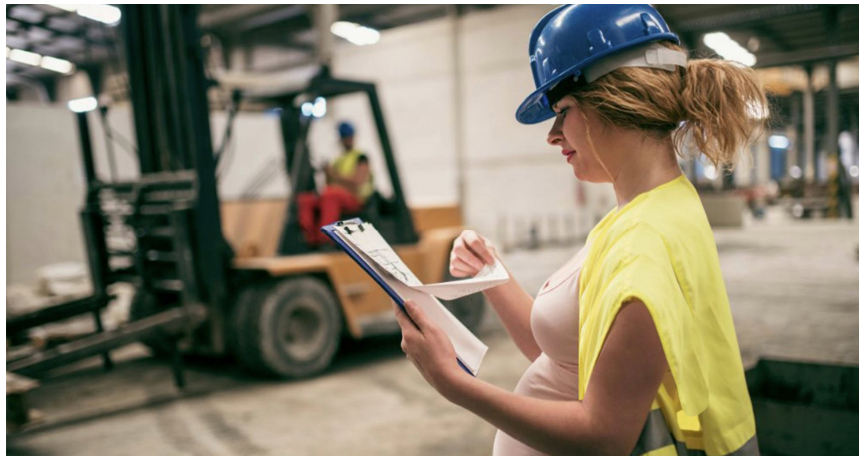
<sup>b</sup> Sum of: wood, animal, paper, textile, flour, oil mist, cooking fumes, other organic

# Preliminary Conclusion and Next Steps

- Preliminary conclusions:
  - Tendency for high exposure to organic and inorganic pollutants to be associated with an increased risk of all three studied outcomes
  - Associations were more pronounced for women pregnant for the first time working full-time and gestational diabetes
  
- Next steps
  - Work is ongoing
  - Updating noise JEM
    - Many in the current sample had missing noise levels, excluded
  - Continuously checking job coding for errors
  - Working on updating combustion exposures

# Questions

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**Thank You**