Multipla exponeringar
Buller och luftföroreningar
- med fokus på omgivningsmiljön

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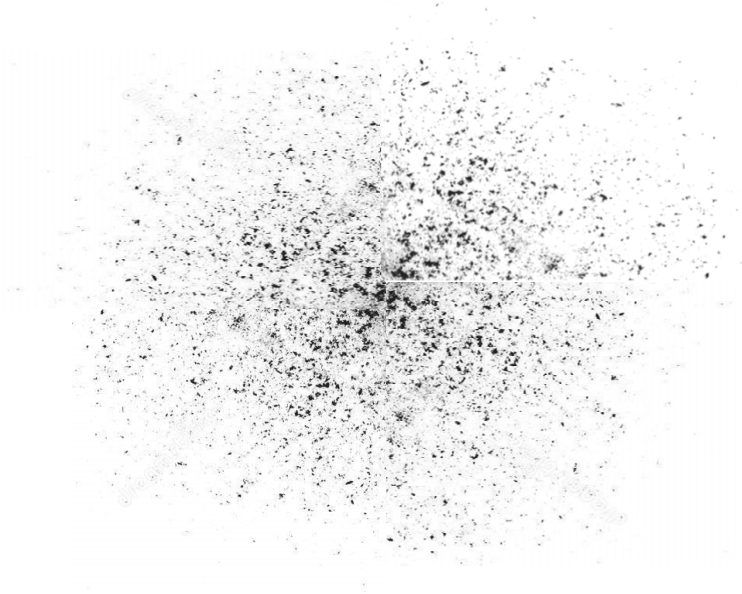
Upplägg – 20 min tot

- Allmänt buller och luftföroreningar, fokus på omgivningsmiljön
- Senaste studierna gällande buller-luftföroreningar i omgivningsmiljön i relation till hälsa.
- Tågstudier – olika upplevelse av störning (lite luftföroreningar)
- Grön-blå struktur
- Prata kort om Nordsound
- Snegla på arbetsmiljön, inte lika korrelerat.
- Senaste studierna där?
- Visa resultat från Filip och mig på studier justerade för varandra som visar på enskilda samband.
- Interaktionsanalyser buller PAH FENIX ?
- Visa kort upplägg AFA-hjärt-kärlstudien

Boendemiljön - Var vi väljer att bo påverkar vår hälsa

Samverkan mellan olika faktorer

Fokus på buller och luftföroreningar i omgivningsmiljön



……men grön/blåstruktur är på intåg

Forskningsstudier buller-luft

- Tidigare studerades buller och luftföroreningar för sig,
- …..men under de senaste åren har dessa studerats tillsammans.

Hjärt-kärlsjukdom

ESC European Society of Cardiology

European Heart Journal (2018) **00**, 1–7
doi:10.1093/eurheartj/ehy650

CLINICAL RESEARCH
Prevention and epidemiology

A systematic analysis of mutual effects of transportation noise and air pollution exposure on myocardial infarction mortality: a nationwide cohort study in Switzerland

Harris Héritier[1,2†], Danielle Vienneau[1,2†], Maria Foraster[1,2,3], Ikenna C. Eze[1,2], Emmanuel Schaffner[1,2], Kees de Hoogh[1,2], Laurie Thiesse[4,5], Franziska Rudzik[4,5], Manuel Habermacher[6], Micha Köpfli[6], Reto Pieren[7], Mark Brink[8], Christian Cajochen[4,5], Jean Marc Wunderli[7], Nicole Probst-Hensch[1,2], and Martin Röösli[1,2]*; for the SNC study group

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Låg korrelation

Table 2 Spearman's rank correlation coefficients for road traffic, railway, and aircraft noise as well as for $PM_{2.5}$ and NO_2

	L_{den} road	L_{den} railway	L_{den} air	$PM_{2.5}$	NO_2
L_{den} road	1				
L_{den} railway	0.13	1			
L_{den} air	0.09	-0.04	1		
$PM_{2.5}$	0.27	0.20	0.24	1	
NO_2	0.44	0.18	0.27	0.62	1

Resultat – buller

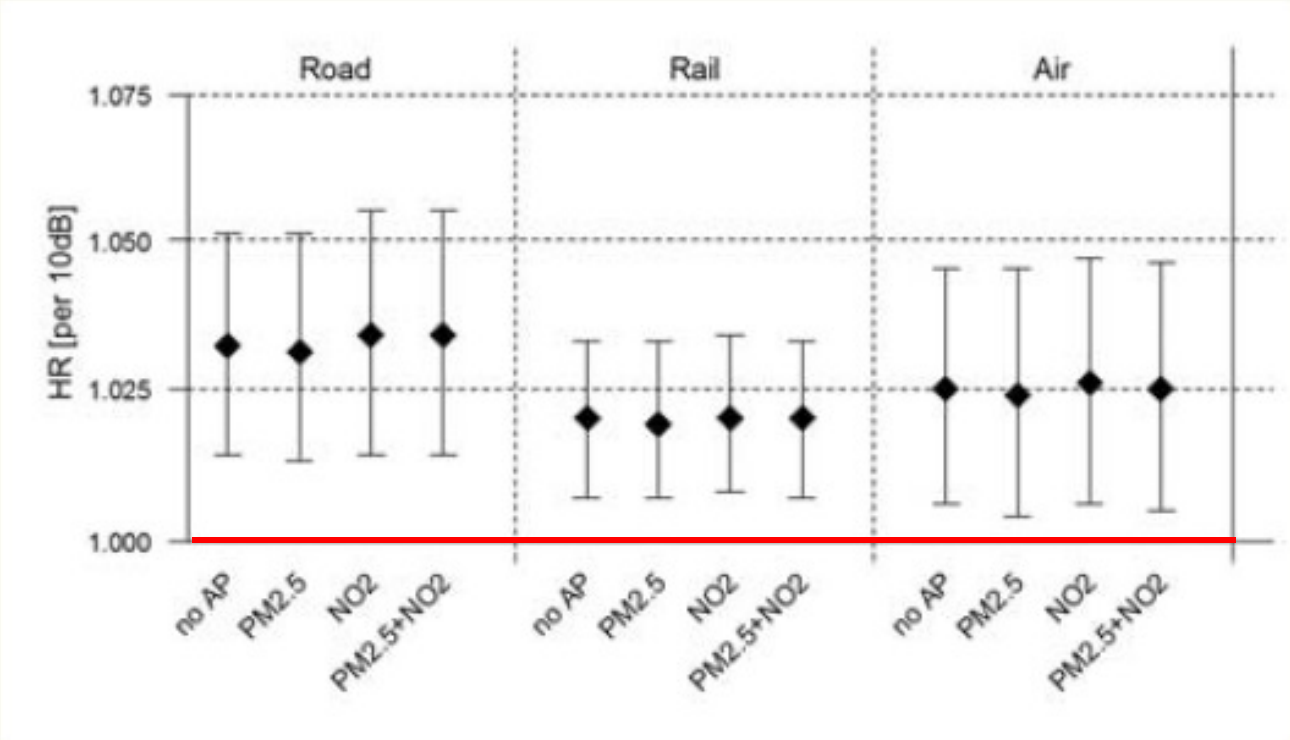

Figure 1 Linear hazard ratios for associations between road, railway, and aircraft noise exposure and myocardial infarction per 10 dB increase in L_{den}, not adjusted for air pollution (no AP), adjusted for $PM_{2.5}$ only ($PM_{2.5}$), adjusted for NO_2 only (NO_2), and adjusted for $PM_{2.5}$ and NO_2 ($PM_{2.5}$ + NO_2). All models were adjusted for age, sex, neighbourhood index of socio-economic position, civil status, education level, mother tongue, nationality, and

Resultat luftföroreningar

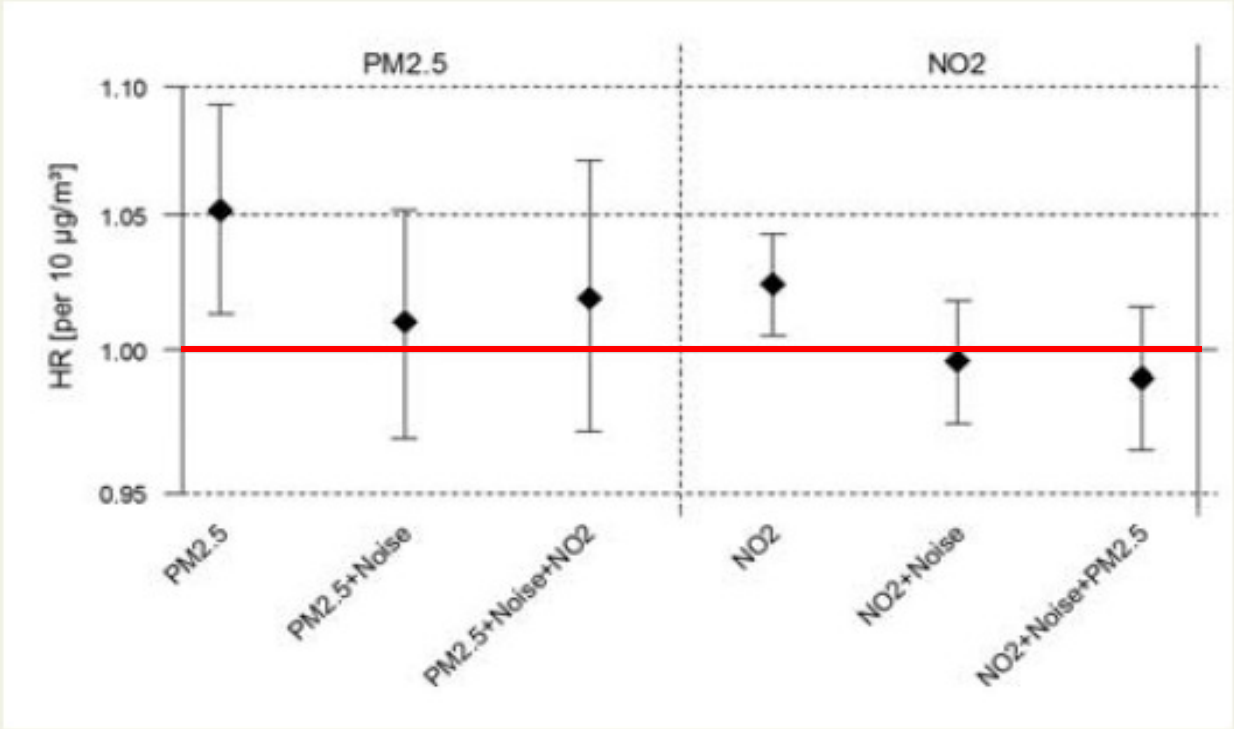

Figure 2 Linear hazard ratios for associations between $PM_{2.5}$ (left side) and NO_2 (right side) per 10 µg/m^3 and myocardial infarction in single exposure models, adjusted additionally for all noise sources, and adjusted for all noise sources and the complimentary air pollutant. All models were adjusted for age, sex, neighbourhood index of socio-economic position, civil status, education level, mother tongue, and nationality.

Ingen tydlig interaktions-effekt mellan buller och luftföroreningar

Kardiovaskulära markörer

- Tydligare samband för luftföroreningar än för buller

ESC European Society of Cardiology

European Heart Journal (2017) **38**, 2290–2296
doi:10.1093/eurheartj/ehx263

CLINICAL RESEARCH
Prevention and epidemiology

Long-term exposure to road traffic noise, ambient air pollution, and cardiovascular risk factors in the HUNT and lifelines cohorts

Yutong Cai[1]*, Anna L. Hansell[1,2], Marta Blangiardo[1], Paul R. Burton[3,4], BioSHaRE, Kees de Hoogh[1,5,6], Dany Doiron[5,6,7], Isabel Fortier[4,7], John Gulliver[1], Kristian Hveem[8], Stéphane Mbatchou[7], David W. Morley[1], Ronald P. Stolk[9], Wilma L. Zijlema[9,10,11,12], Paul Elliott[1], and Susan Hodgson[1]

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Resultat buller och luftföroreningar

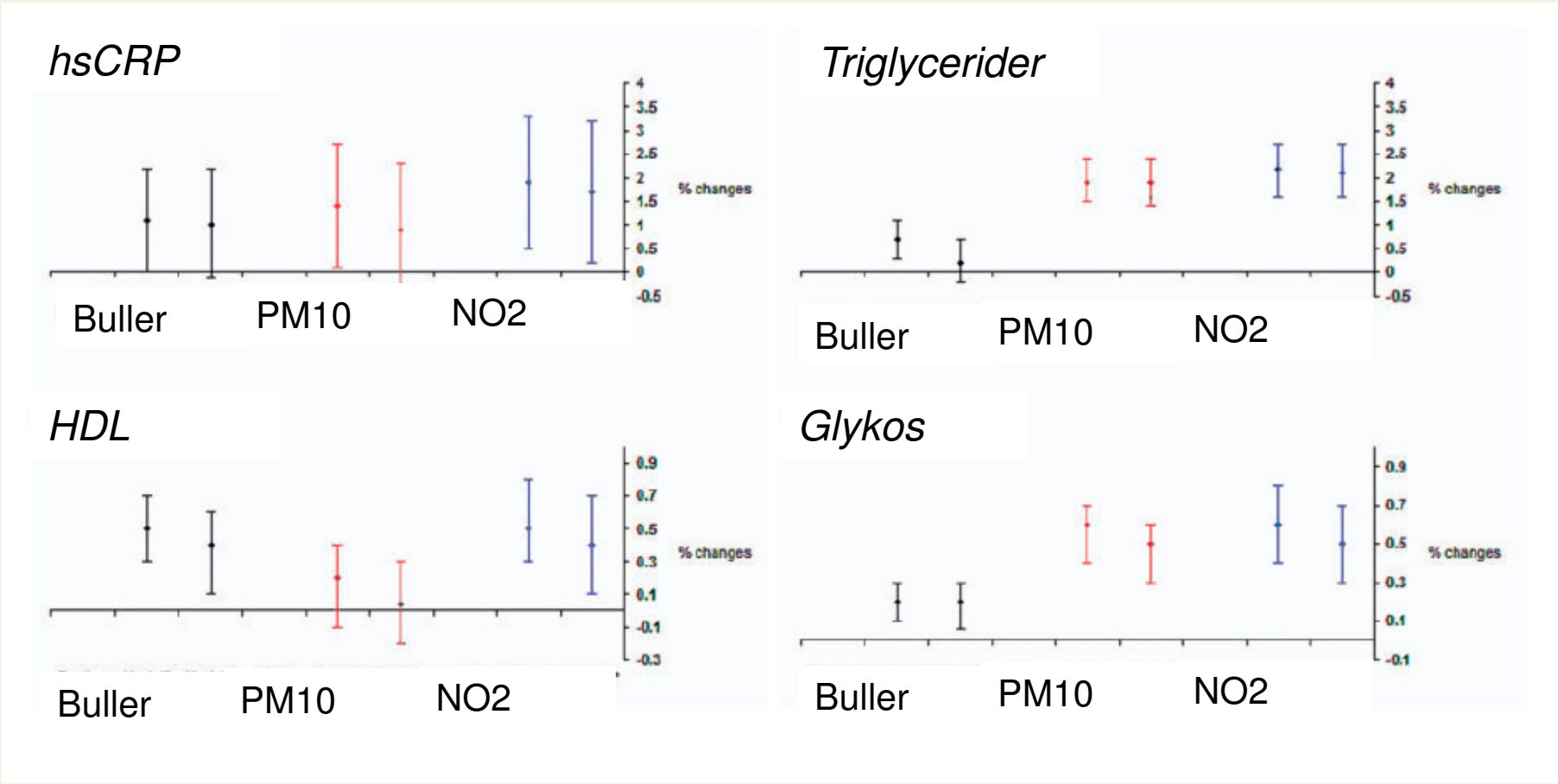

Figure 1 Cross-sectional associations between per IQR* higher exposure and per cent changes in each cardiovascular disease biochemical parameter. Model 2: adjusted for cohort (pooled analysis only), age, sex, season of blood draw, smoking status and pack-years, education, employment, and alcohol consumption. Model 2*: further adjusted for PM_{10} or daytime noise. *IQR, inter-quartile range, which is 5.1 dB(A) for daytime noise, 2.0 µg/m^3 for PM_{10}, 7.4 µg/m^3 for NO_2 for analyses on high-sensitivity C-reactive protein and lipids; 4.2 dB(A) for daytime noise, 2.4 µg/m^3 for PM_{10}, 8.8 µg/m^3 for NO_2 for analyses on blood glucose.

Vad beror de heterogena fynden på?

- Utfall
  - Olika mekanismer
- Exponeringsklassningen av buller och luftföroreningar
  - Samma noggrannhet?
  - Korrelationen?
  - skillnaden snarare återspeglar vilken modell som lämpar sig bäst för att bedöma effekten av trafik kopplad till hälsa?
- Metod
  - Kvarvarande confounding?
  - Power?

Sammanfattning av olika typer exponeringsbedömningar

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Review

Road traffic air and noise pollution exposure assessment – A review of tools and techniques

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HIGHLIGHTS

- Review of literature based on air pollution and noise originating from urban road traffic
- Discussion of various assessment techniques pertaining to both exposures
- Quantification of reported air-noise correlations in the selected studies
- Discussion of several parameters and exposure assessment techniques affect-

GRAPHICAL ABSTRACT

Korrelationen mellan buller och luftföroreningar

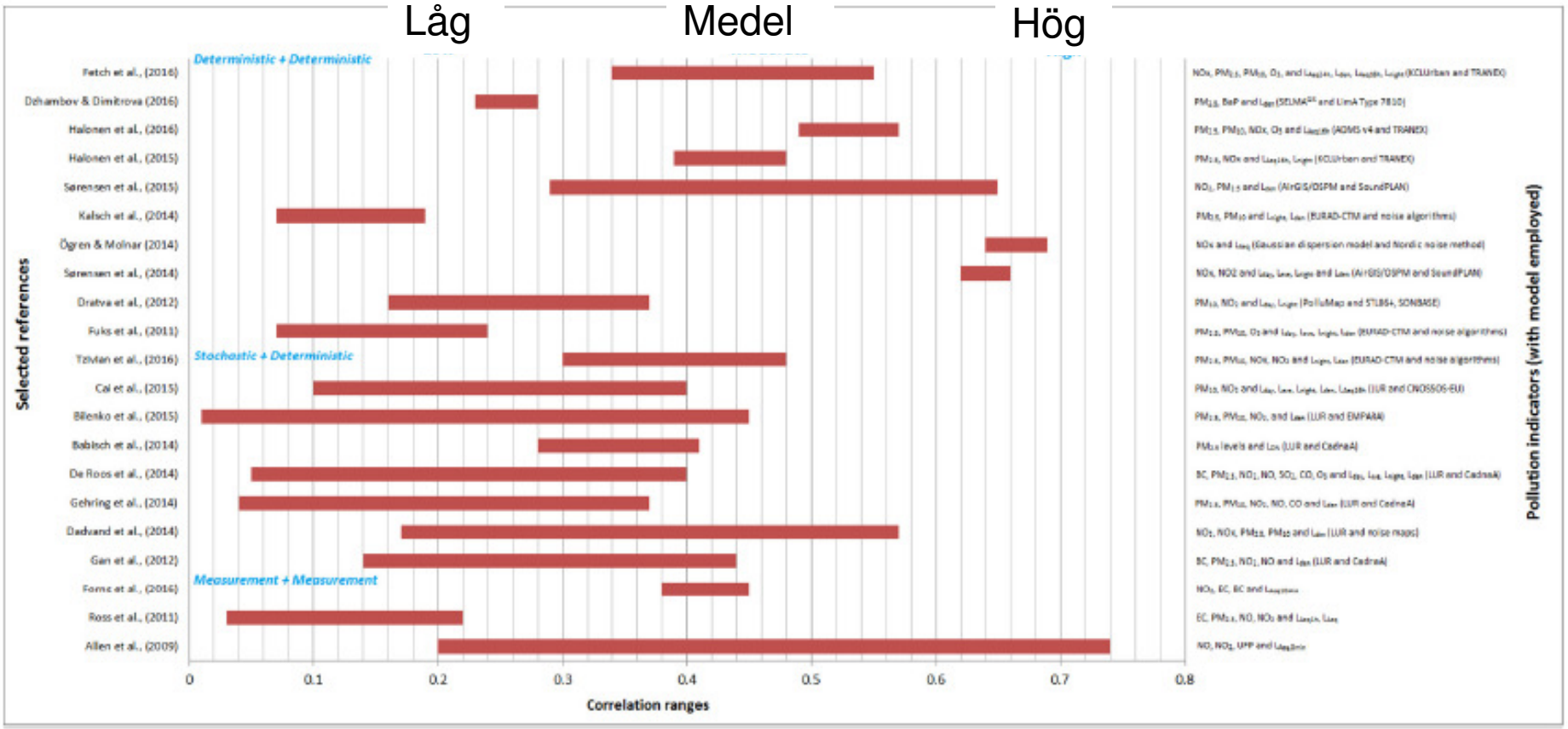


Fig. 3. Correlation ranges between air and noise pollution reported in the selected studies of this review, sorted by publication year and grouped into general type of exposure assessment i.e. Deterministic modelling, Stochastic modelling, Measurement (Nieuwenhuijsen, 2015). Pollution indicators and employed models/methods associated with each correlation range are also shown.

Slutsatser

- Det finns ingen standard eller harmoniserat sätt i den vetenskapliga litteraturen för att klassa buller och luftföroreningar i omgivningsmiljön samtidigt.
- Korrelationen mellan buller och luftföroreningar varierar kraftigt mellan studier: 0.05 till 0.74
- Modelleringen påverkas av ett flertal faktorer
  - Byggnadsstrukturer – buller
  - Meterologiska förhållanden – luftföroreningar
- Rekommenderar GIS-metodik
- Båda exponeringarna måste klassas på ett bra sätt för att kunna urskilja effekten av buller respektive luftföroreningar på hälsa.

Nordsound

- Pågående projekt
  - Exponering:
    - Buller och luftföroreningar i omgivningsmiljön
    - Grön och blå struktur
    - Yrkesbuller (luftföroreningar i arbetsmiljön m.m.)
  - Utfall:
    - Hjärt-kärlsjukdom
    - Metabola utfall
    - Cancer
    - Graviditetseffekter
  - Finansierat av Norforsk
  - Danmark, Sverige, Finland, Norge
  - **Sverige:** Göran Perhagen, Lars Barregård, Jenny Selander, Kerstin Persson-Waye, Mikael Ögren, Charlotta Eriksson, Andrei Pyko m.m.

Buller och luftföroreningar finns även i arbetsmiljön

Buller i arbetsmiljön

- Olika branscher

Yrkesbuller under graviditet och fostertillväxt

Table 3. Odds ratios for maternal occupational noise exposure during pregnancy and small for gestational age SGA subdivided by employment status during pregnancy

Occupational noise exposure [d] dBA	Not working [a]		Part-time workers [b]		Full-time workers [c]	
	Crude [e]	Adjusted [f]	Crude [e]	Adjusted [f]	Crude [e]	Adjusted [f]
	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)
<75	1.00	1.00	1.00	1.00	1.00	1.00
75-84	1.17 (1.05, 1.29)	1.00 (0.88, 1.14)	1.11 (1.06, 1.17)	1.01 (0.95, 1.08)	1.12 (1.05, 1.20)	1.16 (1.07, 1.25)
≥ 85	0.78 (0.42, 1.45)	0.63 (0.31, 1.28)	1.18 (0.92, 1.51)	0.97 (0.73, 1.28)	1.46 (1.06, 2.01)	1.44 (1.03, 2.02)
	n=136 503 *n, cases:* *<75: 1 769* *75-84: 468* *≥85: 10*	*n=114 205* *n, cases:* *<75: 1 425* *75-84: 371* *≥85: 8*	*n=514 336* *n, cases:* *<75: 7 927* *75-84: 2 117* *≥85: 65*	*n=440 432* *n, cases:* *<75: 6 779* *75-84: 1 747* *≥85: 52*	*n=289 386* *n, cases:* *<75: 6 218* *75-84: 1 156* *≥85: 39*	*n=250 854* *n, cases:* *<75: 5 358* *75-84: 1 013* *≥85: 36*

a. *Employed mothers with an absence of >134 days (90th percentile) during pregnancy or who reported "not working" during the registration interview at the prenatal care service in the beginning of pregnancy.*

b. *Mothers that reported that they worked part-time during the registration interview at the prenatal care service at the beginning of pregnancy or had more than 22 days (50th percentile) and less than 134 days (90th percentile) absence from work during pregnancy.*

c. *Mothers that reported that they worked full-time at the beginning of pregnancy and had less than 22 days (50th percentile) absence from work during pregnancy.*

d. *Occupational noise exposure estimated through a job exposure matrix based on measurements at several work sites, dividing the mother's occupation registered at the beginning of the pregnancy into three noise categories.*

e. *Crude analyses, including all single births between 1992 and 2008.*

f. *Analyses adjusted for mother's age, BMI, smoking, education, occupational control, physically strenuous work, family structure, nationality and child's, gender, birth year and parity. Including all single births between 1992 and 2008.*

g. *Small for gestational age SGA, estimated by a calculated growth curve of weight and gestational age by the Swedish Board of health and Welfare.*

h. *Low birth weight, dichotomized at 2 500g , <2500g/ ≥2500g*

Yrkesbuller under graviditet och fostertillväxt

Table 3. Odds ratios for maternal occupational noise exposure during pregnancy and low birth weight subdivided by employment status during pregnancy

Occupational noise exposure [d] dBA	Not working [a]		Part-time workers [b]		Full-time workers [c]	
	Crude [e]	Adjusted [f]	Crude [e]	Adjusted [f]	Crude [e]	Adjusted [f]
	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)
<75	1.00	1.00	1.00	1.00	1.00	1.00
75-84	1.08 (0.99, 1.18)	0.98 (0.88, 1.10)	1.01 (0.97, 1.06)	0.93 (0.88, 0.99)	1.21 (1.15, 1.27)	1.16 (1.10, 1.23)
≥ 85	0.82 (0.49, 1.37)	0.63 (0.34, 1.14)	0.84 (0.64, 1.09)	0.69 (0.51, 0.93)	1.43 (1.10, 1.86)	1.32 (1.00, 1.75)
	n=136 529 n, cases: <75: 2 514 75-84: 619 ≥85: 15	*n=114 221 n, cases: <75: 2 049 75-84: 494 ≥85: 11*	*n=514 395 n, cases: <75: 9 374 75-84: 2 290 ≥85: 55*	*n=440 464 n, cases: <75: 7 967 75-84: 1 900 ≥85: 43*	*n=289 445 n, cases: <75: 9 646 75-84: 1 919 ≥85: 59*	*n=250 895 n, cases: <75: 8 332 75-84: 1 653 ≥85: 54*

a. *Employed mothers with an absence of >134 days (90th percentile) during pregnancy or who reported "not working" during the registration interview at the prenatal care service in the beginning of pregnancy.*

b. *Mothers that reported that they worked part-time during the registration interview at the prenatal care service at the beginning of pregnancy or had more than 22 days (50th percentile) and less than 134 days (90th percentile) absence from work during pregnancy.*

c. *Mothers that reported that they worked full-time at the beginning of pregnancy and had less than 22 days (50th percentile) absence from work during pregnancy.*

d. *Occupational noise exposure estimated through a job exposure matrix based on measurements at several work sites, dividing the mother's occupation registered at the beginning of the pregnancy into three noise categories.*

e. *Crude analyses, including all single births between 1992 and 2008.*

f. *Analyses adjusted for mother's age, BMI, smoking, education, occupational control, physically strenuous work, family structure, nationality and child's, gender, birth year and parity. Including all single births between 1992 and 2008.*

g. *Small for gestational age SGA, estimated by a calculated growth curve of weight and gestational age by the Swedish Board of health and Welfare.*

h. *Low birth weight, dichotomized at 2 500g , <2500g/ ≥2500g*

Partiklar i arbetsmiljön

- Organiska partiklar
- Oorganiska partiklar
- Förbränningsgenererade partiklar
- Svetsrök







Maternal occupational exposure to **organic particles** and SGA, LBW, and PTB subdivided by work participation during pregnancy

	Working full-time with low absence from work[e]				Working full or part-time with moderate absence from work[f]				Working full or part-time with high absence from work[g]			
	Crude OR (95% CI)	(n=376,831) No of cases	Adjusted[h] OR (95% CI)	(n=370,126) No of cases	Crude OR (95% CI)	(n=418,233) No of cases	Adjusted[h] OR (95% CI)	(n=410,370) No of cases	Crude OR (95% CI)	(n=200,779) No of cases	Adjusted[h] OR (95% CI)	(n=196,878) No of cases
SGA												
No Exp	1	8,353	**1**	8,187	1	7,144	**1**	6,998	1	2,631	**1**	2,572
Low Exp	1.19 (1.08–1.32)	430	**1.09 (.98–1.22)**	422	1.19 (1.10–1.30)	573	**1.09 (.98–1.20)**	560	1.15 (1.00–1.33)	201	**0.94 (.79–1.10)**	195
High Exp	1.46 (1.30–1.64)	316	**1.22 (1.07–1.38)**	299	1.39 (1.27–1.52)	557	**1.14 (1.02–1.26)**	528	1.46 (1.28–1.67)	240	**1.01 (.86–1.19)**	230
LBW												
No Exp	1	12,492	**1**	12,272	1	9,049	**1**	8,859	1	3,748	**1**	3,649
Low Exp	1.29 (1.19–1.40)	692	**1.12 (1.03–1.22)**	675	1.05 (.96–1.13)	638	**0.99 (.91–1.09)**	616	1.06 (.93–1.20)	263	**0.92 (.79–1.06)**	253
High Exp	1.50 (1.37–1.65)	483	**1.19 (1.07–1.32)**	462	1.21 (1.11–1.31)	615	**1.07 (.97–1.18)**	587	1.25 (1.10–1.41)	292	**0.96 (.83–1.11)**	277
PTB												
No Exp	1	19,995	**1**	19,654	1	14,476	**1**	14,179	1	6,832	**1**	6,658
Low Exp	1.34 (1.26–1.43)	1,142	**1.15 (1.08-1.23)**	1,118	0.98 (.92–1.05)	960	**0.93 (.86–1.00)**	932	1.01 (.92–1.11)	458	**0.95 (.86–1.06)**	450
High Exp	1.46 (1.35–1.57)	745	**1.17 (1.08–1.27)**	715	1.15 (1.08–1.23)	937	**1.05 (.97–1.14)**	899	1.17 (1.07–1.28)	499	**1.04 (.94–1.17)**	479

Maternal occupational exposure to **organic particles** and SGA, LBW, and PTB subdivided by type of organic particle

	SGA		LBW		PTB	
	Adjusted[f] (n=369,064)		Adjusted[f] (n=369,300)		Adjusted[f] (n=369,115)	
	OR (95% CI)	cases	OR (95% CI)	cases	OR (95% CI)	cases
Wood						
No Exposure	1	8,803	1	13,257	1	21,233
Exposure	1.05 (.87–1.28)	105	1.02 (.86–1.20)	152	1.04 (.92–1.19)	254
Animal						
No Exposure	1	8,884	1	13,365	1	21,403
Exposure	0.73 (.49–1.11)	24	0.87 (.64–1.18)	44	1.03 (.82–1.30)	84
Paper						
No Exposure	1	8,804	1	13,234	1	21,188
Exposure	1.10 (.89–1.35)	104	1.16 (.99–1.36)	175	**1.23 (1.08–1.39)**	299
Textile						
No Exposure	1	8,782	1	13,228	1	21,185
Exposure	1.04 (.87–1.25)	126	1.00 (.86–1.16)	181	1.04 (.92–1.16)	302
Flour						
No Exposure	1	8,895	1	13,389	1	21,454
Exposure	1.13 (.65–1.97)	13	1.05 (.67–1.65)	20	1.03 (.72–1.48)	33
Oil mist						
No Exposure	1	8,809	1	13,246	1	21,287
Exposure	**1.39 (1.13–1.70)**	99	**1.48 (1.26–1.74)**	163	1.11 (.96–1.29)	200
Cooking oil						
No Exposure	1	8,731	1	13,122	1	21,038
Exposure	1.14 (.97–1.33)	177	**1.16 (1.02–1.31)**	287	**1.13 (1.02–1.25)**	449
Other organic						
No Exposure	1	8,725	1	13,130	1	20,990
Exposure	1.01 (.86–1.18)	183	0.96 (.84–1.09)	279	**1.13 (1.02–1.25)**	497

Maternal occupational exposure to **combustion derived products** (in form of PAH) and SGA, LBW, and PTB subdivided by work participation during pregnancy

	Working full-time with low absence from work[e]				Working full or part-time with moderate absence from work[f]				Working full or part-time with high absence from work[g]			
	Crude	(n=376, 831)	Adjusted[h]	(n=370, 126)	Crude	(n=418, 233)	Adjusted[h]	(n=410, 370)	Crude	(n=200, 779)	Adjusted[h]	(n=196, 878)
	OR (95% CI)	No of cases	OR (95% CI)	No of cases	OR (95% CI)	No of cases	OR (95% CI)	No of cases	OR (95% CI)	No of cases	OR (95% CI)	No of cases
PAH												
SGA												
Exp No	1	8,993	**1**	8,805	1	8,185	**1**	7,999	1	3,032	**1**	2,957
Exp Yes	1.57	106	**1.40**	103	1.19	89	**1.04**	87	1.04	40	**0.89**	40
	(1.29–1.91)		**(1.15–1.71)**		(0.96–1.47)		**(0.84–1.29)**		(0.76–1.43)		**(0.65–1.22)**	
LBW												
Exp No	1	13,496	**1**	13,240	1	10,207	**1**	9,968	1	4,251	**1**	4,129
Exp Yes	1.71	171	**1.49**	169	1.02	95	**0.95**	94	0.97	52	**0.84**	50
	(1.47–2.00)		**(1.27–1.75)**		(0.83–1.25)		**(0.77–1.16)**		(0.73–1.27)		**(0.63–1.12)**	
PTB												
Exp No	1	21,668	**1**	21,279	1	16,236	**1**	15,877	1	7,689	**1**	7,489
Exp Yes	1.32	214	**1.13**	208	0.92	137	**0.86**	133	1.03	100	**0.95**	98
	(1.15–1.52)		**(0.98–1.30)**		(0.77–1.09)		**(0.72–1.03)**		(0.84–1.26)		**(0.77–1.17)**	

Maternal occupational exposure to inorganic particles and SGA, LBW, and PTB subdivided by work participation during pregnancy

	Working full-time with low absence from work[e]				Working full or part-time with moderate absence from work[f]				Working full or part-time with high absence from work[g]			
	Crude		Adjusted[h]		Crude		Adjusted[h]		Crude		Adjusted[h]	
	(n=376,831)		(n=370,126)		(n=418,233)		(n=410,370)		(n=200,779)		(n=196,878)	
	OR (95% CI)	cases	OR (95% CI)	cases	OR (95% CI)	cases	OR (95% CI)	cases	OR (95% CI)	cases	OR (95% CI)	cases
SGA												
No Exp	1	8,736	**1**	8,551	1	8,010	**1**	7,828	1	2,927	**1**	2,853
Low Exp	.83 (.71–.97)	156	**.88 (.75–1.03)**	154	.75 (.58–.99)	54	**.89 (.68–1.16)**	54	.85 (.60–1.21)	32	**1.02 (.72–1.46)**	32
High Exp	1.35 (1.17–1.55)	207	**1.20 (1.04–1.39)**	203	1.21 (1.05–1.39)	210	**1.06 (.92–1.22)**	204	1.19 (.98–1.44)	113	**.97 (.80–1.17)**	112
LBW												
No Exp	1	13,085	**1**	12,838	1	9,975	**1**	9,742	1	4,119	**1**	3,999
Low Exp	.84 (.73–.95)	236	**.90 (.79–1.03)**	230	.98 (.79–1.21)	87	**1.11 (.89–1.38)**	85	.73 (.53–1.01)	39	**.84 (.61–1.16)**	39
High Exp	1.52 (1.36–1.70)	346	**1.32 (1.18–1.48)**	341	1.11 (.98–1.26)	240	**1.02 (.90–1.17)**	235	1.08 (.91–1.28)	145	**.93 (.78–1.11)**	141
PTB												
No Exp	1	21,003	**1**	20,630	1	15,904	**1**	15,551	1	7,469	**1**	7,272
Low Exp	.83 (.75–.92)	377	**.89 (.80–.99)**	366	.89 (.75–1.07)	127	**.98 (.82–1.17)**	125	.75 (.60–.95)	73	**.82 (.65–1.04)**	72
High Exp	1.38 (1.26–1.51)	502	**1.18 (1.07–1.30)**	491	.99 (.89–1.10)	342	**.93 (.83–1.04)**	334	1.01 (.89–1.16)	247	**.93 (.81–1.06)**	243

Exponeringar i arbetslivet och omgivningsmiljön

Metaller

Vibrationer

Arbetstider/skift

Yrkesstress

Buller

Grön struktur

Partiklar

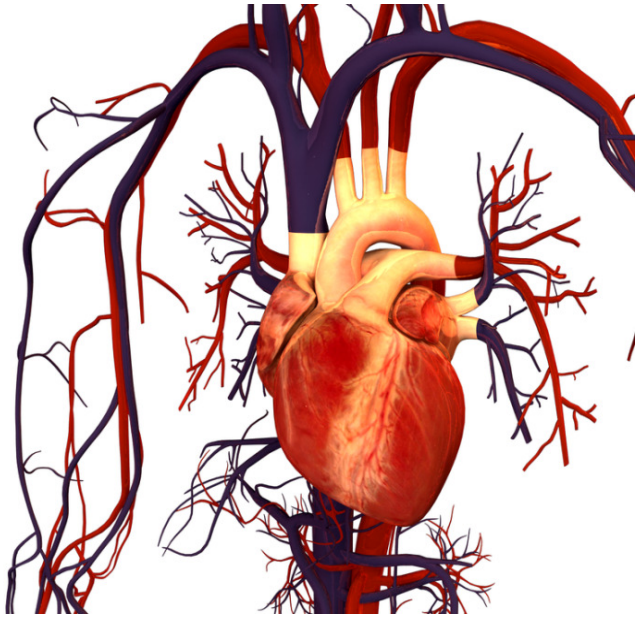
Värme/kyla

Luftföroreningar

Kemikalier

Fysiskt belastande arbete

Exponeringar i arbetslivet och hjärtkärlsjukdom



Metaller

Vibrationer

Arbetstider/skift

Yrkesstress

Buller

Värme/kyla

Partiklar

Luftföroreningar

Kemikalier

Fysiskt belastande arbete

SWEJEM

- Under utveckling
- Nationell resurs
- Kan användas för att klassa yrkesexponering i epidemiologiska studier

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