

Exposure to metallic mercury and cognitive effects in dental personnel in central Norway

By

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Mercury in dental filling material

- Silver amalgam: 50 % mercury and an alloy of silver (≈ 70 %), tin (≈ 25 %), copper (1-6 %), and zinc (0-2 %).
- Copper amalgam: ≈ 70 % mercury and ≈ 30 % copper.

Heated to $> 200^{\circ}\text{C}$ when prepared





Dentomat[®] 2

Degussa



NOTICE
In the bottom of this
machine, there are two
screws which are used
for disassembly and
should be taken off

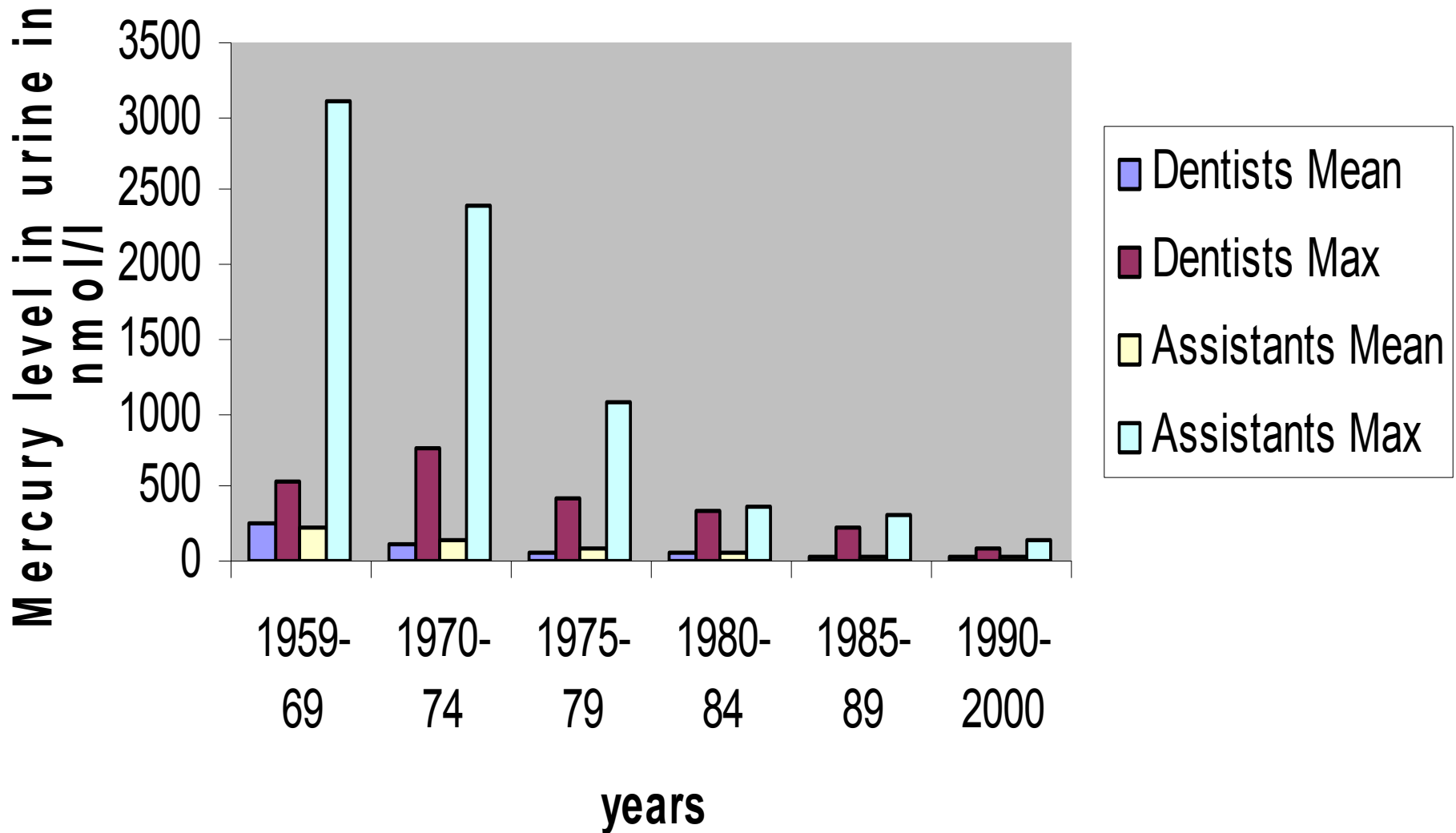




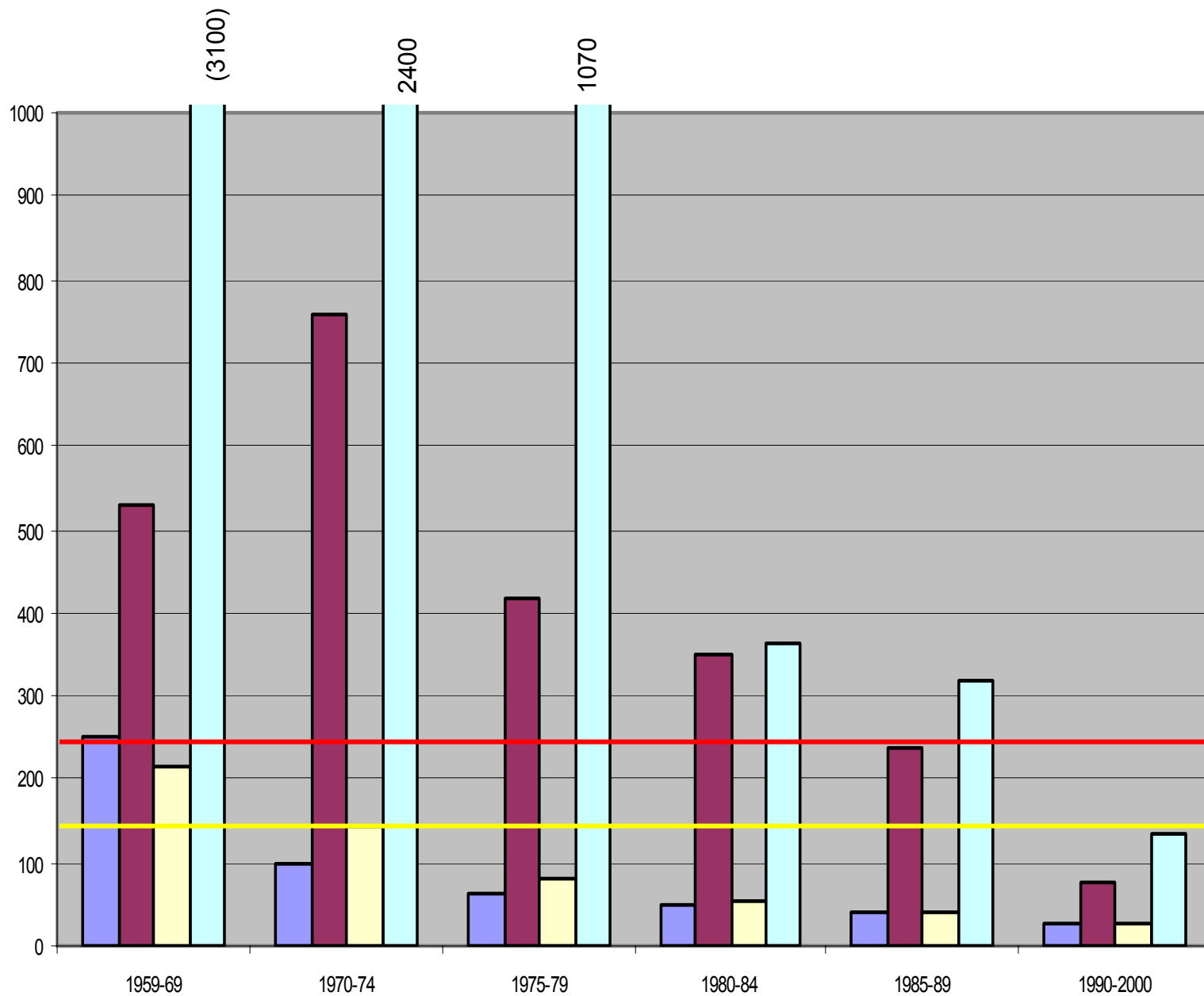
The level of mercury excretion was measured in the urine of Norwegian dental personell from 1955 through 2000

Lervik et al 2006

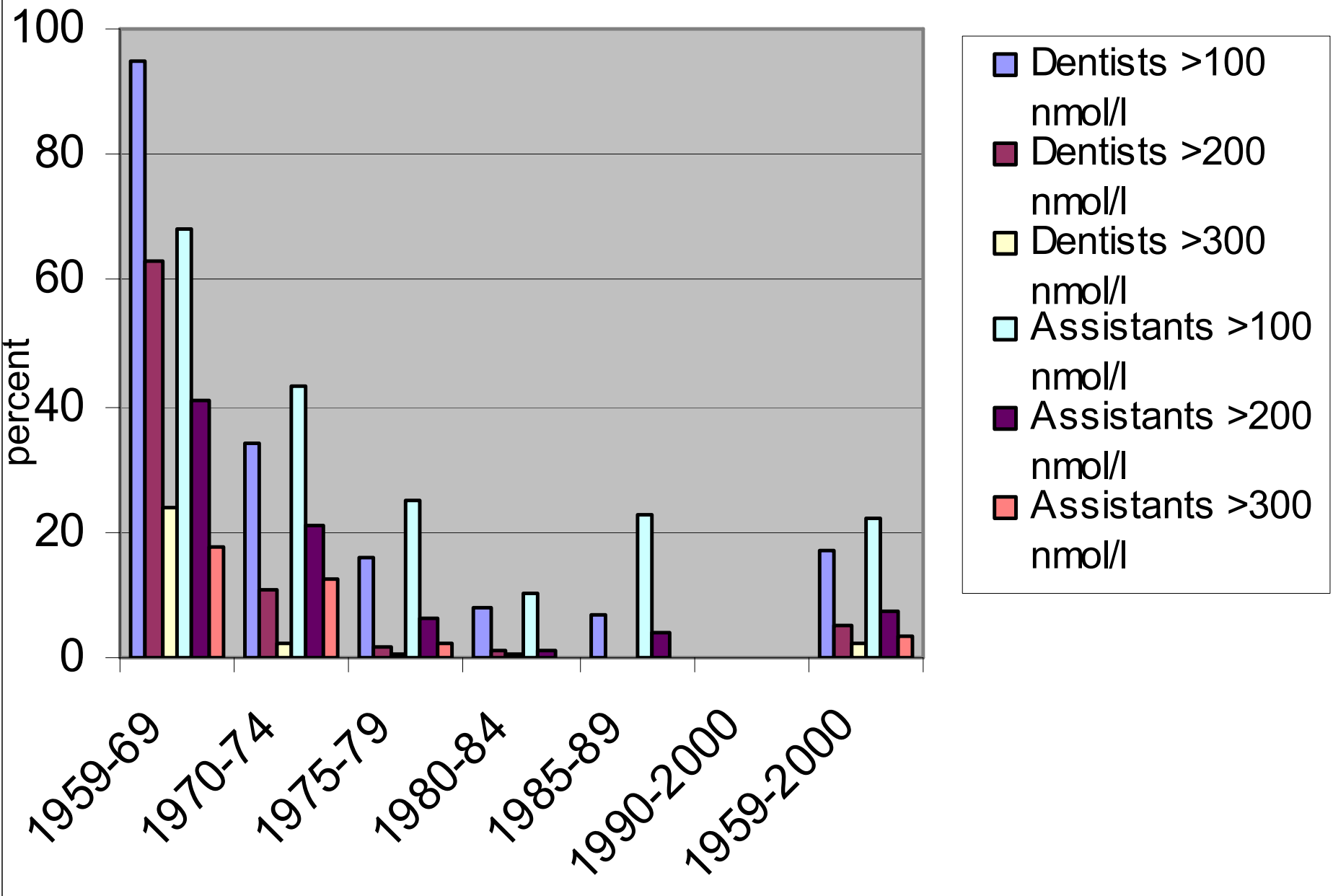
Mercury in urine of dentists and assistants by time



Level of mercury in urine in nmol/l



Mercury in urine of dentists and assistants by time



Measurements of mercury in urine exceeding 100, 200, and 300 nmol/l

Number of measurements exceeding 100,
200, and 300 nmol/l in 4,030 measurements
1959-2000 of mercury in urin in 2,028
female dental assistants

Level	Number of measurements	Percent
>100 nmol/l	865	22,0
>200 nmol/l	287	7,3
>300 nmol/l	135	3,3

**50 (2.5%) of the subjects had levels >300 nmol/l,
15 (0.7%) had levels >500 nmol/l
All before 1985**

Previously published studies of symptoms and/or cognitive function in dental personell

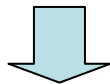
Authors and year	Country	Findings
Shapiro et al, 1982	USA	Disturbed nerve function and some alteration of neuropsychological function.
Uzzell et al, 1986	USA	More symptoms and neuropsychol. alterations
Nilsson et al, 1990	Sweden	No increase in prevalence of symptoms
Ngim et al, 1992	Singapore	Neuropsychological alterations among dentists
Ibarra et al, 1992	Cuba	Mor neurovegetative symptoms and neurspsychol. alterations in dental personnel
Gonzalez-Ramirez et al, 1995	Mexico	Neuropsychological alterations, but insecure.
Ritchie et al, 1995 and later	Skottland	More symptoms and neurepsychological alterations among dentists
Echeverria et al, 1995, and later	USA	More symptoms, neurepsychological alterations and neurological disturbances among dentists. Individual susceptibility.
Langworth et al, 1997	Sweden	Increased prevalence of symptoms in dental personnel
Aydin et al, 2003	Turkey	More symptoms and neuropsychol. alterations

Number of participants and some background variables

Variables		Assistants	Dentists	Controls
Number		657	452	630
Age (SD)		53,3 (11,1)	54,3 (13,8)	53,0 (12,6)
Sex	Female	99,5	41,2	72,4
	Male	0,5	59,8	27,6
Marrietal status	Married	81,0	81,4	79,1
	Single	19,0	18,6	20,9
Educational level	Elementary school	22,3	0	22,0
	College	65,3	0	42,3
	High school/university	12,4	100,0	35,6
Smoking habits	Yes	26,6	10,3	27,6
	X-smoker	32,9	27,6	30,1
	Never	40,6	62,1	42,3
Alcohol consumption	Yes, every week	24,3	48,3	25,2
	Yes, but more seldom	63,1	43,9	59,2
	No	12,7	7,8	15,6
Own amalgam dental fillings	Yes	91,1	83,9	88,1
	Number of fillings	8,21	8,60	9,16

Information on factors of significance for mercury exposure

- Working methods:
 - Use of a mortar
 - Use of copper amalgam
 - Use of self made capsules
 - Use of a Dentomat or similar device
 - Use of prefabricated capsules
- Number of patients
- For how long has there been a dental clinic in the venue
- The amount of local contamination



Quantitative relative exposure score calculated

Exposure levels among respondents with regard to the estimated score and mercury in urine.

	Assistants			Dentists		
	Number	Median	Max	Number	Median	Max
Total exposure score	633	216	31,780	446	137	7,168
Mean level in urine in nmol/l	143	49	298	130	42	258
Max values in urine in nmol/l	143	59	1,065	130	51	305

Symptom questionnaire "Euroquest"

Symptom groups:

- Mood
- Neurological symptoms
- Psychosomatic symptoms
- Memory
- Concentration
- Fatigue
- Sleep disturbances

Answers:

"Seldom or never"	= 1
"Now and then"	= 2
"Often"	= 3
"Very often"	= 4

Symptoms scores among the participants

Symptom	Assistants	Dentists	Controls
Mood	1.71	1.4	1.59
Memory	2	1.63	1.79
Concentration	1.76	1.4	1.57
Sleep disturbances	1.81	1.48	1.65
Neurological symptoms	1.49	1.17	1.34
Psychosomatic symptoms	1.58	1.29	1.47
Fatigue	2.06	1.61	1.82

All differences statistically significant on a 1% level when compared to the control group

Proportions of participants with symptom scores above 3 for each of the symptoms

Symptoms	Assistant s	Dentists	Controls
	≥ 3	≥ 3	≥ 3
Mood	3,7	2,2	3,3
Memory	12,5**	5,4	4,4
Concentration	7,0**	2,2	2,6
Sleep	7,2**	2,2	4,4
Neurological symptoms	1,7	0,5	0,9
Psychosomatic symptoms	0,6	1,1	0,5
Fatigue	13,5**	5,5	9,6

* p < 0,05, ** p < 0,01

Proportion (in %) of subjects who reported symptoms "often" or more frequently

Proportion of seven symptom groups	Assistants	Dentists	Controls
Three and more symptoms	5,0	1,1	2,6
Four and more symptoms	2,9	0,7	0,7
Five and more symptoms	1,1	0,7	0,4

Statistically significant relationships between features of exposure and symptoms by use of general linear modelling

Symptom	Exposure	Value	Assistants	Dentists
Neurological	Total score	P for trend*	X	X
	Amalgam in the hand	“yes”	X	X
	Amalgam pollution	“yes”	X	
	Copper amalgam	“yes”	X	
Psychosomatic	Total score	P for trend*	X	X
	Amalgam in the hand	“yes”	X	X
	Amalgam pollution	“yes”	X	X
	Copper amalgam	“yes”	X	
Concentration	Total score	P for trend*	X	
	Amalgam in the hand	“yes”	X	X
	Amalgam pollution	“yes”	X	X
	Copper amalgam	“yes”	X	
Memory	Total score	P for trend*	X	
	Amalgam in the hand	“yes”		
	Amalgam pollution	“yes”	X	
	Copper amalgam	“yes”	X	

*between quartiles

Cont..

Statistically significant relationships between features of exposure and symptoms by use of general linear modelling

Symptom	Exposure	Value	Assistants	Dentists
Mood	Total score	P for trend*	x	
	Amalgam in the hand	“yes”	x	x
	Amalgam pollution	“yes”	x	
	Copper amalgam	“yes”	x	
Fatigue	Total score	P for trend*	x	
	Amalgam in the hand	“yes”	x	x
	Amalgam pollution	“yes”	x	
	Copper amalgam	“yes”	x	
Sleep disturbances	Total score	P for trend*	x	
	Amalgam in the hand	“yes”	x	x
	Amalgam pollution	“yes”	x	
	Copper amalgam	“yes”	x	

* between quartiles

Conclusion 1

- Due to methodological problems the results are insecure and have a wide space for interpretation
- The assistants reported more exposure to mercury and had higher urine values than the dentists.

Conclusion 2

- Dental assistants reported more cognitive symptoms than the controls, and the dentists reported less.
- For both dental assistants and dentists there was a positive association between reported exposure features and the reported occurrence of cognitive symptoms

From our findings together with previous investigation we draw the conclusion that some dental personnel can have suffered long term cognitive effects from their previous occupational exposure to metallic mercury.

Continuation

As a second part of our study we are now doing neuropsychological investigations on 100 of the participants, 50 with assumed “high” (>80 percentile of our total score), and 50 with “low” (<40 percentile) exposure to metallic mercury. The results will be available this fall.