

# Evaluation of A Prototype Inhalable Sampler: Metal Aerosols

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## Background

Occupational exposure limits are generally decreasing.

It is important to have sampling methods that can quantify concentrations below the exposure limit.

Studies report that many US hygienists do not sample for inhalable mass concentrations, e.g., the IOM, possibly because of the ease of use, low cost, and disposability of the 37-mm cassette.

## Objectives

- To compare the prototype sampler to the IOM sampler for metal working processes.
- Determine whether the new sampler improves the LOD for metals.

## Methods

### Sampler Assemblies

#### Prototype

- 37-mm 8.0  $\mu\text{m}$  MCE filter with bonded capsule
- Housing
- Pump:
  - Sensidyne® Gilian 12
  - 8 Lpm



#### IOM

- 25-mm 0.8  $\mu\text{m}$  MCE filter
- Housing
- Pumps:
  - SKC Universal PCRX4
  - Gilian® GilAir Plus
  - 2 Lpm



## Methods, continued

### Sampling

- Sampled May 17 – December 8, 2016
- Collected paired prototype and IOM personal and area samples
- Analyzed using modified NMAM Method 7300 (ALS, UT) – 15 metals



### Evaluation criteria

Kruskal-Wallis ( $P > 0.05$ ) for differences between sampler by:

- “All metals” collected
- Prototype/IOM ratio for metals
- Prototype/IOM ratio for particle “size”

Regression (Prototype vs IOM) by:

- All samples
- Personal vs area samples
- Particle “size”

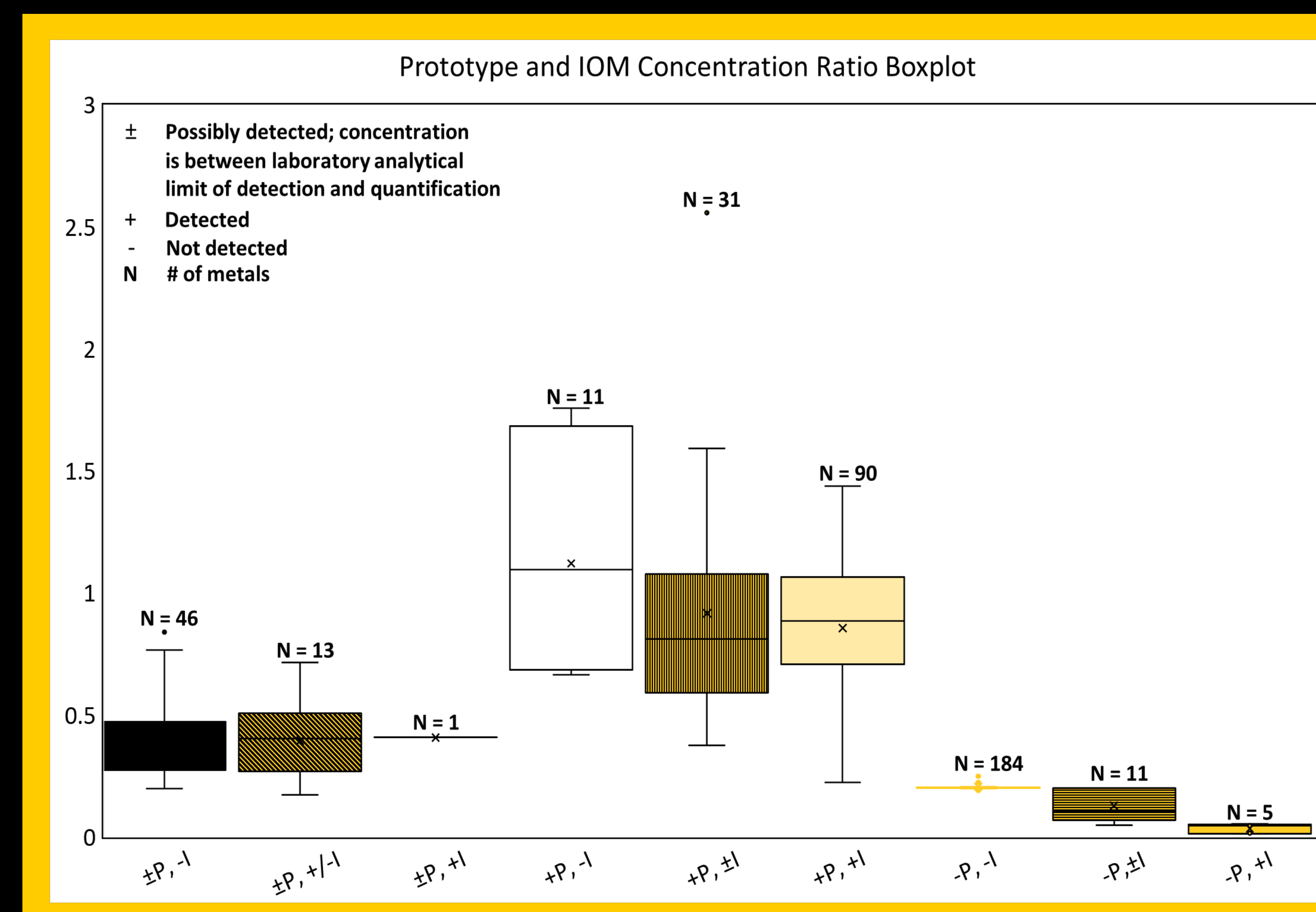


## Results

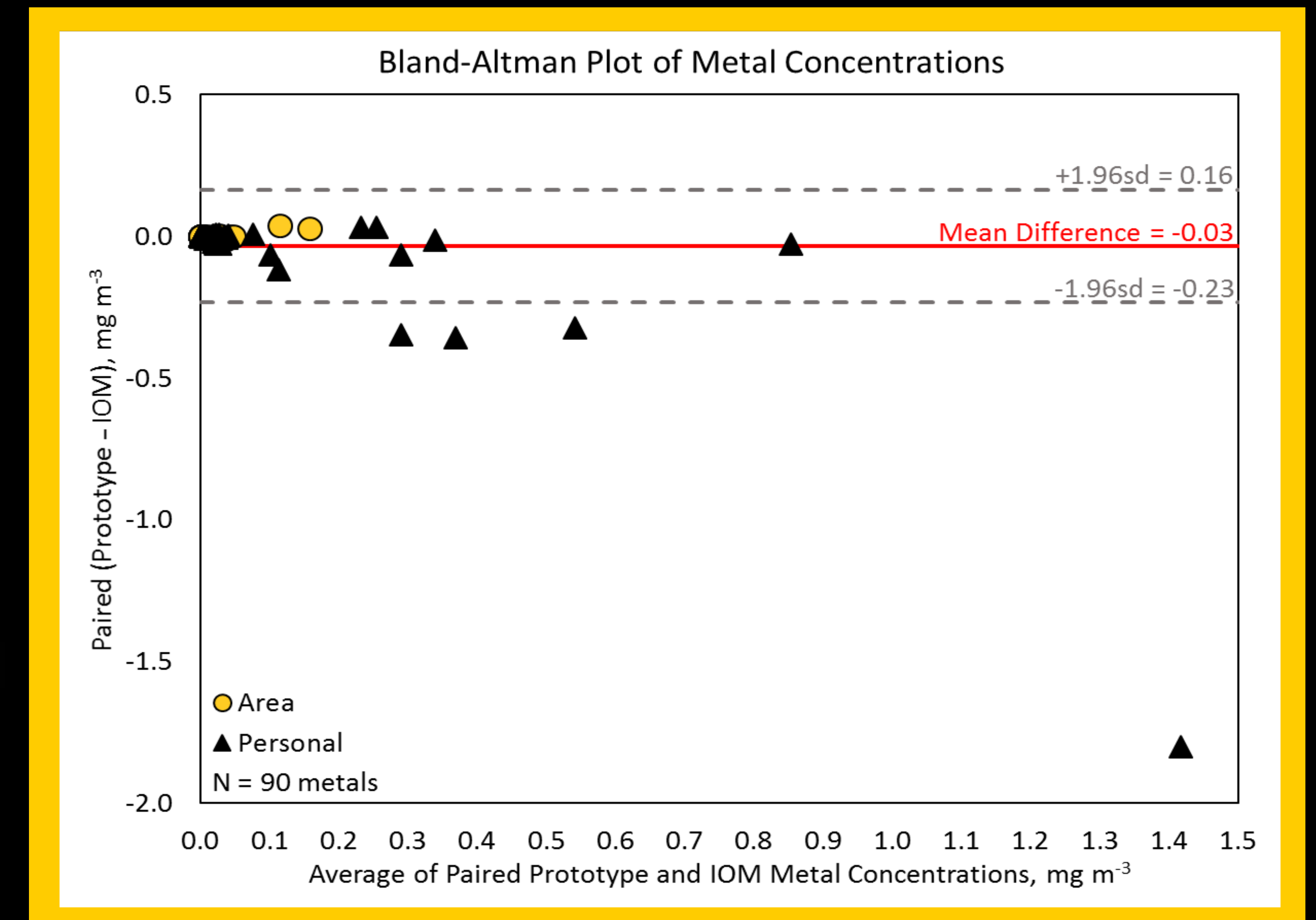
28 paired samples collected  
Mean sample duration = 7 hr  
Metals detected on:

- 21 / 28 samples
- 7 / 8 personal
- 14 / 20 area

Process	# Pairs	# Metals
Welding	6	4
Grinding	5	9
Soldering	4	2
Pouring	2	8
Sawing	2	8
Tending	1	9
Shooting Guns	1	1



## Results, continued



### Kruskal-Wallis

- Aggregate metal concentration:  $p = 0.66$
- P/I ratio between metals:  $p = 0.05$
- P/I ratio between particle “size”:  $p = 0.40$

### Regression between paired samples

By	N	Regression (all $\text{mg}/\text{m}^3$ )	Adj. $R^2$
All samples	89	Prototype = 0.71 IOM	0.85
Personal samples	55	Prototype = 0.70 IOM	0.85
Area samples	34	Prototype = 1.2 IOM	0.98
Small particles	45	Prototype = 0.80 IOM	0.93
Large particles	44	Prototype = 0.56 IOM	0.73

## Conclusions

Prototype and IOM samplers were not significantly different.

Only 11 metals were detected on prototype but not the IOM. Hence, LOD improvement was not assessed.

## Acknowledgements

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