



Finnish Institute of
Occupational Health

WELL-BEING
THROUGH WORK

Workers' exposure to incidental nanoparticles in different lines of work

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Introduction

Workers may be exposed to

- Engineered nanoparticles
 - 6 million by 2020*
- Incidental nanoparticles
 - In UK 1 million only in the metal industry**
 - Many millions world wide
- Environmental nanoparticles
 - Influences on workers' overall exposure burden



*Roco 2011; **Aitken et al. 2004

Introduction

Incidental nanoparticles

- Formation*
 - Nucleation of vaporized compounds
 - Primary particles from combustion sources
- Sources*
 - Combustion
 - Processes involving hot temperatures
 - Mechanical processes involving massive energies



*Hämeri et al. 2009

Methods

- Systematic literature search
- Criteria:
 - Published between 1980-2015
 - Peer reviewed publications written in English
 - Workers' exposure in real life conditions
 - Concentrations reported number based
 - Low end of the measured particles between 1-20 nm

Methods

- Data collection
 - Exposure agent
 - Measurement site or work task
 - Measurement technique and range
 - Number concentration
 - Min, max, mean during the work
 - Background
 - Duration

Results

- 72 peer reviewed articles
 - First articles on 2000
 - 55 articles between years 2008-2015

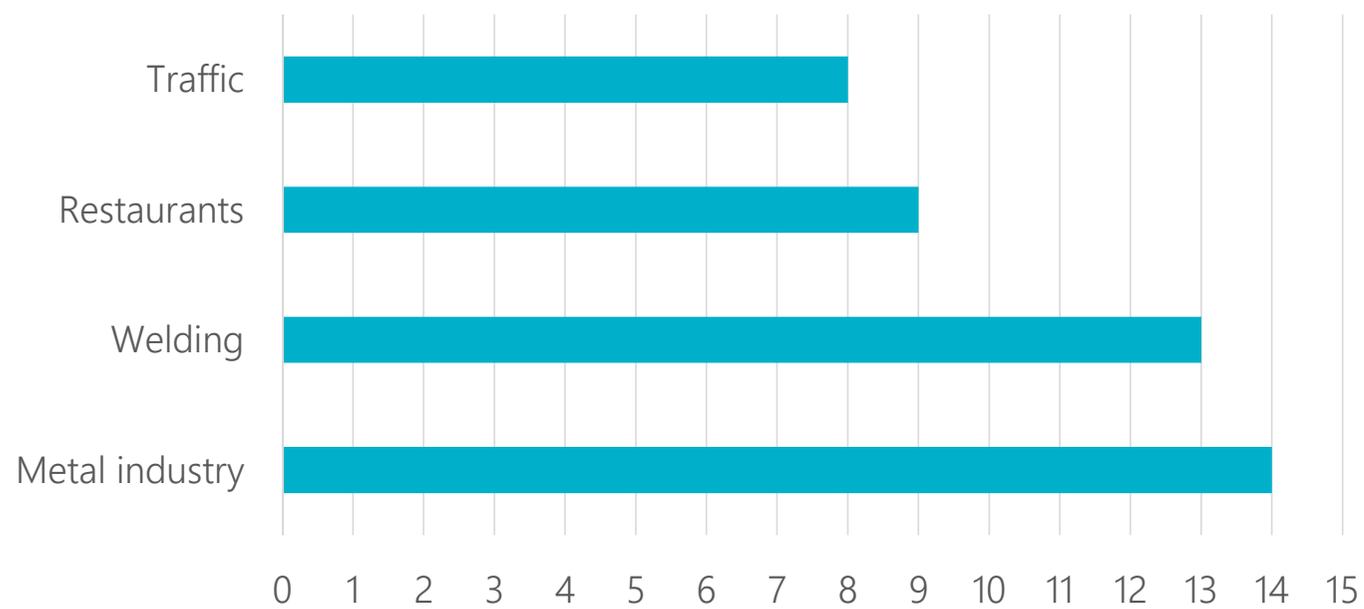
- 314 different work tasks or sites

- Most of the measurements with CPC (62 %)

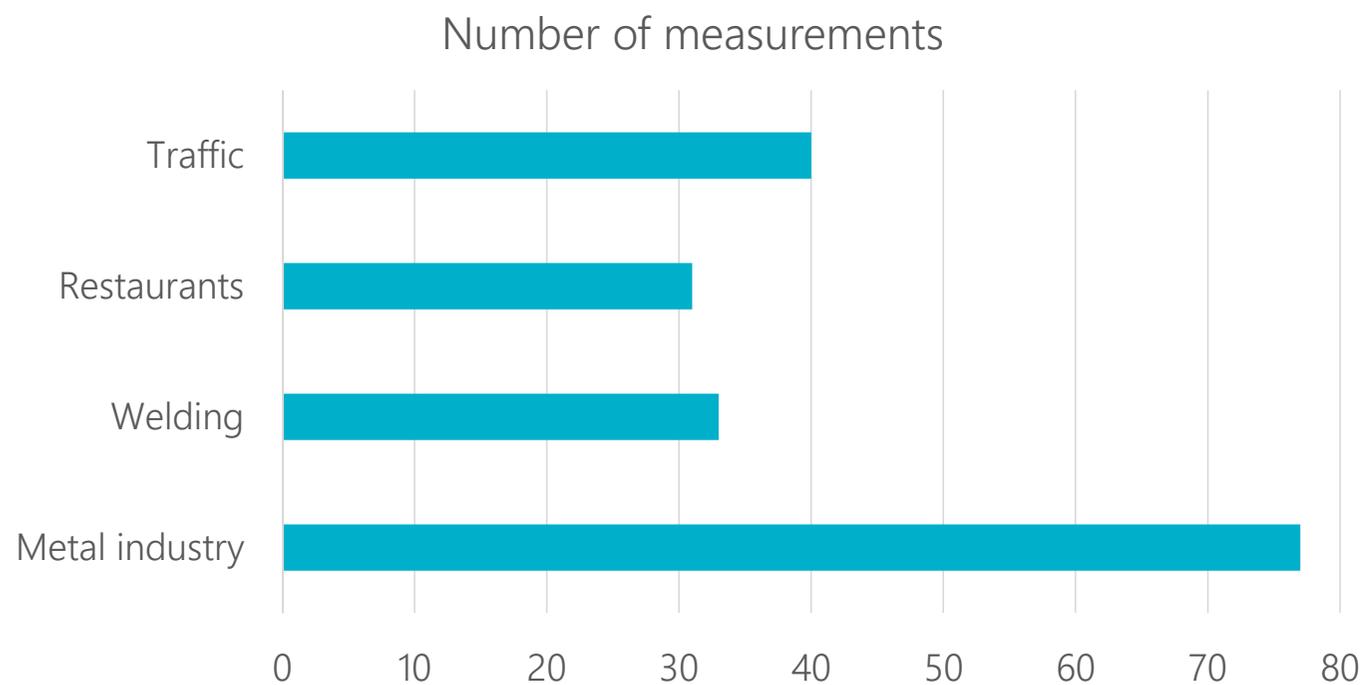
Welding	Drilling	Threading
Heat treating	Cutting	Die casting
Fettling	Sieving	Smelting
Molding	Bagging	Sanding
Sewing	Painting	Coating
Driving	Toll collecting	Asphalt paving
Highway maintenance	Cooking	Serving
Ski waxing	Grounding	Polishing

Results

Number of publications



Results





$> 10\ 000$ particles/cm³



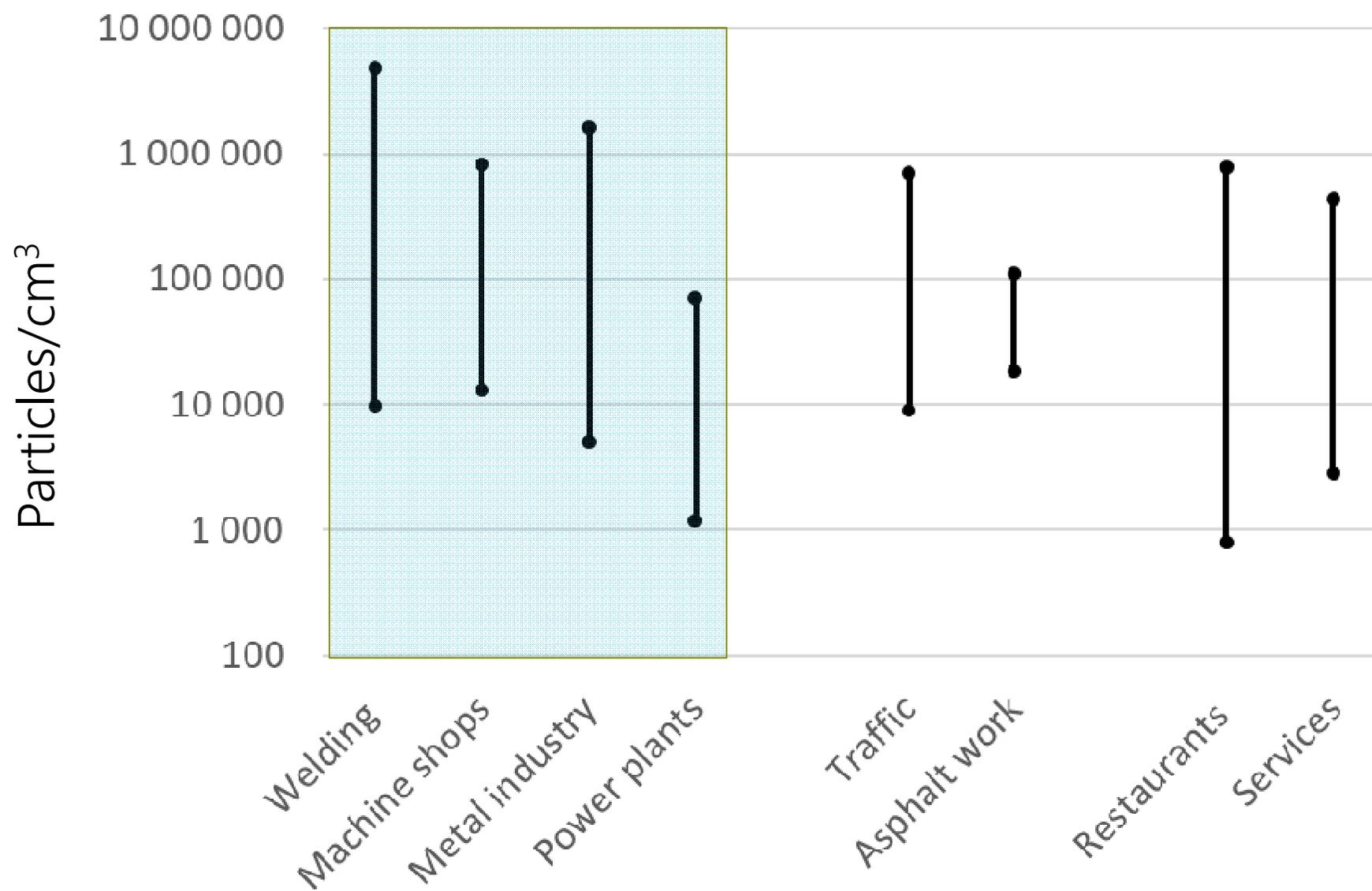
$< 10\ 000$ particles/cm³

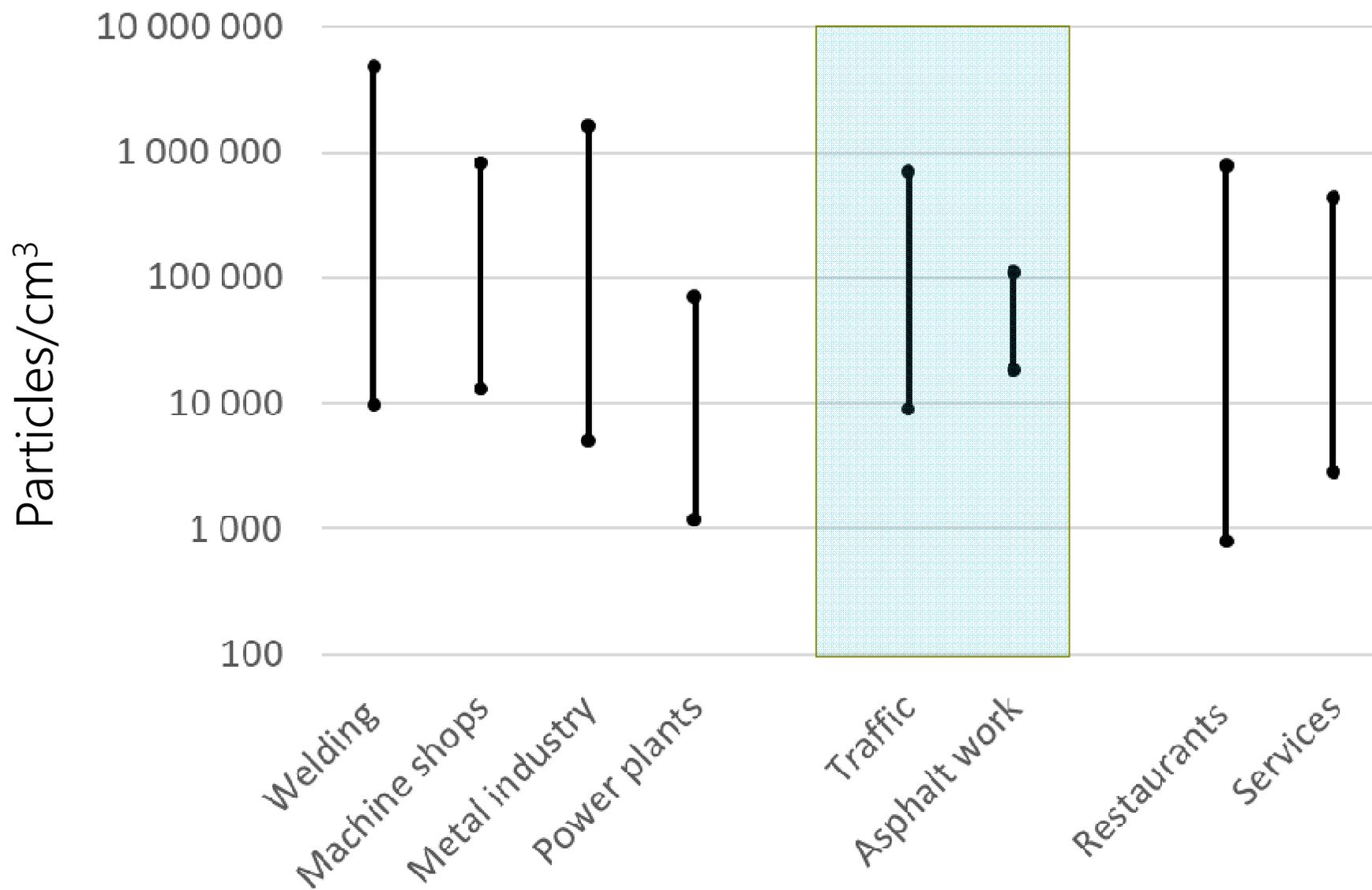


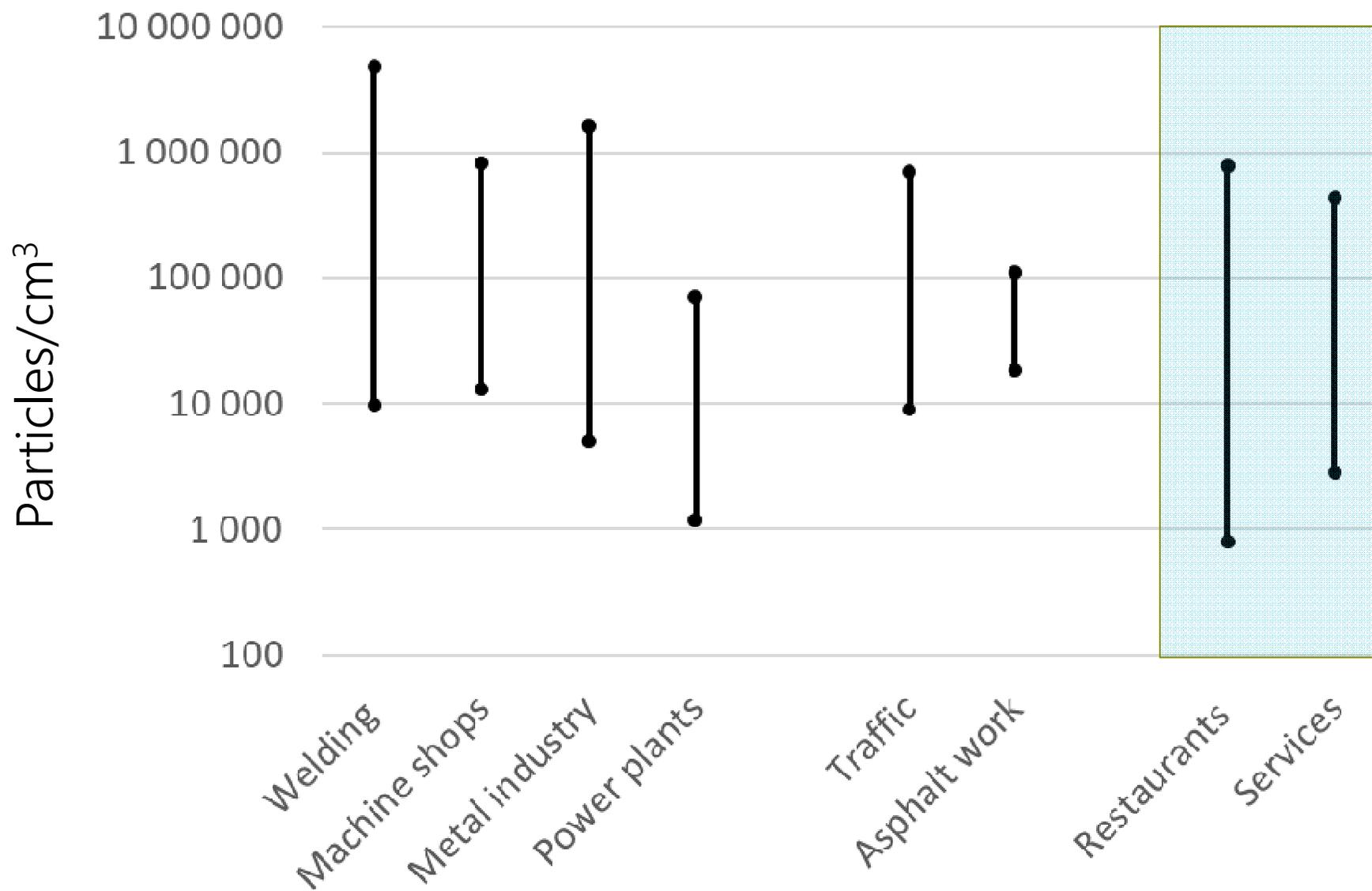
$\sim 10\ 000 - 100\ 000$ particles/cm³



$\sim 10\ 000 - 5\ 000\ 000$ particles/cm³







Summary

- Variation between studies
 - Measurement range
 - Measurement of the background
 - Reporting of the concentration
 - Duration of the measurements

Summary

- Future needs
 - Standardized/harmonized measurement strategy
 - Standardized/harmonized instruments and measurement range
 - Consensus how the background should be measured and treated
 - Breathing zone measurements
 - Routine based work hygienic measurements



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Thank You!



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