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Unveiling Cleaning Workers' Chemical Exposure through Data-Driven Field Monitoring and Activity-Based Analysis

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EXAMEN*

Exposure of cleaning staff to indoor air contaminants associated with their work practices: identifying opportunities to reduce their exposure

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1. INTRODUCTION

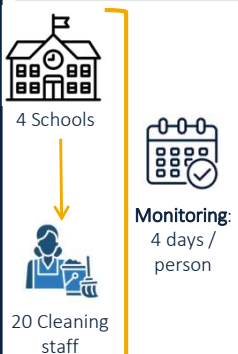
Indoor air conditions for school cleaning staff can vary strongly from one task or room to another.

By tracking exposure dynamics with non-specific sensors, we document temporal profiles and short-term events to better understand which situations, locations and activities drive concentration peaks.

2. OBJECTIVES

- 1 Characterize exposure dynamics among school cleaning staff using time-resolved IAQ sensor data.
- 2 Link high-resolution sensor data with activity logs to identify exposure drivers by task and location.
- 3 Provide evidence to support healthier cleaning practices and school environments.

3. STUDY DESIGN



Torso-worn sensors

PM_{2.5} / CO₂ / VOC
T°C / RH

Activity log tablets

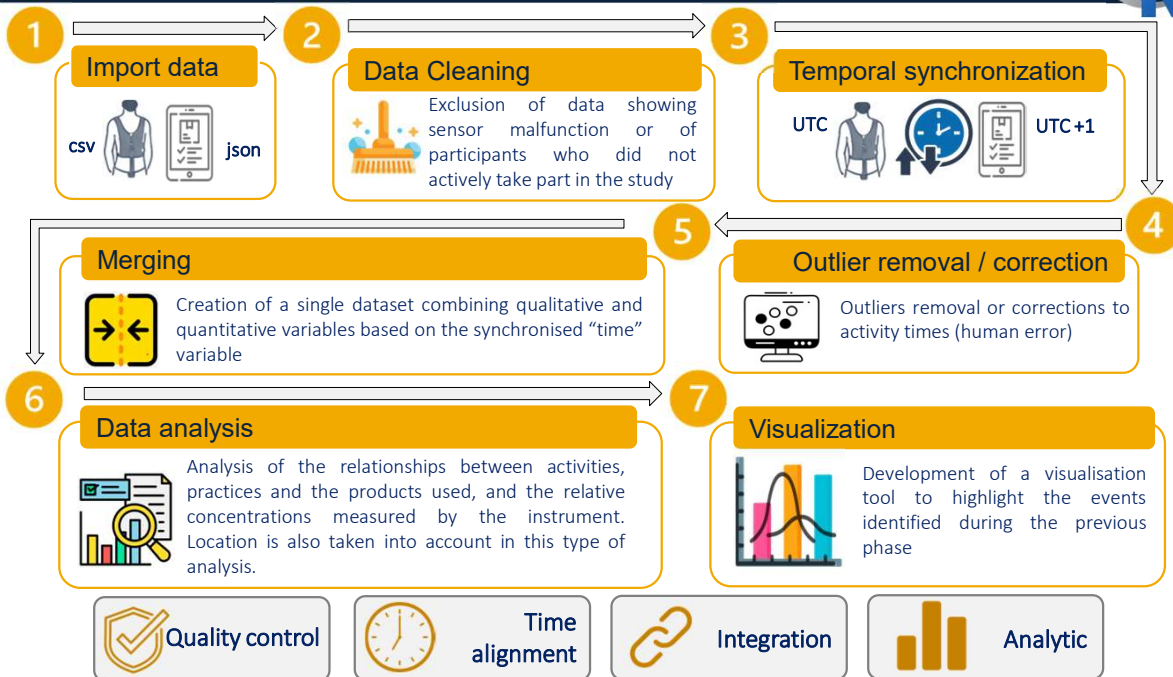
Activity Location
Material use
Cleaning product use

Record

Qualitative variables
Time step: 1min
Automatic recording

Qualitative and quantitative variables
Time step: start/stop
Manual recording

4. DATA PROCESSING WORKFLOW



Using these systems for educational purposes requires well-conceptualised, carefully labelled data, so that temporal, semi-quantitative indicators can be interpreted without overstating their meaning.

5. KEY FINDINGS & IMPLICATIONS

Figure 1

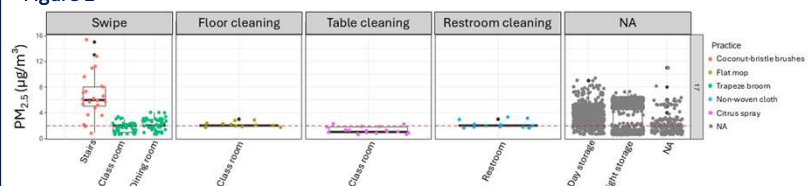


Figure 2

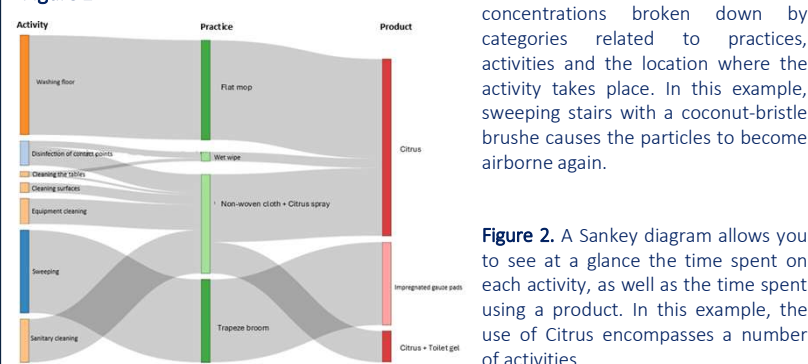


Figure 1. A boxplot showing PM_{2.5} concentrations broken down by categories related to practices, activities and the location where the activity takes place. In this example, sweeping stairs with a coconut-bristle brushes causes the particles to become airborne again.

Figure 2. A Sankey diagram allows you to see at a glance the time spent on each activity, as well as the time spent using a product. In this example, the use of Citrus encompasses a number of activities.

6. TAKE-HOME MESSAGES

- 1 Combining personal IAQ monitoring with activity logs provides high-resolution insights into cleaner's exposure in real-world school environments.
- 2 Exposure varies markedly by task, material use and location.
- 3 Standardized methods and open data practices can support evidence-based policies for healthier indoor environments in schools

The sensors deliver temporal, semi-quantitative indicators useful to detect exposure dynamics and events, but they are **not sufficient** for specific compound characterization or comprehensive health evaluation.