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## Introduction

Exposure day-to-day particulate matter (PM) air pollution is correlated to increased risk of various adverse health outcomes.

In particular, the children are more vulnerable than adults to the effects of airborne agents because their lungs are still developing, they spend more time outdoors, and they breathe faster than adults do.

## Objective of study

Our work was part of the MAPEC (Monitoring Air Pollution Effects on Children for supporting public health policy) project, a multicentric cohort study that involves 1,000 primary school children (6-8 years old) in 5 Italian cities (Brescia, Lecce, Perugia, Pisa and Turin), with different degrees of pollution. The aim of this study was to identify markers of early biological damage, such as micronuclei (MN), predictive of chronic diseases onset in older adulthood.

## Material & methods:

Ambiental and biological sampling were repeated in winter 2014 and in spring 2015

### City air pollution

□ Perugia is the capital city of the region of Umbria in the central Italy; urban air pollution was evaluated by collecting PM<sub>0.5</sub> samples in four schools of Perugia, on the same day of biological sampling (Fig.1);

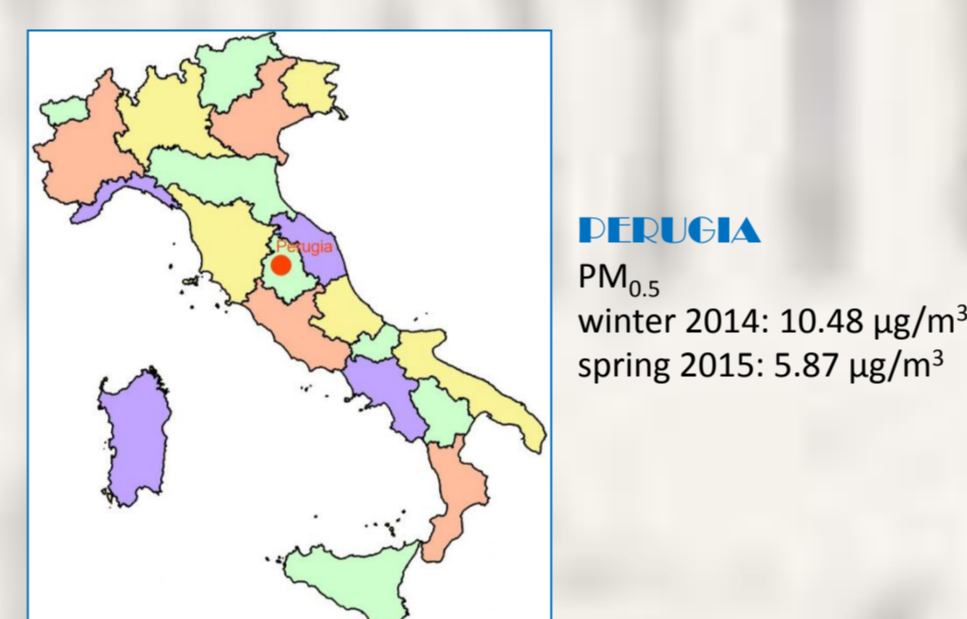


Figure 1. Level of PM<sub>0.5</sub> in Perugia (Italy)

### Study population

□ 230 children (132 males and 98 females) aged 6-8 were recruited from first grade schools of Perugia;

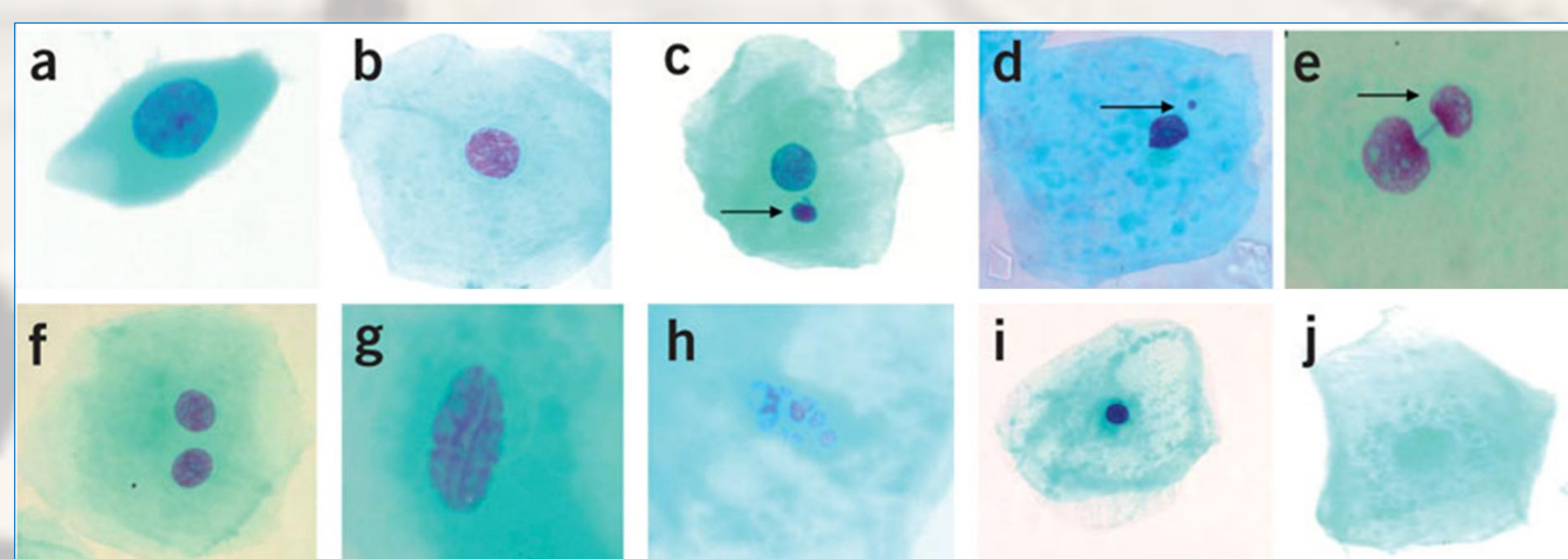
□ questionnaire, including items on demographic and socioeconomic variables, exposures to indoor and outdoor air pollution sources, characteristics of the area of residence, parents' smoking at home, BMI, children's respiratory symptoms and diseases, diet, physical activity and other aspects of children's lifestyle, was administered to parents of children;

### Micronucleus cytome assay

The micronucleus cytome assay was performed in exfoliated buccal mucosa (BM) cells of children. The cells, collected by brushing the inside of the cheek with a toothbrush, were fixed on microscope slides and stained with Feulgen/LightGreen. Microscope analysis was performed using both bright field and fluorescence microscope at 1,000x magnification.

For each subject, 1,000 BM cells were gathered in the following categories :

- basal cells [a], normal differentiated cells [b], binucleated cells [f], apoptotic/necrotic cells (i.e. condensed chromatin [g], karyorrhectic [h], pyknotic [i], and karyolytic [j]);
- DNA-damaged cells, i.e. cells with **micronuclei (MN)**, which are indicative of chromosome loss or fragmentation [c/d] and/or **nuclear buds (NB)**, which may be related to the elimination of amplified DNA or DNA repair [e], were scored in 2,000 normal differentiated cells.



## Results

Table 1 shows the data obtained from questionnaire.

Characteristic	Number	Percent
<b>Gender</b>		
Male	132	57.4
Female	98	42.6
<b>Traffic total</b>		
Low: cars and trucks never/seldom passed the child's house or school	42	18.3
High: cars or trucks passed the child's house or school frequently	188	81.7
<b>Smokers in home</b>		
no	217	94.3
yes	13	5.7
<b>Parent education</b>		
Maximum among parents "secondary school or less"	75	32.6
Maximum among parents "college or university"	155	67.4

Table 1. Characteristics of Study Population

The results showed a statistically **significant decrease** in the frequency of micronuclei in spring compared to the winter season (U=20,027.50, W=45,003.50, z=-4.63, p<0,01).

Spearman's correlation analysis revealed a **significant positive correlation** between:

- PM<sub>0.5</sub> values and the frequency of MN (rho=0.145, p< 0.01);
- Polycyclic aromatic hydrocarbons (PAHs) values and the frequency of MN (rho=0.196, p< 0.01);

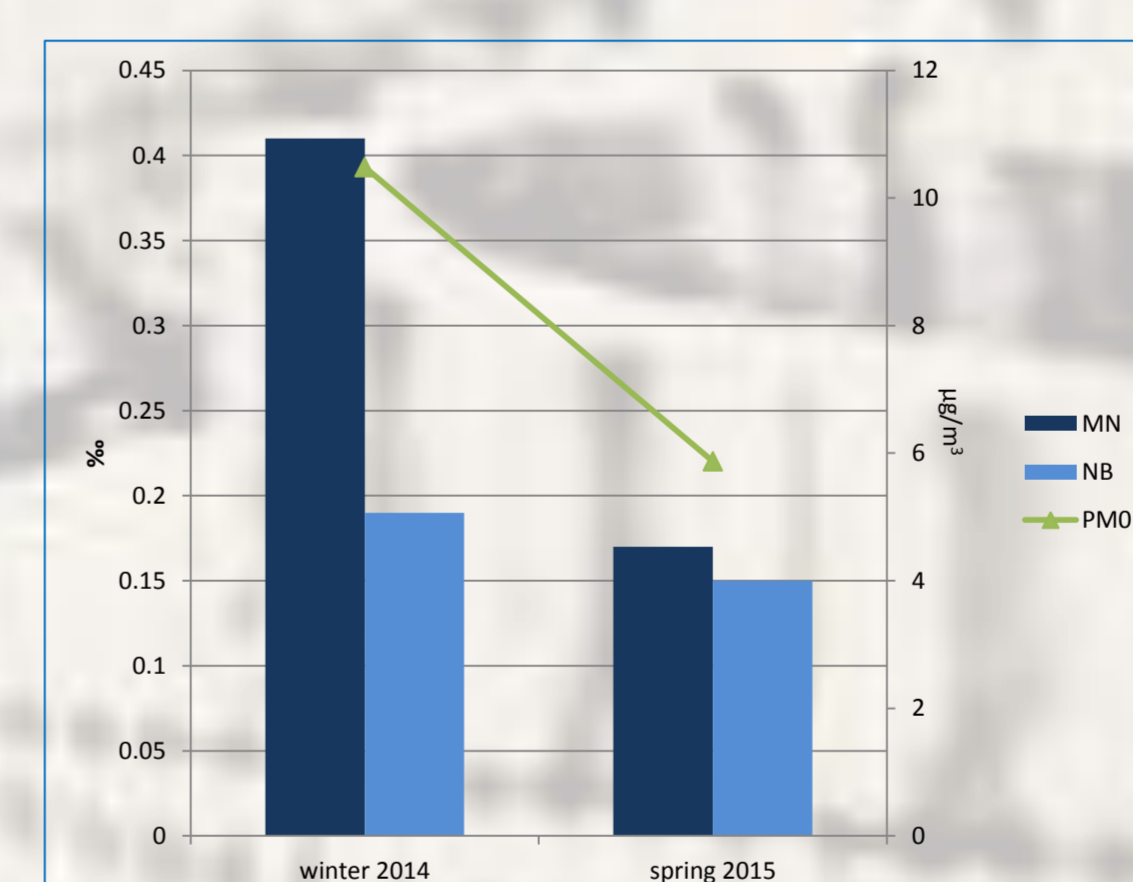


Figure 2. Micronuclei and nuclear buds frequencies (%) in BM of children recruited in Perugia and air PM<sub>0.5</sub> level

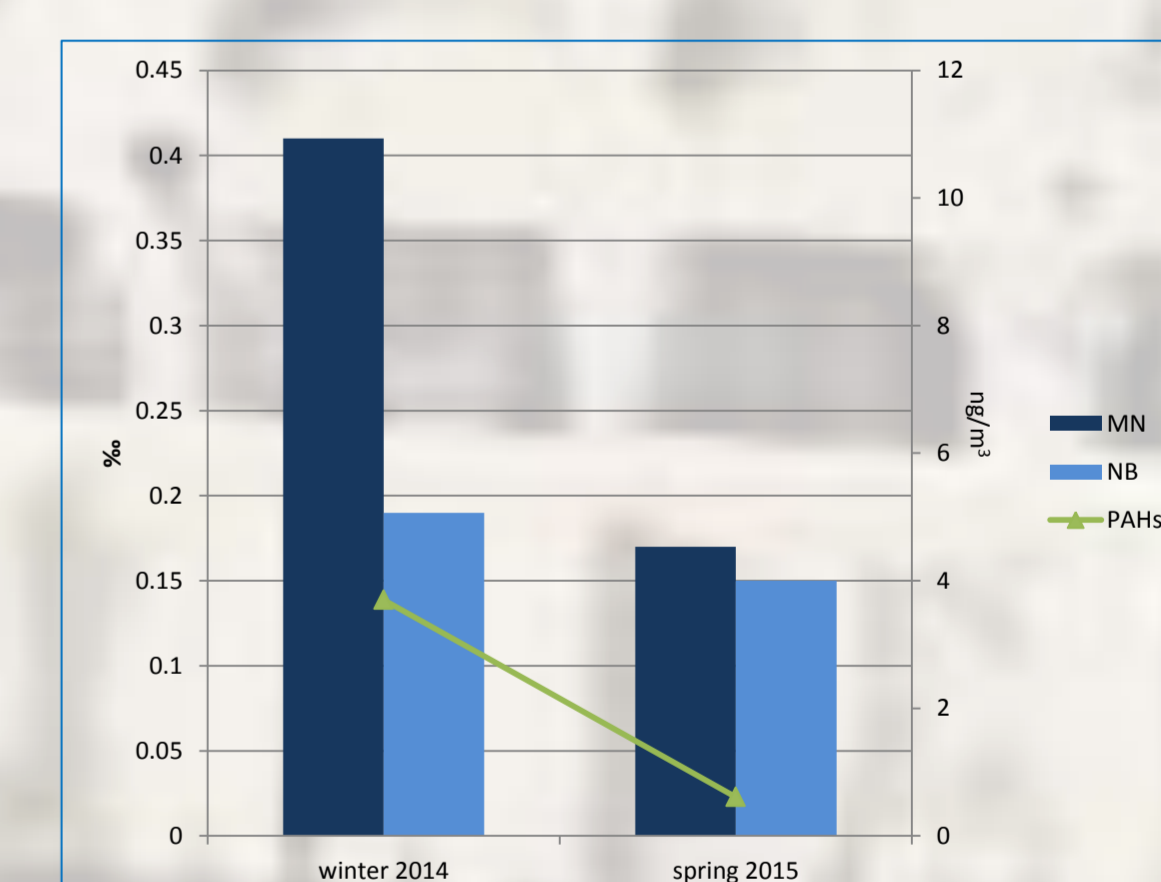


Figure 3. Micronuclei and nuclear buds frequencies (%) in BM of children recruited in Perugia and air PAHs level

## Discussion

Our data showed an increase of the frequency of **DNA damage biomarkers (MN and NB)** with increasing level of **urban air pollution**.

Genotoxic effects of air pollution on human health, in particular children, could be related to lifestyle, dietary factors and environmental exposure of study population.

These results will be integrated to those obtained in other cities involved in the MAPEC project.

### Components of the MAPEC LIFE Study Group:

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