



Exposure to PM_{2.5}-bound PAHs in Rome: the contribution of transportation microenvironments

M. Gherardi, MP. Gatto, A. Gordiani, C. Gariazzo
Inail Research – Via Fontana Candida, 1, 00040 Monteporzio Catone, Rome
m.gherardi@inail.it



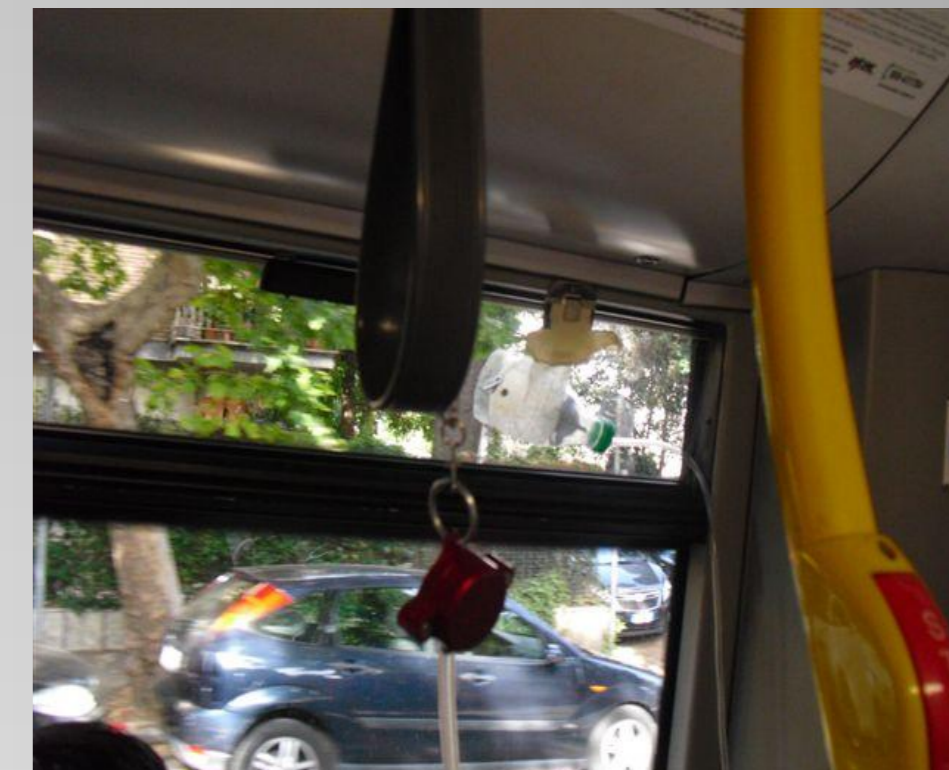
Although outdoor air pollution contributes to adverse health effects, high levels of air contaminants may occur in some microenvironments like vehicles[1-3]. This has important implications for exposure assessment because people spend a significant part of time in commuting and a large amount of exposure is expected to come from the in-vehicle ventilation system.

THE STUDY

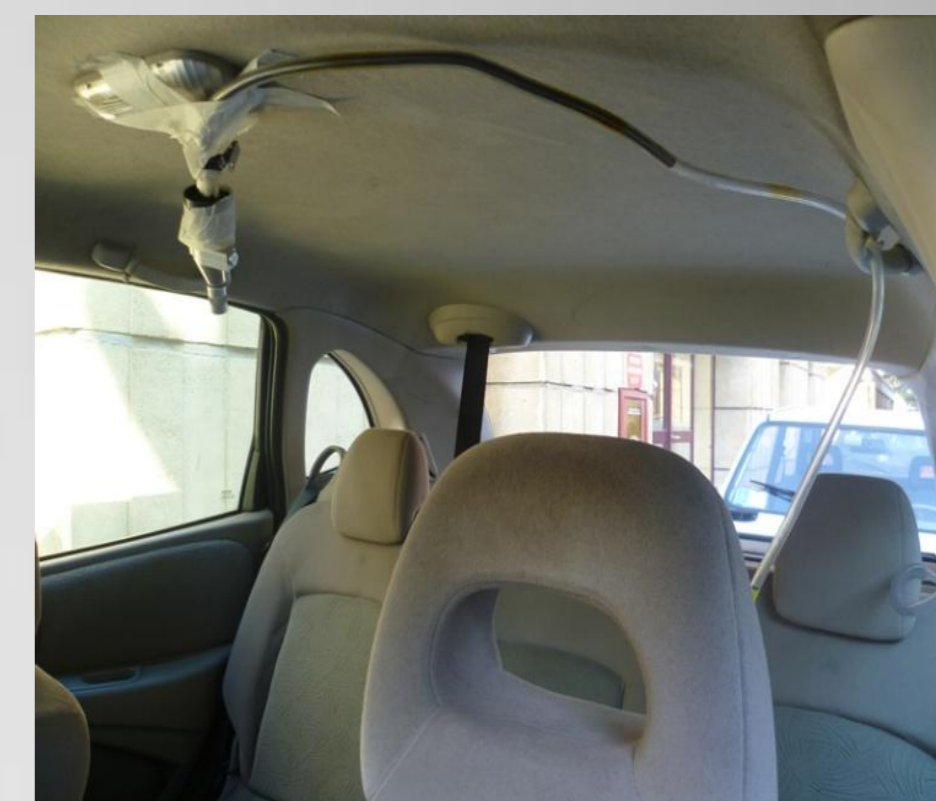
In the frame of the LIFE+ EXPAH Project, we carried out measurements of PM_{2.5}-bound PAHs in one bus and two cars in Rome.

Samplings were performed in real driving conditions, during two seasonal campaigns, each lasting fifteen days, during winter and summer, by simultaneously monitoring indoor and outdoor environments.

PM_{2.5} was collected on PTFE filter and eight high-molecular-weight PAHs were determined by GC-MS: benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene and benzo[ghi]perylene.



MONITORING ACTIVITY IN BUS AND CARS



RESULTS

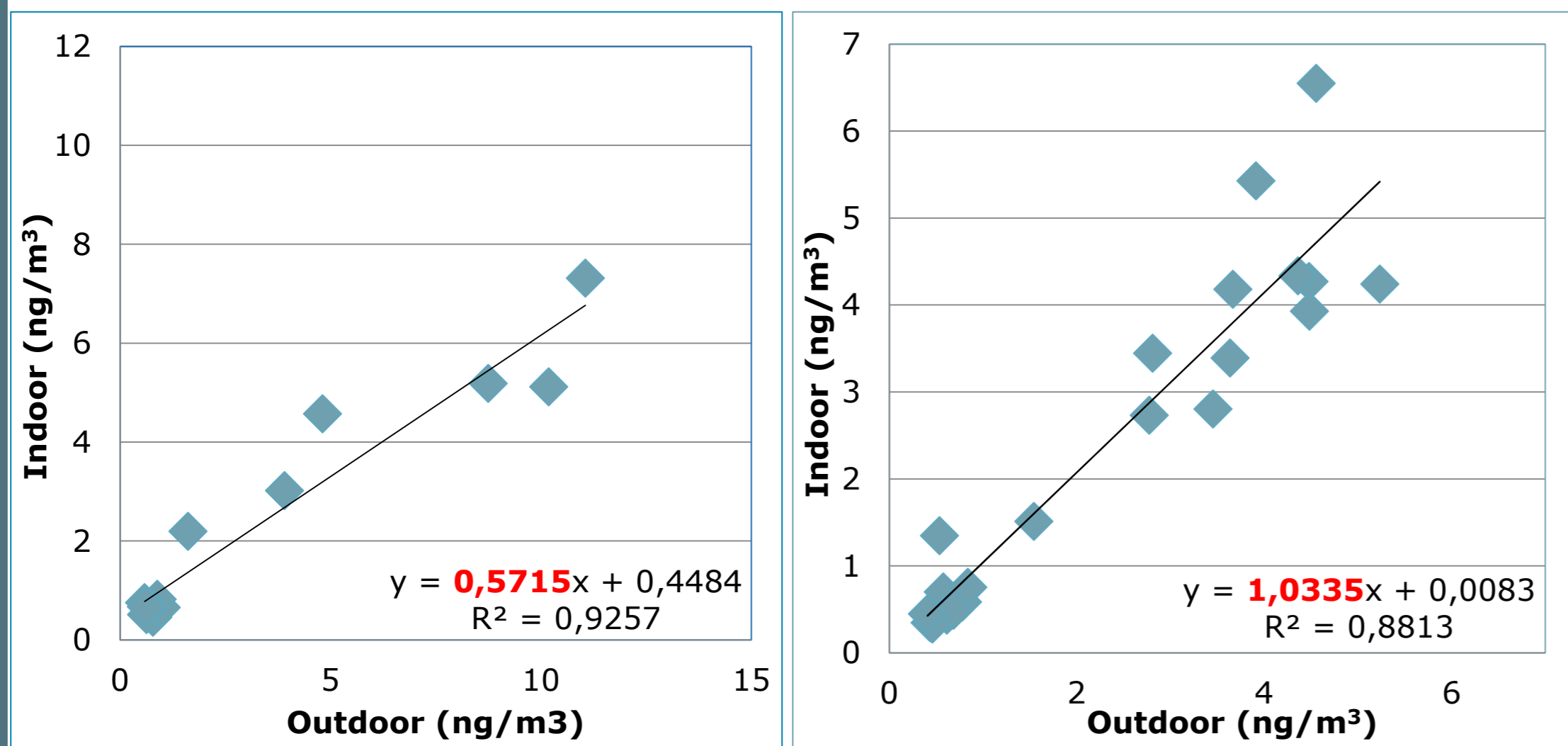
During the winter campaign, ΣPAHs ranged from 2.19 ng/m³ (car, indoor) to 11.05 ng/m³ (car, outdoor).

In the summer ΣPAHs ranged from 0.29 ng/m³ (car, indoor) to 1.54 ng/m³ (car, outdoor).

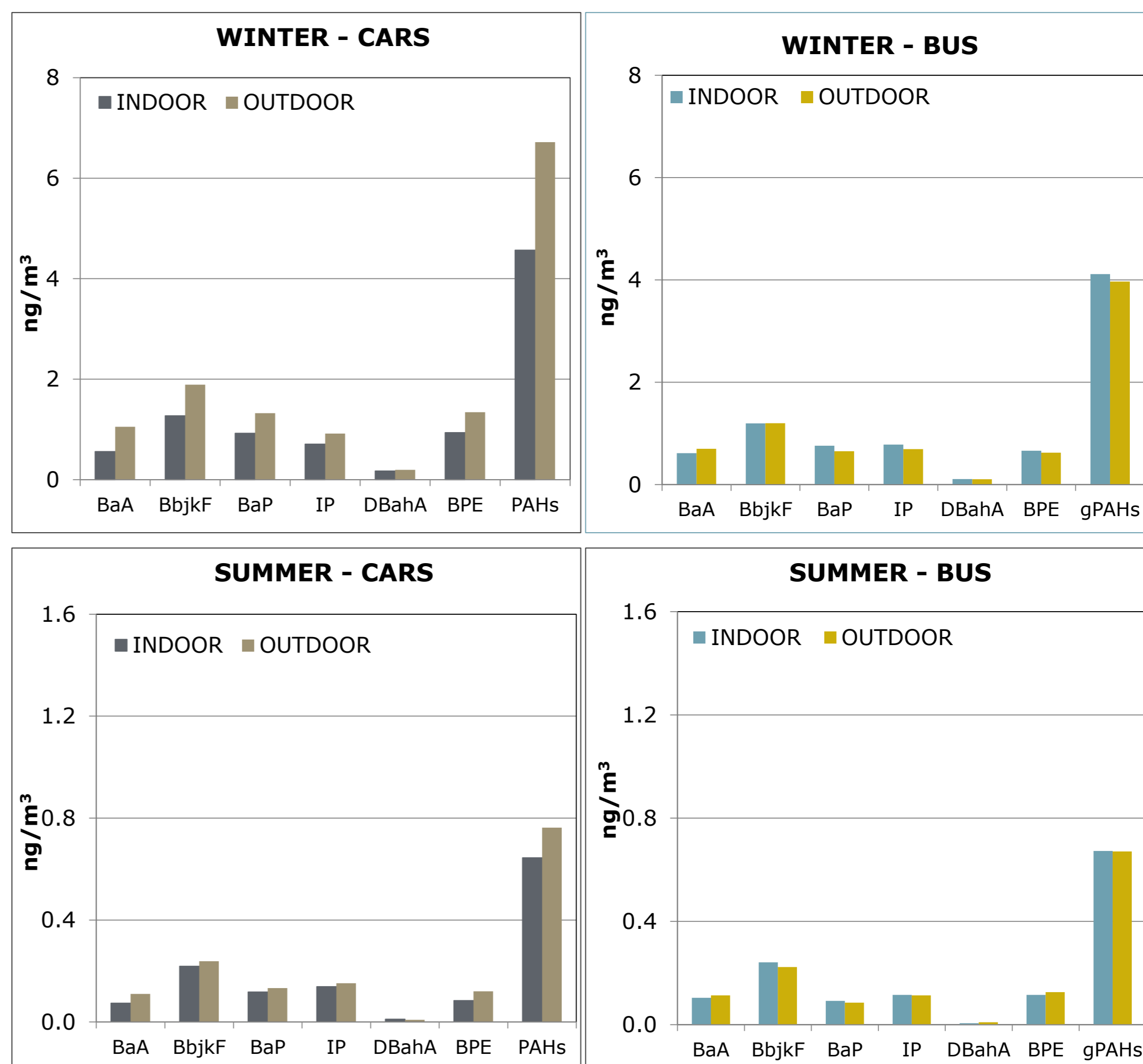
The I/O ratio, calculated by aggregating summer and winter data, resulted about 1 for bus and about 0.6 for cars (slope of the linear regression indoor vs outdoor concentration).

During the winter, sometimes indoor B(a)P was well above the guideline value of 1 ng/m³, whereas the summer values were well below mainly caused by filtering of air-conditioning system[4].

Indoor vs Outdoor Concentration



PAHs mean concentration in vehicles



According to results, in the public transport vehicles humans seem to be exposed to PAH levels similar to those typical of outdoor air, whilst in the cars, the indoor exposure can exceed the outdoor one. In winter, the PAH's level can exceed the guideline values of ambient air quality.

References

[1] Alm, S., Jantunen, M.J., Vartiainen, M., 1999. Urban commuter exposure to particle matter and carbon monoxide inside an automobile. *Journal of Exposure Analysis and Environmental Epidemiology* 9, 237-244.
[2] Shikiya, D.C., Liu, C.S., Hahn, M.I., Juarros, J., Barcikowski, W., 1989. In-vehicle air toxics characterization study in the South Coast Air Basin. Final Report. South Coast Air Quality Management District, El Monte, CA, USA.

[3] Behrentz, E., Fitz, D.R., Pankratz, D.V., Sabin, L.D., Colome, S.D., Fruin, S.A., Winer, A.M., 2004. Measuring self-pollution in school buses using a tracer gas technique. *Atmospheric Environment* (38), 3735-46.
[4] DIRETTIVA 2008/50/CE DEL PARLAMENTO EUROPEO E DEL CONSIGLIO del 21 maggio 2008 relativa alla qualità dell'aria ambiente e per un'aria più pulita in Europa.

