

Occurrence of legacy and current-use plasticizers in indoor dust from various EU countries

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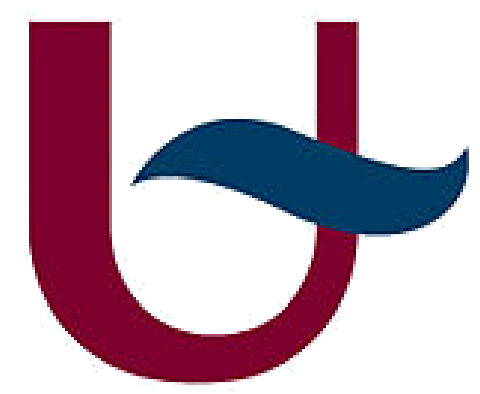
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INTRODUCTION

- Indoor dust accumulates several organic contaminants and act as a repository tank for various contaminants, including plasticizers¹.
- Phthalates are the most used plasticizers worldwide, applied mainly in PVC plastics and to a lower extent to non-PVC products². DEHP is the most well known phthalate applied in products over 50 years³.
- After the restrictions on phthalates, non-phthalate (alternative) plasticizers have become widely applied⁴.

MATERIALS & METHODS

- ✓ We defined as legacy plasticizers (LPs) 7 phthalate compounds and as current-use plasticizers (CUPs) 14 phthalate and non-phthalate compounds.
- ✓ LPs and CUPs were analyzed in indoor dust collected in various indoor environments from Belgium, Ireland, The Netherlands and Sweden.

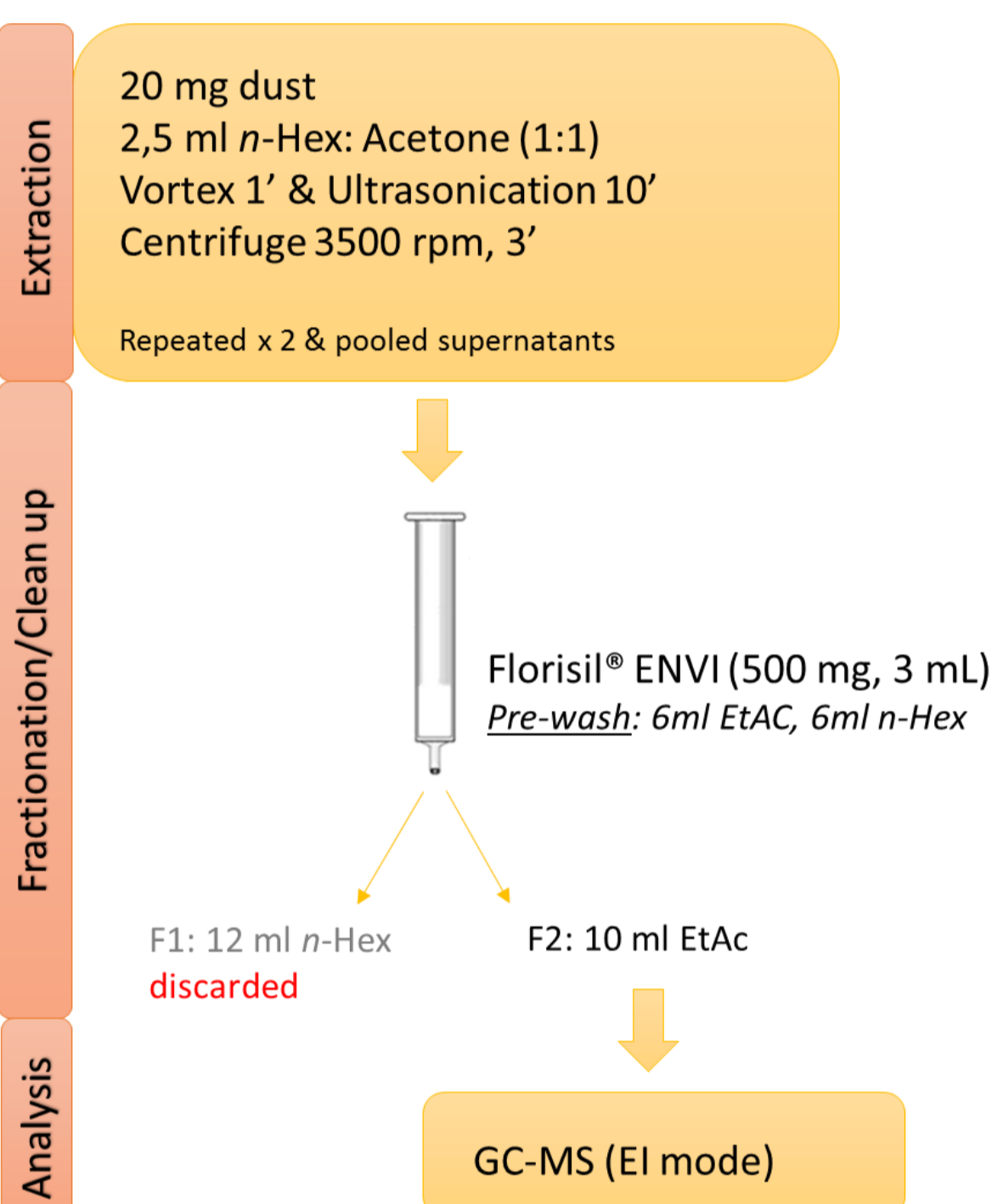
Indoor environments:

Belgian homes ($n=18$), Irish homes ($n=6$), Swedish offices ($n=7$), Swedish kindergartens ($n=5$), Dutch homes ($n=9$), Dutch offices ($n=9$).

Table 1. Target compounds

Abbreviation	Name
LPs	
DMP	dimethyl phthalate
DEP	diethyl phthalate
DNBP	di-n-butyl phthalate
DIBP	di-iso butyl phthalate
BBP	benzyl butyl phthalate
DEHP	bis (2-ethylhexyl)phthalate
DPP	diphenyl phthalate
CUPs	
DIBA	di-iso-butyl adipate
DBS	di-butyl sebacate
ATEC	acetyl triethyl citrate
DPCP	oresyl diphenyl phosphate
DEHA	bis (2-ethylhexyl)adipate
DEHT	bis (2-ethylhexyl)terephthalate
ATBC	tributyl-O-acetyl citrate
THMT	tri-n-hexyl trimellitate
BTHC	n-butyltri-n-hexyl citrate
TOTM	tris (2-ethylhexyl)trimellitate
DINCH	di-iso-nonyl ester 1,2-cyclohexane dicarboxylic acid
DIDP	di-isodecyl phthalate
DINP	di-isononyl phthalate
DPHP	di-(2-propylheptyl)phthalate

Figure 1. Experimental procedure



Method was *in-house* validated:

- QC sample SRM 2585 was spiked with IS (DBzP-d₄) and analyzed in triplicate.
- A low contaminated dust sample was spiked with IS (DBzP-d₄), native standard mixtures and analyzed in triplicate.
- Ten procedural blanks were analyzed for checking laboratory contamination.
- LOQ: concentration corresponding to S/N ratio of 10.
- When concentration values < LOQ, we substituted these with LOQ*df (df: the detection frequency of the compound).
- IS recoveries in all samples was: 114 ± 16 %.

CONCLUSIONS

- ✓ Remarkable levels of plasticizers were found in the dust samples with higher levels detected in the "non-domestic" environments.
- ✓ DEHP remains the dominant plasticizer even though it has been placed under restrictions.
- ✓ It is suggested that the concentration of plasticizers is related to the type of floor.
- ✓ Almost equal contribution of LPs and CUPs was estimated for all indoor environments but the slightly higher levels of the latter is an indication of gradual substitution of the LPs.

References

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RESULTS & DISCUSSION

DEHP, DNBP, DEHT, DINP and DINCH were detected in all indoor environments. 12 out of 21 target compounds were detected above the LOQs in most of the samples: DIBP, DNBP, BBP, DEHP, ATBC, DEHA, DEHT, TOTM, DINCH, DINP, DIDP, and DPHP.

Mean contribution: 60% CUPs & 40% LPs

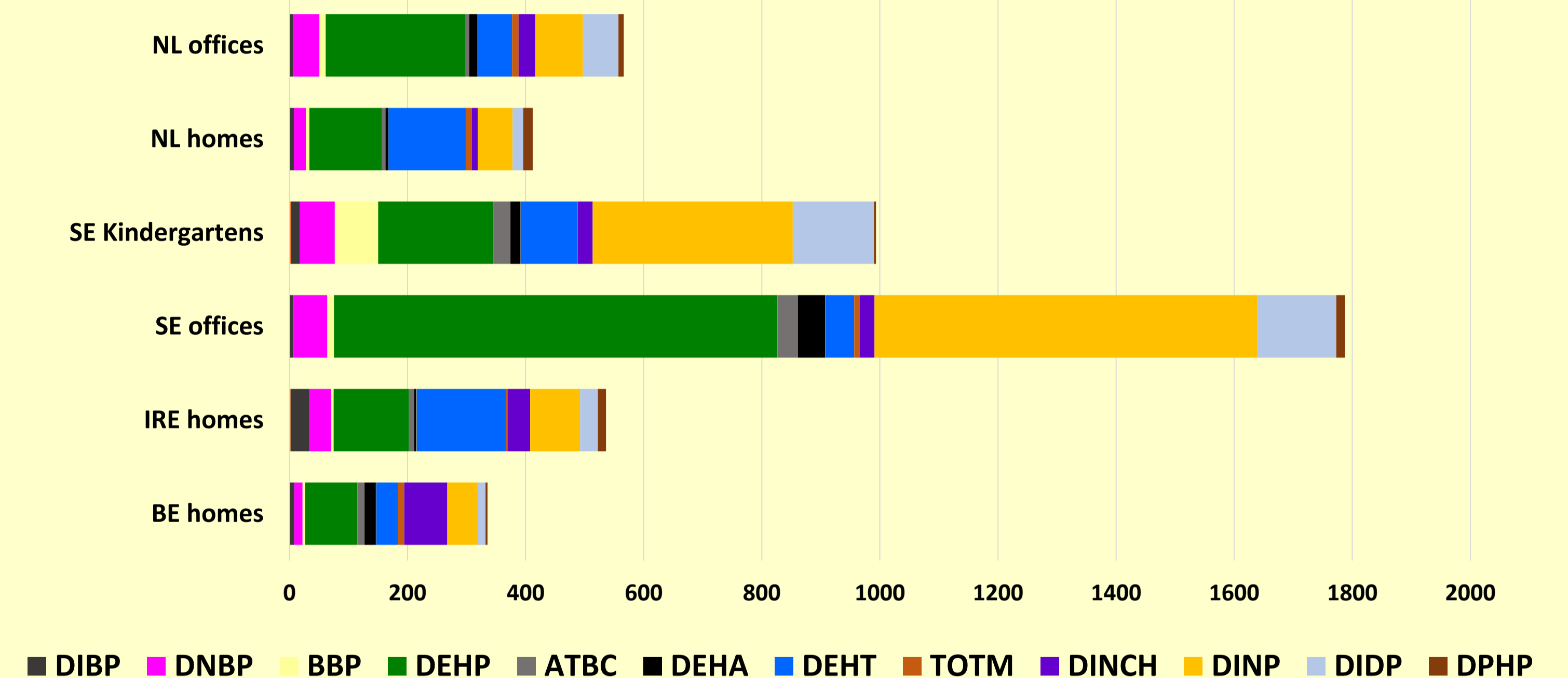


Figure 2. Mean concentrations ($\mu\text{g g}^{-1}$) of main plasticizers in indoor environments.

HOMES (BE, IRE, NL): similar contamination patterns. Main contributors are **DEHP, DEHT & DINP**.
KINDERGARTENS (SE): **DINP** is the dominant compound, followed by **DEHP** and **DIDP**.
OFFICES (SE, NL): diverse contamination patterns. **DEHP** is the major contributor for both, but in SE offices **DINP** is the dominant compound.

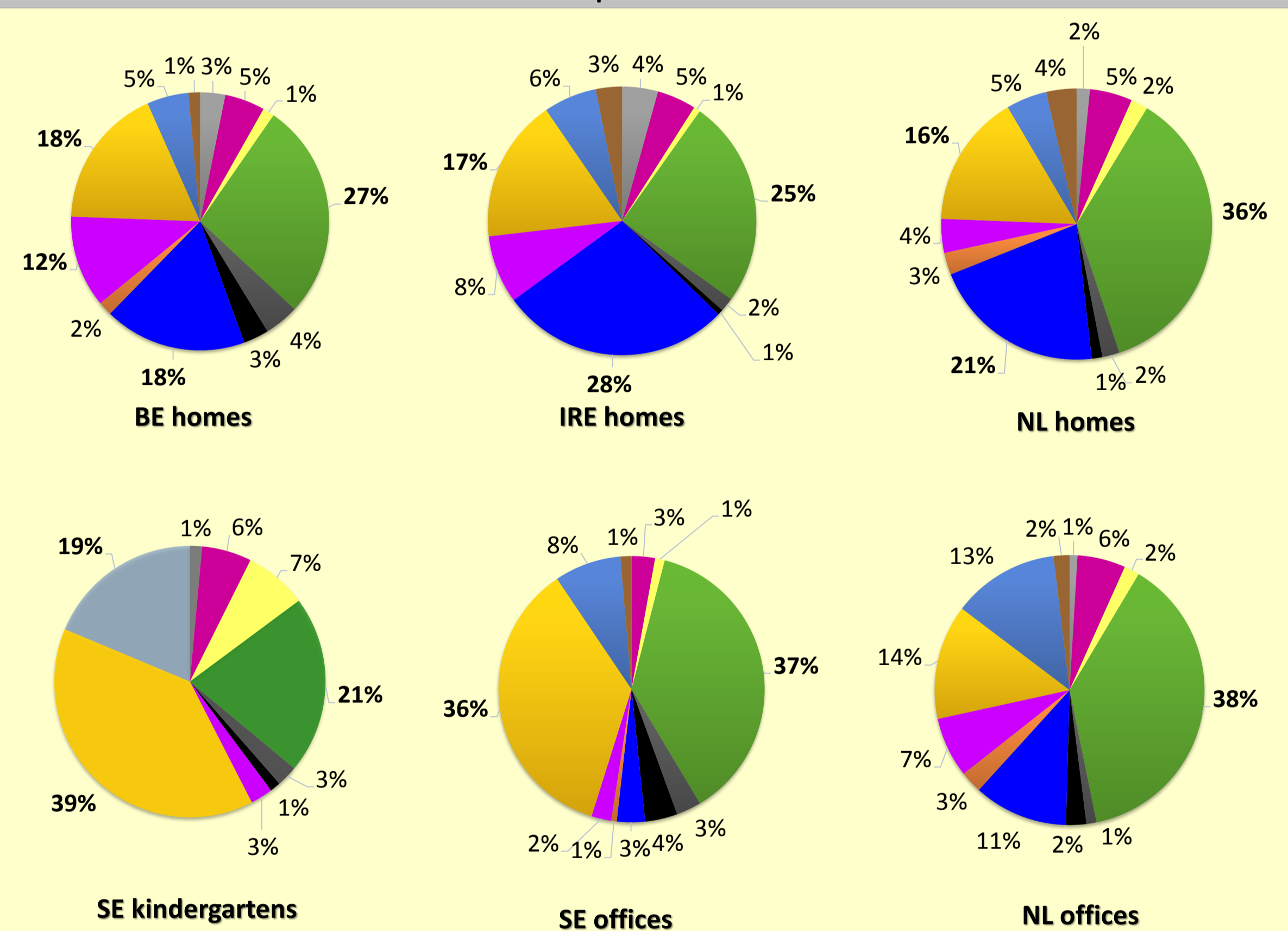


Figure 3. Contribution of the target compounds in indoor environments.

Order of contamination

Swedish offices > Swedish kindergartens > Irish homes ≈ Dutch offices > Dutch homes > Belgian homes
 PVC floor (non-domestic environments) > Wood & Tiles (domestic environments)

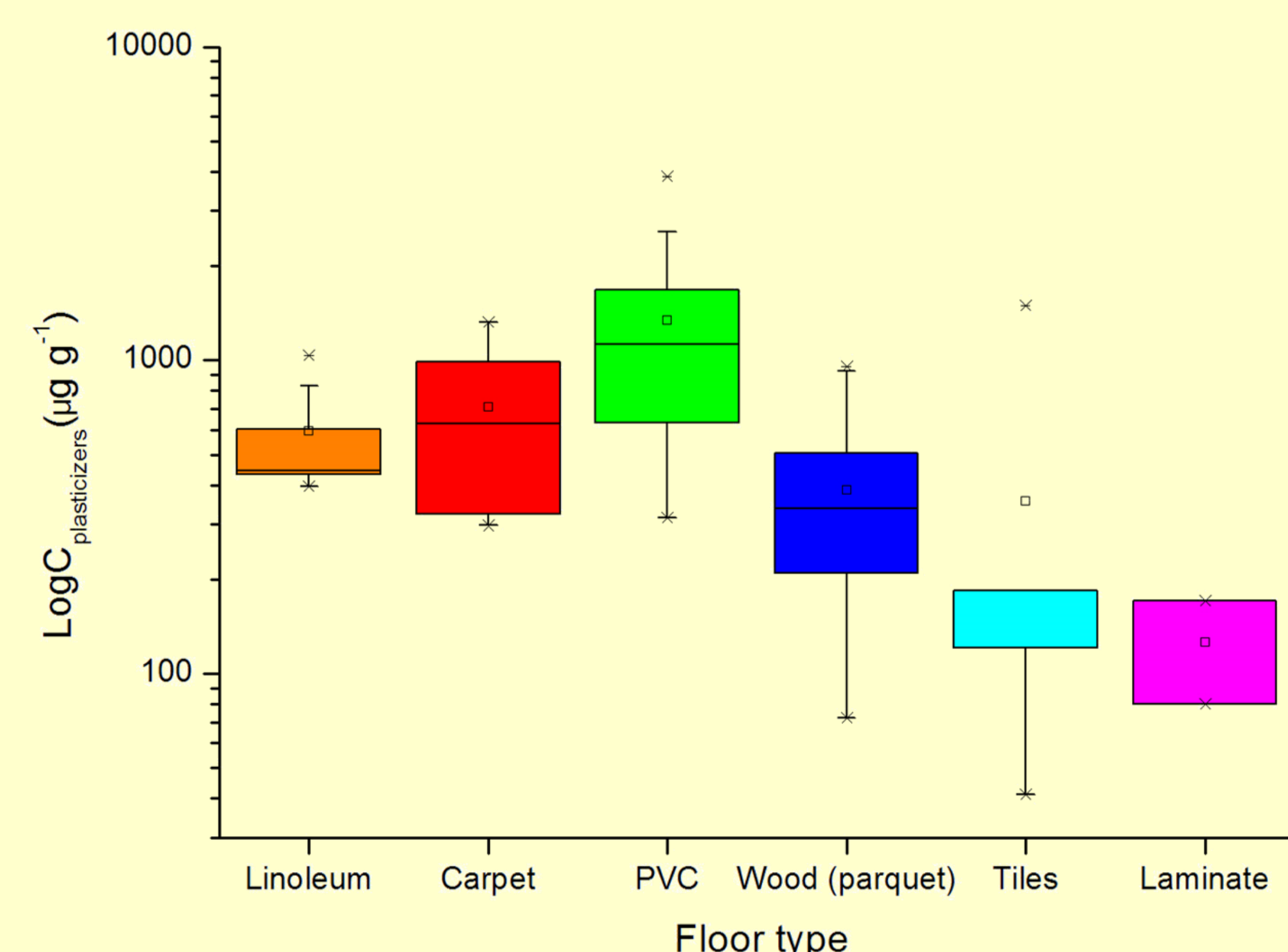


Figure 4. Descriptive statistics of plasticizers in different floor types

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