

## **6. Potential for translating exposome research into clinical practice and policy**

### **6.1. THE MODIFIABLE EXPOSOME**

The modifiable exposome refers to environmental exposures that can be altered or influenced through *individual or collective actions*.

By identifying and understanding exposures that are amenable to change, exposome research provides a roadmap for targeted interventions. This involves recognising lifestyle factors, behavioural choices, and environmental conditions that individuals or communities have the ability to modify. For example, reducing exposure to air pollution by promoting sustainable transportation options or mitigating noise pollution through urban planning strategies.

#### ***Mitigating exposures to endocrine disruptors***

Numerous interventions have demonstrated the potential to modify exposure to the common endocrine disruptors (including phenols, phthalates, and parabens) frequently found in personal care products (PCPs) and dietary sources. Interventions promoting increased exposures, for example, using PCPs containing triclosan and serving meals based on canned foods likely to release BPA, consistently resulted in elevated urinary concentrations of the targeted chemicals. Conversely, interventions removing or substituting these exposure sources generally led to decreased biomarker concentrations. *Lifestyle modifications, label scrutiny, and product replacement* have emerged as feasible strategies, illustrating the individual's capacity to reduce exposure effectively.

However, notable gaps remain, especially as regards the potential health impacts of exposure to glycol ethers and the limited development of bisphenol A (BPA) substitutes. In a recent systematic review including 26 interventions (Yang

et al., 2023), BPA and phthalate metabolites were reported as being the most targeted chemicals, possibly reflecting heightened media scrutiny. Dietary interventions, particularly those focused on BPA, were generally successful either alone or combined with PCP-related measures. Unexpected outcomes, including even increased metabolite concentrations in certain PCP studies, underscore the complexity of exposure reduction. Overall, the studies emphasise the need for interventions to consider participant compliance and motivation, and the ease with which the changes proposed can be adopted to enhance effectiveness.

The challenges of identifying “safer” replacement products were evident, with unintentional contamination from these replacements sometimes posing a risk. Participants, moreover, expressed difficulties in adhering to long-term changes, emphasising the need to promote sustainable interventions. Although varied participant demographics and the lack of long-term follow-up limit the generalisability of some of the interventions reported, successful instances showcase the potential for the widespread impact of policy measures that target exposure sources, transcending individual behavioural changes.

### *Urban exposome interventions*

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Traditional urban structures have been designed primarily to promote mobility in private vehicles and not to meet the needs of the more vulnerable, i.e. children, youth, the elderly, and those with chronic conditions. However, motorised vehicular traffic is a major contributor to poor air quality in most urban areas which, if they also fail to comply with international air quality directives and WHO recommendations, suffer the weighty burden of premature mortality and increased morbidity. This traditional urban planning model, moreover, typically ignores the possibilities of creating more naturalised and inclusive open spaces that can satisfy the diverse needs of daily life, and contribute to reducing other harmful urban exposures: for example, high noise levels, the heat island effect, and the lack of green/blue spaces and areas for physical activity and social interaction. However, in recent decades, cities have responded by developing traffic calming measures aimed at reducing motorised vehicle traffic. Urban re-designs that limit vehicular parking, reduce speed limits or eliminate traffic entirely can improve air quality, safety, and encourage active modes of transportation.

It is evident that effective preventive actions are urgently required to reduce the health and economic burden of the harmful urban exposome. These actions need to recognise the “complex systems” affecting population exposure, including “upstream” (e.g. economic, political, and global forces, as well as the natural