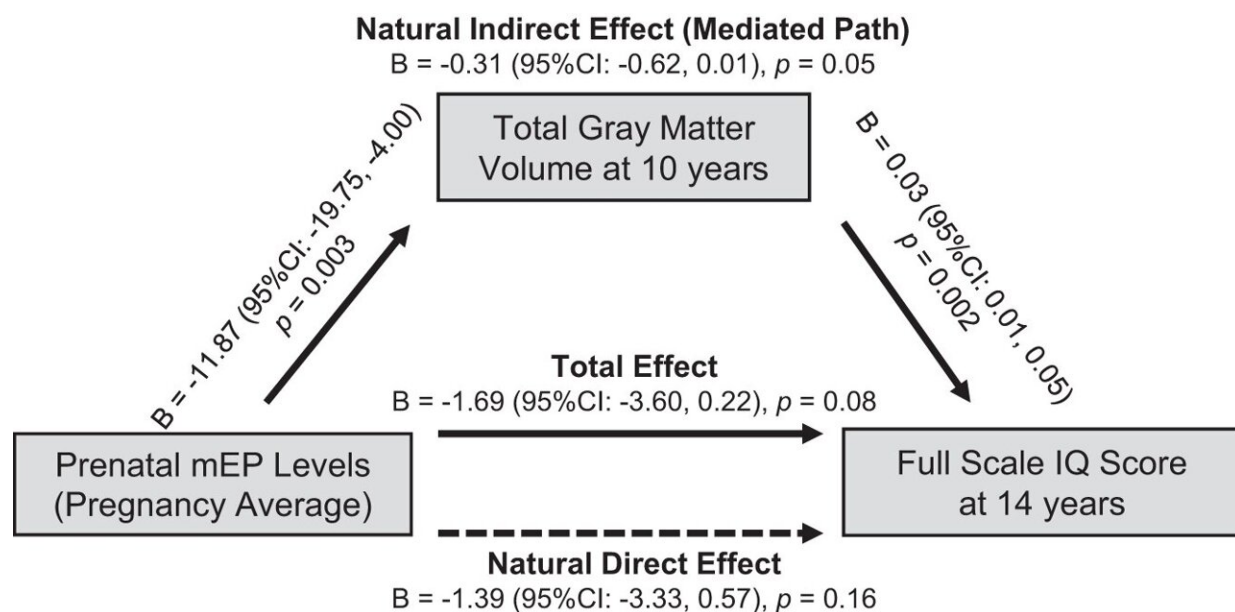


# Exposure to plasticizers in pregnancy associated with smaller volumetric measures in the brain and lower IQ in children

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Associations between prenatal monoethyl phthalate (mEP) exposure (averaged across pregnancy) and child full scale IQ score at age 14 years, mediated by total gray matter volume at age 10 years. Models were adjusted for maternal age, national origin, education, marital status, IQ score, pre-pregnancy body mass index, parity, smoking during pregnancy, MRI quality score, and child sex and age at the neuroimaging assessment and/or age at assessment child IQ. Data shown from the 20th imputation set. Credit: *Molecular Psychiatry* (2023). DOI: 10.1038/s41380-023-02225-6

Children whose mothers had a higher exposure to certain phthalates during pregnancy tend to show smaller total gray matter in their brains at age 10. This is one of the main conclusions of a study led by the NYU Grossman School of Medicine and the Barcelona Institute for Global Health (ISGlobal), and [published in \*Molecular Psychiatry\*](#).

The study also found that [maternal exposure](#) to plasticizers during pregnancy is associated with lower child IQ at age 14, which confirmed the results of two previous study on the topic. Moreover, the research team observed that this relationship between exposure to certain phthalates and lower child IQ is partially influenced by total gray matter volumes. In other words: exposure to plasticizers before birth could lead to smaller total gray matter in childhood, which in turn could be related to a lower IQ.

Finally, the results showed an association between gestational exposure to plasticizers and smaller white matter volumes in girls.

## **Phthalates, a group of chemicals of concern**

Phthalates are a group of chemicals which are ubiquitously used as plasticizers and solvents in a wide range of commercial products, such as [personal care products](#), food packaging or vinyl flooring. Previous studies have shown that certain phthalates are associated with less optimal cognitive function, social development, and motor skills as well as behavioral problems in children.

In order to provide new evidences, the authors used data from 775 mother-child pairs from [Generation R](#), a pediatric neuroimaging cohort based in Rotterdam (The Netherlands). Phthalate exposure of mothers was assessed using [urine samples](#) collected during pregnancy.

Since phthalates are difficult to detect due to their rapid decay in the

[human body](#), the analysis of the samples focused on detecting phthalate metabolites, the breakdown products generated as the consequence of the presence phthalates.

Brain volumetric measures of children were taken using MRI scans at age 10. Lastly, children's IQ was assessed via standard tests performed when children were 14 years old.

## Statistical analysis results

The [statistical analysis](#) revealed an association between higher gestational concentrations of monoethyl phthalate (mEP) and smaller total gray matter volumes in offspring at age 10. mEP is a metabolite, or breakdown product, of diethyl phthalate, a compound used to make plastics more flexible and in cosmetic products.

Higher maternal concentrations in urine during pregnancy of monoisobutyl phthalic acid (mIBP), a metabolite of diisobutyl phthalate (DIBP), were associated with smaller white matter only in girls. DIBP is also used as a plasticizer.

Gray matter is the tissue that contains most of the brain's neuronal cell bodies and help us process information and govern our muscles. This part of the brain is essential in our ability to learn and retain information, speak, move or process sensation and perceptions.

In turn, white matter is a brain tissue that acts as a communication network between the different gray matter areas and between our brain and the rest of our body.

## Lower IQ at age 14

In [2020](#) and [2021](#), the Generation R Study reported that maternal prenatal urinary concentrations of phthalates were associated with lower non-verbal IQ at age 6 years. After showing that the association persists at age 14, the authors state that "the impact of phthalate exposure on the brain and child cognition continues into adolescence."

The new study estimates that 18% of the total effect of [phthalate](#) exposure in pregnancy on children's IQ could be explained by changes in gray matter volumes in both boys and girls. In girls, the association between gestational exposure to mIBP and lower IQ was found to be due to smaller cerebral white [matter](#) in a proportion of 76%.

## Small differences at individual level

"Even though the observed differences in volumetric measures and IQ scores were small at individual level, it is the wide picture what shows reasons for concern because of the widespread exposure to phthalates and poor regulations, which lead to a high public health impact," says Mònica Guxens, ISGlobal researcher and last author of the study.

"In the light of scientific evidences on their health effects, countries such as the US or regions such as the EU have increased the regulations of this ubiquitous compounds. However, the use of new compounds to replace the regulated ones leads to a persistence of the global impact of prenatal exposure to phthalates," says Akhgar Ghassabian, researcher at the NYU School of Medicine.

**More information:** Akhgar Ghassabian et al, Prenatal exposure to common plasticizers: a longitudinal study on phthalates, brain volumetric measures, and IQ in youth, *Molecular Psychiatry* (2023). [DOI: 10.1038/s41380-023-02225-6](#)

Provided by Barcelona Institute for Global Health

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