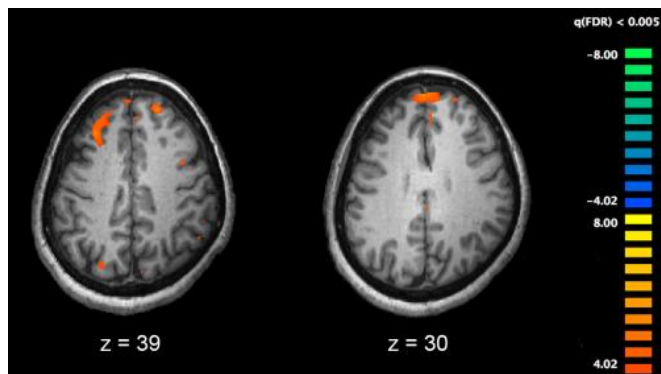


# Smoking during pregnancy associated with increased risk of schizophrenia in offspring

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Functional magnetic resonance imaging (fMRI) and other brain imaging technologies allow for the study of differences in brain activity in people diagnosed with schizophrenia. The image shows two levels of the brain, with areas that were more active in healthy controls than in schizophrenia patients shown in orange, during an fMRI study of working memory. Credit: Kim J, Matthews NL, Park S./PLoS One.

A study by researchers at Columbia University's Mailman School of Public Health, Columbia University Medical Center (CUMC), New York State Psychiatric Institute and colleagues in Finland reports an association between smoking during pregnancy and increased risk for schizophrenia in children. The paper evaluated nearly 1,000 cases of schizophrenia and matched controls among offspring born in Finland from 1983-1998 who were ascertained from the country's national registry. Results showed that a higher maternal nicotine level in the mother's blood was associated with an increased risk of schizophrenia among their offspring. The findings persisted after adjusting for important confounding factors including maternal and parental psychiatric history, socioeconomic status, and maternal age. The study provides the most definitive evidence to date that smoking during pregnancy is associated with schizophrenia.

Findings are published online in the *American Journal of Psychiatry*.

Heavy maternal nicotine exposure was associated with a 38 percent increased odds of [schizophrenia](#).

"To our knowledge, this is the first biomarker-based study to show a relationship between fetal nicotine exposure and schizophrenia," said Alan Brown, MD, MPH, senior author and Mailman School professor of epidemiology and professor of clinical psychiatry at CUMC. "We employed a nationwide sample with the highest number of schizophrenia cases to date in a study of this type."

Researchers analyzed data from a large national birth cohort of pregnant women who participated in the Finnish Prenatal Study of Schizophrenia and their offspring from the Finnish Maternity Cohort, which archived over 1 million prenatal serum specimens since 1983. Sera were drawn during the first and early second trimesters. The Finnish Hospital and Outpatient Discharge Registry was used to identify all recorded diagnoses for psychiatric hospital admissions and outpatient treatment visits.

Heavy smoking based on cotinine, a reliable marker of nicotine in maternal sera, was reported by 20 percent of the mothers of cases, but only 14.7% of the mothers of controls.

Smoking during pregnancy is known to contribute to significant problems in utero and following birth, including low birth weight and attentional difficulties. Nicotine readily crosses the placenta into the fetal bloodstream, specifically targets fetal brain development, causing short- and long-term changes in cognition, and potentially contributes to other neurodevelopmental abnormalities.

"These findings underscore the value of ongoing public health education on the potentially debilitating, and largely preventable, consequences

that smoking may have on children over time," said Brown. "Future studies on maternal smoking and other environmental, genetic, and epigenetic factors, as well as animal models, should allow identification of the biological mechanisms responsible for these associations. Finally, it is of interest to examine maternal cotinine in relation to bipolar disorder, autism, and other psychiatric disorders. In a previous study from a different birth cohort, also reported in the *American Journal of Psychiatry*, Dr. Brown and colleagues found that offspring of mothers who reported smoking during pregnancy have an [increased risk](#) of bipolar disorder.

Provided by Columbia University's Mailman  
School of Public Health

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