

RESEARCH NEWS STORY

September 30, 2026

Maternal House Dust–Related Cleaning Behaviors During Pregnancy Associated with Child Developmental Screening Outcomes

More frequent house dust–related cleaning during pregnancy was associated with lower odds of screening positive for developmental concerns through age 3

House dust contains chemical and biological components that may influence the indoor environment during pregnancy. Researchers from Japan analyzed 81,125 mother–child pairs and found that more frequent house dust–related cleaning behaviors during pregnancy were associated with lower odds of screening positive for developmental concerns from 18 months to 3 years. The findings highlight household environmental management as a potential area for further study while underscoring the need for objective exposure measurements.

House dust can contain chemical and biological components, including phthalates, flame retardants, allergens, endotoxins, and microorganisms. Because pregnant women spend time indoors, household environmental conditions during pregnancy may be relevant to child development. Earlier research linked maternal cleaning behaviors with infant development up to 12 months, but evidence beyond the first year was limited. The researchers therefore examined whether these behaviors were associated with developmental screening outcomes from 18 months to 3 years of age.

To address this gap, a research team led by Specially Appointed Assistant Professor Kanako Shimada of the Toyama Regional Center for JECS at the University of Toyama, Japan, conducted the study in collaboration with researchers from the university's Department of Public Health. They analyzed data from 81,125 mother–child pairs participating in the Japan Environment and Children's Study, a nationwide birth cohort.

Mothers reported how often they vacuumed living-room floors and futons and aired futons during pregnancy, as well as whether they used anti-mite covers for their futons or bedding. Child development was assessed at 1.5, 2.0, 2.5, and 3.0 years using the Japanese Ages and Stages Questionnaires, Third Edition (J-ASQ-3), covering five developmental domains: communication, gross motor, fine motor, problem-solving, and personal–social. Generalized linear models were used to estimate adjusted odds ratios (AORs); Model 1 accounted for maternal factors, and Model 2 additionally accounted for socioeconomic and dwelling environment factors. Their findings were published online in the journal [BMC Pediatrics](#) on September 3, 2026.

Across all four assessment ages, higher frequencies of house dust–related cleaning behaviors were associated with lower odds of screening positive for developmental concerns. In Model 1, adjusted odds ratios ranged from 0.74 to 0.97, while Model 2 produced a range of 0.68 to 0.98. A graded association was observed, with higher frequencies of cleaning-related behaviors

associated with progressively lower odds of screening positive for developmental concerns. *“Our previous study found an association between maternal cleaning behaviors during pregnancy and child development up to 1 year of age. However, it remained unclear whether these associations extended beyond infancy,”* says Dr. Shimada. *“We therefore examined the associations between these behaviors and developmental screening outcomes from 18 months to 3 years of age.”*

The findings may be relevant to household environmental management during pregnancy, particularly behaviors such as regular vacuuming, airing futons, and using anti-mite covers. However, the study did not directly measure house dust or environmental contaminants. The cleaning behaviors were used as proxy indicators of household environmental management, so the researchers could not determine whether the associations reflected reduced exposure to chemical contaminants, allergens, particulate matter, microbial components, or other aspects of the indoor environment. The observed associations were also modest, with adjusted odds ratios close to unity. *“Further research is needed to better understand the factors underlying these associations. Studies using objective measures of the home environment will be particularly important in determining what may explain the observed associations,”* says Dr. Shimada.

Importantly, the findings show an association, not a causal relationship, between maternal cleaning behaviors and developmental screening outcomes.

Overall, the study extends previous findings by showing that maternal house dust–related cleaning behaviors during pregnancy were associated with developmental screening outcomes across multiple time points from 18 months to 3 years. The results should not be interpreted as evidence that cleaning itself directly reduces developmental risk. Differences in caregiving, health-related behaviors, socioeconomic circumstances, postnatal environments, and other unmeasured factors may contribute to the associations. The researchers emphasize studies incorporating objective environmental measurements, such as dust sampling or biomonitoring, as well as replication in diverse cultural and environmental settings, to clarify the underlying mechanisms and generalizability.

Reference

Title of original paper:	Maternal house dust–related cleaning behaviors during pregnancy and neurodevelopment from 18 months to 3 years of age in the Japan Environment and Children’s Study
Journal:	<i>BMC Pediatrics</i>
DOI:	10.1186/s12887-026-07588-7

Additional information for EurekAlert

Latest Article Publication Date:	3 September 2026
Method of Research:	Observational study
Subject of Research:	People
Conflicts of Interest Statement:	The authors declare no competing interests.

About University of Toyama

The University of Toyama located in Toyama Prefecture, Japan, is comprised of 3 former national universities; Toyama University (founded in 1949), Toyama Medical and Pharmaceutical University (founded in 1975), and Takaoka National College (founded in 1983), which were integrated in October 2005. This integrated university houses 9 schools, 8 graduate schools, the University Laboratory, Hospital, and Library, among others like the Organization for International Education and Exchange. There are approximately 9,300 students (including 300 international students) studying at the university.

Website: <https://www.u-toyama.ac.jp/en/>

About Specially Appointed Assistant Professor Kanako Shimada from University of Toyama

Dr. Kanako Shimada is a Specially Appointed Assistant Professor at the Toyama Regional Center of Japan Environmental and Children's Specially Appointed Study (JECS), University of Toyama, Japan. Her research focuses on pediatric nursing, maternal and child health, child development, and public health. Through large-scale birth cohort studies, she investigates parental behaviors, family environments, maternal–infant bonding, and child health and development. Her recent research examines paternal involvement in childcare, child injury, maternal behaviors during pregnancy, breastfeeding, and environmental factors influencing maternal and child health, with the aim of understanding factors shaping child development and family well-being.

Funding information

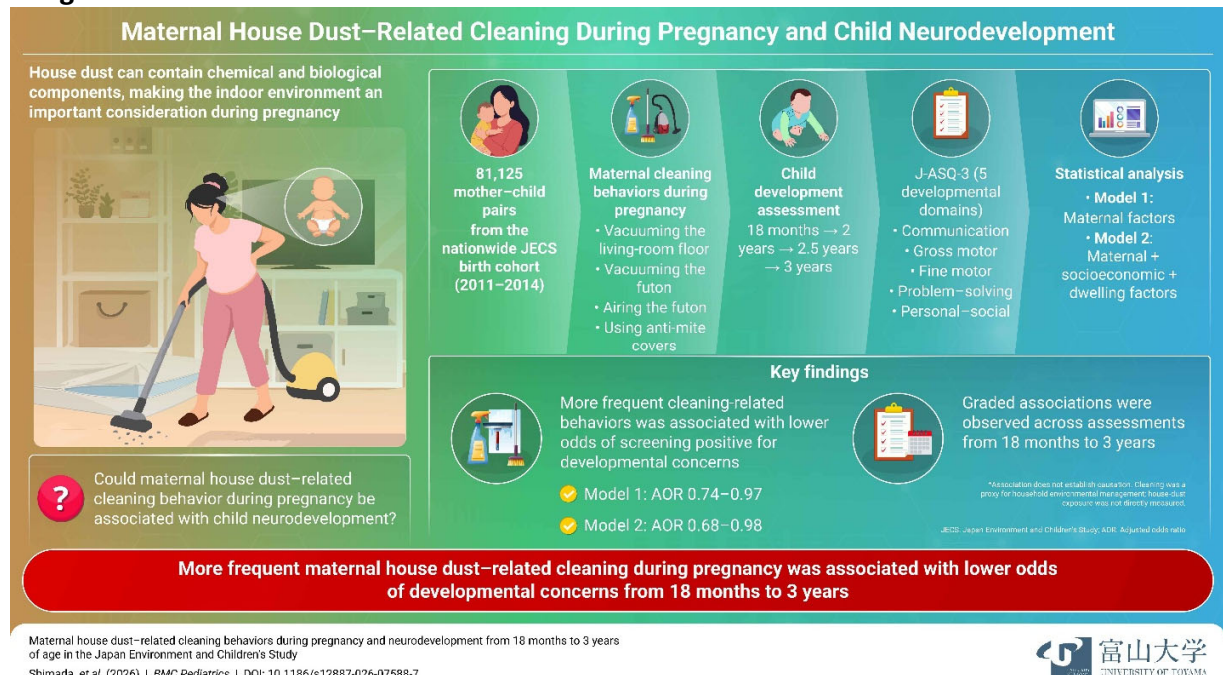
This study was funded by the Ministry of the Environment, Japan. The findings and conclusions of this article are solely the responsibility of the authors and do not represent the official views of the government.

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Image



Title: Maternal House Dust–Related Cleaning Behaviors During Pregnancy and Child Development

Caption: More frequent house dust–related cleaning during pregnancy was associated with lower odds of developmental concerns from 18 months to 3 years, although causality remains uncertain.

Credit: Specially Appointed Assistant Professor Kanako Shimada, University of Toyama, Japan

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