

Study offers new insights into the effects of stress on pregnancy

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Expectant mothers who dealt with the strain of a hurricane or major tropical storm passing nearby during their pregnancy had children who were at elevated risk for abnormal health conditions at birth, according to a study led by a Princeton University researcher that offers new insights into the effects of stress on pregnancy.

The study used [birth records](#) from Texas and meteorological information to identify children born in the state between 1996 and 2008 whose mothers were in the path of a major [tropical storm](#) or hurricane during pregnancy. The children's health at birth was compared with that of [siblings](#) whose gestation didn't coincide with a major [weather event](#).

The study found that mothers living within 30 kilometers of a hurricane's path during their [third trimester](#) were 60 percent more likely to have a newborn with abnormal conditions, which are detailed on birth records. Those conditions included being on a [ventilator](#) for more than 30 minutes or experiencing meconium [aspiration](#), which occurs when a newborn breathes in a mixture of meconium — or early feces — and amniotic fluid around the time of delivery. Increased risk was also found following exposure to weather-related stressors in the first trimester, while evidence was less clear for exposure in the second trimester. The researchers were able to isolate the impact of stress caused by the storm from other factors, such as changes in the availability of health care in a storm's aftermath.

The study breaks ground by honing in on new — and potentially better

— ways to measure the impact of prebirth stress on newborns and opens avenues for further research into the potential impact on such children's later development, said lead researcher Janet Currie, Princeton's Henry Putnam Professor of Economics and Public Affairs at the Woodrow Wilson School of Public and International Affairs and director of the Center for Health and Wellbeing.

"Probably the most important finding of our study is that it does seem like being subjected to stress in pregnancy has some negative effect on the baby, but that the effect is more subtle than some of the previous studies have suggested," said Currie, who conducted the study along with Maya Rossin-Slater, a doctoral candidate in the Department of Economics at Columbia University.

Anna Aizer, associate professor of economics and public policy at Brown University who wasn't involved in the study, said the research "really raises the bar in terms of identification of the effect of stressful events in-utero on birth outcomes."

"Previous work has not really been able to isolate the effect as well as Currie and Rossin-Slater have," said Aizer, whose research focuses on issues related to children's well-being.

Meconium aspiration — usually a sign of fetal distress — and other respiratory problems that necessitate a baby being placed on a ventilator can generally be treated successfully, but the study offers new paths for future research about the long-term health of children born in the wake of stressful events such as hurricanes.

"I think there's every reason to believe that if you have a better measure of child health — like you knew this child was having breathing problems at birth — that might be a stronger predictor of longer-term outcomes," Currie said. "There's a lot of interest in this whole area of

how things that happen very early in life can affect future outcomes."

Previous research into the impact of similar types of stress has found changes in length of gestation and birth weight, but the new study didn't find a significant effect on those measures, Currie said.

Currie said one explanation for the difference is that the new study utilized data that allowed the researchers to control for changes in the population of an area around the time of a storm that could have affected the previous findings. Earlier research hasn't been able to account for the way the population of an area changes around the time of a stressful event — with people of certain demographic groups more likely than others to move away or stay nearby.

The new study included data on eight hurricanes and tropical storms that hit any part of Texas between 1996 and 2008 and caused more than \$10 million damage. The most damaging storms were Tropical Storm Allison in 2001, which caused more than \$50 billion in damage and 40 deaths, and Hurricane Ike, which caused \$19.3 billion in damage and 103 deaths.

Experiencing a [hurricane](#) or major tropical storm can have a significant impact on people that goes well beyond stress. However, Currie said the researchers were able to determine that findings related to abnormal [health conditions](#) at birth generally weren't tied to disruption of medical care or property damage caused by the storms, such as damage to an expectant mother's home that might lead to injury or increased risk of illness. They also found little consistent evidence that the stress associated with storms affected mothers' behaviors, such as smoking, eating as reflected in weight gain and use of prenatal care.

One potential cause of the health problems found in the study is an increase in stress hormones caused by the storm, which occurred in what

is known as the neuroendocrine pathway.

"I think the takeaway finding is that it's worth doing more focused research on those pathways and looking for more subtle effects on the fetus than just looking at birth weight and preterm delivery," Currie said. "And it would be really great if we could follow over time and see what happens to children who are affected by these types of events."

Aizer said the research could also have implications beyond the context of natural disasters.

"Previous work has shown poor mothers are exposed to more stressors. Currie and Rossin-Slater's work suggests that exposure to stress might be one of the mechanisms explaining why poor women have worse birth outcomes," Aizer said. "Policymakers concerned with improving the outcomes of poor families should consider these findings."

Provided by Princeton University

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