

Research finds hurricane forecasts impair birth outcomes

December 1 2022



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In August 2011, as Hurricane Irene approached North Carolina, the National Hurricane Center released forecasts depicting where in the state the storm might hit.

These forecasts undoubtedly helped many people prepare for the coming violent wind and torrential rain. Hurricane Irene ended up bringing destructive tornadoes, 115 mile-per-hour winds, a powerful storm surge, up to 17 inches of rain and five deaths to coastal North Carolina. However, the wide-reaching forecasts also caused stress and anxiety to many farther inland who feared getting nailed but, ultimately, experienced only light wind and rain.

For most people, spending a day or two worrying about a storm that never hits may not have serious effects. However, when such stress affects pregnant women and their unborn babies, it can translate to negative [birth outcomes](#) and health problems later in the babies' lives.

To assess the relationship between [hurricane](#) forecast accuracy and human health impacts, researchers led by Jacob Hochard, Knobloch Assistant Professor of Conservation Economics in the University of Wyoming Haub School of Environment and Natural Resources, examined extensive data, including records for more than 700,000 births that occurred in North Carolina in the five years leading up to and nine months following when Hurricane Irene made landfall. The researchers' goal was to understand potential adverse public health effects from forecasting hurricanes in areas the storms never end up reaching.

In collaboration with Hochard, Nino Abashidze, a UW Haub School postdoctoral research associate, and Yuanhao Li, an assistant professor

in the Norwegian School of Economics, also contributed to the research. The full paper, "Associations of hurricane exposure and forecasting with impaired [birth](#) outcomes," was published recently in the journal *Nature Communications*.

The researchers wanted to know how outcomes compared for births that occurred before the hurricane arrived (the control group); births where the mother experienced the hurricane during pregnancy (intense wind and rainfall); and births where the mother thought she might get hit by the hurricane (because she was in the "cone of uncertainty" depicted in hurricane forecasts) but the hurricane ultimately missed or brushed her (light wind and rainfall).

Researchers found that, indeed, compared to babies born in the same zip code before the hurricane arrived, those who were in utero during the hurricane weighed less, were more likely to have a low (less than 5.5 pounds) or very low (less than 3.3 pounds) birth weight, were born earlier and were more likely to be premature (born before 37 weeks gestation) or extremely premature (born before 34 weeks).

Such outcomes can have lasting effects on a child's life. The researchers cite data showing children weighing less than 2,500 grams (5.5 pounds) were more than 25 percent less likely to pass high school English and math exit examinations, and they also were less likely to be employed at the age of 33 than their counterparts with higher birth weights.

Interestingly, impaired birth outcomes in the study appeared for all moms who were pregnant when the hurricane hit, regardless of whether the moms were in the heart of the hurricane or the hurricane missed them.

"Although we would expect that a higher intensity of rainfall and wind would be associated with more drastic birth impacts, the magnitudes of

these estimated effects did not increase with storm exposure intensity," the researchers wrote.

The researchers ruled out several potential explanations for these findings. Could it be that intense rainfall during the hurricane contaminated drinking [water wells](#) and that is what caused the lower birth weights and shorter gestation periods?

The team examined more than 17,000 private well water samples taken statewide from the same time period as the data on birth outcomes and found no meaningful relationship between storm intensity and water contamination.

Could it be that the [pregnant women](#) who experienced the hurricane had different socioeconomic or medical risk factors than those living inland? According to the researchers, maybe more vulnerable populations—such as those without health insurance or with less access to health care—live in the parts of the state where the storm was the worst. Again, the data showed no evidence of geographic socioeconomic sorting or differing medical risk factors among those who gave birth before the storm, those who were pregnant where the storm hit and those who saw the storm pass.

The researchers also looked at prenatal [health care](#). This time, they did find a relationship. Mothers who were pregnant during the hurricane started prenatal care later in their pregnancies and had fewer overall prenatal care visits compared to those who gave birth before the hurricane hit. This suggests the hurricane forecasts caused women and their care providers to cancel or delay prenatal checkups, including both for women who lived through the storm as well as for those whom the storm only brushed. Perhaps, missed care visits—combined with stress and anxiety of anticipating the storm—caused the lower birth weights and shorter pregnancies.

"I'm very intrigued about the robustness of our findings in this study," Hochard says. "Because we were able to examine such an immense data set, we are confident in the story that this research is telling us. We hope that our findings spark a conversation about how a 'better safe than sorry' approach to releasing disaster forecasts might not always be in the public's best interest."

These findings have relevance for how forecasters generate and disseminate storm warnings, the researchers say. Early storm forecasts—which are less precise than later forecasts and may imply more certainty than they contain—come with the price of harming the unborn. The researchers suggest that recognizing the damages that come from frightening people about storms is a first step to addressing this problem.

They recommend seeking ways to create more "judicious" forecasts that strike a balance between providing the public time to prepare and communicating storm path projections as their trajectories become more certain. They also recognize that further research may be necessary to fully understand this challenge.

More information: Jacob Hochard et al, Associations of hurricane exposure and forecasting with impaired birth outcomes, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-33865-x](https://doi.org/10.1038/s41467-022-33865-x)

Provided by University of Wyoming

Citation: Research finds hurricane forecasts impair birth outcomes (2022, December 1) retrieved 28 January 2023 from <https://medicalxpress.com/news/2022-12-hurricane-impair-birth-outcomes.html>

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