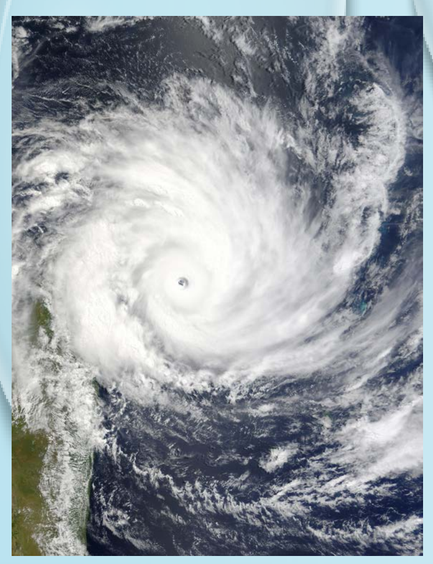

The Effect Of Hurricane Sandy On Infant Health: Examining Race And Socioeconomic Status

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Background

Exposure to toxic stress in utero has pernicious consequences for fetal development. For instance, high levels of stress in utero are associated with low birth weight, preterm birth, and abnormal conditions in infancy. Natural disasters create endemic levels of toxic stress and therefore may be harmful to the fetuses of pregnant mothers exposed to such traumatic events. On October 29, 2012 Hurricane Sandy struck New Jersey causing widespread destruction that may have an inimical impact on pregnant mothers exposed to the storm. We contend, these health disparities in perinatal outcomes will be exacerbated for an entire birth cohort exposed to Hurricane Sandy. *This project will examine how hurricane sandy impacted the health of infants in New Jersey with a focus on subpopulation differences.*

On October 29, 2012 Hurricane Sandy, a Category 2 hurricane with sustained winds of 80 miles per hour, wind gusts of up to 110 miles per hour, and a wind diameter of 1,150 miles, made landfall on the coast of New Jersey. Approximately, 360,000 homes were damaged or destroyed, and 116,000 people were evacuated. In total, 356 schools in 57 school districts experienced damage, affecting 208,000 students. A total of 72 people were killed as a direct result of the hurricane and an additional 87 deaths were attributable to the storms aftermath. Hurricane Sandy was the second-costliest hurricane in U.S. history, with estimated damages between $65 and $68 billion. The entire state of New Jersey was designated a major disaster area with 10 counties in the state suffering the most significant damage (Atlantic, Bergen, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean, Somerset and Union Counties). The storm impacted wealthy and disadvantaged communities equally.

In New Jersey, racial disparities in birth outcomes are an enduring feature of the social landscape and are more pronounced than most other states. For Blacks, 12.9% of births are low birth weight, 13.8% are preterm, and 17.8 % of births are considered small for gestational age. While 6.9% of White births in New Jersey are considered low birth weight, 8.8% are preterm births, and 9.7% are considered small for gestational age. When educational levels are considered, these disparities become even more pronounced. Of Blacks with less than a high school diploma 13.9% of births are low birth weight, while only 7.0% of Whites have a low birth weight births. Not only do blacks experience grave disparities in live birth outcomes, they also experience higher fetal demise rates at every level of education compared to whites. Blacks with less than a high school diploma have a fetal demise rates nearly four times higher than Whites with comparable levels of education (2.4% and 0.7% of live births and fetal deaths, respectively). Blacks with an advanced degree have a fetal death rate of 1.5 times greater than Whites with advanced degrees (0.7% vs. 0.3%, respectively). Disparities in infant health outcomes are significant within communities as well. For example, Toms River and Dover Township are neighboring communities with significant disparities in low birth weight infants. In Toms River, 6.1% of babies born between 2010 and 2012 were considered low birth weight or very low birth weight. In the neighboring town of Dover Township, the percent of low birth weight babies born was 19.8%, more than three times that of Toms River. Toms River and Dover Township are located near the shore in Ocean County, both towns experienced damage from Hurricane Sandy and the storm surge caused by the storm. Given the role stress plays in creating health disparities, we expect the occurrence of a particularly toxic stressor like Hurricane Sandy to exacerbate these already marked racial differences in health outcomes.

Data and Methods

The study's main dataset, the New Jersey Electronic Birth Certificate (EBC), is a restricted dataset available through the State of New Jersey. The file contains birth information for every birth occurring in New Jersey. The EBC includes standard data that is reportable to the National Center for Health Statistics, in addition to data collected by the state for public health program reporting. The EBC is unique because it offers a host of data points not collected by other states in the U.S. or by the National Center for Health Statistics such as measures of postpartum depressive symptoms, duration of oxygen therapy, duration of CPAP, duration of mechanical ventilation, length of stay in the neonatal intensive care unit, and a variety of other variables. There are approximately 360 data points included in the data set. The data is available to CJFHC through both state mandates for the consortium to conduct continuous quality improvement reporting and through application to the State's Institutional Review Board.

This project utilized data from New Jersey EBC records for New Jersey over 2010 to 2013, which is available through the Central Jersey Family Health Consortium. Data were only available for births occurring at one of the 17 Central New Jersey hospitals

Ocean County homes damaged during Hurricane Sandy: Photo from Huffington Post

Measures

Outcome

Birth weight is a continuous measure of weight in grams and determined by attendant at the time of birth.

Key Independent Variables

Vulnerable populations are measured using several variables. Maternal race/ethnicity is calculated from the self-reported race and ethnicity questions from the EBC. Self-reported race/ethnicity of the mother is categorized as black/African American, white, Hispanic, Asian, and other. Educational attainment is asked as the number of years of education the mother has completed. Educational attainment is then categorized as less than high school, some high school, high school graduate/GED, some college, college degree, and advanced degree.

Preliminary Results

Preliminary results suggest:

- The effect of hurricane exposure was highly contingent upon gestational age at exposure
- Exposure during the first and second trimester was associated with lower birthweights
- Exposure during the third trimester was associated with higher birthweights
- These patterns were more pronounced for blacks than Hispanics or whites
- No evidence was found suggesting the effect of exposure varied by educational attainment

Average Birthweight by Hurricane Exposure and Race

	White	Black	Hispanic
No Hurricane Exposure	3,341	3,092	3,267
1st Trimester Exposure	3,323	3,118	3,258
2nd Trimester Exposure	3,346	**3,025**	3,304
3rd Trimester Exposure	**3,384**	**3,203**	**3,313**

Note: Birthweight is measured in grams. Bold indicates signficant difference within race ($p<0.05$)

Average Birthweight by Hurricane Exposure and Educational Attainment

	No College	Some College	College Degree
No Hurricane Exposure	3,230	3,273	3,288
1st Trimester Exposure	3,234	3,266	3,281
2nd Trimester Exposure	3,264	3,296	3,277
3rd Trimester Exposure	**3,323**	**3,329**	**3,333**

Note: Birthweight is measured in grams. Bold indicates signficant difference within education ($p<0.05$)

Barriers

This project experienced two major challenges during the preceding year. First, the data available for this analysis is limited to Central New Jersey. The comprehensive state file will be available within the next year, but due to changes in staffing at the New Jersey Department of Health, disbanding of the NJDOH's internal IRB, and vacant data steward positions, the state file was not available. Second, this project proposed to include postpartum depression; however, the data for postpartum depression is collected on an "ad hoc" module of the Electronic Birth Certificate. Several hospitals from Central New Jersey discontinued use of this module because it caused the system to crash (N=2), another hospital had been entering information in the module but the module was corrupted and no data was able to be salvaged. The three hospitals accounted for approximately a quarter of births and the data was not missing at random; therefore, it could not be included.

Conclusions & Next Steps

Exposure to acute stressor like experiencing a hurricane has been found to have both beneficial and detrimental for birthweight. While the detrimental effects have been hypothesized to operate through stress pathways, the beneficial effects have been hypothesized to operate through altered behaviors and the marshalling of increased social support.

Future steps include: testing to what extent these differences can be explained by health behaviors during pregnancy, developing more precise measures of hurricane severity exposure, testing of dimensions of infant health

Questions should be addressed to
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