Association Between Prenatal Ozone Exposure and Birthweight in Arizona

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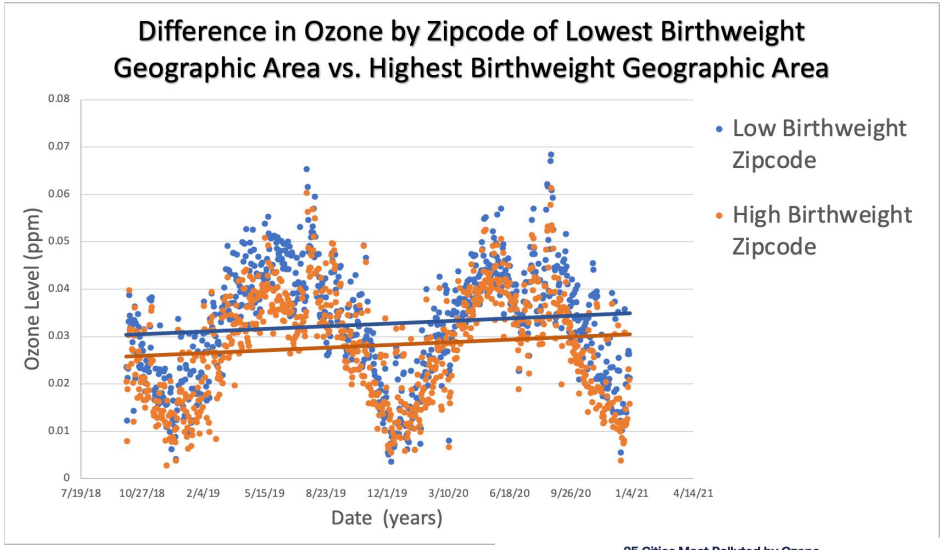
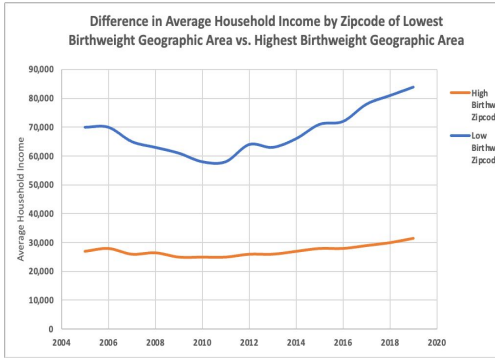
BACKGROUND

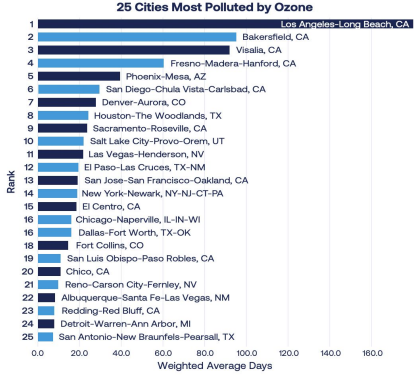
The American Lung Association State of the Air 2022 ranked Arizona fifth in the country for being most polluted by ozone. Ozone has been found to have adverse health outcomes during pregnancy due to the increased gas exchange compared to non-pregnant women. A recent Arizona study examined the part discrimination plays in birth weight, discovering that environmental discrimination had a correlation with low birth weight. With the association between ozone exposure and low birth weight being known, this project will focus on determining if the low birth weights found in specific Arizona zip codes correlate with high ozone levels.

METHODS

The study utilizes a retrospective cohort design to evaluate the level of ozone exposure in a specific cohort of pregnant women over time. In Arizona, Ozone Air Quality Index data is collected using ozone monitoring equipment by Arizona Department of Environmental Quality. The space-time ordinary kriging interpolation will estimate daily air pollution concentrations from each zip-code centroid in Phoenix. Birth weights, used as a proxy for pregnancy outcomes, and maternal zip code of residence will be collected from Valleywise Hospital and St. Joseph's Hospital.







RESULTS

A recent birth outcomes study mapped birth weights from local Arizona hospitals between October 2018 through December 2020 by zip codes to determine potential factors contributing to birth weight and infant outcomes. The zip codes from participants surveyed with at least 5 participants, 85020 had the lowest average birth weight participants at 2916.4 grams and 85009 had the highest birth weight with at 3922 grams. The average ozone levels for 85020 was 0.03267 ppm and the average ozone levels for 85009 from was 0.02809 ppm. There was an associated mean decrease of 26% in birth weight, relative to a 16% increase in ozone exposure prenatally. As a continuation of this preliminary study, ozone levels and birth weights for multiple zip codes will be evaluated to see if the association of the two variables goes beyond 85020 and 85009.

DISCUSSION

The preliminary results show that there are Arizona zip codes with low birth weights that have an increased exposure to ozone. Our preliminary data relies on birthweight data from a relatively small sample size. In order to validate our results and obtain statistical significant a larger population level study comparing zip codes across the Phoenix metro area for both their level of ozone exposure was well as birth outcome data will be needed.