Response to Request to Evaluate Pregnancy and Infant Outcomes in Springport Glen and Granada Apartments, Blackman Township, Michigan

Summary

- A Perinatal Bereavement Coordinator in Jackson, Michigan, noted that cases of miscarriage, fetal death and infant deaths managed in her health care system between 2018-2021 had addresses in two apartment complexes. This person questioned whether there could be an exposure in the environment associated with these outcomes.
- MDHHS used data from 2010-2019 to compare the frequency of infant death, fetal death, low birthweight birth, and preterm birth among residents of the apartment complexes to residents in Jackson County.
- The analysis of available data did not show an increase in preterm birth, low birthweight birth, fetal death or infant death[1] in these apartment complexes compared to Jackson County.
- At this time, we do not recommend an environmental investigation.

Background

In the late summer of 2021, a Perinatal Bereavement Coordinator for Henry Ford Allegiance Health in Jackson, Michigan, noted that several miscarriages, fetal deaths, and infant deaths occurred between 2018 and 2021 in two adjacent apartment complexes in Blackman Township, Michigan. Out of concern that there could be an environmental exposure involved, the individual contacted the Fetal and Infant Mortality Review (FIMR) Coordinator at the Michigan Department of Health and Human Services (MDHHS), which in turn involved both local and state partners.

This document is a brief summary of an assessment performed by the Michigan Department of Health and Human Services Division of Environmental Health and Lifecourse Epidemiology and Genomics Division. Full details of this assessment can be found in the Technical Report in the Appendix.

Description of the Area

The Springport Glen and Granada Apartments are in Blackman Township, Michigan, in a commercial area bordered by Interstate I-94 to the south and U.S. 127 to the east. Based on information from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), there are no currently active or former sites of environmental contamination at the apartment complex location. The two apartment complexes are on the Blackman Charter Township community public water supply.

Methods

We used available vital records data from 2010-2019 to compare the frequency of adverse pregnancy and infant outcomes among residents of the two apartment complexes to these outcomes among residents living elsewhere in Jackson County. We included preterm births and low birthweight births because these outcomes are related to infant mortality. Data on miscarriage are not routinely collected

[1] Infant deaths that were not caused by accident or injury.

in Michigan; therefore, we could not evaluate miscarriage. Data for 2020 and 2021 were not final at the time of this analysis and are not included. Counts less than six are suppressed to protect privacy.

Definitions

Fetal Death: Death of a fetus at least 20 weeks of gestation or weighs at least 400 grams.
Infant Death: Death of an infant before his or her first birthday.
Low Birthweight: A live birth where the birthweight is less than 2,500 grams.
Preterm Birth: A live birth where the infant was delivered before 37 completed weeks of gestation.

Findings

- For the years 2010-2019, 20-41% of all live births in the census tract occurred in residents of the two apartment complexes with 14 to 32 live births each year.
    - During that time period (2010-2019), residents of the complexes accounted for 32% of low birthweight births (21 out of 65) and 28% of preterm births (21 out of 76) in the census tract.
- There were no reported fetal deaths among residents of the apartment complexes 2010-2019.
- There were fewer than six infant deaths among residents of the apartment complexes 2010-2019.
- When all causes of infant death were combined, there was a statistically significant increased risk of infant death in the apartment complexes compared to Jackson County (risk ratio = 3.2, 95% confidence interval: 1.2, 8.6).
- When infant deaths due to accidents and injury were excluded, there was not a statistically significant difference in the risk of infant death between the complexes and the county.
- The causes of death for the infant mortality cases with addresses in the apartment complexes were all unique.

Interpretation

Analysis of 10 years of data (2010-2019) did not find an unusual frequency of preterm birth, low birthweight birth or fetal death in the two apartment complexes when compared to residents living elsewhere in Jackson County.

When all cases of infant death were combined, there was an increased risk of infant death among residents of the apartment complexes compared to the county. However, the causes of the infant deaths among residents of the apartment complexes were all different and unlikely to have a common underlying environmental or hazardous exposure that contributed to the deaths. Furthermore, when we excluded deaths due to accidents or injury, there was no longer an elevated risk of infant death in the apartment complexes compared to the county.

Questions about health outcomes in small populations, such as apartment complexes, are difficult to answer because the small number of cases limits the ability to detect differences or to control for other factors, such as maternal age, marital status, race, level of education, or household income. Additionally, this analysis only included data through 2019 because more recent data were not final at the time of the analysis.

At this time, the data do not support the need for an environmental investigation related to these outcomes but points to the ongoing importance of public health programming that supports safe sleep

practices and encourages regular prenatal and postnatal care along with surveillance of pregnancy and infant outcomes.

Appendix

Full Technical Report: Response to Request to Evaluate Pregnancy and Infant Outcomes in Springport Glen and Granada Apartments, Blackman Township, MI

Background

In the late summer of 2021, a Perinatal Bereavement Coordinator for Henry Ford Allegiance Health in Jackson, Michigan, reported observing a possible increased occurrence of adverse pregnancy and infant outcomes (miscarriage, fetal death, and infant death) between 2018 and 2021 in two adjacent apartment complexes - Springport Glen Apartments on Pheasant Run Drive and Granada Apartments on Granada Drive. Out of concern there could be an environmental exposure involved, she contacted the Fetal and Infant Mortality Review (FIMR) Coordinator at the Michigan Department of Health and Human Services (MDHHS), which in turn involved both local and state partners. There were no specific environmental exposure concerns noted by the requestor or by the Jackson County Health Department.

Based on the requestor's inquiry, the Division of Environmental Health and the Lifecourse Epidemiology and Genomics Division at MDHHS collaborated to conduct an assessment of the frequency of adverse pregnancy and infant outcomes among residents of the two apartment complexes compared to the census tract where the complexes are located and Jackson County as a whole.

Description of the Area

The Springport Glen and Granada Apartments are located in in Blackman Township, Michigan, situated in a commercial area bordered by Interstate I-94 to the south and U.S. 127 to the east (Figure 1). Based on information from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Environmental Mapper[2], there is one location with a land use restriction, several locations with underground storage tanks, and two sites identified with environmental contamination (EGLE Part 201 sites, which are sites of environmental contamination identified by rules administered by EGLE, which is the state environmental regulatory agency) within approximately one mile of both apartment complexes.

The land use restriction is due to chemicals in the groundwater, and the site is to the west of both apartment complexes. The closest apartment complex is approximately 0.2 miles away. The two apartment complexes are on the Blackman Charter Township community public water supply, which receives water from the City of Jackson Water Department. On October 26, 2020, Blackman Township released a notice[3] that their latest round of lead and copper testing of home's tap water resulted in an elevated 90th percentile for lead (132 micrograms per Liter [µg/L]). Both the township and the Jackson County Health Department[4] provided information on how residents can minimize their lead exposure from water and certified lead-reducing filters are available for free to eligible residents. The notice from

[2] The EGLE Environmental Mapper is available at https://www.mcgi.state.mi.us/environmentalmapper/.
[3] https://www.mijackson.org/DocumentCenter/View/10465/UPDATED-00740_BlackmanTwp_LCR_PA-1-003-1?bidId=

[4] Lead Exceedance in Blackman Township Water | Jackson County, Michigan(mijackson.org)

Blackman Township also notes that four of 21 locations were above the lead action level of 15 µg/L and that residents at those locations were directly contacted for follow-up actions.

Based on information from EGLE,[5] there did not appear to be any currently active or former sites that could have environmental contamination at the apartment complex's current locations. Additionally, prior to the 1980s the land appeared to be undeveloped agriculture land (based on historical images).

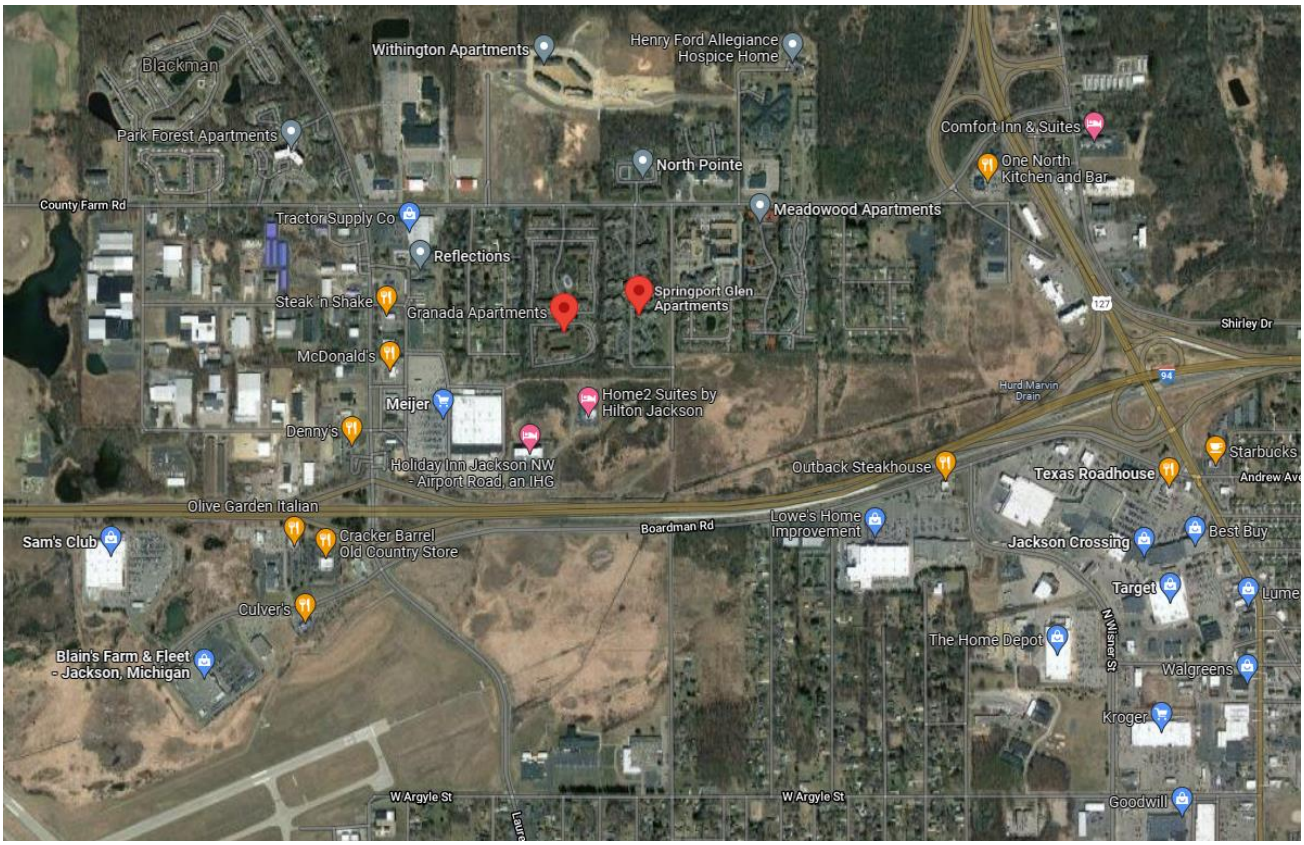

Figure 1: Map of the Springport Glen and Granada Apartments (red markers) in Blackman Township, Jackson County, Michigan.

Methods

Adverse pregnancy outcomes included fetal and infant deaths, as well as key drivers of infant mortality, such as preterm and low birthweight births. There is no surveillance system for miscarriage in Michigan; therefore, this outcome could not be included in the investigation.

Definitions:

Fetal Death: Death of a fetus at least 20 weeks of gestation or weighs at least 400 grams.
Infant Death: Death of an infant before his or her first birthday.
Low Birthweight: A live birth where the baby's birthweight less than 2,500 grams.
Preterm Birth: A live birth where the baby was delivered before 37 completed weeks of gestation (based on obstetric estimate of gestation).

[5] Ray Govus, EGLE Environmental Quality Analyst, personal communication, 11/3/2021

Analyses:

Percent Preterm: Number of preterm births divided by number of live births, multiplied by 100.
Percent Low Birthweight: Number of low birthweight births divided by number of live births, multiplied by 100.

The analysis of outcomes included the combined 2010-2019 time period for residents of the two complexes, residents of the census tract (GEOID: 26075005500) containing the complexes, as well as residents of Jackson County overall. Residence in the census tract and the apartment complex were determined using the geocoded street address reported on the birth certificate; residence in Jackson County was determined using the county of residence reported on the birth certificate. Trend analysis by year or by groups of years was precluded by the small number of adverse events that occurred annually during the time period.

Counts fewer than six are suppressed to protect privacy of residents (see Table 1).

The crude relative risk of infant mortality, preterm birth, and low birthweight among infants born in the apartment complexes from 2010 through 2019 compared to infants born elsewhere in Jackson County was evaluated by calculating risk ratios and corresponding Wald 95% confidence intervals with the Yates correction for small numbers.

The association between the frequency of adverse events in the apartment complexes and elsewhere in Jackson County was evaluated by calculating exact probabilities from the Fisher Exact test and by examining both the two-sided p-value the mid-p exact value. The Fisher Exact test is a test of statistical independence between two or more categorical distributions based on exact calculated probabilities rather than an approximation of the chi-square distribution. This test is appropriate when the sample size and subsequent expected values are too small to approximate the sampling distribution of the chi-square test. The two-sided Fisher exact test p-value can be overly conservative in some cases and therefore the mid-p value is reported as well.[6]

Statistical significance was determined based on a p-values less than 0.05 or the 95% confidence interval for the risk ratio not including the value 1.0. Due to the low number of events, it was not possible to control for potential confounding factors, such as smoking or alcohol consumption during pregnancy, maternal age, or prenatal care.

This analysis was also repeated to exclude any infant deaths with an underlying cause related to an injury (i.e., ICD-10 V01 – Y89). The analysis did not adjust for multiple gestation births.

The 2010-2019 Michigan resident birth, death and fetal death files were provided by the MDHHS, Division for Vital Records and Health Statistics. Final 2020 and 2021 datafiles are not complete, and therefore were not included in the analysis.

Results

During 2010-2019, there were 14 to 32 live births each year among residents of the two apartment complexes. Over the past decade, the residents of the two apartment complexes accounted for 20-41%

[6] Armitage P, Berry G. In: Statistical Methods in Medical Research. Oxford: Blackwell Scientific Publications, 1994:1234.

of all live births in the census tract. During 2010-2019, residents of the two apartment complexes accounted for 32% of low birthweight births (21 out of 65), and 28% of preterm births (21 out of 76) in the overall census tract.

During 2010-2019, there were fewer than six infant deaths among residents of the two apartment complexes. These deaths were sporadic across multiple years with no more than one death per year. During this time, there were seven infant deaths among residents in the corresponding census tract, inclusive of the two apartment complexes.

During 2010-2019, infants born in the apartment complexes had a higher risk of infant mortality than infants born elsewhere in Jackson County (risk ratio = 3.2, 95% confidence interval: 1.2, 8.6). The Fisher exact test demonstrated a significant difference in the distribution of infant deaths among infants born in the apartment complexes and infants born elsewhere in Jackson County (mid-p exact value= 0.0495, p-value = 0.0400).

Review of the infant age at death and causes of death among the infant deaths with addresses in the two apartment complexes showed deaths of distinct cause that are unlikely to have a common underlying etiology. Additionally, after excluding infant deaths with an underlying cause of death related to injury; there was no detectable statistically increased risk of death among infants born in the apartment complexes compared to those born elsewhere in Jackson County (risk ratio = 2.0, 95% confidence interval: 0.5, 8.1). The Fisher exact test did not indicate a significant difference in the distribution of infant deaths (mid-p exact value = 0.3486, p-value = 0.2680). However, a power analysis revealed that given the low number of observed deaths, there is only a 24% probability of detecting an association between residence within the apartment complexes on the risk of non-injury infant death if there is truly an association.

During 2010-2019, there were no reported fetal deaths among residents of the two apartment complexes. However, this may be due to incomplete reporting of fetal deaths to the MDHHS, Division for Vital Records and Health Statistics.

Table 1: Number and Prevalence of Adverse Birth Outcomes, 2010-2019

	Apartment Complexes	Census Tract	Jackson County
Number of Infant Deaths (Excluding deaths due to injury)	<6	<6	80
Number of Infant Deaths	<6	7	101
Number of Fetal Deaths	0	<6	115
Number Preterm (Percent)	21 (9.3%)	76 (10.4%)	1,815 (10.2%)
Number Low Birthweight (Percent)	21 (9.3%)	65 (8.9%)	1,549 (8.7%)

Note: The census tract data is inclusive of the Springport Glen Apartments on Pheasant Run Drive and Grenada Apartments on Granada Drive. Jackson County data is inclusive of the census tract (GEOID: 26075005500) and two apartment complexes.

Data Source: MDHHS, Division for Vital Records and Health Statistics

Over the past decade, there have been up to three low birthweight births each year among residents living in the two apartment complexes, accounting for up to 13% of live births in a given year. In 2017,

the number of low birthweight births increased to six, accounting for approximately 19% of live births among its residents. A similar increase was seen in preterm births in 2017.

The Fisher exact test two-sided p-value and the mid p-value did not demonstrate a significant difference in the distribution of preterm birth (p-values = 0.661 and 0.620, respectively) or low birthweight (p-values = 0.813 and 0.789, respectively) among infants born in the apartment complexes and infants born elsewhere in Jackson County.

Conclusions and Recommendations

The available data do not support an unusual occurrence of adverse pregnancy outcomes among residents of these two apartment complexes or the presence of an environmental contamination of concern. At this time, the data do not indicate the need for an environmental investigation.

Based on the aggregate number of infant deaths reported 2010-2019 in the apartment complexes, there was a statistically significant increased risk of infant mortality for infants with addresses in the apartment complexes relative to the rest of Jackson County; however, review of the case details showed distinct causes of death, including deaths due to accidental and non-accidental injuries, that did not suggest a shared underlying etiology that could be related to an environmental exposure. When the analysis was repeated excluding the injury-related deaths, there was no longer a statistically significant increased risk of infant mortality for infants with addresses in the complexes relative to the Jackson County, though the small number of events limited the power to detect a significant difference. Additionally, the analysis did not find an increase in the risk in low birth weight or premature birth, which are risk factors for infant mortality.

Limitations of this analysis include the potential for incomplete reporting, the absence of a surveillance system for miscarriage, and the small numbers of events, which precluded controlling for confounding variables, such as maternal age, marital status, race, level of education, and household income. This limits the ability to interpret observed differences in the risk of infant mortality in the complexes relative to the county. An additional limitation of the analysis was the lack of final 2020 and 2021 vital records data at the time of the analysis; this precluded analysis for the entire period of concern reported by the requestor.

We recommend continued communication with partners at the Jackson County Health Department and Allegiance Health to monitor for any concerning signals in their data related to pregnancy outcomes or infant mortality related to this area and to continue programming focused on reducing modifiable risk factors for infant mortality.