

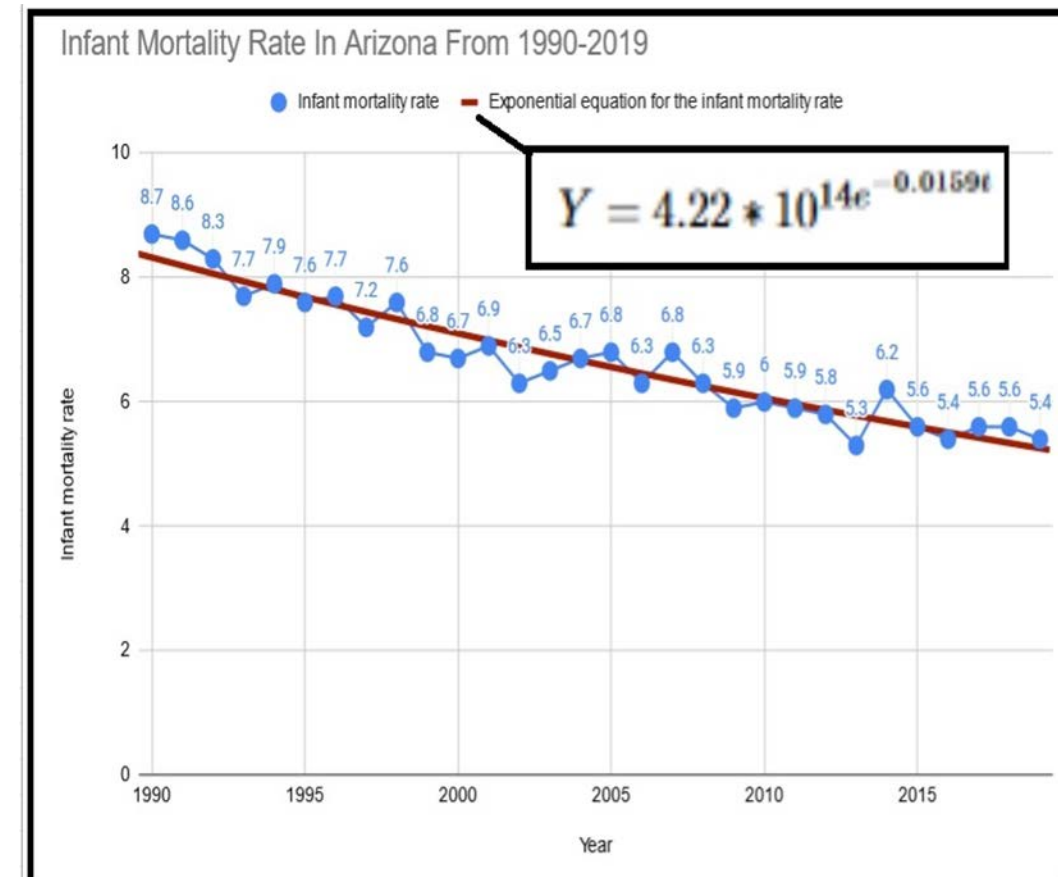
Introduction

- Infant mortality is the death of the infant before his or her first birthday.
- It has many causes such as:
 - Low infant birth weight
 - Gestational age less than 32 weeks
 - Mother's age being less than 20 or greater than 40
 - Mother smoking during pregnancy
 - Mother carrying more than one child
- Infant mortality is measured by the infant mortality rate (IMR), which is the number of infant deaths per 1000 live births. The IMR in Arizona has improved over the years. In 1990 it was 8.7, as of 2019 it is 5.4.
- It is important to study the dynamics of infant mortality in Arizona in order to possibly decrease the infant mortality rate further. If the rate can not be further reduced then it should remain steady and not be increasing.
- Such an improvement or prevention of regression can occur by uncovering patterns and observations regarding infant mortality statistics from 1990 up till now.

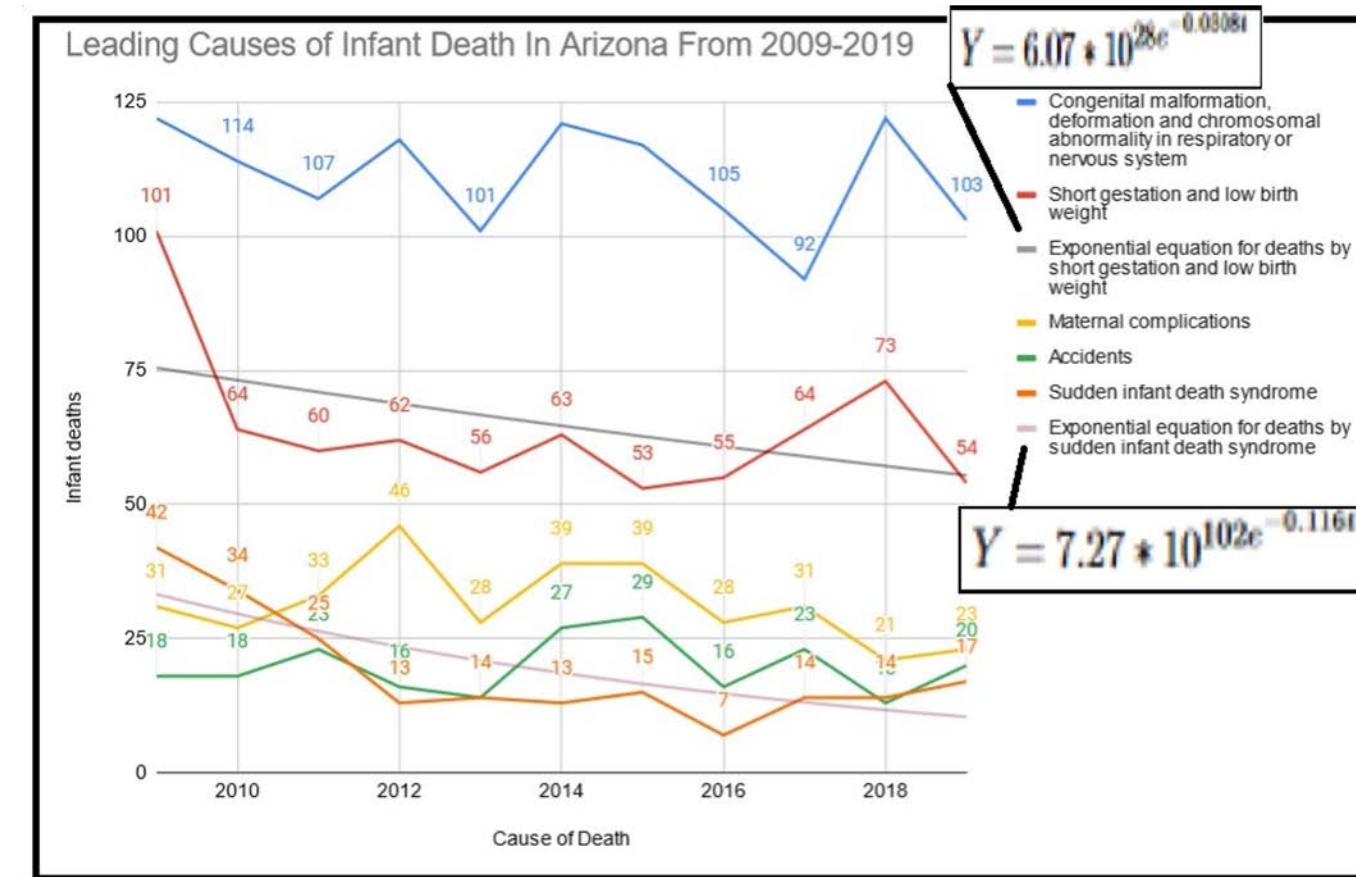
Methods and Objectives

- The infant mortality statistics that will be studied are provided by the Arizona Department of Health Services (ADHS).
- The statistics include: the infant mortality rate in Arizona and each of its counties from 1990 to 2019, number of infant deaths per 1000 live births for each race and ethnicity (including the genders), from 1990 to 2019, and the leading causes of infant mortality from 1990 to 2019.
- The objective of these statistics is to do the following:
 - Understand the dynamics of infant mortality in Arizona from 1990 to 2019
 - Understand the dynamics of the leading causes of infant mortality
 - Understand how the economic status of certain counties impacts their infant mortality rates
 - Understand infant mortality within each race and ethnicity inhabiting Arizona
 - Understand infant mortality between the two different genders within each race and ethnicity inhabiting Arizona.

Results



- The infant mortality rate in Arizona has decreased since 1990. It went from 8.7 deaths per 1000 live births to 5.4
- 1990 to 2000 is when the biggest drop in the rate occurred
- The exponential equation representing the change in the IMR is depicted on the graph to the left in maroon, along with the actual equation.
- t represents time in years from 1990 to 2019
- Average IMR of Arizona from 1990-2019: 6.67

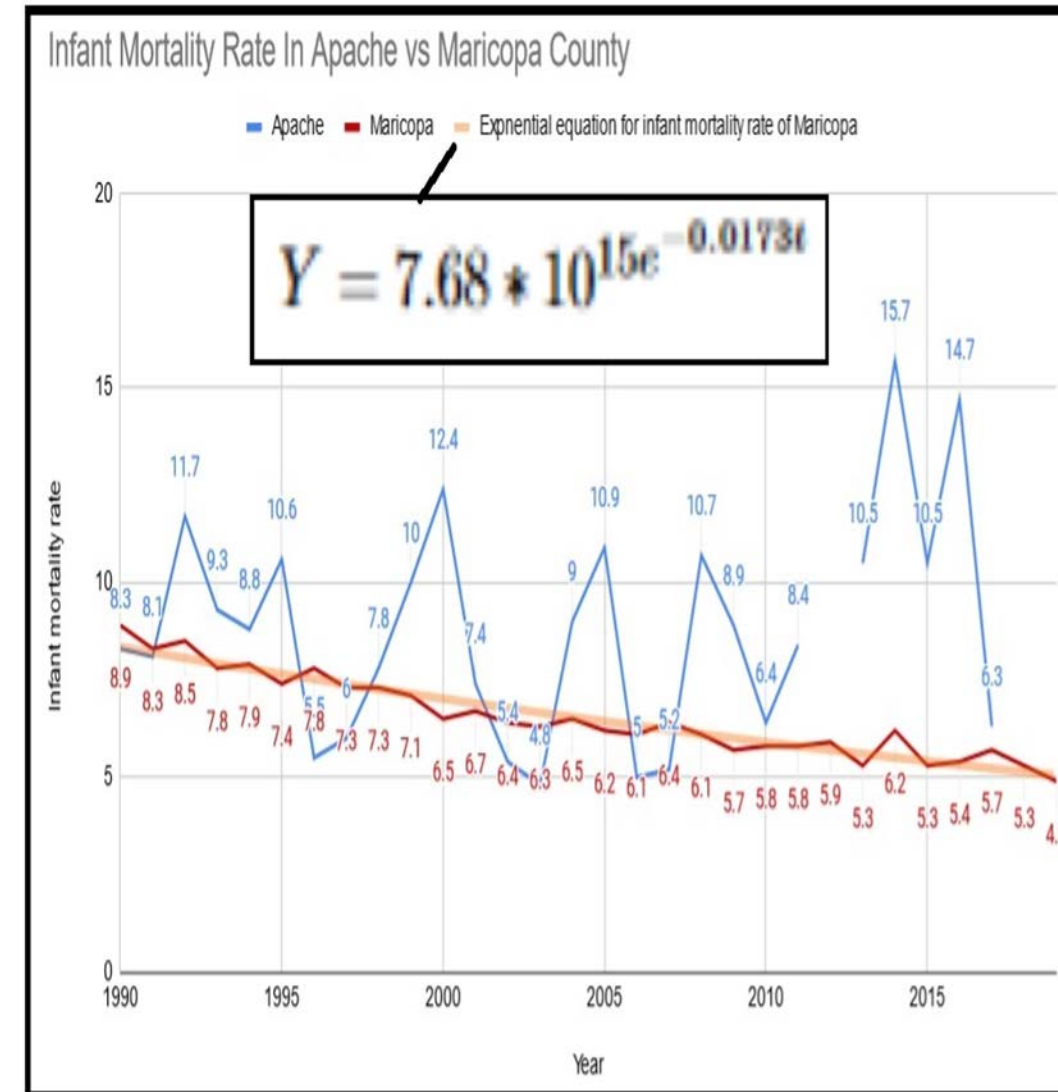


The exponential equation representing change in deaths caused by short gestation and low birth weight

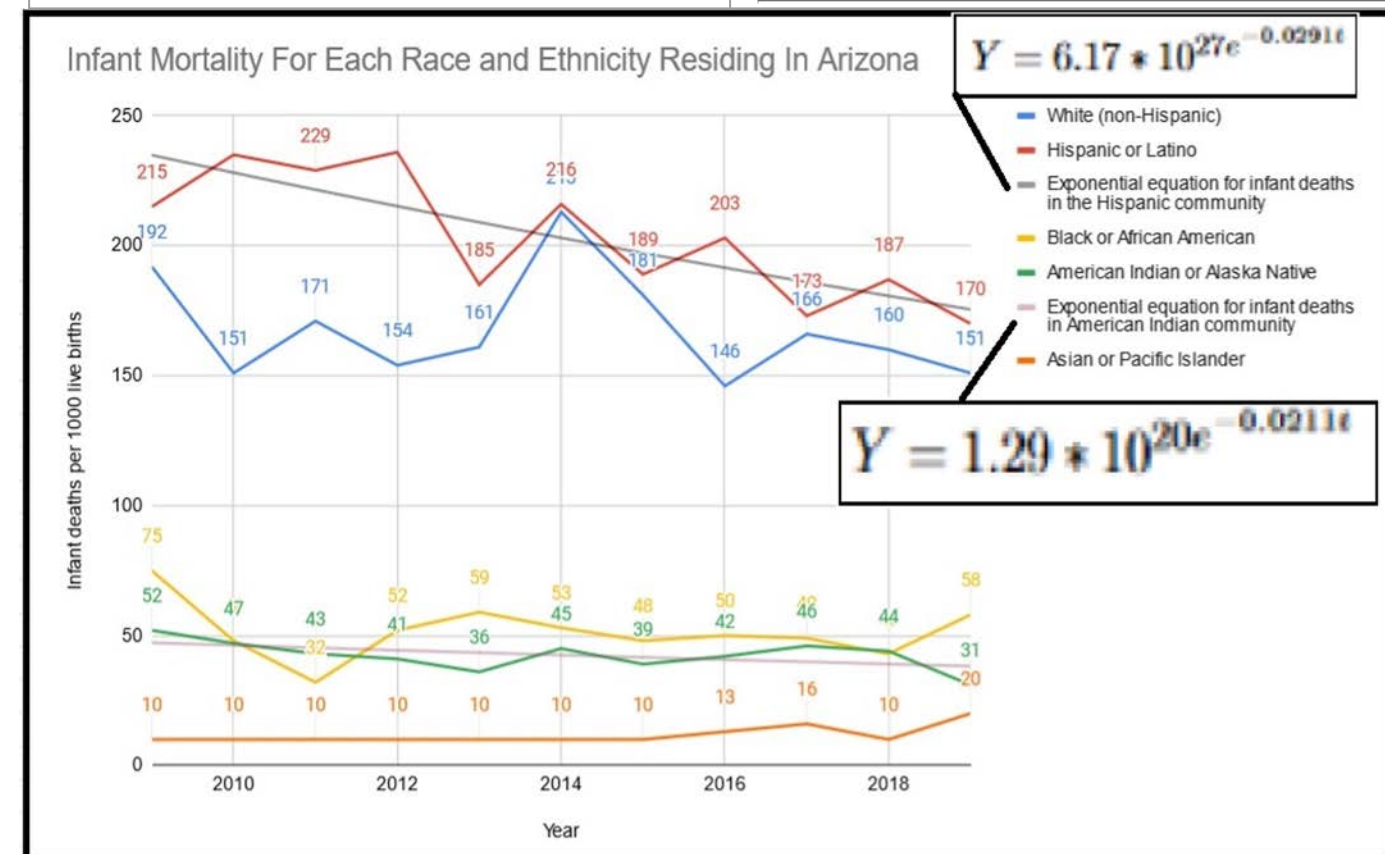
$$Y = 6.07 * 10^{28}e^{-0.0308t}$$

The exponential equation representing change in deaths caused by sudden infant death syndrome

$$Y = 7.27 * 10^{102}e^{-0.116t}$$



- The IMR of Apache County is sporadic
- Some years it is better than Maricopa and others it is not
- On multiple occasions the IMR of Apache County is higher than the highest IMR of Maricopa County (1990)
- The IMR of Maricopa county has steadily gone down since 1990
- Average IMR for each county from 1990-2019: Apache: 8.83 Maricopa: 6.56
- The exponential equation representing the change in the IMR for Maricopa county is depicted on the graph to the left in orange, along with the actual equation
- t represents time in years from 1990 to 2019
- The gap in the Apache county IMR is due to the ADHS reporting a negligible value for the year 2012



- Congenital malformations and deformations and chromosomal abnormalities of the respiratory and nervous system contribute to most infant deaths in Arizona and the amount is remaining steady since 2009
- Infant deaths caused by short gestation/low birth weight and sudden infant death syndrome have decreased since 2009
- The exponential equation representing change in deaths caused by short gestation and low birth weight is depicted in the graph on the left in black, along with the actual equation
- The exponential equation representing change in deaths caused by sudden infant death syndrome is depicted in the graph on the left in purple, along with the actual equation
- For both equations t represents time in years from 2009 to 2019
- Disclaimer: It is not specified by the ADHS whether the number of infant deaths is per 1000 live births or out of 100,000 infants

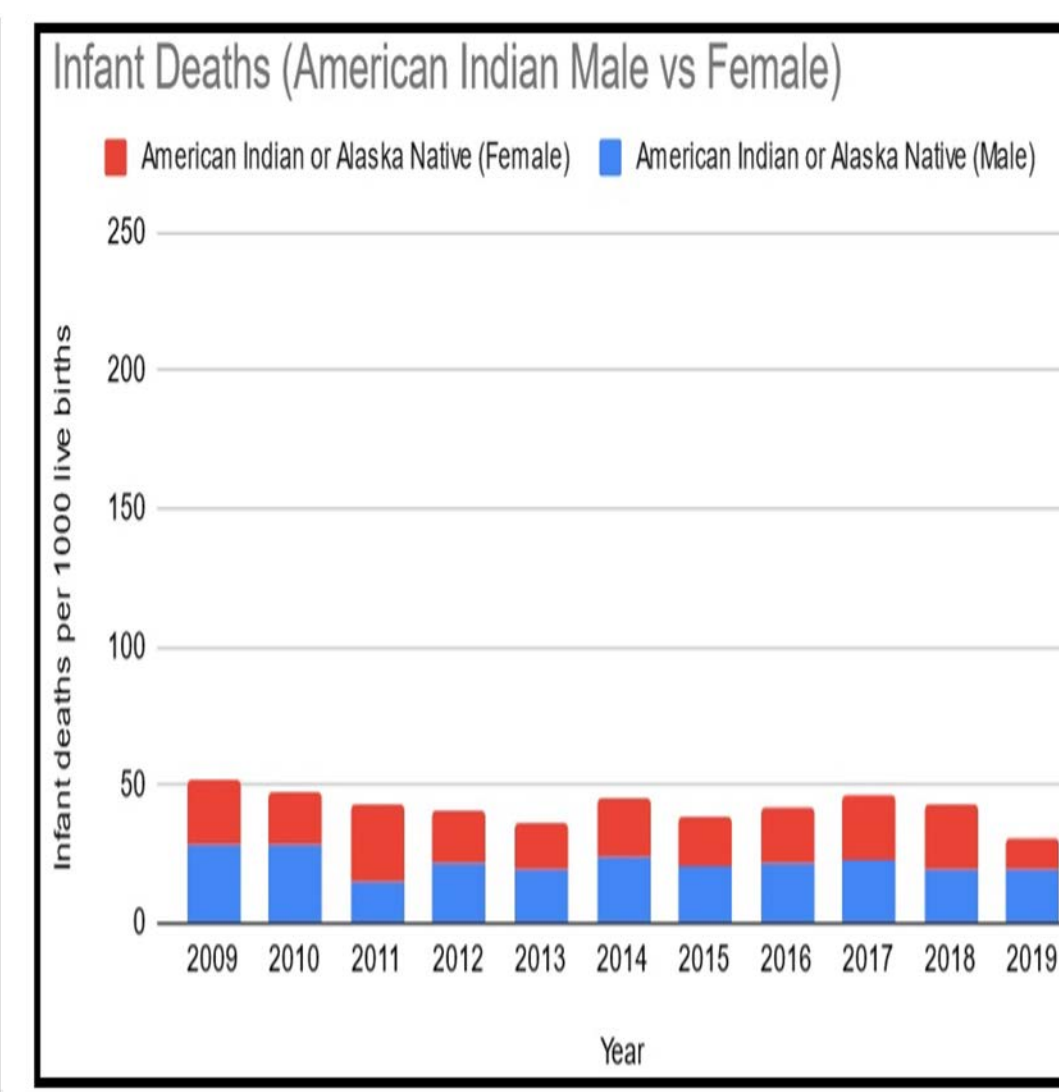
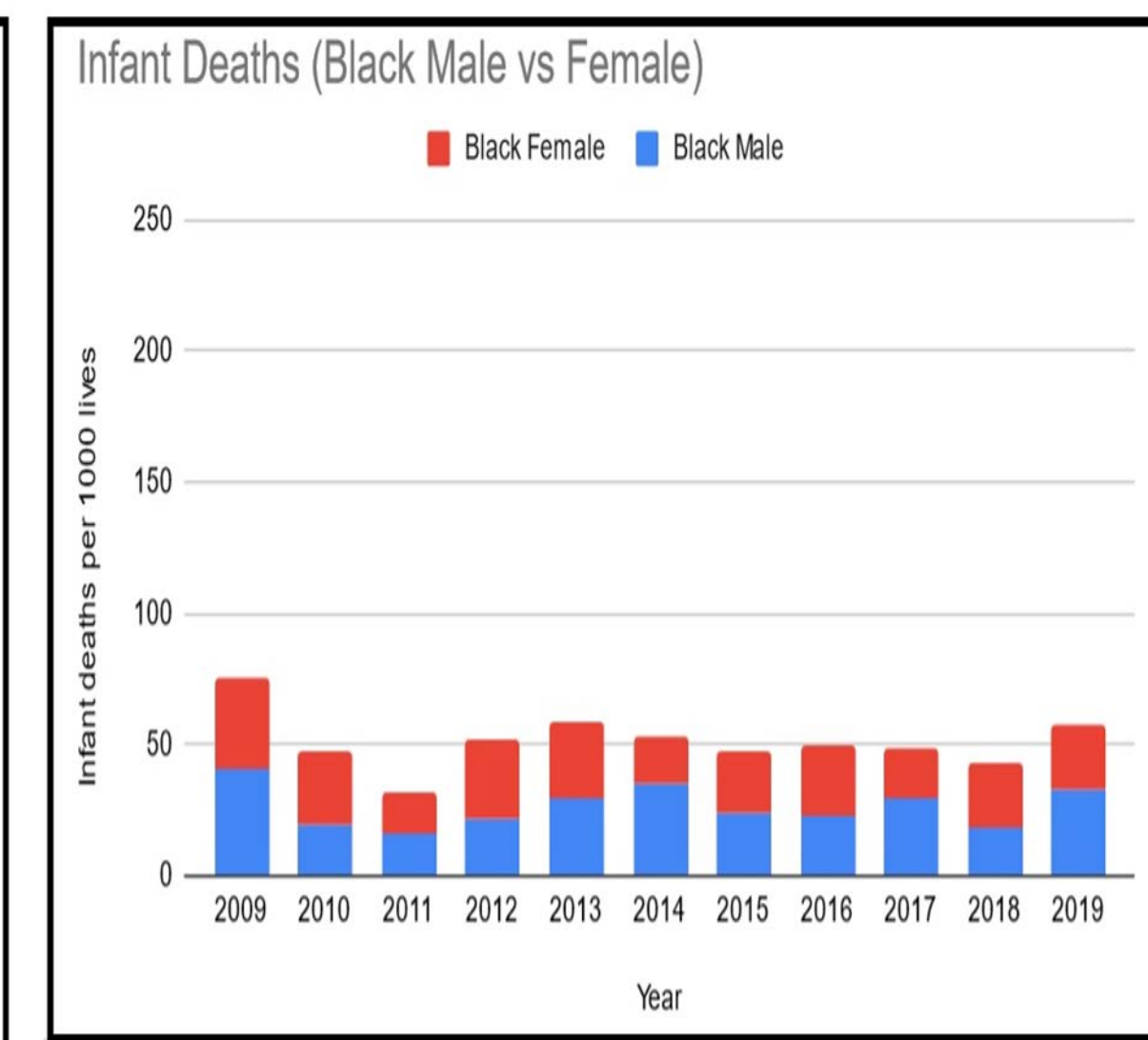
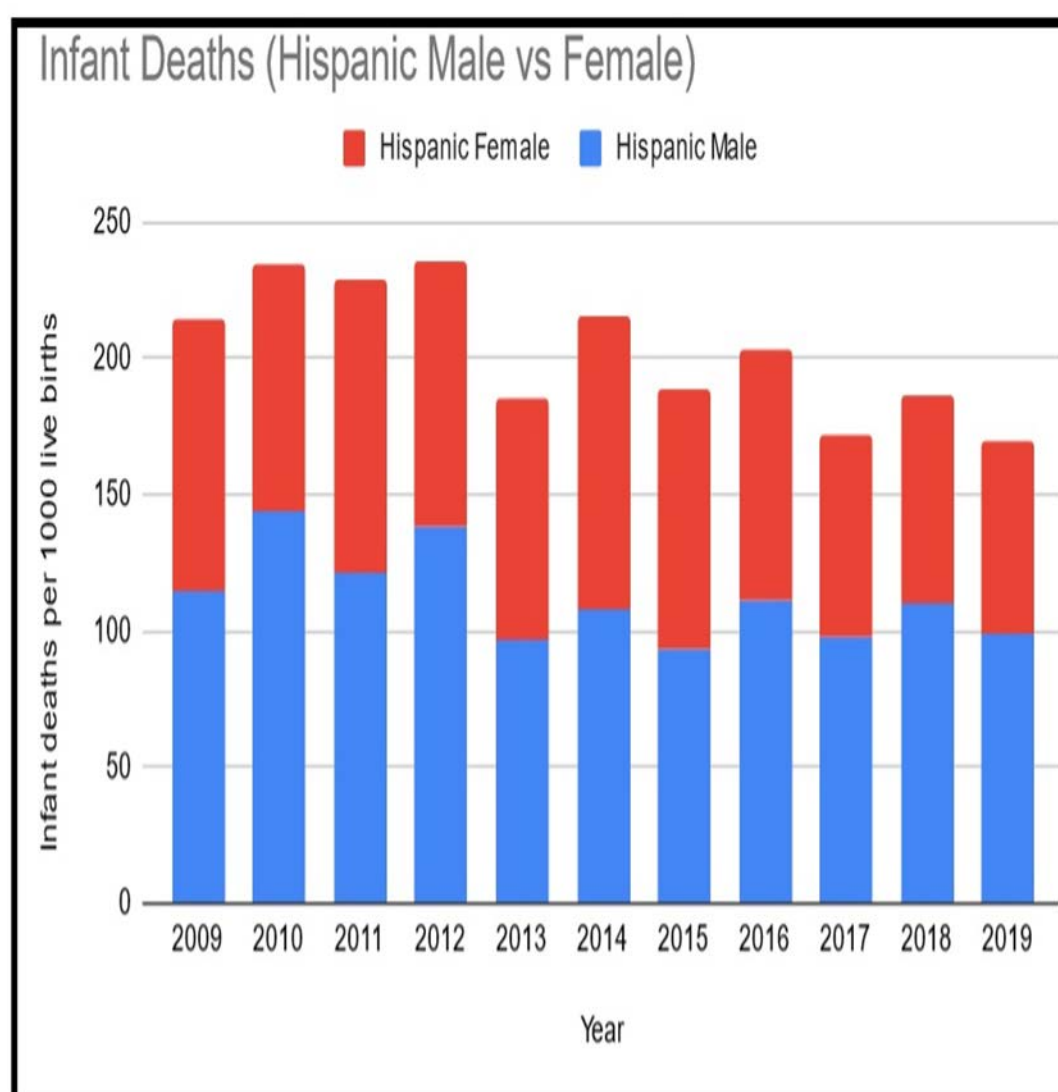
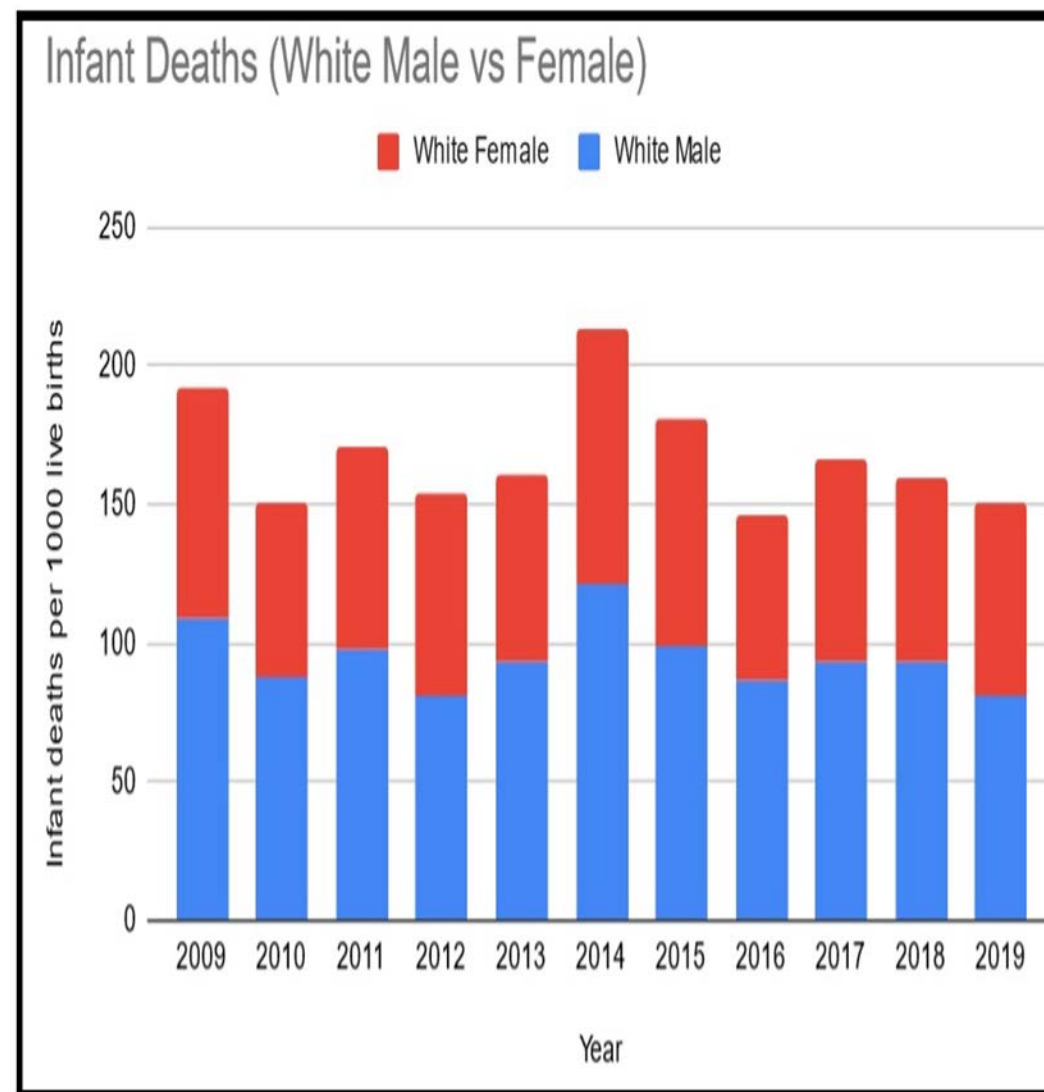
- Hispanics infants have died the most since 2009
- White infant deaths are close to Hispanic infant deaths some years
- The Black, American Indian and Asian infant deaths have remained steady since 2009
- Average infant deaths (per 1000 live births) for each race/ethnicity from 2009-2019:
 - White: 167.82
 - Hispanic: 203.45
 - Black: 51.55
 - American Indian/Alaska Native: 42.36
 - Asian/Pacific Islander: 11.7
- The exponential equation representing the change in deaths in the Hispanic community is depicted in the graph on the left in black, along with the actual equation
- The exponential equation representing the change in deaths in the American Indian community is depicted in the graph on the left in black, along with the actual equation

Conclusions

- The reason as to why the infant mortality rate has dropped in Arizona since 1990 is unknown.
- The data provided from the ADHS regarding leading causes of death does not specify whether the number of deaths is out of 1000 live births or out of 100,000 infants.
- The meaning of the number of infant deaths must be explained by the ADHS to further make any conclusions.
- It is reasonable to conclude that the better the economic status of a county the less likely the infant, conceived from parents residing in said county, will die before their first birthday.
- White and Hispanics infants make up most infant deaths in Arizona since 1990, but it is not known which race or ethnicity suffers the most per capita.
- The population of each race and ethnicity in Arizona from 1990 to 2019 needs to be studied and then compared to the number of infant deaths per each race and ethnicity to determine which one has a higher rate of infant mortality.
- The Black and American Indian populations of Arizona need to be further studied to see why their female infants die as much and sometimes more than their male counterparts, which is something the White or Hispanic community does not experience.

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The exponential equation representing the change in deaths in the Hispanic community

$$Y = 6.17 * 10^{27}e^{-0.0291t}$$

The exponential equation representing the change in deaths in the American Indian community

$$Y = 1.29 * 10^{20}e^{-0.0211t}$$

- In the White community the infant death of males is always greater than females (since 2009).
- It is the same in the Hispanic community, except during 2014 and 2015
- However, the same is not true about the Black and American Indian communities