

Relationship between Infant Mortality, Household Income and Race in Maryland Counties: A Short Communication

AJ Russo, PhD* and James Lukasik

Department of Clinical and Translational Research Management,
Hartwick College, Oneonta, New York.

*Correspondence:

AJ Russo, Department of Clinical and Translational Research Management, Hartwick College, Oneonta, New York.

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ABSTRACT

We used the data collected by the Centers for Disease Control and Prevention, National Center for Health Statistics to analyze infant crude death rate data in Maryland counties between 1999 and 2020 and compared this data to household income data collected by the US Census in the same Maryland counties. We found a significant inverse relationship and correlation between infant deaths and household income in Maryland counties. It is likely that low income plays a role in low birth weight in these infants and therefore may be related to the major cause of infant mortality.

Keywords and Abbreviations

Infant mortality rate (IMR), Crude Death Rate, Non-Hispanic (NH), Household Income, Maryland Counties.

Introduction

Infant mortality rate (IMR) is the number of deaths of humans under one year of age per thousand live births. The crude death rate is the number of deaths divided by the total population at risk [1]. The IMR has been steadily decreasing world-wide from 2007 to 2013 due to changes in the distribution of gestational age and improvements of survival treatments after birth. Also, the preterm birth rate has decreased. Babies that are preterm account for two thirds of all infant deaths [2]. A current study conducted by MacDorman [3] analyzed the infant death rate per 1000 births in different ethnicities / races and concluded the three highest were non-Hispanic Black at 13.35, American Indian / Alaska native at 8.28, and Puerto Rican at 8.01. Adversely, the lowest is Central and South American at 4.52.

In Maryland, the IMR was 5.9 per 1,000 live births in 2019, a 3% decrease compared to the 2018 rate (6.1). The total number of infant deaths declined between 2018 (432) and 2019 (414), along with the number of births. In 2019 there were 207 deaths among infants born to non-Hispanic (NH) Black women, 120 deaths among infants born to non-Hispanic (NH) White women,

66 deaths among infants born to Hispanic women, and 17 deaths among infants born to non-Hispanic Asian women. There was a 9% decrease in the non-Hispanic Black infant mortality rate, from 10.2 in 2018 to 9.3 in 2019. Rates among Hispanic infants increased over the same period by 34%. Rates were unchanged among non-Hispanic White infants (Table 1).

Despite these trends, the data shows the disparity between non-Hispanic Black infant mortality rates and the other races. We analyzed the possible relationship between household income and crude death rate in infants in Maryland counties and found a strong relationship between race, income, and infant mortality, particularly prevalent in NH Black households.

Methods

The crude death rate was calculated by taking the number of deaths and dividing that number by the total population at risk. The decimal is then multiplied by 1,000.

The method for confidence intervals calculated for 100 or more deaths. The lower 95% confidence interval is the crude death rate minus (1.96 times the standard error of the rate). The upper 95% confidence interval is the crude death rate plus (1.96 times the standard error of the rate).

Data collected from: Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999-2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at <http://wonder.cdc.gov/ucd-icd10.html>

Results

Income of African American (AA) households (\$50.9 K +/- \$21.2 K) was significantly lower than the mean income of all households between 1999 and 2020 (\$70.7 K +/- \$20.9 K) ($P < 0.001$) (Figure 1) in Maryland. The crude death rate of children less than 1 year in Maryland was significantly higher in African American households (1231.5 +/- 277.4) than in all households (731.3 +/- 230.2) ($p = .003$) (Figure 2). Household Income and Crude Death rate in all individuals in Maryland counties had a strong negative correlation with one another ($r = -0.75$; $P = 0.0003$) (Figure 3), and household income had a strong negative correlation with AA Crude Death Rate < 1 year in all counties of Maryland ($r = -0.82$; $p = 0.0000275$) (Figure 4).

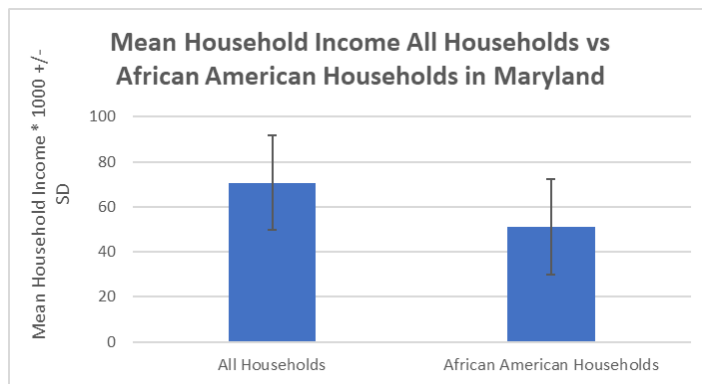


Figure 1: Mean Household Income African American Households (\$50.9 K +/- \$21.2 K) is significantly lower than All Household Incomes (\$70.7 K +/- \$20.9 K) in Maryland ($P < 0.001$).

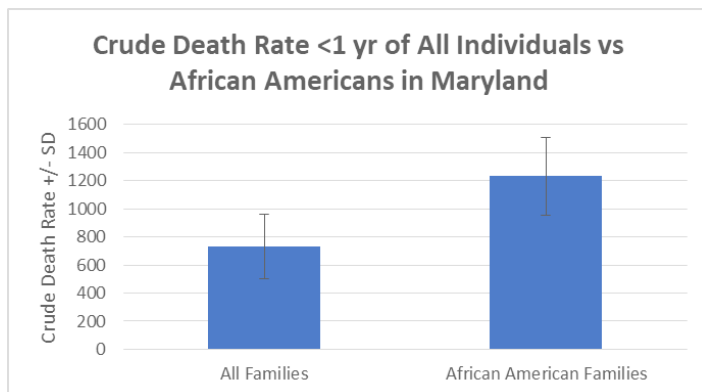


Figure 2: Crude Death Rate <1 yr of African Americans (1231.5 +/- 277.4) is significantly higher than Crude Death Rate of all individuals (731.3 +/- 230.2) in Maryland ($p = .003$).

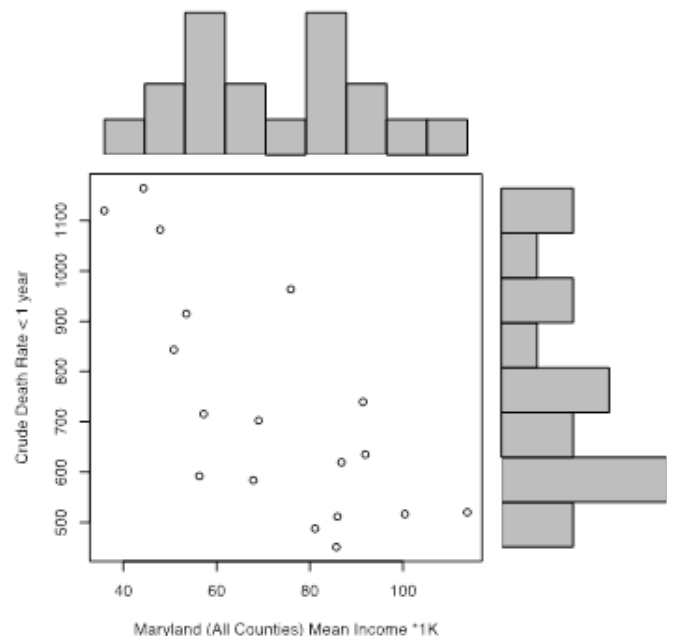


Figure 3: Household Income and Crude Death rate in all individuals in Maryland counties have a strong negative correlation with one another ($r = -0.75$; $P = 0.0003$).

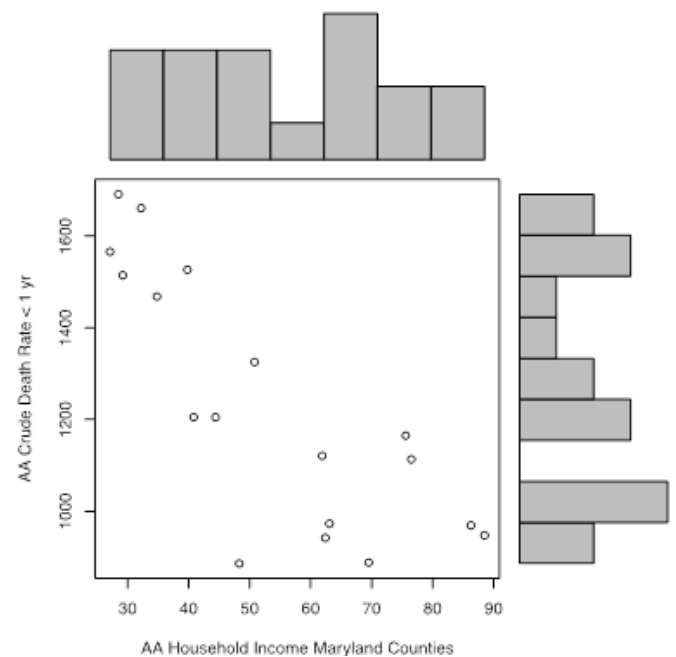


Figure 4: African American (AA) household Income has a strong negative correlation with AA Crude Death Rate < 1 year in Maryland counties ($r = -0.8$; $p = 5.89E-05$).

Table 1: Infant, Neonatal and Postnatal Mortality Rates (per 100 live births) for Selected Years in Maryland.

	Mortality Rate by Year		Average Mortality Rate	
	2018	2019	2010-2014	2015-2019
Infant Mortality				
All Race/Ethnic	6.1	5.9	6.6	6.3
NH White	4.1	4.1	4.3	4.1
NH Black	10.2	9.3	11.2	10.5
Hispanic	3.8	5.1	4.3	4.9
Neonatal Mortality				
All Race/Ethnic	4.2	3.9	4.7	4.4
NH White	2.6	2.7	3	2.7
NH Black	6.9	6.4	8.1	7.4
Hispanic	2.9	3.3	3.1	3.1
Postnatal Mortality				
All Race/Ethnic	1.9	2	1.8	1.9
NH White	1.5	1.4	1.2	1.4
NH Black	3.3	2.9	3.1	3.1
Hispanic	0.9	1.9	1.2	1.4

** Courtesy of the Maryland Health Department
https://health.maryland.gov/vsa/Documents/Reports%20and%20Data/Infant%20Mortality/Infant_Mortality_Report_2019.pdf

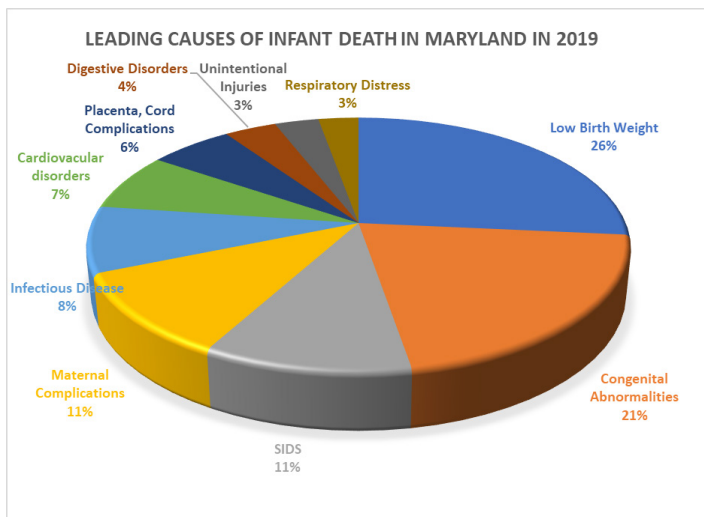


Figure 5: Leading causes of infant death in Maryland in 2019 **

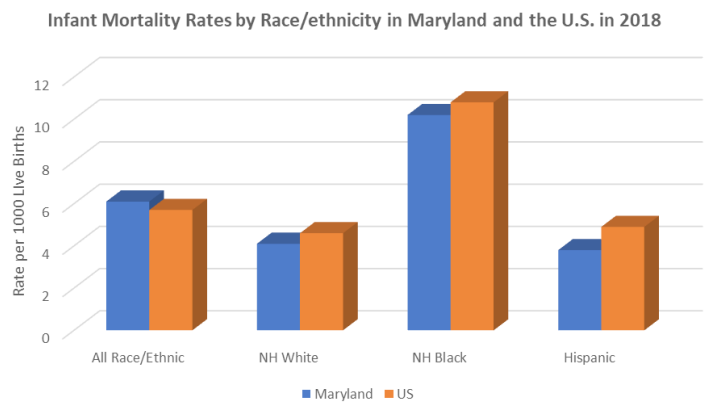


Figure 6: Infant Mortality Rates by Race/ethnicity in Maryland and the U.S. in 2018 **.

Discussion

Our study focused on race, income, and crude death rate in infants less than one year old in Maryland counties between 1999 and 2020 [4]. Our data was collected using the CDC Wonder online database. A past analysis done by Hinman [5] looked at the IMR in Baltimore, Maryland in 1880 and compared it to 1920. Over the 40-year period the IMR went from 250 to 90 per 1000 births. Although the number drastically dropped, 90 per 1000 is extremely high. At the time, Hinman believed that more research needed to be conducted on different areas and relate the economic/environmental standings to the IMR in each area. In our study we determined that there was a significantly higher crude mortality rate of African American children when compared to all children of the same age group in all Maryland counties and this high crude infant mortality rate has a high negative correlation to income in individual counties.

In Maryland, the leading causes of infant death have been related to short gestation (some are associated with congenital abnormalities) and low birth weight (low birth weight and short gestation are often related to one another) (Figure 5). Data presented in this paper demonstrates the inverse relationship and correlation between infant deaths and household income. It is likely that low income plays a role in low birth weight in these infants and therefore may be a major cause of infant mortality.

Low birth weight was the leading cause of death among non-Hispanic Black infants (28%) in 2019. Congenital abnormalities were the leading cause of death among Hispanic (26%) infants and among non-Hispanic White (22%) infants. Cause-specific mortality rates continue to be higher for non-Hispanic Black infants than non-Hispanic White infants for all leading causes of death. Compared with non-Hispanic White infants, non-Hispanic Black infants were nearly four times more likely to die in 2019 as a result of LBW, 30% more likely to die from congenital abnormalities, twice as likely to die from SIDS, and four times more likely to die from maternal complications of pregnancy [6].

African American households have had significantly lower incomes compared to all households in Maryland, and they have significantly higher infant death rates than all households do as well as, more specifically, non-Hispanic White and Hispanic households (Figure 6). The crude infant death rate in Maryland counties shows a strong correlation between household income and infant mortality for all households as well as for African American households. This suggests that low income plays a role in increasing the chance of infant mortality possibly by leading to deaths associated with low birth weight.

In summary, NH Black infant, neonatal, and postneonatal mortality rates are consistently higher than every other race in Maryland. Our data shows that this high mortality rate is significantly associated with low household income. More analysis needs to be done to see how income directly affects life sustainment and general living conditions for infants less than one year. Also, further research needs to be conducted to evaluate environmental conditions of

different African American communities in Maryland and compare them to all other types of communities. Legislation to implement a baseline of infant care for all families, especially in areas where poverty is pervasive, could be a potential solution to the high IMR.

References

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