Infant Deaths and Mortality from Gun Violence: Causal or Casual?

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Abstract: Objective: Describe trends in non-Hispanic black infant mortality (IM) in the New York City (NYC) counties of Bronx, Kings, Queens, and Manhattan and correlations with gun-related assault mortality.

Methods: Linked Birth/Infant Death data (1999-2013) and Compressed Mortality data at ages 1 to ≥85 years (1999-2013). NYC and United States (US) Census data for income inequality and poverty. Pearson coefficients were used to describe correlations of IM with gun-related assault mortality and other causes of death.

Results: In NYC, the risk of non-Hispanic black IM in 2013 was 49% lower than in 1995 (rate ratio: 0.51; 95% CI: 0.43, 0.61). Yearly declines between 1999 and 2013 were significantly correlated with declines in gun-related assault mortality (correlation coefficient (r) = 0.70, p = 0.004), drug-related mortality (r = 0.59, p = 0.020), major heart disease and stroke (r = 0.85, p < 0.001), malignant neoplasms (r = 0.57, p = 0.026), diabetes mellitus (r = 0.63, p = 0.011), and pneumonia and influenza (r = 0.78, p < 0.001). There were no significant correlations of IM with chronic lower respiratory or liver disease, non-drug-related accidental deaths, and non-gun-related assault. Yearly IM (1995-2012) was inversely correlated with income share of the top 1% of the population (r = −0.66, p = 0.007).

Conclusions: In NYC, non-Hispanic black IM declined significantly despite increasing income inequality and was strongly correlated with gun-related assault mortality and other major causes of death. These data are compatible with the hypothesis that activities related to overall population health, including those pertaining to gun-related homicide, may provide clues to reducing IM. Analytic epidemiological studies are needed to test these and other hypotheses formulated from these descriptive data.

Keywords: Infant Mortality■African American■Assault

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INTRODUCTION

In recent years, New York City (NYC), New York experienced significant declines in infant mortality (IM) leading to the lowest rates in its history by 2013-2014, despite persistent poverty and rising income inequality.[1,2] The hypothesized causes include numerous maternal and infant care programs including breastfeeding promotion; safe-sleep education; providing cribs; home-visits; increased access to contraception to promote planned pregnancies; assistance to pregnant women and their families with childbirth education; prenatal exercise classes; doula support during labor and delivery; infant safety classes; and work with community-based organizations in vulnerable neighborhoods to support workshops, outreach, referral services, case management, peer education and other activities.[3,4]

It is important to note that IM is also associated with overall community health,[5] including murder and violence.[6,7] In particular, secular trends in IM and assault mortality have been linked in large urban communities throughout the United States (US).[6] Similarly, community violence has been associated with increased risk of preterm birth in a US urban environment.[7] In addition, firearm-related homicide mortality is a particular burden in African American communities.[8-10] In this brief report, we explore correlations between IM in NYC and firearm-related homicide, as well as other causes of death among non-Hispanic (NH) blacks.

MATERIALS AND METHODS

For IM, we ascertained 1995-2013 county-level Linked Infant Birth/Death mortality rates from the US Centers for Disease Control and Prevention (CDC WONDER) internet site.[11] For mortality in the general population one year of

age and older, we ascertained from the 1999-2013 Compressed Mortality files age-adjusted mortality rates and 95% confidence intervals (CI), also from CDC WONDER.[11,12] These periods of observation were chosen because of availability as well as CDC recommendations for using Linked Infant Birth/Death data for IM classified by race and ethnicity.[13,14] At the time of these descriptions, Linked Infant Birth/Death data were available on WONDER from 1995 to 2013, whereas for child and adult mortality, information about Hispanic origin was available only from 1999 forward.[11] Thus, we used 1999-2013 for child and adult data, and 1995-2013 for IM.

Causes of death were those identified as leading causes in NYC in prior studies.[15,16] During the present observation period, these causes collectively accounted for 87.4% of all NH-black deaths at ages 1 year and older and all but one (kidney disease) individually accounted for >1% of all deaths.[11] International Classification of Diseases, Tenth Edition (ICD-10) diagnosis codes included: major cardiovascular diseases including heart disease and stroke (I00-I78); malignancies (C00-C97); HIV/AIDS (B20-B24); diabetes (E10-E14); pneumonia and influenza (J10-J18); chronic lower respiratory diseases (J40-J47); drug-related (F11-F16, F18-19, X40-42, X44); homicide (sub-divided as gun-related (X93-X95) and non-gun-related (X-85-X92, X96-Y09 assault); liver disease (K73-K74); and external causes other than drug-related (V01-X39, X43, X45-X59, Y85-Y86). Sequelae of homicide (Y87.1) were not included because this category accounted for a very small fraction of homicide deaths (122 of 5091) and there was no differentiation between gun and non-gun-related homicide.[11]

Socio-economic data included yearly percent share of income among the top 1% of the NYC population (available for 1995-2012, with 2011 and 2012 representing projected values),[17] decennial (1990, 2000, 2010) county-level Gini coefficients,[18,19] and percentages of the population with an annual income below poverty.[19-22]

Pearson product-moment coefficients[23] were used to estimate the magnitude and direction of correlations between yearly IM and yearly age-adjusted mortality in the general population aged one year or older. For each rate ratio (RR), we calculated two sided p-values and 95% confidence intervals (CI) using StatsDirect software.[24]

RESULTS AND DISCUSSION

NH-black IM declined significantly from 515 deaths among 36,000 live births in 1995 to 170 deaths among 23,624 live births in 2013 (RR = 0.51 (95% CI: 0.43, 0.61)), while the corresponding RR for 2013 versus 1999 was 0.69 (95% CI: CI 0.57, 0.84). Table 1 shows mortality rates for major causes of death among the NYC NH-black population aged ≥1 year, from 1999 to 2013, as well as correlation coefficients (r) and corresponding p-values (p). Statistically significant correlations were found between IM and several other major causes of death among NH-blacks: gun-related homicide ($r = 0.70$, $p = 0.004$) and drug-related disease ($r = 0.59$, $p = 0.020$); several chronic diseases, including major heart disease and stroke ($r = 0.85$ $p < 0.001$); malignancies ($r = 0.57$, $p = 0.026$); HIV/AIDS ($r = 0.81$, $p < 0.001$); diabetes mellitus ($r = 0.63$ $p = 0.011$); and pneumonia and influenza ($r = 0.78$, $p < 0.001$). All correlations for non-gun-related homicide and non-drug-related external causes of mortality were not statistically significant.

These results are compatible with a previous observation linking IM, assault, and other causes of death in large urban US centers.[6] These observations are also consistent with numerous studies linking social disorder with maternal stress, which has, in turn, been associated with IM.[25-34] Maternal use of cocaine, amphetamine, and multiple other drugs has also been associated with increased risk of IM.[35] The present results are also compatible with the hypothesis that the historic declines in NH-black IM in NYC did not occur in isolation, but instead reflected factors related to overall community health, including those related to gun violence.

From 1995 to 2013, despite increasing income inequality, as represented by the growing income share of the top 1%, there was a significant inverse correlation with the decreasing NH-black IM ($r = -0.66$, $p = 0.007$). From 2000 to 2010, there were declines in county percent poverty and wealth inequality (Gini coefficient), except for an increase in the New York County Gini coefficient from 2000 to 2010. Nonetheless, from 1990 to 2010, the percent of the population in poverty remained stable (22.7% in Kings County) or increased (from 24.0 to 29.3 − Bronx, and 10.9 to 14.4 − Queens) in three of the four counties, and even with minor improvements in Gini coefficients between 2000 and 2010, county coefficients in 2010 were all higher than those for 1990, reflecting a general increase in wealth inequality: Bronx = 0.460 to 0.480; Kings = 0.448 to 0.505; New York = 0.552 to 0.594 and Queens = 0.372 to 0.440.

These data support the previous observation that reductions in overall black and NH black IM in NYC occurred despite persistent poverty and increasing income inequality. Our findings contrast with a previous report[36] of strong linkages between poor infant outcomes, Gini coefficients, and median family incomes. Their findings were based on aggregated state health data for 2000-2004 and a much shorter timeframe for a specific geographic area. While such factors are important determinants of