**Distribution Agreement**

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Julian Villar Date

**Latino and African American Adolescent and Young Adult Homicide Mortality Peak: Data from the National Violent Death Reporting System 2005-2008**

By

Julian Villar
MPH

Epidemiology

_____

Julie Gazmararian, PhD, MPH
Committee Chair

**Latino and African American Adolescent and Young Adult Homicide Mortality Peak: Data from the National Violent Death Reporting System 2005-2008**

by

Julian Villar
BA, Wesleyan University, 2005
MD, Emory University, 2011

Thesis Committee Chair: Julie Gazmararian, PhD, MPH

An Abstract of
a thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
In partial fulfillment of the requirements for the degree of
Master of Public Health
In Epidemiology
2011

## Abstract

### Latino and African American Adolescent and Young Adult Homicide Mortality Peak: Data from the National Violent Death Reporting System 2005-2008

Julian Villar

**Purpose**: To determine if there is an increase in homicide rates of Latinos and non-Latino African Americans relative to non-Latino Whites in adolescents and young adults using data from the sixteen states participating in the National Violent Death Reporting System (NVDRS).

**Methods**: A retrospective observational study using deaths reported to the NVDRS between 2005 and 2008 was conducted. Source population demographic information for each state was obtained from the US Census Bureau. Analysis included 16,193 homicides in 16 states, over 317,645,051 person-years.

**Results**: Statistically significant peaks in the homicide rate ratios of both Latinos (RR 4.11, 95% CI 3.61, 4.67) and non-Latino African Americans (RR 13.72, 95% CI 12.48, 15.07) aged 20-24 years relative to non-Latino Whites are present when all 16 states are combined. Massachusetts had the largest peak for both African Americans and Latinos. Rate ratios for males were greater than for females in all states. Peaks were present for Latino males in all states except Alaska, Rhode Island, and South Carolina; for Latina females only in Colorado and North Carolina; for African American males in all states except Utah; and for African American females in all states except Alaska, Massachusetts, New Mexico, Oregon, Rhode Island, and Utah. A weak positive correlation exists between the proportion of each racial/ethnic group living in poverty and the homicide rate for that group in each state ($r^2$= 0.21, p= 0.04) when all races/ethnicities were plotted together. This relationship disappears when stratified by race/ethnicity and sex.

**Conclusions**: Latinos and African Americans are at higher risk of homicide than Whites in all age groups. Though this relationship had been previously alluded to in California, it had not previously been shown in other states or demonstrated directly. The relationship between poverty and homicide appears to be confounded by race/ethnicity. It is likely, therefore, that cultural differences between adolescents and young adults of different races/ethnicities, not socioeconomic status, are the driving force behind differences in homicide rates. Exploration of the homicide rate ratio patterns in the remaining states, as well as further characterization of factors contributing to homicide are important next steps.

**Latino and African American Adolescent and Young Adult Homicide Mortality Peak: Data from the National Violent Death Reporting System 2005-2008**

by

Julian Villar
BA, Wesleyan University, 2005
MD, Emory University, 2011

Thesis Committee Chair: Julie Gazmararian, PhD, MPH

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
In partial fulfillment of the requirements for the degree of
Master of Public Health
In Epidemiology
2011

**Acknowledgements**

The author gratefully acknowledges Julie Gazmararian, PhD, for her advice and guidance, Debra Karch, PhD, for her guidance in using the NVDRS data, the faculty and staff of the Rollins School of Public Health for their support and contributions to this study, and Emory University School of Medicine for their support in their financial and logistical support in the pursuit of the Master in Public Health.

# Table of Contents

## Introduction

Traumatic injuries, including accidental, self-inflicted harm, and external violent harm, represent one of the leading causes of death in the US, especially for adolescents and young adults, for whom traumatic injury is the single most important mechanism of death[1]. Homicide is the second leading form of traumatic injury and subsequent death among persons aged 15-24 years, resulting in an age-specific mortality rate of 10.7 deaths per 100,000 person-years in 2003, as compared to 8.9 for individuals aged 25-34 years, and 3.0 for those aged 35-64[2]. Most homicides in this age group are carried out with firearms[3].

Adolescents display difficulties in emotional moderation, impulsivity, and risk-taking behavior due to the unique emotional and psychosocial changes during this stage of life[4]. It has been shown that adolescents that engage in risk-taking behaviors like smoking and drinking are also more likely to develop violence-related behaviors later in life[5]. Furthermore, those who have been victims of bullying and harassment are similarly at increased risk of both engaging in violence and of being victims of future violence[5]. All cause morbidity and mortality rates double from childhood to adolescence[4].

In a particular region of Los Angeles County, 92% of all homicide victims between 2001 and 2006 were African American. This resulted in a significant reduction of 2.1 years in the life expectancy of African American males of LA County. In low-income neighborhoods, life expectancy of African American males was reduced by 5 years[6]. The total homicide rate for LA County in this time period mirrored the national rate of 10.6

victims of homicide per 100,000 person-years of all ages and all races[6]. However, a disparities exist when it is expanded by race. Whites were murdered at a rate of 5.5 per 100,000 person-years, Latinos at a rate of 18.1 per 100,000 person years, while African Americans were murdered at the staggering rate of 73.0 per 100,000 person years[6].

Poverty is also associated with death by homicide. A comparison among neighborhoods of LA county has shown there is an exponential relationship between the percentage of the population living below the poverty line and the years of life expectancy lost to homicide. Specifically, years of life lost doubles with each 10% increase in the proportion of the population living bellow the poverty line[6]. In addition, evidence suggests that income *inequality* and homicide are related: a comparison among 33 rich and middle-income countries found that there is a direct positive correlation between Gini coefficient of income and homicide rates[7].

Males are substantially more at risk of being victims of homicide than females. In the US, the homicide mortality rate for males is 7.1 per 100,000 person-years, compared to females at 1.2 events per 100,000 person-years[2]. Among individuals aged 15-24 this difference is even more pronounced: 18.8 males and 2.2 females homicides per 100,000 person-years respectively[2].

These disparities in homicide rates notwithstanding, there exists a positive health outcome profile for Latinos in the US, compared to non-Latino Whites, despite consistently negative socioeconomic status profiles[8]. Termed the Latino Epidemiologic

Paradox, it was first described by Markides and Coreil in their 1986 landmark paper, which showed that Latinos in the Southwestern United States exhibited longer life expectancies, lower rates of infant mortality and mortality from cardiovascular diseases than their White counterparts[9].

However, Hayes-Bautista et al later described an age-dependent exception to this paradox. They found increases in all-cause mortality rates of Latino males in California relative to Whites as the population reached adolescence and young adulthood, termed the Latino Adolescent Male Mortality Peak (LAMMP)[10]. In other words, all-cause mortality rates are lower for Latinos males than for White males of all ages, except between the ages of 15-24 when the mortality rates for Latinos surpasses that of whites. Then at older ages the rates return to levels favoring the Latino group. Vaca et al subsequently suggested that this peak could be attributed to an increase in homicide rates: if homicide is eliminated as a cause of death, this anomalous peak disappears[8]. They did not, however, explore the relationship between homicide rate ratios and age *directly*.

The increase in crude homicide rates for all races/ethnicities at adolescence and young adulthood is a clear public health concern[2]. If truly present, however, the disproportionate rise in the homicide rates of Latinos and non-Latino African Americans *relative* to non-Latino Whites in these age groups is significantly more pressing: not only would it represent an age-dependent health disparity, but one based on race/ethnicity as well. The acuity of the issue is especially poignant given that the Latino community is the fastest growing minority group in the US[11]. Our ability to fully characterize the

relationships among age, race/ethnicity, sex, poverty, and homicide rates is a crucial first step in mitigating this disparity, and relieving these populations of such a heavy disease burden.

In view of this disparity, a retrospective observational study comparing the homicide rates of Latinos, non-Latino African Americans and non-Latino Whites across 16 states participating in the Centers for Disease Control and Prevention's National Violent Death Reporting System has been conducted in order to determine if (1) this age-dependent increase in homicide rate ratios can be demonstrated directly when the 16 states are pooled; (2) if it is sex specific; (3) if it can be demonstrated each individual state other than California; and (4) if there is a relationship between the proportion of each racial/ethnic group living in poverty and the homicide rate of individuals aged 15-24 years of that group in each of the 16 participating states.

# Methods

## Data Source

*Homicides*

Data for this study was obtained from the National Violent Death Reporting System (NVDRS). This system receives information on all violent deaths that take place in the 16 participating states: Alaska, Colorado, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Virginia, and Wisconsin.

Data for each incident is compiled by the specific state agency in charge of death certificates, police reports, crime laboratory reports, and coroner or medical examiner reports. Information is collected on victim and offender demographic characteristics, substance use, relationship of victim to offender, circumstances of the injury, date and location of the incident, mechanism of death, manner of death, weapon type, as well as a variety of other data for both the victim and the perpetrator[12].

A limited data set without any identifiable health information is available on the NVDRS website[13]. It can be accessed at the Web-Based Injury Statistics Query and Reporting System (WISQARS)[13]. It contains basic demographic characteristics of victims and offenders, but does not report identifiable health information. This online data reporting system was used to obtain all death events taking place in each age group in each state between 2005 and 2008, as well as the demographic characteristics of the victims.

Though the WISQARS may be used to generate crude and age-adjusted rates, this feature was not used; WISQARS was used only to obtain death events.

*Source Population*

For the purposes of calculating age specific rates, and thus rate ratios, estimated population demographic information available through the US Census Bureau was used. The US Census generates these estimates by calculating the changes in population size using the 2000 US Census as a baseline[14].

Total number of people of a given age group, race/ethnicity, and sex estimated to have lived in each state in the years 2005, 2006, 2007, and 2008 was obtained from the "Vintage 2009 State Characteristics Population Estimates, State by Age, Sex, Race, and Hispanic Origin: 6 race groups – 5 race alone groups and one multiple race group"[15]. The data are available in four separate 'coma separated variables' files by state: Alabama through Idaho, Illinois through Missouri, Montana through Pennsylvania, and Rhode Island through Wyoming. Population information from each of the 16 states participating in the NVDRS was abstracted from each of the corresponding 'coma separated variable files' and included in the final analytic data set.

*Poverty level*

Information regarding the proportion of the population living below the poverty line for each state for each study year was obtained from the US Census Bureau[16]. The averaged proportion of non-Latino Whites, non-Latino African Americans, and Latinos of all races

living below the poverty line was obtained for each of the states participating in the NVDRS between 2005-2008.

**Participants**

Homicides from 2005 to 2008 were eligible for inclusion. During this time period, a total of 17,070 homicides were reported across the 16 participating states. Incidents (or victims) were excluded if there was missing age (n=21), gender (n=1) or race/ethnicity (n=855). Only individuals who could be classified into "non-hispanic Whites", "non-hispanic Blacks", and "Hispanics all-Races" were included. (Although the NVDRS uses the term "Hispanic" to refer to individuals of Latin American or Spanish-speaking ancestry, for the purposes of the present study, the term "Latino" was used). A total of 16,193 eligible homicides occurring between 2005 and 2008 in the 16 participating states were included in the final analytic data set.

**Variables**

The following variables were used: *state, year, age, sex, race, ethnicity, deaths, population*. *State* was coded using the Federal Information Processing Standard[17] codes (i.e. Alaska = 2, Colorado = 8, etc.). *Age* was converted from single-year age into 5-year age groups (0-4, 5-9…); ages 85 and older were collapsed into a single age group. *Sex* was coded as 1 for "males", 2 for "females" and 0 for "both sexes"[18].

Race and ethnicity characteristics for deaths (from the NVDRS) and for the source populations (from the US census Bureau) were standardized as follows: For non-Latino

Whites and non-Latino African American "non-hispanic" (coded '1') as the value of the *Origin* variable, and "white" ('1') or "black"('2') as the value for the *race* variable, were used respectively. For Latinos, all races were included; "hispanic"(2) was used as the value for the *Origin* variable. Death events and source populations for "Hispanic Whites", "Hispanic Blacks", "Hispanic Native American", etc., were summed to generate a single Ethnicity category "Latino All Races". For ease of analysis, a combined race/ethnicity variable was constructed: *allrace*. Non-Latino Whites were coded as '1', Non-Latino Blacks as '2', and Latinos of all races as '3'.

Death events for a given race/ethnicity, sex, and age group taking place in each state during the study period were coded in the variable *deaths*.

**Analysis**

The number of people of each race/ethnicity, sex, and age group living in each state in each of the study years (2005 – 2008), were summed to generate the total number of person-years of a given race/ethnicity, sex and age group responsible for generating the death events with those same demographic characteristics.

Homicide rates (per 100,000 person-years) were calculated by dividing the number of deaths by the person-years for each state, sex, race/ethnicity, and age group. Homicide rate ratios for each age group and sex were calculated by dividing the homicide rates of Latinos or non-Latino African Americans by the homicide rates of the corresponding

non-Latino White sex and age group. For both rates and rate ratios, confidence intervals (95% CI) were calculated using the log-normal approximation of the Poisson distribution.

The number of deaths and person-years for each race/ethnicity and sex in each age group were summed across all 16 states. Homicide rates and rate ratios were then calculated to produce the 16-state composite effect. Deaths and person-years were then separated by sex, and the analysis was repeated to generate 16-state composite effect for males and females separately.

Homicide rate ratios were plotted for each age group by Race or Ethnicity, for all 16 states combined (objective 1), by sex (objective 2) and for each state individually (objective 3). A peak was considered to exist if there was an age – dependent increase in the magnitude of the rate ratios that reached a maximum at levels significantly greater than 1, and subsequently decreased.

The proportion of each racial/ethnic group living in poverty and the homicide rate for that group in each state were plotted together, and the Pearson correlation coefficient was calculated. The proportion of each ethnicity/race living in poverty was then plotted against the homicide rate for each race/ethnicity and sex separately, and Pearson correlation coefficients were calculated for each (objective 4).

This study was conducted with the guidance of the NVDRS, and received exemption by the Emory University Institutional Review Board. All statistical analyses were conducted using SAS 9.2 statistical software.

# Results

## Demographics

A total of 16,193 homicides in 16 states occurring between 2005 and 2008 were included in the final analytic data set (Table 1). Racial and ethnic representation vary significantly by state (Table 2). Kentucky had the smallest Latino population at 2.3% while New Mexico had the largest at 44.6%. Utah had the smallest African American population at 1.2%, while Georgia had the largest at 30.3%.

## Homicide Rate Ratios

Homicide rate ratios (and 95% CI), for Latinos and African Americans relative to Whites, by state, sex, and age group were calculated. There were 32 instances where the homicide rate for Whites was zero, but the homicide rate for the corresponding Latino or African American age group was not zero. In calculating rate ratio, this would generate undefined values (cannot divide by zero). In these cases, the rate ratio was set to zero (Table 3).

### *Overall Effect*

Figure 1 shows the 16-state-combined homicide rate ratios for males and females, together for Latinos and African Americans, relative to Whites by age group. The rate ratios for African Americans ranged from 0 (95% CI 0, 0) in the 85+ age-group, to 13.7 (95% CI 12.5, 15.1) in the 20-24 age group. African Americans had rate ratios in excess of 1.00 for all age groups except 85+ where there were no cases. However, for age

groups 70-74 and 80-84, the 95% confidence intervals span the null (0.6, 1.7 and 0.4, 2.4, respectively).

The rate ratios for Latinos ranged from 0 (age groups 5-9, and 60-85+ [no deaths]) to 4.1 (95% CI 3.6, 4.7) in the 20-24 years age group. While the point estimates for age groups 10-14, 45-49, and 55-59 are greater than one, their confidence intervals include the null value of 1.0.

A distinct and statistically significant peak in the homicide rate ratios of both Latinos and African Americans (relative to Whites) can be observed in young adults. For African Americans, the rate ratios progress from 2.5 (1.5, 4.1) at 5-9 years of age, to 9.9 (6.5, 15.0) at 10-14 years, to 12.6 (11.2, 14.2) at 15-19 year, and peak at 13.7 (12.5, 15.1) at 20-24 years, before dropping to 10.8 (9.8, 11.9) for the 25-29 year age range. Latinos demonstrate a similar pattern, though at more limited magnitudes. Rate ratios progress from 0 (0, 0) at 5-9 years, to 1.4 (0.7, 3.2) at 10-14 years, to 3.8 (3.2, 4.5) at 15-19 years, peaking at 4.1 (3.6, 4.7) at the 20-24 year age range, and then returning to 2.8 (2.5, 3.3) in the 25-29 year age group (Figure 1).

*Sex-Specific Effect*

This same peak was found when the analysis was performed on males alone (Figure 2). For African American males (red line in figure 2), the rate ratio increased from 0 in the 10-14 year age group, to 17.7 (15.3, 20.5) in the 15-19 year age group and 17.6 (15.8, 19.7) in the 20-24 year age group, before declining to 14.3 (12.8, 16.1) in the 25-29 year

age group. For Latino males (blue line in figure 2), rate ratios increased from 0 (0, 0) in the 10-14 year age group, to 4.99 (4.1, 6.1) in 15-19 year age group and 4.8 (4.1, 5.5) in the 20-24 year age group, before returning to 3.2 (2.8, 3.8) in the 25-29 year age group.

The effect is not as robust for females. The maximum rate ratio for Latina females (teal line in figure 2) was 1.08 in the 20-24 year age range. Furthermore, there were no age groups in which the relative rates were not equal to zero where the confidence interval excluded the null. African American females (brown line in figure 2) showed two significantly different peaks, one at 10-14 years (13.90, CI 6.07, 31.82), and a much smaller one at 20-24 years (5.10 CI 4.13, 6.31) (Figure 2).

*State-Specific Effect*

Homicide rate ratio peaks can be seen in every state that was examined, although the magnitude of the peak varied significantly from state to state. Furthermore, not all states showed peaks for both African Americans and Latinos. Table 4 shows the age groups at which homicide rate ratios peaked for each race/ethnicity and sex, by state. In nine of the sixteen states, the homicide rate ratios for Latino males peaked in the 20-24 year age-range, and four of the sixteen showed peaks in the 15-19 year age range. Seven states had homicide rate ratios peaks for African American males in the 20-24 year age range (Table 4 and Appendix 1).

The magnitude of the effect was greater across all states for African American males than for African American females or for all Latinos. African American males in

Massachusetts displayed the largest homicide rate ratio of 56.2 (29.5, 106.8) in the 15-19 year age range (Appendix 1 - Massachusetts). Although a significant homicide rate ratio peak was seen when African Americans of both sexes aged 20-24 years were combined in Rhode Island, no statistically significant peak was observed for African American males or females alone (Appendix 1 – Rhode Island). Furthermore, no peak was seen for African American females in Alaska, Colorado, Massachusetts, New Mexico, Oregon, Rhode Island, or Utah (Appendix 1).

Homicide rate ratio peaks were not found for Latino males or females in Alaska and South Carolina. Latino males had distinct and statistically significant peaks in homicide rate ratios in all other states, ranging from 15 to 29 years of age, and clustering in the 20-24 year age range. Massachusetts had the highest magnitude of the Latino male homicide rate ratio at 13.5 (6.6, 27.9); New Mexico had the lowest significant rate ratio at 2.08 (1.1, 3.8). Only Colorado and North Carolina demonstrated peaks for Latina females of 3.9 (1.5, 10.5) and 2.65 (1.1, 6.2), respectively (Appendix 1). While the Latina female peak came in the usual age range in North Carolina (20-24), the peak in Colorado was seen in the 30-34 year age range.

An interesting second peak was observed for African American and Latino males in New Jersey (Appendix 1). African American male homicide rate ratio peaks in the 15-19 year age group at 37.4 (22.0, 65.6), and then drops below 10 in by the 40-45 year age group, before spiking to 12.1 (6.5, 22.5) in the 45-49 year age-group. For Latino males, the first peak was reached in the 15-19 year age-range at 5.75 (3.0, 10.8), and then remains

between 2.05 and 3.44, before peaking again in the 50-54 year age-range to 5.31 (2.4, 11.8).

**The effect of Poverty**

Table 5 shows the 2005-2008 percent of each ethnic or racial group living in poverty in each state. The proportion of Latinos living in poverty ranged from 9.9% in Maryland to 34.1% in Kentucky, with a 16-state average of 22.0%. The proportion of non-Latino African Americans living in poverty ranged from 5.1% in Utah to 31.2% in Kentucky, with a 16-state average of 20.7%. The proportion of non-Latino Whites living in poverty ranged from 6.0% in Maryland to 14.4% in Kentucky, with a 16-state average of 9.7%.

A weak, but statistically significant relationship was observed between poverty and homicide rates when all races/ethnicities and both males and females were plotted together: $r^2 = 0.21$ ($p = 0.0384$). However, when stratified by each race/ethnicity and sex, different results are observed. For African American males ($r^2= 0.05$, $p= 0.84$), as well as for African American, and Latina females ($r^2= 0.10$, $p= 0.70$ and $r^2= 0.05$, $p= 0.86$, respectively), absolutely no relationship was observed. For White males and White females modest, but non-significant relationships were observed. ($r^2= 0.31$, $p= 0.24$ and $r^2= 0.38$, $p= 0.15$, respectively). Even for Latino males, who displayed a modest correlation $r^2= 0.45$, $p= 0.08$, no statistically significant relationship at the 0.05 significance level was observe. The weak, but statistically significant correlation that was seen when all races/ethnicities and both sexes were analyzed together was likely to be due to confounding and is not a true association.

## Discussion

Homicide rate ratios peaks for Latino and African Americans adolescents and young adults relative to Whites in the 16 states participating in the National Violent Death Reporting System have been characterized here. The presence of these peaks indicates a significantly increased risk of death by homicide for Latino and African American adolescents and young adults relative to their White counterparts. The risk is greatest in the 20-24 year age-range, as high as 9.4 times greater for Latino relative to Whites, and 40.3 times greater for African American relative to Whites in Massachusetts. Males are consistently at higher risk of death by homicide than females, across all age groups and all ethnicities. Finally, there is a positive, though weak, statistically significant association between the proportion of a community living in poverty, and the homicide rate within that community when all races/ethnicities and sexes are taken together, though this relationship disappears when stratified by race/ethnicity and sex.

The homicide rate ratio peaks could only be demonstrated in selected ethnic/racial groups in each state, and the demographic characteristics of these subpopulations varied from state to state. Furthermore, although Alaska, Massachusetts, New Mexico, and Rhode Island displayed statistically significant peaks in the 15-24 year age range, there were no African American or Latino victims of homicide in the immediately younger and older age groups. Similarly, Latino males in Kentucky, Massachusetts, New Mexico, and Rhode Island showed significant, but narrow peaks: a peak is present in the 15-24 year age range in each of these states, but significant results are absent in the age groups immediately younger and older.

We hypothesized that states with larger proportions of a particular ethnic/racial minority would have homicide rate ratio peaks of larger magnitudes. However, Massachusetts, where the magnitude of the peaks was largest for both Latino and African American males, has 8.2% Latino and 7.8% African American representation. New Mexico, on the other hand, has 44.6% Latino representation, but has one of the smallest homicide rate ratio maximums at 2.08.

It is clear, however, that while this increase in homicide rates for Latinos and African Americans relative to Whites can be shown for females in select states, the effect is much larger, prominent, and widespread for males than for females. This was expected, however, given the previously shown differences in homicide rates between males and females[2]. Despite some state-to-state variability in the homicide rate ratio peak, as a whole African American and Latino adolescents and young adults remain at substantially higher risk of death from homicide than their white counterparts. This represents a pressing public health problem.

All cause male mortality rate ratios have previously been shown to peak for Latinos and African Americans in the 15-24 year age group. It has also previously been shown that by excluding homicide as a cause of death, these peaks disappear for Latino males[8]. It was thus suggested that the peak in *all cause* mortality can be attributed to spikes in *homicide* rate ratios. However, the homicide rate ratio peaks for each of the states considered here had not previously been characterized. The homicide rate ratio peaks for Latino and African Americans described here follow the same general pattern as the

all cause mortality peaks previously described. It is likely, therefore, that the all cause mortality peak can be attributed to a spike in homicides during adolescence and young adulthood.

Though income poverty was not shown to account for the variability in the homicide rates of adolescents and young adults, other social stressors could very well be responsible. Cultural differences between African Americans, Latinos, and Whites could account for the observed homicide age-dependent differences in mortality rates. More likely, however, is that pervasive and persistent alienation and disenfranchisement has made African American and Latino populations in select states more prone to violent behavior and thus more likely to become victims of homicide. Discrimination, housing conditions, employment conditions, and the prevalence of severe mental illness have all been suggested as psychosocial stressors[19] that could drive violent behavior and homicide within communities. State – to – state variation in these social stressors could explain the observed variation of in the magnitude of the homicide rate ratio peaks between states.

Our findings confirm that the peak in homicide rate ratio observed in California is indeed present in other states. The nature of these peaks points to a dual public health problem. This country's youth, of all ethnic and racial backgrounds, remain at higher risk of violent death in general and homicide in particular. Furthermore, gross disparities such as the ones shown here between racial and ethnic groups are not only morally unacceptable, but prevent the development of a cohesive, unified, and successful society. If age-dependent spikes in all cause mortality for adolescents and young adults can truly

be attributed largely to homicide, it is crucial to target public policy interventions at reducing specific risk factors for homicide.

The most important limitation of the present study is in its design. The unit of comparison used was number of deaths in a particular age group between racial/ethnic groups, and across states, and thus the ecological nature of the results makes them inherently unstable. Furthermore, since the NVDRS to date has only 16 participating states, the results are not representative of the country as a whole. Moreover, the poverty rates that were utilized could not be separated by age group or sex. These limitations notwithstanding, the present study represents a strong contribution to our previous understanding of homicide risk profiles in the US.

**Conclusions**

Despite attention and effort made by public health authorities, disparities and inequalities remain prominent features of the American health profile[20]. One such feature has been characterized here, showing that Latinos and African Americans are at higher risk of homicide than their White counterparts at all age groups, and especially in adolescents and young adults. The results presented in this study confirm the previous suggestion that the Latino Adolescent Male Mortality Peak is due to spikes in the homicide rates of Latinos relative to Whites. Contrary to what was expected[6], poverty was not observed to be related to homicide rate. Other social stressors such as discrimination, racism, and alienation could account for the differences in homicide rates among races/ethnicities and across states. As additional states participate in the NVDRS, it will be important to

examine these trends in each additional state. It will also become important to further explore possible causes for the observed state-to-state variability in the magnitudes of the homicide rate ratio peaks, and to more fully further other potential predictors of homicide. This will be an important tool in our efforts to develop preventive programs for this age- and race/ethnicity-dependent burden of disease.

**References:**


1. Gary R Strange, William R Ahrens, RW Schafermeyer, RA Wiebe. *Pediatric Emergency Medicine*. 3e. McGraw-Hill
2. EG Richardson, D Hemenway. "Homicide, Suicide, and Unintentional Firearm Fatality: Comparing the United States with Other High Income Countries, 2003" *Journal of Trauma*. 2011 January; 70 (1): 238 – 243
3. KK Christoffel. "Violent Death and Injury in US children and Adolescents." *Am J Dis Child*. 1990 Jun; 144(6): 697-706
4. RE Dhal. "Adolescent Brain Development: A period of Vulnerabilities and Opportunities" *Annals of the New York Academy of Science*. 2004; 1021: 1-22
5. E Smith-Khuri, R Iachan, PC Scheidt, MD Overpeck, SN Gabhainn, W Pickett, Y Harel. "A Cross-National Study of Violence-Related Behaviors in Adolescents". *Archives of Pediatric and Adolescent Medicine*. 2004; 158: 539-544.
6. M Redelings, L Lieb, F Sorvillo. "Years off Your Life? The effects of homicide on Life expectancy By Neighborhood and Race/Ethnicity in Los Angeles County". *Journal of Urban Health*. 2010; 87(4): 670-676
7. FJ Elgar, N Aitken. "Income Inequality, trust, and homicide in 33 countries". *The European Journal of Public Health*. Online 4 June, 2010
8. FE Vaca, CL Anderson, DE Hayes-Bautista. "Latino Adolescent male mortality peak revisited: attribution of homicide and motor vehicle crash death". *Injury Prevention*. online December 5, 2010
9. KS Markides and J Coreil. "The Health of Hispanics in the Southwestern United States: an Epidemiologic Paradox" *Public Health Rep*. 1986; 101(3): 253 – 265
10. DE Hayes-Bautista, P Hsu, M Hayes-Bautista, et al. "An Anomaly within the Latino Epidemiological Paradox: the Latino Adolescent Male Mortality Peak." *Archives of Pediatric Adolescent Medicine*. 2002; 156: 480-484.
11. US Census Bureau. *Ethnicity and Ancestry Branch Population Division*. "Hispanics in the United States, 2008". http://www.census.gov/population/www/socdemo/hispanic/hispanic_pop_presentation.html (accessed 3 March, 2011).
12. Centers for Disease Control and Prevention "Data Collection and Access". *National Violent Death Reporting System*. http://www.cdc.gov/ViolencePrevention/NVDRS/datacollectionaccess.html. Accessed online March 2011.
13. Centers for Disease Control and Prevention "Web-based Injury Statistics Query and Reporting System". *National Violent Death Reporting System*.. http://wisqars.cdc.gov:8080/nvdrs/nvdrsDisplay.jsp. Accessed Online March 2011
14. US Census Bureau "Methodology for the State and County Total Resident Population Estimate by Age, Sex, Race, and Hispanic Origin (Vintage 2009): April 1, 2000 to July 1, 2009" *Population Estimates*, http://www.census.gov/popest/topics/methodology/2009-stco-char-meth.pdf. Accessed Online March 2011.
15. US Census Bureau "Vintage 2009 State Characteristics Population Estimates". http://www.census.gov/popest/states/asrh/. Accessed Online March 2011.

16. US Census Bureau "Current Population Survey Table Creator". http://www.census.gov/hhes/www/cpstc/cps_table_creator.html. Accessed online March 2011.
17. United States Department of Labor "List of State FIPS Codes" *Bureau of Labor Statistics*. http://www.bls.gov/lau/lausfips.htm. Accessed Online March 2011.
18. US Census Bureau, Population Division "Annual State Resident Population Estimates for 6 Race Groups (5 Race Alone Groups and Two or More Races) by Age, Sex, Hispanic Origin: April 1, 2000 to July 1, 2009". http://www.census.gov/popest/states/asrh/files/SC-EST2009-ALLDATA6.pdf. Released June 2010. Accessed Online March 2011.
19. M Fisher and F Baum. "The Social Determinants of Mental Health: implications for research and health promotion" *Australian and New Zealand Journal of Psychiatry*. 2010; 44: 1057-1063
20. Institute of Medicine. *Challenges and Successes in Reducing Health Disparities: Workshop summary*. Washington, DC: IOM, 2008.

**Table 1** – Homicide incidents eligible for inclusion in then study. All homicides in the16 states participating in the National Violent Death Reporting System between 2005 and 2008.

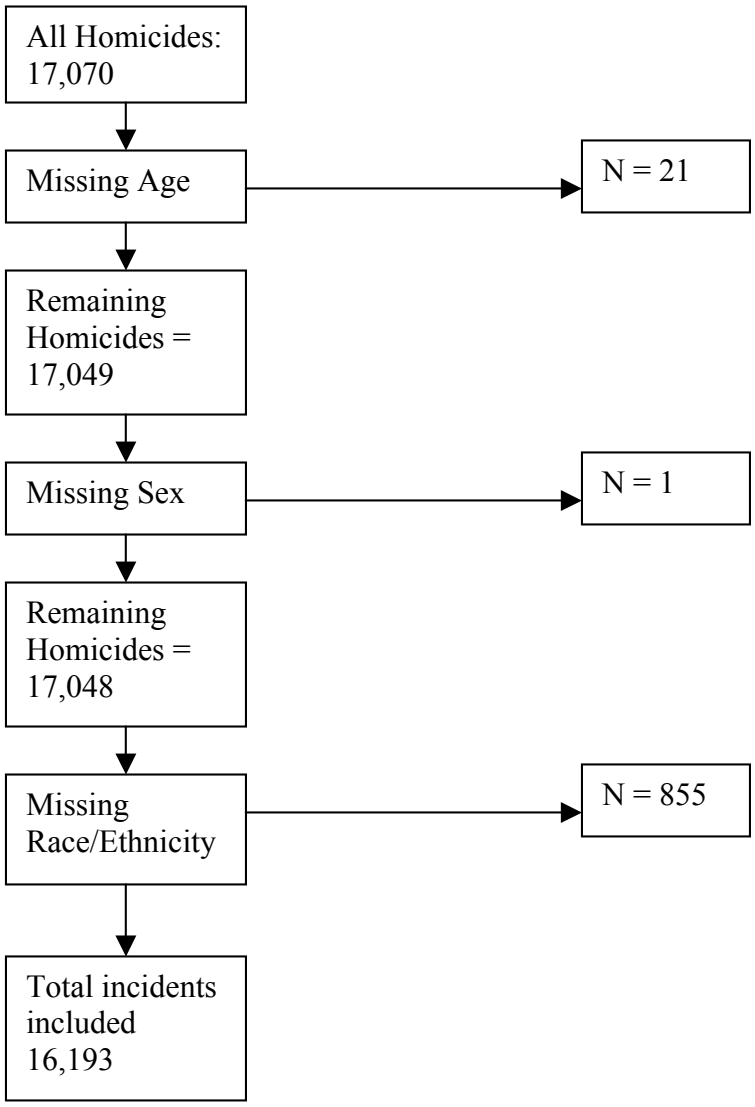


**Table 2** – Source populations. Latinos, African Americans, and Whites living in each state participating in the National Violent Death Reporting System between 2005 and 2008, as person-years, and as proportion of the total state population. From "Vintage 2009 State Characteristics Population Estimates", US Census Bureau**.**

| | **Population Breakdown by Race/Ethnicity (person-years 2005-2008)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Latino** | | **African American** | | **White** | | **Total** |
| **State** | Number | % | Number | % | Number | % | Number |
| 16 states average | 29,621,292 | 9.3% | 50,102,192 | 15.8% | 203,965,621 | 64.2% | 317,645,051 |
| Alaska | 162,404 | 6.0% | 115,608 | 4.3% | 1,790,675 | 65.9% | 2,717,235 |
| Colorado | 3,765,012 | 19.6% | 953,395 | 5.0% | 13,750,336 | 71.6% | 19,191,296 |
| Georgia | 2,942,294 | 7.8% | 11,411,347 | 30.3% | 22,180,480 | 58.9% | 37,659,113 |
| Kentucky | 409,101 | 2.4% | 1,535,814 | 9.1% | 14,890,324 | 87.9% | 16,945,876 |
| Maryland | 1,493,056 | 6.6% | 6,730,304 | 29.9% | 13,092,671 | 58.2% | 22,487,613 |
| Massachusetts | 2,144,105 | 8.3% | 2,026,446 | 7.8% | 20,722,930 | 79.8% | 25,962,300 |
| New Jersey | 5,464,728 | 15.8% | 5,094,748 | 14.7% | 21,633,006 | 62.6% | 34,544,999 |
| New Mexico | 3,483,005 | 44.6% | 244,255 | 3.1% | 3,309,755 | 42.4% | 7,814,640 |
| N. Carolina | 2,521,447 | 7.0% | 8,062,067 | 22.5% | 24,331,875 | 67.9% | 35,847,637 |
| Oklahoma | 1,067,674 | 7.4% | 1,326,861 | 9.2% | 10,322,827 | 71.9% | 14,363,314 |
| Oregon | 1,540,640 | 10.4% | 518,602 | 3.5% | 11,965,554 | 80.8% | 14,811,362 |
| Rhode Island | 476,213 | 11.2% | 304,145 | 7.2% | 3,362,545 | 79.4% | 4,233,696 |
| S. Carolina | 737,569 | 4.2% | 5,174,468 | 29.5% | 11,434,997 | 65.3% | 17,523,110 |
| Utah | 1,190,727 | 11.4% | 210,829 | 2.0% | 8,641,049 | 82.5% | 10,474,500 |
| Virginia | 2,068,266 | 6.7% | 6,341,151 | 20.6% | 20,722,979 | 67.4% | 30,726,056 |
| Wisconsin | 155,051 | 0.7% | 52,152 | 0.2% | 1,813,618 | 8.1% | 22,342,304 |

**Table 3** – Age groups where Homicide rate for Whites was zero, but homicide rate for African American or Latino was not zero.[1]

| State | Race/Ethnicity | Sex | Age Group | Homicide Rate (per 100,000 PY) |
|---|---|---|---|---|
| Georgia | African American | Male | 5-9 | 1.59 |
| Georgia | | | 10-14 | 1.28 |
| Georgia | | Female | 10-14 | 1.75 |
| Maryland | African American | Total | 10-14 | 2.98 |
| Maryland | | Male | 10-14 | 3.53 |
| Maryland | | | 65-69 | 7.69 |
| Maryland | | Female | 0-4 | 1.72 |
| Maryland | | | 10-14 | 2.42 |
| New Jersey | African American | Total | 10-14 | 3.57 |
| New Jersey | | Male | 10-14 | 3.22 |
| New Jersey | | Female | 10-14 | 3.94 |
| New Jersey | | | 30-34 | 9.67 |
| New Jersey | Latino | Female | 0-4 | 2.36 |
| New Mexico | Latino | Total | 10-14 | 2.77 |
| New Mexico | | Male | 0-4 | 3.65 |
| New Mexico | | | 15-19 | 21.89 |
| New Mexico | | Female | 0-4 | 3.76 |
| New Mexico | | | 20-24 | 4.27 |
| New Mexico | | | 35-39 | 5.27 |
| North Carolina | African American | Male | 10-14 | 4.53 |
| North Carolina | | Female | 10-14 | 2.32 |
| Rhode Island | African American | Total | 15-19 | 28.91 |
| Rhode Island | Latino | Male | 20-24 | 36.60 |
| Rhode Island | | | 30-34 | 33.23 |
| South Carolina | African American | Total | 5-9 | 2.48 |
| South Carolina | | | 10-14 | 2.01 |
| South Carolina | | Male | 10-14 | 3.45 |
| South Carolina | | | 75-79 | 21.34 |
| Utah | Latino | Male | 15-19 | 11.71 |
| Utah | | | 35-39 | 12.17 |
| Virginia | African American | Total | 10-14 | 2.84 |
| Virginia | | Male | 10-14 | 4.34 |

[1] In calculating the rate ratio, a homicide rate of zero for the White group would have yielded an undefined value (cannot divide by zero). In these instances, the rate ratio was set to zero. This table shows the value of the crude homicide rates for the African American or Latino groups whose corresponding rate ratios were adjusted to zero.

**Table 4** – Magnitude of Peaks – Significant homicide rate ratio peaks, and 95% confidence intervals, 2005- 2008

| State | Race/Ethnicity | Sex | Peak Age | Rate Ratio | 95% CI |
|---|---|---|---|---|---|
| **Alaska** | African American | Total | 20-24 | 11.92 | (3.84, 36.97) |
| | | Males | 20-24 | 11.63 | (3.75, 36.07) |
| **Colorado** | Latino | Total | 20-24 | 5.55 | (3.51, 8.79) |
| | | Males | 20-24 | 6.59 | (3.90, 11.13) |
| | | Females | 30-34 | 3.9 | (1.45, 10.46) |
| | African American | Total | 25-29 | 16.05 | (9.32, 27.64) |
| | | Males | 25-29 | 22.4 | (11.90, 42.16) |
| **Georgia** | Latino | Total | 20-24 | 4.99 | (3.35, 7.42) |
| | | Males | 20-24 | 5.41 | (3.50, 8.37) |
| | African American | Total | 20-24 | 10.38 | (7.77, 13.86) |
| | | Males | 20-24 | 12.51 | (8.96, 17.47) |
| | | Females | 20-24 | 5.58 | (3.09, 10.08) |
| **Kentuky** | Latino | Total | 20-24 | 5 | (2.10, 11.93) |
| | | Males | 20-24 | 5.41 | (2.21, 13.07) |
| | African American | Total | 20-24 | 13.78 | (8.96, 21.19) |
| | | Males | 20-24 | 14.66 | (9.07, 23.72) |
| | | Females | 20-24 | 8.3 | (3.01, 22.89) |
| **Maryland** | Latino | Total | 20-24 | 3.13 | (1.78, 5.48) |
| | | Males | 20-24 | 3.54 | (1.90, 6.56) |
| | African American | Total | 20-24 | 17.9 | (12.84, 24.97) |
| | | Males | 20-24 | 24.6 | (16.65, 36.35) |
| | | Females | 15-19 | 5.96 | (2.42, 14.71) |
| **Massachusetts** | Latino | Total | 15-19 | 9.42 | (4.95, 17.94) |
| | | Males | 15-19 | 13.52 | (6.56, 27.88) |
| | African American | Total | 15-19 | 40.31 | (23.29, 69.77) |
| | | Males | 15-19 | 56.16 | (29.53, 106.81) |
| **New Jersey** | Latino | Total | 15-19 | 4.21 | (2.41, 7.36) |
| | | Males | 15-19 | 5.74 | (3.04, 10.85) |
| | African American | Total | 15-19 | 27.57 | (17.67, 43.00) |
| | | Males | 15-19 | 37.41 | (22.01, 63.58) |
| | | Females | 15-19 | 7.65 | (3.12, 18.76) |
| **New Mexico** | Latino | Total | 15-19 | 2.58 | (1.24, 5.35) |
| | | Males | 20-24 | 2.08 | (1.14, 3.80) |
| | African American | Total | 25-29 | 5.51 | (2.15, 14.07) |
| | | Males | 25-29 | 5.23 | (2.03, 13.48) |
| **N. Carolina** | Latino | Total | 20-24 | 5.55 | (3.95, 7.82) |
| | | Males | 20-24 | 6.1 | (4.15, 8.96) |
| | | Females | 20-24 | 2.65 | (1.14, 6.18) |
| | African American | Total | 20-24 | 9.82 | (7.63, 12.64) |
| | | Males | 20-24 | 12.96 | (9.64, 17.42) |
| | | Females | 20-24 | 3.74 | (2.21, 6.33) |
| **Oklahoma** | Latino | Total | 20-24 | 4.3 | (2.62, 7.03) |
| | | Males | 20-24 | 4.76 | (2.76, 8.19) |
| | African American | Total | 15-19 | 11.17 | (7.01, 17.08) |
| | | Males | 15-19 | 14.29 | (8.42, 24.25) |

| | | | | | |
|---|---|---|---|---|---|
| | | Females | 20-24 | 4.69 | (1.82, 12.10) |
| **Oregon** | Latino | Total | 15-19 | 4.63 | (1.72, 12.42) |
| | | Males | 15-19 | 5.76 | (2.02, 16.42) |
| | African American | Total | 25-29 | 15.03 | (6.66, 33.93) |
| | | Males | 25-29 | 14.49 | (6.01, 34.95) |
| **Rhode Island** | Latino | Total | 20-24 | 6.14 | (2.23, 16.94) |
| | African American | Total | 20-24 | 9.97 | (3.35, 29.68) |
| **S. Carolina** | African American | Total | 20-24 | 7.41 | (5.30, 10.38) |
| | | Males | 20-24 | 9.03 | (6.18, 13.21) |
| | | Females | 25-29 | 4.3 | (2.11, 8.78) |
| **Utah** | Latino | Total | 20-24 | 7.89 | (3.42, 18.20) |
| | | Males | 20-24 | 11.17 | (3.98, 31.38) |
| **Virginia** | Latino | Total | 20-24 | 3.72 | (2.42, 5.71) |
| | | Males | 20-24 | 4.4 | (2.72, 7.12) |
| | African American | Total | 15-19 | 11.82 | (8.01, 17.44) |
| | | Males | 15-19 | 18.11 | (11.18, 29.32) |
| | | Females | 20-24 | 4.38 | (2.49, 7.68) |
| **Wisconsin** | Latino | Total | 15-19 | 6.62 | (3.34, 13.12) |
| | | Males | 15-19 | 10 | (4.44, 22.52) |
| | African American | Total | 20-24 | 33.94 | (22.56, 51.08) |
| | | Males | 20-24 | 46.44 | (28.13, 76.68) |
| | | Females | 20-24 | 11.36 | (5.01, 25.75) |

**Table 5** – Proportion of Latinos, African Americans, and Whites living in poverty in each state participating in the National Violent Death Reporting System.

| | Proportion of State Population Living in Poverty | | |
|---|---|---|---|
| **State** | **African Americans** | **Latinos** | **Whites** |
| Alaska | 7.30 | 11.70 | 6.30 |
| Colorado | 26.90 | 23.40 | 9.30 |
| Georgia | 23.20 | 23.10 | 9.40 |
| Kentucky | 31.20 | 34.10 | 14.40 |
| Maryland | 23.90 | 9.90 | 6.00 |
| Massachusetts | 23.90 | 33.60 | 9.70 |
| New Jersey | 18.00 | 15.50 | 6.80 |
| New Mexico | 23.60 | 21.50 | 14.30 |
| North Carolina | 26.20 | 25.80 | 10.20 |
| Oklahoma | 29.80 | 22.90 | 11.70 |
| Oregon | 19.10 | 25.60 | 11.80 |
| Rhode Island | 21.80 | 30.00 | 9.60 |
| South Carolina | 20.50 | 17.50 | 10.40 |
| Utah | 5.10 | 20.30 | 9.00 |
| Virginia | 14.60 | 15.50 | 7.20 |
| Wisconsin | 11.70 | 22.10 | 8.60 |

Data source: US Census Bureau, 2005-2008

**Figure 1 – Homicide rate ratios Latino and non-Latino African American relative to non-Latino Whites**
**by 5-year age group, 16 states combined, 2005-2008**

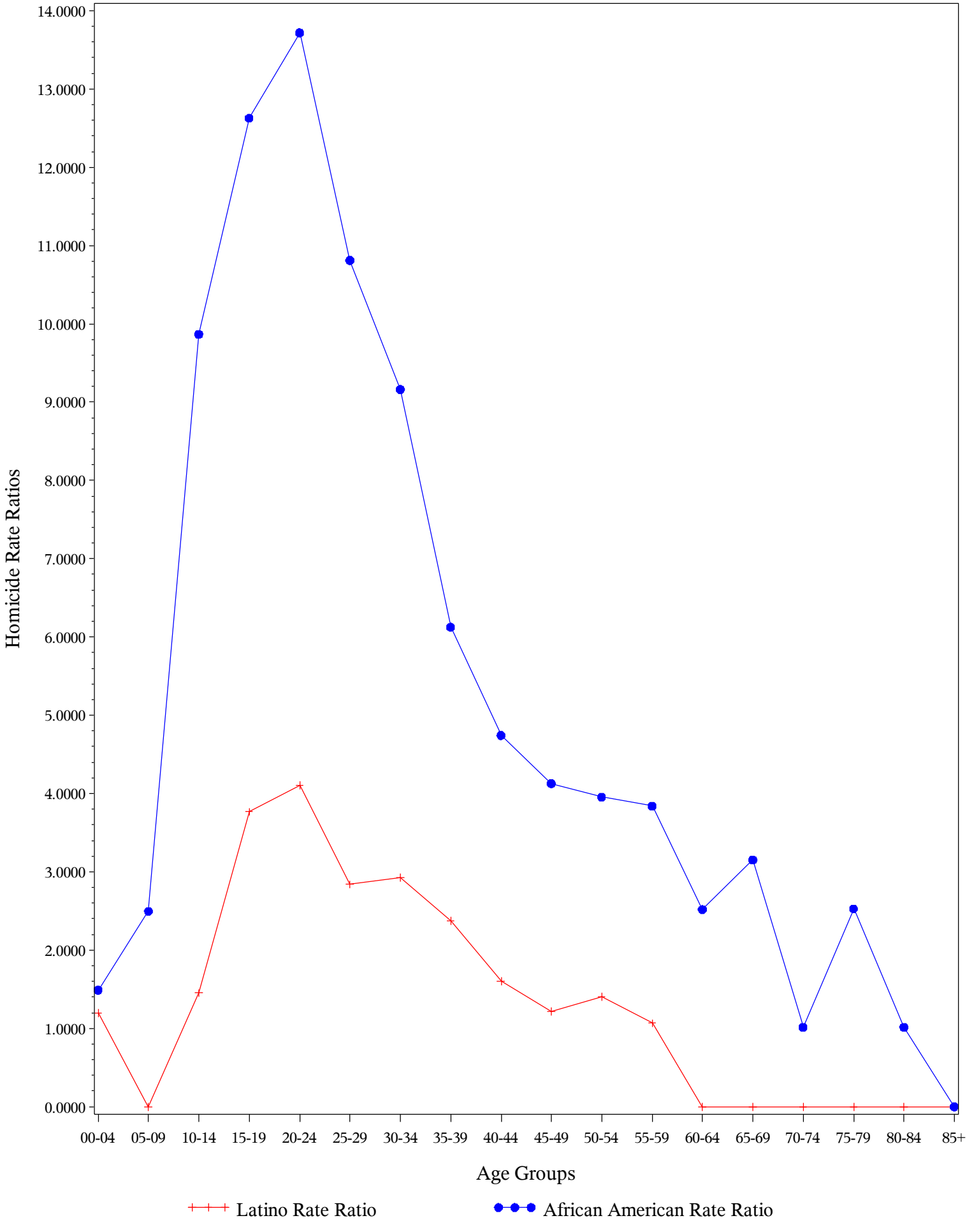
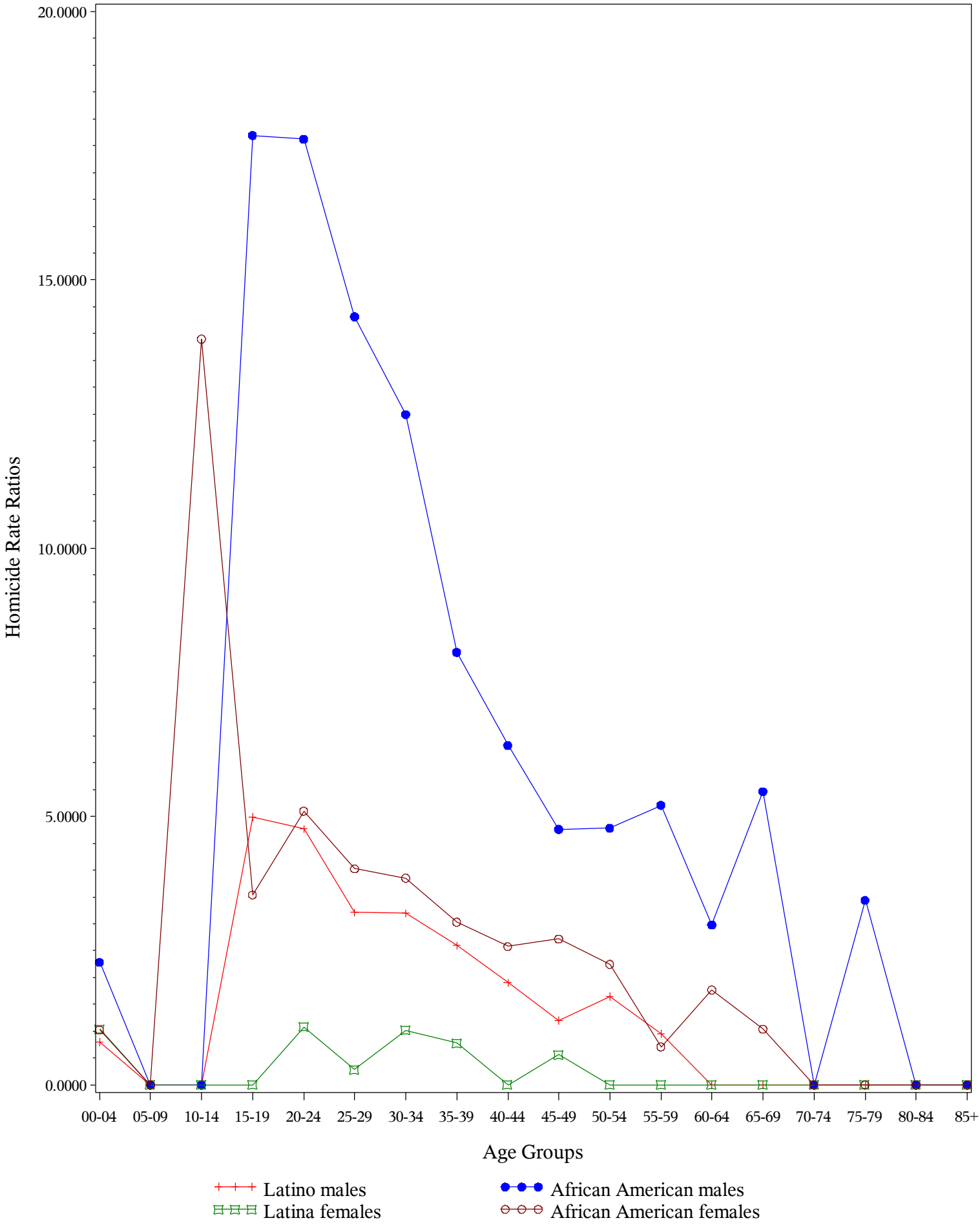
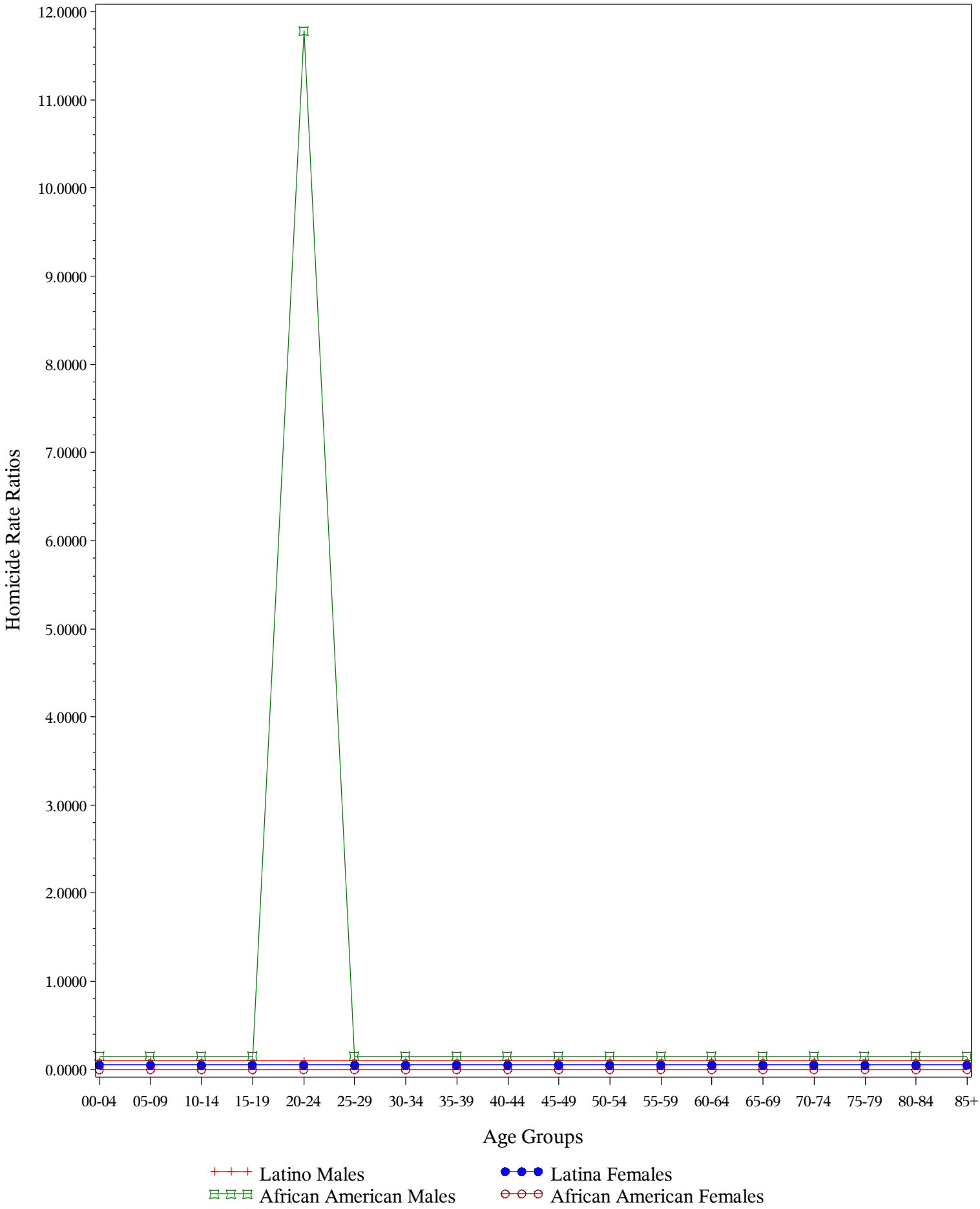


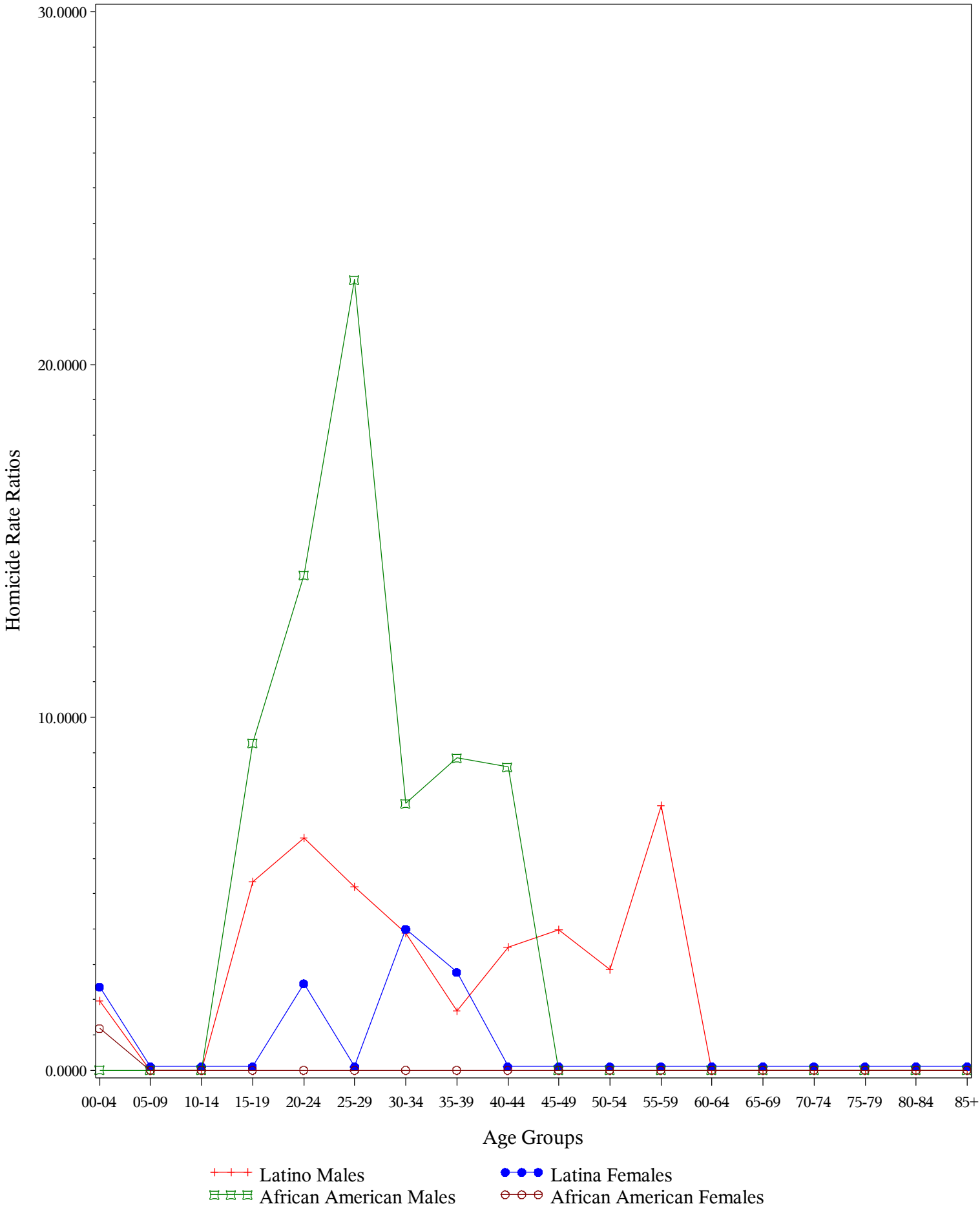
**Figure 2 – Homicide rate ratios Latino and non-Latino African American relative to non-Latino White**
**by 5-year age group, Males and Females separately, 16 states combined, 2005-2008**



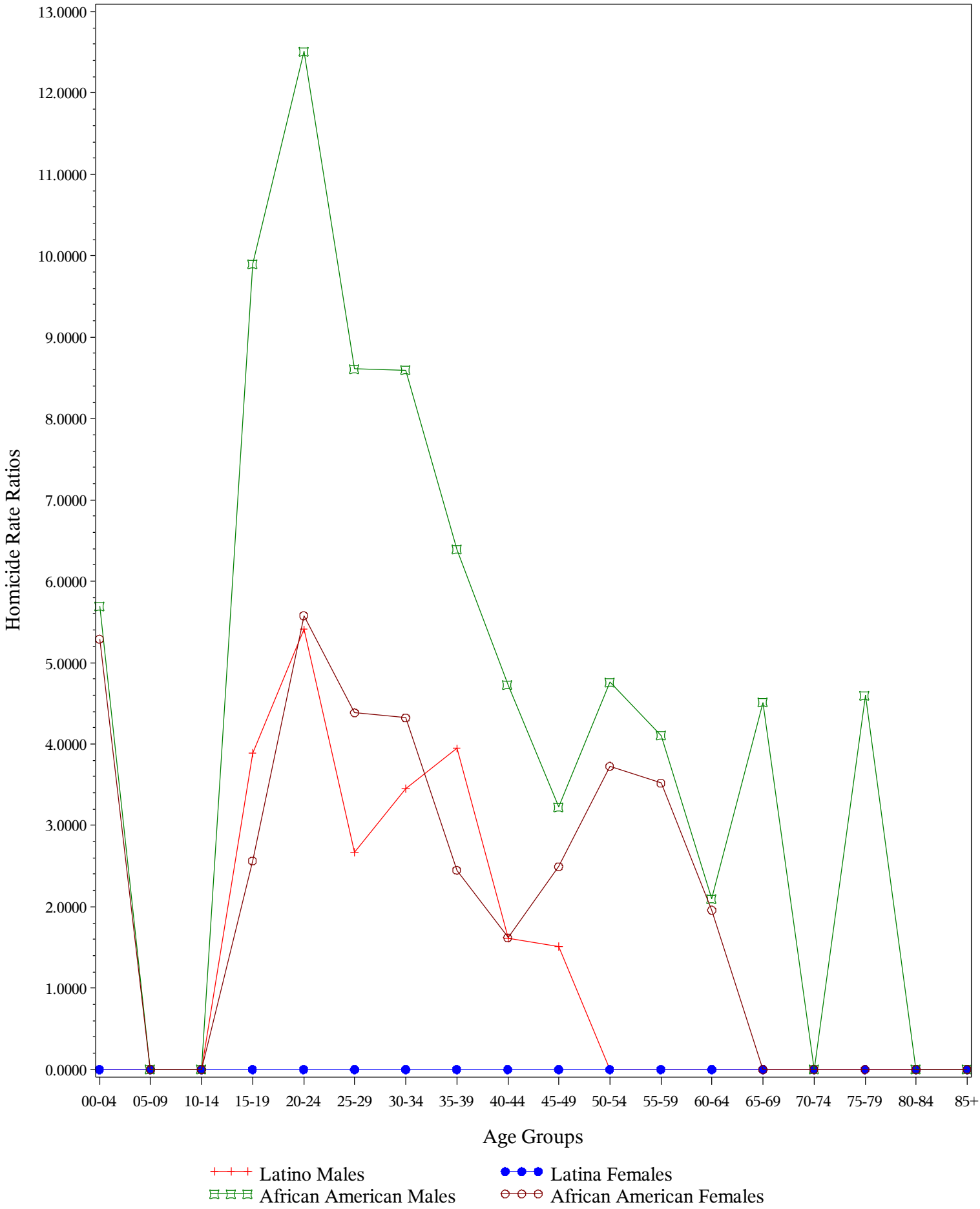
**Appendix 1 – Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Alaska**



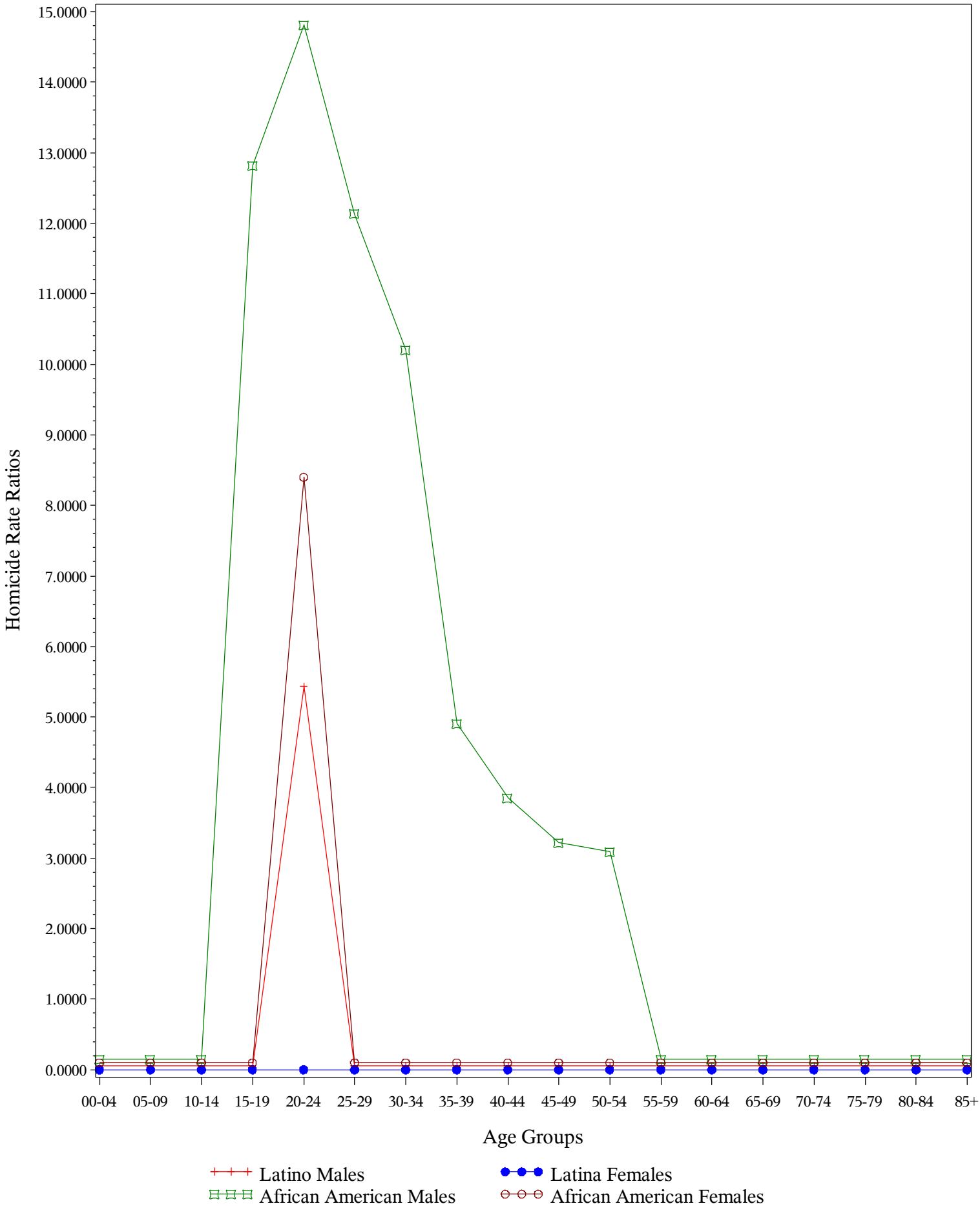
**Appendix 1 – Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Colorado**



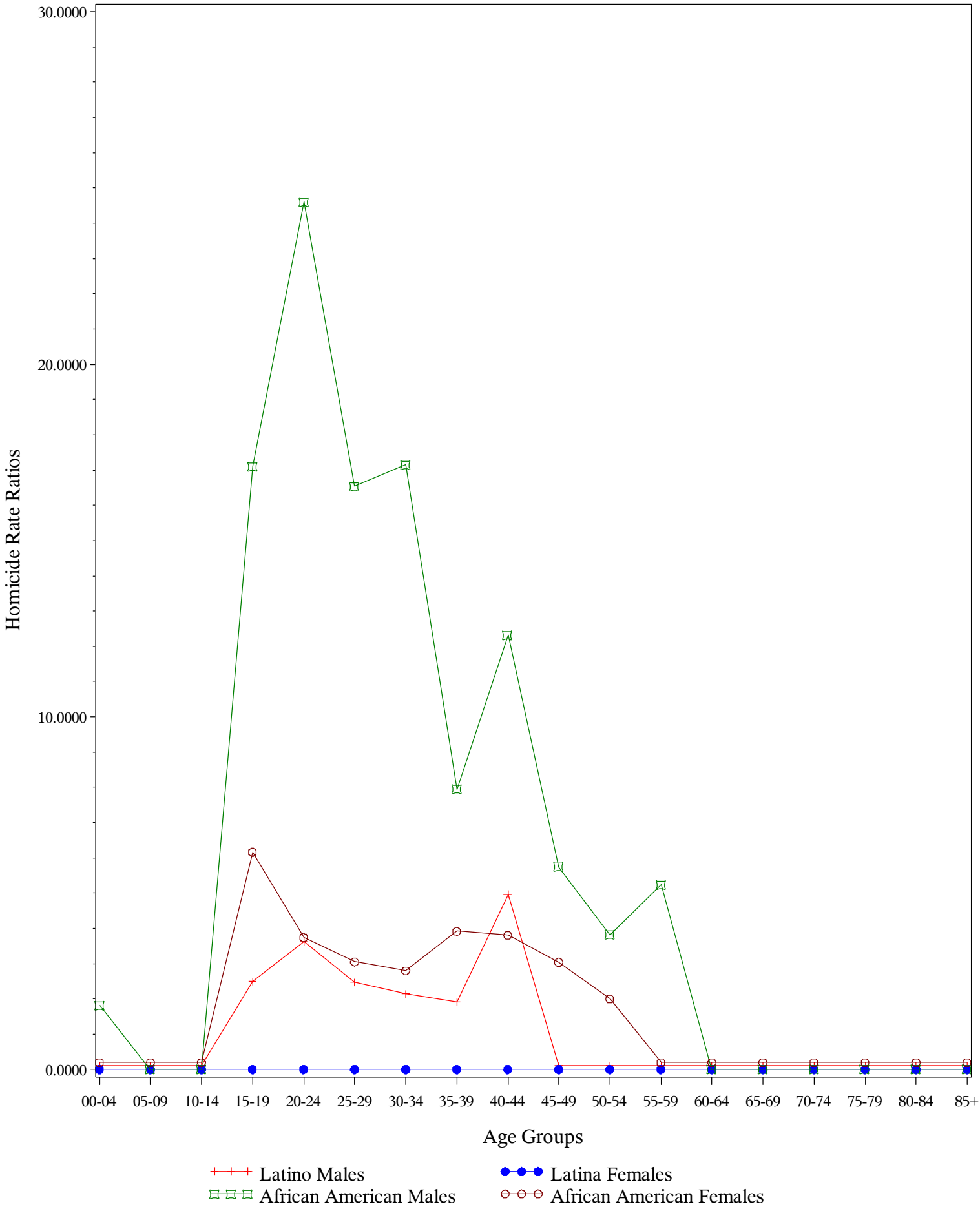
**Appendix 1 – Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Georgia**



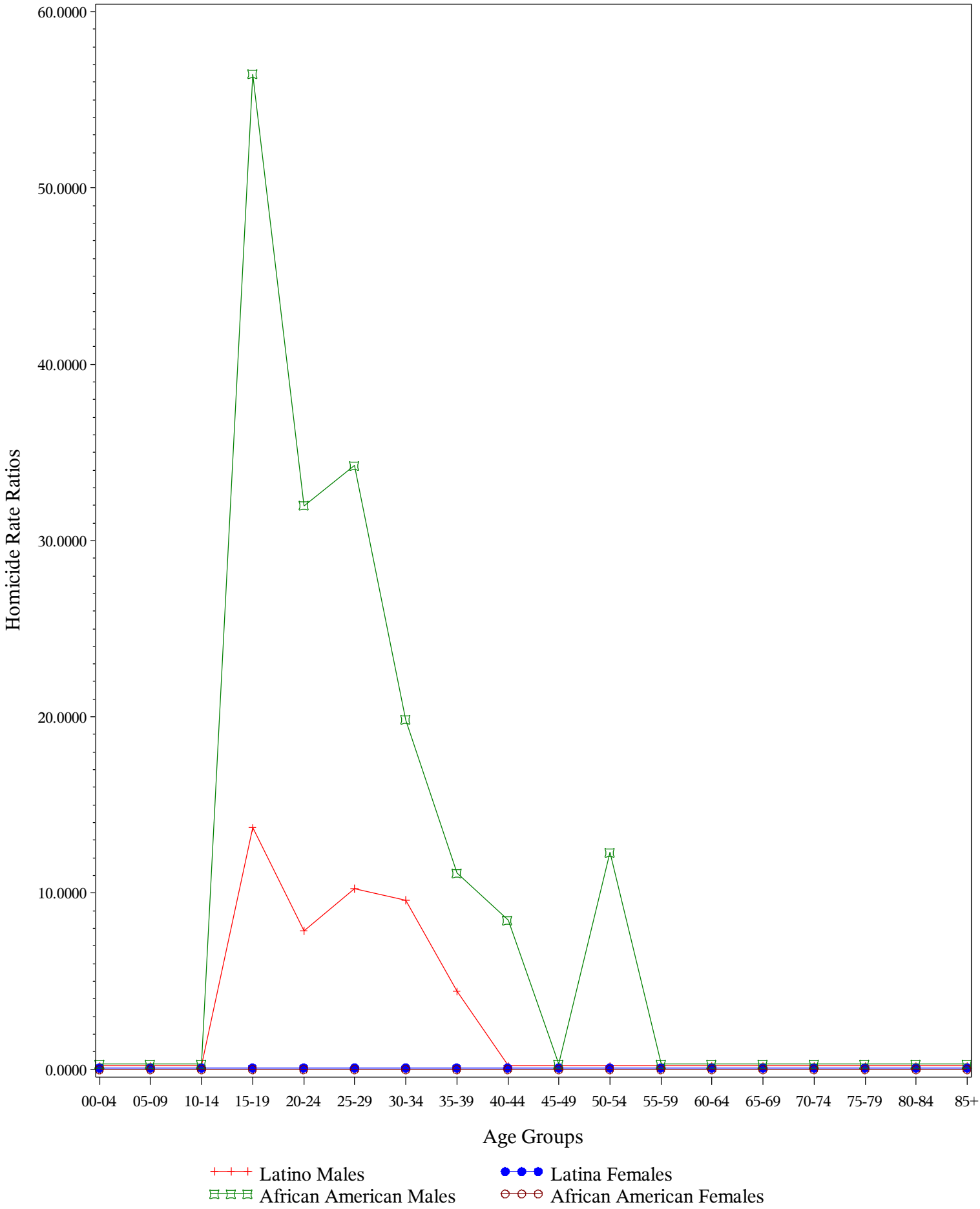
**Appendix 1 – Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Kentucky**



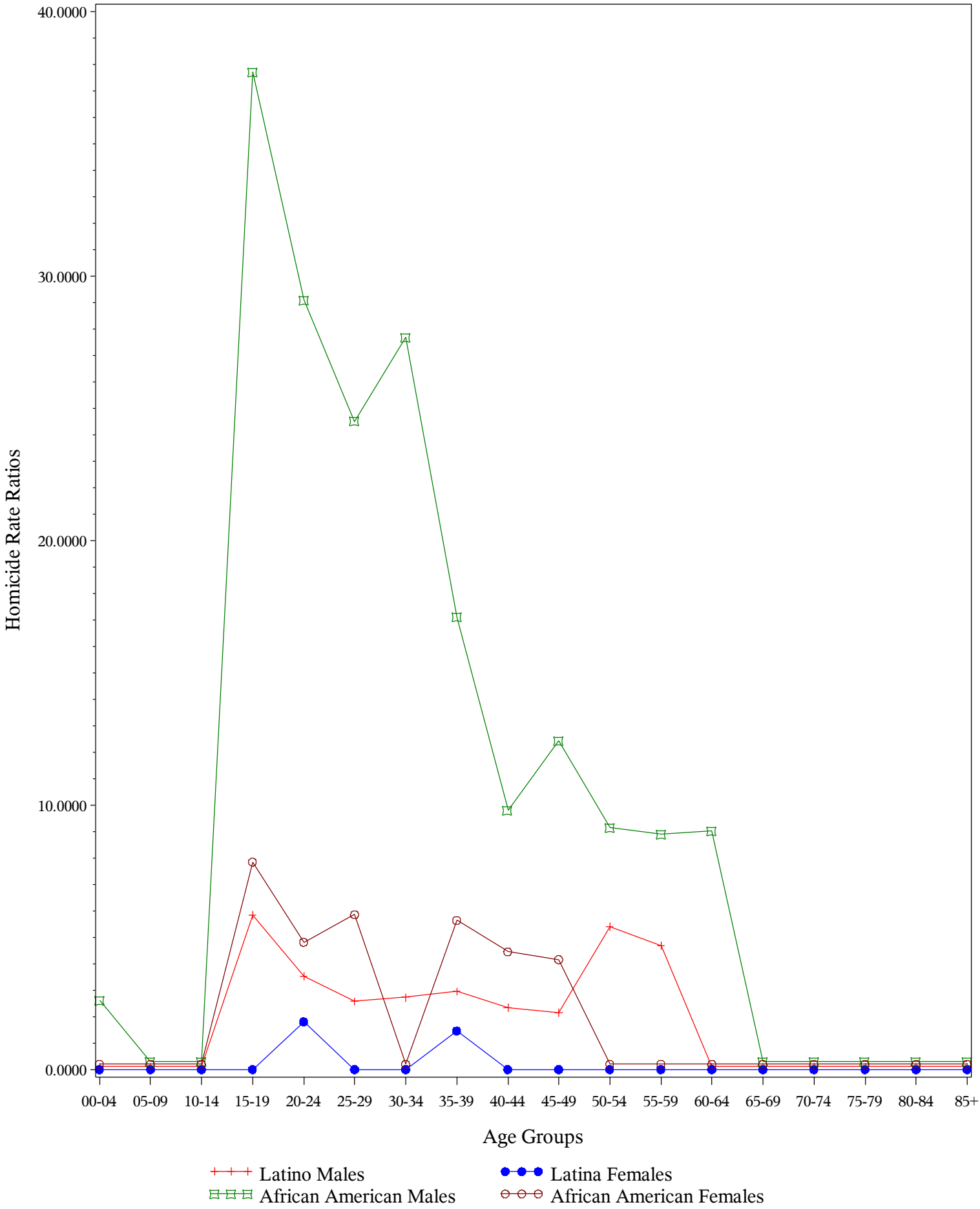
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Maryland**



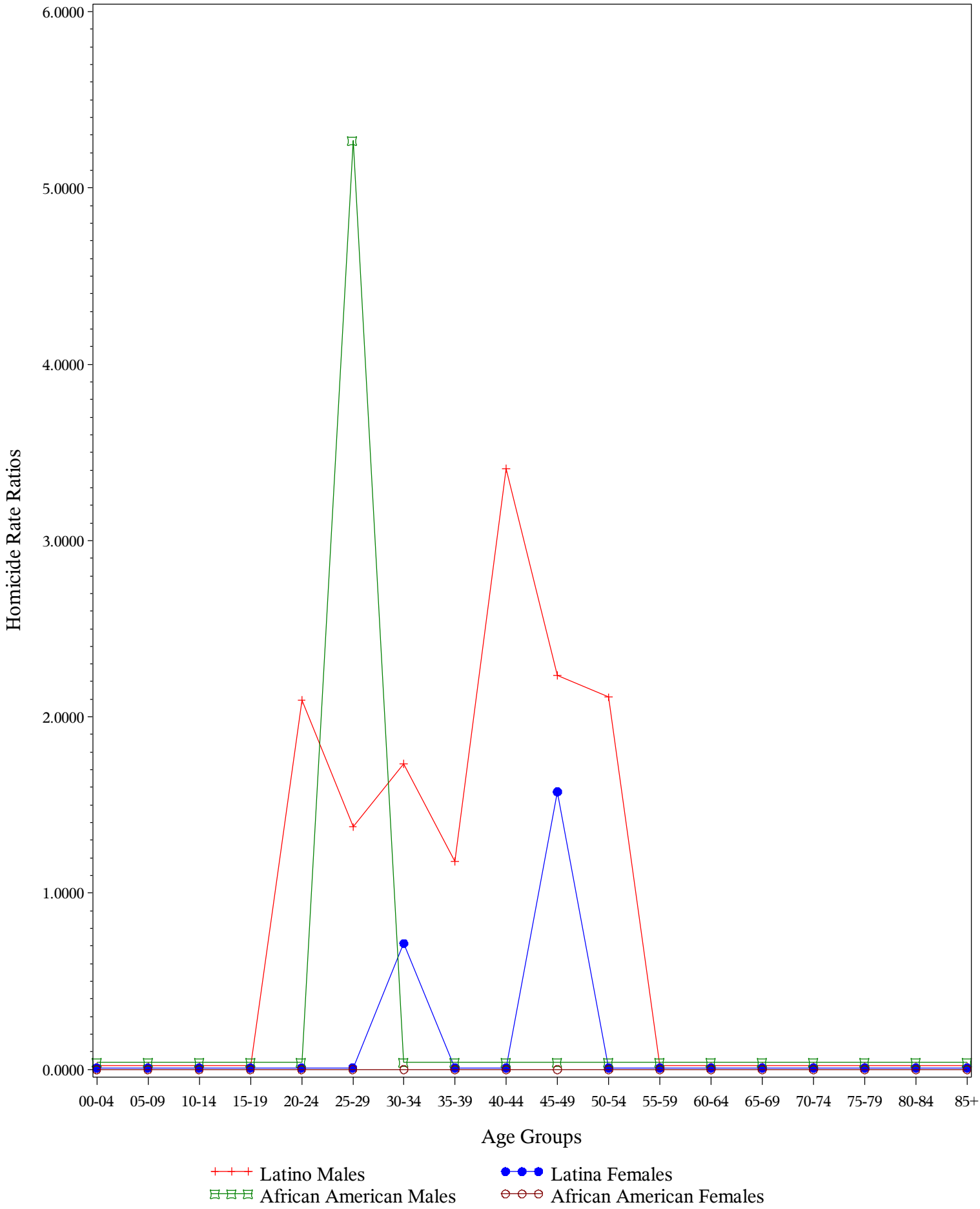
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Massachusetts**



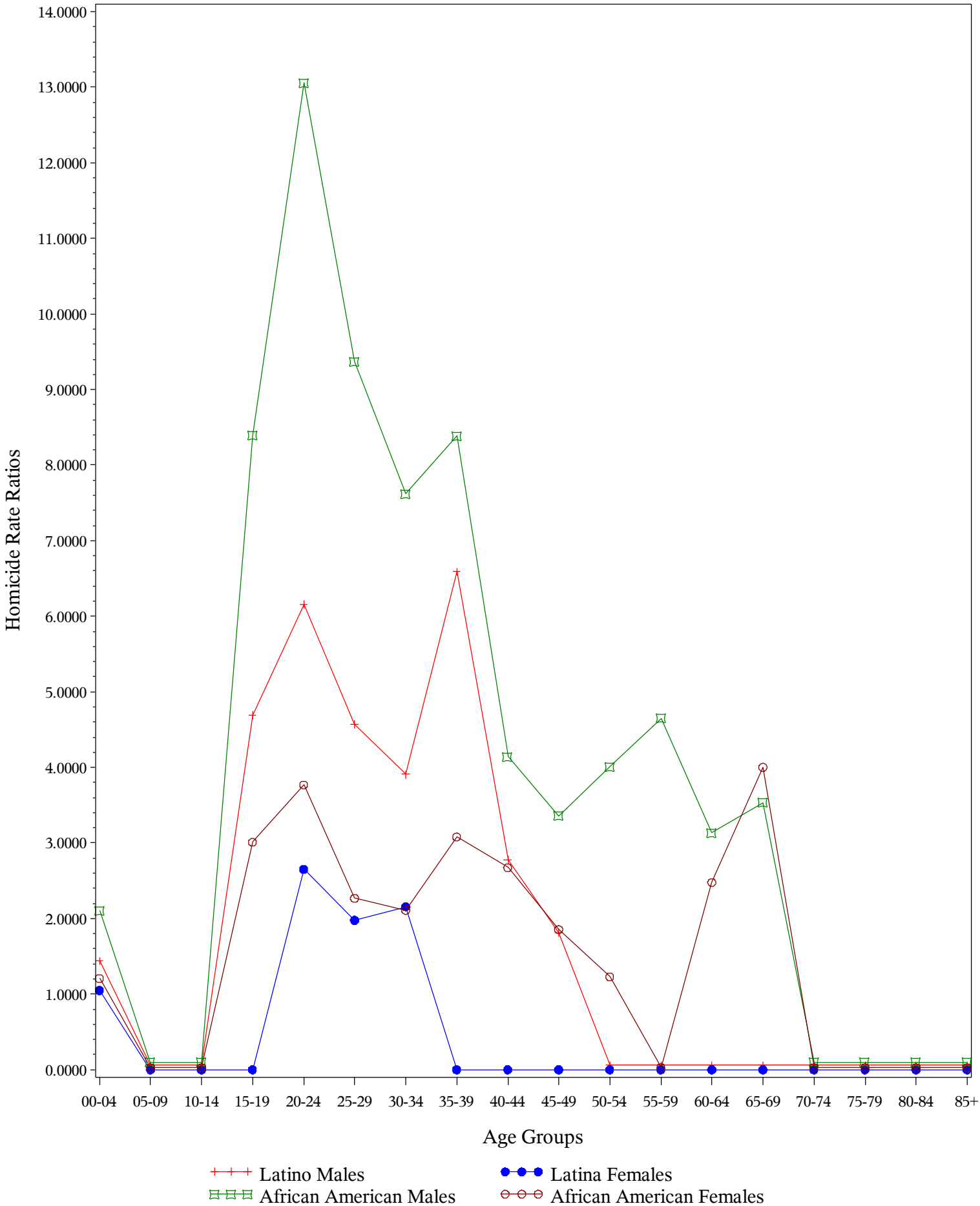
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**New Jersey**



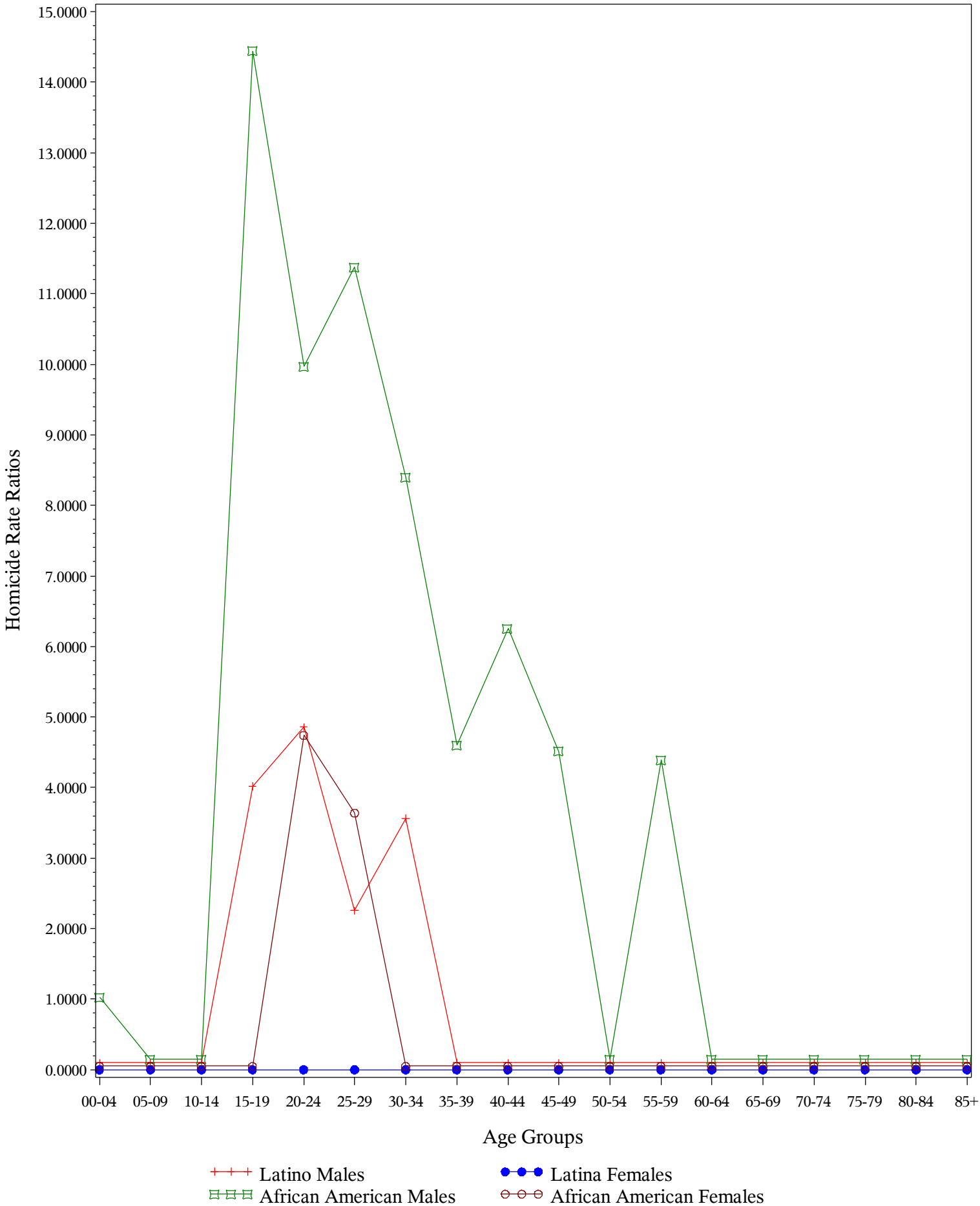
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**New Mexico**



**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**North Carolina**



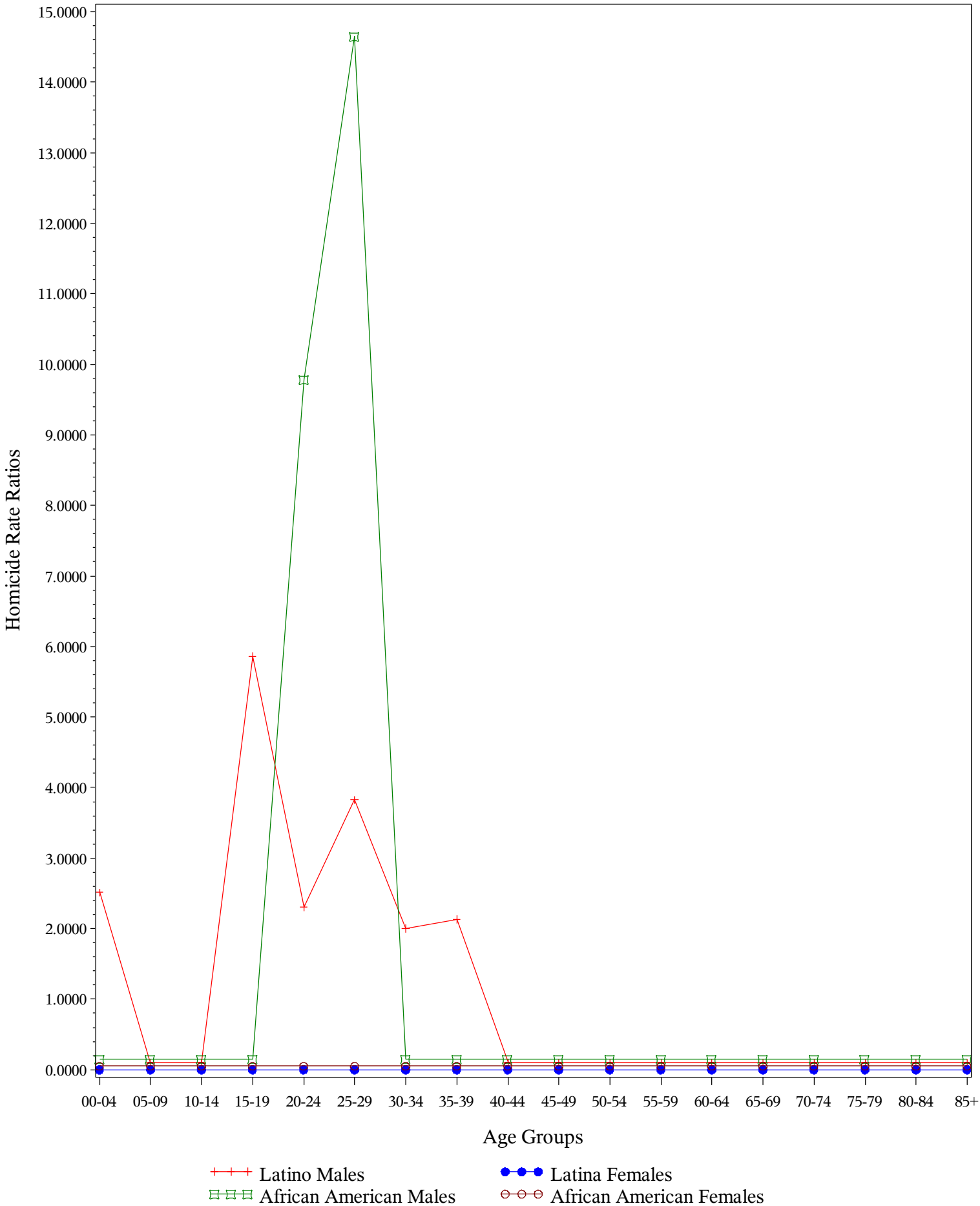
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Oklahoma**



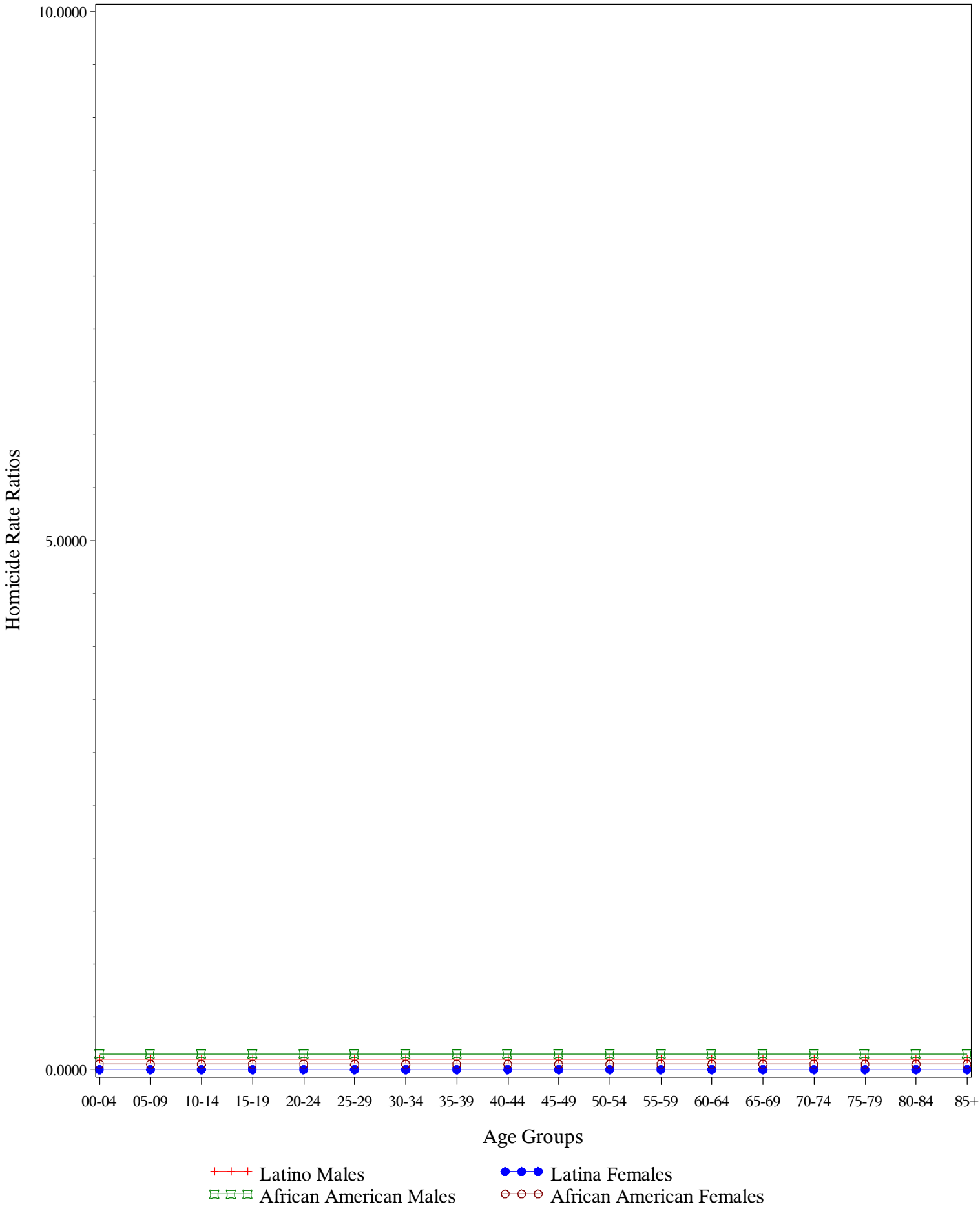
# Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites

**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**

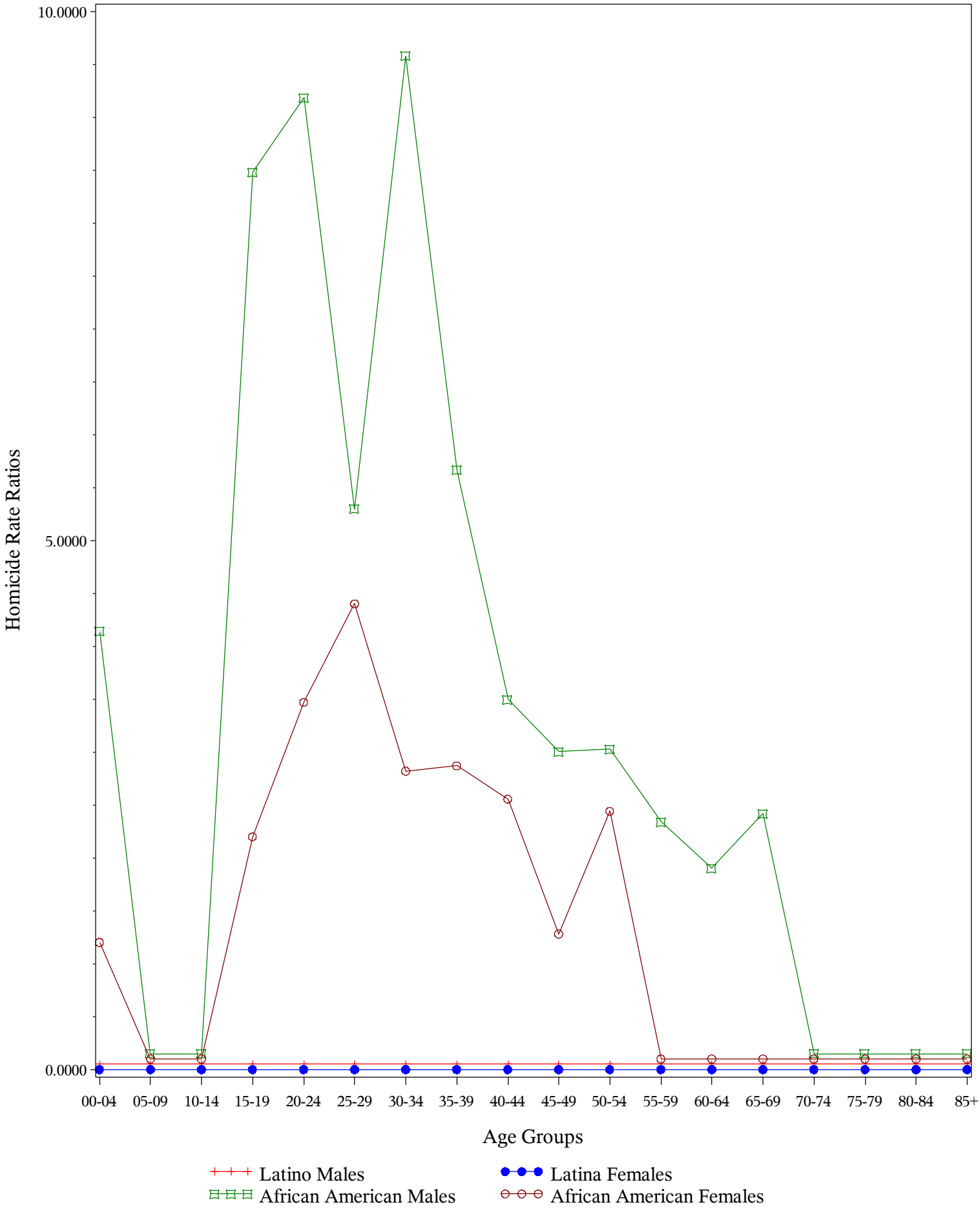
**Oregon**



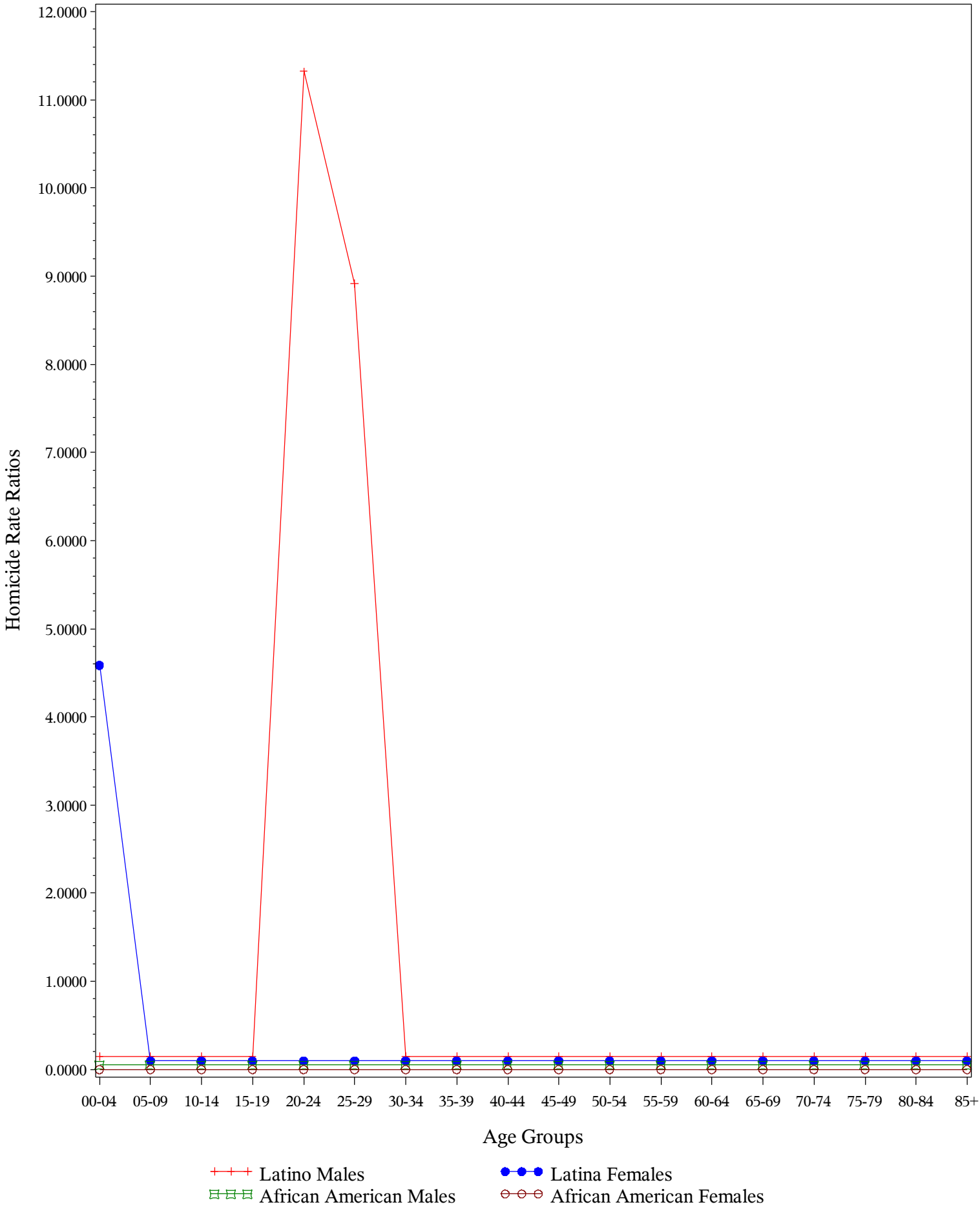
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Rhode Island**



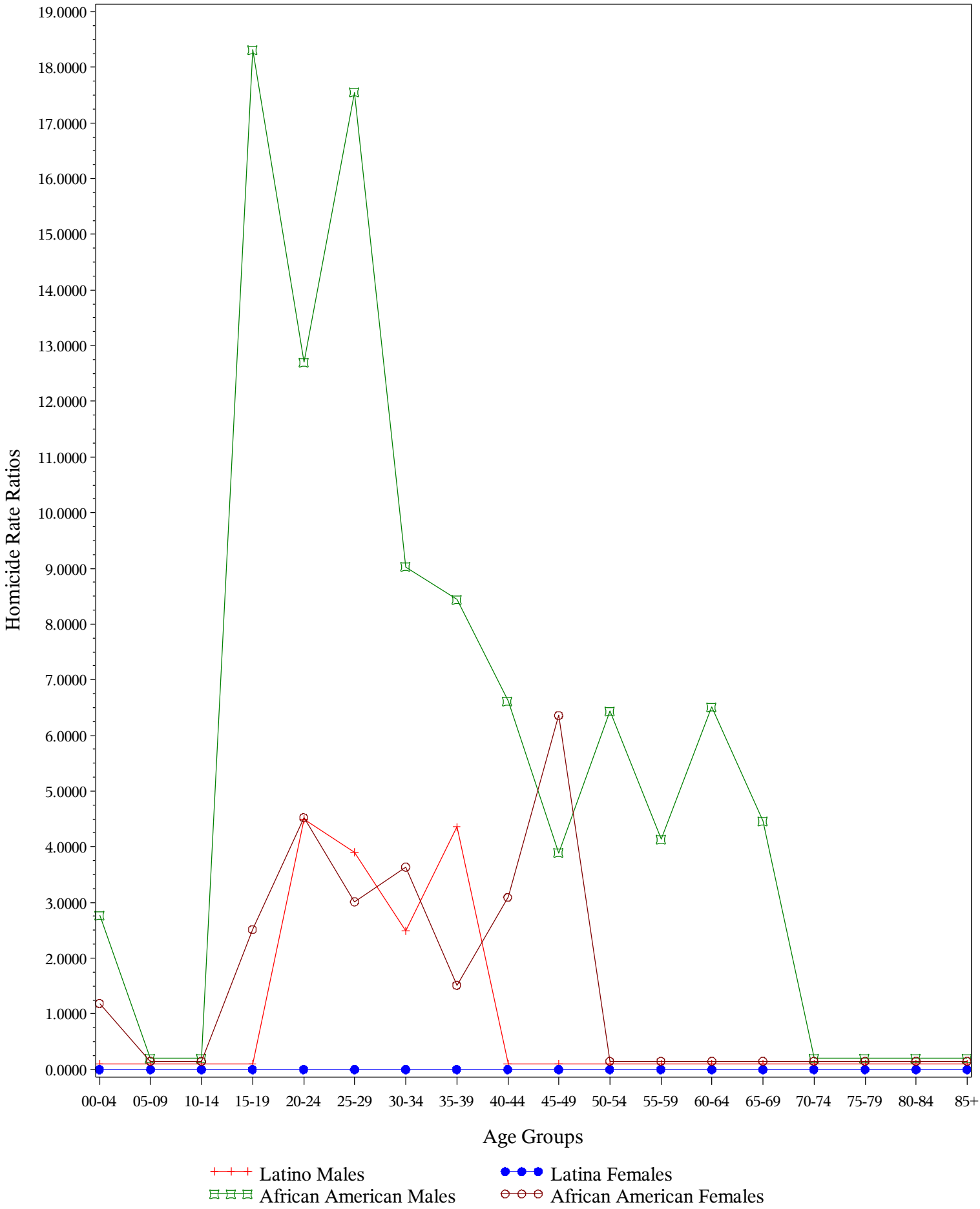
**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**South Carolina**



**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Utah**



**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Virginia**



**Appendix 1 - Homicide rate ratios Latino and non-Latino African American relative non-Latino Whites**
**by 5-year age groups, Males and Females, for each state participating in the National Violent Death Reporting System, 2005-2008**
**Wisconsin**