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Gender Disparities in Injury Mortality: Consistent, Persistent, and Larger Than You'd Think

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Abstract

Objective. Given the recent increase in injury mortality, particularly among women, it is important to update knowledge about gender disparities in injury mortality.

Methods. Data were drawn from the Web-based Injury Query System, which contains U.S. injury mortality data from 1981 through 2007. Male-to-female rate ratios in injury mortality were calculated for key variables, and age and ethnic group comparisons were made.

Results. Boys and men are more likely than girls and women to die of injury. From 1981 to 2007, the male-to-female age-adjusted rate ratio decreased by 20% to 2.15 for unintentional injury and increased by 11% to 3.91 for violence-related injury. Excess male mortality exists in manner of death, cause of death, and within ethnic and age groups. In addition, with rare exception, the gender disparity is greater than ethnicity and age disparities in unintentional and violence-related injury mortality.

Conclusions. Gender disparities in injury mortality are consistent and persistent. Gender patterns in injury mortality do not follow typical social justice analyses of health in that the structurally advantaged group, men, is at greater risk. Lifestyle and behavioral risks as well as masculine socialization are considered.

Disciplines

Public Affairs, Public Policy and Public Administration | Social and Behavioral Sciences

Comments

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ABSTRACT

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Conclusions. Gender disparities in injury mortality are consistent and persistent. Gender patterns in injury mortality do not follow typical social justice analyses of health in that the structurally advantaged group, men, is at greater risk. Lifestyle and behavioral risks as well as masculine socialization are considered.

Male humans begin with a numerical advantage, an advantage that is whittled away over time. At birth there are 105 boys for every 100 girls.[1] There would be even more but fetal death is 7% higher for boys than girls.[2] The mortality gap begins to widen immediately; by their first birthday, 21% more boys than girls die.[3] Excess male demise continues throughout life such that by age 65 and beyond, there are 75 men for every 100 women.[4]

These numbers from the U.S. represent a pattern that can be noted around the globe. Among 229 countries, all 229 have more male than female births such that the world's gender ratio at birth is 107.[4] But the male advantage is not maintained in most locales; 93% of those same 229 nations report having more women than men over the age of 65.[4] Moreover, in relative terms, the gender gap in premature mortality in 187 countries has widened since 1970.[5]

Men are more likely than women to die of almost every disease and illness and to do so earlier. Injury, a leading cause of premature death, is no exception.[6,7] Men's higher unintentional injury, suicide, and homicide mortality rates have been observed in all age groups in low-, middle-, and high-income countries.[8] The sole exception is for homicide of children under the age of 15 in low- and high-income countries, where the rates for girls are similar to or higher than those for boys.

Mortality risk is not stagnant. In the U.S., total injury mortality rates decreased from 1979-1999 then increased through 2005.[9] From 1999-2005, unintentional injury mortality increased only for whites, and increased more for white women than white men (19-20% vs. 7-15%).[10,11] The most recent reviews of gender differences in injury mortality, based on data from the 1980s,[6,7]merit being brought up to date so as to take into

consideration the subsequent gender-related trends.

The purpose of this paper is to update knowledge about gender differences in injury mortality, to examine the stability of the differential (over time, across types of injuries, and within two key population groups), and to place the resulting information in the context of other injury disparities.

METHODS

Data for the U.S. were used to explore the magnitude and stability of male-to-female injury ratios. Mortality data from the National Center for Health Statistics were accessed via the Web-based Injury Query System (WISQARS), a repository of fatal and nonfatal injury data.[12]

Data from 1981 through 2007, the first and last years of injury mortality data that currently are available online, were accessed. The ICD-9 classification system was used until 1999, when the ICD-10 was instituted. For unintentional injuries, the comparability ratio is 1.0303, which indicates an increase in deaths of 3% due to the ICD revision.[13] Virtually all of the increase is due to shifts from natural causes (e.g., pneumonia) in ICD–9 to unintentional injuries in ICD–10. Comparability ratios for suicide and homicide are .996 and .990, respectively, shifts that are small enough that it appears that the revision does not substantially affect mortality patterns for suicide or homicide. In addition, in the absence of any indication of a differential or systematic gender bias in coding under the two systems, the change in classification systems most likely had little effect on the primary variable of interest herein, that is, the relative risk for men and women.

Missing data are not a problem in WISQARS. WISQARS mortality data are based on death certificates provided by all 50 U.S. states and the District of Columbia, and most states require a death certificate to report sex, the central variable of interest in this investigation, and will not register a certificate unless it is reported (Robert N. Anderson, Chief, Mortality Statistics, National Center for Health Statistics, e-mail communication, July 8, 2010). In the rare cases when sex, race, or age are not reported, they are assigned by the National Center for Health Statistics according to established conventions[14] before the data are entered in WISQARS.

Mortality data for men and women were downloaded, and male-to-female (M:F) rate ratios (the rate for men divided by the rate for women) were calculated to assess relative risk. M:F rate ratios by age and ethnic group also were calculated. To explore the magnitude of gender vs. other disparities, rate ratios were calculated for ethnic groups (non-Hispanic Black, Hispanic White, American Indian and Alaska Native, and Asian and Pacific Islander vs. non-Hispanic White) and age groups (20-34, 35-54, 55-74, and 75 or more years vs. 0-19 years). Analyses involving ethnic groups and investigator-determined age groups are based on deaths beginning in 1990, which is when an Hispanic identifier was added to mortality data as well as the first year that user-generated age groups can be implemented in the online database. All rates and rate ratios, except for age comparisons, reported herein are age adjusted, with the standard year being the year 2000. Results are displayed graphically so as to make the straightforward findings most accessible. Statistical tests are not appropriate given that the data are for the population, not a sample. Due to space constraints, supplemental figures are posted with the online (but not print) version of the paper. The

figures available online are indicated as such in the text.

For ease of exposition, boys and men are referred to as men and girls and women are referred to as women.

RESULTS

From 1981-2007, a total of 2,920,260 men and 1,119,669 women died of an injury. Findings reported herein document that men are more likely than women to die of injury. This pattern can be observed, with rare exception, for manner of death, cause of death, and across ethnic and age groups. The gender disparity in unintentional and violence-related injury mortality is greater, with rare exception, than ethnic and age group disparities in fatal injury.

Consistency of Male Excess

To better understand the stability and trends in gender discrepancies in injury, the 27 years of fatal injury data that are currently readily available were reviewed.

Manner of death. We begin first with the two broad categories of injury, unintentional and violence-related. (Note that WISQARS refers to intentional injury as violence-related injury and will be the term used herein.) For both men and women, mortality due to unintentional injury decreased from 1981 to 1991 then remained relatively stable until 2000 when it began to increase slightly, a trend that continued through 2007. Mortality due to violence-related injury decreased for both groups during the same time period. (See Figure A that is posted with the online version of this article.)

Whereas both groups are at lower risk of dying from injury in 2007 than they were in 1981, the difference in their rates results in a change in relative risk. As shown in Figure

1, from 1981 to 2007, the M:F rate ratio decreased steadily by 20% for unintentional injury mortality and increased by 11% for violence-related mortality. Thus, while men's risk of unintentional injury (relative to women's risk) has dropped, men's risk of violence-related injury (relative to women's risk) has increased.

Cause of death. Individual causes of death were explored in a similar manner (i.e., rates for men, rates for women and rate ratios over time). Each cause of death documented an excess of men over women in each of the 27 years. (Individual graphs are available from the author.) The trend was not consistent across cause of death: the mean 1989-1991 and mean 2004-2007 M:F rate ratio decreased for motor vehicle crashes (2.77 to 2.47), falls (1.91 to 1.71), drowning (4.43 to 3.33), and fire/burns (1.84 to 1.64) and increased for poisoning (1.60 to 1.81), suffocation (2.41 to 2.57), and firearms (4.82 to 6.71).

Three causes of death that arguably have relatively little to do with exposure or the behavior of the decedent – deaths of undetermined intent, medical misadventures, and adverse reactions to drugs – also document higher rates of mortality among men. The M:F rate ratio, although substantially lower than that of other causes of death, consistently was above 1.0. (See Figure B that is posted with the online version of this article.)

Age. Gender disparities in injury risk can be observed at the youngest of ages. The general pattern across the study period is for the gender disparity to be largest (i.e., over 2.0) among age groups from late adolescence through age 69, with a peak in young adulthood (20-24 years).

The lowest M:F rate ratio by age group for unintentional injury was 1.31 (for 0-4

year olds in 2005) and the highest was 4.38 (for 25-29 year olds in 1981). Except for the very young (0-4 years), where the relative risk remained generally stable, the trend in relative risk was downward for all age groups. The largest absolute decreases were for young adulthood through middle-age: 25-29 year olds (from 4.38 in 1981 to 2.16 in 2007), 30-34 year olds (from 4.18 in 1981 to 2.93 in 2007), 35-39 year olds (from 3.70 in 1981 to 2.56 in 2007), and 40-44 year olds (from 3.42 in 1982 to 2.35 in 2007). The M:F rate ratio decreased by 25% or more in 10 of the remaining 14 age groups. The M:F rate ratio did not increase over the 27 years for any of the age groups.

As shown in Figure 2, gender disparities by age were larger for violence-related injury. For the oldest age group (85 or more years old), for example, the gender rate ratio for violence-related injury is seven-fold that for unintentional injury in the same age group. The general pattern is for the gender disparity to climb steeply from birth through late adolescent and young adult age groups, to decrease and remain similar across age groups during middle-age, and to climb steeply again from age 65 onward.

The lowest M:F rate ratio for violence-related injury was 0.84 (for 0-5 year olds in 2002; the rate ratio was below 1.0 for only six of the age-group-by-year (n=486) categories), and the highest M:F rate ratio was 10.1 (for persons 75 or more years old in 1999 and again in 2003). From 1981 to 2007, the M:F rate ratio in violence-related mortality remained roughly the same in eight of the 18 five year age groups and increased in the remaining 10 age groups. Sometimes the increase in the rate ratio was particularly notable: for each of the five year age groups from 10 through 24 years, the rate ratio increased by about 40%.

Ethnicity. As shown in Figure 3, the M:F rate ratio was higher for violence-related

(vs. unintentional) injury mortality for each ethnic group. The M:F rate ratio was above 1.6 for unintentional injury and above 2.4 for violence-related injury each year in each ethnic group.

The pattern of M:F rate ratios over time differed by ethnic group and manner of death. Among unintentional injury deaths, Hispanic Whites had the largest M:F rate ratio in 17 of the 18 years of data and Asians and Pacific Islanders had the lowest (just below 2.0) each year. From 1990 to 2007, the M:F rate ratio dropped substantially for American Indians and Alaska Natives (3.0 to 2.1), decreased gradually for non-Hispanic Blacks (2.9 to 2.5), and remained comparatively stable for non-Hispanic Whites (2.3 to 2.1).

Among violence-related deaths, Asians and Pacific Islanders again had the lowest M:F rate ratio (about 2.5). The M:F rate ratio for non-Hispanic Whites remained stable near 3.5, and the M:F rate ratio for Native Americans, while less stable, trended downward to a similar point. M:F rate ratios for Hispanic Whites and non-Hispanic Blacks mirrored one another: the M:F rate ratio began high for Hispanic Whites and decreased (6.2 to 5.1), whereas for non-Hispanic Blacks, it began at 5.1 and ended at 6.0.

Other Sociodemographic Disparities in Injury

To put the gender disparity in context, injury risk associated with two other sociodemographic variables – age and ethnicity – were examined. As can be seen in Figure 4, in unintentional injury, the gender rate ratio is higher than ethnic disparities. The higher gender ratio is evident across all years.

A similar pattern can be observed for violence-related injury: aside from one ethnic disparity (non-Hispanic Blacks vs. non-Hispanic Whites) in three years in the early 1990s, the gender disparity was higher than all ethnic disparities in violence-related injury.

The M:F rate ratio in unintentional injury is similar to that for each age group with the exception of the oldest vs. the youngest (75+ vs. <19 years), where the rate ratio was very large. (See Figure C that is posted with the online version of this article.) The M:F disparity in violence-related mortality almost always (in 65 of the 72 age-group-by-year comparisons) exceeded that of age groups.

DISCUSSION

Men are more likely than women to die of injury. The pattern of excess male mortality holds, with rare exception, across time, manner of injury, cause of injury, and age and ethnic groups. Men's risk of unintentional and violence-related injury overall has been at least two and three times, respectively, that of women during each year of the last generation.

Moreover, the gender disparity in unintentional and violence-related injury mortality is greater than the disparity by ethnicity and age group. Do these findings imply that injury mortality is not important for women or that ethnic disparities in injury mortality are not a problem? No. Injury ranks high as a cause of death for women and for all ethnic groups.[15] Thus, persons interested in women's health can be expected to be concerned about injury. In addition, for some specific causes of death (e.g., in the U.S., homicide among non-Hispanic Blacks, motor vehicle crashes among American Indians and Alaska Natives), ethnic disparities exceed gender disparities. Nonetheless, gender disparities consistently exceed age and ethnic disparities in injury mortality.

How generalizable are these findings? Data from low-, middle-, and high-income countries document that men have higher rates of unintentional injury, suicide, and

homicide mortality than do women.[8] The systematic analysis of gender differences in injury mortality, such as that reported herein, in multiple and diverse countries would help document the scope and nature of the phenomenon. To my knowledge, no other such analyses have been published in the peer-reviewed literature. Adequate vital statistics systems and other components of a well-functioning data infrastructure would facilitate the likelihood of such research.

Mortality data were chosen for this investigation because they are the most reliable and widely-available data. Whether the same pattern of findings as those reported herein (e.g., gender disparities are larger than ethnic and age group disparities) applies to nonfatal injury remains to be seen.

Information about male-female differences, as with other group differences, in injury mortality can help prevention and intervention efforts. A thorough understanding of the phenomenon will allow for the development of more sophisticated public health activities and their evaluation.

Frameworks for Understanding Injury Disparities

Although understanding the basis for the gender disparity in injury mortality is beyond the scope of this descriptive paper, it may be useful to place the findings in the context of a brief review of existing conceptual frameworks. Most consider biological, sociodemographic, or behavioral characteristics links to mortality.

Returning to the idea of male advantage followed by disadvantage, as described in the opening paragraphs of this paper, perhaps male excess in injury mortality is part of a general pattern within the species. But are men biologically at particular risk? To my knowledge, no evidence supports the idea that men are

physiologically more vulnerable to injuries and their fatal outcomes.

Current public health analyses of mortality patterns tend to focus not on the biological but on the social and individual. Health disparities research, for example, typically uses a social and structural framework in which certain population groups (e.g., low socioeconomic classes, African Americans) are posited as being at higher risk of poor health because of their position in society. The disadvantaged populations are less likely to be in the labor force, to be paid less when employed, more likely to face prejudice and discrimination, and to experience considerable role strain. If this framework were extended to gender, women, about whom research generates similar findings, would be expected to have higher mortality rates. However, men, not women have higher rates of injury and all mortality. Thus, a structural disadvantage framework generally is not applied and does not, at least as is commonly conceived, seem to be directly relevant to gender disparities in injury mortality.

Nine lifestyle and individual behavior choices are considered to be the "actual causes of death"[16] in the developed world.[17] Perhaps men are more likely to be in circumstances that increase their exposure to injury risk. Some of the circumstances (e.g., occupational) may result in extended exposure (e.g., long-distance trucker). Others may be situational and, sometimes largely, of men's own making. Alcohol use is one example. Alcohol consumption is common in both unintentional injury and violence-related mortality. General population surveys in 10 countries indicate that men consistently exceed women in typical drinking frequencies and quantities, as well as in rates of heavy drinking episodes.[18] Male gender is the largest predictor by far of driving under the influence.[19]

Such behaviors also are a product of the expectations of others. Goode writes that "It has long been noted that masculinity can be harmful to men's health" and observes that scholars theorize that masculine socialization predisposes young men to take excessive risks.[20] Risk-taking, which is related positively to injury,[21] has long been associated with being male and a meta-analysis of 150 studies supports this assumption.[22] Gender and risk-taking are so closely linked that boys and girls as young as six years old believe that boys are more risk-taking than girls but that boys are at lower risk of injury than are girls.[23] In addition, recent injury-related research indicates that, more than biological sex, the level of masculinity and the level of internalization of gender roles explain gender differences in risk-taking among adolescent pedestrians.[24] These studies suggest that risk-taking is perceived as a male-linked trait without negative consequences. However, men's risk-taking is not constant over ages or contexts,[22] which suggests that it is situation specific. Moreover, risk-taking may be related to a gender-linked difference in competitiveness.[22] Recent research in Australia[25] buttresses prior work[22] indicating that the gender gap in risk-taking is decreasing across cohorts: girls are becoming more risk taking, which may be to the detriment of injury prevention.

In reality, a combination of factors likely best describes the basis of gender differences in injury mortality. Li and Baker invented a technique, which they called the decomposition method, to quantitatively examine the major determinants of the male-female discrepancy in injury mortality rates.(26) When examining gender differences in the rate of fatal motor vehicle crashes per driver (women are involved in fewer), they found that 51% of the discrepancy could be attributed to driver gender and 41% to exposure differences (i.e., annual average miles per driver).[26] Gender differences in

death rates from bicycling injury yielded comparable percentages.[27] Risk associated with gender and exposure can be allocated via the decomposition method, but the largest difference – gender – remains a black box of sorts.

Implications and Conclusions

Whether the focus is on injury or on health disparities, a more full acknowledgment of the pervasiveness of gender disparities in injury mortality likely would benefit prevention efforts. Public health attempts to change lifestyle and behavior with population-level interventions, for example, comprehensive campaigns to prevent and reduce tobacco use, policies and programs designed to change diet and activity patterns so as to reduce obesity. Relatively little effort, however, has been invested in modifying masculinity-linked behavior. As noted recently,[28] gender-based risks are, in principle, amenable to social change, and they offer untapped potential for health interventions.

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Human Participant Protection: Institutional review board review was not needed for this study.

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Figures

Figures 1 through 4 go in the text.

Figures A through C are supplemental and should be posted (online) with the online version of the paper.

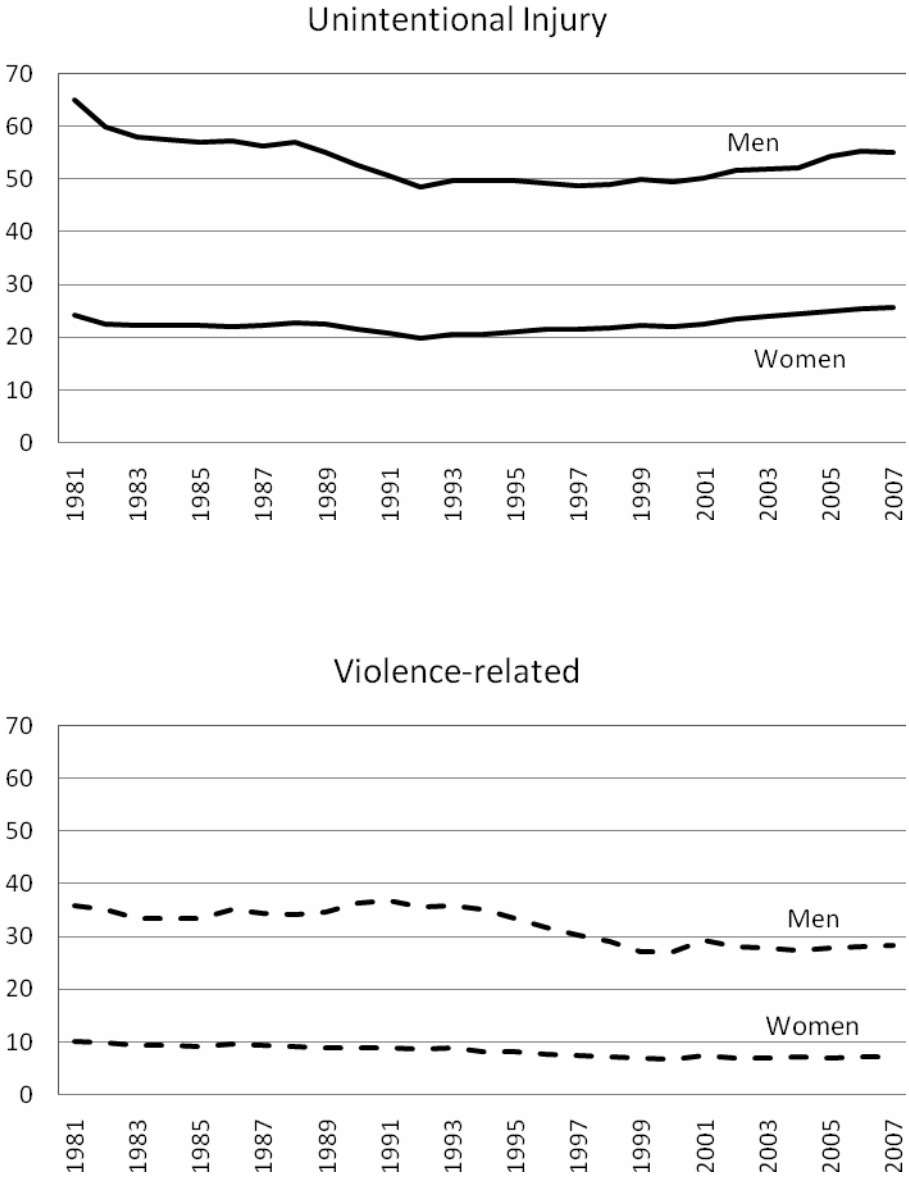

Figure A. Injury mortality rates, age adjusted, per 100,000, by gender

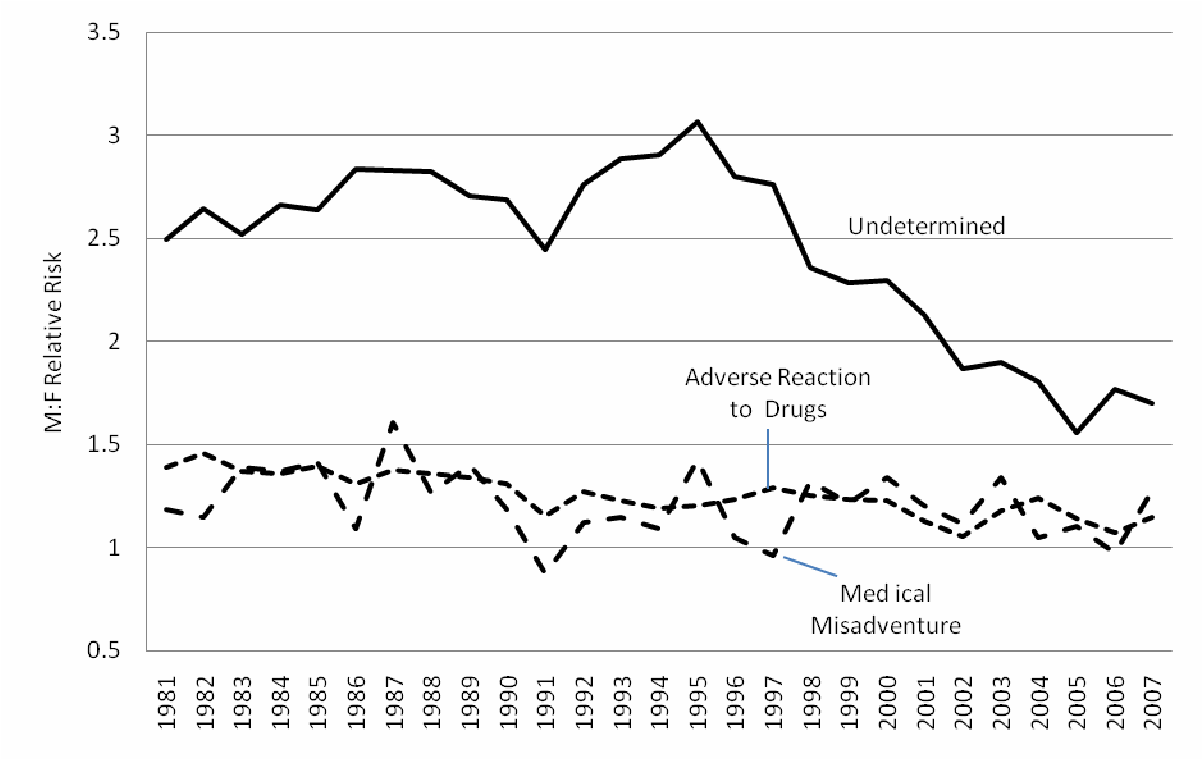

Figure B. Male:female rate ratio, three types of injury mortality, age adjusted, 1981-2007

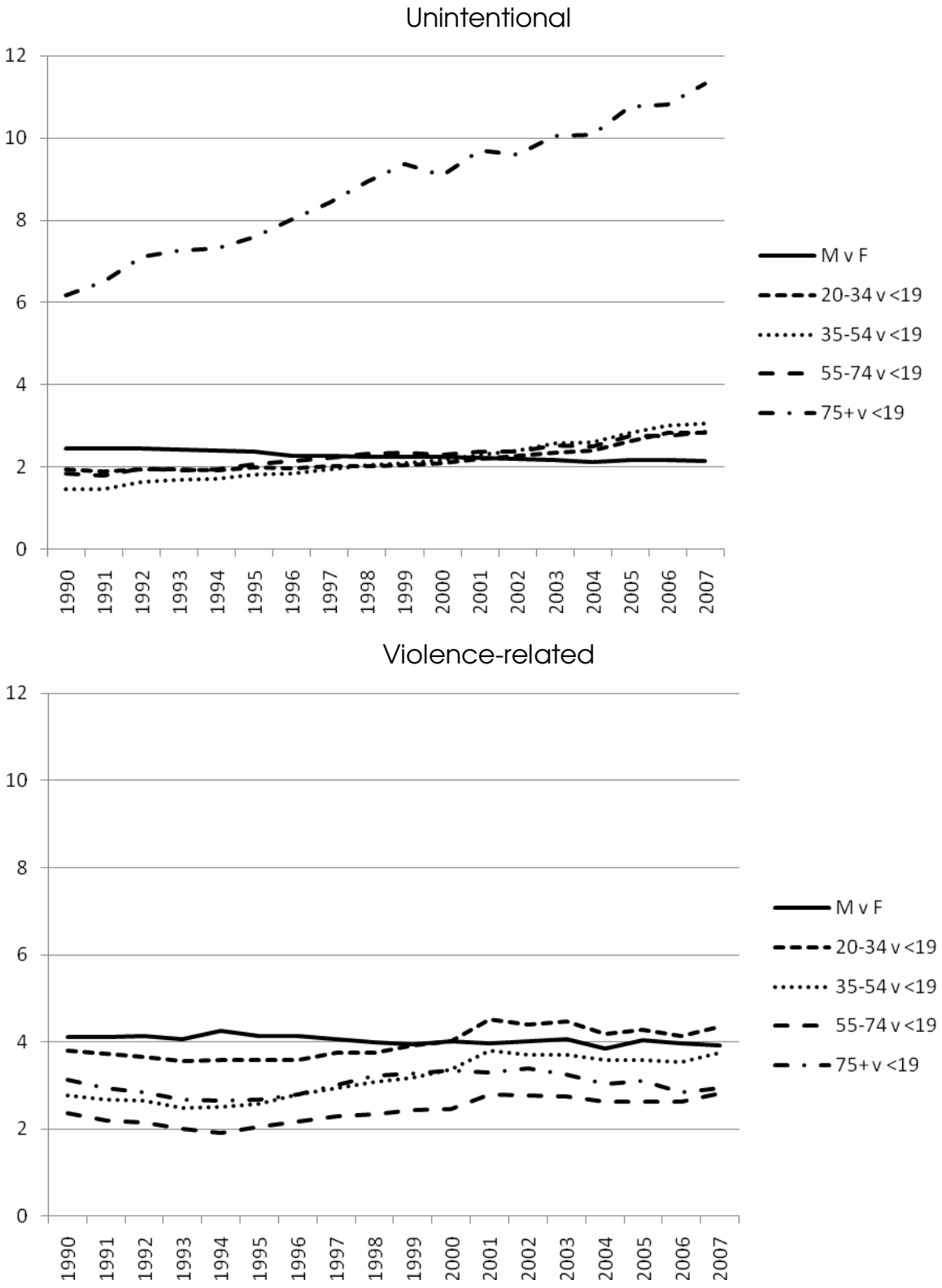

Figure C. Male:female and age group rate ratios, unintentional and violence-related injury mortality, 1990-2007

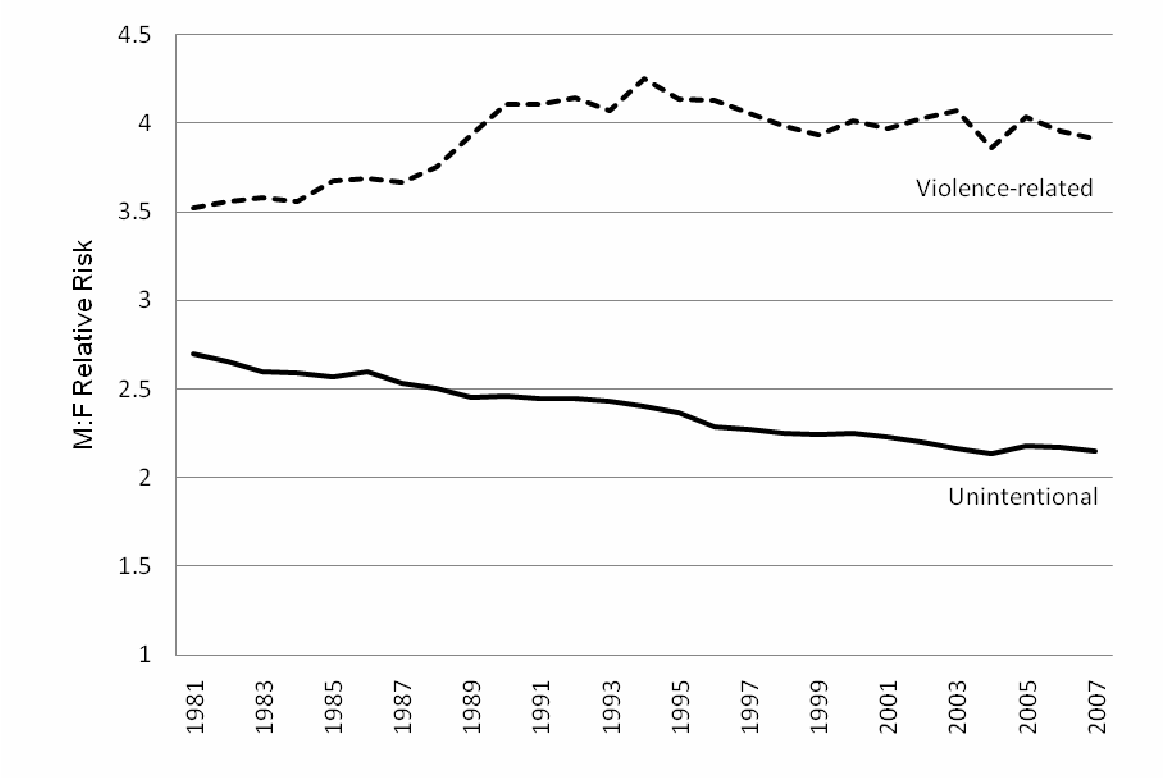

Figure 1. Male:female rate ratio, unintentional and violence-related mortality, age adjusted, 1981-2007

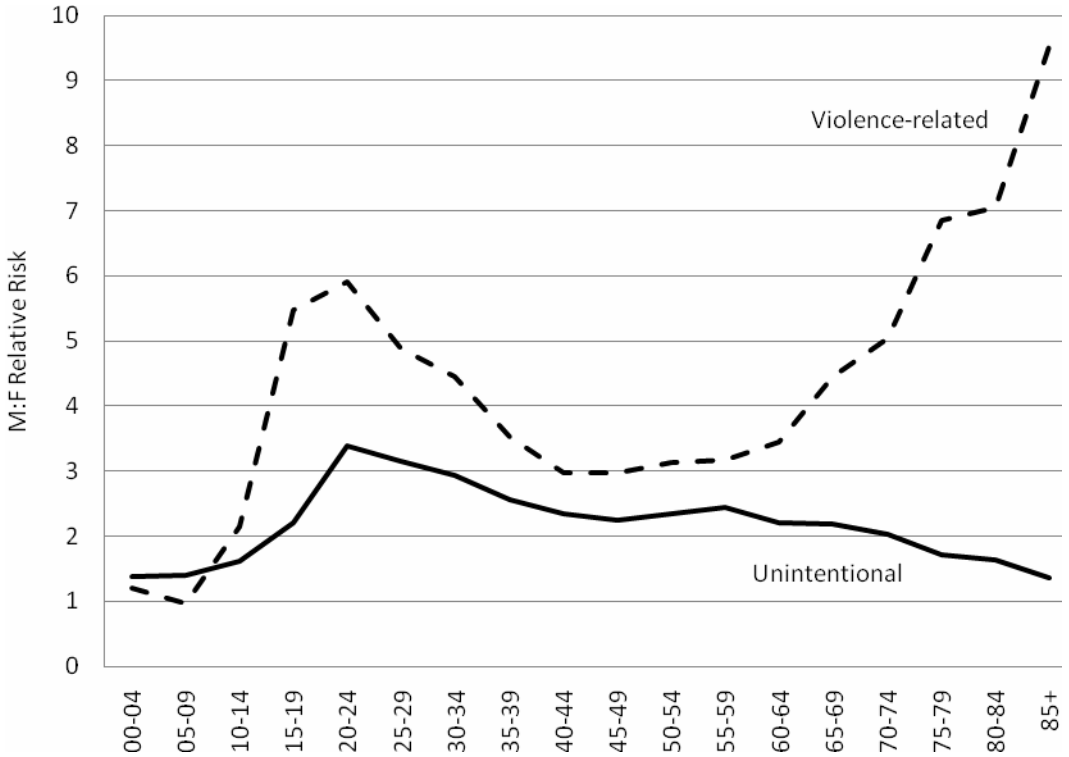

Figure 2. Male:female rate ratio, unintentional and violence-related injury mortality, by age group, 2007

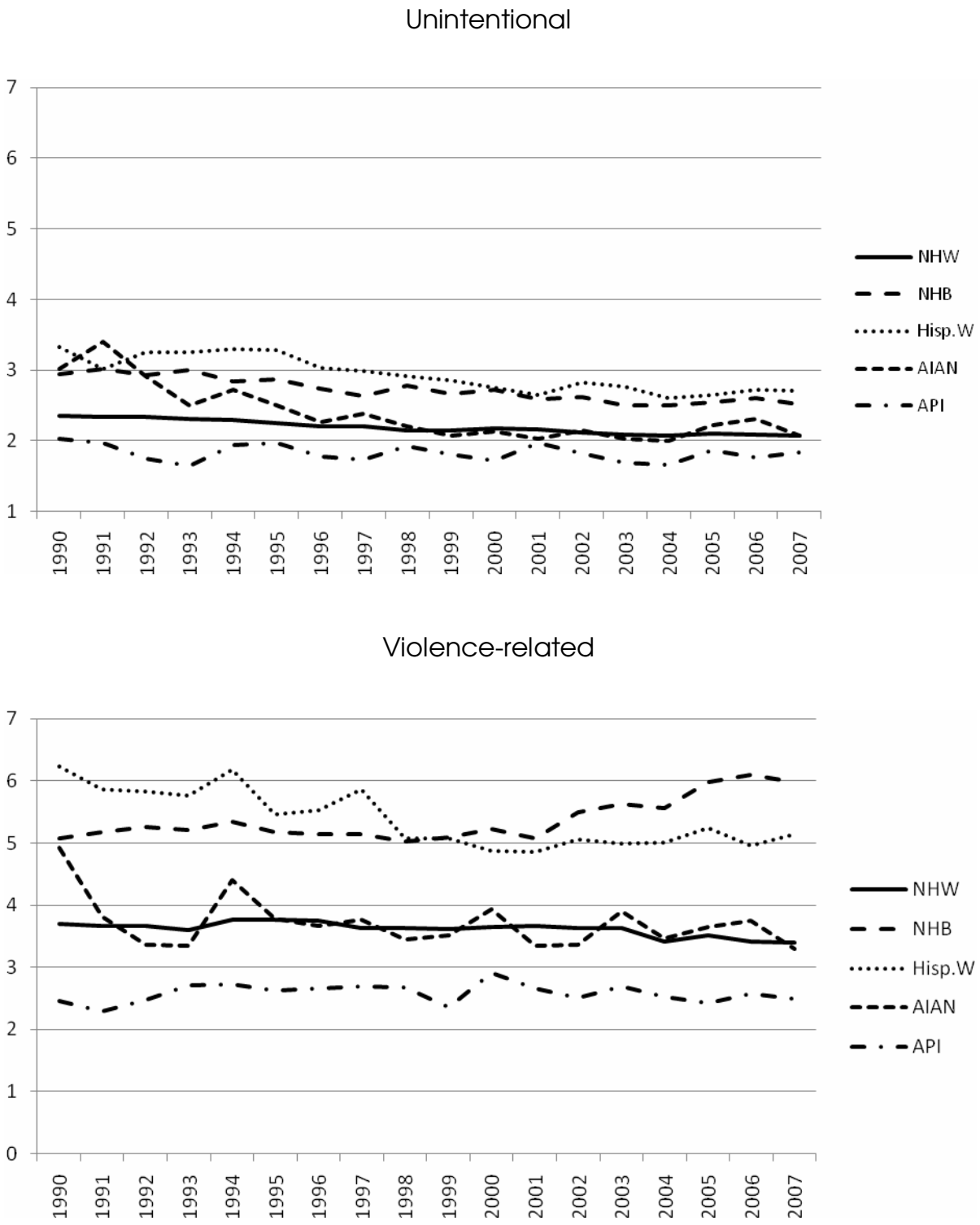

Figure 3. Male:female rate ratio, unintentional and violence-related injury mortality, age adjusted, by ethnic group, 1990-2007

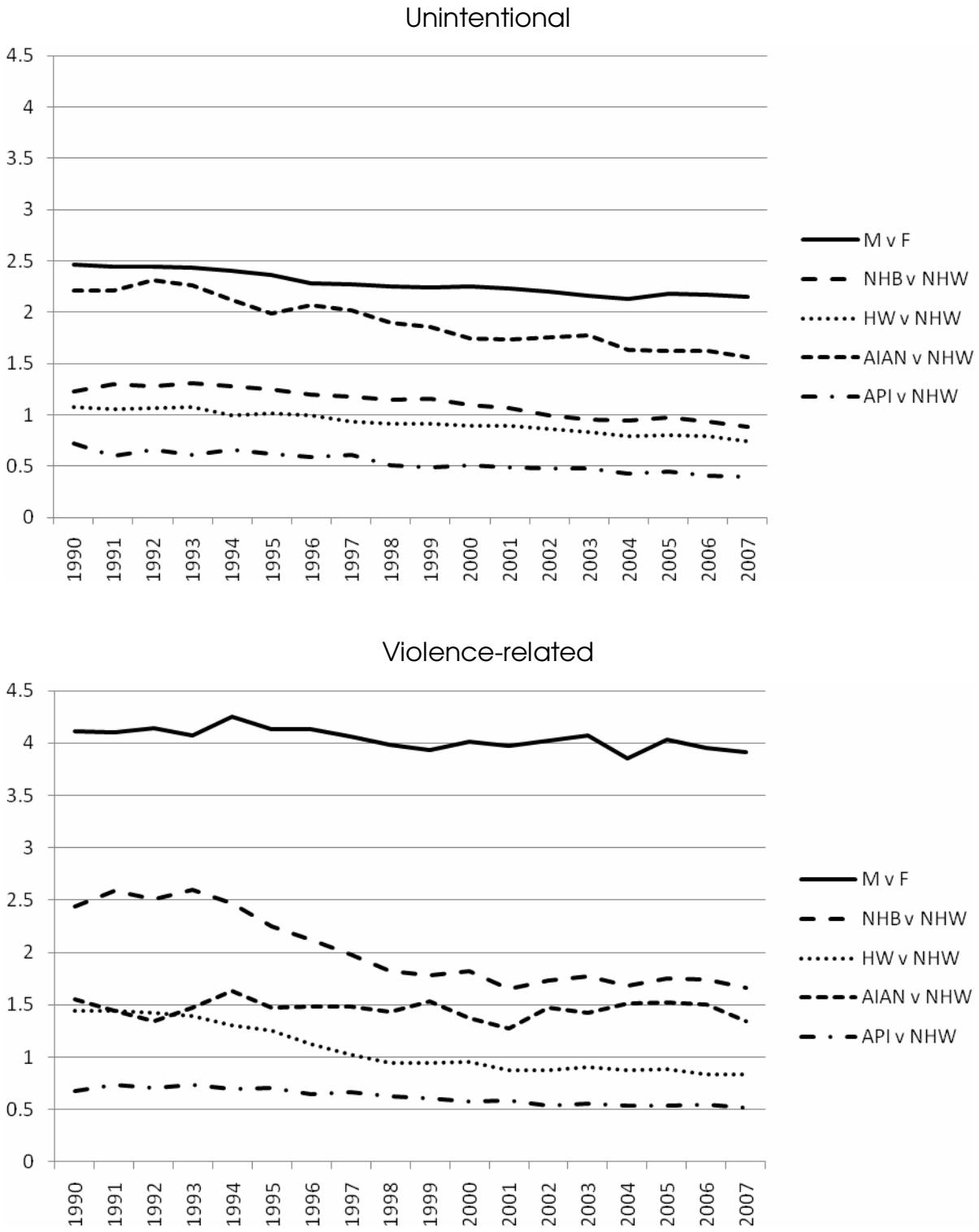

Figure 4. Male:female and ethnic group rate ratios, unintentional and violence-related injury mortality, age adjusted, 1990-2007