

SEX RATIOS AND HOMICIDE ACROSS THE U.S.

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ABSTRACT

This research explored how imbalanced sex ratios may impact regional levels of violence. It was predicted that in locations with fewer women relative to men, there would be greater male violence against women as a result of more severe control tactics, as well as greater violence among men as a result of competition for relatively scarce females. In contrast, rates of felony-type violence should be uncorrelated with sex ratios. Census data on sex ratios and FBI homicide data were examined using U.S. states as the unit of analysis. Higher sex ratios for young adults (18-26) were associated with male homicides against intimate female partners (a small to moderate effect size) and were marginally associated with argument-related homicides among males (a small effect size). As expected, felony-related homicides were not correlated with sex ratios.

Keywords: sex ratio, homicide, domestic violence, aggression

Research highlighting some psychological difference across cultures often inspires questions about the origins of such differences. Ultimately, cultural differences are assumed to have their origins in ecological, demographic, and historical circumstances (Berry, 1976; Triandis, 1994; Vandello and Cohen, 1999). One environmental feature that may have a profound, but largely unappreciated, influence is the ratio of males to females in a culture. Sex ratios can fluctuate over time and place for various reasons – wars may kill large numbers of males, migration patterns may introduce large numbers of males, sex differences in health practices may favor one sex over the other, or female

infanticide can create shortages of females. In the history of the United States, for example, there was a surplus of males relative to females until World War II. Since then, the sex ratio for the total population has fluctuated, tipping the balance between surpluses of males and females. Similarly, sex ratios change across age cohorts. Generally speaking, males outnumber females early in life, but males tend to die at higher rates than females throughout the lifespan, shifting the sex ratio to increasingly favor females with age. For instance, across the United States in 2000, there were 104.8 males under the age of five for every 100 females; for the age group from 65 to 74, there were only 82.3 males for every 100 females (U.S. Bureau of the Census, 2001). Following convention, in this paper, sex ratios will be described as the number of males for every 100 females; *high* sex ratios will refer to greater numbers of males relative to females, and *low* sex ratios will refer to greater numbers of females.

In some societies and time periods, sex ratios have been quite noticeably imbalanced. In the frontier West of the 19th century United States, there were several times as many men as women (Guttentag and Secord, 1983). Classical Sparta had an unusually small number of males relative to females, due in part to their emphasis as a military state in which males were often either gone fighting or killed off (Guttentag and Secord, 1983). In some cultures such as India and rural China, practices of female infanticide, sex-selective abortions, and health neglect have created large shortages of females (Coale and Banister, 1994; Dube, Dube, and Bhatnagar, 1999; Secondi, 2002). In contrast, in the contemporary United States, while there is variation across regions and age cohorts, imbalances are generally small enough that they escape notice. Recently, researchers have begun examining social consequences of these imbalances in sex ratios.

SEX RATIOS AND SOCIAL BEHAVIOR

Changes in sex ratios have been linked to a number of social phenomena including gender roles (Guttentag and Secord, 1983), sexual mores (Guttentag and Secord, 1983; Pederson, 1991), teen pregnancy (Barber, 2000a; 2001), patterns of marriage and divorce (Guttentag and Secord, 1983; South and Lloyd, 1992), and violence and crime (Barber, 2000b; Lester, 1998; O'Brien, 1991; South and Messner, 1987).

The question of the social-psychological consequences of cultural sex ratios was given its most extensive treatment by Marcia Guttentag and Paul Secord (1983) in their book, *Too Many Women? The Sex Ratio Question*. They drew on an impressive wealth of historical and contemporary records to show substantial

connections between sex role imbalances and social norms. Guttentag and Secord provided two important theoretical insights. First, they used the logic of social exchange theory (Thibaut and Kelley, 1959) to posit how imbalances in sex ratios would affect social norms. According to social exchange theory, relationships are like economic transactions where one's satisfaction is determined by costs and rewards of maintaining the relationships, and by expectations, which determine comparison levels for alternatives. Sex ratios can affect relationship satisfaction, because they change the balance of power and dependency. To the extent that alternative relationships are available, one's expectations will be higher, and one will be less dependent on the current partner. The person with less dependency in the relationship has greater power. So, if one sex becomes rarer, they should become more powerful, because readily available alternatives become hard to find for their partner. Thus, the sex in shorter supply should have more of a say in establishing satisfying relationships.

Guttentag and Secord's (1983) second and related important insight was to distinguish between *dyadic* and *structural* power. Structural power is the economic, political, and legal control that men maintain in virtually every society and is not affected by the sex ratio. In contrast, dyadic power stems from social exchanges within the relationship and is determined directly by imbalanced sex ratios. In short, the sex in shorter supply is bestowed with greater dyadic power because of scarcity.

By combining these two forms of power, Guttentag and Secord were able to explain asymmetries in societies where the sex ratio imbalance favors males or females. In places where men have structural power but women have dyadic power (i.e., women are in shorter supply), the authors argue that male and female roles become more traditional. Women's dyadic power should allow them to choose among men for marriage partners, and they can gain economic mobility through marrying upward. The authors speculate that women in such societies would not have strong career ambitions, nor would they press for political or legal rights because of the relative comfort and power stemming from their scarcity (Guttentag and Secord, 1983; Secord, 1983).

In contrast, in places where men have both structural and dyadic power (i.e., men are in relatively short supply), women should feel devalued by society. Women will be more likely to be seen as sex objects, and marriage will become destabilized as men with more options choose to remain single or get divorced. Sexual mores should become more liberal in general, with rises in adultery, teen pregnancy, and casual sexual relations. In addition, feminism in various forms should be accelerated, with women pressing for greater economic, legal, and

social independence and equality in order to shift the power imbalance (Guttentag and Secord, 1983; Secord, 1983).

Guttentag and Secord had surprisingly little to say about any potential links between sex ratios and rates of violence. However, other researchers have more recently begun to address this question. The evidence so far linking sex ratios and violence is mixed, suggesting that any relationship is at least complex and non-obvious.

SEX RATIOS AND VIOLENCE

Given that gender is strongly linked to various forms of violence (see Felson, 2002; Vandello and Cohen, in press), we might reasonably expect rates of violence to be affected by changes in the sex ratio. Of the studies that have examined the relationship between sex ratios and violence, some have found such a relationship, some have not, and of those that did find a relationship, the direction of the effect has been inconsistent.

Several studies have failed to find a link between sex ratios and violence. South and Messner (1987) looked at a sample of 91 nations and found that high sex ratios were not associated with female homicide victimization rates; however they did correlate with fewer female criminal offenses. Lester (1998) similarly found no correlation between sex ratios and homicide across 70 nations, though he did find a correlation between high sex ratios and suicide.

Barber (2000b) found that *low* sex ratios correlated with greater violent crime across nations. Similarly, O'Brien (1991) examined the connection between sex ratios and rape, and found that low sex ratios were associated with more reported rapes.

In contrast, several studies have found that *high* sex ratios are associated with greater violence. Messner and Blau (1987) looked at a sample of 124 metropolitan areas in the U.S., and found that high sex ratios correlated with greater criminal homicide and rape, but not robbery. Looking at the 1990 U.S. Census, Avakame (1999) found that high adult sex ratios increased the incidence of female homicide victimization. In addition, Pederson (1991) presented anecdotal evidence suggestive of a link between increasing sexual violence in the U.S. as sex ratios move into the higher range. A review by Messner and Sampson (1991) suggested that null effects of the sex ratio on violence found in some studies may be the result of opposing forces where the effect of large numbers of males (which they argued should increase violence because they are a relatively violent cohort) is offset by greater family stability.

Previous research linking sex ratios to violence may be limited by the level of aggregation in the data. Sex ratios have generally been measured as the total number of males to females in a population, but sex ratios fluctuate across age cohorts. Similarly, measures of violence have also been aggregated across categories, though different types of violence likely have different causes. For instance, looking at total rates of homicides may obscure relations between certain subcategories of homicide (e.g. felony-related versus argument-related). In order to address the specificity problem, more detailed data on both sex ratios and homicide were used in the present research to test specific hypotheses about possible links.

SEX RATIOS, COMPETITION, PROTECTION, AND CONTROL

The present research is based on the assumption that sex ratios are linked to certain forms of violence primarily through their effects on the dating and marriage environments. Drawing on insights of Guttentag and Secord (1983), as well as the logic of sexual selection theory (see, for example, Buss, 1989; Pederson, 1991), we can make several predictions about sex ratios and dating environments.

Guttentag and Secord (1983) argued that when sex ratios are high (particularly at the ages when men and women typically date and marry), young adult women will be highly valued. The question is, how does this increased value relate to violence? A first guess might be that if women are prized (and thus have dyadic power) because of their rarity, they might be at a lesser risk for violence at the hands of male partners. However, I argue here that women's dyadic power may instead make them more vulnerable to violence at the hands of male partners. By being the rarer sex, they have greater incentive to abandon relationships to find alternative (and relatively plentiful) mates. This power will be seen as a threat to males, who may then use violence as a strategy of control. Thus, male jealousy should be greater when sex ratios are high, and more vigilant and extreme methods for retaining a mate may be favored. Homicide is of course the most extreme form of control, and would seem to be counterproductive in "protecting" one's partner from rivals. However, killing is not necessarily the motivation underlying most homicides. Homicide is often a passionate, desperate, and somewhat spontaneous act. It is often the result of a more general strategy of coercion, control, or competition spurred by intense jealousy or rivalry (Daly and Wilson, 1988). In essence, male violence against women, or the threat of violence,

is a strategy intended to increase the psychological costs associated with straying from the relationship.

Guttentag and Secord (1983) provide evidence that strategies for controlling females become more likely with high sex ratios. For instance, in places and times with high sex ratios, sexual morality is stressed, particularly for women. Gender roles become more traditional and female virginity is prized. As Guttentag and Secord (1983) argue, “Men would be motivated to promote morality for women so that they could maintain exclusive possession of a woman” (p. 20). Cultures around the world often develop norms and customs that promote female purity, conservative sexual habits, and male honor, and these cultures often have high rates of male domestic violence against women (Vandello and Cohen, 2003; 2004).

High sex ratios should also have implications for male violence against other males. Evolutionary theorists see the dating market as an environment of competition among men for access to women, because men are less investing in offspring than women (and hence reproductive success for males favors quantity of couplings) (Trivers, 1972). As women become scarcer, it pays to favor riskier tactics. Indeed, male violence has been characterized as primarily a competitive tactic among men for access to fertile women (Daly and Wilson, 1988; 1990).

The proposed hypotheses suggest that sex ratios influence violence by changing the dynamics of male-female relationships. Violence in this sense is about dating and mating, and controlling one's valued resources. This specificity allows us to test some control conditions. Other types of violence should not necessarily increase with high sex ratios. For instance, felony-related homicides such as robbery, burglary, or drug-related killings are unrelated to dating and marriage market concerns, and they should thus be largely unaffected by changes in the sex ratio.

HYPOTHESES

Summarizing the above theorizing, the present research tested the following hypotheses:

Hypothesis 1: Where sex ratios are high (more males than females), there will be greater male violence against female partners as a coercive proprietary strategy to keep women from rival males.

Hypothesis 2: Where sex ratios are high, there will be greater violence among men as a result of inter-male competition for relatively scarce females.

Specifically, there will be greater rates of argument-related or honor-related homicide where sex ratios are high.

Hypothesis 3: Sex ratios will be uncorrelated with rates of male felony-related homicides, which are unrelated to gender and sex concerns. This is an important test to rule out the possibility that simply having higher rates of males, a violence-prone group, will lead to more violence in general (Messner and Sampson, 1991).

Hypothesis 4: Female-perpetrated homicides will be uncorrelated with sex ratios. Females are less violently competitive over status and mating conflicts, and from an evolutionary standpoint, a shortage of males should be less important to females than a shortage of females would be to males. That is, reproductive potentials are limited by females' reproductive capacities (a limit of roughly one child per year), not males'.

Alternative hypotheses. At this point, it is useful to consider some plausible alternative hypotheses that could be made regarding sex ratios and violence. According to Guttentag and Secord (1983), when women are plentiful (low sex ratios) their value decreases; that is, they are low in dyadic power. One could argue that in such circumstances, women would be more likely to tolerate certain abuses because of a lack of alternatives. Similarly, as women become devalued by being more abundant, men might be less restrained in using violence against them. Thus, contrary to the first hypothesis above, one might predict that low sex ratios would lead to more male violence against women. Note that one would not predict that low sex ratios would lead to increases in male-on-male violence, however.

Another alternative hypothesis might argue that both of the above hypotheses are correct (Hypothesis 1 and the first alternative hypothesis). That is, male violence against female partners might be expected to increase when sex ratios become imbalanced in either direction. When sex ratios are low women are at an increased risk for violence because their dyadic power is low; when sex ratios are high, women face an increased risk of violence because they are more valued (and contested). Male-on-male violence should still be linearly related to sex ratios, with high sex ratios leading to more inter-male violence as a result of more competition for women.

METHOD

To test the hypotheses above, two types of data are needed: detailed data on sex ratios across various locations and corresponding data on violence. Good cross-cultural data on sex ratios and violence are difficult to find, but data from the United States are quite detailed. I chose to examine sex ratios in the United

States, across the state level, using the U.S. states as the unit of analysis. (Because Florida does not report homicide data to the Uniform Crime Reports, analyses are limited to the 49 remaining states). Correspondingly, to examine data on various types of violence, I looked at state-level U.S. homicide data compiled by the Federal Bureau of Investigation.

The major advantage of using data from the United States is that they provide precise, detailed, and reliable figures unavailable in larger cross-national samples. The limitations of such data are that variance is somewhat restricted in terms of sex ratios and violence across states, and the sample size is necessarily restricted to the number of U.S. states. An alternative would be to examine data at the county level, which would increase the sample size to over 3000. The problem with these data is that homicides are infrequent enough that many counties will have little or no homicides over the course of a year. Thus, any advantage of increasing the local precision and sample size is offset by the high unreliability of data at this level. In short, state-level data provide perhaps the most precise data with which to test the specific hypotheses outlined above.

Data Sets

Sex Ratios Data

The U.S. Census Bureau compiles detailed sex and age population statistics every ten years. The data in these analyses come from the last three censuses (relevant homicide data were compiled beginning in 1976) (U.S. Bureau of the Census, 1980; 1990; 2000).

Ratios of total men to women in a state are limited in their usefulness because they aggregate across all age cohorts. Secord (1983) suggests that examining sex ratios for selected cohorts is more useful than ratios for total populations. The cohort of most relevance to the present hypotheses is young adults. This is the age at which people begin to pair up and marry, and it is the age at which competition in the “marriage market” should be the highest. Perhaps not coincidentally, it is also the age range at which homicides peak (Daly and Wilson, 1988). Since 1980, males and females marry for the first time on average between the ages of 22 and 26 (Median age at first marriage: 1980 men = 24.7, women = 22.0; 1990 men = 26.1, women = 23.9; 2000 men = 26.8, women = 25.1; U.S. Bureau of the Census, 1980, 1990, 2000). Men also tend to marry women slightly younger than themselves, about two years younger on average. Based on these trends, I calculated state sex ratios for young adult cohorts that reflect approximate normative dating and marriage ages in the United States. For each state I divided

the total number of males aged 20-26 by the total number of females 18-24. Following convention, I multiplied this ratio by 100; thus, a perfectly balanced sex ratio would be 100.

Homicide Data

To measure state-level homicides, I used data compiled by the FBI. Specifically, the FBI catalogs incident-level information on most homicides in the United States in the annual Uniform Crime Report data, Supplementary Homicide Reports. Supplementary Homicide Reports are archived back to 1976, so I examined homicide data from 1980, 1990, and 2000 (Fox, 1994; U.S. Department of Justice, Federal Bureau of Investigation, 2002).

For every homicide, the Supplementary Homicide Reports classifies a number of types of information, including sex of the perpetrator and victim, the type of weapon used, the relationship between perpetrator and victim (if known), and the circumstances of the homicide. For each year, I calculated totals for five types of homicides: 1) total homicides, 2) male domestic violence homicides, 3) honor- or argument-related homicides, 4) felony-related homicides, and 5) total female-perpetrated homicides. For each homicide type, total state homicides were divided by total state population to arrive at homicide rates.

Total Homicides

Total homicides were calculated by summing the total number of homicides of all types for each state.

Domestic Violence Homicides

Domestic violence homicides were calculated by first selecting only murders or non-negligent homicides (disregarding manslaughter or negligence) with a single perpetrator and single victim. Next, I selected all homicides by male offenders against female victims. Finally, I selected only homicides against wives, ex-wives, common-law wives, or girlfriends (this is an exhaustive list of all relevant categories of male-female romantic relationships).

Honor-Related Homicides

Honor- or argument-related homicides were calculated by selecting murders or non-negligent homicides with a single perpetrator and single victim; both perpetrator and victim were male; and the situation was classified as: brawl due to influence of alcohol, brawl due to influence of narcotics, lovers triangle, argument over money or property, or other arguments.

Felony-Related Homicides

Felony-related homicides were calculated similarly to honor-related homicides, but the situation was classified as: robbery, burglary, larceny, motor vehicle theft, narcotic drug laws, or suspected felony.

Female-Perpetrated Homicides

Female-perpetrated homicides were calculated by selecting all murders or non-negligent homicides with a female perpetrator. The relative rarity of female homicides precluded breaking them down into finer categories.

In general, a limitation of making more fine-grained analyses on homicide is that the sample sizes become smaller and less stable. For instance, 43 homicides were recorded in Kansas in 2000. Looking at subsets of these homicides reduces that number even further. (Looking at homicide rates for young adults only would be valuable, but sample sizes become too small to be useful at this level of analysis). In order to increase the stability of state homicide rates for each of the categories, mean rates were calculated by averaging the rates from 1980, 1990, and 2000. Similarly, sex ratios were averaged across these time periods as well. For both homicide rates and sex ratios, intercorrelations across time periods were high (average correlation for homicides across years = .56; average correlations of sex ratios across years = .83). Table 1 lists state sex ratios and homicide rates of various types, combining data from 1980-2000.

Table 1. Sex ratios and homicide rates per 100,000 people across U.S. States, 1980-2000

STATE	Sex Ratio (m20-26/f18-24)	Domestic Homicides	Argument- Related Homicides	Felony- Related Homicides	Female- Perpetrated Homicides
Hawaii	1.26	.71	.26	.07	.18
Alaska	1.24	.85	.29	.07	.72
California	1.13	.59	.46	.30	.30
Nevada	1.13	.88	.39	.19	.55
Arizona	1.07	.76	.31	.12	.46
Washington	1.07	.44	.14	.09	.22
Colorado	1.06	.51	.15	.09	.19
North Carolina	1.06	.81	.49	.09	.74
Virginia	1.06	.68	.35	.16	.51
North Dakota	1.05	.15	.03	.04	.10
Wyoming	1.05	.35	.23	.05	.21
Texas	1.04	.76	.62	.20	.59

Kansas	1.04	.34	.19	.02	.22
Oregon	1.03	.51	.12	.09	.13
New Jersey	1.03	.32	.18	.14	.17
Georgia	1.03	.72	.38	.14	.60
Illinois	1.02	.44	.27	.16	.33
Oklahoma	1.02	.76	.44	.12	.52
Connecticut	1.01	.38	.14	.11	.08
Montana	1.00	.37	.10	.01	.16
Maryland	1.00	.62	.31	.32	.39
Minnesota	.99	.23	.07	.06	.06
Nebraska	.99	.25	.10	.05	.10
Tennessee	.99	.62	.42	.12	.52
New Mexico	.99	.64	.27	.10	.24
South Dakota	.99	.43	.02	.02	.04
New York	.99	.32	.30	.24	.18
South Carolina	.98	1.07	.60	.18	.78
Kentucky	.98	.40	.35	.08	.33
Wisconsin	.98	.32	.15	.08	.19
Idaho	.98	.19	.09	.02	.19
Michigan	.97	.46	.38	.25	.35
Indiana	.97	.37	.19	.11	.39
Iowa	.97	.24	.04	.03	.10
Maine	.96	.57	.10	.04	.14
Massachusetts	.96	.22	.10	.06	.08
Missouri	.96	.42	.23	.19	.39
Ohio	.96	.38	.21	.11	.39
Arkansas	.96	.87	.44	.18	.65
Pennsylvania	.95	.45	.26	.13	.24
N. Hampshire	.95	.29	.05	.03	.15
West Virginia	.95	.47	.28	.11	.36
Utah	.95	.27	.10	.07	.14
Louisiana	.95	.72	.49	.25	.74
Alabama	.94	.94	.52	.15	.93
Vermont	.94	.25	.07	.07	.18
Delaware	.94	.90	.16	.14	.15
Rhode Island	.93	.48	.15	.07	.14

Results

As a first step, I examined sex ratios and homicide at the most general aggregate level. The correlation between sex ratios for total state populations and overall homicide rates was $r = -.19$ ($p = .18$). In other words, as males outnumber females, there is a slight trend for homicides to decrease. At this level of analysis, it is unclear how to interpret any relationship. Narrowing the focus to consider the age cohort of interest (males 20-26 and females 18-24) presents a different

picture: a correlation of $r = .11$, ($p = .43$) with overall state homicide rates. However, it is still not clear how sex ratios relate to specific forms of violence. Next, I considered correlations of restricted sex ratios with specific types of violence. See Table 2 for a summary of these correlations.

Table 2. Correlations between sex ratios and homicide rates across U.S. states, 1980, 1990, 2000

	Sex Ratios for:	
	Total Population	Males 20-26 and Females 18-24
Total homicide rates	-.19	.11
Male homicides against intimate partner (wives, ex-wives, girlfriends, common law wives)	.07	.25
Male-on-male argument- or honor-related homicides	-.12	.14
Male-on-male felony-related violence	-.26	.02
Female-perpetrated homicides	-.03	.10

Domestic Violence Homicides

The first hypothesis predicted a correlation between high sex ratios and male homicides against female partners. The correlation between sex ratios (males 20-26 over females 18-24) and domestic violence homicides was $.25$ ($p = .087$) providing some support for the hypothesis.

Argument-Related Homicides

The second hypothesis predicted that high sex ratios would be associated with violence among males, particularly as it related to honor- or argument-related conflict brought about by an increasingly competitive dating market. The correlation between sex ratios (males 20-26 over females 18-24) and argument-related homicides was $r = .14$ ($p = .32$), a non-significant effect, but larger than the conventional designation for a small effect size, $r = .10$ (Cohen, 1977).

Felony-Related Homicides

As a control test, I also examined the relationship between sex ratios and felony-related homicides, with the expectation that felonies would be unrelated to sex ratios. This prediction was supported: there was almost no correlation between sex ratios (males 20-26 over females 18-24) and felony-related homicides, $r = .02$ ($p = .87$).

Female-Perpetrated Homicide

I also examined the association between sex ratios and female-perpetrated homicides, without any strong predictions. It might be that female homicides are unrelated to sex ratios, but one might also argue that there is a positive relationship between the two. Female-perpetrated homicides are believed often to be responses to domestic violence from male partners (Daly and Wilson, 1988), so female homicide may increase as male homicides against women increase. There was a small positive correlation between sex ratios (males 20-26 over females 18-24) and female-perpetrated homicides, $r = .10$ ($p = .53$).

High and Low Sex Ratio States

The above correlational analyses test for a simple linear association between sex ratios and violence. The theoretical account offered in the introduction suggests that rates of violence should be greater specifically in places with high sex ratios. Violence is often a male tactic of control over females, or strategy for eliminating other males in a competitive dating environment, tactics that will increase as women become scarcer. In contrast, places with surpluses of females were not predicted to have greater rates of violence. Thus, correlations might underestimate the actual pattern of homicides.

To focus analyses further, I categorized states as having high, balanced, or low sex ratios. High sex ratio states were defined as those having ratios greater than 105 (nine states qualified), and low sex ratio states were defined as having ratios of less than 95 (nine states qualified). The remaining thirty-one states were classified as having balanced sex ratios. Figure 1 shows the homicide trends for low, balanced, and high sex ratio states. For each type of homicide (domestic violence, argument-related, and felony-related) two types of contrasts were tested: first, a contrast testing whether high sex ratio states had significantly greater rates of homicide compared to balanced or low sex ratio states (a -1 -1 2 contrast) and secondly, a contrast testing whether either low or high sex ratio states had higher homicide rates than balanced sex ratio states (a 1 -2 1 contrast).

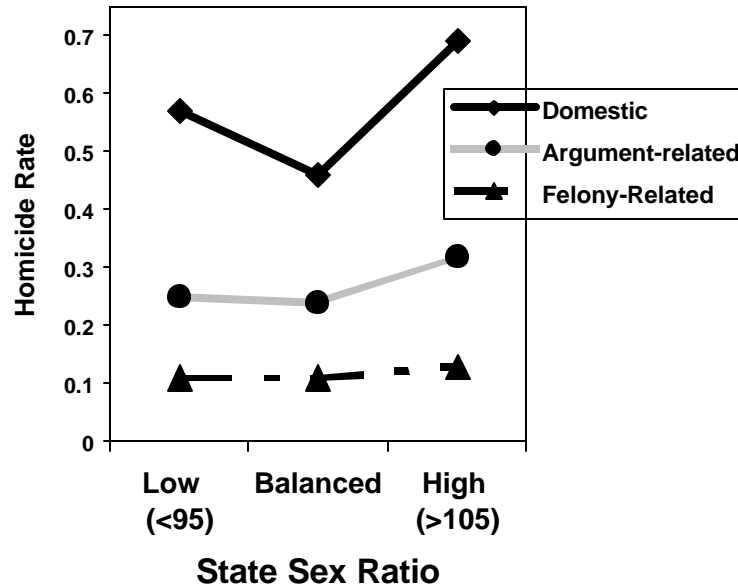


Figure 1. Male homicide trends for low, balanced, and high sex ratio states

States with the highest sex ratios did indeed have greater rates of male domestic homicides, $t(46) = 2.16$, $p < .05$, and argument-related homicides, $t(46) = 1.39$, $p = .18$, compared with balanced- and low-sex ratio states, though the increase in argument-related homicides did not reach conventional significance levels. Also, as expected, high sex ratio states did not have greater levels of felony-related homicides $t(46) = 0.66$, $p = .51$.

Unexpectedly, low sex ratios states showed somewhat higher rates of male domestic violence compared to balanced states (see Figure 1). However, this trend is less pronounced than the increase in homicides with high sex ratios. A contrast testing the curvilinear trend that both high and low sex ratio states had greater domestic violence homicides than balanced sex ratio states was significant, $t(46) = 2.71$, $p < .01$. Similar contrasts on argument-related homicides $t(46) = 0.96$, $p = .34$, and felony-related homicides, $t(46) = 0.41$, $p = .68$, were not significant.

A note on race. Sex ratios within the United States differ by race with Blacks having noticeably lower ratios than Whites. For instance, whereas the total sex ratio for Whites in the U.S. in 2000 was 96.4, the sex ratio for Blacks was 90.5

(U.S. Bureau of the Census, 2001). There is little reason to believe any of the effects reported above are inflated by confounds with race, and there is some reason to believe racial compositions of states might actually suppress the correlations. For example, homicide rates are much higher among Blacks, and sex ratios are lower among Black populations. Thus, we might expect that states with highest Black populations tend to have lower sex ratios as well as higher homicide rates, which would go against the present hypotheses.

Nonetheless, I attempted to examine the effect of race in the present analyses. Ideally, one could look at homicides separately for Blacks and Whites, but such a split would yield totals that are too small to be reliable for the present state-level data. However, one can control for the percentage of a state's population that is Black (Almapi, 1994; U.S. Bureau of the Census, 2001). Controlling for percentage Black (averaged across 1980, 1990, and 2000), the correlations between sex ratios and domestic violence homicides ($r = .26$, $p = .072$), argument-related homicides ($r = .15$, $p = .31$), and felony-related homicides ($r = .03$, $p = .86$) remained virtually unchanged, suggesting any effect of race is negligible.

Summary

The correlations between sex ratios and violence reported here are in the predicted direction, but they are not large. While the relationship between male homicides against female partners and sex ratios approached traditional significance levels, the expected relationship between argument-related male homicide and sex ratios was not significant. It should be noted, however, that an analysis at the state level necessarily limits the sample size (to 49 in this case). Thus, while the correlations are not large, the association between male-on-female homicide ($r = .25$) is close to a medium effect size using Cohen's (1977) designation (medium effects are about $r = .30$), and the association between argument-related homicide ($r = .14$) is greater than Cohen's small effect size ($r = .10$).

DISCUSSION

There were about 281 million people in the United States in 2000, about 50.9 percent of which were females (U.S. Bureau of the Census, 2001). These relatively balanced numbers at the aggregate level obscure regional and age cohort sex ratio imbalances. Further, even when imbalances are small enough to escape notice, they can result in large total surpluses or shortages of one sex. In addition, even modest increases in homicides, while small in statistical effect size,

can have enormous practical consequences (see Rosenthal and Rubin, 1983; Rosnow and Rosenthal, 1989; and Yeaton and Sechrest, 1981, on how small statistical effects can have large practical or applied significance).

The present study provides some intriguing evidence for a link between sex ratios and specific types of violence. Using census data that allows for examinations of precise sex ratios of young adults, states with relatively few women were shown to have greater degrees of male-on-female partner homicides, as well as male-on-male argument-related homicides. Though the relationships are modest and the study has limitations, the results nonetheless serve as an initial step linking an overlooked fluctuating demographic characteristic to a social behavior with important consequences.

Unexpectedly, there was also a small tendency for states with low sex ratios (fewer men relative to women) to have higher rates of male-on-female partner homicide, but there was no corresponding increase in male-on-male argument-related homicides. One plausible explanation is that in low sex ratio societies, women have fewer alternatives, and might therefore tolerate certain abuses because of a lack of alternatives. In extreme cases, this may lead to women being killed rather than leaving dangerous relationships. A second plausible explanation is that women become devalued as they become more abundant, and men might be less restrained in using violence against them. The present macro-level analyses do not allow us to tease apart various psychological explanations, but the finding is intriguing and worthy of further exploration. By looking beyond simple linear trends, more complex relationships may be uncovered.

Limitations

A major challenge in linking sex ratios to specific cultural practices lies in the difficulty in obtaining specific and accurate quantitative data. Guttentag and Secord's (1983) work is often qualitative, relying on historical and anthropological descriptions of social behaviors. Later work examining sex ratios and violence has primarily used total homicide rates. In the present study, I have attempted to link sex ratios to specific, quantifiable indicators of violence. The use of data from U.S. states provides both advantages and limitations. Detailed, reliable data are available at the state level, making analyses of restricted age cohorts possible, as well as analyses of specific forms of violence. On the other hand, sex ratios across U.S. states are not as variable as sex ratios in many places around the world. This restriction in range (because the states are part of a relatively homogeneous culture) can make it difficult to find large correlations. In future analyses, it would

be useful to examine cross-national links between sex ratios and violence, if quality data sets can be found.

Another limitation of the current study is that homicides represent only the most extreme form of violence on a continuum. The appeal of using homicides is obvious: they are a very accurate measure of a specific type of violence, because they are nearly impossible to fake, exaggerate, or underestimate (assuming official reports can be trusted, another problem of looking at cross-national homicides rates). Still, it would be enlightening to examine less severe types of violence, perhaps from self-reported survey results.

A further limitation of the present state-level data sets is that the sample size is necessarily limited to the fifty states. Because only medium effect sizes ($r = .30$) or larger will be statistically significant (Cohen, 1977, p. 80), many smaller effects may appear “unimportant” due simply to small sample size (see also Vandello and Cohen, 1999). Strictly speaking, inferential statistical tests are unnecessary when examining state-level data, because reported correlations are based on the entire universe of states. Nonetheless, reporting significance levels allows for judgments of strength of findings against purely random effects (see Baron and Straus, 1989, p. 35). Note also, as mentioned previously, using a smaller unit of analysis such as counties will yield a larger sample size, but homicide data at this level become too unreliable to be useful. Thus, state-level data represent perhaps the best compromise.

Despite the limitations mentioned above, the present data do provide some quantitative support to more speculative and anecdotal conclusions from earlier studies. This study is best seen as an initial attempt to document a predicted pattern of relationships; further investigation is certainly warranted before drawing strong conclusions.

Alternative Strategies for Future Research

Analyses of homicides at the county or city level are difficult because of the rarity of homicides, but there are strategies that may be employed that might make this type of data more useful. For example, aggregating homicides across multiple years might yield stable figures. One could also look for extreme cases at the county or city level, to maximize the chance of finding significant differences. For example, one could compare samples of cities with high sex ratios (for example, Salinas, California had an overall sex ratio of 113.7 in 2000, Ft. Lauderdale, Florida had a sex ratio of 110, U.S. Bureau of the Census, 2001) to cities with unusually low sex ratios (for example, Gary, Indiana at 84.6 or Philadelphia,

Pennsylvania at 86.8, U.S. Bureau of the Census, 2001). In addition, there may be reliable data on prevalence rates of violence other than homicide (for example, domestic assault) that are less extreme but more frequent.

Alternatively, one could examine relationships between sex ratios and violence by doing a longitudinal analysis. For example, one could examine how changes in the sex ratio over time are associated with homicide rates over time. As sex ratios fluctuate, do homicide rates fluctuate in a corresponding fashion?

Moving from macro-level to more psychological-level processes, another interesting unanswered question is how the *perceived* imbalance of sex ratios affects attitudes and behaviors. In the present study, there was no presumption that individuals are aware of imbalances (that is, people need not be aware of imbalances for there to be noticeable consequences on social behaviors). But there are certainly social milieus where people do in fact perceive sex imbalances, such as college campuses or work environments. These perceptions may have important effects on local norms, attitudes, and behaviors.

CONCLUSIONS

Changes in sex ratios may have noticeable consequences on violence as demographic changes affect regions of the U.S. in different ways. From 1990 to 2000 the West experienced the fastest growth rate in the country, with the male population growing slightly faster than the female population (U.S. Bureau of the Census, 2001). The West already has the highest sex ratios in the country, and it will be interesting to see if demographic trends in this region correspond with increases in violence in the upcoming years. More generally, analyses of the dynamics of male-female relationships will benefit from going beyond the dyad to consider how larger demographic patterns can sometimes unwittingly shape gender roles, sexual scripts, and attitudes in complex and subtle ways.

AUTHOR NOTE

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