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Sibling Sex Ratio and Sexual Orientation in Men and Women: New Tests in Two National Probability Samples

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One line of research on the etiology of sexual orientation has examined sibling sex ratio, the ratio of brothers to sisters collectively reported by a group of individuals, but this research has only used clinical and/or convenience samples. In the present study, homosexual men and women's sibling sex ratio was examined in two national probability samples. Results indicated that homosexual men had a sex ratio of 129.54 male live births to 100 female live births. This ratio was within the range of elevated sex ratios found in some previous studies of homosexual men, although it was only marginally significant ($p = .09$) relative to the known human sex ratio with regard to live births. Additional analyses indicated that this effect was likely the result of a high fraternal birth order (i.e., an elevated number of older brothers) in homosexual men. The sibling sex ratio for lesbians was 122.58 male live births to 100 female live births, which did not significantly differ from the known human sex ratio with regard to live births. The results for lesbians, however, should be interpreted with caution because the sample size (and resulting power) was low. The results in men add to research suggesting that homosexual men, unselected for gender identity or gender role behavior, do not have elevated sibling sex ratios. These results also suggest that research should concentrate on finding the cause(s) of the fraternal birth order effect, the consistent finding that homosexual men have an elevated number of older brothers.

KEY WORDS: sexual orientation; homosexuality; sibling sex ratio; fraternal birth order.

INTRODUCTION

One line of research on the etiology of sexual orientation has examined biodemographic variables that have traditional interest to social scientists, biologists, and medical practitioners. One such variable is sibling sex ratio, the ratio of brothers to sisters collectively reported by a group of individuals. Sibling sex ratio has been of interest to researchers examining sexual orientation development since the 1930s (e.g., Lang, 1936). It has also been examined fairly extensively in sexual orientation studies of recent years, at least in men (Blanchard, 1997). Recent explanations of a potential altered sex ratio in men are both psychosocial and biological in origin (see Blanchard, 1997).

For white populations, the sex ratio is 106 male live births to 100 female live births (e.g., James, 1987). White homosexual men have been found to have elevated sibling sex ratios (i.e., more brothers than sisters) relative to this known sex ratio in approximately half of the studies examining this issue (Blanchard & Sheridan, 1992; Blanchard, Zucker, Bradley, & Hume, 1995; Blanchard, Zucker, CohenKettenis, Gooren, & Bailey, 1996; Bogaert, 1998; Jensch, 1941a, 1941b; Kallmann, 1952; Lang, 1960; Zucker et al., 1997). Sex ratios in these studies have ranged from 114 to 141 male live births to 100 female live births. Significantly elevated sex ratios have not been found in the remaining studies (Blanchard & Bogaert, 1996a, 1996b; Blanchard & Zucker, 1994; Blanchard, Zucker, Siegelman, Dickey, & Klassen, 1998; Ellis & Blanchard, 2001; Slater, 1958; Zucker & Blanchard, 1994). I am not aware of any studies demonstrating the opposite: homosexual men having lower sibling sex ratios. On average, then, the weight of the evidence suggests that an elevated sibling sex ratio effect may be reliable in homosexual men.

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After reviewing trends in existing studies, Blanchard (1997; Blanchard et al., 1995, 1996) argued that elevated sibling sex ratios do not occur in groups of homosexual men unselected for gender identity or gender role behavior. For example, significantly elevated sibling sex ratios have been found for homosexual transsexuals and boys with gender identity disorder (e.g., Blanchard & Sheridan, 1992; Zucker et al., 1997) but not in most nonclinical or convenience samples of homosexual men (see, e.g., Blanchard & Bogaert, 1996b). Homosexual transsexuals and boys with gender identity disorder are usually very feminine relative to most samples of homosexual men unselected for gender identity or gender role behavior. One exception to the trend of only finding of an elevated sibling sex ratio in homosexual men selected for gender identity or gender role behavior was Bogaert's (1998) study of nonwhite homosexual men surveyed by Kinsey and his colleagues during the 1930s to the 1960s. There was no evidence that this group was unusually feminine, although this characteristic may have been used–perhaps inadvertently–by Kinsey and his colleagues to recruit nonwhite homosexual men, who are fewer in number than white homosexual men in the U.S.

Blanchard (1997) also argued that elevated sibling sex ratios and the fraternal birth order effect, the finding that homosexual men have an elevated number of older brothers (for reviews, see Blanchard, 1997; Bogaert, 2002), are distinct phenomena. For example, homosexual transsexual men have both a large number of older and younger brothers relative to their number of older and younger sisters, but in homosexual men not selected for gender identity or gender role behavior, only a fraternal birth order effect (i.e., an elevated number of older brothers) is observed.

The relation between sibling sex ratio and sexual orientation has not been examined extensively in women (see Blanchard, 1997) and the literature, to the extent that it exists, seems to suggest that no reliable effect exists. For example, the largest study to date was by Bogaert (1997), who examined the sibling sex ratio of 257 lesbians interviewed by Kinsey and his colleagues between the 1930s and 1960s. The sex ratio was 97 male live births to 100 female live births, which did not significantly differ from the known human sex ratio with regard to live births for white populations.

Although studied fairly extensively (at least in men), research on sibling sex ratio would be advanced if new research on this variable were conducted. As mentioned, the extant literature is somewhat equivocal on the relation between sibling sex ratio and sexual orientation in men, and little research exists on sibling sex ratio and sexual orientation in women. In addition, the existing literature has used only clinical and/or convenience samples. As such, new studies on sibling sex ratio and sexual orientation in both men and women using representative samples (e.g., national probability samples) would advance this research. This is the goal of the present study. The relation between sibling sex ratio and sexual orientation in men and women was examined in two recent national probability samples, one from Britain and the other from the United States (Laumann, Gagnon, Michael, & Michaels, 1994; Wellings, Field, Johnson, & Wadsworth, 1994). These two studies were stimulated by the need for sexual information in the general population in the wake of HIV/AIDS, and they are among the best sexuality surveys of recent years (see Hyde & DeLamater, 2000). Thus, any recruitment or ascertainment bias that can occur with convenience or clinical samples is minimized. Note that these data sets have been used in three published studies examining the fraternal birth order effect (Blanchard & Bogaert, 2004; Bogaert, 2000, 2003), but they have not been used to examine sibling sex ratio.

METHOD

Samples

Wellings et al. (1994) used a probability sample of households in Britain (England, Wales, and Scotland). A total of 18,876 participants were interviewed and given one of two versions of a questionnaire, a long form to which a representative 25% of the sample responded (N = 4,548) or a short form to which the remainder responded. For the present study, the sub-sample employing the long form was used because only these participants responded to sibling questions. For the 1,973 men in this sub-sample, I discarded the data of 185 men who had one or more stepsiblings. Note that there was no additional way of separating biological from non-biological sibs (e.g., adopted). I also discarded the data of 12 men whose recorded responses to various family-composition variables contradicted each other or else indicated that the participant was uncertain about his exact number of siblings. In addition, 50 cases with missing data on key sibling or sexual attraction variables (see below) were eliminated. Finally, I eliminated 86 men who were non-white. Because white participants are in the majority in both samples, they were used as the test group to assess sibling sex ratio, which is compared against a known value for a particular race/ethnicity (106 male live births to 100 female live births for white populations). The final sample of men comprised 1,640 cases. For the 2,575 women in the sub-sample, I discarded the data of 263 women who had one or more stepsiblings. I also

discarded the data of 19 women whose recorded responses to various family-composition variables contradicted with each other or else indicated the participant was uncertain about her exact number of siblings. I also eliminated 71 cases with missing data on key sibling or sexual attraction variables. Finally, I eliminated 98 women who were non-white. The final sample of women comprised 2,124 cases.

Laumann et al. (1994) used a probability sample of U.S. households (adults age 18 to 59). The survey consisted of 1,921 women and 1,511 men. In the sample of men, 38 cases were eliminated with missing data on key sibling or sexual attraction variables. In addition, 313 men were eliminated because they were non-white. The final sample of men comprised 1,160 cases. In the sample of women, 57 cases were eliminated with missing data on key sibling or sexual attraction variables. In addition, 489 women were eliminated because they were non-white. The final sample of women comprised 1,375 cases.

Measures

Sibling Variables

In the Wellings et al. survey, participants were asked whether they had only sisters, only brothers, or both brothers and sisters (or none). Birth order was assessed by three categories–first born, last born, and in-between. Finally, participants were asked for their total number of siblings. From these variables, number of older brothers, older sisters, younger brothers, and younger sisters were constructed (see also Bogaert, 2003). For example, the following decision rules were used to construct a participant's number of older brothers: (1) if he/she reported having no siblings, no brothers, or was the oldest, then a score of "0" was given; (2) if he/she had only brothers and was last born, then the score for older brothers equaled total siblings; (3) if he/she had only brothers, was "in-between," and had two siblings, then a score for older brothers was "1;" (4) if he/she had both brothers and sisters, was last born, and had two siblings, then a score for older brothers was also "1;" (5) if he/she had only brothers, was "in-between," and total siblings was greater than 2, then the score for older brothers equaled total siblings/2; (6) if he/she had both brothers and sisters, was last born, and total siblings was greater than 2, then older brothers also equaled total siblings/2; and finally (7) if he/she had both brothers and sisters and was "in-between," then older brothers equaled total siblings/4. Note that the first four rules give exact quantities for older brothers and that the last three give expected quantities for older brothers (including fractions). Also note that similar rules were used to construct older sisters, younger brothers, and younger sisters.

In the Laumann et al. survey, birth order was again limited to three categories–first born, last born, and in-between–and there was no information on specific sibling characteristics (e.g., older brothers). Participants did indicate, however, their total number of sisters and their total number of brothers. For these totals, Laumann et al. collapsed 6 through 10 siblings into 6, and 11 or more siblings were collapsed into 11. For example, if a participant happened to have 8 brothers and 12 sisters, his or her scores on these variables would be 6 and 11, respectively. Thus, possible values for these sibling variables were 0, 1, 2, 3, 4, 5, 6, and 11. Also note that both biological and non-biological (e.g., adopted) siblings were included in the totals, and there was no way to separate biological siblings from non-biological siblings (including step-siblings). Similar to the procedure used for the Wellings et al. study, number of older brothers, older sisters, younger brothers, and younger sisters were constructed from this sibling information. For example, the following decision rules were used to construct a participant's number of older brothers: (1) if he/she was the oldest or reported no brothers, then a score of "0" was given; (2) if he/she reported being last born, then the score for older brothers equaled the number of brothers; and finally (3) if he/she was "in-between," then the score for older brothers equaled number of brothers/2. Note that the first two decision rules give exact quantities for older brothers and that the last one gives both exact quantities (for 2 older brothers and no sisters) and expected quantities (for the remaining cases) for older brothers (including fractions). Also note that similar decision rules were used to construct older sisters, younger brothers, and younger sisters. Note that the lack of precision in the sibling variables in both samples should not systematically bias the results in favour of finding significant effects. This lack of precision, if anything, may reduce the chance of finding significant effects, because it adds measurement error to the results.

Sexual Attraction

Both the Wellings et al. and Laumann et al. surveys included a question about the sex of persons to whom the participant was erotically attracted. The responses were coded in five categories: only the opposite sex, mostly the opposite sex, both sexes equally, mostly the same sex, and only the same sex. In the present study, participants who indicated that they were only or mostly attracted to members of the opposite sex were classified as heterosexual, and participants who indicated that they

were equally, mostly, or only attracted to members of the same sex were classified as homosexual. In the Laumann et al. survey, 1,116 men were classified as heterosexual and 44 men were classified as homosexual. In the Wellings et al. survey, 1,605 men were classified as heterosexual and 35 men were classified as homosexual. In the Wellings et al. survey, 2106 women were classified as heterosexual and 18 women were classified as homosexual. In the Laumann et al. survey, 1,363 women were classified as heterosexual and 12 were classified as lesbian.

RESULTS

To maximize the number of cases, the two samples were combined. Power is an issue because the test statistic (z approximation to the binomial test) requires large samples to achieve a reasonable probability of detecting a significant difference (e.g., Moore & Gledhill, 1988). Note that the sibling sex ratio results in homosexual men are presented as one-tailed tests because there is evidence that these men have significantly elevated sibling sex ratios. All other tests are presented as two-tailed tests.

The 79 homosexual men from both samples had 114 brothers and 88 sisters (129.54 male live births to 100 female live births or .564). The sex ratio in homosexual men did not significantly exceed the known sex ratio for white populations (106/100 or .5146), $p = .091$, one-tailed. However, this ratio was within the range of elevated sibling sex ratios found in other studies (114–141) and note that the significance level was marginal. Thus, despite the small sample and the resulting weak power, there was evidence of an elevated sibling sex ratio for the homosexual men in these samples. The 2,721 heterosexual men from both samples had 3,774 brothers and 3,474 sisters (108.63 male live births to 100 female live births or .521). Despite the power to detect a significant effect in this group, the sex ratio in heterosexual men did not differ significantly from the known sex ratio for white populations ($p = .338$, two-tailed).

To evaluate whether the (marginally) elevated sibling sex ratio in homosexual men was the result of the fraternal birth order effect, I calculated sibling sex ratios for both older siblings and younger siblings (see also Blanchard, 1997). Thus, I compared older brothers versus older sisters and younger brothers versus younger sisters. The homosexual men had 71.50 older brothers (rounded to 72) versus 49.50 older sisters (rounded to 50). This ratio, 144.44 male live births to 100 female live births or .590, was high, although it achieved only borderline significance ($p = .058$, one-tailed). It should be kept in mind, however, that the power to detect a significant difference here is even weaker than in the test for homosexual men with all siblings. The homosexual men had 42.50 younger brothers (rounded to 43) and 38.50 younger sisters (rounded to 39). This ratio, 110.26 male live births to 100 female live births or .524, did not exceed the known ratio for white populations ($p = .476$, one-tailed). Thus, the marginally elevated sibling sex ratio for homosexual men was carried by the fraternal birth order effect (i.e., an elevated number of older brothers). The heterosexual men had 1869.5 older brothers (rounded to 1,870) and 1,758 older sisters. This older sibling sex ratio, 106.37 male live births to 100 female live births or .515, did not differ from the known sex ratio for the white population ($p = .972$, two-tailed). The heterosexual men had 1,904.5 younger brothers (rounded to 1,905) and 1,716 younger sisters. This younger sibling sex ratio, 111.01 male live births to 100 female live births or .526, was also not significantly different from the known sex ratio for the white population ($p = .186$, two-tailed).

The 30 lesbian women from both samples had 38 brothers and 31 sisters. This ratio, 122.58 male live births to 100 female live births or .551, was not significantly different from the known sex ratio for white populations ($p = .636$, two-tailed). For older siblings, lesbians had 15.25 older brothers (rounded to 15) and 12.25 older sisters (rounded to 12). This older sibling sex ratio, 125.00 male live births to 100 female live births or .556, did not differ significantly from the known sex ratio for white population ($p = .820$, two-tailed). For younger siblings, lesbians had 22.75 younger brothers (rounded to 23) and 18.75 younger sisters (rounded to 19). This younger sibling sex ratio, 121.05 male live births to 100 female live births or .548, was not significantly different from the known sex ratio for the white population ($p = .790$, two-tailed). The 3,471 heterosexual women from both samples had 4,938.5 brothers (rounded to 4939) and 4,681.5 sisters (rounded to 4,682). This sibling sex ratio, 105.55 male live births to 100 female live births or .513, did not significantly differ from the known sex ratio for white populations ($p = .754$, two-tailed). For older siblings, heterosexual women had 2,527 older brothers and 2,402 older sisters. This older sibling sex ratio, 105.20 male live births to 100 female live births or .513, did not differ significantly from the known sex ratio for the white population ($p = .756$, two-tailed). For younger siblings, heterosexual women had 2,411.5 younger brothers (rounded to 2,412) and 2,279.5 younger sisters (rounded to 2,280). This younger sibling sex ratio, 105.79 male live births to 100 female live births or .514, did not differ from the known sex ratio for white populations ($p = .910$, two-tailed).

DISCUSSION

The present study was the first to examine homosexual men and women's sibling sex ratio in two national probability samples. The results indicated that, as in previous investigations, lesbians did not have an altered sex ratio relative to the known sex ratio for the white population. However, it should be kept in mind that the number of lesbian participants was very small ($n = 30$) even when the two samples were combined and that the test statistic requires large samples to achieve a reasonable probability of detecting a significant difference. The results also indicated that homosexual men had a marginally elevated sex ratio relative to the known sex ratio for the white population, but additional analyses indicated this effect was the result of the fraternal birth order effect (i.e., an elevated number of older brothers in homosexual men). Previous analyses of these data demonstrated a fraternal birth order effect (Blanchard & Bogaert, 2004; Bogaert, 2003; cf. Bogaert, 2000), and the present results, cast in a somewhat different form than these previous investigations, affirm this conclusion. These previous investigations of the fraternal birth order effect demonstrated that this effect was probably stronger than in prior seminal investigations (e.g., Blanchard & Bogaert, 1996b). For example, Blanchard and Bogaert (2004), using the combined national probability samples used here, found that 1 in 4 gay men acquired their sexual orientation from this effect, whereas Cantor, Blanchard, Paterson, and Bogaert (2002), using data from Blanchard and Bogaert (1996b), found that 1 in 7 gay men acquired their sexual orientation from this effect. Thus, perhaps it is not surprising that an elevated sibling sex ratio (though marginal)–indeed even a ratio as high as 129.54–was found here because it reflects a relatively strong fraternal birth order effect in these national probability samples. One implication of these results is that some of the early studies finding elevated sibling sex ratios in homosexual men (e.g., Jensch, 1941a, 1941b; Lang, 1960) may have occurred because of a similar trend: a relatively strong (but undetected) fraternal birth order effect.

The present results support Blanchard's (1997) conclusion that elevated sibling sex ratios do not occur in samples of homosexual men who are unselected for gender identity or gender role behavior. Of course, the level of femininity in the homosexual men in these samples is unknown, but there is no reason to believe that these national probability samples contain a high number of extremely feminine homosexual men (e.g., homosexual transsexuals). The results also establish that existing convenience samples of homosexual men (e.g., Blanchard & Bogaert, 1996b) are probably not atypical and/or have problematic ascertainment bias, and that the conclusions drawn from them (e.g., Blanchard, 1997) are probably correct. Finally, the present results support the conclusion that fraternal birth order is more relevant than sibling sex ratio in men's sexual orientation development, and that research should continue to concentrate on the cause(s) of this effect.

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