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Biodemographic Comparisons of Homosexual and Heterosexual Men in the Kinsey Interview Data

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Relations between sexual orientation and several biodemographic variables previously reported to differentiate between homosexual and heterosexual men were examined. Subjects were 4948 white, postpubertal males, who were never reared in foster homes, orphanages, or other institutions, and were never arrested or convicted on criminal charges. These were dichotomously classified as homosexual (n = 844) or heterosexual (n = 4104). Data came from survey interviews conducted by staff members of The Kinsey Institute for Research in Sex, Gender, and Reproduction from 1938 to 1963. Results extended previous findings that, compared with heterosexual controls, homosexual men have a later birth order, an earlier onset of puberty, and a lower body weight. Sexual orientation was weakly related or unrelated to height, paternal age, and sibling sex ratio. A more detailed analysis of the late birth order of the homosexual group showed that homosexual men have a greater number of older brothers than do heterosexual men, but they do not have a greater number of older sisters, once their number of older brothers has been taken into account.

KEY WORDS: birth order; body weight; homosexuality; parental age; puberty; sex ratio; sexual orientation; stature.

INTRODUCTION

Researchers in the field of human sexuality have reported differences between homosexual and heterosexual men on several biodemographic

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variables: sibling sex ratio, birth order, parental age, age of pubertal onset, and adult height and weight. The theoretical and statistical significance of these findings is not yet certain, because the studies of each variable have been few in number and sometimes mixed in outcome. The objective of the present research was to help determine which of these variables are reliably associated with homosexuality and are therefore likely to be, or to be correlated with, causal factors in the development of sexual orientation. It was hoped that the outcome of this study would permit future investigators to concentrate their efforts on the most promising of these variables, thus facilitating research on their actual mechanisms of action. The major prior findings for each variable are reviewed below.

Sibling Sex Ratio

This variable is the ratio of brothers to sisters collectively reported by a given group of probands. In white populations, the ratio of male live births to female live births is close to 106:100 (Chahnazarian, 1988; James, 1987). The ratio of brothers to sisters reported by any group of men drawn at random from the general population should therefore approach 106 (brothers per 100 sisters). Five of the seven largest methodologically adequate studies of homosexuals' sibling sex ratios have suggested that homosexual men have an excess of brothers (Blanchard and Sheridan, 1992; Blanchard *et al.*, 1995b; Jensch, 1941; Kallmann, 1952; Lang, 1960). These found sibling sex ratios ranging from 114 to 141. The remaining studies (Blanchard and Zucker, 1994; Slater, 1958) produced sibling sex ratios of 104 and 111, which were not statistically different from the normal population value. The weight of evidence suggests that the sibling sex ratio effect is reliable. Six of these studies, however, including all five with positive results, were carried out on psychiatric patients, convicted criminals, and men identified as homosexual by police in Nazi Germany (who might or might not have been representative of other homosexual men who escaped detection). There is thus a need for further research before these findings can be generalized to well-adjusted homosexuals.

Birth Order

Early studies of this variable in homosexual men used the birth order index introduced by Slater (1958, 1962). Slater's index equals the number of siblings older than the proband divided by the proband's total number of siblings. This index cannot be calculated for only children; for all other

individuals, regardless of their number of siblings, it expresses birth order as a quantity between 0 and 1, where 0 corresponds to firstborn and 1 corresponds to last born. These early studies employed one-sample tests comparing the observed birth orders of their homosexual subjects with the theoretical mean of Slater's index for samples drawn at random from the general population (.50). The two largest studies to use this approach found birth order indexes significantly greater than the theoretical mean, indicating that homosexual men are born later than members of the general population (Hare and Moran, 1979; Slater, 1962). Demographic research has shown, however, that one-sample tests of birth order are not conclusive (Hare and Price, 1969, 1974; Price and Hare, 1969). Recent studies have therefore used two-sample tests comparing heterosexual and homosexual subjects matched on age (or year of birth) and sibship size (Blanchard and Sheridan, 1992; Blanchard and Zucker, 1994; Blanchard *et al.*, 1995b). All three studies using this approach found that the homosexual subjects were born significantly later than the heterosexual controls. A fourth study, which used a less stringently matched control group, also obtained the same result (Blanchard *et al.*, 1996). Although these results appear consistent, the early studies are problematic for methodological reasons alluded to above. These studies also require replication with nonclinical samples because all but one (Blanchard and Zucker, 1994) were carried out on psychiatric patients.

Only one of the above-mentioned studies (Blanchard *et al.*, 1995b) attempted to determine whether the late birth order of homosexual men reflects a correlation between sexual orientation and number of older brothers, or a correlation between sexual orientation and number of older siblings, regardless of sex. The findings suggested that older brothers and older sisters relate about equally to a boy's likelihood of developing a homosexual orientation. The statistical methodology used in that study, however, was probably not optimal for addressing this question. That is because Blanchard *et al.* (1995b) overlooked the expected positive correlation between a proband's number of older brothers and his number of older sisters. Because of this correlation, any group whose defining characteristic is related to an excess of older brothers will also tend to show a somewhat smaller, secondary excess of older sisters. Thus, the critical question, which Blanchard *et al.* (1995b) did not address, is whether the excess of older brothers completely explains the excess of older sisters.

The issue of whether the birth order effect relates to older brothers only or to older siblings of both sexes is obviously important to theoretical interpretations of that effect. There is a need, therefore, for more sophisticated investigations of this problem.

Parental Age

Five studies have examined this variable, the age of a person's parents at the time when that person was born. Three found that the fathers of homosexual men were older than expected (Abe and Moran, 1969; Blanchard and Zucker, 1994; Hare and Moran, 1979), one found that they were younger than the fathers of heterosexual controls (Robertson, 1972), and one found that they were the same age (Blanchard and Sheridan, 1992). All studies found that mother's ages did not differ or else that elevated maternal age was merely secondary to elevated paternal age. Thus, the prior evidence regarding paternal age is mixed, but that regarding maternal age consistently shows no between-groups differences.

Age of Puberty

Across studies, homosexual men have typically recalled various physiological and behavioral signs of puberty as happening earlier than do heterosexual men. The observed differences include age of first orgasm or ejaculation (Stephan, 1973; Tripp, 1982); age of first masturbation (Manosevitz, 1972); age of onset of sexual feelings, fantasies, and arousal (Saghir and Robins, 1973); age of voice change (McCormick, 1990); onset of adolescence estimated from multiple physical developments (Kinsey *et al.*, 1948); "beginning of puberty," left to the examinees' interpretation (Cole, 1983); and onset of interpersonal sexual activity (Bieber *et al.*, 1962; Manosevitz, 1970).

The direction of the foregoing findings is clear enough; however, there is a need for further research to investigate whether the observed difference in pubertal age might be an artifact of some other difference between homosexual and heterosexual males. Of particular concern is the difference in average birth order. Two large-scale studies of women have found that birth order is negatively correlated with menarche; that is, as birth order increases, age of first menstruation decreases (Dann and Roberts, 1984; Roberts and Dann, 1975). If age of puberty also decreases as birth order increases in men, then homosexual men might have an earlier puberty than heterosexual men merely because they have a later birth order. If that is true, then the apparent pubertal age difference between these groups would disappear when birth order is controlled for. There is therefore a need for multivariate studies of pubertal age in homosexual and heterosexual men that control for birth order as well as other variables of possible relevance.

Height and Weight

Several studies have found that homosexual men are lighter, or lighter in proportion to their height, than heterosexual controls (Blanchard *et al.*, 1995a; Evans, 1972; Gettelman and Thompson, 1993; Herzog *et al.*, 1991; Nedoma and Freund, 1961; Tourney *et al.*, 1975). Others have produced nonsignificant differences in the same direction (Sanders *et al.*, 1985; Terman and Miles, 1936) or differences that would have been significant if the investigators had performed a one-tailed test of the (directional) hypothesis that homosexuals tend to weigh less than heterosexuals (Silberstein *et al.*, 1989). We know of only two investigations with an adequate sample size that found no tendency for homosexual men to be lighter (Siever, 1994; Yager *et al.*, 1988).

Fewer studies have compared the mean heights of heterosexual and homosexual males; in contrast to the studies of weight, these have usually found no differences (Evans, 1972; Sanders *et al.*, 1985; Tourney *et al.*, 1975). The sole exception (Blanchard *et al.*, 1995a) compared homosexual and nonhomosexual gender dysphorics. Gender dysphorics are individuals with persistent and recurrent dissatisfaction with their anatomic sex; these include transsexuals as well as persons with less severe forms of gender identity disorder, for example, men who wish to have feminine breasts but not a vagina (Blanchard, 1993a, 1993b; Money and Lamacz, 1984). Gender-dysphoric males may be classified into two broad groups: homosexual (erotically attracted to other males) and nonhomosexual (attracted to females, to both sexes, or to neither sex) (Blanchard, 1985, 1988, 1989a, 1989b). Blanchard *et al.* (1995a) found that homosexual gender dysphorics are significantly shorter than nonhomosexual gender dysphorics. Additional research is needed to clarify whether this positive finding arose because this study's sample was 3-17 times larger than those of the negative studies, or because it investigated gender-dysphoric homosexuals, who are nearly always extremely feminine.

The Kinsey Database and the Present Study

The Kinsey Institute for Research in Sex, Gender, and Reproduction possesses the world's largest database of survey interviews with systematic information on the variables reviewed above. The large number of participants in this database, and the large number of variables collected on them, make feasible statistical tests that would be impossible or problematic with small samples. These include multivariate tests of key variables that can include as many control variables as necessary and still maintain adequate

subjects-to-variables ratios, and analytic procedures that require, at some point, sufficient statistical power to justify acceptance of the null hypothesis.

The Kinsey database, therefore, represents a rare opportunity to advance our empirical knowledge of biodemographic correlates of sexual orientation beyond the relationships demonstrated thus far. Although these biodemographic data were collected, in the main, from adults, the potential developmental relevance of most of them is obvious. An adult homosexual man, for example, cannot influence his birth order, but his birth order, or some factor associated with it, could have influenced the development of his sexual orientation. The same argument holds for paternal age, sibling sex ratio, and age of puberty.

The present study, for the foregoing reasons, analyzed a sample of homosexual and heterosexual participants from the Kinsey interview data. It focused on white males, because this is the group in which the phenomena of present interest have previously been demonstrated. Studies of these variables in lesbian women have been few in number, generally inadequate in sample size, and inconclusive in outcome (see reviews by Blanchard and Sheridan, 1992; Blanchard *et al.*, 1995b). Comparable studies of Asians, blacks, Native Americans, or Hispanics have yet to be conducted.

METHOD

Probands

The computerized databases of The Kinsey Institute for Research in Sex, Gender, and Reproduction (KIRSGR) include 17,502 case histories taken from 1938 to 1963 using the interview schedule devised by the KIRSGR's founder, Alfred C. Kinsey (Gebhard and Johnson, 1979). As already stated, the present study focused on the white men.

The Kinsey interview data are stored in several files. Those designated for white, postpubertal males with no convictions for felonies or misdemeanors (other than traffic violations) contain 6102 cases. We eliminated 2 sex offenders who appear to have escaped prior screening, and 52 men who had been arrested without subsequent conviction or else with unknown outcome. The latter were excluded because they might, whether ultimately convicted or not, have spent time in jail, and thus were more likely to have had homosexual experiences that did not reflect their basic orientation. We further eliminated 214 men who had at some point resided in a foster home or institution (e.g., orphanage) before age 18 years.

The sexual orientation of the remaining 5834 men was classified according to the following criteria. Individuals were classified as homosexual

if they reported "extensive" homosexual experience, defined by Gebhard and Johnson (1979) as more than 20 male sexual partners or more than 50 homosexual experiences. They were classified as heterosexual if they met two criteria: (i) they reported either no or "rare" homosexual experience, the latter defined by Gebhard and Johnson (1979) as 1 male sexual partner or 1–5 homosexual experiences, and (ii) they did not respond that they experienced "much" sexual arousal to questions about sexual arousal from seeing and thinking of other males.

There were 886 men who could not be classified as heterosexual or homosexual according to these rather stringent criteria. The remaining 4948 men constituted the probands in the present study: 844 were classified as homosexual, and 4104 as heterosexual. Some of our data analyses, for reasons explained later, excluded the 330 probands who were less than 18 years old when interviewed. The 4618 probands in the over-18 subsample included 800 homosexuals and 3818 heterosexuals. Because of missing data, the degrees of freedom vary somewhat both in analyses employing the full sample and in those using the over-18 subsample.

Descriptive characteristics of the homosexual and heterosexual groups are presented in Table I. The variable, parental socioeconomic status (hereafter, parental SES), refers to the financial circumstances of the proband's parents when the proband was 14 to 17 years old. It was coded on an 8-point scale from 1 (*extreme poverty*) to 8 (*extreme wealth*). In the present study, parental SES was preferred to the proband's education as an index of the proband's social class, because many probands were still in school when interviewed and their current educational level would not reflect their ultimate educational level.

Table I shows that the homosexual and heterosexual probands were closely similar on the demographic variables compared. Even the statistically significant differences are quite small in absolute magnitude. It should be noted that all p values in this study, including those in Table I, are two-tailed unless stated otherwise.

Materials and Procedure

The data analyses were run at the KIRSGR according to instructions from the present authors. Details, necessary for planning these analyses, about the Kinsey interview questions and the coding of responses were collected from four sources: Kinsey *et al.* (1948), Gebhard and Johnson (1979), and two publications of the KIRSGR, the *Kinsey Interview Kit* (KIRSGR, 1985) and the *Kinsey Interview Kit: Code Book* (KIRSGR, 1991). Some of

Table I. Descriptive Characteristics of the Homosexual and Heterosexual Groups

Variable	Homosexual $\bar{X}$	Homosexual SD	Heterosexual $\bar{X}$	Heterosexual SD	t	df	p
			Full sample (N = 4948)				
Age	29.7	10.7	27.8	11.1	4.65	4946	<0.001
Grades completed	14.5	3.4	15.6	3.2	-9.06	4944	<0.001
Parental SES	4.9	1.5	4.9	1.3	0.40	4854	ns
Year of birth	1916.5	10.5	1917.1	9.9	-1.51	4946	ns
Year interviewed	1946.7	4.4	1945.3	4.3	8.55	4946	<0.001
			Subsample over age 18 (n = 4618)				
Age	30.5	10.4	28.7	11.0	4.25	4616	<0.001
Grades completed	14.8	3.2	16.0	3.0	-10.28	4614	<0.001
Parental SES	4.9	1.5	4.8	1.3	1.39	4572	ns
Year of birth	1915.9	10.4	1916.4	9.9	-1.16	4616	ns
Year interviewed	1946.9	4.4	1945.5	4.3	8.24	4616	<0.001

these details are also relevant to interpreting the present results, as explained below.

The two variables, the mother's and father's ages when the proband was born, refer explicitly to the proband's biological parents. In contrast, the information recorded about the proband's siblings is rather imprecise. The available data are the numbers of older brothers, older sisters, younger brothers, and younger sisters. Numbers over 8 were collapsed into one category, 8+; in other words, a proband with 10 older brothers would show the same number as a proband with 8, and so on. Moreover, there is no way to distinguish full, half-, and step-siblings in the computerized data, although a distinction between full versus half- and step-siblings appears to have been made in the original interview protocols (KIRSGR, 1985). This point is important because the proportions of half- and step-siblings may have been substantial, with unknown and possibly vitiating effects on sibship-related findings. On the positive side, it is clear that deceased siblings were recorded, and that twins were not counted in these four totals.

Height and weight were reported by the respondent, not measured by the interviewer. Height was recorded to the nearest inch. It appears that exact weight was originally recorded in pounds (KIRSGR, 1985), but in the computer files weight is coded in 10-lb. ranges, for example, 12 = 120–129 lb., 13 = 130–139 lb., and so on.

According to Kinsey *et al.* (1948, pp. 189, 299), the age at which the respondent reached puberty was fixed as the date of the first ejaculation, unless there was evidence that ejaculation would have been possible at an earlier age if the individual had been stimulated to orgasm. This principle

was implemented by means of the following guidelines: (i) If the year of first ejaculation coincided with the year in which other signs of physical maturation appeared (e.g., pubic hair, growth spurt, voice change), then that year was taken as the age of puberty. (ii) If the first ejaculation followed other signs of physical maturation by a year or more, and if there was no overt sexual behavior that would have provided opportunity for orgasm prior to the first ejaculation, and if the respondent's memory appeared reliable regarding the date of the other signs of maturation, then the date of the other signs was taken as the age of puberty. (iii) If the first ejaculation occurred as a nocturnal emission, then the previous year was taken as the age of puberty.

It must be stressed that the procedure for quantifying pubertal age described in the preceding paragraph was devised by Kinsey, not by the present writers. Kinsey's interviewers arrived at a single figure for the subject's age of puberty, based on the various milestones and guidelines quoted above, and that is what they recorded. That is what is in the computer files now, not the whole set of events that they might have taken into consideration in estimating the subject's age of puberty. The researcher therefore has no choice but to use the subject's age of puberty as Kinsey's interviewers were trained to estimate it.

Kinsey's interviewers did record the simple datum, age of first ejaculation, in addition to age of puberty, as described above. Age of first prepubertal masturbation to orgasm and age of first postpubertal masturbation to orgasm were also recorded as separate items. We combined them into one variable, age of first masturbation, by simply taking the first age at which masturbation to orgasm occurred.

RESULTS

Sibling Sex Ratio

This analysis was carried out for the 4933 probands in the full sample with complete sibship data. The homosexual probands had 1027 brothers and 927 sisters. Thus the proportion of males in this group's siblings was 0.5256, which corresponds to a sex ratio of 111 males per 100 females. The observed proportion of males was compared with the known proportion of male live births in the general population, 0.5146 (106/206), using the z approximation to the binomial test. The proportion of males in the homosexual group's siblings did not differ from the expected value, $p > 0.30$.

The heterosexual probands had 4669 brothers and 4486 sisters, which represented a proportion of 0.5100 males and a sex ratio of 104. Their

Table II. Mean Number of Siblings of Each Type in Different Groups

	Homosexual		Heterosexual	
Sibling type	$\bar{X}$	SD	$\bar{X}$	SD
Older brothers	0.70	1.12	0.58	0.98
Older sisters	0.59	0.97	0.54	0.93
Younger brothers	0.50	0.89	0.58	0.90
Younger sisters	0.48	0.77	0.58	0.88

proportion of male siblings was also close to the expected value in absolute terms and also did not differ statistically from it, $p > 0.30$.

Birth Order

This variable was investigated with the over-18 subsample, to minimize any possible distorting effects of incomplete sibships. This subsample contained 4606 probands with complete sibship data.

The first statistical procedure for investigating birth order was a 2 × 2 × 2 analysis of variance. There was one between-subjects factor, group (heterosexual or homosexual), and two within-subjects factors, sex of sibling (brother or sister) and age of sibling (older or younger than the proband). The dependent variable was the proband's number of siblings, computed for each group × sibling sex × sibling age combination. The eight cell means thus corresponded to the mean numbers of older brothers, older sisters, younger brothers, and younger sisters for each group. The observed means are presented in Table II.

The results of this analysis are shown in Table III. The main effect for group was close to zero because the two groups reported nearly identical sibship sizes. The mean number of siblings (older brothers + older sisters + younger brothers + younger sisters) was 2.27 (SD = 2.11) for

Table III. Analysis of Variance for Birth Order

Effect	F	p
Group	0.01	ns
Sibling age	9.35	<0.005
Group × Sibling Age	14.15	<0.0002
Sibling sex	9.12	<0.005
Group × Sibling Sex	1.94	ns
Sibling Age × Sibling Sex	4.78	<0.05
Group × Sibling Age × Sibling Sex	0.56	ns

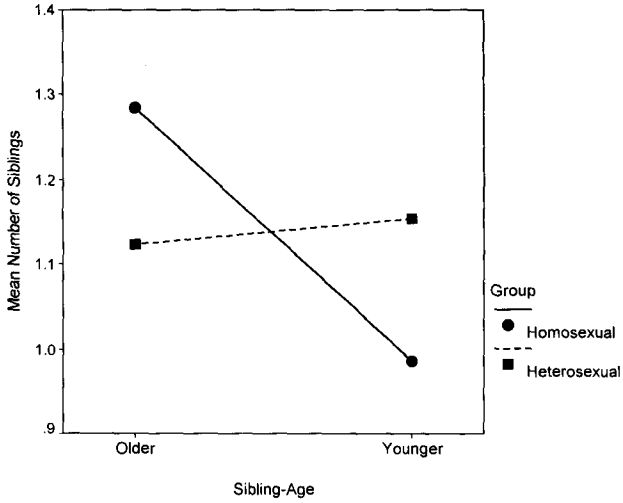

Fig. 1. Birth order of the homosexual probands compared with that of the heterosexual probands. The black circles show the mean number of older siblings and the mean number of younger siblings reported by the homosexual group. The black squares show the means for the heterosexual group.

the homosexual probands and 2.28 (SD = 2.02) for the heterosexual probands.

The main effect for sibling age was significant because the average proband (ignoring group membership) had more older than younger siblings. This result, which was caused entirely by the homosexual group, is superseded by the Group × Sibling Age interaction discussed next.

The Group × Sibling Age interaction, which essentially compared the relative numbers of older siblings in the two groups, tested the hypothesis that homosexual men tend to have a later birth order. The observed interaction is depicted in Fig. 1. This figure shows that the average heterosexual proband had about the same number of older and younger siblings, whereas the average homosexual proband had distinctly more older than younger siblings. This interaction, which was highly significant, thus confirmed previous findings of a later birth order for homosexual men.

The significant main effect for sibling sex confirmed that the average proband (ignoring group membership) had more male than female siblings. This was to be expected, because the true sex ratio at birth of the human population is known to be higher than 0.50, as indicated above.

The Group × Sibling Sex interaction, which essentially compared the relative numbers of male siblings in the two groups, constituted an addi-

tional test of the hypothesis that homosexual males have a higher proportion of brothers. The nonsignificant result confirmed the negative finding, reported earlier, that the homosexual probands in this study did not have a higher than expected sibling sex ratio.

The Sibling Age × Sibling Sex interaction tested whether, ignoring group membership, the sex ratio of older siblings differed from the sex ratio of younger siblings. The result showed that the sex ratio of older siblings was significantly higher. This outcome, like the significant main effect for sibling sex, was also predictable from general demographic findings. It has been well established that the human sex ratio is correlated with birth order, the earlier births in a sibline having a higher probability of being male (Chahnazarian, 1988; James, 1987).

The three-way interaction, Group × Sibling Age × Sibling Sex, tested whether, with all the previous effects controlled for, there remained any residual excess or deficiency in older brothers, older sisters, younger brothers, or younger sisters in one group compared with the other. The relevance of this interaction is that it provided one test of the hypothesis that homosexual men are born late relative to their brothers only, against the hypothesis that they are born late relative to their brothers and to their sisters. The result did not approach statistical significance, lending support to the second hypothesis.

It is questionable whether the foregoing approach offers the most powerful test of the hypothesis that the late birth order of homosexual men relates primarily to their number or proportion of older brothers. We therefore conducted a further investigation, which consisted of two analyses of covariance. In the first, the independent variable was group (heterosexual or homosexual), the dependent variable was number of older brothers, and the covariates were number of older sisters, number of younger brothers, and number of younger sisters. In the second, the independent variable again was group, the dependent variable was number of older sisters, and the covariates were number of older brothers, number of younger brothers, and number of younger sisters. The results are shown in Table IV. The homosexuals had a significantly greater number of older brothers, even with the remaining three classes of siblings controlled for. In contrast, there was no difference between homosexual and heterosexual men in regard to number of older sisters when the remaining three classes of siblings were controlled for. The results therefore indicated that the late average birth order of homosexual men is driven entirely by their greater number of older brothers, and that birth order among sisters has no relation to sexual orientation, once birth order among brothers has been taken into account.

Table IV. Analysis of Covariance for Older Brothers (Controlling for Older Sisters, Younger Brothers, and Younger Sisters) and Analysis of Covariance for Older Sisters (Controlling for Older Brothers, Younger Brothers, and Younger Sisters)

Dependent variable	*F*	*df*	*p*
No. of older brothers	5.66	1, 4601	<0.02
No. of older sisters	0.01	1, 4601	>0.90

Parental Age

This analysis was carried out on the full sample. There were 3922 probands with complete data for parental age and for the other variables examined (parental SES, year of birth, and birth order).

The mean age of the homosexuals' fathers at the time that these probands were born was 32.93 years (SD = 7.55), and the mean age of the heterosexuals' fathers was 32.30 years (SD = 6.95). The reliability of this age difference was assessed in a multiple regression analysis, in which the criterion was paternal age, and the predictors were parental SES, year of birth, and sexual orientation (coded as homosexual = −1 and heterosexual = 1). The results are summarized in Table V, Equation 1.

Table V, Equation 1 shows that the slightly greater age of the homosexuals' fathers was statistically significant. Comparison of the beta coefficient for sexual orientation with the zero-order correlation between paternal age and sexual orientation (which also rounded to −.03) revealed that controlling for parental SES and year of birth had a negligible effect on the beta coefficient for sexual orientation. We can state here that controlling for parental SES and year of birth also had virtually no effect on any of the other findings for sexual orientation reported later, which saves us the necessity of repeating this for every analysis. The other statistically significant finding in Equation 1 was that paternal age decreased over the years in which these probands were born (1861–1941). That result is consistent with demographic findings for the general population during this period (Ryder, 1980).

In Table V, Equation 2, we added one more predictor, namely, birth order. The measure of birth order used here was the quantity, number of older siblings minus number of younger siblings. Because this measure is not necessarily correlated with sibship size, it is in that sense a "purer" measure of birth order than the simple birth rank (1 = firstborn, 2 = second born, and so on). The results show that, when birth order was controlled for, paternal age was no longer significantly related to sexual orientation. Thus, we were unable, in this sample, to eliminate the possi-

Table V. Beta Coefficients from Regression Equations Predicting Paternal and Maternal Ages at the Time of the Proband's Birth

	Predictor			
Criterion	Sexual orientation	Parental SES	Year of birth	Birth order
Paternal age				
Equation 1	−.03[a]	.02	−.08[d]	
Equation 2	−.01	.02	−.12[d]	.50[d]
Maternal age				
Equation 3	−.02	.03[a]	−.06[c]	
Equation 4	.01	.03[b]	−.11[d]	.56[d]

[a] $p < 0.05$.
[b] $p < 0.02$.
[c] $p < 0.0002$.
[d] $p < 0.0001$.

bility that the elevated paternal age of homosexual men is merely an artifact of their later birth order.

The mean age of the homosexuals' mothers was 28.66 years (SD = 6.27), and the mean age of the heterosexuals' mothers was 28.28 years (SD = 5.95). Table V, Equations 3 and 4 reveal that maternal age was not significantly related to the proband's sexual orientation, with or without birth order controlled for. Maternal age was higher for women of higher SES and, like paternal age, decreased over the years in which these probands were born. The first result is consistent with demographic findings for the general population (e.g., Rindfuss *et al.*, 1980), as is the second (Ryder, 1980).

Age of Puberty

This analysis was carried out on the full sample. The number of probands with complete data on all the variables studied was 4841 for age of puberty (as determined by the Kinsey interview guidelines), 4823 for age of first ejaculation, and 4560 for age of first masturbation.

The mean age of puberty (Kinsey guidelines) was 12.64 years (SD = 1.31) for the homosexual group, and 12.94 years (SD = 1.22) for the heterosexual group. The reliability of this age difference was assessed in a multiple regression analysis, in which parental SES and year of birth were simultaneously controlled for. The results are presented in Table VI, Equation 1.

The pubertal age difference was highly significant. The results further showed that probands from higher socioeconomic backgrounds reached puberty earlier, which confirms previous analyses that used different subsam-

Table VI. Beta Coefficients from Regression Equations Predicting Age of Puberty, Age of First Ejaculation, and Age of First Masturbation

	Predictor				
Criterion	Sexual orientation	Parental SES	Year of birth	Birth order	Sexual orientation × birth order
Puberty					
Equation 1	.09[c]	−.05[b]	−.07[c]		
Equation 2	.11[c]	−.05[b]	−.07[c]	.01	−.02
Ejaculation					
Equation 3	.12[c]	−.04[a]	−.06[c]		
Equation 4	.13[c]	−.04[a]	−.06[c]	.00	−.01
Masturbation					
Equation 5	.15[c]	−.00	−.13[c]		
Equation 6	.14[c]	−.00	−.13[c]	−.00	.01

[a] $p < 0.02$.
[b] $p < 0.0005$.
[c] $p < 0.0001$.

ples of the Kinsey data (Kinsey *et al.*, 1948; Rushton and Bogaert, 1988) and agrees with general demographic research (Tanner, 1962). The results showed, finally, that the age of puberty decreased over the years when these probands were born, which also agrees with general demographic research (Grumbach and Styne, 1992; Tanner, 1962).

In Table VI, Equation 2, we added two more predictors, namely, birth order and the interaction of sexual orientation and birth order. If age of puberty decreases as birth order increases in men, and if homosexual men have an earlier puberty than heterosexual men merely because they have a later birth order, then the pubertal age difference between these groups should disappear when birth order is controlled for. The interaction term was added in case the relation between birth order and age of puberty should be different for homosexual and heterosexual males. In this analysis, we used the simple birth rank as our measure of birth order, to make our investigation more similar to the previously cited research on females (Dann and Roberts, 1984; Roberts and Dann, 1975).

Table VI, Equation 2 shows that pubertal age was unrelated to birth order, and that there was no difference in this regard between the homosexual and heterosexual males. These results indicate that the earlier pubertal age of the homosexual group was not a result of their later birth order.

The mean age of first ejaculation was 12.75 years (SD = 1.46) for the homosexual group, and 13.25 years (SD = 1.54) for the heterosexual group. All findings for this variable (Table VI, Equations 3 and 4) were closely

Table VII. Beta Coefficients from Regression Equations Predicting Height and Weight

Criterion	Predictor					
	Sexual orientation	Parental SES	Year of birth	Age	Age^2	Height
Height						
Equation 1	.03[a]	.13[d]	.13[c]	−.02		
Weight						
Equation 2	.11[d]	.06[d]	.16[d]	.70[d]	−.44[d]	
Equation 3	.10[d]	.00	.10[b]	.69[d]	−.42[d]	.48[d]

[a] $p < 0.10$.
[b] $p < 0.005$.
[c] $p < 0.001$.
[d] $p < 0.0001$.

similar to those for age of puberty. That is not surprising, because the determination of pubertal age relied heavily on age of first ejaculation.

Age of first masturbation to orgasm showed the largest between-groups difference: The mean age was 12.40 years (SD = 2.69) for the homosexual group, and 13.63 years (SD = 3.19) for the heterosexual group. This difference was, of course, also highly significant (Table VI, Equations 5 and 6). The regression equations reveal one notable contrast between age of first masturbation and the other two criterion variables: There was no relation at all between parental SES and the age at which the proband first masturbated to orgasm.

Height and Weight

These analyses used the over-18 subsample, to minimize the relation between age and height. The number of probands with complete data for all variables examined was 4563 for height, and 4558 for weight.

The homosexuals were minutely shorter than the heterosexuals: The mean height of the homosexual group was 69.67 inches (SD = 2.64), and that of the heterosexual group was 69.86 inches (SD = 2.67). The reliability of this height difference was assessed in a multiple regression analysis, which controlled for age as well as parental SES and year of birth. The results are presented in Table VII, Equation 1.

The difference in height was not statistically significant, according to the two-tailed test used elsewhere in this study. It might be argued that a one-tailed test could be applied here, because this analysis was intended to replicate the previous finding of a shorter stature for homosexual men reported by Blanchard *et al.* (1995a). In a one-tailed test, the observed

height difference would be significant at the $p < 0.05$ level. Table VII, Equation 1 also shows that the children of wealthier parents attained a taller adult height, which is consistent with prior demographic research (Tanner, 1962), and that final adult height increased over the years when these probands were born, which also agrees with prior demographic research (Tanner, 1962). As intended, age had no relation to height in this subsample.

As already stated, weight was recorded in 10-lb. intervals. The mean score of the homosexual group was 15.34 (SD = 2.10), and that of the heterosexual group was 15.86 (SD = 2.12). Thus, the average homosexual proband was around 5.11 lb. lighter than the average heterosexual proband ([15.8551 - 15.3444] × 10 lb./interval = 5.107 lb.). The reliability of this substantial weight difference was assessed in a multiple regression analysis, which controlled for age and age squared as well as parental SES and year of birth. We added the quadratic term for age because we expected the relation between age and weight to be nonlinear. (People gain weight throughout early adulthood and middle age, but this eventually levels off.) The results are presented in Table VII, Equation 2.

Equation 2 shows that the difference in weight was highly reliable. Probands from higher socioeconomic backgrounds weighed more (a point clarified later) and probands born in more recent years weighed more. Weight was nonlinearly related to age, as predicted.

In Table VII, Equation 3, we added one more predictor, namely, height. The beta coefficient for sexual orientation was barely affected, because the two groups were nearly the same height to begin with. The relation between weight and parental SES disappeared. This means that the higher class probands weighed more only because they were taller; there was no relation between social class and weight adjusted for height. The coefficient for year of birth was still significant, indicating that weight, even after adjustment for height, increased over the years in which these probands were born. That is consistent with known trends in the general population (Sinclair, 1989; Weil, 1984). The unstandardized coefficient for sexual orientation in Equation 3 (not shown in Table VII, which presents only the standardized coefficients) revealed that, after adjustment for parental SES, year of birth, linear and quadratic terms for age, and height, the mean difference in weight between the two groups increased to 5.71 lb.

DISCUSSION

The present study, perhaps because of its large sample, confirms most of the biodemographic differences between homosexual and heterosexual

men reported previously in the literature. There is, moreover, a striking correspondence between the statistical significance of each difference observed in this study and the amount of evidence for that same difference in prior research studies. That is, the variables that were most strongly related to sexual orientation in this investigation—birth order, pubertal age, and weight—are also those with the longest history of prior positive findings. Conversely, the variables that were weakly related or unrelated to sexual orientation—height, paternal age, and sibling sex ratio—are also those with mixed results in the previous literature.

Birth Order

As in earlier studies (Blanchard and Sheridan, 1992; Blanchard and Zucker, 1994; Blanchard *et al.*, 1995b, 1996; Hare and Moran, 1979; Slater, 1962; Zucker and Blanchard, 1994), the mean birth order of the homosexual probands was significantly later than that of heterosexual controls. Blanchard and Zucker (1994) concluded that birth order appears to be the single most reliable family-demographic difference between homosexual and heterosexual men. That assessment is reinforced by the present study.

The birth order phenomenon has now been demonstrated in probands examined in recent years and probands examined decades ago, in samples collected in England, Canada, the Netherlands, and the United States, in psychiatric patients and in nonpatient volunteers, in subjects examined in adulthood and subjects examined in childhood, and in gender dysphorics as well as individuals whose gender identity is congruent with their anatomy. As already stated, all the samples studied so far have consisted entirely or predominantly of whites. Aside from that limitation, however, the collective evidence suggests that a late birth order is associated with homosexuality in men regardless of the local culture.

The results of applying statistical procedures, specifically designed to investigate whether the birth order effect relates to older brothers only or to older siblings regardless of sex, indicate that only older brothers are associated with an increased likelihood of homosexuality. The results of this analysis are quite clear-cut, and the sample size appears to be adequate. Since the completion of the present study, these results have been confirmed in a new, large sample of homosexual and heterosexual volunteers (Blanchard and Bogaert, 1996). Therefore, the conclusion that the birth order effect is driven by older brothers can be regarded with almost as much confidence as the existence of the birth order effect itself.

Some prior explanations of the birth order effect have in fact assumed—although without any hard data to justify it—that the birth order

effect is solely produced by older brothers, and that the existence of older sisters is irrelevant to this effect or might actually prevent it. Nash and Hayes (1965) suggested that homosexuality may result when parents, especially mothers, disappointed in their desire for a girl by a succession of boys, treat one of the late-born boys as a girl. A similar hypothesis was framed by Money (1970), who conjectured that an effeminate gender identity may develop more easily in boys whose families have a shortage of sisters and daughters. Presumably, this identity would develop in response to the family's perceived desire for a girl. These hypotheses predict that homosexual men should show a deficiency of older sisters as well as an excess of older brothers. This prediction is not supported by the present data (see Table II). The disconfirmation of the foregoing hypotheses does not, of course, rule out the possibility of other psychosocial explanations.

The one previous biological explanation of the birth order effect also assumes that it is caused by older brothers. That is the hypothesis that antibodies to testosterone, produced by a woman pregnant with a male fetus and passed through the placenta from the mother to the fetus, could reduce the hormone's biological activity and thus compromise the sexual differentiation of the fetal brain (MacCulloch and Waddington, 1981; see also Ellis and Ames, 1987, p. 248). Such a maternal immune response might develop over several pregnancies (like the Rh incompatibility phenomenon), leading to a higher probability of homosexuality for later born males. This hypothesis also attributes the birth order effect to older brothers, because male fetuses produce greater quantities of testosterone than female fetuses, and the testosterone produced by female fetuses does not pass across the placenta into the maternal circulation (Meulenberg and Hofman, 1991).

There are various difficulties with MacCulloch and Waddington's hypothesis, including the general nonantigenicity of steroid hormones and the lack of empirical evidence that some pregnant women do, in fact, develop antibodies to testosterone. However, our finding that the likelihood of homosexuality correlates only with older brothers tends to support the notion that the birth order effect, if biological in origin, probably does involve some kind of maternal immune response. It has been argued that male fetuses are more antigenic to the mother than female fetuses, and that male fetuses are therefore more likely to provoke maternal immune reactions, with incremental effects on each succeeding pregnancy (Gualtieri and Hicks, 1985). That view does not, of course, exclude the possibility that a greater effect of older brothers on male sexual orientation might actually result from some other kind of difference between male and female fetuses, for example, size. It is difficult to imagine, however, what these other differences might be. Therefore a stronger biological ef-

fect of older brothers versus older sisters would seem easiest to explain in immunological terms.

Age of Puberty

The present study reinforces the varied research indicating an earlier puberty for homosexual males (Bieber *et al.*, 1962; Cole, 1983; Manosevitz, 1970, 1972; McCormick, 1990; Saghir and Robins, 1973; Stephan, 1973; Tripp, 1982). It should be stressed that Kinsey *et al.* (1948) were themselves the first to point out a relation between homosexual activity and age of puberty in their data. They did not, however, assess the reliability of this effect or attempt to control for the possibly confounding effects of birth order, and their sample was not identical to ours, which included males interviewed up to 1963. Our analyses of pubertal age, therefore, are not redundant with theirs.

It is necessary to consider two potential methodological problems with the present findings of an earlier pubertal age for homosexual males. The first of these concerns the global measure of pubertal age only. The second applies to all three measures of pubertal age used in this study.

Puberty is a lengthy process rather than a brief transitional period, and the various signs of maturation in males (e.g., appearance of pubic hair and voice change) might be separated by a number of years. It is therefore questionable whether any composite measure of age of onset of puberty, like the global measure of pubertal age estimated by Kinsey's interviewers, could be a meaningful index of individual differences. Two lines of evidence argue that Kinsey's global measure of pubertal age, despite its obvious arbitrariness, was in fact sufficiently sensitive to individual differences for the purposes of this study. The first is that the findings we obtained with this measure—that it correlated with sexual orientation, parental SES, and year of birth—replicated the findings obtained in other studies using other measures. The second is that the findings we obtained with this composite variable closely resembled the findings we obtained with the two simple variables, age of first ejaculation and age of first masturbation. In fact, if we had simply dropped the global estimate of pubertal age from this study, we would have arrived at precisely the same conclusions.

The second potential methodological problem, as already indicated, concerns all three indexes of pubertal age: age of first masturbation, age of first ejaculation, and globally estimated age of onset of puberty. This is the problem of accuracy of recall. It is possible that homosexual and heterosexual boys, on average, go through puberty at exactly the same time, but that adult homosexual men tend to recall pubertal milestones as having

occurred earlier. One might conjecture, for example, that homosexual men remember pubertal events differently because these events were associated, for them, with feelings of guilt, shame, or fear of ostracism provoked by their emerging awareness of sexual interest in other males. Such ad hoc hypotheses are likely to raise as many questions as they answer. (Why should the putative emotional loading of these events systematically cause them to be remembered as happening *earlier?*) There is no compelling reason, therefore, to prefer explanations in terms of systematic recall bias to the more parsimonious one that homosexual men recall pubertal events as occurring earlier because they did, in fact, occur earlier.

Storms (1981) advanced a psychosocial theory of the pubertal age effect, which asserts that age of puberty has an indirect but causal effect on sexual orientation. He hypothesized that a pubescent boy's sexual drive becomes directed toward his peer group; that boys at younger ages tend to have all male friends, whereas boys at older ages usually have female as well as male friends; and that boys who reach puberty at earlier ages are therefore more likely to become conditioned to respond sexually to males. Storms assumed that patterns of peer group membership are the same for all boys, regardless of their eventual sexual orientation. Prospective (Green, 1987) and retrospective (Bailey and Zucker, 1995) research has shown, however, that prehomosexual boys are more likely to prefer the company of girls than are preheterosexual boys. They are therefore *more* likely to have female peers when they reach puberty, not less likely, as Storms's theory requires.

One could just as easily formulate a biological explanation of the pubertal age difference: Pubertal age is sex-dimorphic, being earlier in heterosexual females than in heterosexual males (Underwood and Van Wyk, 1992). Homosexual males resemble heterosexual females in this regard because relevant, sex-dimorphic structures in their brains are differentiated according to the female pattern. The plausibility of this notion is supported by one postmortem study showing that, in homosexual men, a sex-dimorphic interstitial nucleus of the anterior hypothalamus, INAH 3, is shifted in size toward the range typical for women (LeVay, 1991), and another postmortem study of the brain yielding similar results for the anterior commissure (Allen and Gorski, 1992). Another explanation is that stress precipitates an early puberty in prehomosexual boys. This hypothesis is suggested by the findings that stress may accelerate age of menarche in girls (Belsky *et al.*, 1991; Surbey, 1990; Wierson *et al.*, 1993), and that prehomosexual boys experience more stress than their preheterosexual peers, for reasons related to their sexual orientation (e.g., Harry, 1983). The foregoing hypotheses assume that pubertal age has no causal influence on sexual orientation, and thus illustrate that potential explanations of the

pubertal age effect can differ in fundamental ways besides their emphasis on biological versus psychological processes.

Weight

The last of our strongly positive results is the finding, consistent with those of earlier investigators (Blanchard *et al.*, 1995a; Evans, 1972; Gettelman and Thompson, 1993; Herzog *et al.*, 1991; Nedoma and Freund, 1961; Sanders *et al.*, 1985; Silberstein *et al.*, 1989; Terman and Miles, 1936; Tourney *et al.*, 1975), that homosexual men tend to weigh less than heterosexual men. It is noteworthy that the weight difference observed in this study, 5.71 lb. after adjustment for age and height, is about the same as the 6.04-lb. difference observed by Blanchard *et al.* (1995a) in a large sample of homosexual and nonhomosexual gender-dysphoric men, whose body-image concerns and life-styles were presumably very different from those of the present sample.

One might conjecture that the general tendency for homosexual men to weigh less results from a greater preoccupation with slimness, but there are no empirical data that directly support this. There is evidence that clinical eating disorders are more probable in homosexual than in heterosexual men (Fichter and Daser, 1987; Herzog *et al.*, 1984, 1991; Robinson and Holden, 1986; Schneider and Agras, 1987), and there is some positive evidence that homosexual men are more preoccupied with slimness than heterosexual men (Gettelman and Thompson, 1993; Siever, 1994; Yager *et al.*, 1988) along with mixed or negative findings on that point (Herzog *et al.*, 1991; Silberstein *et al.*, 1989). There is no published evidence, however, of a correlation between preoccupation with slimness and actual body weight in homosexual men, outside of that minuscule proportion who develop clinical eating disorders. Moreover, two of the three studies that produced the clearest self-report data indicating that homosexual men have a stronger "drive for thinness" than heterosexual men failed to find any difference in actual weight (Siever, 1994; Yager *et al.*, 1988), which suggests that, in nonclinical male samples, the correlation between the wish to be slender and actual weight may be small. Finally, it should be noted that the studies that have found homosexual men to be lighter than heterosexual controls have simply examined gross weight; they have not demonstrated that this weight difference is primarily a difference in quantity of fat. It would therefore be premature to discount other possible explanations of the weight difference between homosexual and heterosexual men, for example, that homosexual men tend to have a lighter frame or less muscular bulk.

Height

The mean height of the homosexual group was only fractionally less than that of the heterosexual group, although the observed difference was statistically significant when we applied the most liberal test possible. On balance, this result tends to support previous findings of no height differences (Evans, 1972; Sanders *et al.*, 1985; Tourney *et al.*, 1975). We can only speculate on the discrepancy between these negative findings and the previous finding that homosexual gender-dysphoric men are markedly shorter than nonhomosexual gender-dysphoric controls and also shorter than population norms (Blanchard *et al.*, 1995a). It is, of course, always possible that the latter result was caused by chance or, more likely, by some undetected confounding variable. It is also, however, possible that only extremely feminine homosexual men are shorter than expected.

Parental Age

The mean age of the homosexuals' fathers at the time that these probands were born was slightly greater than that of the heterosexuals' fathers. At the same time, the mean age at birth of the homosexuals' mothers was not significantly elevated. Both results agree with the three previous studies that found elevated paternal but not maternal ages (Abe and Moran, 1969; Blanchard and Zucker, 1994; Hare and Moran, 1979), and disagree with the studies that found that the fathers of homosexual men are younger than the fathers of controls (Robertson, 1972) or the same age (Blanchard and Sheridan, 1992).

Although the findings for paternal age in the present study were rather weak, we believe that there is sufficient evidence of a possible paternal age effect to warrant further investigation. It is true that the collective research suggests that the paternal age effect is less consistent than the birth order effect. On the other hand, the evidence for the paternal age effect was stronger than that for the birth order effect in two previous studies (Blanchard and Zucker, 1994; Hare and Moran, 1979).

Both psychosocial and biological explanations for male homosexuals' older fathers have been proposed, in this instance, by the same authors. Abe and Moran (1969) speculated that an effect of something in the intrafamilial environment associated with high paternal age might be a causative or facilitating factor in homosexuality. They also noted, however, that other possibilities should be excluded, for example, that in both fathers and sons there is a genetic predisposition to "sexual deviance," manifesting in the fathers as a tendency to marriage at a later age than the norm. A

different type of genetic explanation has been suggested by Raschka (1995), who argued that the paternal age effect might reflect an increased mutation rate in the spermatogenesis of older fathers.

Sibling Sex Ratio

Our results do not confirm the observation that homosexual men have a higher than expected proportion of male siblings (Blanchard and Sheridan, 1992; Blanchard *et al.*, 1995b; Jensch, 1941; Kallmann, 1952; Lang, 1960). The present study, therefore, joins those of Slater (1958) and Blanchard and Zucker (1994) as a third notable failure to replicate the sibling sex ratio finding in a large sample.

Our negative finding for sibling sex ratio may have to do with specific characteristics of the sample studied. Blanchard *et al.* (1995b) pointed out that the sibling sex ratios obtained in their study and in the study by Blanchard and Sheridan (1992) were among the highest ever reported for samples of homosexual males (see review in Suarez and Przybeck, 1980). In their view, the fact that the samples in both studies consisted of extremely feminine homosexuals suggests that elevated sibling sex ratios are found primarily in effeminate homosexual men. Blanchard *et al.* (1995b) further noted that this hypothesis is congruent with an earlier finding from Jensch (1941). Jensch examined a selected subsample of 244 highly effeminate homosexuals; the sex ratio of their siblings, 157, was considerably higher than that of his unselected homosexual probands, which was 114.

Studies conducted after the study by Blanchard *et al.* (1995b) have produced further findings consistent with their hypothesis. Homosexual probands did not show an elevated sibling sex ratio in the present study or in the study by Blanchard and Zucker (1994), both of which investigated homosexual men who were selected without regard to gender identity or gender role behavior, and who were probably not effeminate, for the most part. In contrast, a sample of transsexual (i.e., completely female-identified) homosexuals recently collected in the Netherlands showed a markedly elevated sibling sex ratio of 134, which was significantly higher than the expected value (Blanchard *et al.*, 1996).

A correlation between excess brothers and effeminacy in homosexual males—assuming that the recent pattern of findings holds—could arise in various ways. A predominantly male sibship might be a risk factor for cross-gender identification in prehomosexual boys, but have nothing to do with the development of sexual orientation per se. Alternatively, a predominantly male sibship might be associated with a specific developmental pathway to

homosexuality—a pathway more likely to entail cross-gender identification than other developmental routes leading to a homosexual orientation.

Future Research

Our closing remarks concern future directions for research on the origins of sexual orientation. The possibility raised in the preceding paragraph, that homosexual orientations may be attained through several different developmental pathways, has long been recognized by researchers in human sexuality. The accumulating data indicate that this is almost certainly the case. There is now evidence that a gene within the Xq28 region of the X chromosome underlies the sexual orientation of some homosexual men (Hamer *et al.*, 1993). The birth order data illustrate that genes (either in Xq28 or elsewhere) cannot completely account for sexual orientation, because purely genetic phenomena do not show birth order effects. The collective findings for paternal age, tenuous as they are, may point toward yet another pathway; it is possible that these findings are weak merely because this pathway is relatively rare and is therefore likely to have few representatives in any developmentally heterogeneous sample of homosexual men.

The apparent diversity of the antecedents of male homosexuality implies that research in this area would proceed more surely if investigators studied samples of homosexual men whose sexual orientations were likely to have the same origins. An example of this approach is the study by Hamer *et al.* (1993). By assembling a sample of homosexual men who all had homosexual brothers, they increased the likelihood that the sexual orientation of these men had some genetic component.

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