Behavior Genetics, Vol. 25, No. 5, 1995

Development and Familiality of Sexual Orientation in Females

Angela M. L. Pattatucci[1,2] and Dean H. Hamer[1]

Received 25 Oct. 1994—Final 15 Feb. 1995

The development and familial clustering of sexual orientation were studied in 358 heterosexual, bisexual, and homosexual women. Sexual orientation, as measured by the Kinsey scales, was diverse yet showed statistical congruity and stability over a 1- to 1.5-year time span. Developmental patterns, as measured by retrospective reports on the ages of first sexual or romantic attraction and of self-acknowledgment of sexual orientation, were very similar in the heterosexual and lesbian subjects except for the difference in object choice. The bisexual subjects displayed intermediate patterns that were more similar to the heterosexuals' on most facets yet closer to the lesbian subjects' on other dimensions. Familial clustering of nonheterosexual orientation was significant. Using two criteria, elevated rates of nonheterosexuality were found in four classes of relatives: sisters, daughters, nieces, and female cousins through a paternal uncle. The current data are not sufficient to distinguish between genetic and shared environmental sources of this familial aggregation. We discuss the possibility of using developmental criteria to differentiate between inherited and cultural sources of variation in female sexual orientation.

KEY WORDS: Homosexuality; lesbian; bisexual; sexual orientation; familiality; development; heredity.

INTRODUCTION

Over half a century has past since Hirshfeld (1936) commented on the apparent familiality of both female and male homosexuality. However, systematic behavioral genetic studies designed to examine the sources of this familial aggregation have only recently been attempted.

Genetic studies of sexual orientation in women have been particularly sparse. Familial aggregation has been observed in two nuclear family studies in which homosexual women reported having more lesbian sisters than did heterosexual women (Pillard, 1990; Bailey and Benishay, 1993). However, the genetic and environmental contributions to this familial clustering have not been resolved by the four published twin studies, which have yielded somewhat contradictory results. Bailey *et al.* (1993), who analyzed the largest and most systematically collected series of subjects, estimated heritability (h^2) to be approximately .5 (range, .27 to .76) based upon concordance rates of 48% for monozygotic twins compared to 16% for dizygotic twins raised together. Similarly, Whitman *et al.* (1993) reported a 75% concordance rate for four pairs of female monozygotic twins. In contrast, Eckert *et al.* (1986) described four sets of female identical twins raised apart who were discordant for sexual orientation. King and McDonald (1992) also found low twin concordance rates for homosexuality in their combined study of female and male cotwins but did not break down the data according to sex.

The single published adoption study of female sexual orientation showed that the rate of homo-

[1] Laboratory of Biochemistry, National Cancer Institute, Building 37, Room 4A13, National Institutes of Health, Bethesda, Maryland 20892. Fax: (301)402-3095; E-mail: Luciana%bchem.dnet@dxi.nih.gov.

[2] To whom correspondence should be addressed.

0001-8244/95/0900-0407$07.50/0

sexuality was lower in the adoptive than in the biological sisters of lesbian probands (Bailey *et al.*, 1993). Although this was interpreted to support a genetic hypothesis, some effect of shared environmental factors could not be ruled out because heterosexual probands were not included in the study. This highlights one of the difficulties with research in this area, namely, the uncertainty about the population incidence of nonheterosexuality in females; current estimates range from 0.6 to over 10%, depending on the criteria and sampling strategy employed (Kinsey *et al.*, 1953; Bailey and Benishay, 1993; Johnson *et al.*, 1994). Therefore it is prudent to establish background rates independently for each new protocol and group of subjects under study.

Several papers have addressed the question of whether the familialities of female and male homosexuality are etiologically independent or overlapping, but the results and interpretations are ambiguous. The prediction of the independent model is that female and male homosexuality will run in different families; that is, that female homosexual subjects will have an excess of lesbian sisters but not of gay brothers, whereas male homosexual subjects will show the opposite pattern. Pillard (1990) and Bailey and Benishay (1993) did find that lesbians had more homosexual sisters than brothers, a noteworthy finding since the population incidence of homosexuality is approximately half as high in women as in men; however, the differences between sisters and brothers were not statistically significant in the samples studied. Similarly, Pillard and Weinrich (1986), Bailey *et al.* (1991), Bailey and Pillard (1991), and Hamer *et al.* (1993) found that gay men had more homosexual brothers than sisters, but again, the differences were not significant. In contrast, Bailey and Bell (1993), who reanalyzed data collected by Bell *et al.* (1981a, b), found that both gay men and lesbians had more homosexual brothers than sisters. The prediction of the overlapping model is that elevated rates of homosexuality will be found in the opposite-sex siblings of both female and male homosexual subjects. Significant evidence in this direction has been presented by Pillard (1990), Bailey and Benishay (1993), Hamer *et al.* (1993), and Bailey and Bell (1993). Hence there are data to support both the independent and the overlapping models for the familial aggregation of female and male homosexuality, and it is possible that both hypotheses are partially correct.

A clear prediction for a genetically influenced trait is that it should appear at elevated rates in second and third degree lineages as well as within the nuclear family. Hamer *et al.* (1993) found that male homosexuals had higher than baseline rates of gay maternal uncles and male cousins through maternal aunts but not of gay paternal relatives. This led to the hypothesis of sex-linked transmission in selected families and the eventual identification of a linkage between DNA markers on a discrete region on the X chromosome known as Xq28 and male sexual orientation. Similar extended family and molecular studies of female sexual orientation have not been reported.

The clearest evidence linking genetics and sexual orientation in a subset of women comes from studies of female patients with congenital adrenal hyperplasia (CAH), a group of enzymatic deficiencies in cortisol biosynthesis transmitted by autosomal recessive genes. The most common form, accounting for 95% of the cases, is a deficiency in 21-hydroxylase activity mediated by the cytochrome P450c21 gene located within the human HLA major histocompatibility locus on the short arm of chromosome 6 (Higashi *et al.*, 1986; Miller, 1988). Insufficient cortisol production results in an increased accumulation of androgens, causing a masculinization of the genitalia to varying degrees. Influences on the developing brain are also believed to occur but are not well understood. However, a "masculine" pattern of gender-role behavior has been reported for CAH patients in several studies (Money and Ehrhardt, 1972; Ehrhardt, 1979; Ehrhardt and Meyer-Bahlburg, 1981; Slijper, 1984). Furthermore, recent studies focusing on adult psychosexual development and sexual orientation indicate that females with CAH have significantly higher rates of homosexual orientation, behavior, and fantasy coupled with lower rates of heterosexual activity compared to their nonaffected sisters (Dittman *et al.*, 1990a, b, 1992). These results suggest that excess prenatal androgens can predispose some women toward development of a homosexual orientation. However, because CAH is a relatively rare condition, and a majority of patients develops an apparent heterosexual orientation, it is evident that CAH plays only a minor role in the overall variability of female sexual orienta-

tion within the general population. Other putative predisposing genetic and psychosocial factors that might be pertinent to a larger percentage of homosexual females have yet to be identified.

As a first step in addressing the possible role of inheritance in sexual orientation in females, we conducted a familial and developmental analysis of 358 female probands. Our goal was to ascertain the degree of familial clustering of homosexual and/or bisexual orientations and to determine if discernable patterns of transmission could be identified. Additionally, we investigated possible developmental differences among heterosexual, bisexual, and lesbian probands with the aim of identifying potential markers for genetic or environmental loading.

METHODS

Announcements seeking participants for the study were distributed to local homophile organizations and social groups and to Women's Studies programs at universities within the Washington, D.C., metropolitan area. The announcements stated that the study was on "sexuality in women" but not that it was focused on sexual orientation. The homophile groups were targeted to obtain lesbian probands, whereas the Women's Studies programs were chosen to recruit a sampling of heterosexual subjects. Bisexual participants were found in both groups.

This recruiting strategy resulted in a population consisting of 358 female probands over the age of 18 years. Although the procedure achieved its goal in obtaining diversity with respect to sexual orientation, we emphasize that our subject population is neither random nor necessarily representative of any particular sexual orientation nor of sexuality in women in general. Therefore, we use terms such as *heterosexual, bisexual, lesbian, homosexual,* and *gay* to enhance presentational clarity rather than to imply that the conclusions drawn from the data are generally applicable to any particular group. Several researchers have noted that it is difficult, if not impossible, to obtain a randomized or representative sample of a marginalized and secretive population such as homosexuals (Gonsiorek, 1982; Morin, 1977; Weinberg, 1970). Less commented upon is the problem of recruiting a comparable group of heterosexuals who are comfortable discussing sexual and gender-related issues; this was the motivation for seeking the heterosexual participants through Women's Studies programs.

Participants signed an informed consent and then completed a structured interview covering demographics, childhood gender identification, childhood and adolescent sexual development, adult sexual behavior, and sexual orientation. Subjects were allowed to refuse any question asked and were invited to qualify any answer to a question that they deemed did not accurately reflect their experience. The participants were white non-Hispanic (84.6%), Hispanic (7.3%), African American (3.9%), Asian (3.4%), and Middle-Eastern (0.8%), with a mean ($\pm$SD) family annual income of \$46,000 $\pm$ \$21,000, and a mean ($\pm$SD) educational level of 15.0 $\pm$ 2.8 years. Probands ranged in age from 18 to 68 years, with a mean ($\pm$SD) age of 31.4 $\pm$ 8.7 years.

Sexual orientation was assessed by self-report using the 7-point Kinsey scale, ranging from 0 for exclusive heterosexuality or opposite-sex romantic/sexual relations to 6 for exclusive homosexuality or same-sex romantic/sexual relations (Kinsey *et al.*, 1948, 1953). The probands rated themselves on four individually administered scales: self-identification, sexual/romantic attraction, sexual/romantic fantasy, and sexual behavior. The four scores were averaged to yield a composite Kinsey self-rating as follows. Probands with averages <0.5 were designated Kinsey 0; 0.5–1.49, Kinsey 1; 1.5–2.49, Kinsey 2; 2.5–3.49, Kinsey 3; 3.5–4.49, Kinsey 4; 4.5–5.49, Kinsey 5; and 5.5–6.0, Kinsey 6. A total of 25 probands declined to rate themselves on one or more of the attraction, fantasy, or behavior scales. For these cases an average of the available self-ratings was used.

The pedigree analysis was conducted by collecting family histories and asking the proband to rate first-, second-, and third-degree relatives over the age of 18 years as either definitely homosexual (Kinsey 5 or 6), definitely bisexual (Kinsey 2–4), or definitely heterosexual (Kinsey 0–1). Family members for whom the proband was unclear about their sexual orientation were counted as heterosexual. Six probands declined to provide pedigree information but agreed to participate in the other aspects of the study. For the remaining 352 probands, family members were counted as homosexual or bisexual *only* if they had personally

acknowledged their sexual orientation to the proband, or to another family member who subsequently shared this information with the proband, or if they had publicly acknowledged their sexual orientation such that it was common family knowledge.

To investigate the accuracy of the family histories, probands were asked to have one of their relatives contact the investigators by phone to participate in a collateral interview. A majority declined, but 13% (47/352) were able to secure the participation of a second relative. Among these probands, 33 were lesbian, 9 were bisexual, and 5 were heterosexual. Among the contacted relatives, 30 were lesbian or gay, 12 were bisexual, and 8 were heterosexual. An abbreviated version of the primary interview was administered to participating relatives in which they were asked to provide information about their familial relationship to the proband, their own sexual orientation, and the sexual orientation of first-, second-, and third-degree relatives over the age of 18 using the methodology described above. Family history data provided by the proband were not shared with participating relatives. The two resulting family histories were subsequently compared for accuracy. A total of 937 relatives was confirmed. Because the probands and collateral relatives for this portion of the study were predominantly nonheterosexual, it is possible that we have overestimated the accuracy of family data because of heightened awareness of sexuality issues in the families of homosexuals. However, there was no evidence that this was the case; the homosexual relatives of heterosexual probands were not aware of any additional homosexual relatives in the family and the heterosexual relatives of lesbian and bisexual probands were not unaware of any of their homosexual relatives.

Several probands (228) originally had agreed to participate in a follow-up interview conducted during a period 12–18 months after the initial interview. Attempts to contact probands were first made by telephone or, if unsuccessful, through a letter asking the proband to call the investigator. A total of 175 (76.8%) responded and was administered a short follow-up interview in which they were asked questions about the gender of their sexual partners over the last 12 months, their self-identification with respect to their sexual orientation, and if any family members had acknowledged themselves as lesbian, gay, or bisexual since the first interview.

The pedigree data were analyzed by two criteria: a broad nonheterosexual criterion including both bisexual and homosexual individuals and a narrow, exclusively homosexual criterion. The nonheterosexual baseline rates for the broad criterion were computed by counting the number of lesbian, gay, and bisexual relatives, compiled from everyone but minors and grandparents, among the heterosexual (Kinsey 0–1) probands. This procedure yielded rates of 1.2% (7/574) for females and 2.1% (12/572) for males. Strictly homosexual baseline rates were ascertained by counting the number of lesbian and gay relatives, compiled using everyone but minors and grandparents, from probands in Kinsey groups 0–3. This gave baseline rates of 0.85% (9/1055) for females and 1.8% (19/1077) for males. Minors were excluded from the analysis because they were considered to be too young to obtain reliable information about sexual orientation. Grandparents were excluded from the baseline calculations because probands tended to be uncertain about their sexual orientation.

These baseline rates are likely to be conservative because of the stringent criterion used for counting nonheterosexual or homosexual family members, so that secretive relatives were undoubtedly missed, and because they were calculated from the families of heterosexual probands rather than from a random population sample. Nevertheless, our baseline rates are consistent with several large studies reporting population rates of 2.0–5.0% for male homosexuality and 0.6–2.5% for female homosexuality (Johnson *et al.*, 1994; reviewed by Diamond, 1993). Furthermore, reanalysis of the original Kinsey *et al.* (1953) data yielded an estimate of 1.0–1.5% for predominantly homosexual women (Gebhard, 1972).

RESULTS

Subject Recruitment

Our sampling strategy involved ascertainment from two distinct sources. Identical announcements seeking participants for a study on "sexuality in women" were distributed to local homophile organizations and social groups and to Women's Studies programs at universities within the Wash-

ington, D.C., metropolitan area. The homophile groups were targeted to obtain lesbian probands. Among the 287 women recruited through this procedure, 176 were lesbian, 106 were bisexual, and 5 were heterosexual by our assessment criteria. The Women's Studies programs were chosen to obtain a sampling of heterosexual subjects. A total of 71 women was recruited, of whom 57 were heterosexual, 8 were bisexual, and 6 were lesbian. The two groups were combined to yield a sample consisting of 358 probands.

Assessment and Stability of Sexual Orientation

We began by asking the probands to describe their sexual orientation on the 7-point Kinsey scale, which ranges from 0 for exclusive heterosexuality to 6 for exclusive homosexuality (Kinsey *et al.*, 1948, 1953). The subjects rated themselves on four separate components of sexuality: self-identification, sexual/romantic attraction, sexual/romantic fantasy, and sexual behavior. Pairwise analysis of the four scales indicates that they are highly correlated ($r > .807, p < .001$). Moreover, factor analysis showed that the four scales could be accurately described by a single factor that accounted for >92% of the total variance.

The strong correlations between the individual self-ratings suggested that averaging the four components to yield a composite rating was justified. For ease of presentation, probands with Kinsey composite ratings of 0 and 1 are referred to as *heterosexual*, those with ratings of 2–4 as *bisexual*, and those with ratings of 5 and 6 as *lesbian*. Table I shows the distribution of the subject population according to composite Kinsey score and the average age for each of the three groups. Interestingly, nearly one-third of the subjects were bisexual. Because our recruiting strategy was highly selective, the information presented in Table I cannot be extrapolated to the distribution of sexual orientation in the population at large. Nevertheless, it is of interest that other researchers have also reported high degrees of bisexuality in female populations (Bailey and Benishay, 1993; Bailey *et al.*, 1993; Bailey and Bell; 1993; Rust, 1992; Pillard, 1990). Furthermore, although not representative of a normal population, this diversity represents an obvious departure from distributions reported for sexual orientation in males, in which most subjects rate themselves as either homosexual or heterosexual (Bailey and Pillard, 1991; Whitman *et al.*, 1993; Hamer *et al.*, 1993).

Table I. Characteristics of the Sample[a]

Kinsey designation[b]	Number of probands	Percentage of total sample	Mean (± SD) age of probands (yr)[c]
Heterosexual			
0	28	7.8	31.4 ± 9.7
1	34	9.5	
Bisexual			
2	21	5.9	
3	60	16.8	28.1 ± 9.4
4	33	9.2	
Lesbian			
5	86	24.0	33.2 ± 7.3
6	96	26.8	

[a] $N = 358$ probands.
[b] Kinsey designations are based upon an average of four individually administered scales assessing self-identification, romantic/sexual attraction, romantic/sexual attraction, and sexual behavior.
[c] Mean (± SD) ages represent combined Kinsey 0 and 1 (heterosexual), Kinsey 2–4 (bisexual), and Kinsey 5–6 (lesbian) designations.

Given the observed diversity of sexual orientation in our selected population of female subjects, it was of interest to determine if their Kinsey self-ratings were stable or unstable over time. To address this question, we conducted follow-up interviews with 175 of the subjects (see Methods). Because sexual behavior and self-identification showed the least variability in the initial interview, these were deemed sufficient for reassessing sexual orientation in the follow-up study.

Table II shows the number of individuals in each Kinsey group who had the same or a different Kinsey score 12 to 18 months following the initial interview. The results show that the sexual orientation of the women in this sample, for the period of time studied, was quite stable (Chronbach $\alpha = .985$). The majority of the women (80.2%) did not change. Among those who did, there were no large fluctuations; most moved by only one Kinsey self-rating and no one changed by more than two. Although all Kinsey categories showed some movement, Kinsey 2 and Kinsey 4 exhibited the greatest variability, whereas Kinsey 6 was the most stable. Thus, despite representing only 34% of the total follow-up group, bisexuals account for slightly over one-half of the probands whose Kin-

Table II. Stability of Sexual Orientation[a]

Kinsey designation[b]	Kinsey designation[c] 0	1	2	3	4	5	6
0	**8**	3	1	0	0	0	0
1	3	**17**	0	0	0	0	0
2	0	0	**8**	5	0	0	0
3	0	0	3	**26**	2	0	0
4	0	0	0	3	**7**	4	1
5	0	0	0	0	3	**27**	5
6	0	0	0	0	0	3	**46**

[a] Analysis was performed on 175 probands recontacted approximately 1 year after the initial interview and again assessed for sexual orientation. Probands with the same Kinsey composite rating for both interviews are presented in boldface.
[b] Kinsey composite rating assessed at primary interview.
[c] Kinsey composite rating assessed at secondary interview.

sey self-rating changed from 1 year to the next. This may be an age phenomenon, as the bisexual group was slightly younger than the heterosexuals and lesbians (Table I) and, therefore, might have had a tendency to engage in more experimentation. However, it is important that a majority of the bisexuals whose Kinsey self-rating changed during the time period under examination did so to another Kinsey self-rating within the 2–4 bisexual range rather than to a lesbian or heterosexual rating. These data suggest that bisexuality, like homosexuality and heterosexuality, can be a stable identity in women.

Table III. Developmental Analysis

	Kinsey designation 0–1	2–4	5–6
1. Romantic or sexual attraction to a female[a]			
a. Yes	67.7%	99.1%	100%
No.	32.3%	0.9%	0%
b. Mean age (yr)	17.8	12.6	10.6
SD	±7.5	±5.8	±4.7
95% conf.	15.53–20.07	11.50–13.70	9.87–11.33
2. Romantic or sexual attraction to a male[b]			
a. Yes	100%	85.2%	45.3%
No	0%	14.8%	54.7%
b. Mean age (yr)	10.6	9.5	12.8
SD	±3.1	±2.8	±3.0
95% conf.	9.82–11.38	8.69–10.31	11.79–13.81
3. Self-acknowledgment of sexual orientation[c]			
Mean age (yr)	19.2	21.4	20.4
SD	±8.2	±7.2	±6.6
95% conf.	16.35–22.0	19.7–23.14	19.08–21.62
4. Age at menarche[d]			
Mean age (yr)	12.6	12.3	12.6
SD	±1.1	±1.5	±1.5
95% conf.	12.3–12.9	11.9–12.6	12.4–12.8

[a] Probands were first asked if they had ever experienced a romantic or sexual attraction to a female (1a). For probands responding affirmatively, a subsequent question was asked regarding the timing of their first attraction to a female (1b).
[b] Probands were first asked if they had ever experienced a romantic or sexual attraction to a male (2a). For probands responding affirmatively, a subsequent question was asked regarding the timing of their first attraction to a male (2b).
[c] Probands were asked at what age they first self-acknowledged their present sexual orientation.
[d] Probands were asked to identify their age at menarche.

Developmental Analysis

Developmental studies have the potential to identify markers for genetic versus environmental sources of variability in female sexual orientation. Therefore, we asked several questions with the goal of ascertaining if sexual orientation developed along parallel or disparate pathways for the three groups of subjects defined by our protocol. Table III presents average ages and confidence limits based upon the retrospective reports of individual probands for four milestones in female sexual development: first attraction to a female, first attraction to a male, self-acknowledgment of sexual orientation, and onset of menarche.

We first asked each subject if she had ever been romantically or sexually attracted to a female (Table III, 1a). Surprisingly, fully two-thirds of our selected sample of heterosexual women gave an affirmative response to this question. This represents a significant departure from that reported for males, where very few of the heterosexual male probands had recognized same-sex attractions (Hamer *et al.*, 1993). Not surprisingly, since it is part of the defining criteria, virtually all of the bisexual and lesbians reported experiencing attractions to females, giving an affirmative response rate that was significantly greater than for the heterosexual subjects ($p < .00001$).

We next asked whether there was any difference in the timing of the first attraction to a woman, if it occurred, in the three different groups. Table III, 1b, shows that the onset of same-sex attraction for women in our selected sample occurred first in lesbians, later in bisexuals, and last in heterosexual women. The differences between the three groups

were significant ($p < .002$ for each pairwise comparison), and the 95% confidence intervals were nonoverlapping. These results show that although women in all three groups have recognized same-sex attractions, there are significant differences in the developmental timing of these feelings.

Probands were also asked if they had ever been romantically or sexually attracted to a male (Table III, 2a). In this case, the unexpected result was that approximately half (45.3%) of the women identified by our protocol as predominantly or exclusively lesbian reported such attractions. As expected, the bisexual (85.2%) and heterosexual (100%) subjects had significantly higher affirmative response rates compared to lesbians ($p < .00001$).

We subsequently investigated differences in the timing of first attraction to a male, if it occurred, among the three different groups. Table III, 2b, shows that the onset of opposite-sex attraction for women in our selected sample occurred first in bisexuals, later in heterosexual women, and last in lesbians. Chi-square comparisons of heterosexuals vs. lesbians ($p < .00001$), heterosexuals vs. bisexuals ($p < .005$), and bisexuals vs. lesbians ($p < .00001$) all reveal significant differences between the three groups. Unlike the above same-sex attraction analysis, there is some overlap in the 95% confidence intervals for bisexuals and heterosexuals. However, a one-way analysis of variance ($F = 12.16$, $p < .0001$) indicates that the three groups are significantly different in their onset of attraction to males. Similar to that found for same-sex attraction, these results indicate that although women in all three groups have recognized opposite-sex attractions, there are significant differences in the developmental timing of their manifestation.

The two remaining measures, self-acknowledgment of sexual orientation and onset of menarche, showed no significant differences in either pair- or groupwise comparisons (Table III, 3 and 4). Taken together, these data suggest that development for lesbians and heterosexuals in this selected population occurs along largely parallel paths, with the only substantial difference being the object of attraction. Bisexuals follow a somewhat intermediate path.

Pedigree Analysis

To address the question of familiality, we asked our subjects about the sexual orientation of their first-, second-, and third-degree relatives. Individuals were counted as being lesbian, gay, or bisexual only if the relatives had either personally acknowledged their sexual orientation to the proband or had publicly acknowledged their sexual orientation such that it was common family knowledge. To assess the reliability of these reports, we conducted collateral interviews with selected relatives of 47 probands (see Methods). In a majority of instances (46/47; >97%), the probands' reports on the sexual orientation of their relatives were confirmed. A single case was found in which a proband had misidentified the sexual orientation of a relative; a female cousin identified as bisexual by a proband stated that she was lesbian when interviewed. There was also strong agreement (935/937; >99%) between probands and collateral participants regarding the sexual orientation of other relatives not interviewed. Disagreement occurred in only two instances. Both of these were third-degree male relatives whose sexual orientation was unclear to the proband, and were therefore initially scored as heterosexual, but who were identified as homosexual by a second relative and subsequently verified by a third family member. Thus, our stringent criterion for identifying lesbian, gay, and bisexual relatives resulted in a high degree of specificity, at least among the selected group of families for which confirmatory information was available. Other researchers have reported similar high degrees of specificity regarding assessment of sexual orientation among siblings (Bailey and Benishay, 1993; Bailey and Pillard, 1991; Pillard, 1990; Pillard and Weinrich, 1986). Accordingly, the probands' reports on the sexual orientation of their relatives were deemed sufficient for the remaining families as long as the criterion of private within-family or public acknowledgment had been met.

We analyzed the pedigree data in two ways. Table IV examines the data using a broad definition of sexual orientation that includes all nonheterosexual relatives of nonheterosexual probands (Kinsey 2–6). Table V analyzes the results from a narrow scope that includes only the homosexual relatives of the lesbian probands (Kinsey 5–6). The family pedigrees of the 62 probands identified by our protocol as heterosexual (Kinsey 0–1) were used to establish a female nonheterosexual (Kinsey 2–6) baseline rate of 1.2% and a male nonheterosexual rate of 2.1%. For the narrower homosexual

Table IV. Rates of Nonheterosexual Relatives Among Kinsey 2–6 Probands[a]

Relative[b]	*N*	G[c]	B[c]	G + B	% G + B[d]
Brothers	295	13	7	20	6.8**
Sisters	258	12	14	26	10.1**
Sons	12	0	0	0	0.0
Daughters	19	3	3	6	31.6**
Fathers	285	4	0	4	1.4
Mothers	290	6	1	7	2.4
Nephews	58	1	0	1	1.7
Nieces	48	1	2	3	6.3*
Pat. unc.	285	7	0	7	2.5
Pat. aunts	252	4	0	4	1.6
Male csn./pat. unc.	201	5	0	5	2.5
Male csn./pat. aunts	203	4	1	5	2.5
Female csn./pat. unc.	186	6	7	13	7.0**
Female csn./pat. aunt	196	3	2	5	2.6
Pat. grandfathers	229	0	0	0	0.0
Pat. grandmothers	229	1	1	2	0.9
Mat. unc.	269	2	1	3	1.1
Mat. aunts	285	1	2	3	1.1
Male csn./mat. unc.	229	5	0	5	2.2
Male csn./mat. aunts	203	4	3	7	3.4
Female csn./mat. unc.	191	1	3	4	2.1
Female csn./mat. aunts	198	2	2	4	2.1
Mat. grandfathers	246	1	0	1	0.4
Mat. grandmothers	246	3	2	5	2.0

[a] $N = 290$ nonheterosexual probands (Kinsey 2–6). Pat., paternal; unc., uncles; csn., cousins; mat., maternal.
[b] Relatives reported are over the age of 18 years.
[c] G, gay; B, bisexual. Relatives were counted as homosexual or bisexual only if they either had privately acknowledged their sexual orientation to the proband or had made a public acknowledgment such that it was common family knowledge.
[d] Rates for nonheterosexual relatives meeting the established criterion. One-tailed Fisher's exact test for significance: $*p \leq .05$ and $**p < .001$, based upon baseline rates of 1.2% for females and 2.2% for males (see Methods).

Table V. Rates of Homosexual Relatives Among Kinsey 5–6 Probands[a]

Relative[b]	*N*	L/G[c]	% L/G[d]
Brothers	219	11	5.0*
Sisters	165	9	5.5**
Sons	6	0	0.0
Daughters	6	2	33.3**
Fathers	172	3	1.7
Mothers	177	4	2.3
Nephews	53	1	1.9
Nieces	37	1	2.7
Pat. unc.	205	5	2.4
Pat. aunts	162	3	1.9
Male csn./pat. unc.	151	2	1.3
Male csn./pat. aunts	118	2	1.7
Female csn./pat. unc.	138	6	4.3*
Female csn./pat. aunts	125	3	2.4
Pat. grandfathers	143	0	0.0
Pat. grandmothers	143	1	0.7
Mat. unc.	182	4	2.2
Mat. aunts	185	1	0.5
Male csn./mat. unc.	163	1	0.6
Male csn./mat. aunts	135	1	0.7
Female csn./mat. unc.	133	0	0.0
Female csn./mat. aunts	145	0	0.0
Mat. grandfathers	154	0	0.0
Mat. grandmothers	154	2	1.3

[a] $N = 177$ lesbian probands (Kinsey 5–6).
[b] Relatives reported are over the age of 18 years. Pat., paternal; unc., uncles; csn., cousins; mat., maternal.
[c] L, lesbian; G, gay. Relatives were counted as homosexual only if they either had privately acknowledged their sexual orientation to the proband or had made a public acknowledgment such that it was common family knowledge. Bisexuals are counted as heterosexual.
[d] Rates for homosexual relatives meeting the established criterion. One-tailed Fisher's exact test for significance: $*p < .01$ and $**p < .001$, based upon baseline rates of 0.85% for females and 1.8% for males (see Methods).

categorization, baseline rates of 0.85% for females and 1.8% for males were established (see Methods).

Interestingly, the two analyses yielded nearly identical elevated categories. The highest rates were for daughters, where approximately one-third were identified by probands as nonheterosexual or lesbian (Tables IV and V). Although this elevation was significant in our data set, it should be noted that the sample size was small, that only one of the daughters was actually interviewed, and that no adjustment was made for possible cohort effects. Sisters were the group showing the next highest rate. The rate of 10.1% for nonheterosexual sisters (Table IV) represents about an eightfold elevation above our established baseline. A rate of 5.5% (Table V) was found for lesbian sisters and represents about a 6.5-fold increase over our lesbian baseline. Rates approximately threefold above our baseline rate were seen for both nonheterosexual and homosexual brothers. These significant elevations in rates of nonheterosexual sisters and brothers of nonheterosexual female probands are within the ranges that have been reported previously (Bailey *et al.*, 1993; Bailey and Benishay, 1993; Bailey and Bell, 1993).

Elevated rates above our established baselines were also seen for two categories of extended rel-

atives. Nieces had a rate that was fivefold above background, but only using the broad criterion (Table IV). This category was not significantly elevated under the narrow criterion. However, nieces represented one of the youngest groups in our sample and tended to be identified as bisexual by probands. This could account for the appearance of elevated rates using the broad criterion but not under the narrow criterion. Additionally, female cousins of paternal uncles showed significant rates of five- to sixfold above background for both analyses (Tables IV and V). No other second- or third-degree relative category showed rates elevated above our established baselines for either analysis.

If it is proposed that homosexuality has genetic and sex-specific components, two clear predictions are that the rate of nonheterosexuality in daughters should not exceed the rate in sisters and that the rate in sisters should exceed the rate in brothers. In fact, the observed rates for daughters were significantly higher than the rates for sisters for both the broad and the narrow analyses ($p < .05$; Fisher exact test). Furthermore, the absolute rates of nonheterosexuality in sisters and brothers were indistinguishable ($p > .1$, Fisher exact test) and the relative rates (compared to baseline) were higher for sisters compared to brothers only for the broad criterion ($p < .05$, likelihood-ratios test) (see Bishop *et al.*, 1975). Thus, neither the daughter vs. sister nor the sister vs. brother predictions are robustly met.

We therefore asked if the rates of nonheterosexual relatives in our family pedigrees would change if a more stringent criterion for nonheterosexuality were applied. Thus, a *post hoc* analysis was performed imposing the following two additional requirements for probands in our selected sample to be considered nonheterosexual. First, attraction to a female had to occur at ≤14 years, the upper level confidence limit determined for bisexuals in this study (see Table III, 1b). The second requirement was that attraction to a male, if present, must have occurred within the same time frame or at a later age than first attraction to a female. These two additional criteria resulted in the elimination of 96 probands from the Kinsey 2–6 sample and yielded the results presented in Table VI.

The additional criterion had a noticeable effect on the distribution of nonheterosexual relatives in the selected pedigrees. First, the rate for nonheterosexual daughters of probands meeting the *post hoc* criterion is reduced approximately twofold (compare Tables IV and VI). A Fisher test for significance reveals that the resulting rate is only marginally significant with respect to our established baseline ($p = .09$). Furthermore, a comparison of the rate in daughters to the rate in sisters indicates no significant difference ($p = .60$). However, caution should be exercised in overinterpreting this result, as a comparison of the daughter rate in Table IV to the daughter rate in Table VI indicates that they are not significantly different ($p = .36$). An additional affect that the *post hoc* criteria had on the sample is that it resulted in a significant ($p < .01$, likelihood-ratios test) increase in the ratio of nonheterosexual sisters to nonheterosexual

Table VI. Rates for Nonheterosexual Relatives Among Kinsey 2–6 Probands[a] Post Hoc Adjusted Criteria[b]

Relative[c]	*N*	G[d]	B[d]	G + B	% G + B[e]
Brothers	205	8	4	12	5.9*
Sisters	179	10	12	22	12.3**
Sons	2	0	0	0	0.0
Daughters	7	1	0	1	14.3
Fathers	192	5	0	5	2.6
Mothers	194	6	0	6	3.1
Nephews	21	1	0	1	4.8
Nieces	13	0	1	1	7.7
Pat. unc.	186	6	0	6	3.2
Pat. aunts	169	1	0	1	0.6
Male csn./pat. unc.	144	5	0	5	3.5
Male csn./pat. aunts	155	3	1	3	2.6
Female csn./pat. unc.	130	6	5	11	8.5**
Female csn./pat. aunts	147	3	0	3	2.0
Mat. unc.	185	4	1	5	2.7
Mat. aunts	186	1	1	2	1.1
Male csn./mat. unc.	146	2	0	2	1.4
Male csn./mat. aunts	153	2	0	2	1.3
Female csn./mat. unc.	140	1	1	2	1.4
Female csn./mat. aunts	153	1	1	2	1.3

[a] $N = 194$ nonheterosexual probands (Kinsey 2–6).

[b] Additional criteria included attraction to a female at or below the age of 14 years and, when applicable, attraction to a female at the same age or younger than attraction to a male.

[c] Relatives reported are over the age of 18 years. Pat., paternal; unc., uncles; csn., cousins; mat., maternal.

[d] G, gay; B, bisexual. Relatives were counted as homosexual or bisexual only if they either had privately acknowledged their sexual orientation to the proband or had made a public acknowledgment such that it was common family knowledge.

[e] Rates for nonheterosexual relatives meeting the established criterion. One-tailed Fisher's exact test for significance: $*p < .01$ and $**p < .001$, based upon baseline rates of 1.2% for females and 2.2% for males.

brothers. Finally, application of the additional criteria resulted in elevations in the rates of sisters and in female cousins of paternal uncles. Although neither was significant, the rates did increase from 10.1 to 12.3% and from 7.0 to 8.5%, respectively (compare Tables IV and VI). Thus, by employing information obtained from the developmental analysis we were able putatively to identify a subset of probands in our nonheterosexual sample who exhibit patterns consistent with sex-limited genetic factors contributing to their sexual orientation.

DISCUSSION

The purpose of the current study was to lay the groundwork for exploring the role of heredity in individual variations in female sexual orientation. The specific goals were to define phenotypes, compare their stability and ontogeny, and seek patterns of familial clustering. Our subjects were 358 women who encompassed a full range of heterosexual, bisexual, and homosexual identities.

Ascertainment is a particular problem when studying marginalized and secretive populations such as lesbians or bisexuals, making it virtually impossible to obtain a truly random sample. Thus, the data reported in this analysis do not necessarily apply to all lesbian or bisexual women, but only to the particular cohort that we studied. Rarely addressed is the ascertainment of heterosexual samples, which can potentially pose an even greater problem. Due to the social stigma associated with homosexuality and bisexuality, one can be reasonably certain that any population of heterosexually identified women will actually contain a number of individuals who have some degree of same-sex orientation. Although no methodology can completely address this dilemma, we chose to recruit a heterosexual sample through Women's Studies programs specifically because the course work regularly confronts gender and sexuality issues. Our hope was that this pool of women would be more comfortable and honest in discussing sexuality-related issues than a sample ascertained from the general population.

Sexual orientation was assessed by individually administered Kinsey scales assessing self-identification, romantic or sexual attraction, romantic or sexual fantasy, and sexual behavior. These four facets of sexuality were highly intercorrelated and form a single, statistically cohesive factor.

A substantial fraction of the participants in this study were identified as bisexual by our criteria. Because of the deliberately nonrandom nature of the sample, inferences about the proportion of bisexual women in the population at large are not possible. Nevertheless, it is noteworthy that in similar samples of men, only a small proportion considered themselves fully bisexual (Bailey and Pillard, 1991; Whitman *et al.*, 1993; Hamer *et al.*, 1993). Our data are consistent with several reports that bisexuality is more common in women than in men (Rust, 1992; Bailey *et al.*, 1993; Bailey and Benishay, 1993).

Regarding the stability of sexual orientation for women, in a study of 346 lesbians, Rust (1993) reported that 40% of the subjects had self-identified as bisexual in the past and that one-third of these women had switched between lesbian and bisexual identities multiple times. The remaining were represented by women who had self-identified as bisexual prior to, or within the same year as, coming out as lesbian, never to identify as bisexual again (transitional), and women who had identified as bisexual after coming out as lesbian. The latter group was interpreted as having bisexual identities that are temporary but not transitional. These retrospective data suggest that there may be considerable fluidity between lesbian and bisexual identities but that this rarely extends to the adoption of a heterosexual identity.

Our data suggest that bisexuality is not necessarily transitory for a large percentage of women and represents a stable sexual orientation. Most of the bisexual women in our recontacted sample reported no change in their sexual orientation status from one year to the next. Although reassessment 12–18 months after the initial interview can hardly be considered a longitudinal study, given the size of our sample and breadth of the age range, if bisexuality does represent a transitional phase to either lesbianism or heterosexuality, it seems reasonable that we should have been able to detect such a phenomenon occurring. Contrary to this assumption, we saw no convincing evidence for a transition to heterosexuality. There was some evidence for a trend toward lesbianism: among five probands previously rated as Kinsey 4, one moved to Kinsey 6 and the remaining four to Kinsey 5. This trend was balanced by three probands previously rated as Kinsey 5 moving to Kinsey 4. However, a majority of the bisexuals who had a

different Kinsey designation at the second interview changed to another designation within the bisexual range. More broadly interpreted, these data suggest a fluidity between bisexual and lesbian identities that does not extend to encompass heterosexual identities similar to that reported by Rust (1993); no one self-rated as Kinsey 2–6 switched to Kinsey 1 or 0. We would like to emphasize that this study presents data regarding sexual orientation over the period of 12–18 months and is representative for only approximately one-half of the original sample studied. More extensive quantitative longitudinal data will need to be gathered to assess accurately the stability of sexual orientation over time.

Our analysis suggests that with respect to romantic or sexual attraction, lesbian and heterosexual women develop along parallel paths, but the object of attraction is reversed. The lesbians in our sample tended to recall romantic and sexual attractions to females first and considerably later, if at all, to males; a reciprocal trend was observed among heterosexuals. The bisexual women in our sample followed a somewhat intermediate path, but were generally more similar to heterosexuals. Although these developmental differences were significant, they are based on retrospective reports that could potentially be biased by current sexual orientation status. Further research will be required to determine the validity of retrospective measures of female sexual development.

Our goal in performing the pedigree study was to determine if female sexual orientation runs in families, how strongly, and to ascertain if discernable patterns exist. If a trait is genetically influenced, then it should aggregate in families. Obviously the converse of this is not necessarily true; for example, last names and religious affiliation run in families but are not genetic. Nevertheless, established familiality is a prerequisite for future research aimed at identifying specific genetic loci. If no familial aggregation of female sexual orientation were observed, molecular studies would be unwarranted.

In fact, clear evidence of a familial component to female sexual orientation was obtained in our sample. Specifically, we observed elevated rates of nonheterosexual and lesbian orientation in four classes of female relatives: sisters, daughters, nieces, and cousins through a paternal uncle. The rates of 6% (narrow definition) to 10% (broad definition) observed in sisters are similar to those found by other researchers (Bailey *et al.*, 1993; Bailey and Benishay, 1993), especially considering the low baseline rates calculated using our stringent criteria for nonheterosexuality in relatives. The rates of 32 to 33% found in daughters were also significantly elevated over the background but may be an overestimate due to the small sample size, age-related cohort effects, and possible reporting bias. Other studies, in which the daughters of lesbians were directly interviewed, have given substantially lower rates of homosexuality (Green, 1978; Golombok, 1983; Huggins, 1989; Gottman, 1990; Javid, 1993). A larger and more systematic study of the offspring of lesbians, including both biological and adoptive children, would be useful.

Our study is the first to examine sexual orientation in the extended families of lesbian and bisexual women. Elevated rates of lesbian and nonheterosexual orientation were observed in nieces (6% using the broad criteria) and female cousins through a paternal uncle (4 to 7%) but not in aunts or the three other types of cousins.

Among the male relatives of the female probands, increased frequencies of nonheterosexuality were observed only in brothers. The rates in brothers, which were 7% for the broad definition and 5% for the narrow definition, were significantly above the population incidence but tended to be lower than in sisters. In a previous study of gay male probands, the rate in sisters was 5.4%, which was above the background level but lower than in brothers (Hamer *et al.*, 1993). Hence the emerging picture is that the factors that underlie the familial aggregation of same-sex orientation are at once overlapping yet distinct between the sexes (Bailey and Pillard, 1991; Bailey *et al.*, 1993; Bailey and Benishay, 1993; Whitman *et al.*, 1993; Bailey and Bell, 1993; Hamer *et al.*, 1993).

Despite the evidence for familial clustering of female sexual orientation, the source of this aggregation remains enigmatic. In the following discussion we consider genetic compared to environmental theories in light of the available evidence. We recognize, however, that both models may operate to varying extents in different individuals and families and in different sociocultural contexts.

The simplest genetically based model is that the observed familial aggregation is due in part to a sex-limited, autosomal dominant locus with re-

duced penetrance and a net negative effect on female reproduction. The sex-limited provision would account for the higher rates of nonheterosexuality in female compared to male relatives. The hypothesized dominance of the locus would explain the frequent appearance of mother-to-daughter transmission. Reduced penetrance is required to understand the less than Mendelian ratios observed in all classes of relatives. Finally, the effect on female but not male reproduction would account for the elevated rates in cousins through a paternal uncle, who are the only third-degree relatives who are re lated to the proband exclusively through males, and the higher rates in daughters than in mothers. From our pedigree data, we estimated the relative reproductive rate of lesbians to be approximately 50% as high as in heterosexual women. However, it is possible that in past generations the effect was stronger.

An alternative genetic model is that an X chromosome-linked dominant locus with incomplete penetrance contributes to familial aggregation. The main motivations for proposing this hypothesis are the observed linkage between Xq28 DNA markers and male homosexuality (Hamer *et al.*, 1993) and the approximately 2:1 ratio of nonheterosexual female to male siblings. It is difficult to test this hypothesis based on family pedigrees because the characteristic maternal inheritance observed for X-linked traits in males does not hold for females, who inherit their sex chromosomes from both parents, and because the hypothesized low penetrance of the locus would obscure the hallmark of complete father-to-daughter transmission. DNA linkage analysis, which is currently in progress, could provide a more rigorous test for this model.

Environmental models emphasize the role of the nuclear family milieu on the development or identification of same-sex orientation. One hypothesis, which would account for a trend toward higher rates of nonheterosexuality in the daughters than in the sisters of the probands, is that women can somehow "learn" to be lesbian from their mothers. Strongly arguing against this model is the observation that most lesbians do not have lesbian mothers and that most of the daughters of lesbians are heterosexual. Moreover, most of the probands with nonheterosexual daughters recounted that they had acknowledged their nonheterosexual orientation after their daughters.

A second environmental model is that social and cultural factors within the family influence the likelihood that a woman will recognize or act on same-sex attractions rather than the probability of actually having such attractions. That is, having a bisexual or lesbian sister or mother might make it seem more "acceptable" for a woman to adopt a nonheterosexual identity; this is formally equivalent to a reporting bias rather than a true effect on sexual orientation. However, the problem with this and other environmental models is that they do not explain the observed increase in nonheterosexuality in nieces and cousins who are raised by different parents and in different family environments than the probands.

Family histories alone are not capable of distinguishing between the above models. In principle, cultural and genetic transmission can be distinguished by quantitative segregation analysis, but in practice this methodology has limited power except in clear cases of Mendelian inheritance. Twin and adoption studies present a more direct test of the theories, but so far the data are contradictory. The genetic model predicts rates of nonheterosexuality to be greater in monozygotic twins than in dizygotic twins than in adopted sisters of lesbian probands. Although this is the pattern found by Bailey *et al.* (1993) and Whitman *et al.* (1993), the results are inconclusive because of the potentially biased ascertainment schemes used in both studies. Environmental models predict low, baseline concordance rates of homosexuality in monozygotic twins raised apart. Although Eckert *et al.* (1986) reported that four sets of female identical twins were discordant for sexual orientation, the small sample size makes any definite conclusions premature.

Given the difficulties in distinguishing between genetic and cultural transmission of female sexual orientation based on family data, it would be desirable to establish additional criteria for differentiating between inherited and environmental sources of individual variation. Developmental data provide one potentially useful source of information. For example, Bailey *et al.* (1993) explored the possibility of using recalled childhood gender nonconformity, which shows a significant correlation with adult sexual orientation, as a marker for genetic loading in their study of female twins. However, they found no difference in the degree of childhood gender nonconformity in the lesbian probands of concordant compared to discordant monozygotic twin pairs, suggesting that this is not a strong indicator of genetic transmission.

As an alternative strategy, we used our developmental data on the timing and direction of initial sexual attractions as a potential marker for inherited versus cultural transmission of female sexual orientation. Specifically, we focused on the families of those probands who were attracted to women early and either before or within the same time frame in which they had experienced any attraction to men. The prediction was that the pedigrees for this subset of families would appear more typical of dominant, autosomal sex-limited inheritance; that is, that the rates of nonheterosexuality would be the same or higher in sisters compared to daughters, that the ratio of nonheterosexual sisters to brothers would be increased, and that nonheterosexuality in second- and third-degree relatives would be elevated. Although each of these predictions was fulfilled, only the brother/sister ratio was statistically significant. Repetition on other samples is needed to verify the validity of these developmental criteria.

In summary, we have shown that female sexual orientation is an apparently quantifiable and stable trait that clusters in families. Goals for future research are to define more precisely distinct aspects of heterosexual, bisexual, and lesbian development and to apply this information to the search for genetic and environmental factors that contribute to individual variations in sexual identity and behavior.

ACKNOWLEDGMENTS

We thank all of the participants for making this study possible. We also acknowledge Drs. Maxine Singer, Elliot Gershon, and Jeffery Streuwing at the NIH, Jeremy Nathans at Johns Hopkins University, and an anonymous reviewer for their thoughtful comments on the manuscript. Additionally, we thank Dr. Edward Kaplan at Yale University for his consultation on the statistical analysis.

REFERENCES

Bailey, J. M., and Bell, A. P. (1993). Familiality of female and male homosexuality. *Behav. Genet.* **23**:313–322.

Bailey, J. M., and Benishay, B. A. (1993). Familial aggregation of female sexual orientation. *Am. J. Psychiat.* **150**: 272–277.

Bailey, J. M., and Pillard, R. C. (1991). A genetic study of male sexual orientation. *Arch. Gen. Psychiat.* **48**:1089–1096.

Bailey, J. M., Pillard, R. C., Neale, M. C., and Agyei, Y. (1993). Heritable factors influence sexual orientation in women. *Arch. Gen. Psychiat.* **50**:217–223.

Bell, A. P., Weinberg, M. S., and Hammersmith, S. K. (1981a). *Sexual Preference: Its Development in Men and Women*, Indiana University Press, Bloomington.

Bell, A. P., Weinberg, M. S., and Hammersmith, S. K. (1981b). *Sexual Preference: Statistical Appendix*, Indiana University Press, Bloomington.

Bishop, Y. M. M., Feinberg, S. E., and Holland, P. W. (1975). *Discrete Multivariate Analysis: Theory and Practice*, MIT Press, Cambridge, MA.

Diamond, M. (1993). Homosexuality and bisexuality in different populations. *Arch. Sex. Behav.* **22**:291–310.

Dittmann, R. W., Kappes, M. H., Kappes, M. E., Börger, D., Stegner, H., Willig, R. H., and Wallis, H. (1990a). Congenital adrenal hyperplasia. I. Gender-related behavior and attitudes in female patients and sisters. *Psychoneuroendocrinology* **15**:401–420.

Dittmann, R. W., Kappes, M. H., Kappes, M. E., Börger, D., Meyer-Bahlburg, H. F. L., Stegner, H., Willig, R. H., and Wallis, H. (1990b). Congenital adrenal hyperplasia. II. Gender-related behavior and attitudes in female salt-wasting and simple-virilizing patients. *Psychoneuroendocrinology* **15**:421–434.

Dittmann, R. W., Kappes, M. E., and Kappes, M. H. (1992). Sexual behavior in adolescent and adult females with congenital adrenal hyperplasia. *Psychoneuroendocrinology* **17**:153–170.

Eckert, E. D., Bouchard, T. J., Bohlen, J., and Heston, L. L. (1986). Homosexuality in monozygotic twins reared apart. *Br. J. Psychiat.* **148**:421–425.

Ehrhardt, A. A. (1979). Psychosocial adjustment in adolescence in patients with congenital abnormalities of their sex organs. In Vallet, H. L., and Porter, I. H. (eds.), *Genetic Mechanisms of Sexual Development*, Academic Press, New York, pp. 473–483.

Ehrhardt, A. A., and Meyer-Bahlburg, H. F. L. (1981). Effects of prenatal sex hormones on gender-related behavior. *Science* **211**:1312–1318.

Gebhard, P. (1972). Incidence of overt homosexuality in the United States and western Europe. In Livingood, J. M. (ed.), *National Institute of Mental Health Task Force on Homosexuality: Final Report and Background Papers*, DHEW Publ. No. HSM 72-9116, U.S. Government Printing Office, Washington, DC, pp. 22–29.

Golombok, S., Spencer, A., and Rutter, M. (1983). Children in lesbian and single-parent households: Psychosexual and psychiatric appraisal. *J. Child Pyschol. Psychiat.* **24**: 551–572.

Gonsiorek, J. C. (1982). Introduction. In Paul, W., Weinrich, J. D., Gonsiorek, J. C., and Hotvedt, M. E. (eds.), *Homosexuality: Social, Psychological, and Biological Issues*, Sage, Beverly Hills, CA.

Gottman, J. S. (1990). Children of gay and lesbian parents. *J. Homosexual.* **21**:177–196.

Green, R. (1978). Sexual identity of thirty-seven children raised by homosexual or transsexual parents. *Am. J. Psychiat.* **135**:692–697.

Hamer, D. H., Hu, S., Magnuson, V. L., Hu, N., and Pattatucci, A. M. L. (1993). A linkage between DNA markers on the X chromosome and male sexual orientation. *Science* **261**: 321–327.

Higashi, Y., Yoshioka, H., Yamane, M. Gotoh, O., and Fujii-Kuriyama, Y. (1986). Complete nucleotide sequence of two steroid 21-hydroxylase genes tandemly arranged in human chromosome: A pseudogene and a genuine gene. *Proc. Natl. Acad. Sci. USA* **83**:2841–2845.

Hirschfeld, M. (1936). Homosexuality. In Bloch, I. and Hirschfeld, M., (eds.), *Encyclopaedia Sexualis*, Dingwall-Rock, New York.

Huggins, S. (1989). A comparative study of self-esteem of adolescent children of divorced lesbian mothers and divorced heterosexual mothers. In Bosett, F. (ed.), *Homosexuality and the Family*, Hayworth Press, Binghamton, NY, pp. 123–136.

Javid, G. A. (1993). The children of homosexual and heterosexual single mothers. *Child Psychiat. Hum. Dev.* **23**: 235–248.

Johnson, A. M., Wadsworth, J., Wellings, K., and Field, J. (1994). *Sexual Attitudes and Lifestyles*, Blackwell Scientific, London.

King, M., and McDonald, E. (1992). Homosexuals who are twins: A study of 46 probands. *Br. J. Psychiat.* **160**:407–409.

Kinsey, A. C., Pomeroy, W. B., and Martin, C. E. (1948). *Sexual Behavior in the Human Male*, W. B. Saunders, Philadelphia.

Kinsey, A. C., Pomeroy, W. B., Martin, C. E., and Gebhard, P. (1953). *Sexual Behavior in the Human Female*, W. B. Saunders, Philadelphia.

Miller, W. L. (1988). Molecular biology of steroid hormone synthesis. *Endocr. Rev.* **9**:295–318.

Money, J., and Ehrhardt, A. A. (1972). *Man and Woman. Boy and Girl*, Johns Hopkins University Press, Baltimore.

Morin, S. F. (1977). Heterosexual bias in psychological research on lesbianism and male homosexuality. *Am. Psychol.* **32**:629–637.

Pillard, R. C. (1990). The Kinsey Scale: Is it familial? In McWhirter, D. P., Sanders, S. A., and Reinisch, J. M. (eds.), *Homosexuality/Heterosexuality: Concepts of Sexual Orientation*, Oxford University Press, Oxford.

Pillard, R. C., and Weinrich, J. D. (1986). Evidence of familial nature of male homosexuality. *Arch. Gen. Psychiat.* **43**: 808–812.

Rust, P. C. (1992). The politics of sexual identity: Sexual attraction and behavior among lesbian and bisexual women. *Social Problems* **39**:366–386.

Rust, P. C. (1993). "Coming out" in the age of social constructionism: Sexual identity formation among lesbian and bisexual women. *Gender Soc.* **7**:50–77.

Slijper, F. M. E. (1984). Androgens and gender role behaviour in girls with congenital adrenal hyperplasia (CAH). In DeVries, G. J., DeBruin, J. P. C., Uylings, H. B. M., and Corner, M. A. (eds.), *Sex Differences in the Brain. Progress in Brain Research, Vol. 61*, Elsevier, Amsterdam, pp. 417–422.

Weinberg, M. S. (1970). Homosexual samples: Differences and similarities. *J. Sex. Res.* **6**:312–325.

Whitman, F. L., Diamond, M., and Martin, J. (1993). Homosexual orientation in twins: A report on 61 pairs and three triplet sets. *Arch. Sex. Behav.* **22**:187–206.

Edited by Joanne Meyer