Sex Preselection in the United States: Some Implications

Charles F. Westoff and Ronald R. Rindfuss

Recent speculation about the possible development of ways to predetermine the sex of offspring has focused both on the biological feasibility of sex-control technology and on its social implications. Although there is disagreement regarding the imminence and features of such technology, there is a consensus that sex preselection is a realistic expectation within the foreseeable future (*1–4*). Scientists have already been successful in manipulating the sex ratio of nonmammalian vertebrates. The potential for application to humans through sperm treatment followed by artificial insemination has been greatly enhanced by the recent development of a technique to identify the Y chromosome in human cells, including spermatozoa. The other technique that currently appears feasible is selective abortion. Both procedures entail sufficiently high costs (medical, economic, and psychological) to discourage routine use. Other potential techniques, such as use of a suitable biochemical agent or of prophylactics designed to block either male-bearing or female-bearing spermatozoa, are still at the theoretical stage but seem more likely to be widely adopted if developed.

The sociological discussion of sex control focuses on the preferences of parents (and parents-to-be) for sons or daughters, and on the implications of these preferences. The development of such technology has been credited with potentially contributing to the control of population growth, but the presumed effects on the sex ratio and the resulting social implications have been cited as serious concerns.

Various studies on the preference for sex of offspring have been reviewed (*1*, *5*, *6*). The impact of sex preferences (in the absence of sex-control technology) on fertility in the United States appears to be that couples have a slight tendency to want and have additional children if previous children are all the same sex (*7*, *8*). In a longitudinal study (*8*) of white, urban couples in the United States it was shown that couples with children of the same sex were more likely to have additional children than were couples with children of both sexes. From data collected in the 1970 National Fertility Study (*9*) it appears, for example, that about 25 percent of women with two children of the same sex intend to have additional children compared with 19 percent of women with a son and a daughter. There is also some tendency for women with only daughters to intend and to have more subsequent children than those with only sons.

In studies of preferences for sons or daughters, it has consistently been found that there is a preference for more males than females and a preference for the firstborn to be male (*10*). However, the conclusions reached regarding the effect of sex-control technologies on the sex ratio at birth (currently 105 males are born in the United States for every 100 females) range from essentially no change to a substantial surplus of male births. For example, Whelpton and his colleagues (*11*) suggest that the sex ratio would be 106 (*12*), whereas Markle and Nam (*6*) estimate that the sex ratio would be 122 (*13*). In a later study, Markle (*14*) reports a "desired-family sex ratio" of 113. Some of these previous studies have been deficient in two respects: (i) they tend to rely on attitude questions that combine the effect of number preference with that of sex preference, and (ii) some rely on small, nonrepresentative samples—primarily of college students.

This article describes the preferences of currently married women in the United States for sons or daughters, and the implications of such preferences if an effective technique of sex preselection were to be routinely used by women having a preference. Specifically, we examine the implications of sex preselection for (i) the aggregate sex ratio at birth, and (ii) the sex and birth-order composition of the offspring of individual couples. The data are from the 1970 National Fertility Study (*9*), a national probability sample of 6752 ever-married (currently and formerly married) women under 45 years of age residing in the United States. The analysis reported here is based on the 5981 currently married women in the sample.

Two important qualifications must be noted. Although the data from the 1970 National Fertility Study are probably the best available from which to estimate the effect on the sex ratio of the use of technology to predetermine the sex of offspring, only the woman's view is represented; since the husband would presumably be involved in the decision about whether to plan a son or a daughter, the question arises of whether women's preferences would be altered in the aggregate by incorporation of men's preferences. The research literature on this subject is sparse and limited in generality. In one survey (*13*) of university students it was found that men had a much stronger preference than women for a son as an only child, but two-thirds of the women also expressed such a preference. In another study (*6*) of college students, no difference was found between the preferences of men and women for the sex of a first child; both strongly preferred a male. In a study (*15*) of married couples in a Midwestern city in 1941, it was found that twice as many men as women preferred a son if they were to have only one child, but when queried about their sex preferences for two children, husbands and wives had similar responses. A Gallup poll (*16*) conducted in 1947 showed that men had a much stronger preference than women for a son as a next child; however, this difference narrowed appreciably when the calculation was restricted to married persons and narrowed even further when restricted to married persons with at least one child. Thus, the evidence—such as it is—is mixed but suggests that the influence

Charles F. Westoff is professor of sociology and associate director of the Office of Population Research, Princeton University, Princeton, New Jersey 08540. Ronald R. Rindfuss was research associate at the Office of Population Research and is currently research associate at the Center for Demography and Ecology, University of Wisconsin, Madison 53706.

of the husband would be in the direction of increasing the proportion of male births.

Another limitation is that our estimates are based quite simply on the immediate response of the woman to a question to which she may have given very little thought. It is conceivable that, under conditions of real choice, different decisions might be reached. The questions asked are hypothetical in the absence of sex-control technology.

Measures of Sex Preferences

Three questions were asked to determine preference for sex of offspring. The first, following a question about ideal size of family (a husband, a wife, and how many children?), was, "How many of these [children] should be boys and how many girls?" Currently pregnant women (who were 6.8 percent of the currently married sample) were asked: "Do you want it to be a boy or a girl?" Nonpregnant women were asked: "Suppose you were going to have a(nother) child. Would you want it to be a boy or a girl?"

For the total sample, the sex preference ratio of ideal number of sons to ideal number of daughters was 110. However, there was marked variation depending on whether an odd or an even number of children was considered ideal. The sex preference ratios for women who considered two or four children ideal were 106 and 104 respectively; whereas women who considered three children ideal had a sex preference ratio of 125. Thus the sex preference ratio derived from the question about the ideal number of sons and daughters represents a combination of sex preference and number preference. For this reason, we do not extensively analyze the question in this article; rather, we rely on the questions about the preference for the sex of the next child.

The responses of currently pregnant and nonpregnant women to questions about their preference for the sex of the next child were very similar; they would have been even more similar if the distributions by number of children had been taken into account. The ratio of preferences for the sex of the next child was 108 for currently pregnant women and 104 for nonpregnant women—sufficiently similar to justify combining the two groups and treating the whole sample as if they had been asked the same question. These ratios were calculated by allocating the responses of women who expressed no preference by replying "either" sex (32 percent of the currently pregnant women and 20 percent of the nonpregnant women) to both sexes in proportion to the natural sex ratio, on the assumption that these women would not use such technology (*10*). A small group (6 percent) of the nonpregnant women replied "neither," a response that probably reflected a strong aversion to the very thought of another child. These "neither" responses, since they provided no indication of sex preference, were treated the same as nonresponses and were eliminated from the analysis.

Table 1. Preference for sex of next child, according to current parity and sex composition of past births. (Number of women shown in parentheses.)

Parity	Sex preference for next child	Total (%)	Sex preference if past births were		
			All or most boys (%)	Equal number of boys and girls (%)	All or most girls (%)
All	Boy	51.1	19.8	51.1	80.6
	Girl	48.9	80.1	48.9	19.4
		(5828)	(2084)	(1050)	(1841)
0	Boy	63.2			
	Girl	36.8			
		(853)			
1	Boy	47.2	21.3		77.8
	Girl	52.8	78.7		22.2
		(1151)	(611)		(540)
2	Boy	48.8	15.0	50.9	84.2
	Girl	51.2	84.9	49.1	15.8
		(1505)	(392)	(777)	(336)
3	Boy	49.1	20.8		81.1
	Girl	50.9	81.2		18.8
		(1052)	(548)		(504)
4	Boy	50.7	18.4	50.9	84.2
	Girl	49.3	81.6	49.2	15.8
		(611)	(198)	(218)	(195)
5 +	Boy	50.3	26.6	55.2	77.8
	Girl	49.7	73.4	44.8	22.2
		(656)	(335)	(55)	(226)

Sex Ratio at Birth

The short-term or period effect of the widespread adoption of sex preselection technology can be estimated by calculating the sex preference ratio for women who intend to have more children. We do not make any assumptions about the specific details of sex preselection techniques, but we do assume that such techniques will be effective, acceptable, and routinely used by women with a preference (as of 1970). We also make the implicit assumption that such new technology would not in and of itself alter sex preferences but would only permit the realization of such preferences. This may be an unlikely assumption for future generations (*3*), but it seems reasonable for the first cohort.

The first set of mothers to use sex preselection techniques would be a combination of women who would use this technology for all their children (that is, zero parity women) and women who would have already had varying numbers of children before the introduction of the new technology. Women who intend to have more children are a biased subset of all women in connection with sex preference, because of the relatively high concentration of zero parity women. One-third of the women who intended to have (more) children had not yet had a child, compared with 6 percent of the women who intended to have no more children. Since there was a decided tendency for women to prefer a male firstborn, the sex preference ratio for the total category of women intending (more) children was higher. For all women who intended to have children in the future, the calculated sex preference ratio was 124; this ratio was 189 for childless women and 102 for women with children. The effect of a technological breakthrough in this area could therefore be expected to result in nearly a 20 percent "excess"

of male births in the transitional period. This estimate is very much influenced by the parity distribution of women at the time in question. In 1970, the proportion of zero parity women was quite high because of the lower fertility of the period and the more youthful age distribution of women (reflecting the bulge of the baby boom 20 years earlier). The implication, therefore, is that a different effect could occur at other time periods. The period of transition that would actually occur if such technology suddenly became available would probably be fairly gradual in any event, so that the effect would be more attenuated and blurred.

The estimation of the long-range implications of sex preselection techniques is problematic. As we have indicated, a straightforward question about the number of sons and daughters preferred does not allow the separation of sex preference from number preference. Although inquiring about the sex preference for the next child elicits responses in which sex preference is separate from number preference, it does not allow calculation of the proportion of each respondent's children that would be male or female under conditions of sex control. For the aggregate, however, calculation of the sex ratio of these preferences should give us the answer, since the sex ratio of the existing children born to these women is approximately "normal."

The preference for a balance of sons and daughters is indicated in Table 1. After a strong preference for a male first child by 63 percent of the zero parity women, the subsequent sex preferences were overwhelmingly determined by the sex composition of previous births. The drive for balance is strikingly indicated by the complementarities of the percentages. For example, 85 percent of women with two children, both of whom were boys, indicated a preference for a girl if they were to have a third child, whereas 84 percent of women with two children, both of whom were girls, registered a preference for a boy as the next child. Women with a child of each sex were evenly divided as to the sex preference for the next child. Similar complementaries appear at each parity.

Overall, 51.1 percent preferred the next child to be a male, and 48.9 percent preferred the next child to be a female, yielding a total sex preference ratio of 104. In terms of sampling error, this is indistinguishable from the current sex ratio at birth of 105. Thus, the implication is that, apart from the transitional period, sex-control technology would have very little effect on the sex ratio at birth (assuming, of course, that current preferences remained stable).

Table 2. Sex distributions of the first two births in 1000 women. The number observed, calculated from (*19*), is compared with the number expected under conditions of sex preselection.

Birth order		Births	
1	2	Observed	Expected
Boy	Girl	251	504
Girl	Boy	248	286
Boy	Boy	264	128
Girl	Girl	237	82
All		1000	1000

Composition of Families

What effect would the use of sex-control technology have on the sex and birth order of the offspring of individual couples? Estimates are presented for two- and three-child families. In order to estimate these effects for the two-child case, we first calculated the probability that childless women would prefer the first child to be a male or a female; we then calculated, for women with one child, the conditional preference for the second child, given the sex of the first. The product of these two probabilities yields the expected proportion under conditions of sex preselection in each of the four possible birth-order and sex permutations. In a similar manner the calculations were extended to the three-child case. The results of these calculations and the currently prevailing distributions are shown in Table 2 for the first two births and in Table 3 for the first three births.

Table 3. Sex distributions of the first three births in 1000 women. The number observed, calculated from (*19*), is compared with the number expected under conditions of sex preselection.

Birth order			Births	
1	2	3	Observed	pected Ex-
Boy	Girl	Boy	129	278
Boy	Girl	Girl	122	227
Girl	Boy	Boy	127	133
Girl	Boy	Girl	121	153
Boy	Boy	Boy	135	19
Boy	Boy	Girl	128	109
Girl	Girl	Boy	121	69
Girl	Girl	Girl	115	13
All			1000	1000

The chance expectation (in the absence of sex preselection techniques) that the firstborn will be a boy and that the second child will be a girl is 0.25—approximately the same as the chance expectation of the other three permutations. Under conditions of complete sex control, the probability of the boy-then-girl sequence doubles to 0.50. The probability of the opposite sequence, a girl first and a boy second, rises slightly to 0.29, while the combined preference for both children of the same sex drops to 0.21 compared with the 0.50 expectation. Thus, although the sex ratio would appear to be unchanged, there would be a significant increase in the probability of the firstborn being a male and the second child being a female, and a large drop in the probability of both being the same sex. Extending the calculation to include the third birth (see Table 3) sharpens the latter contrast even more. Whereas the current biological expectation would dictate that 25 percent of the first three children born would be all boys or all girls, if women's preferences prevailed, these two combinations of the first three births would drop to a total of 3 percent.

Acceptance of Sex Preselection

Up to this point, we have assumed that sex preselection technologies would be effective, acceptable, and used by prospective parents with a preference for a child of a particular sex. To the extent that these assumptions are only partially fulfilled, the expected implications of sex preselection technology would be attenuated or perhaps reversed. One relevant datum would be the demand for such technology. Although demand tends to be unpredictable before the introduction of a technology (witness the automobile), the women in the sample were asked the following question about their attitude toward sex preselection: "Sometime soon, couples will be able to choose in advance whether they will have a boy or a girl. How would you feel about being able to choose the sex of a child?" The responses were coded as for, against, or neutral.

Table 4. Attitudes of currently married women toward the possibility of sex preselection, according to sex composition of past births.

Sex composition of past births	For (%)	Against (%)	Neutral (%)	Total (%)	Women (%)
No births	39.8	43.8	16.4	100	847
All boys	40.1	45.8	14.1	100	1239
More boys than girls	37.7	49.0	13.3	100	844
Equal number of boys and girls	32.7	50.0	17.3	100	1043
More girls than boys	39.8	47.7	12.4	100	789
All girls	42.7	43.7	13.6	100	1043
Total	38.8	46.7	14.6	100	5805

The results show some preponderance of negative reactions: 46.7 percent against, 38.8 percent in favor, and 14.6 percent neutral. As the distribution in Table 4 indicates, there is a slight tendency for women with children of one sex only to be more in favor of such a development than women with children of both sexes; those with the same number of boys and girls are the least in favor of having such control. At a minimum, this suggests that there will be a lag between the introduction of sex-control technology and its routine use, and that such techniques may only be selectively used. Moreover, if the considerable incidence of unplanned births in the United States [44 percent of all births between 1966 and 1970 were reported by women as unplanned (*17*)] were to continue, the effects of sex preselection technology would be further diluted.

Summary and Conclusions

If effective sex control technologies were rapidly and widely adopted in the United States, the current sex preferences of married women indicate that the temporary effect would be a surplus of male births in the first couple of years. This would be followed by a wave of female births to achieve balance, and the oscillations would eventually damp out. Ultimately, under conditions of sex predetermination, the sex ratio would be similar to the existing natural sex ratio at birth of 105. In the transitional generation, the fact that the excess of male births would precede an excess of female births means that the effect on the marriage market two decades later would be reduced.

The most lasting implication of the introduction of sex-control technologies would appear to be a significant increase in the probability of the firstborn being a male, and the second child being a female. Whatever characteristics are associated with being firstborn would thus be concentrated among males. Social-psychological literature (*18*) suggests that firstborn are more susceptible to social pressure and more likely to achieve (educationally and economically) than subsequent children. Sex-control technology could also facilitate the marriage market by increasing the probability that a given individual would have a friend of the same sex with a sibling of the appropriate sex and age for marriage.

Rather than speculate further about the implications of these changes in the sex and birth-order composition of the offspring of individual couples, we would like to introduce some notes of caution. The assumption has been that parents would routinely choose the sex of their offspring when provided with an effective and acceptable technique of sex preselection. The current attitudes of married women suggest that a substantial proportion would be unfavorably disposed toward being able to choose the sex of their children. Although these attitudes may change when a simple and effective technique of sex preselection becomes available, the possibility that such techniques would be infrequently used cannot be dismissed.

These findings relate only to the United States. In other developed countries, sex-control technology may have more of an effect on the sex ratio because of the much greater frequency of one-child families. Indeed, if fertility continues to decline in the United States and the one-child family becomes more common, an increase in the proportion of male births would then also be expected here. In the developing countries, the greater cultural emphasis on having sons suggests the possibility of a more radical impact on the sex ratio. But it seems clear from the data that the only major impact in the United States would be on the sex of the first two births, with little effect on the overall sex ratio at birth.

References and Notes

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10. In this article, two related statistics are used: (i) percentage preferring a male, $[M/(M+F)] \times 100$, and (ii) sex preference ratio, $(M/F) \times 100$, where M is the number preferring a male and F the number preferring a female. It should be noted that a difference in percentages produces a much larger difference in the ratios. For example, a shift from 51 percent to 52 percent would correspond to a shift in the ratio of 104 to 108, see M. S. Teitelbaum, *J. Biosoc. Sci.* (Suppl. 2) 64 (1970).
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