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ABSTRACT

This study compared the careers of women who graduated from all-girls independent secondary schools to the careers of those who graduated from comparable coeducational schools, in order to determine if there are differences between the career choices of these two groups. Comparisons were made of the number of women in each of 10 traditionally-male fields: medicine; law; engineering; dentistry; veterinary medicine; finance; computers; scientific research; architecture; and psychology. A total of 12,651 alumnae records were screened covering the periods from 1960 to 1985. Results showed that there were very few differences between the careers of graduates of girls' schools and those women graduating from coeducational secondary schools. In those cases where differences did occur, they all favored the coeducational schools. In none of the 10 fields did the graduates of the girls' schools have a proportionately larger number of women, which contradicts other research showing positive effects of girls' schools. Careful consideration of these conclusions is made in light of findings from other studies. Contains 19 references. (GLR)

Career Patterns of Women Graduates of Independent Schools: A Comparison of Coeducational and All-Girls High Schools

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The objective of this study was to compare the careers of women who graduated from all-girls independent secondary schools to the careers of those who graduated from comparable coeducational schools, in order to determine if there are differences between the career choices of these two groups.

In the last twenty-five years, there has been a strong movement away from single-sex education to coeducation, both at the college and the secondary school level. Ironically, this came about at a time when research was just beginning to demonstrate a positive effect of single-sex education for women at the college level. Tidball (1973) showed that women's colleges were much more likely to produce women of achievement, especially in nontraditional fields like the sciences. Tidball and Kistiakowsky (1976) demonstrated that women who obtained doctorates in the biological and physical sciences were more likely to have graduated from women's colleges than from coeducational undergraduate institutions.

Much less research has been done on the effects of single-sex education at the secondary school level. Studies in Great Britain, Australia and Canada seem to indicate that girls in single-sex schools are less likely to view the

sciences and calculus as "masculine" and more likely to enroll in these courses than girls at coeducational schools (Kahle, 1983); girls at these single sex schools also express more positive attitudes towards physics, the most "masculine" of the sciences, than their counterparts at coeducational schools (Stables, 1990). In the United States, Lee and Bryk (1986) compared girls attending coeducational Catholic schools to those at all-girls Catholic schools and found strong effects in favor of the single sex situation: girls at the all-girls schools were more positive about academics in general, expressed a greater interest in mathematics, showed greater achievement gains in science, and had higher educational aspirations than their peers at coeducational schools. Lee and Marks (1990) also showed that these same girls held less stereotyped views about the role of women in the workplace, which may lead these girls to choose more nontraditional careers.

At this time, most of the secondary schools that remain single-sex are either Catholic schools or independent college preparatory schools. (Since the passage of Title IX in 1972, single-sex public education has almost vanished; two all-girls public high schools remain, in Philadelphia and Baltimore.) Since the 1970s, the pool of applicants for girls' independent schools has diminished, as many boys' schools have become coeducational, thereby drawing off many of the girls who traditionally would have gone to girls' schools. Additionally, many former girls' schools have themselves turned into coeducational institutions or merged with boys' schools. At present, the remaining all-girls independent schools, in order to attract new applicants, are marketing their schools as places free from gender stereotyping, places that encourage girls to develop their full potentials (Coalition of Girls' Boarding Schools, 1991; Harvard magazine, 1992). However, no one has tried to examine whether, like the women's colleges, the girls' schools produce young

women more likely to achieve higher educational goals, especially in nontraditional fields. The present research begins to study this question.

Method

Specifically, this research compared the subsequent careers established by graduates of girls' independent schools to the careers of women graduates of similar schools that are coeducational. Career information was provided by the alumnae offices of thirteen independent schools in the northeastern United States: the Chapin School, the Dalton School and Friends Seminary, all in New York City, Kingswood-Oxford School in West Hartford, Connecticut, Linden Hall School in Lititz, Pennsylvania, Loomis-Chaffee School in Windsor, Connecticut, Milton Academy in Milton, Massachusetts, Miss Porter's School in Farmington, Connecticut, Staten Island Academy in Staten Island, New York, Suffield Academy in Suffield, Connecticut, Ethel Walker School in Simsbury, Connecticut, Westover School in Middlebury, Connecticut, and Winsor School in Boston, Massachusetts. Six of these are presently all-girls schools, and seven are presently coeducational. This sample comprises a mix of boarding and day schools (7 boarding and 6 day), and a mix of city and suburban schools (4 city, 9 suburban) as well. Of the coeducational schools, two have always been coeducational (Friends Seminary and Staten Island Academy), while the other five are formerly a girls' school (Dalton School), a boys' school(Suffield Academy), and coordinated girls' schools that have merged with their "brother" schools (Kingswood-Oxford and Loomis-Chaffee Schools, and Milton Academy).

To the extent that these were available, the present careers of women graduates of the thirteen schools from the classes of 1960 through 1985 were examined. The number of women in each of ten fields were recorded for each

class. The ten fields were: medicine, law, engineering, dentistry, veterinary medicine, finance, computers, scientific research, architecture and psychology. These ten fields were chosen because they have been traditionally male fields, or they require skill in mathematics/science, or both. Several of the alumnae offices were able to provide these numbers directly since they had these computerized and coded; others provided their most up-to-date alumnae directories, and the author examined the directories for this information. The method of data collection thus provides some uncertainty: not all the alumnae have kept their alumnae offices supplied with up-to-date information, and many alumnae list their name and addresses but not their present occupations. Nonetheless, there is no reason to believe that the proportion of women who have not communicated recent career information to their alumnae offices differs between coeducational and all-girls schools.

For classification purposes, the following decisions were made: Only those alumnae who listed themselves as physicians or held the title M.D. were classified under medicine; nurses, physical therapists and other allied health fields were excluded because these have traditionally been female occupations. Likewise, only those who called themselves attorneys, lawyers or judges were recorded under law; paralegals were not counted. Dental assistants and dental hygienists were excluded from dentistry, and veterinary assistants were excluded from veterinary medicine. Alumnae who worked as bankers or stockbrokers were listed under finance, but not those who were accountants or who worked in insurance (unless they were lawyers or systems analysts, in which case they were counted under law or computers). Elementary or secondary school teachers of science or of computer science were not counted under science or computers, since teaching has been a traditonal female

occupation. Likewise, medical technologists were not counted as scientists. Landscape architects were not counted as architects, since the field of landscape architecture does not require the physics and mathematical background that "pure" architecture does. Only those who listed themselves as psychologists or psychotherapists were counted under psychology; social workers and counselors were excluded, although this is somewhat problematical since some alumnae with degrees in psychiatric social work may call themselves psychotherapists. Psychiatrists were listed under medicine rather than psychology, since they have M.D. degrees. In the classes of 1980-85, alumnae who listed themselves as students at a particular medical school or law school were listed under medicine or law; those who listed themselves as "pre-med" or "pre-law" were excluded. Within these parameters, every effort was made to be as consistent as possible in classification.

A total of 12,651 alumnae records were screened and recorded in this manner, 4488 from the classes of 1960-69, 4894 from the classes of 1970-79, and 3269 from the classes of 1980-85. Classes later than 1985 were not surveyed since it was evident that many of these alumnae were still in school and/or had not yet chosen careers. Data from the classes of 1980-85 from the Dalton School were dropped, since the most up-to-date directory was dated 1986, and this data seemed to be too out-of-date for such recently graduated classes. (Other directories were dated 1992.)

Results

Although seven of the schools in this study are presently coeducational, only two of them were coeducational during most of the 1960s. Thus a meaningful comparison could not be made between alumnae of girls' schools and coeducational schools of the 1960s, since there was so little data

from the coeducational schools.. Instead, the data from the 1960s was compared to data from the 1970s to examine the effects of the women's movement, burgeoning during the 1970s, on career patterns of all the women graduates of these schools. It was hypothesized that more women from the classes of 1970-79 would choose nontraditional fields than women from the classes of 1960-69; this hypothesis was tested among graduates of girls' schools that remained single-sex throughout the 1960s and 1970s, graduates of girls' schools that became coeducational during the early 1970s, and graduates of coeducational schools. This data is displayed in Table 1. Because of the nature of the data, the nonparametric statistic chi-square was used to test for statistical significance of these differences. It was found that graduates of the 1970s were more likely to have careers in engineering than graduates of the 1960s, whether they attended a girls' school or a girls' school that had recently become coeducational; since the two schools that were coeducational in the 1960s produced no engineers from the classes of 1960-69, a chi-square could not be performed on that data. Girls' school graduates of the 1970s were much more likely to have careers in finance and less likely to have careers in psychology than graduates of the 1960s from the same schools; aside from these two fields and engineering, as mentioned above, no significant differences were found between girls' school graduates of the 1960s and 1970s. Graduates of the 1970s from coeducational schools that were formerly girls' schools were more likely to have careers in law, as well as engineering, than graduates of the same schools from the 1960s. No other significant differences were found between the classes of the 1960s and classes of the 1970s.

Comparisons were also made between the classes of 1970-79 and the classes of 1980-85, although it was felt that these may not be as reliable since members of the later classes were perhaps still in the process of choosing

careers. Nonetheless, few significant differences were found. These data are shown in Table 2. The 1980s graduates of coeducational schools appeared to be less likely to enter the fields of medicine, law and psychology than the 1970s graduates of the same schools; no differences were found in other fields for the coeducational schools, and no differences were found between the 1970s and 1980s classes of the girls' schools.

Comparisons were made between the seven girls' schools (Milton Academy still had separate classes for girls in the 1970s and so was counted as a girls's school here) and six coeducational schools for the graduates of the classes 1970-79. The data are displayed in Table 3. Statistical analysis by means of the chi-square statistic revealed that graduates of coeducational schools were more likely than girls' school graduates to have careers in four fields: law, computers, science and psychology. No significant differences were found among the other fields between girls' school and coeducational alumnae.

Similar comparisons were made between the six girls' schools and seven coeducational schools (here Milton Academy was counted as a coeducational school) for the classes of 1980-85. The data are displayed in Table 4. The only significant difference found was that alumnae of coeducational schools were more likely to have careers in science than alumnae of girls' schools. Once again, it should be stressed that the data from the classes of 1980-85 are probably the least reliable.

Discussion

Very few differences were found between the careers of graduates of girls'schools and those of women graduates of coeducational schools. In the few cases in which they occurred, all differences favored the coeducational

schools. In none of these ten fields did the graduates of the girls' schools have a proportionately larger number of women. Since this seems to contradict studies by other researchers that show positive effects of girls' schools, careful consideration of these results is in order.

One obvious difference between this study and that of Tidball (1973) and Tidball and Kistiakowsky (1976) is that those studies looked at the effects of women's vs. coeducational colleges, while the present study looked at secondary schools. It may well be that the effect of college is much more significant to a woman's eventual career choice than any effects of the secondary school she attended. It has been shown (Tobias, 1990) that 40% of students who enter college planning to major in science change their minds by the end of freshman year; also women seem to change their minds about majoring in science more often and for different reasons than men (Ware and Steckler, 1983). Thus it may be that many of the girls' school graduates who had chosen nontraditional careers during high school, and who went on to coeducational colleges, became discouraged or disenchanted with their fields and changed to more traditional fields, while those that went on to women's colleges continued with their chosen fields, as the Tidball studies suggest.

Additionally, the methodology of the Tidball studies was in the opposite direction from the present study; that is, in those studies, women of achievement in nontraditional fields were identified first, then their undergraduate institution was determined, whereas in this study graduates of particular schools were identified first and their occupational fields determined second. It is not immediately apparent that these two methodologies should produce different results, but it is a possibility, particularly since all of these schools are located in one geographical area (the northeast) while Tidball was examining career patterns on a national

scale. Also, where Tidball looked only at women obtaining doctorates in the sciences and engineering, this study examined women in other professions such as medicine, dentistry etc. that were not part of the Tidball study.

On the other hand, the studies that showed the empowering effect of girls' high schools, such as those of Lee and Bryk (1986) and Lee and Marks (1991), not only looked at a different population (Catholic girls' schools rather than independent schools), but also examined only attitudes and aspirations. No attempt was made to determine whether these young women actually *achieved* the careers to which they aspired in high school. Again, it may be possible that girls' schools instill in young women the desire to achieve in nontraditional fields, but that desire is easily turned aside by the pressures of college and coeducation. In fact, Riordan (1985) has demonstrated, using data from Catholic schools, that although girls from girls'schools outperform their counterparts in coeducational schools in both English and mathematics, they do *not* have higher educational attainment, where educational attainment is measured simply by the numbers of years of schooling completed. A longitudinal study, which follows a group of young women through high school and college and measures changes in their aspirations, attitudes and achievements as they proceed through these eight years of schooling, would provide some valuable information about this. Such a study has just been initiated by this author.

It should also be pointed out that only ten fields were chosen as "nontraditional" ones for the purpose of this study. Had other careers been examined, it is possible that other differences would have been found; for example, some women in the study were listed as airplane pilots or police officers, which are certainly nontraditional careers for women. These, however, were even fewer than the rare dentists and veterinarians found in

this study. Many of the schools had alumnae in the arts or journalism. While these are not necessarily nontraditional areas for women, it may be that these women have carved out highly successful or unusual careers in these fields. The present study did not accommodate such career choices.

It is interesting to compare these data to national trends as reported by various professional organizations. For example, the percentage of graduates of veterinary schools who are women grew from 5% in the late 1960s to 22% in the late 1970s to 50% in the late 1980s (Wise, 1992); this tenfold increase is not reflected in the data from these thirteen schools. Clearly, the graduates of northeastern independent schools are not the ones currently swelling the ranks of women veterinarians, although it must be noted that a high proportion of women who enter veterinary programs are over 30 when they graduate, so some of the alumnae of the classes of the 1970s and 1980s may yet become veterinarians. Veterinarians tend to come from other parts of the country than the northeast, so the geographical bias of this study may also account for the low numbers of veterinarians found. Similarly, the increases found in the number of women graduating from medical schools (Bickel & Quinnie, 1992) - 8% in the late 1960s to 23% in the late 1970s to 35% in the late 1980s - is not shown by the women in this sample , nor is the doubling of the number of women getting doctorates in psychology, computer science, and the natural sciences in the last fifteen years (Browne, 1993). At present, dental school graduates are nearly 50% female and architectural school graduates are 30% female, while practicing dentists are 9% female and practicing architects are 7% female,(American Dental Association, 1992; American Institute of Architects, 1992) again showing the growth of the numbers of females in these fields over the last decades, a growth not shown in this sample . Although an increase in woman engineers is shown in this

sample, it is certainly not the 37-fold increase - from 0.4% in 1965 to 15% in 1985 - shown in the national statistics (American Association of Engineering Societies, 1989). Independent school alumnae, whether from girls' schools or coeducational schools, are not following these national trends, although the reasons are not clear.

For the purposes of the present study, it is more important to speculate upon why this study shows no significant effects in favor of the girls' schools. One possibility is that the two sets of schools were not matched properly, so that the sample chosen favored the coeducational schools. The sample was chosen by the author with the intention of having a representative group of both types of schools, some very selective and others less selective in their admissions policies, some drawing from an exclusively local population and others drawing from a national and international clientele (although all with a northeastern bias). Nonetheless, matching for average SAT scores might have better insured that the two samples were equivalent.

If the samples are equivalent in terms of academic ability of the students, there may still be differences in the students that attend the two types of schools that may account for the results. For example, during the 1970s, when many of these schools were becoming coeducational, it may have been the more aggressive or more adventurous girls who chose to go to the newly coeducational schools. These traits might make them more likely to enter and to succeed in the nontraditional fields. Lee and Marks (1992) suggest that, at least at present, girls who attend all-girls independent schools tend to come from more traditional homes than those attending coeducational independent schools. If this was true during the 1970s and 1980s, it might be that girls attending girls' schools during those years were less likely to receive parental support for venturing into nontraditional, "masculine" fields.

Thus, as Marsh (1989) has suggested, differences between types of students who attend single sex and coeducational schools may be more important than the effects of the schools themselves.

It is also be possible that the type of school does have an effect. Perhaps in the coeducational high school classroom, at least some of the girls learn how to compete with males in mathematics and science, and thus are less likely to be overwhelmed by the competitive atmosphere of these classes in college than the girls who went to girls' schools. This is in contradiction to Tidball's work, which found that women's college graduates were more likely to get doctorates in the sciences than coeducational college graduates; the women's college alumnae clearly were not overwhelmed by male competition in graduate school. But since this study dealt with high schools and Tidball's with colleges, the difference in age may be significant. Perhaps the high school to college transition is made at a more vulnerable age than the college to graduate school transition, and the effect of going from an all-girls' atmosphere to a coeducational one is more overwhelming at that age.

In fact the nurturant atmosphere of the girls' school is in direct contrast with the cold impersonal nature of the college science classroom; it is this cold impersonal atmosphere that Tobias (1990) has found to be one of the chief reasons why students, especially women, decide that science is not for them. Thus, the contrast between high school classes and college classes in science may be that much stronger for graduates of girls' schools, making them more likely to withdraw from science courses. It is certainly the personal experience of this author, who spent nearly 20 years as a science teacher at independent schools, that female students who enjoyed science in high school are often disappointed and overwhelmed by the cold and competitive atmosphere of the college science class.

Lastly, it must be at least considered that coeducational high schools might have done a better job at giving girls the skills and knowledge that they needed to compete with males in college. Prior to the mid 1970s, some of the girls' schools badly neglected their science departments in terms of both curriculum and facilities, and thus their graduates were ill-equipped to deal with college science courses, even if they left high school with the intention of entering nontraditional fields. Again, this is corroborated by the author's personal experience; interviewing for a position as a science teacher in 1974, I was told by several heads of girls' schools that they were finally ready to start "upgrading" their science programs. As upgrading takes several years - building new facilities, hiring new faculty, changing curriculum all take considerable time - students who went to girls' schools in the 1970s may well have obtained a lesser education in the sciences.

If this last possibility is the correct explanation, then the improved science departments of the girls' schools should be making a difference for the graduates of the 1980s and 1990s, and a subsequent study may confirm this. If, however, it is the case that the nurturant atmosphere of the girls' school makes the college science course more difficult to adjust to, should girls' schools become less nurturant? It is doubtful that anyone would accept this. It might be that nurturing girls while they learn how to do science and then giving them some experience in competing with males (in state and national science competitions) would be an effective compromise.

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Table 1 - A Comparison of the Classes of 1960-69 to Classes of 1970-79

A. Girls'Schools:

	Med	Law	Engr.	Vet	Dent	Fin	Comp	SciR	Arch	Psych
1960s (N=3373)	47	95	4	4	0	51	30	19	20	33*
1970s (N=3300)	57	114	12*	10	3	111*	26	24	28	16

B. Girls' ('60s) changed to Coed ('70s)

	Med	Law	Engr	Vet	Dent	Fin	Comp	SciR	Arch	Psych
1960s (N=964)	16	28	1	0	0	23	19	8	4	17
1970s (N=1180)	32	61*	7*	1	2	35	23	18	4	17

C. Coeducational Schools

	Med	Law	Engr	Vet	Dent	Fin	Comp	SciR	Arch	Psych
1960s (N=151)	3	13	0	0	0	4	1	1	1	4
1970s (N=291)	4	33	1	0	0	12	1	7	4	2

* Significant at the 0.05 level

Table 2 - A Comparison of the Classes of 1970-79 to Classes of 1980-85

A. Girls'Schools:

	Med	Law	Engr.	Vet	Dent	Fin	Comp	SciR	Arch	Psych
1970s (N=3300)	57	114	12	10	3	111	26	24	28	16
1980s (N=1975)	25	86	3	1	1	69	17	9	9	5

B. Coeducational Schools

	Med	Law	Engr	Vet	Dent	Fin	Comp	SciR	Arch	Psych
1970s (N=1594)	36*	95*	9	1	2	48	25	26	8	19*
1980s (N=1294)	8	54	6	2	1	53	15	16	3	6

* Significant at the 0.05 level

Table 3 - A Comparison of Girls' Schools Alumnae to Coeducational Schools Alumnae for the Classes of 1970-79

	Med	Law	Engr.	Vet	Dent	Fin	Comp	SciR	Arch	Psych
Girls' (N=3300)	57	114	12	10	3	111	26	24	28	16
Coed (N=1594)	36	95*	9	1	2	48	25*	26*	8	19*

*Significant at the 0.05 level

Table 4 - A Comparison of Girls' Schools Alumnae to Coeducational Schools Alumnae for the Classes of 1980-85

	Med	Law	Engr.	Vet	Dent	Fin	Comp	SciR	Arch	Psych
Girls (N=1975)	25	86	3	1	1	69	17	9	9	5
Coed (N=1294)	8	54	6	2	1	53	15	16*	3	6

*Significant at thc 0.05 level