

ACADEMIC CAREERS: CHOICE AND ACTIVITY OF GRADUATES OF A PEDIATRIC RESIDENCY PROGRAM 1974-1986

FREDERICK H. LOVEJOY, JR., FRED D. LEDLEY, (by invitation),
DAVID G. NATHAN

BOSTON

The Children's Hospital in Boston is an academically oriented institution that emphasizes general pediatric training but with the goal of placing a majority of its graduates in academic pediatrics both locally and throughout the country. The career choices of 280 graduates from 1974 to 1986 were studied to ascertain: (a) whether these objectives are being achieved; (b) the current nature of professional activity of these graduates; and (c) the nature of their publication record as an indicator of their academic activity.

CAREER CHOICES

Methods

Data concerning the careers of 270 Children's Hospital graduates between 1974 and 1986 were determined by questionnaire, departmental records and follow up discussions. Careers were classified as either academic pediatric (that is salaried positions within medical schools or their affiliated hospitals), or pediatric practice (that is private practice independently or part of a group).

Results

Characteristics of the careers chosen by these graduates are shown in Table 1 (1). Of the 270 former house officers, 177 (66%) are in academic pediatrics, 84 (31%) in practice, and 9 (3%) involved with other professional activities (NIH, CDC, public health). These figures contrast with national data for programs in pediatrics in which 19% enter academics and 81% enter practice. One hundred and seventy eight (66%) are men and 92 (34%) are women. There has been a steady increase in the percentage of women in our program with 30% in 1974, 39% in 1986 and 50% in 1991; 75% of the men and 57% of the women are pursuing academic careers (as contrasted with 22% of men and 18% of women at a national level). Of the 270 house officers, 13 (5%) are African-Ameri-

The Department of Medicine, Children's Hospital; the Department of Pediatrics, Harvard Medical School; 300 Longwood Avenue, Boston, Massachusetts, 02115.

Reprint requests to Frederick H. Lovejoy, Jr. at the above address.

TABLE 1
*Characteristics and Career Choices of 270 Graduates of the Pediatrics Residency at The Boston Children's Hospital, 1974-1986**

Characteristics	Total No. Graduates	No. and % Choosing Career			
		Academic Pediatrics		Pediatrics Practice	
		No.	%	No.	%
Graduates by gender	270	186	69	84	31
Men	178	134	75	44	25
Women	92	52	57	40	43
Underrepresented minorities by gender	13	9	69	4	31
Men	6	6	100	0	0
Women	7	3	43	4	57
Location	261‡	177	68	84	32
Massachusetts	120	77	64	43	36
California	30	17	57	13	43
All other states	111	83	75	28	25
Activity after fellowship	224	182	81	42	19
Medical school	†	177‡	100	†	†
Harvard	†	60	34	†	†
Tufts	†	8	5	†	†
UCLA	†	7	4	†	†
U. of Penn.	†	7	4	†	†
Wash U.	†	7	4	†	†
All others	†	88	49	†	†
Practice	†	†	†	84‡	100
General or specialty	†	†	†	64	76
Managed care	†	†	†	20	24
Special groups	41	32	78	9	22
Alternative Pathway	26	23	90	3	10
Chief residents	15	9	60	6	40

* Using departmental records and follow-up interviews, the authors obtained data on the career choices of 270 of the 276 graduates who had served at least two years in the residency. The graduates' careers were classified either as academic pediatrics careers (chosen by those who had salaried positions within medical schools or their affiliated hospitals) or careers in pediatrics practice (chosen by those who were in private practice, either independently or as part of a group). A few graduates had careers in other areas, such as public health, government, or industry.

† Not applicable.

‡ Six of the 270 were not from the United States, and three died.

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cans, of whom 9 (69%) have chosen academic careers. The distribution of African-American men and women in academic pediatrics and practice is also indicated in the table. Of the 270 graduates, 224 (83%) took a fellowship or did further residency training, while 46 (17%) have proceeded directly into practice, this contrasting with figures from a Ross

national survey in 1990 in which 57% proceeded into fellowship or further residency and 43% took no further training. Following fellowship, 81% entered academic pediatrics, in contrast to a national average of 60%, as compiled by a Pediatric Department Chairman survey of 1985. The graduates are distributed among 46 (38%) of the 128 medical schools in the United States, with 34% currently holding appointments at the Harvard Medical School and 44% associated with the four medical schools in Massachusetts. Twenty-six percent of the 224 entering fellowships selected two subspecialties, neonatology (13%) and hematology/oncology (13%), followed by infectious diseases (10%), cardiology (8%), gastroenterology (8%), anesthesiology/intensive care (7%), general academic pediatrics (7%), genetics (7%), neurology (6%), and allergy/immunology/rheumatology (5%). Of the 84 graduates who chose pediatric practice, 64 (76%) are in general or specialty oriented private practice and 20 (24%) are in managed care. Of the 270 graduates, 26 (9%) pursued the Alternative Pathway of the American Board of Pediatrics (2 years of residency followed by a fellowship). Twenty men and six women in the Alternative Pathway entered fellowships in hematology/oncology (18), neonatology (4), cardiology (2), nephrology (1), and infectious disease (1). Twenty-three (90%) are pursuing academic careers, 11 hold academic appointments at the Harvard Medical School, with the remainder (12) distributed among ten other medical schools. At present, four are instructors, and ten are assistant, six associate, and three full professors.

PROFESSIONAL ACTIVITIES

Methods

A subset of the 270 graduates, specifically, a cohort of 150 graduates between 1976 and 1981, were further analyzed by questionnaire to determine the nature of their professional activity. Individuals not responding to questionnaire mailing were individually contacted by the authors.

Results

Of 117 (78%) respondents, 70% are in academic pediatrics and 30% in practice. Forty-seven percent of their time is committed to pursuing clinical care activities, 25% administration and teaching, and 28% research (Table 2). The majority (71/117, 61%) reported at least 10% effort in all three activities; 30% reported no research, 7% no teaching or administration, and 8% no clinical care activity. These fractions are significantly different for those in academic positions as compared to those in clinical practice (Table 2). Most individuals involved in academic practice report clinical activities requiring 30% or less of their time. In

TABLE 2
Distribution of Time 1976-1981

	Clinical Care	Administration and Teaching	Research
	(%)	(%)	(%)
1) All (n = 117)	47	25	28
2) Academic Pediatrics (n = 82)	35	27	38
			(40% clinical, 60% basic)
3) Practice (n = 35)	77	18	5
			(100% clinical)
4) MD/PhD	30	24	46
			(22% clinical, 78% basic)

Distribution of time in clinical care, administration and teaching, and research for all graduates, those in academic pediatrics, those in practice, and those in academic pediatrics with a combined MD/PhD degree.

contrast individuals in community practice dedicate more than 80% of their time to clinical activities (Figure 1a). While over half are involved in research, few dedicate more than 50% of their time to research activities; none reported 100% involvement in research (Figure 1b). Eighty-five percent drew the majority of their salary from clinical sources (fee for service or clinical salary), while only 15% report 100% salary support from non-clinical sources (primarily intramural programs of the NIH or CDC) (Figure 1c). Figure 2 shows the relative interest in community or academic practice, and clinical or basic research at different times of training. Interest in academic practice and clinical research increased throughout preclinical and clinical training. Figure 3a indicates that the most important factors enhancing the *decision* to do research include pre-existing interest in research or academic medicine as well as research experience in the summer, as an undergraduate, during fellowship, or post-doctoral programs. The major negative factors include salary expectancy, funding for research, and the perceived competitiveness of academic life. Figure 3b indicates those factors enhancing the *ability* to do research including PhD training, fellowship training, or post doctoral training, while the most often cited negative factors include research time and funding, clinical and administrative duties, and family responsibilities.

SCHOLARSHIP

Methods

The nature of academic scholarship was also ascertained for the cohort of 150 graduates between 1976 and 1981 utilizing MEDLINE literature

citations (January, 1966–January, 1989) recalling title, journal, year of citation (2).

Results

Of 2,098 citations by 122 or 81% of these 150 graduates, 32% (48) published before residency (range of 1 to 24 papers; 171 citations); few published during residency, and within a 7 year time frame post-residency, 74% (111) published at least one paper (range 1 to 58; 1327 citations) (Figure 4). When publication activity is normalized for the number of years since completing residency, there is a rapid increase in the fraction of individuals publishing each year during the first 3–4 years after residency, then subsequently flattening, and finally a gradual increase in the rate of citations per individual per year (Figure 5). Figure 6

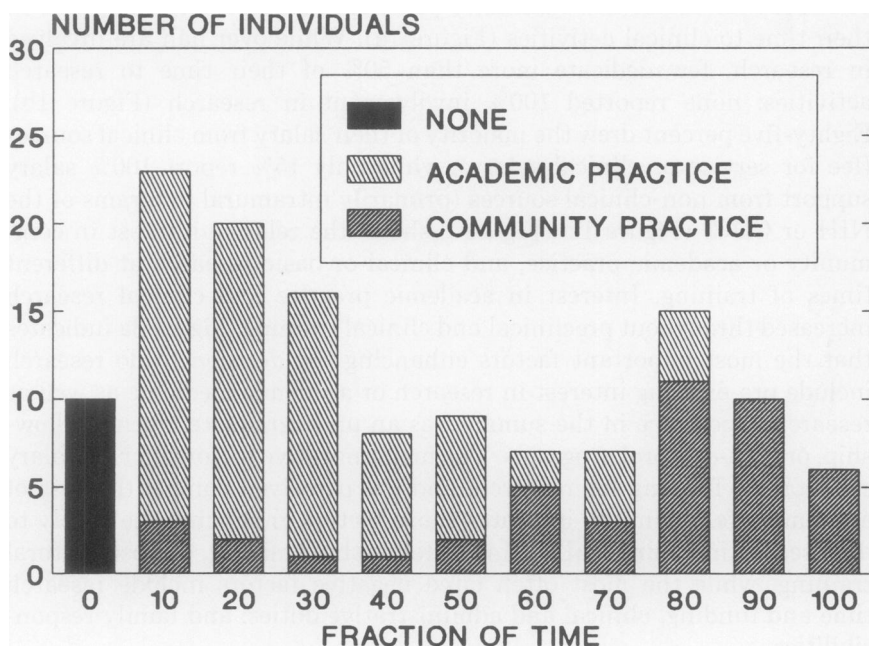


FIG. 1. Fraction of time spent in clinical activities among those in academic practice or community (private or group) practice. Data are shown for two activities and total clinical activity (upper figure—a). Fraction of time spent in basic research and clinical research. Data are shown for two activities and total research activity (middle figure—b). Support by fraction of salary drawn from clinical salary, clinical billing and non-clinical (research and governmental sources) (lower figure—c).

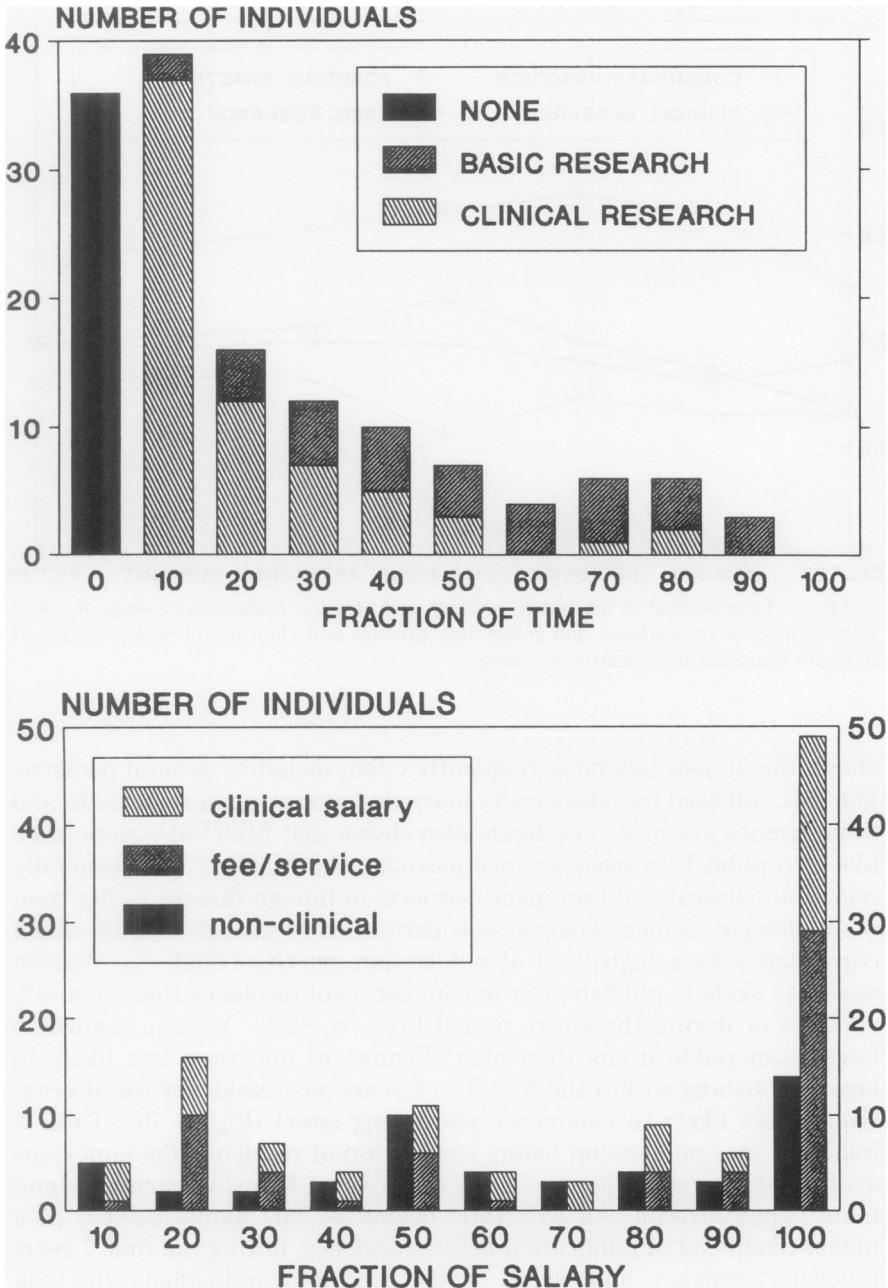


FIG. 1. B & C

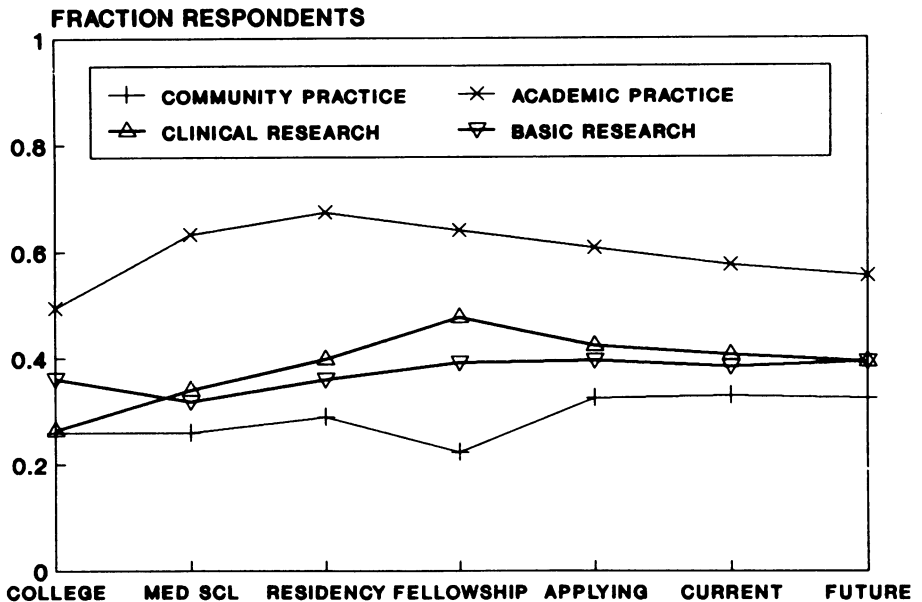
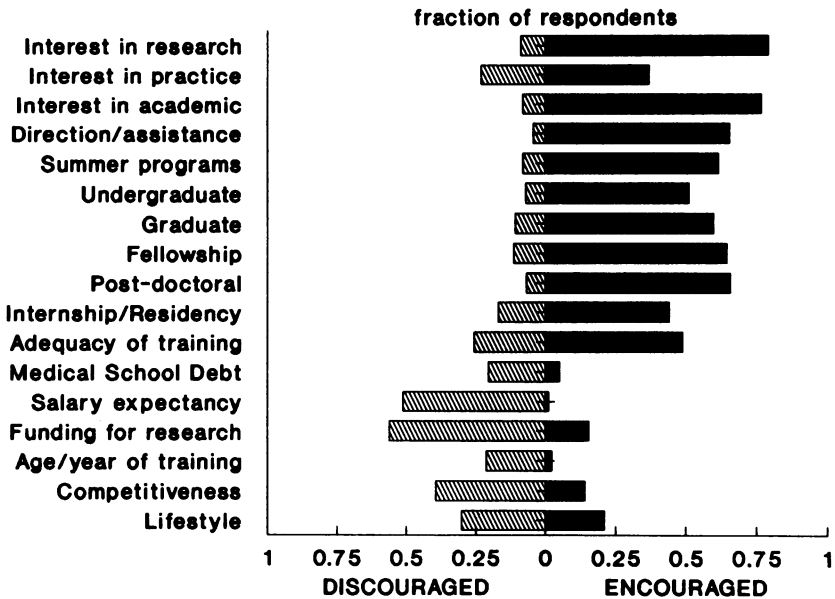


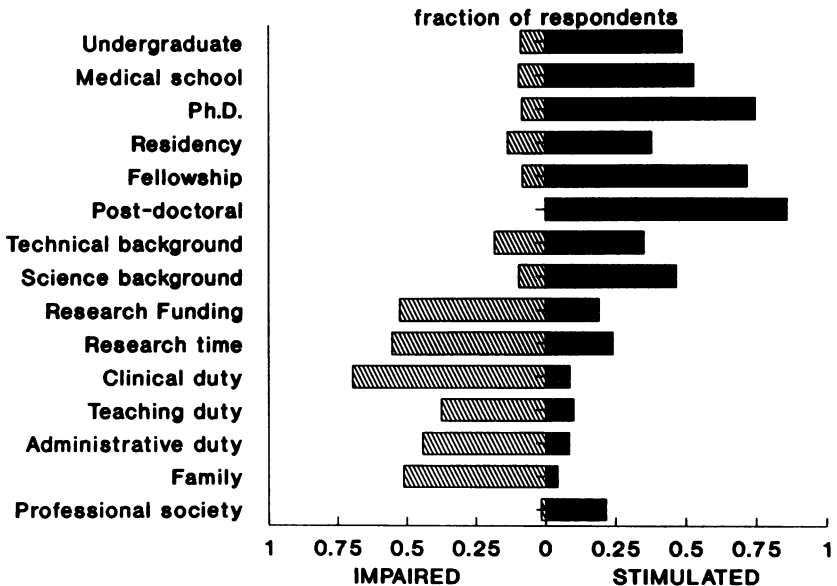
FIG. 2. Development of interest in research and practice. Indication on scale of 1-4 of relative interest in academic and community practice and clinical and basic research at different times during education/training.

shows the 25 journals most frequently cited, including general pediatric journals, followed by subspecialty journals, general medical journals, and basic science journals. The figure also shows that MD/PhDs were more likely to publish in basic science journals. Publications were generally related to clinical and therapeutic aspects of human disease rather than basic biologic science. Analysis was performed to identify factors which correlated with a high level of publication activity (Table 3). Women were less likely to publish prior to completion of residency than men (9% vs 42%) or during the entire period (57% vs 82%). Women tended to have fewer publications than men (Figure 7a) and were less likely to begin publishing within the first 3 to 4 years post-residency (or alternatively more likely to commence publishing later) (Figure 7b). Table 3 indicates that publication before completion of residency (vs none) was associated with more papers in the seven years following residency and more papers overall. An MD/PhD degree vs MD alone resulted in a higher likelihood of publication before residency, during the first 7 years following residency, and overall (Table 3). Finally, individuals who took fellowships were significantly more likely to have citations than those in practice (81% vs 41%).

Factors Affecting Decision to do/not do Research



Factors which affect ability to do research



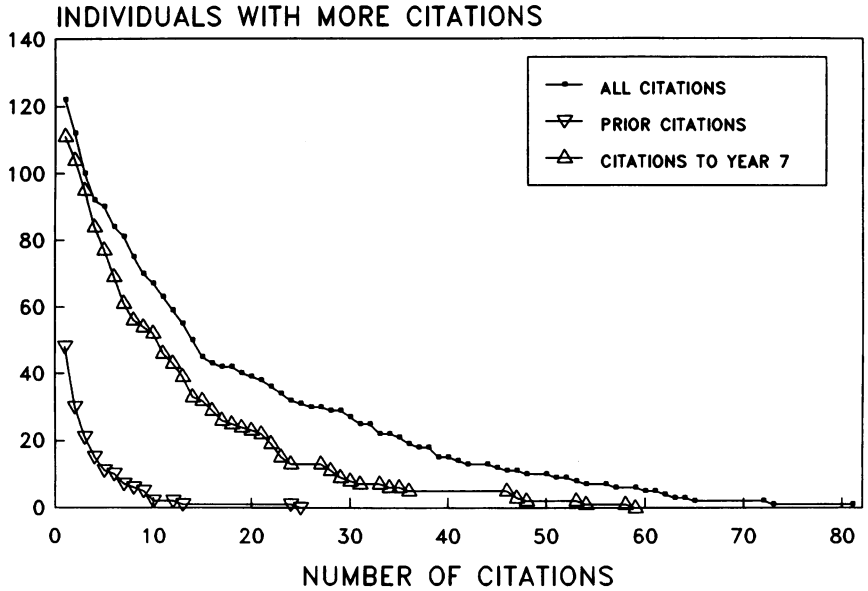


FIG. 4. Citations in MEDLINE for 150 individuals who completed training. Data are ranked as a plot of number of citations (X-axis) and number of individuals (Y-axis) as shown for all citations (all citations), for publication dates before completion of residency (prior citations), and citations within seven years after completion of residency (citations to year 7).

DISCUSSION

Conclusions

These data demonstrate that: (a) this training program is placing a significantly higher number of its graduates (total group, women, minorities, alternative pathway) in academic pediatrics when contrasted with national figures in pediatrics; (b) academic careers are multifaceted; clinical care, administration or teaching and research co-exist in most careers; research supplements rather than supplants clinical interest; financial support is derived predominantly from clinical revenue; interest in academic careers and clinical research increases during preclinical and clinical training; and factors both strongly enhance and impair the decision and the ability to do research, (c) publication prior to completion of residency, M.D./Ph.D. training, and fellowship training is associated

FIG. 3. Factors affecting participation in research. Fraction of respondents indicating factors which encouraged or discouraged (upper figure—a) and stimulated and impaired (lower figure—b) research.

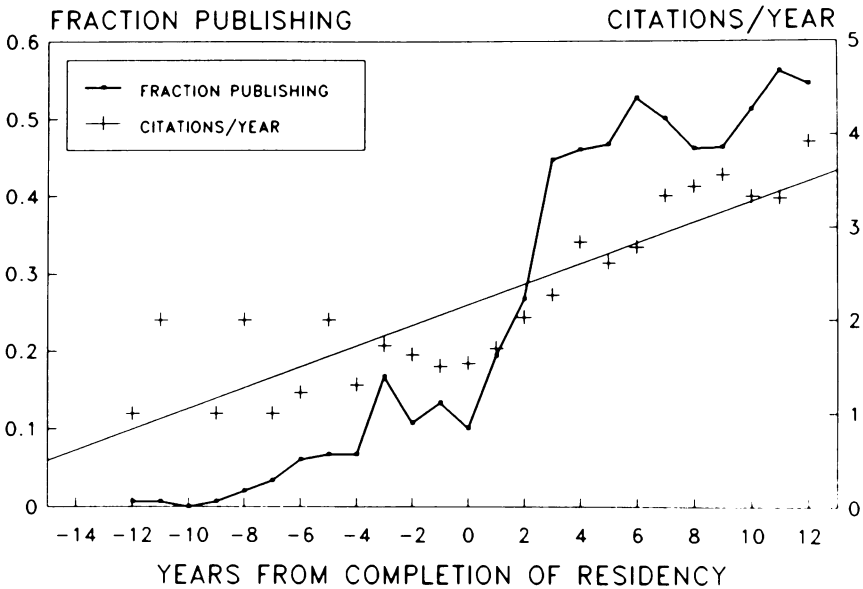


FIG. 5. The fraction of all individuals who publish at least one paper/year (left Y-axis) and average productivity (citations/person/year) (right Y-axis) as a function of number of years after completion of residency (X-axis).

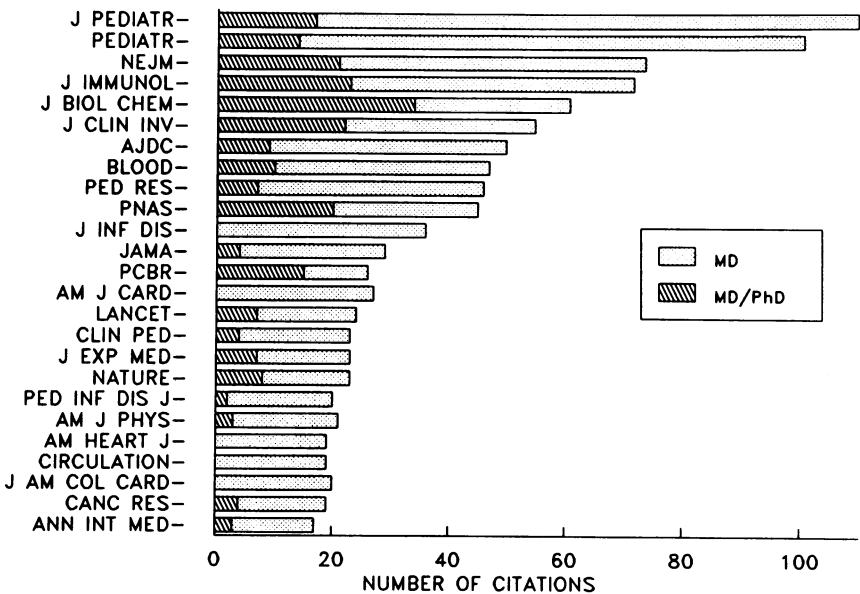


FIG. 6. The number of citations in the most commonly cited journals shown for individuals with MD and combined MD/PhD degrees.

TABLE 3
Factors Relating to Publication Rate 1976-1981

	Men (N = 104)	Women (N = 46)	Prior to (N = 48)	None (N = 102)	MD/PhD (N = 17)	MD (N = 132)
Prior to Completion of Residency						
A) Publishing (%)	42	9	100	0	65	27
B) Average # Publications	2	0.1	4	0	4	1
First 7 Years Post Residency						
A) Publishing (%)	81	54	96	62	94	67
B) Average # Publications	10	2	14	5	16	7
Combined						
A) Publishing (%)	82	57	100	62	100	67
B) Average # Publications	12	2	18	5	20	7

Factors contributing to publication activity. The distribution of citations (% and average number) by different groups (men/women, publication prior to the completion of residency vs none, MD/PhD vs MD degree alone) compared by Wilcoxon Rank Test for non-paired variables.

with enhanced subsequent scholarly activity, a plateau in the fraction of individuals publishing is reached by 3-4 years post residency with a gradual yearly increase in the number of publications per individual each year up to 8 years, women tend to publish less than men and later, and publications focus predominantly on clinical and therapeutic aspects of human disease.

IMPLICATIONS

Academically Oriented Training Programs

The current national trend is to limit the number of specialists, increase the number of primary care generalists and achieve this goal by supporting through graduate medical education dollars those institutions that do. Our data demonstrate that this institution, along with a handful of others, places a majority of its pediatric graduates in academic careers (3).

Should an institution such as ours change? With the national effort being placed on the production of generalists, there will remain an important need for a limited number of highly trained academic pediatricians. As Kelch and Novello have suggested, there are only a few pediatric institutions that have the resources, the intellectual climate, and the talent of their faculty to accomplish high level training for academic careers (4). They create a fertile environment that both educates and carefully nurture aspiring residents and fellows. Further, PhD holding scientists with a strong interest and capacity for basic biologic research have been competing for research funding with increasing

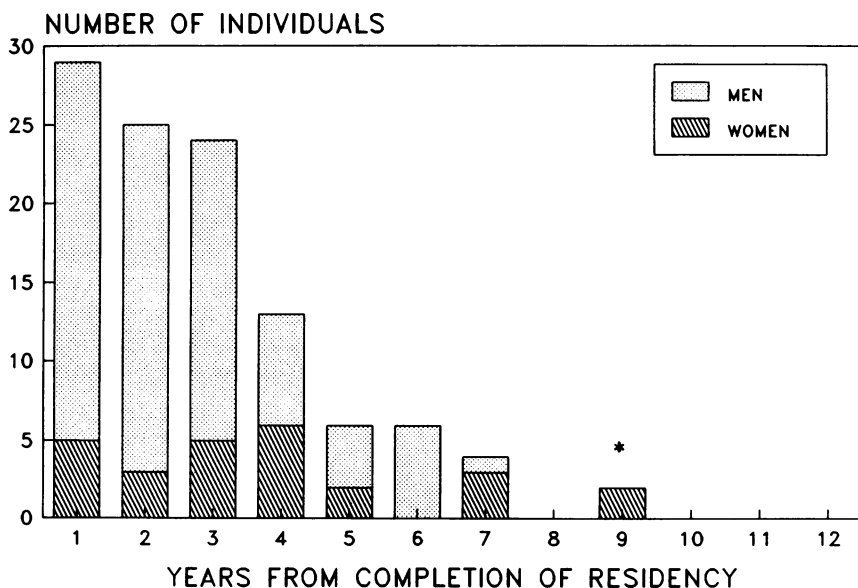
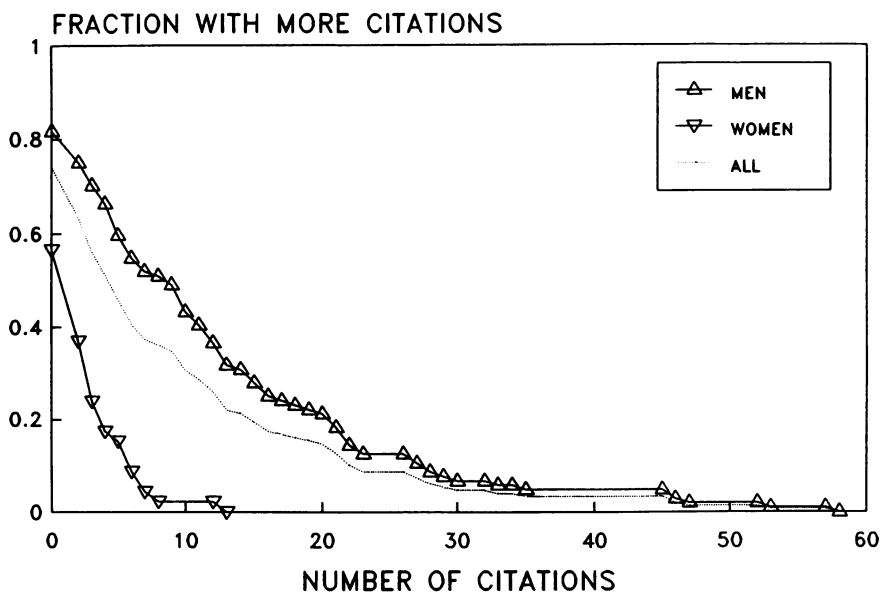


FIG. 7. Differential publication activity by men and women with at least one citation (upper figure—a). Pattern of beginning publication by men and women. The time and year between the first paper published and completion of residency is shown (lower figure—b).

success relative to those holding MD's, emphasizing the need for programs such as ours with the capacity to produce physician scientists.

With such a focus, will the breadth of resident education in an institution suffer? Not necessarily. As medical schools strive for a program of general medical education for their students so also can academically oriented pediatric residency training programs strive for broad pediatric education. Principles of specialty pediatrics can be offered concurrently with general and primary care pediatrics giving greater educational depth to the core of general pediatric training (5). A careful balancing of primary, secondary and tertiary care pediatrics in the inpatient, outpatient and out of the hospital setting can be achieved. Avoidance of a curriculum that is overly focused on primary care or alternatively overly subspecialty oriented is important. Finally, increased flexibility within residency training programs can result in a tailoring of the curriculum to meet individual career goals and aspirations, for example, with a menu of choice offered in the third year of residency.

Multifaceted Careers

Our data in the aggregate suggest that the "triple threat," involvement in clinical care, education/administration and research, still co-exist in the lives of the majority of our graduates in academic pediatrics. Certain individual graduates (i.e. M.D./Ph.D.s) commit a greater percentage of their time to basic research, while those involved in clinical investigative or health care research exhibit a greater clinical research focus. Further, at different chronologic points in time, a given individual will commit greater amounts of time to a given area, for example, research earlier in a career, and administration and teaching later in a career. Still our data suggest care of the patients is central, publications reflect issues emanating from the clinical care setting, and financial support derived from clinical care, similar to national data, is now a central component of funding for the majority in academic pediatrics (6). This suggests that for the majority, academic careers are multifocused rather than unifocused, and care and teaching are a larger and more important focus in their professional lives.

Faculty Satisfaction

This, however, raises problems of expectations. Our data suggest that graduates experience "stress overload" from actual and perceived expectations involving *simultaneous* administrative, teaching, patient care, and research responsibilities. This is compounded by the fact that they are often competing with those whose focus is predominantly in the laboratory. Yet as noted, the reality of today is a divided focus and for

the majority not focused solely in the laboratory. Demands of clinical care and teaching are a reality and they need to be supported financially and through promotion. Wide-spread anxiety generated by multiple demands must be better addressed through more realistic career counseling of junior faculty. Finally, a greater targeting of funds for applied research is also needed to support those who are in a position to carry out this important patient oriented research.

Enhancing Scholarship During Training

Academic careers have at their core scholarship and the reporting of new knowledge and information. Thus the capacity to write well, coupled with an appreciation for investigation, is clearly necessary to assure success in academic medicine. Our data suggest exposure to research during college and medical school, a Ph.D. degree, or a record of publication prior to residency are important predictors of future academic productivity. This has been reported by others (7) but our data emphasize the need to afford opportunities for both scholarship and research pursuits during medical school. Further, due to the time constraints created by the heavy clinical responsibilities of residency, a hiatus between medical school and fellowship exists for research and publication. This suggests the need for fostering opportunities for exposure to clinical investigative and medical outcomes research during residency as well as teaching that links effectively clinical disease and basic biology (8). To these ends, residency programs can be tailored to encourage academic pursuits. In our program, for those with a strong subspecialty orientation, "short tracking" after two years of residency into a fellowship or "half tracking" (a half senior year followed by a half year of focus in a given subspecialty) exists (1). For internal medicine, Wolf and Braunwald have similarly fashioned research oriented tracks that successfully interdigitate with the clinical curriculum during residency (9). Electives can be carefully tailored to foster academic careers. Fellowships need to be lengthened so as to assure adequate research and clinical training for future success as junior academic faculty.

Women and Academic Medicine

Women are increasingly attracted to pediatrics as a professional career (10). Our data suggest that an academic climate during residency is an important stimulus for women to pursue academic careers. Our data, however, also suggest that female graduates are less successful in the narrowly defined area of publication activity. This disadvantage begins during college and medical school with fewer holding Ph.D. degrees and fewer accomplishing scholarship before residency. Our data suggest that

during fellowship women publish less and later. For many women successful professional lives must run in concert with family responsibilities, raising the necessity of major adjustments in professional requirements and expectations. Pediatrics has a unique and special challenge in this regard. The numerous suggestions made by others will not be repeated here, but their significance for pediatrics is considerable (11). At a minimum, however, residency must incorporate increased flexibility through electives, shared residencies, day care support, increased opportunities for academic exposure, and wise and highly supportive career mentoring to encourage and promote academic opportunities for young women.

SUMMARY

In summary, our data suggest that the playing field for academic medicine is changing. It is more patient care oriented, more multifaceted and supported more by clinical dollars than in the past. Greater flexibility in what constitutes "academic success" is necessary to assure a supportive environment in which tomorrow's academic faculty can develop and flourish. To accomplish these goals promotion systems that reward not only research but also teaching and clinical care accomplishments will be necessary. Clinicians will need to be compared with clinicians, teachers with teachers, clinical investigators with clinical investigators and basic investigators with basic investigators. Sources of support will need to be more clearly targeted along activity lines with clinical dollars supporting the clinician, medical education dollars supporting the teacher-educators and federal and foundation dollars supporting research. In our department, time and effort for research (45%) approximates dollar support for this activity (44%), while clinical dollars (43%) fund to a greater degree time and effort committed to clinical care (34%), and administration and teaching dollars (13%) under fund time and effort committed to these activities (21%). This suggests the need to identify increased funding to support teaching and education. Promotion expectations for women will need to be more flexible and adjusted to family responsibilities and demands. Most of all, however, we academic faculty must support enthusiastically the importance and joy of our work. We must be encouraging to our colleagues and our students and continue to recognize that for all of the difficulties and challenges, academic life is a rewarding and fulfilling enterprise.

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DISCUSSION

Gray, Stanford: Let me congratulate you on a splendid survey. The reason I understand it perhaps better than you do is because at Stanford we have taken an enormous survey of students, fellows, house staff in all aspects of medicine over the past 20 years. We have just obtained the survey with 70% return, a huge job. So I understand what you have done. Our motivation was a little bit different. We consider ourselves to be a similar, sort of elitist institution. We are very concerned that women and minorities were not going into academic medicine. We see women comprising 30-40, even 45% all through the programs, including fellowships, and then disappearing and dropping off and not entering faculty jobs at the same relatively high rates that you show. Although, I notice you have 75% men and 57% women, that may be statistically different. That was the reason for our survey and I can't say anything about it yet. Probably, next year, we might be able to bring it to the group, but thanks very much. If you could comment about women and minorities, we are trying very hard in our survey to ask questions to try to see what women's perceptions in particular are in terms of how the environment could be made more attractive. Because I think at our institution and at others of a similar type, for the women who go through our programs, the programs certainly are not attractive to bringing them into academia.

Lovejoy: Thank you so much for those comments. I think that you've hit on two critically important points. Relative to minorities, our data do not hold up as well as we would like either. With this data in hand, we are trying to address how to make the institution more attractive to minorities. Once within the institution, things seem to go pretty well, but the entrance level is a significant problem for us. As it relates to women in academic medicine, this is something we are doing a great deal of thinking about as well. For the women who now comprise 50% of our program, the issue of balancing family life demands with complex, multifaceted academic careers is particularly challenging. We think that we really need to address in a major way different ways of thinking about professional expectations, reward systems, such as academic promotion, and wise career mentoring and counseling. We look forward to seeing your data as well.

Carol Johns of Baltimore. As a woman, I can't resist making a comment here. There is no question that when one is balancing what you refer to as "non-professional," I'll say family, with a professional career, the thing that you can put off until tomorrow is writing that paper. I am not a bit surprised at the data showing fewer publications, nor are you, I'm sure. Jack Stobo at Hopkins has been taking the future of women in academia very seriously not for just totally compassionate reasons, but realistically and practically, since probably half of the people coming through the system are going to be women. It is important to enable the success of some of these women. An early survey has indicated the perceived value of a mentor who encourages, coaches and guides people, for both men and women, but it is particularly true that the women often feel that they have had a little less of this as they have gone along. I certainly encourage all of you who are the leaders and responsible people to think very seriously about mentors both for men and women, but particularly for women, who also may be inclined toward the clinical side of things with less attention to the scholarly publications. There's something about many of us that very much enjoys helping to take care of patients, and yet if we're serious about our academic career, we've got to make sure we keep our priorities straight and get some publications.

Lovejoy: Thank you for those comments. The same sorts of data have been mobilized in our institution concerning the critical importance of mentors and encouraging that. Thank you.

New, New York: Dr. Lovejoy, I'd like to ask two questions. One concerns what has been done at Harvard to encourage women to maintain their families while pursuing their academic careers. Do you have a day care center? Do you have a split residency so that two women could employ themselves as one and prolong their training so they can continue to look after their children while pursuing an academic career? I'm sure these are factors that have gone into the reduced publication rate of women in your program. I'll ask you the second question after your answer.

Lovejoy: We believe what you are suggesting is immensely important. The need to create more flexibility within residency training programs is particularly compelling. Consequently, we've gone to considerable lengths in our program to accomplish this. More specifically, for example, we have assisted two recent graduates of the medical school, who both have academic spouses, to do their internship year over two years (in a month on, month off arrangement) with a projected residency time of six years rather than three.

New: You have done that?

Lovejoy: Yes, we've done that and, in addition, have assisted an individual who is fairly well-known nationally, Dr. Perri Klass, an author with two children and an academic husband, to carry out her residency over four years rather than the required three years. Additionally, we allow enough flexibility in the senior year through electives for women to begin their families before commencing the often highly intensive initial clinical year of fellowship. Clearly adjustments in the relatively rigid time requirements of residency for Board eligibility will be necessary in the future to meet the family planning needs of women. We have a day-care center in place for all employees, and an occasional resident uses this service.

New: Well you've succeeded with Perri Klass, who publishes widely. The second question I have is have you actually provided an incentive for general pediatrics? We are in this crisis at Cornell right now where the question is should we address the needs of teaching and research and academics at Cornell, it's a small program, or should we be the people at Cornell providing special training for generalists in pediatrics to go out and do primary care and you left that question sort of unanswered. I wondered what your thoughts on that were.

Lovejoy: Thank you very much. Our program, as you saw from the data through 1986, has a heavy focus on sub-specialization. David Nathan, when he came in as our Chief, felt

we must make a major change in the philosophy of our program by emphasizing the importance of general pediatric training and ambulatory care. I think that that emphasis from the top has been crucial and important. This has resulted in the general pediatric program growing in size, attracting some of our best residents, and being the creator of a number of excellent teachers. Deriving protected time from care responsibilities to pursue scholarship successfully requires financial support and there has been a significant effort within our department to try to address this need.

I think also that greater flexibility in what defines academic success in a promotional sense is also necessary. I believe that teacher-educator tracks, which have been started in essentially two-thirds of medical schools throughout the country, is a way to begin to reward the teaching expertise of individuals in general pediatrics and in other hospital-based subspecialties. There is also a necessity to address the needs of those academic physicians whose focus is primarily clinical. There tends to be a very heavy clinical load in the general pediatric setting for such individuals, making recognition through promotion, which is based solely on investigative productivity, most difficult. Yet clinically-based academic physicians need to be recognized to maintain morale and to prevent feelings of second class citizenship. With departments heavily funded by clinical dollars, the promotion system needs to be adjusted to reward these clinical faculty for their labors.

Berlin, Miami: Have you thought of looking at the track record of your graduates with respect to training programs, career development awards or NIH grants?

Lovejoy: We did do that. I don't have that data easily available for you now, but those data are obtainable and I would be pleased to send it to you.