



Age and Gender Differences in Authorship among University Hospital Physicians in Sweden, Norway and Italy (The HOUPE Study)

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Authors' contributions

This work was carried out in collaboration between all authors. Authors LTL, AF and DM designed the study and wrote the protocol. Authors LTL, ICG and OML performed the statistical analysis. Author LTL wrote the first draft of the manuscript and managed the literature searches. All authors read and approved the final manuscript

Short communication

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ABSTRACT

Background: For decades there has been a prominent gender gap in the number publications among physicians in academic medicine. Increased recruitment of women into medicine and a new generation work force that emphasize work-life balance can contribute to narrow this gap.

Aims: The present study investigates whether younger hospital physicians may display less gender differences in authorship of scientific publications compared to those older of age.

Methodology: Baseline cross-sectional survey data among senior consultants (N=1379) working at public university hospitals in three European countries, participating in the HOUPE study (Health and Organization among University hospital Physicians in

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Europe).

Analysis: Chi-square tests and logistic regression analysis with probit link function.

Results: There were differences in number of publications based on country where Italy and Sweden reported a significantly higher number of first- or last authorship compared to Norway ($X^2=30.6$, $P<.001$). Logistic regression analysis confirmed gender differences in number of publications and first-and last authorships ($P<.001$) across all age categories. The rate of increase in number of publications is higher for men than for women physicians.

Conclusion: These findings confirm that scientific production is still more relevant to discuss in terms of gender than generation. It is important to look at factors that are essential to career choice and faculty retention in women in particular but also among women and men in the new generation of physicians.

Keywords: Senior consultant; research; publication; gender differences; university hospital; Italy; Norway; Sweden.

1. INTRODUCTION

In addition to ordinary clinical duties, an important characteristic of a university hospital is its commitment to scholarly activities such as teaching and research to produce new ideas and knowledge. An important measure of research activity is number of publications in peer reviewed medical journals. This provides important financial and scientific merit to the organization and is also highly emphasized in the academic promotion process.

Despite the increased focus on research production there is a general concern about the underrepresentation of women in the production of research manifested by authorship [1,2]. Today women enter many medical schools in equal proportions to men. Reports from medical faculties show that the number of female medical students has steadily increased from 52% to 63% in Norway for the last decade with similar trends in Sweden and Italy. Yet statistics show that women are underrepresented as superiors and specialists at university hospitals and they are less likely to enter academic medicine [3,4]. This implies an under-utilization of valuable resource personnel in academic production [2,5]. Though the proportion of women as first and last authors of original research in prominent medical journals has increased the last decade, they still compose a minority of the authors in the journals studied [6,7]. The proportion of female first authors holding MD degrees in six prominent US medical journals increased from 6% to 29% in from 1970 to 2004 [6]. Similar results were found among medical academics in the UK where female first authors increased from 10% to 37% for the last three decades [7]. It is important to investigate whether these differences also are valid among physicians in academic clinical medicine or whether the gap in publication rates has narrowed for younger physicians in their early career stage, reflecting the increased share of women entering medicine.

Research production in academic medicine is not just about gender differences, but also generational differences in priority of a clinical academic career. Concurrent with the new generation in the European workforce, female and male physicians' desire for flexibility and work-life balance [8-10] can decrease motivation for both genders to pursue a research career on behalf of their family and leisure. This can also contribute to less gender difference in publication rates among university hospital physicians of younger age, who entered the workforce in the last 10-15 years.

It is important to investigate whether possible gender differences in publication rate are unique for each hospital or a common phenomenon among European university hospital physicians. Whether country specific or not, a gender gap in publication rate indicates important cultural, organizational factors that may cause this variation. For example although there is a common desire for increasing flexibility in work life, societies support to find the balance between professional and private life may differ among countries. Scandinavian countries have welfare incentives known to facilitate economic growth by high female employment and reduction of strain associated with conflicting work-family responsibilities and demands. This includes entitled child care, reserved paid parental leave for fathers, generous rules of sick leave on behalf of employees and their children compared with for instance Italy. Alternatively, regardless of the society's facilitation and physicians desire for work-life balance, the medical profession may in itself display a performance oriented culture that strives to achieve maximum quality of achievement, competence and productivity which make other factors subordinate in this regard. Accordingly (as a first step in the research process among European university hospital physicians) it is relevant to include cross country comparisons to investigate if the gender gap in publication rate is present in the academic medicine regardless of country or hospital.

The aim of this study is to investigate whether there is a gender gap in self-reported research productivity among senior consultants at in three public European university hospitals, and if so, how this differs according to age and country.

2. MATERIALS AND METHODS

2.1 Setting and Subjects

The present results are based on a sample of senior consultants (N=1379) from Sweden (n=779), Norway (n=233) and Italy (n=364) that gave their survey response in phase I of the HOUPE study (Health and Organization among University hospital Physicians in Europe). Methods of the survey are described elsewhere. The HOUPE study investigates the effect of work conditions and organization on career development, work satisfaction and health among university hospital physicians.

2.2 Measures

The present study is based on a selection of items from Physicians Career Path Questionnaire [3] that were included in the main questionnaire. Number of publications was measured by two items on the number of international peer reviewed publications and number of international peer reviewed publications as first or last author. These items were given responses according to seven categories (No publications, 1-5, 6-15, 16-30, 31-50, 51-100, and <100 publications). We also included measures of age, gender and country.

2.3 Statistics

Chi-square statistics were used to compare proportions for categorical variables. Ordinal logistic regression (OLG) model was applied to investigate gender differences in number of publications with age as latent variable, as number of publications is a function of increased age. The two prior assumptions of increased number of publications with age and larger variance in number of publications in older age warranted a probit link function that assumes normally distributed residuals of each category. These assumptions provided a regression

model best suited the current data. As the categories in number of publication were uneven we provided a graphic illustration of gender differences in number of publication with age by recoding each category of number of publication into its median value. Then we constructed charts with error bars as shown in (Figs. 1 and 2). SPSS 18 software (IBM, New York, USA) was used for all statistical analyses.

3. RESULTS AND DISCUSSION

Demographic characteristics for each sample are shown in (Table 1). In Italy and Norway about one third of the respondents were women, which corresponds to the gender distribution of the total sample of senior consultants at these hospitals. The Swedish sample constitutes of 46% women and 54% men which also corresponds to the total sample of senior consultants at the time of the data collection. An analysis of non-respondents showed that the sample of senior consultants were also representative in terms of age.

Table 1. Demographic characteristic of men and women in the sample

Gender	Men N (%)	Women N (%)	P
	817(59)	559(41)	
Country			
Sweden	424(54)	355(46)	<.001
Norway	154(66.1)	79(33.9)	.013
Italy	239(65.7)	125(34.3)	.003
Age			
<40	98(12)	79(14)	.119
40-55	433(53)	357(64)	<.001
55<	286(35)	123(22)	<.001

Between-country differences in the physicians' number of publications (Table 2) showed that Norway had a higher proportion of non-publishing physicians compared with other countries ($X^2=23.78$, $P<.0001$), while Italy had fewer with 1-5 publications ($X^2=21.16$, $P<.0001$). Sweden reported higher on 6-15 publications ($X^2=17.7$, $P=.0001$). Italy reported higher number of >50 publications compared with the other countries ($X^2=61.44$, $P<.0001$).

Italy and Sweden reported a significantly higher number of first- or last authorship compared to Norway ($X^2=30.6$, $P<.0001$). Sweden reported 6-15 publications with first and last authorship more often than other countries ($X^2=15.6$, $P=.0005$). We added the categories of number of publication from 16 to 100< and analyzed cross country differences. Italy reported more first-or last authorship for the categories of number of publication from 16 to 100< than Sweden and Norway ($X^2=124.67$, $P<.0001$).

To investigate the relationship between number of publications, gender and age we performed an ordinal logistic regression model with probit link function. The model presented in (Table 3) shows gender differences throughout in number of publications controlled for age. There were no differences in separate logistic regression analyses based on country.

Table 2. Distribution of publications according to country

No of publications	0	1-5	6-15	16-30	31-50	51-100	100+
	% (N)	% (N)	% (N)	% (N)	% (N)	% (N)	% (N)
Sweden	11.0(82)	25.7(192)	26.6(199)	13.0(97)	8.6(64)	8.3(62)	6.8(51)
Norway	26.6(59)	29.7(66)	14.9(33)	7.2(16)	10.4(23)	6.3(14)	5.0(11)
Italy	2.5(9)	12.4(45)	14.9(54)	17.4(63)	13.5(49)	21.5(78)	17.9(65)
First/last authorship							
Sweden	18.3(136)	34.4(256)	28.0(208)	8.8(65)	4.9(36)	3.9(29)	1.6(12)
Norway	35.2(77)	31.1(68)	14.2(31)	10.5(23)	5.0(11)	2.7(6)	1.4(3)
Italy	11.9(43)	30.9(112)	18.8(68)	14.4(52)	10.2(37)	10.2(37)	3.6(13)

Table 3. Ordinal regression analysis of gender differences in number of publications controlled for age

No. of publications	Number of publications			First- or last authorship		
	Estimate	SE	P	Estimate	SE	P
0	1.048	.201	<.001	1.711	.243	<.001
1-5	2.533	.276	<.001	3.636	.372	<.001
6-15	3.652	.358	<.001	5.172	.512	<.001
16-30	4.405	.422	<.001	6.220	.623	<.001
31-50	5.119	.489	<.001	7.201	.739	<.001
51-100	6.343	.619	<.001	9.038	.987	<.001
100+						
Age	.560	.060	<.001	.601	.066	<.001
Gender (ref. Men)	.678	.117		.641	.127	
Scale age	.104	.016	<.001	.121	.017	<.001

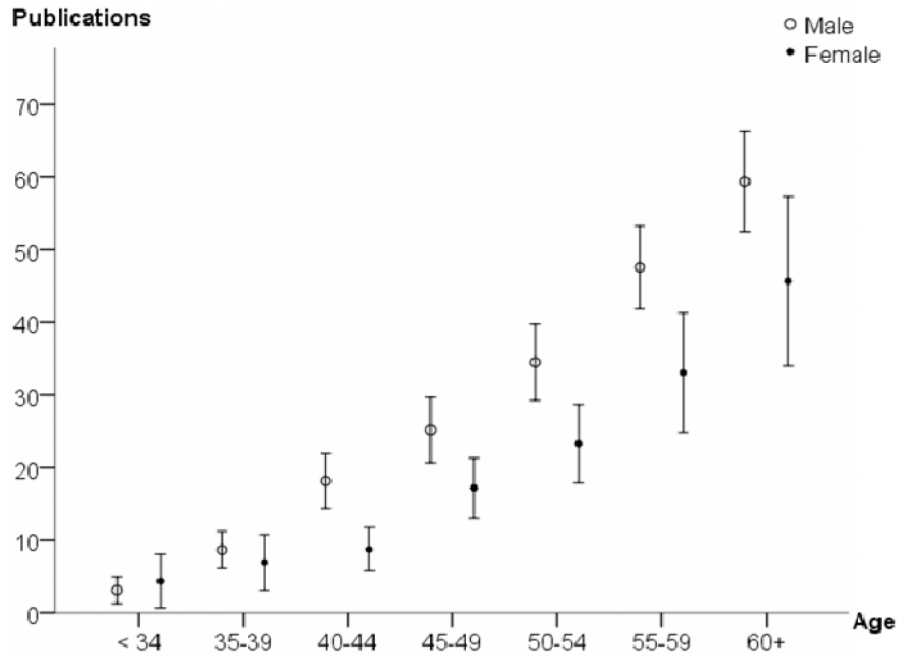


Fig. 1. Age and gender differences in number of publications

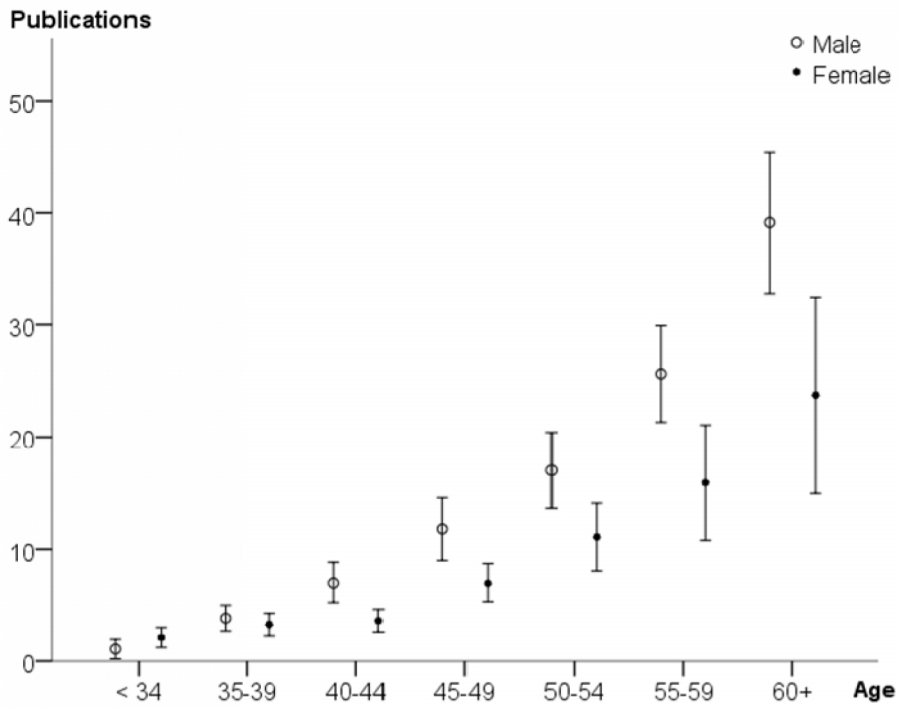


Fig. 2. Age and gender differences in number of first-and last authorship

A graphic illustration of this relationship is shown in (Figs. 1 and 2). The variation in number of publications among the eldest are larger than for the younger physicians, as productivity are more limited at the early stage of their career. The graphic illustration shows that the number of publications among women stabilizes between the age of 35 and 45, compared to men (Fig. 1 above).

A similar trend is visible in the number of first- or last authorship among women up to the age of 45 as illustrated in (Fig. 2 above).

4. CONCLUSION

The study found gender differences in number of publications across age among physicians in three European university hospitals. The results confirm earlier studies of a gender gap between male and female medical academics [6,7].

The stabilization in number of publications among women 35 to 40 years of age in all three samples are most likely explained by increased family responsibilities and parenthood among female physicians. A postponement of childbearing among women has gradually spread to all regions of Europe. The average age of childbearing is approximately 29-30 years for the first child in Italy, Norway and Sweden. However, physicians are among those who have most children compared with the general population (Statistics Norway, 2000). So even though they have highly demanding jobs and work in an occupation with high career orientation, female physicians are also highly oriented towards parenthood and family.

As this is baseline data we are unable to detect changes in publication rate over time. For instance whether the gender gap has narrowed for younger physicians, or even dropped due to family and leisure priority at the expense of their research career. Neither, we cannot conclude if the gender gap for older physicians widen due to females have taking on more responsibility for children at a stage important for in their research career trajectory, slowing them in gaining the necessary expertise for the next stages of career development.

Numbers of publications reported in the current study diverge from earlier publication reports [11] and statistics of publication rate in medical journals in The Scopus database (www.scopus.com). Based on country and each university hospital respectively the number of publications reported of each university hospital and its respective medical faculty in the last two decades show that Sweden has published about six times more articles and reviews in international peer reviewed journals since 1990 than Norway and Italy, while data collected from the Italian sample reports higher numbers. This inconsistency may be partially explained by the possibility of Italian doctors publishing in Italian language journals which are not listed in Scopus. The larger number of 1-16 publications among the Swedish senior consultants relative to the Norwegian can reflect that senior consultants must have a PhD to apply for this position in this specific university hospital, while this is not required in Norway. A PhD implies peer reviewed publications, experience in research presentations and research experience that are more likely to generate co-authorship in publications.

The main measure of productivity used in this study does not include important aspects of research performance such as citation and impact. Self-reports on research production are one of two ways to assess number of publications. The other is to compare bibliometrics from each hospital which estimates the output in terms of quantity of publications across different subject areas in medicine and types of hospital. However, our findings are parallel to studies that investigate gender differences in number of publications of main medical

journals based on bibliometrics in several countries [12-15]. In this regard, the strength of this study is the size of a representative sample of physicians and transnational group comparisons that are often sought in research as they increase generalizability of the results.

The present study confirms earlier reported gender differences in number of publications and that focus on scientific production in terms of number of publications is still more relevant to discuss in terms of gender than generation. It is important to examine potential correlates of productivity and societal, cultural and organizational factors that show best practice in facilitating recruitment to academic medicine to ensure steady employment of skilled and motivated physician scientists.

CONSENT

Not applicable.

ETHICAL APPROVAL

The project is approved by the CEOs in each hospital, Regional Ethics Board and Data Inspectorate in Norway (28th of September, 2004), Sweden (Stockholm 8th of December, 2004, ref. no. 04-913/2) and in Italy (Padova 9th of May, 2005 ref. no. 1039P).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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