

## Gender and Workforce in Urology: Use of the BG Index to Assess Female Career Promotion in Academic Urology

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**Purpose:** Today, the majority of medical graduates in countries such as the UK, the US or Germany are female. This poses a major problem for workforce planning especially in urology. We here use first the first time the previously established Brüggmann Groneberg (BG) index to assess if female academic career options advance in urology.

**Methods:** Different operating parameters (student population, urology specialist population, urology chair female:male (f:m) ratio) were collected from the Federal Office of Statistics, the Federal Chamber of Physicians and the medical faculties of 36 German universities. Four time points were monitored (2010, 2005, 2000 and 2015). From these data, female to male (f:m) ratios and the recently established career advancement (BG) index have been calculated.

**Results:** The German hospital urology specialists' f:m ratios were 499 (0.257 female vs. 1944 male) for 2015, 0.195 for 0.133, 2010 for 2005 and 0.12 for 2000. The career advancement (BG) index was 0.0007 for 2000, 0.0005 for 0.094, 2005 for 2010 and 0.073 for 2015. The decrease from 2010 to 2015 was due to an increase in the f:m ratio of hospital urologists and female medical students.

**Conclusion:** The BG index clearly illustrated that there is an urgent need for special academic career funding programs to counteract gender problems in urology. The BG index has been shown to be an excellent tool to assess female academic career options and will be very helpful to assess and document positive or negative changes in the next decades.

**Keywords:** academic medicine; career promotion; gender difference; promotion index; BG-index

### INTRODUCTION

Despite the influx of females into medicine it is very likely that female urologists will remain a minority for the foreseeable future<sup>(1)</sup>. The challenge for urology was supposed to be how to recruit more female physicians to become specialists in an atmosphere where it has been reported that female physicians are discouraged from pursuing surgery by lifestyle factors, lack of interest and most disturbingly female discrimination<sup>(1,2)</sup>. Among the different factors that influence the selection of specialization, questions of career advancement gain more and more importance<sup>(3,4)</sup>. The potential presence of obstacles to female career promotion may prevent female physicians to become urologists. Especially in surgical fields this question is subject to debate amongst other influencing factors<sup>(5-10)</sup>. It would be of great use to assess gender issues by the use of measurable indices. However, no precise indices have been used so far for urology that describe the magnitude of gender imbalance concerning academic career progression. Using the recently established BG-index for female career promotion<sup>(11)</sup>, we here present the first

data for the field of urology for the time points 1995, 2000, 2005, 2010 and 2010 for Germany.

### METHODS

This study is the first use of the BG index (equation 3) to obtain a first insight in to the field of urology concerning gender issues. The following databases were used to access student and physician data: DeSTATIS database and Federal Chamber of Physicians data base. The DeSTATIS database is an online platform which is maintained by the Federal Statistical Office, Germany<sup>(12)</sup>. The BG-(Brüggmann-Groneberg) index (equation 3) has recently been introduced by Brüggmann and Groneberg as an index to characterize female career promotion in academic medicine<sup>(11)</sup>. They used a set of different female to male ratios (f:m) to construct this index which can be used to denominate the extend by which women can ascent in their academic career<sup>(11)</sup>. In order to assess the field-specific academic promotion in the field of urology, presently the ratio of female to male (f:m) medical students was chosen as an entry parameter according to Brüggmann and Groneberg<sup>(11)</sup>,

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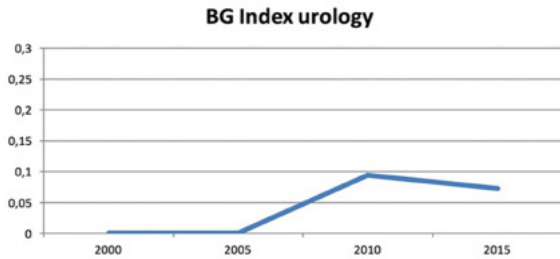
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**Figure 1.** Evolution of the urology BG index between 2000 and 2015.

since the medical student numbers describe the total of candidates for top academic urology positions. We used the data on numbers of students on a 5 year basis of the years 1995, 2000, 2010 and 2015, as described by Brueggmann and Groneberg<sup>(11)</sup>. The database of the Federal Chamber of Physicians<sup>(13)</sup>, an institution run by the regional chambers of physicians, is also published on a yearly basis and supplies relevant data on the physician demography in Germany. As a third set of operating figures needed for the BG-index, we identified the numbers of female full professors/chairs in urology by internet searches and consultations of journals. As described by Brueggmann and Groneberg<sup>(11)</sup>, the numbers of female chairs were exactly given between the period of 2000 – 2015 in 5 years steps. The exact number of male chairs was only obtainable for 2015. At the time points 2010, 2005 and 2000, there is an error of margin possible, due to difficulties to identify the exact date, when the chair appointment process was terminated and the possibility of more than one chair per university (i.e. Charité Berlin). As previously described, the number of 36 (common and realistic assumption that all faculties have a urology chair) was used with the numbers of female chairs being subtracted to get the male number for the ratio.

**RESULTS**

**Medical student numbers**

In the year 2015, a total of 89 998 medical students (54 638 female students and 35 360 male students) studied medicine with a f:m ratio of 1.545. This ratio was 1.142 in 2000 and 0.888 in 1995 (**Table 1**).

**Specialized urologists and urology chairs**

In 2015, a total of 5771 urology specialists worked in Germany. The f:m ratio was 0.192 (931 female vs. 4840 male urologists). In comparison, the f:m ratios were 0.142 for 2010, 0.106 for 2005 and 0.081 for 2000, respectively (**Table 2**). Generally, the f:m ratio increased towards the present situation but there is still with a large majority of male urologists.

The analysis of numbers of urologists who work at hos-

pitals resulted in a slightly higher f:m ratio: In 2015, 499 female urologists worked at German hospitals (vs. 1944 male, f:m ratio of 0.257). In 2010, this f:m ratio was 0.195 (340 female and 1743 male urologists). In 2000, the f:m ratio was 0.120 (147 female and 1222 male urologists).

The number of female chair positions was 0 for urology in 2000. It increased towards 1 for urology in 2010 and stayed at 1 in 2015 (**Table 2**).

**BG-index**

In 2015, this f:m ratio for medical students in 2013 was 1.545. This parameter was then related to the f:m ratio of full urology professors/academic chairs.

The resulting preliminary index is for the year 2015: (equation 1)

$$\frac{f:m \text{ ratio chairs}_{urology}}{f:m \text{ ratio medical students}_{Germany}} = \frac{1 : 35}{1.545} = \frac{0.0286}{1.545} = 0.01849$$

This index describes the general urology-specific ascension by which in this case, female medical students reach chair positions in urology. Ideally, this ratio could be 1 in a society that is fully gender-equal. These results using the preliminary index formulae demonstrate a dramatic difference to the ideal gender equity situation in both fields on first appearance.

As next step, the BG-index integrates a factor that mirrors the appeal that a given medical field – here urology - has on female physicians in medical training: The f:m ratio of registered urologists which can be found in the databases of the federal chamber of physicians. This ratio represents a corrector factor for urology as a field of medicine, which is per se less appealing for women and which therefore does not attract high numbers of female physicians to specify in this field. The resulting preliminary index is for the year 2015:

(equation 2)

$$\frac{f:m \text{ ratio chairs}_{urology}}{f:m \text{ ratio total specialist physicians}_{urology}} = \frac{\frac{1}{35}}{\frac{931}{4840}} = \frac{0.029}{1.545} = 0.098$$

As stated by Brügmann and Groneberg, the integration of the general attractiveness of a clinical field (f:m ratio of total registered specialists) may not completely reflect the attractiveness towards a career in hospital medicine which ultimately reaches its climax in the position of a clinical chair.

Therefore, the f:m ratio of hospital-based urologists was used in the final BG-index (equation 3). For the year 2015, the final index was:

(equation 3)

$$\frac{f:m \text{ ratio chairs}_{urology}}{f:m \text{ ratio hospital specialist physicians}_{urology}} = \frac{\frac{1}{35}}{\frac{499}{1944}} = \frac{0.029}{1.545} = 0.073$$

**Table 1.** f:m ratio of medial students in Germany from 1995-2015. Retrieved from (12)

Year	Total number medical students			f:m ratio
	total	male	female	
2015	89 998	35 360	54 638	1.545
2010	80 574	31 182	49 392	1.584
2005	79 847	32 025	47 822	1.493
2000	80 200	37 440	42 760	1.142
1995	84 958	44 992	39 966	0.888

For the year 2000, this BG-index was 0.0007, for 2005 it was 0.0005 and for 2010 it was 0.094 (for detailed calculations see appendix). It has to be noted that the first female chair for urology was appointed in 2008 and therefore, calculations of the BG-index in 2000 and 2005 were normalized with 0.0001 instead of 0 for n=0 female chairs (**Figure 1**).

In order to visualize the influence of the variables, we

**Table 2.** Specialized urologists and urology chairs 2000-2015.

Year		Specialists at work	Specialists at hospital	urology	Occupied University Chairs
2015	Total	5771	2443		36
	Female	931	499		1
	Male	4840	1944		35
	f:m ratio	0.192	0.257		0.086
2010	Total	5204	2083		36
	Female	648	340		1
	Male	4556	1743		35
	f:m ratio	0.142	0.195		0.029
2005	Total	4 804	1889		36
	Female	461	222		0
	Male	4343	1667		36
	f:m ratio	0.106	0.133		0.029
2000	Total	4384	1369		36
	Female	329	147		0
	Male	4055	1222		36
	f:m ratio	0.081	0.120		0

present in equations 4, 5 and 6 hypothetical variations in the variables f:m ratio chairs (equation 4 and 5) and f:m ratio medical students (equation 6).

To show the influence of a small increase in the number of female chairs, we hypothesize a number of 2 female chairs and 34 male chairs. This would increase the index to 0.149. Equation(4)

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_hospital\_specialist\_physicians_{uro}} = \frac{\frac{2}{34}}{\frac{499}{1944}} = \frac{0.059}{0.257} = 0.149$$

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_medical\_students_{Germany}} = \frac{\frac{2}{34}}{\frac{54638}{35360}} = \frac{0.059}{1.545} = 0.149$$

To show the influence of a larger increasing number of female chairs, we hypothesize a number of 10 female chairs and 26 male chairs. This would increase the index to 0.969. (equation 5)

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_hospital\_specialist\_physicians_{uro}} = \frac{\frac{10}{26}}{\frac{499}{1944}} = \frac{0.385}{0.257} = 0.969$$

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_medical\_students_{Germany}} = \frac{\frac{10}{26}}{\frac{54638}{35360}} = \frac{0.385}{1.545} = 0.969$$

To show the influence of an increasing number of male students, we hypothesize a ratio of 10000 female medical students to 79998 male students. This would increase the index to 0.903. That means that in a hypothetical world in which only a low number of women study medicine, the current situation of 1:35 female to male chairs would not lead to a very low index level. (equation 6)

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_hospital\_specialist\_physicians_{uro}} = \frac{\frac{1}{35}}{\frac{499}{1944}} = \frac{0.029}{0.257} = 0.903$$

$$\frac{f:m\_ratio\_chairs_{uro}}{f:m\_ratio\_medical\_students_{Germany}} = \frac{\frac{1}{35}}{\frac{10000}{79998}} = \frac{0.029}{0.125} = 0.903$$

## DISCUSSION

The present study is the first use of the BG-index to characterize female academic promotion in urology. It used Germany since data bases were available of the different variable used by the index. The urology-specific BG-index seems to be quite low with values of 0.073 for 2015 or 0.094 for 2010. In the years before, it is even lower since zero female chairs lead to an extremely low BG-index.

What are the limitations of the study? The high weighting of zero female chairs in the BG-index is one limitation. Changes in the variable "f : m. ratio of chairs" have a relatively strong influence on the index level. To show this purpose, we used hypothetical values of 10 female versus 26 male chairs. Using this ratio, the index increases to 0.969, indicating, that women gain more influence in the field of urology. Likewise, when the number of female students decrease - hypothetical in equation 5 to a number of 10 000 female students - the index also increases (0.903) since women also relatively gain importance due to the decreasing number of female students. A further limitation is the time period. The index needs to cover a longer time period to get a better picture of female promotion patterns. Even so, the index represents an important step, as discussed by Sugimoto<sup>(14)</sup>. Concerning this issue, we currently expanded the period to 1995 in contrast to the first establishment of the index.

In the US, the supply of urology specialists relative to the US population growth decreased<sup>(15)</sup>. This short come is expected to be exacerbated due to factors such as an aging and relatively older urology physician workforce, particularly in rural areas, and the migration of younger urologists towards group practice in urban areas<sup>(15)</sup>. In contrast to countries such as the US with a decreasing urology workforce<sup>(15)</sup>, the German urology workforce has seen slightly increasing numbers as illustrated in table 2 of the results section. As shown for the US with a slight increase in absolute numbers female urologists, there is also an increase in absolute numbers of female German urologists present. However, from a relative viewpoint, the f:m ratio is decreasing.

A strength of the BG-index is the possibility to compare the gender dynamics in a field such as urology over a long-time period. Given the assumption, that e.g. in the year 2020 there would be two appointed female chairs of urology, the index would increase to 0.149, indicating a relative improvement of female career promotion in academic urology. Increases of this index can be used as an indicator of an increasing attractivity for young female physicians to specialize in this area of medicine. As a matter of fact, this increase of female urology chairs can be anticipated since there are currently a number of female associated professors who might receive an appointment to a full professorship/ chair position within the next years. It is also interesting to compare the present data to other fields of medicine

and surgery. In this respect, Brüggmann and Groneberg introduced first data of their new index in the fields of obstetrics and gynecology and ENT<sup>(11)</sup>. In these two fields, the BG-indices were in the year 2013 0.044 for OBGYN with 4 female chairs and 38 male chair. For ENT, the value of the BG-index was 0.113 (3 female vs 30 male chairs, 516 female vs 894 male hospital ENT specialists and a f:m student ratio of 1.54). Hence, the current urology BG index with 0.073 for the year 2015 is even better than the index for OBGYN. This means that academic career promotion for a female urologist is probably easier than for a female OBGYN specialist even if there is only one female urology chair but 4 female OBGYN chairs. The reason for this slightly better female career promotion opportunity in urology compared to OBGYN is based upon the difference in the ratios of hospital specialists for both medical specialties: The OBGYN female:male hospital specialist ratio is 1.566 while the urology ratio is 0.257. For ENT, the BG index is 0.113. This value is better than the urology BG index. The reason for this is that there are 3 female and 30 male chairs while the f:m hospital ENT specialist ratio is 0.577.

Women are needed in urology. A very recent study by Kim et al. has especially pointed to their importance with regard to female patients: More than half of female participants who were asked had a preference for female urologists. By contrast, the majority of male participants did not express a preference for the gender of their urologist<sup>(16)</sup>.

But why is the attractivity of urology so low for female physicians? An excellent summary is given by Dr. Gwen Grimsby in a recent commentary entitled "The Journey of Women in Urology: The Perspective of a Female Urology Resident"<sup>(17)</sup>: "I chose urology for the patient variety and wonderful mix of clinic and surgery. I never considered my gender an issue, but I am continually surprised by the reaction of others in this regard. I am frequently asked by male patients why I chose urology. Women in the clinic are excited to see me, and men call me "honey," ask when the "real doctor" is coming in, label me as the nurse, or call me by my first name, even though I just introduced myself as Dr. Gwen Grimsby."<sup>(17)</sup> Similar problems have also been reported in a 2006 survey among urology residents by Jackson et al<sup>(18)</sup>: Most common challenges of female urology residents were refusal to be seen by male patients (60%), the inappropriate treatment by male colleagues (36%) or male patients (29%). Also, sexual harassment was a major issue (22%)(18). Facing these unique struggles, G. Grimsby concluded that there is a special need to continue to foster female success for the future in urology<sup>(17)</sup>.

In this respect, our present approach offers the opportunity to establish an urology-specific index that incorporates numbers of female medical students - who are the basis for future urologists, female urology specialists - who are the basis for future chairwomen of urology and numbers of chairwomen. The index can be used on a yearly basis to dissect and illustrate positive and negative changes. We here used Germany as an example since the system of academic urology is quite simple and follows a strict hierarchical system with the chair at the top position of urology. This index might be of use for other countries with a similar structure.

This approach will now be used on a yearly basis in

order to characterize the f:m ratio and female academic progression in urology in the future.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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