Original Investigation

Bridging the Gap: Identifying Global Trends in Gender Disparity Among the Radiology Physician Workforce

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Rationale and Objectives: Women make up half of American medical school graduates, but remain underrepresented among radiologists. This study sought to determine whether workforce gender disparities exist in other countries, and to identify any country-specific indices associated with increased female representation.

Materials and Methods: In this cross-sectional study, 95 professional radiology organizations in 75 countries were contacted via email to provide membership statistics, including proportion of female members, female members aged 35 or under, and women in society leadership positions. Country-specific metrics collected included gross domestic product, Gini index, percent female medical school enrollment, and Gender Development Index for the purposes of univariate multiple regression analysis.

Results: Twenty-nine organizations provided data on 184,888 radiologists, representing 26 countries from Europe ($n = 12$), North America ($n = 2$), Central/South America ($n = 6$), Oceania ($n = 2$), Asia ($n = 3$), and Africa ($n = 1$) for a response rate of 34.7% (26/75). Globally, 33.5% of radiologists are female. Women constitute a higher proportion of younger radiologists, with 48.5% of radiologists aged 35 or under being female. Female representation in radiology is lowest in the United States (27.2%), highest in Thailand (85.0%), and most variable in Europe (mean 40.1%, range 28.8%–68.9%). The proportion of female radiologists was positively associated with a country's Gender Development Index ($P = .006$), percent female medical student enrollment ($P = .001$), and Gini index ($P = .002$), and negatively associated with gross domestic product ($P = .03$).

Conclusions: Women are underrepresented in radiology globally, most notably in the United States. Countries with greater representation of women had higher gender equality and percent female medical school enrollment, suggesting these factors may play a role in the gender gap.

Key Words: Gender; equality; workforce; female; international.

INTRODUCTION

In recent decades, representation of women in medicine has increased dramatically, as evidenced by the fact that 48% of all American medical school graduates were female in 2014 (1). Women constitute 46% of all resident physicians, and they have achieved parity or are the gender majority in pediatrics, obstetrics and gynecology, pathology, family medicine, and psychiatry (1–3).

Despite such progress, gender gaps remain. Only 38% of faculty positions, 21% of full professorships, and 16% of deanships at American medical schools are held by women (1). Female physicians have lower mean unadjusted salaries than male physicians (4). Furthermore, female gender distribution among specialties is uneven, ranging from 60.4% in pediatrics to 4.6% in orthopedic surgery (2). Although female medical school graduates are increasingly entering specialties in which they were historically underrepresented, large gender disparities remain, most notably in the surgical subspecialties and diagnostic radiology. According to a 2016 report by the Association of American Medical Colleges, only 24.7% of active radiologists in the United States are female (5). This is in keeping with survey data from the American College of Radiology, finding that only 22% of the US radiology physician workforce was female in 2014 (6). Compared to all specialties, radiology has one of the lowest proportions of full-time female faculty at 28%, better only than orthopedic surgery (16%) and general surgery (22%) (1). Of note, in the case of general surgery, the percentage of female residents is substantially higher at 38% (1). A 2016 review of 51 major academic radiology faculty rosters in the United States reported that only 25%

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of vice chairs and section chiefs and 9% of department chairs were women (7).

Radiology is distinct from other male-dominated medical specialties in that it is not surgical in nature. As a specialty, diagnostic radiology has many characteristics that should make it desirable to both genders, including the perception of predictable scheduling, ability to work part time, and relatively generous compensation in the United States (7,8). Previous authors have theorized that a paucity of female role models, lack of patient contact, averseness to physics and technology, lack of exposure in medical school, and sexual harassment underlie radiology's gender gap (9–12). To help further increase understanding of this important issue, it would be prudent to know whether differences exist in other countries, specifically developed vs developing nations. However, there are no published data on international trends in gender disparity among the radiology physician workforce. This study aimed to determine whether similar gender disparities exist in other countries, and to identify any country-specific metrics that predict inequality.

MATERIALS AND METHODS

This was a cross-sectional study performed between February 2015 and March 2017. National professional radiology organizations were targeted to obtain gender statistics on the composition of the radiology physician workforce for as many countries as possible. Contact information for 95 professional radiology organizations in 75 countries was obtained through publicly available databases on the Radiological Society of North America (RSNA) (13) and International Society of Radiology (14) websites, via individual Internet searches, and through personal contacts. All of these organizations were contacted via email and asked to provide membership statistics related to gender, including the total number of members and female members, the subset of total and female members aged 35 or under, and the subset of total and female members holding leadership positions in the organization (ie, board of directors or similar). Each country was asked about typical duration of training to become a radiologist after high school, as it has been postulated that length of training may be a contributing factor to the gender disparity in radiology, since it is one of the characteristics that radiology has in common with other male-dominated subspecialties in the United States (12,15,16). Organizations were also asked to provide any personal, subjective thoughts on why a disparity existed or did not exist. Individualized English, Spanish, French, and Korean-language email templates were utilized, and each country was contacted twice. When available, national physician registries were queried for their national gender breakdown of radiologists; specifically, these included the United Kingdom, South Africa, and Canada.

Additional country-specific metrics were collected using publicly available sources. Basic economic metrics were gathered, namely, gross domestic product (GDP) (17) and Gini index. The Gini index is a commonly used statistical measure of inequality in the distribution of family income, and helps define the gap between the rich and the poor in a given country (18). The more unequal a country's income distribution, the higher its Gini index (18). Female medical school enrollment proportions were collected based on public data and obtained for 14 countries. Lastly, we reported the United Nations Gender Development Index (GDI), a validated metric of gender equality that accounts for disparities between women and men in health, knowledge, and living standards. Data sources include life expectancy at birth, mean and estimated years of schooling, and gross national income per capita, stratified by gender. For this index, a higher ratio indicates less disparity between genders in that country (19).

For Europe, data were obtained from individual European countries ($n = 12$) and the European Society of Radiology (ESR). As there was likely an overlap between these memberships, two data sets were created. The first data set contained ESR data and excluded individual European countries, and was utilized for global statistics as it contained more radiologists. The second data set included only individual European countries, and was used for the analytic model given that the unit of analysis was the individual country.

In cases where data were obtained from two professional societies in the same country (eg, Brazil, which has both the Colégio Brasileiro de Radiologia [CBR] and the Sociedade Paulista de Radiologia [SPR]), the larger of the two datasets was used to avoid duplicate memberships. In the United States, data from both allopathic and osteopathic professional organizations were used.

Descriptive statistics (item counts, percentages) were used to characterize the data as a whole and create graphics. A two-sample t test was used to compare means between groups. Univariate multiple regression was performed to determine which country characteristics were associated with the outcome of increased female representation in the radiology physician workforce. All statistical analyses were performed in Stata (version 12; StataCorp, College Station, TX).

This study was exempted from institutional review board review.

RESULTS

Twenty-nine total organizations provided data on 184,888 radiologists, representing 26 countries in Europe ($n = 12$), North America ($n = 2$), Central/South America ($n = 6$), Oceania ($n = 2$), Asia ($n = 3$), and Africa ($n = 1$) (Figs 1 and 2) for a response rate of 34.7% (26/75). Globally, 33.5% of these radiologists are female (Table 1). Female society representation in radiology was the highest in Thailand (85.0%), Spain (50.4%), and Romania (68.9%). Sixty-three percent of countries reported female society representation of at least one-third. In the United States, female representation was the lowest within the RSNA (27.1%) and the American Osteopathic College of Radiology (20.0%). European societies had the greatest variability (mean 40.1%, range 28.8%–68.9%). Female society representation was just above average (mean 38.3%, range