Evolution of Regional, Age and Gender Demographics in the ATLAS Collaboration

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The ATLAS Collaboration consists of more than 5000 members from about 100 different countries. This study presents data showing aspects of the regional, age and gender demographics of the collaboration, including the time evolution over the lifetime of the ATLAS experiment at the LHC. In particular the relative fraction of women is discussed, including their share of contributions, recognition and positions of responsibility, and showing how this depends on other demographic measures.

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1. Introduction

The information presented here is part of the studies [1] related to gender, age and geographic diversity in the ATLAS Collaboration, based on the data collected by the CERN Human Resources (HR) database and complemented by the ATLAS database [2]. Information about a person's gender – male or female – is based on what is stated on their government-issued ID at the time of registration in the database. The region they are assigned to is based on the location of their home institution.

In order to study the evolution of demographics in the ATLAS Collaboration, three periods of time are defined based on milestone events of the ATLAS experiment at the LHC [3]: construction (1998-2009), Run 1 (2009-2014) and Run 2 (2014-2019).

2. Evolution of authorship in the ATLAS collaboration

A person who belongs to the ATLAS collaboration is called a *member*, and those who sign publications are *authors*. The number of authors in the collaboration, as seen in Figure 1, has been increasing throughout the years with close to 3000 authors in 2019. The fraction of women authors has also been increasing. The fraction of women authors for the year 2019 is considered a reference value for the following plots where the fraction of women is considered. Additionally, the fraction of women authors over the age of 35 years is used as a reference value.
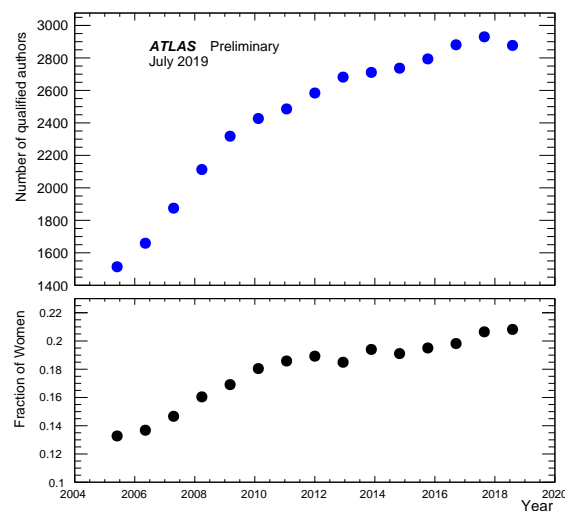

Figure 1: (top) Total number of ATLAS authors on 1 July for each year from 2005 to 2019. (bottom) the fraction of women authors on 1 July for each year between 2005 and 2019. Gender can only be male or female, as defined in the CERN HR database [2].

3. Age distribution of the ATLAS collaboration

The age of members of the ATLAS collaboration spans at least 5 decades. The bulk of the collaboration is below the age of 40, both in terms of members and authors (see Figure 2). The

evolution of age distribution also indicates that the ATLAS collaboration is getting younger. The fractions of women members and authors decreases with age, and both have steadily increased in almost every age bin over the time periods considered.
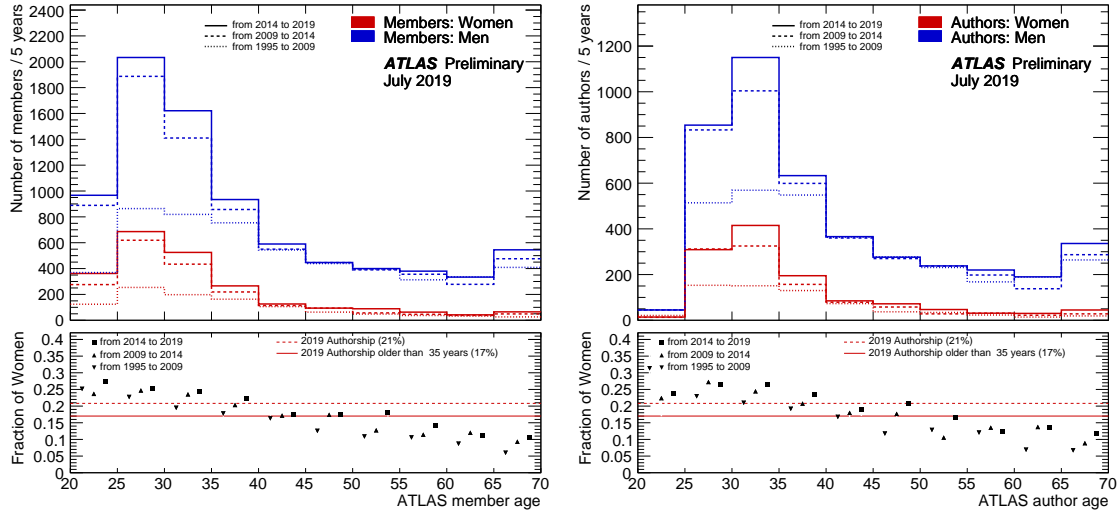

Figure 2: Age distribution of ATLAS members (left) and authors (right) over three time periods. The bottom panel shows the fraction of women as a function of age. Gender can only be male or female, as defined in the CERN HR database [2].

## 4. Regional distribution of the ATLAS collaboration

The CERN membership database includes the country of home institute. The regions considered are composed of the following countries:

1. Asia: Armenia, Azerbaijan, China, Georgia, Japan, Taiwan

2. Eastern Europe: Belarus, Czechia, Poland, Romania, Russia (including JINR Dubna), Serbia, Slovakia, Slovenia

3. Mediterranean: France, Greece, Israel, Italy, Portugal, Spain, Turkey, Morocco

4. North America: Canada, USA

5. Northern Europe: Austria, Denmark, Germany, the Netherlands, Norway, Sweden, Switzerland (including CERN), UK

6. Southern Hemisphere: Argentina, Australia, Brazil, Chile, Colombia, South Africa

Figure 3 shows that Asia, North America and Northern Europe have experienced a considerable increase of authors, while Eastern Europe is the region with the slowest increase of authors. Most regions have had a steady increase in the fraction of women authors, except for the Mediterranean, which nonetheless is the region with the largest fraction of women authors in all three time periods. Asia is the region with the smallest fraction of women authors. A finer distribution of the demographic distribution of ATLAS authors can be seen in Figure 4.
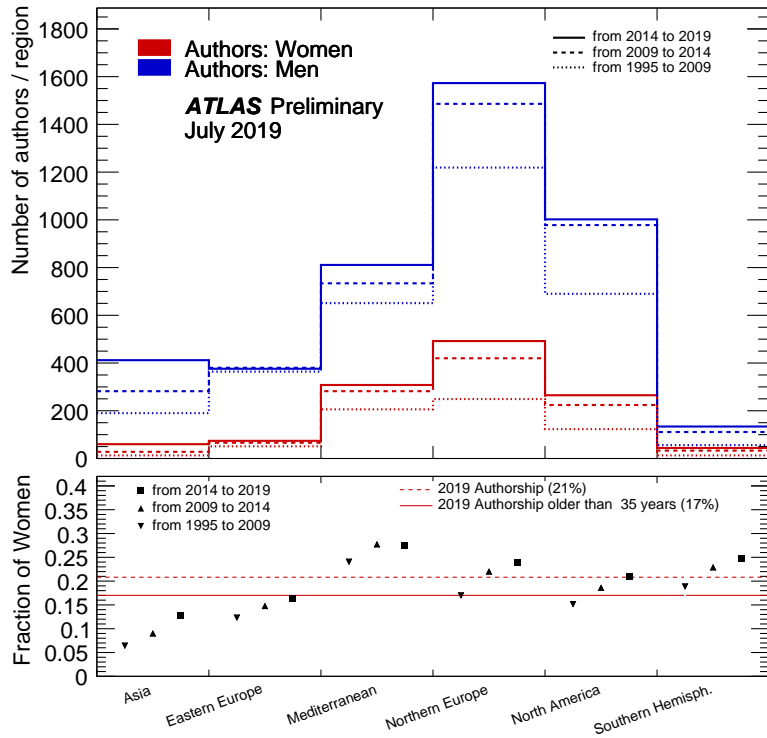
Figure 3: Region of affiliation of ATLAS authors in three time slices. The bottom panel shows the fraction of women as function of region. Gender can only be male or female, as defined in the CERN HR database [2].
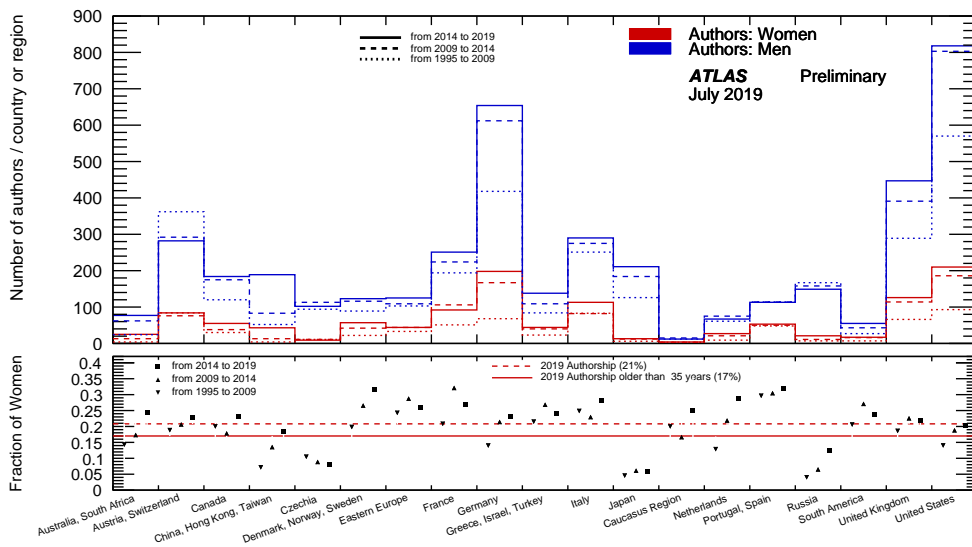

Figure 4: Geographic distribution of affiliation of ATLAS authors in three time slices. The bottom panel shows the fraction of women as function of region. Gender can only be male or female, as defined in the CERN HR database.

5. Leadership by gender

The fraction of women in leadership roles in ATLAS is plotted in Figure 5. There are seven categories of leadership role considered, which are listed as follows, with terms of two years unless stated otherwise:

- Top level management: six roles.

- Major area coordinators: 16 roles.

- Physics and performance group: 36 roles.

- Physics and performance subgroup: 120 roles.

- Publications Committee: 12 members.

- Speakers Committee (three years): 15 members.

- Institution Team Leader: 182 ATLAS member institutions.

It is important to note that the institution team leader is chosen by the home institution and not the ATLAS collaboration. The fractions of leadership roles held by women members has increased between Run 1 and Run 2 for all roles.
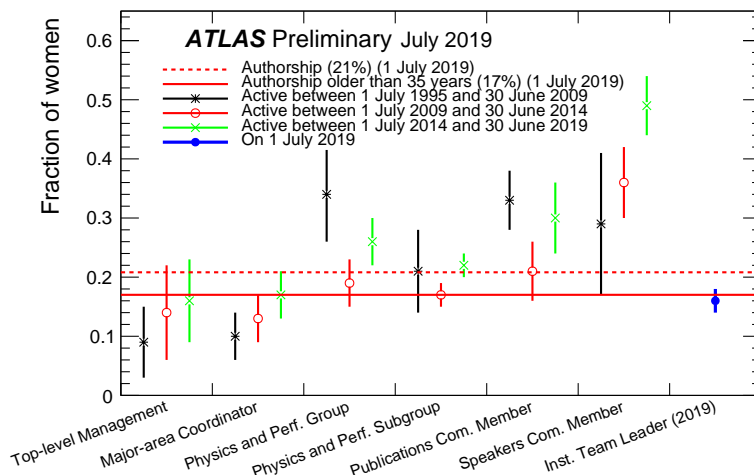

Figure 5: Fraction of women in leadership roles. The horizontal dashed (solid) line shows the average fraction of women who are authors (aged over 35 years) in 2019. The data are shown per term, i.e. if the same person held the responsibility for two terms there are two entries. For Inst. Team Leaders the data shown are for 2019. All other data are evaluated within the time period specified. Gender can only be male or female, as defined in the CERN HR database [2].

6. ATLAS week contributions by gender

The ATLAS collaboration meets three times per year for *ATLAS week*. The fraction of contributions to ATLAS week plenary talks per gender are plotted in Figure 6. Because names of people

in the calendar system cannot be linked to entries in the CERN HR database, for this plot, gender is derived from first name using http://genderize.io. The fraction of contributions made by women is currently above the fraction of women authors.
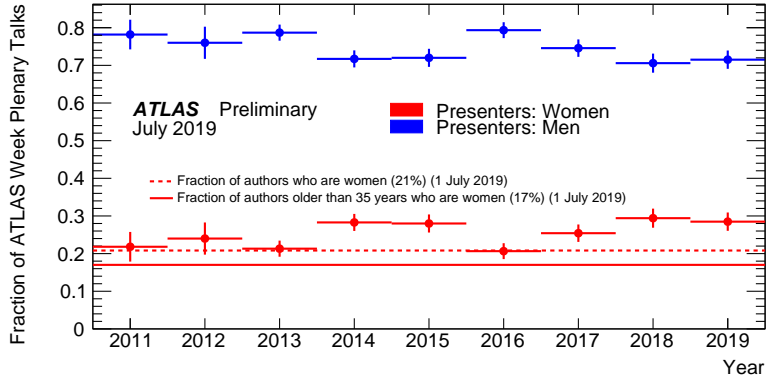
Figure 6: Fraction of plenary talks given during the ATLAS Overview Weeks separated by gender in a given calendar year [2].

7. Final remarks

This series of plots summarizes the regional, gender and age data of the members of the Collaboration, over three time periods within the lifetime of the ATLAS experiment at the LHC. The ATLAS Collaboration is composed of members from about 100 countries, with ages spanning several decades.

The fraction of women members in the collaboration decreases with age and varies significantly among the different institute regions. Currently, $\sim 21\%$ of ATLAS authors are women and $\sim 17\%$ of ATLAS authors over the age of 35 are women. Some regions have shown considerable membership growth over the years the ATLAS collaboration has been active. In parallel, almost all regions have seen an increase in the fraction of women members.

Participation of women speakers in ATLAS week talks is currently greater than the fraction of women authors. The fraction of leadership roles held by women members has increased over the last five years for all roles.

References

[1] The ATLAS collaboration, *Studies related to gender and geographic diversity in the ATLAS Collaboration*, ATL-GEN-PUB-2016-001, CERN, Geneva, July, 2016.

[2] The ATLAS Collaboration, *Evolution of Regional, Age and Gender Demographics in the ATLAS Collaboration*, GEN-2019-001, CERN, Geneva, July, 2019.

[3] ATLAS Collaboration, *The ATLAS Experiment at the CERN Large Hadron Collider*, JINST 3 (2008) S08003.