

Writing Good Research



@chao_mbogho

My research experience



20+ publications in peer reviewed journals and conferences, as well as online articles.

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Member of the international committee - Special Interest Group in Computer Science Education.

Learning outcomes

- Explore some landscape of research in Africa.
- Recognize the importance of good research.
- Define the parts of a research paper.
- Understand high-level writing techniques of four parts of a paper.
- Perform a critical analysis of a research paper.
- Take away 5 key lessons.

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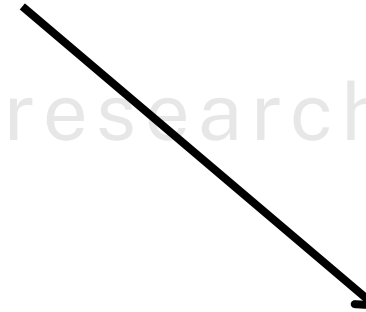
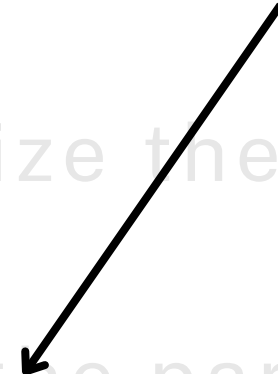
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R & D?

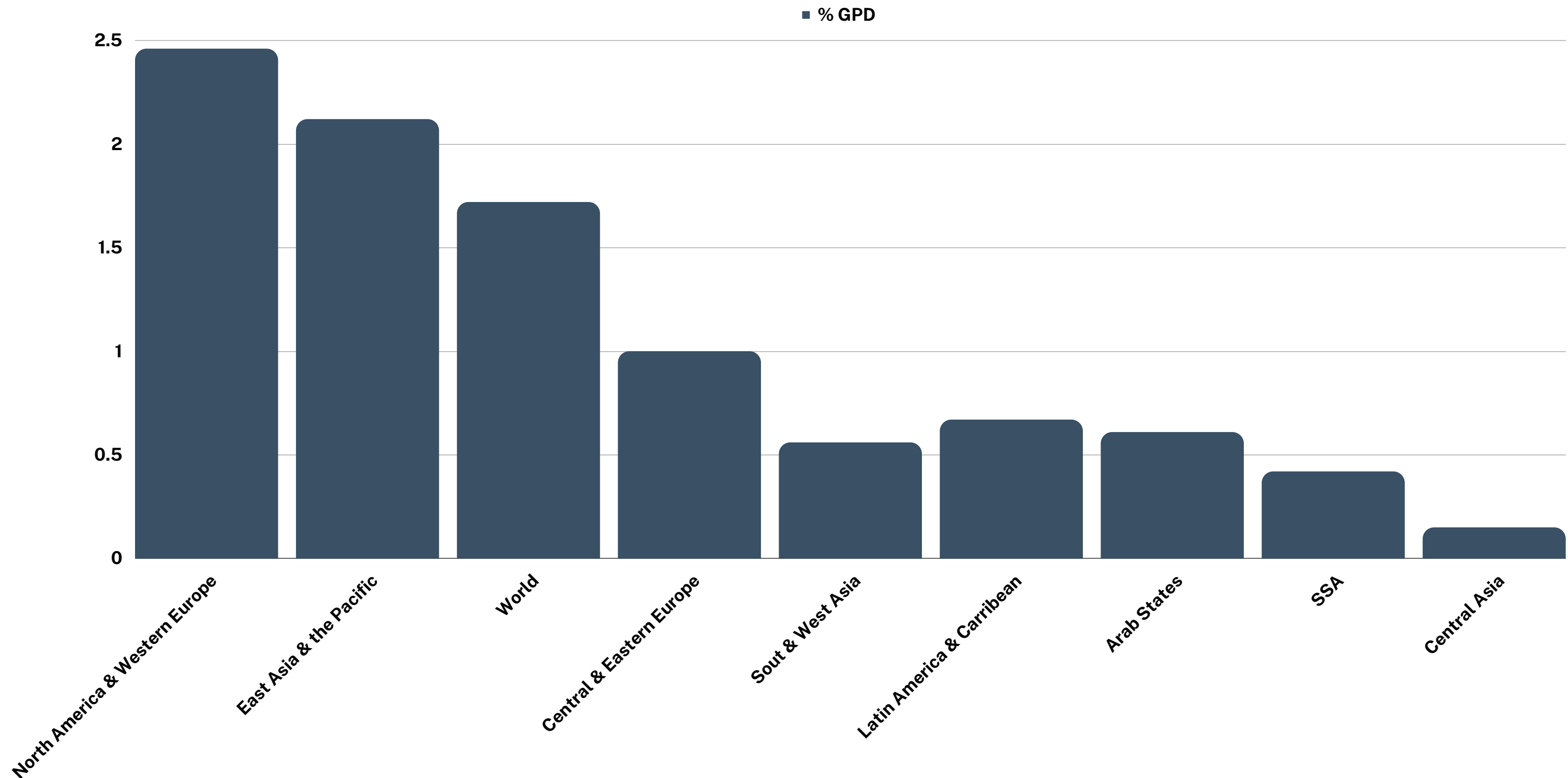
How many science publications
come from Africa?

What is the gender representation
of researchers in Africa?

How much do African countries invest in R & D?

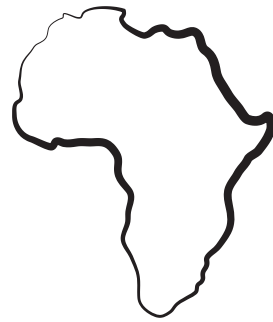


World average % of GDP spending on R&D is 1.7%

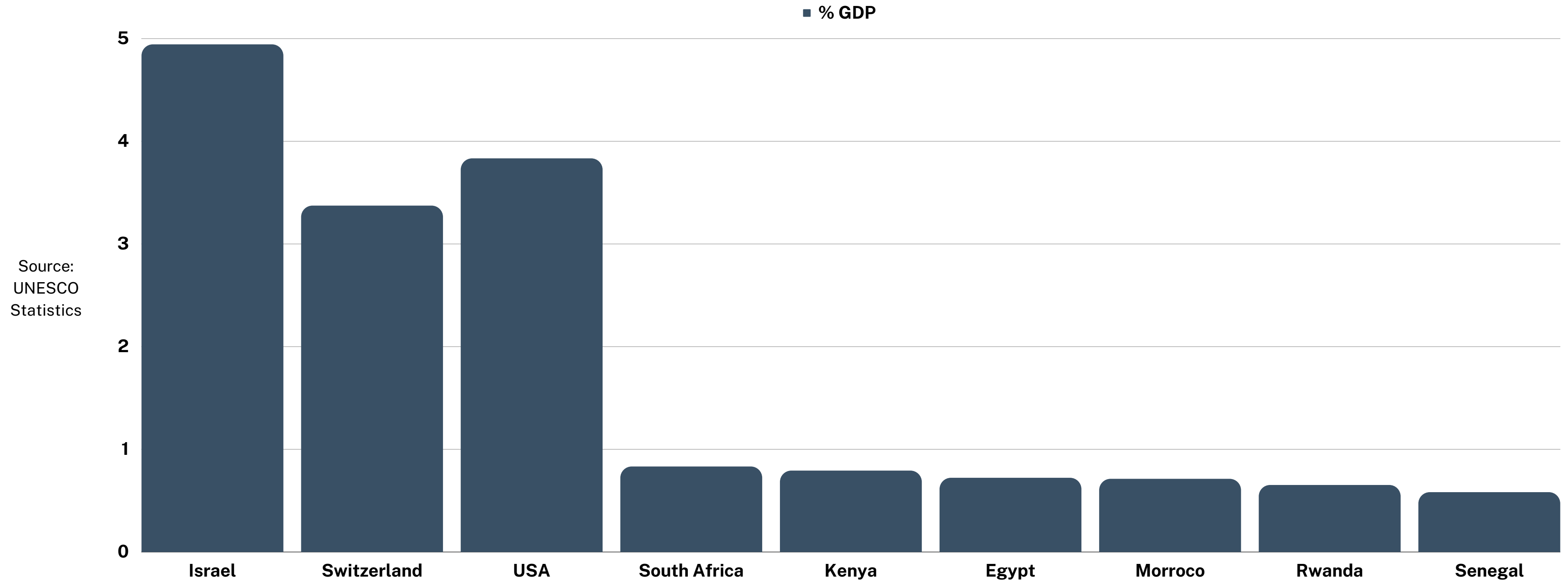


Source:
UNESCO
Statistics

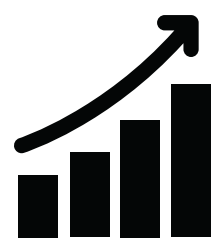
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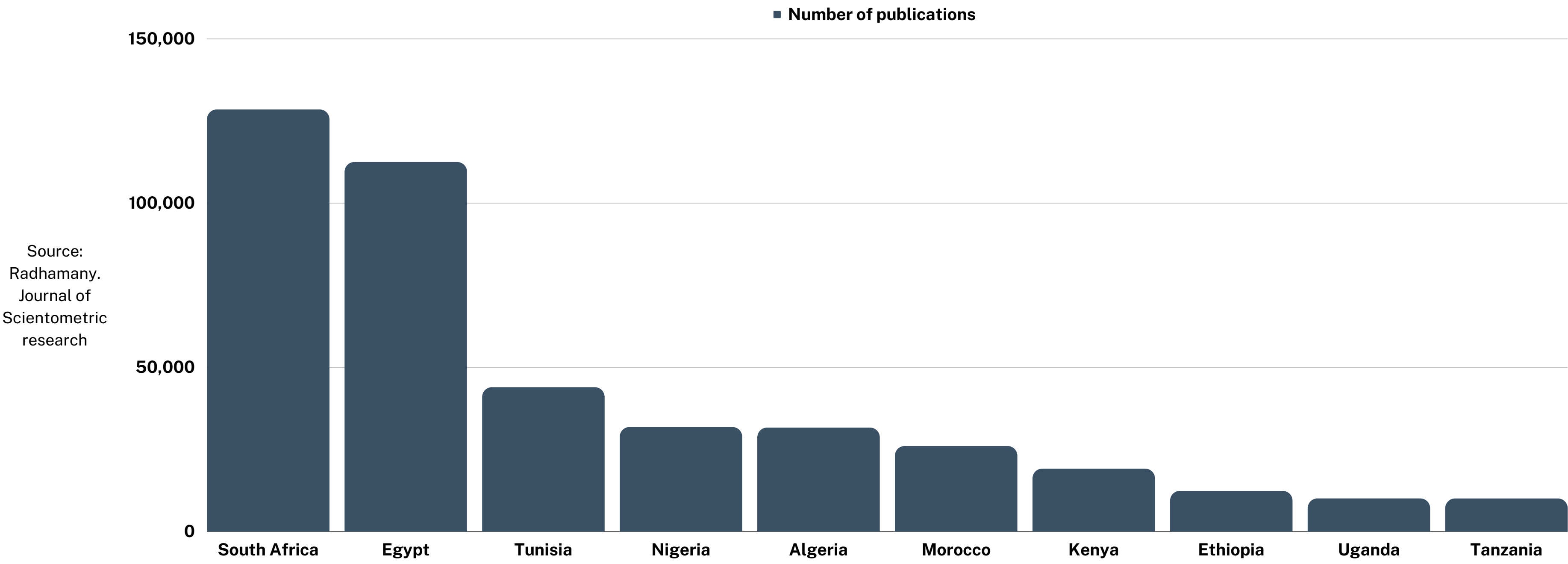
Africa Union set the target at 1% GDP. No African country has achieved that. Yet.



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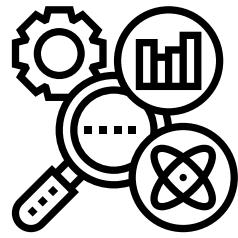


Africa produced 508,102 journal publications in science between 2001 and 2018, out of 6,688,920 globally.

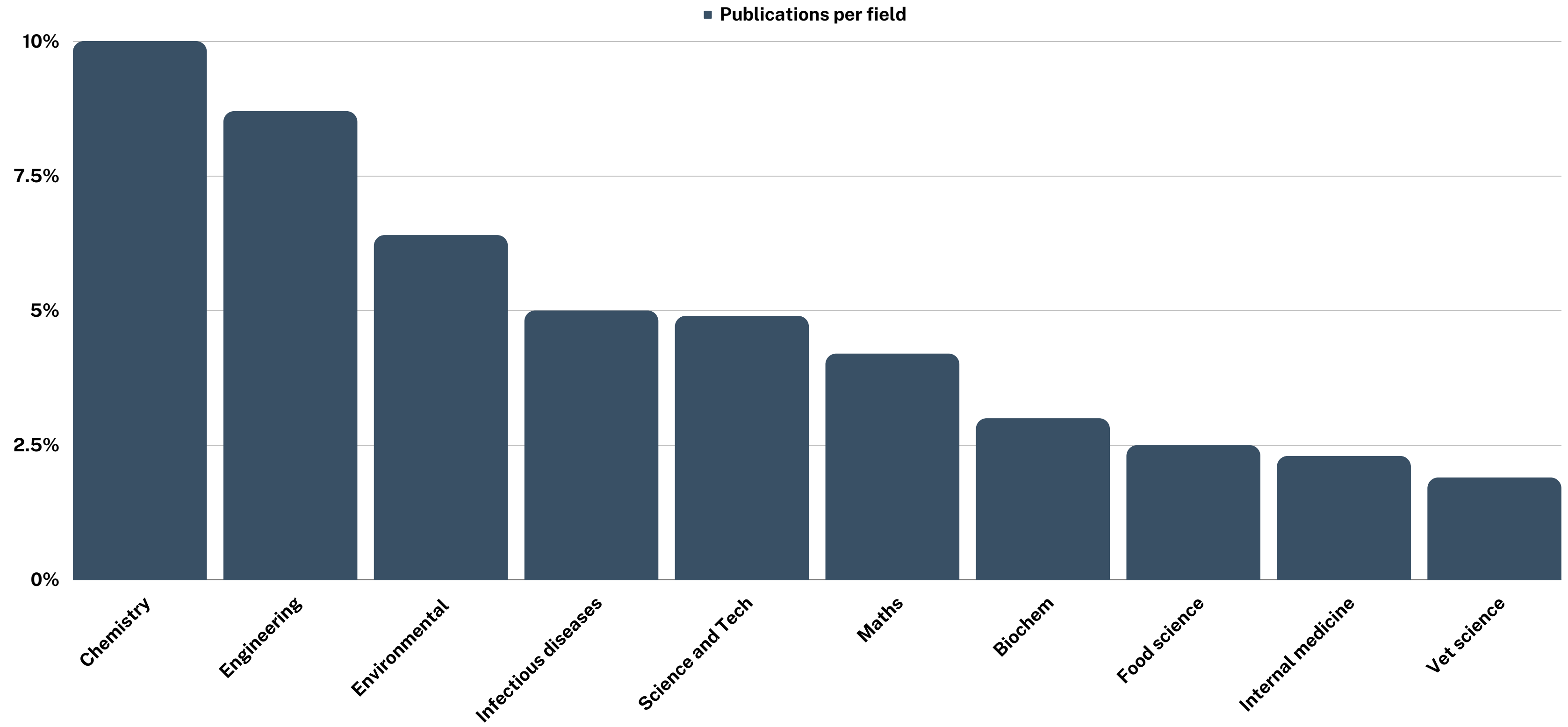


Source:
Radhamany.
Journal of
Scientometric
research

Which fields do most publications focus on in Africa?



Chemistry & Engineering are most published areas.

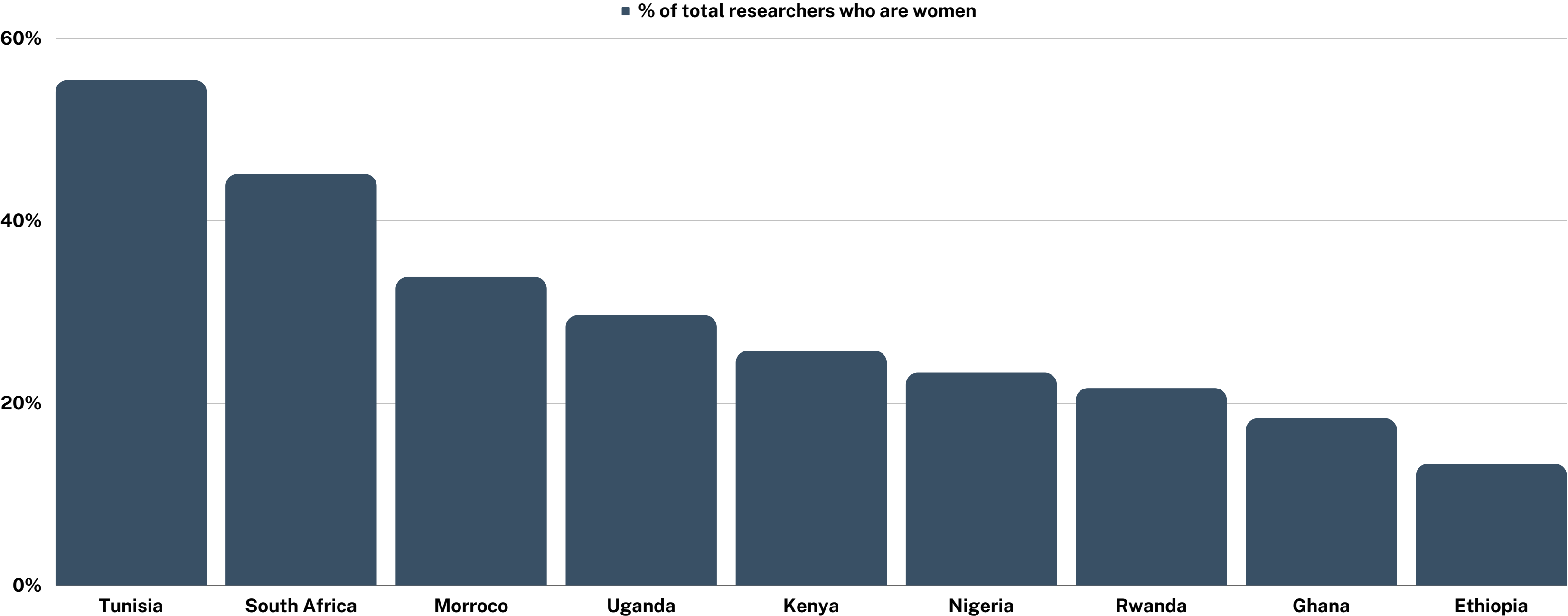


Source:
Radhamany.
Journal of
Scientometric
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What is the gender representation of researchers in Africa?



Globally, 1 in 3 researchers is a woman.



Source:
UNESCO
Statistics

The good news

Annual output of African authored publications grew from 1.5% in 2005 to 3.2% in 2016 (Muoton et al).

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Advances in new research fronts, such as astronomy (Maartens & Ellis)

Increased international investment in research (Mouton, J)

Between 2001 -2018 publications in science in most African countries increased substantially, varying from 2 to 20 times (Radhamany)

Lesson 1

More financial, technical, human, and **intellectual** resources are needed to advance Africa's progression in scientific contribution.

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Importance

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- Contribute to global intellectual resources.



Importance

- Investment in young talent.
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- Increase sources of legitimate information and advances from Africa.

A magnifying glass with a thick black handle and frame is positioned over a newspaper clipping. The word "Research" is prominently displayed in the center of the lens in a large, bold, black serif font. The background shows various parts of the newspaper, including the masthead "DAILY NEWS" at the top, a navigation bar with categories like "Arts • Science • Health • Wellness • Sports", and several columns of text. A horizontal blue bar is visible behind the word "Research".

Research

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Research

Importance

- Investment in young talent.
- Contribute to global intellectual resources.
- Increase sources of legitimate information and advances from Africa.
- Form a sound basis for technological innovations and policy.
- Increase skill in effectively communicating our work.

Lesson 2

Learning how to conduct and write good research is a necessary skill for personal and sector growth.

Learning outcomes

- Explore the landscape of research in Africa.
- Recognize the importance of good research.
- Define the sections of a research paper.
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Disclaimer

**** These tips may not be applicable to all fields, and some journals/conferences have their own requirements.**

Sections of a research paper

	Section	What this section should entail
1	Abstract	The general & specific problem, paper objective, methodology, summary of results, contribution of paper. No more than 300 words.

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2	Introduction	Expanded general & specific problem, research questions, summary of methodology, contribution of paper, description of sections.

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1	Abstract	The general & specific problem, paper objective, methodology, summary of results, contribution of paper. No more than 300 words.
2	Introduction	The general & specific problem, research questions, summary of methodology, contribution of paper, description of sections.
3	Related work	Use a funnel shape model to describe and relate to past works

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2	Introduction	The general & specific problem, research questions, summary of methodology, contribution of paper, description of sections.
3	Literature review	Use a funnel shape model to describe and relate to past works
4	Context	Describe the context within which the research took place.

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3	Literature review	Use a funnel shape model to describe and relate to past works
4	Context	Describe the context within which the research took place.
5	Methods	Research design, questions, study participants, data collection and analysis, evaluation criteria.

Sections of a research paper

	Section	What this section should entail
6	Results	Grouped per evaluation metric or research question.

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7	Discussion	Answer questions and address paper objectives
8	Conclusion	How the paper addressed the objectives, contribution, limitations and future works

**** (Typical) Sections of a research paper**

Abstract	Introduction	Related work
Context	Methods	Results
Discussion	Limitations and future work	Conclusion

Abstract example

	Section	What this section should entail
1	Abstract	<ul style="list-style-type: none">• The general & specific problem• Methodology (approach + population + measurements)• Summary of results• Contribution of paper• No more than 300 words <p><u>Design and Use of Static Scaffolding Techniques to Support Java Programming on a Mobile Phone</u></p> <p><u>Failure rates in introductory programming revisited</u></p>

Sections of a research paper

	Section	What this section should entail
3	Literature review	<ul style="list-style-type: none">• Use a funnel shape model to describe and relate to past works.• Works that have addressed general issue.• Specific problem. Why is it a problem? Why is it worth solving.• Is there any theory others have used?• What are the works outside your region and in your region?• What were the outcomes of the related work?• Opportunities and gaps (could also be the end of each paragraph to link your paper to the related work). <p><u>A Structured Mentorship Model for Computer Science University Students in Kenya</u></p>

Sections of a research paper

	Section	What this section should entail
4	Context	<ul style="list-style-type: none">• Describe the context within which the research took place.• Could include the country, locale, tool or model that was implemented to achieve the results discussed in the paper.• Context can also be discussed in the methodology (3rd example) <p><u>Semaphore or Metaphor? Exploring Concurrent Students' Conceptions of and with Analogy.</u></p> <p><u>Nurturing employability using structured mentorship for tech students in Kenya</u></p> <p><u>Design and Use of Static Scaffolding Techniques to Support Java Programming on a Mobile Phone</u></p>

Sections of a research paper

	Section	What this section should entail
6	Results	<p>Grouped per evaluation metric or research question.</p> <p><u>Computing Educational Programmes with more Women are more about People & less about Things</u></p> <p><u>Nurturing employability using structured mentorship for tech students in Kenya</u></p>

Lesson 3

A research paper typically contains the 8 aforementioned sections.

Lesson 4

Use these between-the-line skills to write a good paper:

- Use the funnel method when writing abstract, introduction, and literature review.
- Center your methods and results around research questions.
- Conclusion should always show contribution of the study.

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Guideline to Paper Critique - Example

Section	Critique metric
Abstract	<ul style="list-style-type: none">• Is it between 150-300 words?• Is there a general problem?• Is the general problem narrowed to a specific problem that this paper will handle?• Is there a general objective that this paper addresses?• Is there a summary of approach/methods?• Is there a summary of results?• Is there a so what (contribution)?

Guideline to Paper Critique - Example

Section	Critique metric
Introduction	<ul style="list-style-type: none">• Does it start with the general context?• Does it use the funnel method to reach to the specific issue addressed in this paper?• Does it have the author's voice?• Does it introduce the approach that was used to address the specific problem?• Does it have research questions or objectives?• Does it summarize the contributions of this paper?• Does it seamlessly lead to the related work?

Guideline to Paper Critique - Example

Section	Critique metric
Related work	<ul style="list-style-type: none">• Does it start with the general problem and narrow to specific problem?• Does it use recent works? Ideally in the last 5 years, except for theories.• Does it describe international/outside-local context?• Does it describe local context?• Does it identify the gaps or opportunities in the related work?• Does it critique the related work by adding the author's voice?• Are the cited papers legitimate?• Are the cited papers listed in the bibliography/reference list?

Lesson 5

Use the same principles for well-written sections of a paper to critique other research papers.

*** For those in the research journey, a great start is to schedule paper discussions.

What we have covered

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