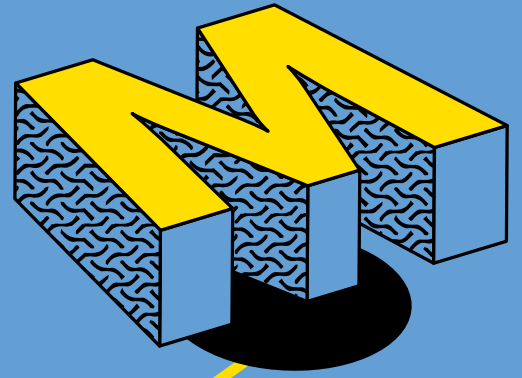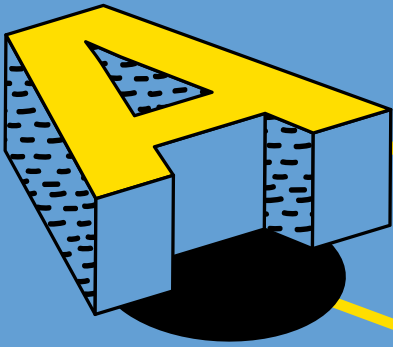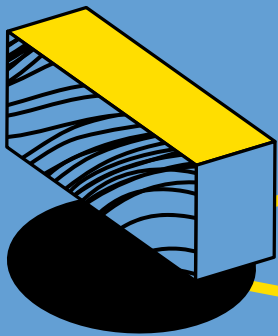# Mapping of Health Sciences Research and Funding

Angola
Cape Verde
Guinea-Bissau
Mozambique
S. Tomé and Principe

FUNDAÇÃO
CALOUSTE GULBENKIAN
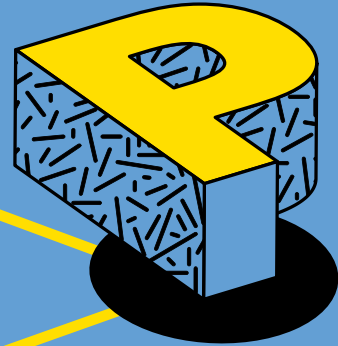
Tiago Santos Pereira

MAPIS–PALOP
Interim Monitoring Report

Mapping Health Sciences Research in Angola, Cape Verde, Guinea-Bissau, Mozambique and Sao Tomé and Principe

Tiago Santos Pereira
Center for Social Studies of the University of Coimbra (CES), Portugal
tsp@ces.uc.pt

Index

List of Figures

List of Tables

1. Introduction

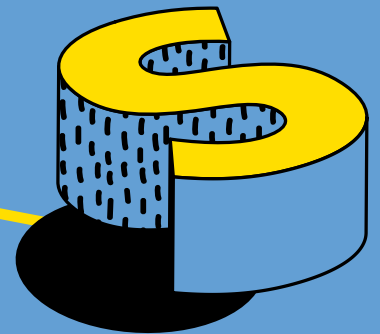Following the publication of the MAPIS Report – Mapping of Health Sciences Research and Funding – this document updates the set of data developed as part of the MAPIS project for the three years following the period previously analysed, i.e. for the period 2021-2023, henceforth considered as the reference period for this study. The data presented here makes it possible to monitor the evolution of research in Health Sciences in the *Portuguese-Speaking African Countries* (PALOP) and to reflect on the most recent publication trends.

This study is presented as an interim monitoring document over a limited period of time, and is therefore not intended to be comparative with the previous study. Thus, the analysis presented here has more limited objectives, focusing on data on scientific production which are identified as central indicators of the evolution of the dynamics of research systems, and with greater sensitivity to context changes. The aim is for the data presented here to uncover emerging trends to be identified and to contribute to outlining future mapping (possibly within an identical three year period) and to outlining a more comprehensive future mapping. In comparison with the MAPIS Report, the current interim review does not include qualitative analysis, which requires a different time frame, yet also reflects more structural characteristics that are less susceptible to rapid change, nor does it analyse participation in clinical trials. It was also decided not to include network analyses, which are particularly relevant to a global mapping, and whose changes over shorter periods of time may be more circumstantial in nature.

One element that is also analysed, and which was an important and innovative contribution of the MAPIS methodology, is the analysis of the role of the different funding institutions, both local and predominantly international, that support research activities in Health Sciences in the PALOP countries. This data is particularly important for monitoring purposes of funding organisations, such as the Calouste Gulbenkian Foundation.

As an interim report, this document should be read as a complement to the final report of the MAPIS project, which provides its context. In this sense, the report is more concise, focusing essentially on the indicators produced and their analysis, rather than on the broader context of the PALOP research systems. The context of PALOP research systems and their evolution in recent years is therefore not presented here. These structural changes require a broader analysis, combining other indicators and documentary analysis with the indicator analysis, which is strictly focused on data from scientific publications. The changes and evolution of the systems are expected to be analysed at a later date. It is noteworthy that there is still a clear lack of analysis and statistical production in this area in the PALOP countries. This had already been concluded with the MAPIS report, which identified the strengthening of the system to produce science and technology statistics as an important objective for the consolidation of the systems and for reflecting on the policy options to be implemented. The currently existing data on the national research systems, in particular on the allocated financial and human resources, do not differ from those presented in the MAPIS report, and no updates have been produced in the meantime. Furthermore, a new edition of the UNESCO Science Report has not yet been published, which could act as a stimulus for the production of internationally comparable data.

Therefore, this study aims to proceed with the main objective of strengthening the impact of research in Health Sciences within the scope of international collaboration for development in the PALOP countries, by monitoring data on the knowledge produced and the visibility of local research in Health Sciences, as well as the strategies for the development of research in Health Sciences in the PALOP countries. The update to the previously developed aims at contributing to the promotion of the following results:

- monitoring the evolution of the research carried out in the area of Health Sciences in the PALOP countries, contributing to increase its visibility;

- identify the main funding agencies supporting Health Sciences research in the PALOP countries, and the corresponding main thematic areas of intervention.

After this introduction, Section 2 of the report presents the methodology for collecting and analysing the bibliometric data used in this analysis, emulating the approach adopted in the MAPIS report, however with a more synthetic analysis. Section 3 contains a brief overview of research production in the PALOP countries, complemented by an analysis of the output specifically in the Health Sciences, in Section 4. This analysis considers not only the quantitative output, but also the content of publications (the research areas) and patterns of international collaboration. This is followed, in Section 5, by an analysis of the activity of research funders who support publications in Health Sciences in these countries, an innovative contribution from the MAPIS project. The final section of the report, Section 6, summarises the main conclusions.

Finally, it is worth mentioning the collaboration with Dr. Hugo Confraria, co-author of the MAPIS report, who has since taken up a new position at the European Commission's *Joint Research Centre* (JRC). Although he is not a co-author of this report, he remains a member of the teams and a consultant of the MAPIS project. In addition, this interim report follows the bibliometric analysis methodology that he coordinated.

2. Data and methods

The methodology used in this study replicated the methodological approach adopted in the MAPIS study, in order to ensure the highest comparability between the data.

2.1. Publication data

The data analysed here is based on the data collected from publications in the Web of Science Core Collection (WoS), which has a high quality and comprehensive coverage of scientific publications, and which allows the analysis of data relating to the identification of funding sources.

The research conducted comprised all publications with at least one author from a PALOP institution in the period between 2021 and 2023, following the methodology previously developed in the MAPIS study.

The specific publications relating to the area of Health Sciences was identified on the basis of two classifications defined by reference institutions, in order to obtain a broad definition of the area of Health Sciences. Both the OECD classification of broad scientific and technological areas, with reference to the area 'Medical and Health Sciences' were used, defined based on the classification of scientific journals, and the CWTS classification, with reference to the Macro Citation Topic 'Clinical and Life Sciences', developed on the basis of journal citation patterns were used. In this way, a set of 2030 scientific publications was gathered that corresponded to these search criteria.

The analytical section is made up of two sections. In Section 3 (Research output in the PALOP), we use descriptive statistics to analyse research publication trends in the PALOP countries, collaboration patterns and research specialisation in all research areas. In Section 4 (Health sciences in the PALOP) we analyse in more detail the research associated with medical and health sciences between 2021 and 2023.

Thus, the publication data was extracted from the Web of Science Core Collection (WoS) in August/September 2024. All the scientific publications developed by at least one author from a PALOP institution were selected. Given that the aim is to identify scientific activity, valuing all collaborative activities which take on great importance in learning processes, we used the full counting method, attributing each article to each of the countries involved (for example, an article written in international collaboration between researchers in Portugal, Mozambique and Angola would be fully credited both to Mozambique and Angola). Although some studies use the fractional counting method, attributing to the authors/institutions/countries only the corresponding share in a publication with several authors/institutions/countries, we have opted here to adopt the total counting method because our aim is to map the participation of PALOP researchers in international research. Fractional counting is sometimes used in evaluation processes or studies aimed at producing rankings, where there is a particular concern with issues pertaining to the attribution of partial authorship (and avoiding double counting). While this is not the focus of this mapping, it is also important to emphasise that the activity itself, through participation, should be valued in this context, as it is the participation itself that provides

learning opportunities, collaboration and institutional scientific development. Apart from other methodological limitations of fractional counting, namely, the fact that it is also an estimate of the corresponding partial effort and not a concrete measure, it is considered that the opportunity to carry out research, as recognised through international publication, and reflected in the corresponding authorship, contributes to strengthening research capacities, which is the focus of the mapping presented here. Thus, co-authorships, whether individual, institutional or international, are not perceived as a mere division of labour but rather as a fully collaborative effort that strengthens the capacities of all participants, justifying their full recognition.

As in the previous study, we chose to collect publication data from the Web of Science (WoS). The Web of Science (WoS) is the oldest publication database, which has since been reinforced by the introduction of Scopus and, more recently, the Dimensions database. PubMed is also a relevant source, specifically for the Health Sciences. Based on the previous analysis of these different sources, it was considered that WoS is the database that best aligns with the different objectives of the study, particularly with regard to the coverage of publications produced in the PALOP countries, the categories available for classifying the Health Sciences, the quality of the information for identifying authorship and institutional affiliation and, in particular, the quality of the information on the sources of funding for publications, which we have been working on in an innovative way. In addition, WoS has been showing improvements in the inclusion of journals from the Global South regions, it is a highly reliable database that is widely used for bibliometric studies.

We have adopted various disciplinary breakdowns for our analysis. In Section 3, we adopt the six major OECD disciplinary areas ('Agricultural Sciences', 'Engineering and Technology', 'Medical and Health Sciences', 'Natural Sciences', 'Social Sciences' and 'Humanities') to analyse the specialisation of each PALOP country in each of these disciplinary areas in compari-son with the general distribution of publications in Africa and globally. Next, to identify research related to the 'Health Sciences', we endeavoured to have as broad a definition as possible to cover the largest number of publications and approaches. As such, we framed the concept of 'Health Sciences' by combining all publications authored by individuals from PALOP countries that are classified by WoS as OECD 'Medical and Health Sciences' or CWTS Macro Citation Topic 'Clinical & Life Sciences'. Our 'Health Sciences' dataset in section 4 consists of the 2030 publications with at least one author from a PALOP institution between 2021 and 2023. To analyse which topics each PALOP country specialised in within this set, we used the 326 CWTS Meso Citation Topics[1] from InCites[2] to assess the percentage of research carried out by PALOP authors in each of these topics.

One of our interests in mapping research in the PALOP countries was to identify the main patterns of international collaboration in these research systems. The research carried out by PALOP researchers and institutions is largely based on international collaboration, defined in this report as research involving authors from different countries, i.e. international co-authorship.

2.2. Funding data

As previously mentioned, this report makes a particularly innovative contribution by analysing the structure and sources of funding for research carried out in the PALOP countries. We used the acknowledgements of scientific publications in WoS, where authors are expected to acknowledge the support of the respective funding agencies, to identify the funding institutions in a given area of research. In identifying funders, we also applied the total counting method, considering only the existence of a contribution from a funding organisation to the research presented in an article, regardless of the number of funding organisations involved.

In this analytical section, we focused only on articles and reviews from 2021 to 2023, using data from the MAPIS report for the previous period, from 2008[3] onwards. We manually cleaned the WoS "Funding Orgs" column, looking at the "Funding Text" and comparing it with what the WoS algorithms retrieve in the "Funding Orgs" column. We then used OpenRefine[4] to group together different variations of the name for the same funding organisation (e.g. Bill and Melinda Gates Foundation, Gates Foundation or BMGF = Gates Foundation). In institutional cleaning, we have aggregated the institutions that have undergone name changes over this period. With regard to public funding organisations, we have maintained the distinctions between thematic agencies within the same country (e.g. development cooperation agency, research funding agency, health policy agency), except for the PALOP countries, where we have aggregated all funding recognitions under the identification 'Government of...', since the thematic distinction tends to be less relevant, with the Ministries of Health playing a particularly important role, and a greater distribution of institutions would make the national contribution less visible.

It is important to note that there are some relevant caveats regarding this data[5]. The funding data retrieved from the publications does not cover all health research funding directed at the region, since not all research projects that are funded result in publications in the WoS. Furthermore, not all articles include acknowledgements of research funding. This may be due to the fact that some publications do not receive the research funding that the authors consider necessary to acknowledge, or possibly because the author did not consider or decided not to include acknowledgements of research funding. The implementation in research funding contracts of formal requirements to acknowledge research funders in research outputs, such as research publications, has been changing, with different practices in different research systems. Researchers also vary in their acknowledgement practices, but they have been improving their communication of the funding received (also due to pressure from funders) and the quality of this information has also been improving. Nevertheless, it should be noted that the information analysed here does not identify the amount of the funding contribution, but simply the participation of the funding organisation. As

---

[3.] The processing of this earlier data benefited from the invaluable research help of Assucénio Chissaque.

[4.] https://openrefine.org/

[5.] As this is an interim study, replicating the previous methodological approach, and limited to an analysis of the primary data now collected, it is essentially a complement or addendum to the MAPIS report, which is why it was decided not to present any bibliographical references here. However, the bibliographical references presented in the MAPIS report remain relevant.

such, the identification of different funding organisations in supporting a given article does not fully recognise their distinct contribution. Funding acknowledgements can indicate the main funding of the supporting project or simply an indirectly related project, from regular institutional funding, which can also be acknowledged in most articles of a research institute, or from a specific contribution to a resource involved in the research, such as a training grant, instrumentation or mobility support, for example. These differences, which are not directly reflected in the funding date, should be taken into account when analysing funding data.

After cleaning the funding data of the 2030 publications, we identified 722 publications with no funding information and 1308 publications that acknowledged funding. We then used this dataset to identify the main funders and the corresponding co-funding relationships, and to understand the specialisation patterns of research funding by different funding organisations.

3. Research output in the PALOP Countries: publications, collaboration and specialisation

The scientific weight of the PALOP countries remains very limited, with relatively incipient indicators of scientific activity. As previously concluded in the MAPIS report, the global percentage of PALOP publications in WoS, with a stable weight of around 0.034% since 2020, reflects a very low baseline, much lower than the corresponding share of the world population (0.9 %).

The annual volume of scientific output from the PALOP countries in all scientific areas, in the period 2021 to 2023, was approximately 900 publications in WoS[6]. This figure has decreased in the last two years, partly due to the database update process. However, given the significant decrease, it is believed that this figure also reflects a reduction in scientific activity in these countries during this period, which might be attributed to the effects of the pandemic[7]. Mozambique continues to play a key role in this scientific output, with a share of around 2/3 of all publications (some of which in collaboration with other PALOP countries), but there is a significant increase in scientific output of other countries during the reference period (2021-2023).

Figure 1a. Evolution of research output (all areas) in the PALOP countries. 1991-2023.

Source: WoS.
Note: Only articles and reviews.

[6.] Only scientific articles and review articles, the type of publication considered in bibliometric studies to contain new contributions to scientific knowledge, are considered here.

[7.] The overall publication pattern, according to the same search criteria, also reflects this decline, and more markedly. It should be noted that the data for more recent years are constantly being updated and undergoes slight variations over time. These data were collected at the end of August and beginning of September 2024.
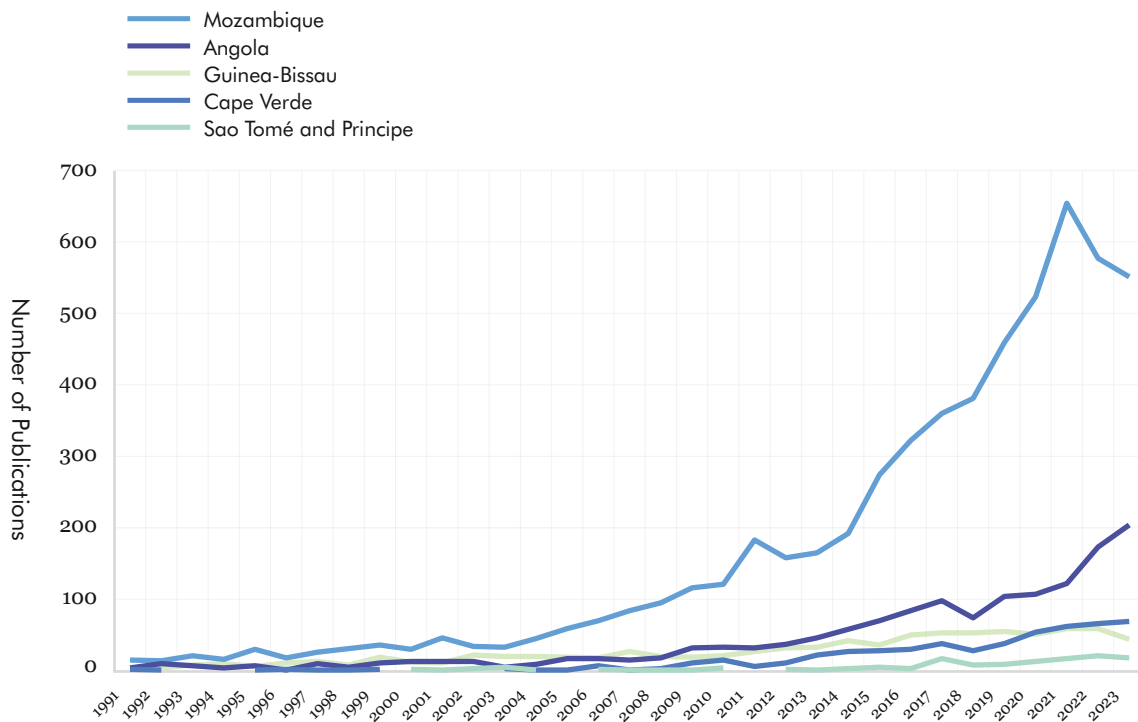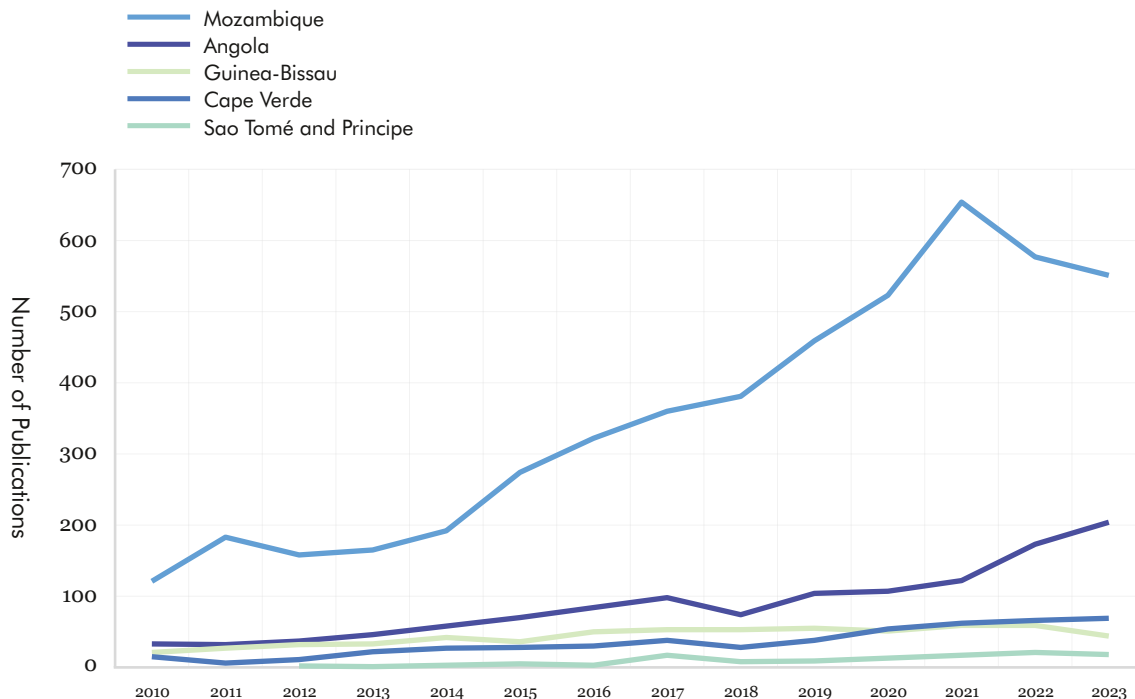
Figure 1b. Evolution of research output (all areas) in the PALOP countries. 2010-2023.

Source: WoS.
Note: Only articles and reviews.

Figures 1a and 1b show the evolution of scientific output in the PALOP countries over three decades, with a focus on the evolution since 2010. Compared to the data previously available in the MAPIS report, it is clear that, although Mozambique remains the centre of scientific production, there is a clear increase in other countries, particularly Angola. It is possible that research in Mozambique, which is strongly based on international collaborations that are heavily involved locally and with higher levels of activity, has suffered greater repercussions from the pandemic, limiting the travelling of international collaborators, reducing activity and possibly reallocating some research resources in order to directly support essential services in response to the pandemic, such as conducting diagnostic tests on the local population. We lack concrete evidence of this, but it is considered a plausible explanation. Despite this, the strong growth in publication by researchers in Angola is noteworthy, with the total number of publications doubling in just four years (from 104 publications in 2019 to 204 in 2023), and including the years most affected by the pandemic. Thus, researchers in Angola went from being present in around 15 per cent of PALOP publications to participating in around 20 per cent. Cape Verde and São Tomé and Príncipe have also experienced a significant increase in recent years in recent years, especially in São Tomé and Príncipe. The involvement in international research related to the Covid-19 pandemic has also contributed to an increase in publications during this period. In Guinea-Bissau, as in Mozambique, there was a decrease in publications, especially during the last year, 2023, which suggests that this may not be merely a result of the pandemic but perhaps a more structural effect. In fact, considering the qualitative research carried out in the MAPIS project, this decrease (which, for the time being, is only reflected in one year, albeit significantly) could be the result of a shift in strategy by the main international research partners in Guinea-Bissau, namely Denmark. These international

partners, particularly in the Bandim Health Project, were going through a strategic reflection process on their ongoing collaboration, also as a result of a reorientation of priorities by the traditional funders of this project.

In fact, the international dependency of research in the PALOP countries continues, and has even deepened, in recent years. The pattern of high international collaboration is typical in countries with fewer scientific, human and financial resources, were international collaboration emerges as an effective way not only of learning but also of sharing and complementing the resources needed for research, which are more difficult to obtain in their entirety in smaller countries.

The PALOP countries have very high levels of international collaboration, with typically 95 per cent or more of their publications developed in international collaboration. Although these small fluctuations are normal, the most recent indicators show that this pattern has deepened and is not yet showing trends towards greater autonomy, even in countries such as Mozambique or Angola, which had the highest levels of international collaboration during this period.

To analyse the influence and importance of international research collaboration in the PALOP countries, Figure 2 shows the percentage of a country's co-authored international articles vs. the percentage of these articles in which a researcher from the country is the corresponding author (CA). Internationally, we found a negative correlation between the two variables, which reflects, as expected, that, on average, countries with higher levels of international collaboration in research[8] have a lower percentage of publications in which the CA is a national citizen of the country. This inverse relationship between a country's percentage of international collaboration and its "leadership" in international collaboration is not surprising, since the more "dependent" a country is on international collaboration, the less capacity it should have to lead research projects[9].

Figures 2a and 2b show the position of all the countries identified in the WoS in relation to these two indicators for the 2021-2023 period. Additionally, for the PALOP countries, the reference point for the previous period, the 2010-2020 decade, is also included, alongside the 2021-2023 reference period. While Figure 2a shows that the PALOP countries are part of a broad group of small countries with high levels of international collaboration and with lower levels of scientific leadership, Figure 2b clearly illustrates the PALOP's position for these two periods.

[8.] Percentage of publications from a country with a foreign author on the list of affiliations.

[9.] Chinchilla-Rodríguez, Z., Sugimoto, C.R., Larivière, V., 2019. Follow the leader: On the relationship between leadership and scholarly impact in international collaborations. *PLoS One*; De Moya-Anegon, F., Guerrero-Bote, V.P., Lopez-Illescas, C., Moed, H.F., 2018. Statistical relationships between corresponding authorship, international co-authorship and citation impact of national research systems. *J. Informetr.* 12, 1251–1262.
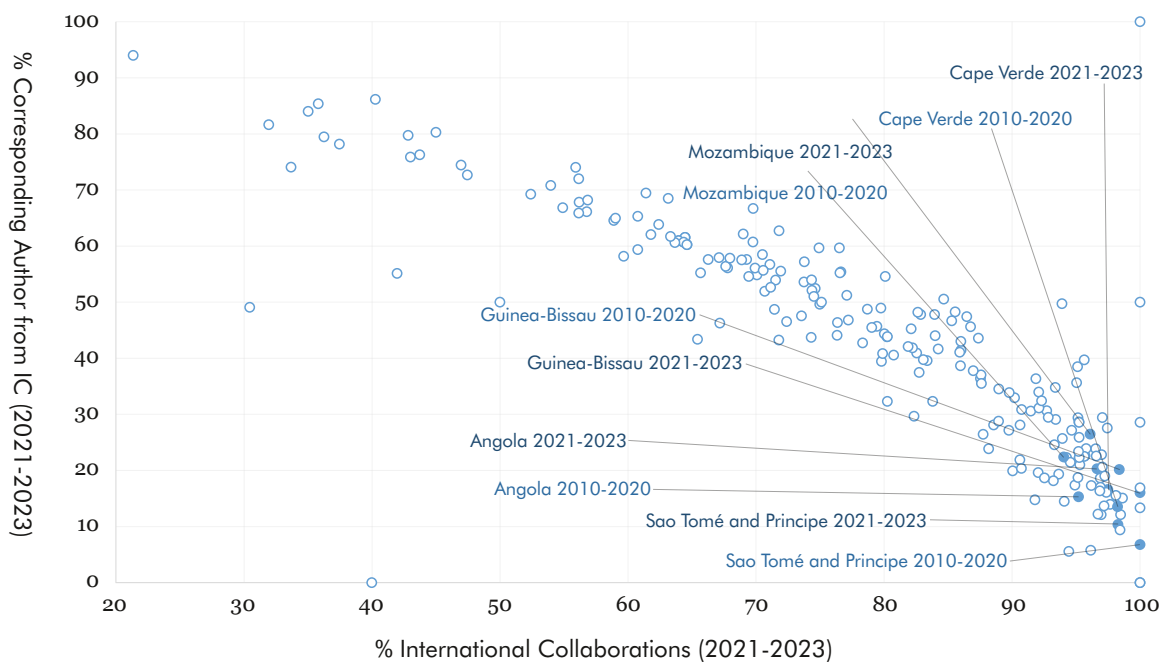
Figure 2a. International collaborations (%) vs Corresponding Authors (%), by country, all areas. Data for PALOP 2010-2020/2021-2023.
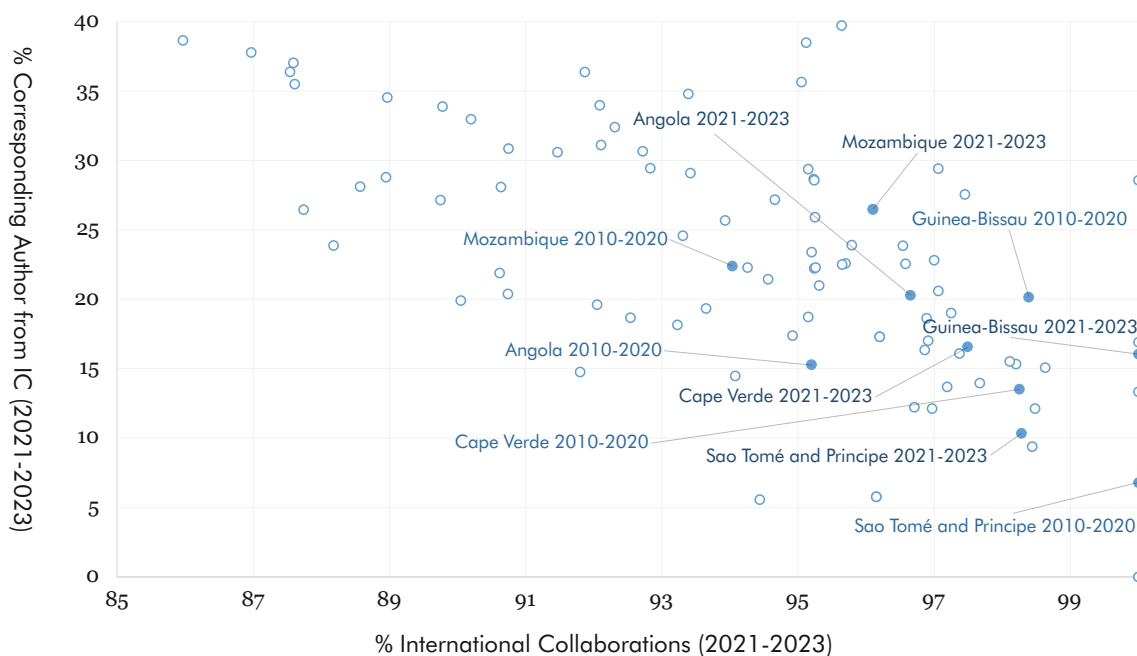
Source: InCites/WoS.

Figure 2b. International collaborations (%) vs Corresponding authors (%), by country, all areas. Focus on the data for PALOP 2010-2020/2021-2023.

Source: InCites/WoS.

From the outset, it can be seen that the PALOP countries carry out research in international collaboration in nearly all publications in leading international journals. Only Mozambique, in the previous period 2010-2020, had less than 95% of its publications in international collaboration (around 94%). Mozambique is also the PALOP country with the highest levels of scientific autonomy, with more than 20% of international co-authored publications in which its researchers are corresponding authors.

It is also worth noting that with the exception of Guinea-Bissau, all the countries show some form of progression in these indicators towards greater scientific independence, albeit limited, with an increase in the weight of the corresponding authorships. In the case of international collaboration, there was a general upward trend (a reduction in the case of São Tomé and Príncipe, but with low numbers and a previous value of 100 per cent, and a slight reduction in the case of Cape Verde), to which the significant increase in scientific production is also not irrelevant. It should be noted that Mozambique, in particular, but also Angola, are beginning to approach the inflection point of the global trend curve, suggesting a progression towards positions of lesser dependence on international collaboration. On the other hand, the case of Guinea-Bissau shows a period of uncertainty in the development of the research system[10].

Figures 3a and 3b show comparative data on the research specialisation areas of the PALOP countries, in comparison with the African and global averages, for the period 2008-2020 (Figure 3a, as presented in the MAPIS report) and for the reference period (Figure 3b). Figure 3 analyses the patterns using the six major scientific areas of the OECD (Agricultural Sciences, Engineering and Technology, Medical and Health Sciences, Natural Sciences, Social Sciences and Humanities). The PALOP countries stand out precisely because of the weight of research carried out in 'Medical and Health Sciences', especially through the research carried out by researchers in Angola, Guinea-Bissau and Mozambique in this area, with publication percentages in this area well above the world or African average. Cape Verde and São Tomé and Príncipe are relatively specialised in 'Natural Sciences' (Angola also has scientific production figures in 'Natural Sciences' at the international average and equivalent to the area of 'Medical and Health Sciences'), but their production is much less significant, as seen in Figure 1. It should be noted that, with the exception of Angola in the reference period, all PALOP countries have a weak specialisation in 'Engineering and Technology', with potential impacts on their innovative capacity.

[10.] The MAPIS report had already identified the weight of Danish authors even as local corresponding authors.

Figure 3a. Research specialisation in the PALOP countries in 6 major scientific areas. 2008-2020.

Source: WoS (OECD classification of scientific areas).
Note: Only articles and analyses. Some publications may belong to more than one OECD area (we have normalised the results to reach 100%).
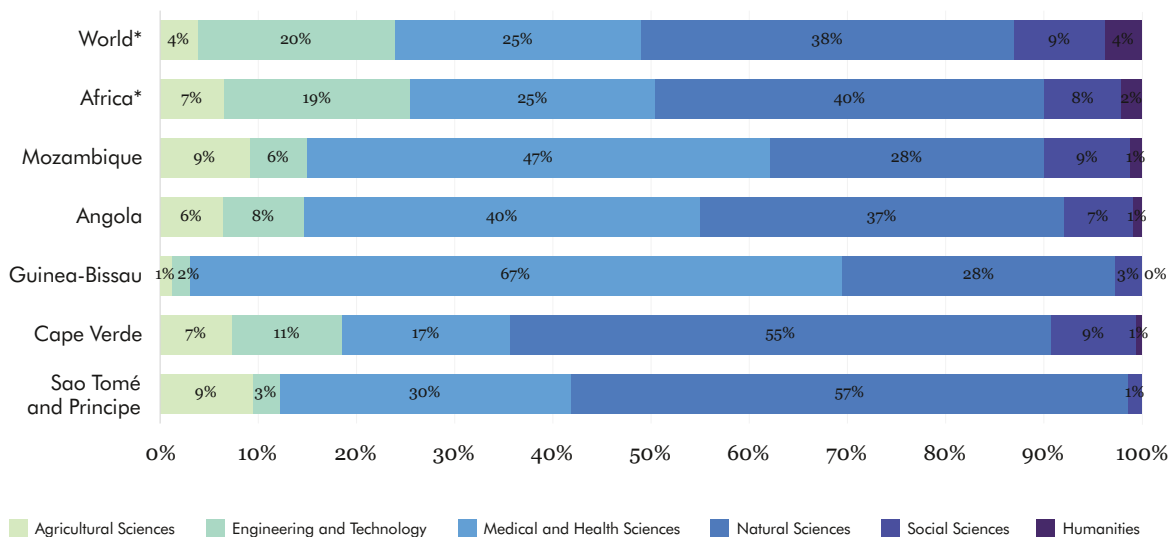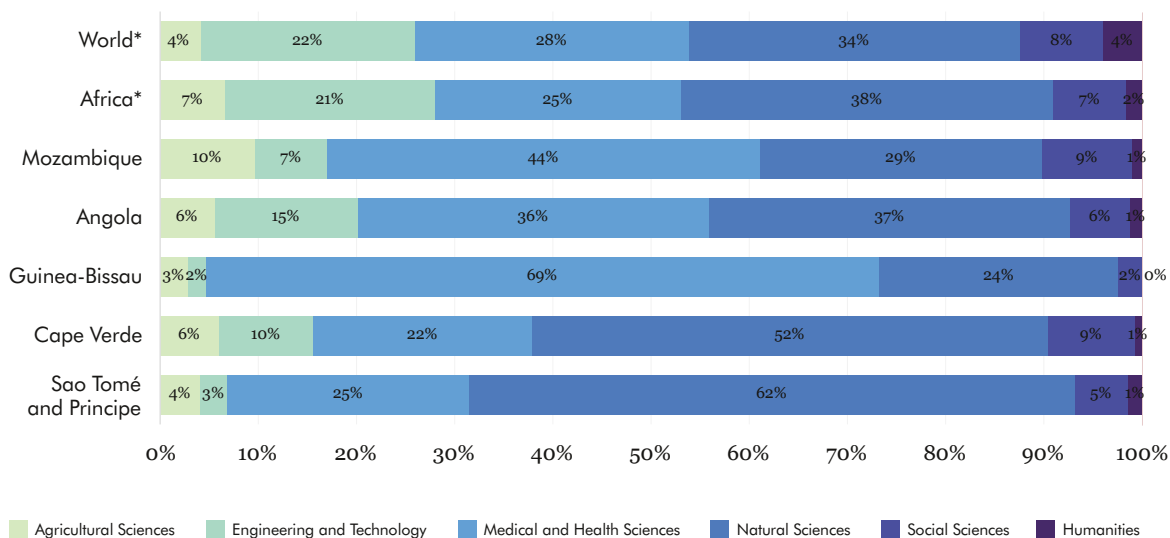

Figure 3b. Research specialisation in the PALOP countries in 6 major scientific areas. 2021-2023.

Source: WoS (OECD classification of scientific areas).
Note: Only articles and analyses. Some publications may belong to more than one OECD area (we have normalised the results to reach 100%).

4. Health Sciences Research in the PALOP Countries

In this section we follow up the analysis of the general context of research production and collaboration in the PALOP countries in all areas of research, in order to deepen the analysis of the patterns of specialisation and collaboration of the PALOP countries in the Health Sciences. As presented in the methodology section, and following the methodology adopted in the MAPIS report, here we use the concept of 'Health Sciences' by combining all publications with an author from a PALOP country that are classified by WoS (InCites) as 'OECD Medical and Health Sciences' or 'CWTS Clinical & Life Sciences'. In this way, we endeavour to have the broadest coverage of scientific activity in the PALOP countries in this area. Through this definition, we have compiled a database of 2030 publications[11] between 2021 and 2023, the reference period for this analysis.

4.1. Scientific publications in Health Sciences from the PALOP countries

Figure 4 presents the evolution of scientific publications in Health Sciences over five successive triennia[12], in order to consider the comparison with the 2021-2023 reference period. As in the global pattern, even slightly more markedly, Mozambique participates in the vast majority of these publications, with its participation corresponding to 71 per cent of PALOP publications in the reference period. It is worth noting here a particularly significant increase in publications by researchers in Angola, since they doubled their number of publications in the last three years, from 72 publications in 2020 to 153 in 2023. It is also worth noting that, as with the overall figures, the other countries experienced fluctuations in the trend during this period, namely Mozambique, with a sharp decrease between 2021 and 2023 (from 539 to 433 publications), after a significant increase from 2020 to 2021 (from 410 to 539). While Cape Verde saw steady progress (from 21 to 30 publications in this area between 2020 and 2023), Guinea-Bissau saw a significant decrease from 57 publications in 2020 to just 38 in 2023 (reaching 63 in 2021).

These figures reinforce the idea that there is a consolidation of research in Health Sicences in Angola. Although this interim analysis did not make an exhaustive analysis of the institutions involved in health sciences research in the PALOP countries, it should be noted that the main institutions are the Agostinho Neto University, the Angolan Health Research Centre (CISA), the Ministry of Health and the National Institute for Health Research (INIS). In Mozambique, the main institutions are Eduardo Mondlane University, followed by the Manhiça Health Research Centre, the Ministry of Health and the National Health Institute (INS), in an institutional parallel between the Angolan and Mozambican systems. In the case of Guinea-Bissau, it is worth noting that while the main institution is the Bandim Health Project/Indepth Network, it is swiftly followed by a Danish university, the University of

---

[11.] This number corresponds to the complete set of publications identified according to the methodological principles defined (and in an equivalent way to the collection carried out for the MAPIS report), and the references onwards relating to 'Health Sciences'. Partial sets will be used for some of the analyses presented below, according to the specific information available, which may differ. In these cases, the number of publications being analysed will be identified.

[12.] The period starting in 2009 is considered here, rather than 2008, in order to include identical three-year periods for comparison.

Southern Denmark, which was at the origin of the Bandim Health Project and maintains close collaboration. In Cape Verde, the main institution is the University of Cape Verde, followed by the National Institute of Public Health and the Ministry of Health. The Universities of Lisbon and Nova de Lisboa are also actively involved. In São Tomé and Príncipe, the Ministry of Health and hospital structures are mainly involved in these publications.
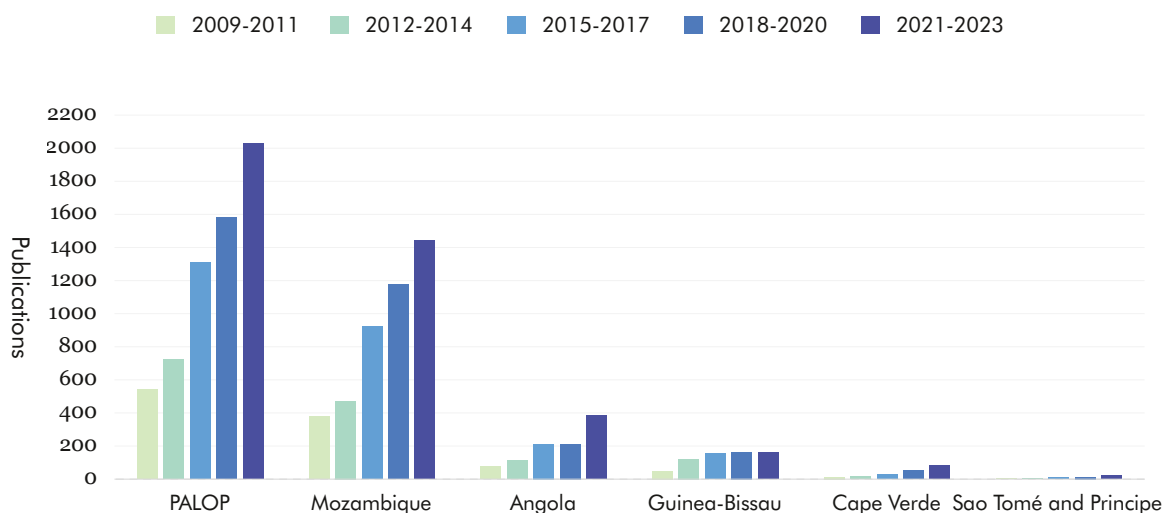
Figure 4. Evolution of research output in the PALOP countries in Health Sciences. 2009-2020.

Source: WoS.

Another indicator of the impact of a research system concerns the number of citations received by publications with a corresponding institutional affiliation in that country. Table 1 shows a set of comparative indicators between the periods 2008-2020 and 2021-2023 for each of the PALOP countries. In addition to the number of publications and citations received, five additional indicators are also presented to analyse the citation impact of PALOP research (percentage of publications cited – % Publ Cited; percentage of a country's publications that belong to the top 1% and top 10% globally, controlling for year and research area – % Documents in Top 1% & % Documents in Top 10%), international collaboration (percentage of publications with at least one foreign institution – % International Collaborations), and scientific 'leadership' (percentage of publications in which the corresponding author has a national affiliation – % Corresponding Author).

Table 1. Impact of research in the PALOP in Health Sciences. 2008-2020 vs 2021-2023.

		Publ	Cits	% Publ Cits	% Docs Top 1%	% Docs Top 10%	% Int Collabs	% Corresp Author
Mozambique	2008-2020	3398	167953	95,82	2,85	12,3	93,76	26,16
	2021-2023	1793	18586	81,65	2,06	11,15	96,1	26,49
Angola	2008-2020	798	19670	94,49	1,38	6,64	94,86	18,92
	2021-2023	507	3412	81,66	0,39	6,71	96,65	20,12
Guinea-Bissau	2008-2020	494	13752	98,18	1,62	12,35	98,58	20,24
	2021-2023	162	1020	88,89	0,62	6,79	100	16,05
Cape Verde	2008-2020	316	7742	96,52	1,58	9,49	98,42	13,61
	2021-2023	197	2252	82,23	1,52	10,66	97,46	16,75
S. Tomé and Principe	2008-2020	67	1128	98,51	0	4,48	98,51	8,96
	2021-2023	58	282	77,59	1,72	3,45	98,28	10,34

Source: InCites/WoS.

Table 1 provides a series of conclusions. It should be considered that the number of citations cannot be directly compared between the two periods, as not only do these periods have different lengths of time, but also older publications tend to be more cited because they have been available for longer. Similarly, the percentage of cited publications tends to be higher for the older period, as there has been more opportunity for citation. In this indicator, it is particularly relevant that all countries have a high percentage of cited publications, showing a significant impact. Finally, with regard to the most cited publications (Top 1% and Top 10%), Mozambique shows very positive results, always higher than the corresponding average (the value is positive if it is higher than 1% or 10%, respectively). In the recent period, Guinea Bissau and, in particular, Angola present lower impact figures, with a decrease compared to the previous period. São Tomé and Príncipe also show very low impact values in the top 10% of publications.

4.2. Research areas

In this section, we analyse in more detail the areas of Health Sciences research in which the different PALOP countries showed the most activity during the reference period. Table 2 shows the results of this analysis based on the 326 CWTS Meso Citation Topics[13] referenced in WoS. These citation topics essentially correspond to groups of articles (research areas) related to each other through more intense citation relationships.

The topics with the highest research activity closely follow the pattern developed in the period analysed in the MAPIS report, and the prevalence of different diseases at the local level. The main change, in global terms, is not irrelevant. It corresponds precisely to the most

---
[13.] https://clarivate.com/blog/introducing-citation-topics/

researched topic in the reference period, which is the topic of '*Virology – General*'. Although this is a significant change, it is not surprising, as it reflects the research carried out in recent years in response to the Covid-19 pandemic caused by a coronavirus, which has led all health research systems to prioritise research in this area. Research in general virology has gained significant prominence in the PALOP countries in recent years, being the main, or one of the main, areas of research identified. Among these are several publications with a high number of citations, mostly on Covid-19 and others on other respiratory viruses.

In the other topics, it is noteworthy that research in parasitology, predominantly on malaria, a disease that continues to have a high incidence in several PALOP countries, was the second most researched topic after virology, surpassing the number of publications on HIV.

In Mozambique, the research priority patterns are maintained (with the exception of the emergence of 'Virology – General'), with research related to "Parasitology – Malaria, Toxoplasmosis and Coccidiosis", in which CISM is particularly active, HIV", "Health Care Policy", "Diarrhoeal Diseases", "Tuberculosis and Leprosy", "Antibiotics and Antimicrobials" and "Nutrition and Dietetics", showing diversity and also an important component of laboratory research.

In Angola, in addition to research into "Virology – General", research in "Antibiotics and Antimicrobials", "Parasitology – Malaria, Toxoplasmosis and Coccidiosis" and "Health Care Policy" should be emphasised, with a similar pattern to the previous period.

In Guinea-Bissau, it should be noted that the high level of research activity in "Health Sciences" in the area of "Virology – General" is not only the result of research on Covid-19 but is also related to Measles, an area that was already of local interest. This is followed by research on "Tuberculosis and Leprosy", HIV, "Health Care Policies" and "Obstetrics and Gynaecology".

In Cape Verde and São Tomé and Príncipe, the amount of research by topic is too limited to make any meaningful analysis of research specialisation. However, we can see a concentration of publications related to 'Parasitology' (for example, 'Malaria' in São Tomé and Príncipe) and 'Virology – Tropical Diseases' (in Cape Verde), in addition to 'Virology – General'.

As previously analysed in the MAPIS report, research in these contexts should pay special attention to aligning health research priorities with the disease burden of specific conditions. In the PALOP countries, this relative alignment seems to persist, despite the growing pressures of international publication standards, as the main causes of DALYs (disability-adjusted life years) in these countries are neonatal diseases, HIV/AIDS, malaria, tuberculosis, lower respiratory infections and diarrhoeal diseases, all of which are, to some extent, the subject of research in these countries[14].

[14.] https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-dalys

Tabela 2. Especialização da investigação dos PALOP nas 25 principais áreas de investigação em Ciências da Saúde. 2021-2023.

PALOP Meso Citation Topics	Moçambique	Angola	Guiné-Bissau	Cabo Verde	São Tomé e Príncipe	Total PALOP
Virology – General	10%	8%	24%	12%	8%	199
Parasitology – Malaria, Toxoplasmosis & Coccidiosis	10%	6%	4%	6%	13%	155
HIV	9%	2%	9%	1%	8%	144
Healthcare Policy	7%	5%	8%	1%	13%	117
Tuberculosis & Leprosy	5%	1%	22%		4%	101
Antibiotics & Antimicrobials	5%	7%		4%	8%	87
Diarrheal Diseases	5%	1%	2%	3%		76
Nutrition & Dietetics	4%	4%	1%	5%		66
Virology - Tropical Diseases	3%	1%	1%	9%		47
Parasitology - General	2%	4%		1%	8%	43
Urology & Nephrology - General	2%	1%	1%	3%		37
Psychiatry	2%	1%	1%	5%		36
Obstetrics & Gynecology	2%	1%	5%	1%	4%	35
Cardiology - General	2%	4%				33
Trauma & Emergency Surgery	2%	1%		3%		25
Oncology	1%	2%		1%		25
Ophthalmology	2%	1%				25
Bacteriology	2%	1%				23
Nursing	2%		1%			23
Hepatitis	1%	1%		1%		21
Medical Ethics	1%	3%		1%		20
Fertility, Endometriosis & Hysterectomy	1%	1%	1%			16
Medical Mycology	1%	1%				16
Psychiatry & Psychology	1%	1%		1%		16
Sports Science	1%	2%				15
	1306	349	148	77	24	

Note: The percentage of publications per topic is calculated by dividing the number of publications associated with a specific topic by the total number of publications associated with any topic.

To highlight that the most cited publications in these countries (among the 10% of most cited publications in their field internationally) are largely in the areas of greatest activity during this period, namely in 'Virology – General' (which would be expected given the pandemic and the interest that this research has generated), 'Tuberculosis and Leprosy', 'Antibiotics and Antimicrobials', 'Health Care Policies', 'Parasitology – Malaria, Toxoplasmosis and Coccidiosis' and 'Cardiology – General', with many of these publications resulting from major international collaborations.

4.3. International collaboration

As mentioned above, international collaborations play a central role in the scientific activity of the PALOP countries, with around 95 % of publications developed in international collaboration. It is also not surprising that the publications with the greatest impact are international collaborations. In part, these are collaborations with large consortia, with comparative research in the area of health, whether in the context of clinical trials or experimental research.

The MAPIS report found that the PALOP countries, despite their proximity and similar research priorities, have little experience of international collaboration among them. In fact, international collaboration is seen both as a learning opportunity, which has greater potential in situations of greater asymmetry between the parties, and as a funding opportunity that often arises through other international partnerships. The limited level of public research funding in the PALOP countries (as noted in the MAPIS report) requires the existence of other international partnerships to support research, and international research collaborations also arise in this context.

Table 3. Top 5 Collaborating Countries and % of International Collaboration for each PALOP in Health Sciences. 2021-2023.

	Docs	1.º	2.º	3.º	4.º	5.º	...
Mozambique	1441	USA (45%)	Spain (27%)	UK (26%)	South Africa (24%)	Brazil (16%)	6.º Portugal (13%)
Angola	383	Portugal (27%)	USA (26%)	Spain (20%)	Brazil (20%)	Mexico (13%)	
Guinea-Bissau	159	Denmark (64%)	UK (27%)	USA (22%)	Uganda (15%)	Sweden (14%)	10.º Portugal (11%)
Cape Verde	84	Portugal (44%)	USA (29%)	UK (29%)	Brazil (20%)	Spain (18%)	
S. Tomé and Principe	24	Portugal (59%)	USA (36%)	Switzerland (27%)	Brazil (23%)	UK (23%)	

Source: WoS.
Notes: Portugal's position is highlighted in red when it is not among the top 5 PALOP collaborating countries.

Table 3 shows the countries with the highest international collaboration with each of the PALOP countries during the period in question, as well as their weight in the total number from these countries. The data gives some interesting insights. With the exception of Angola, each of the PALOP countries has a clearly defined main international collaboration partner: the USA, in the case of Mozambique, Denmark with Guinea-Bissau, and Portugal, with Cape Verde and São Tomé and Príncipe. In Angola, Portugal continues to be the main partner, but it is no longer as central as it was in the period analysed in the MAPIS report (2008-2020). USA is now the second international collaboration partner, with a very similar weight in Angola's international collaborations as a whole. Given that the main collaborating countries remain the same for each of the PALOP countries, there are three main points to be learnt from this international collaboration data.

Firstly, the US has established itself as the main collaborating country for the PALOP countries as a whole. Two factors are central to this dynamic. On the one hand, in the context of internationalisation strategies, it is normal for the country with the greatest scientific activity to be the potential main collaboration partner. This is the natural pattern, just as the pattern shows that small scientific countries have higher levels of collaboration in percentage terms. Despite this, research into international collaboration also shows that there are other factors, apart from size, that define collaboration patterns. These include language and cultural, political and economic links. In this case, the latter dimension has a specific declination, evident in the data in the next section on the weight of US-based funding agencies in health sciences research in the PALOP countries. The growing role of the Bill and Melinda Gates Foundation or federal health programmes, led by the National Institute of Health (NIH), in the PALOP countries is reflected in the funding acknowledged in these publications. We can therefore see that, in addition to the important scientific dimension of the USA, there is concrete action to support health sciences research in these countries, which contributes to US research centres being among the main partners of

researchers in the PALOP countries. The USA is Mozambique's main international colla-
boration partner, Angola, Cape Verde and São Tomé and Príncipe's second, and Guinea-
Bissau's third.

Secondly, we realise that Portugal has been losing weight as a scientific partner of the
PALOP countries. Although it continues to be the main partner of Angola (but with a
significant decrease), Cape Verde and São Tomé and Príncipe, it is not even among the
first five partner countries in Mozambique (it is the sixth partner) or Guinea-Bissau (it is
the tenth partner), where other polarities have developed. In this case, the factor of size
and international scientific weight seems to be clearly outweighing the connecting factors,
such as language or cultural, political and economic ties. In a way, we can conclude that
Portuguese scientific and cultural diplomacy is not having such a significant impact on the
national research strategies of the PALOP countries.

Thirdly, the data shows that the PALOP countries continue to have a residual level of
collaboration among themselves, of a non-bilateral nature, mostly in the context of major
international collaborations and, in other cases, in the context of smaller collaborations
with other intermediation. Three cases of 'mediation' are identified here: collaborations
at the regional level, with African partners; collaborations with US partners, who are,
as we have seen, an important partner for all PALOP countries; or collaborations in the
linguistic area, in which Portugal and Brazil are part of the collaboration. In this sense,
it is worth noting an important space for Portuguese intervention in scientific cooperation
with the PALOP countries, precisely by promoting cooperation areas with the PALOP
countries. It is also clear that the CPLP can play a central role here, taking on scientific
diplomacy as an important dimension of its activity.

5. Research funding in the PALOP Countries

This section presents data on the institutions funding health sciences research in the PALOP countries during the reference period. This work, as mentioned in the methodological section, is innovative in the way it identifies funding institutions in the context of research in the Global South. This interim analysis only reviews the main funding institutions and priority areas of intervention, and does not analyse the cross-collaboration between them, as this would require more advanced data process than was feasible to develop within this scope.

5.1. Main research funding organisations in the PALOP Countries

Figure 5 highlights the 25 main funding organisations for Health Sciences research carried out with the participation of PALOP countries between 2008 and 2023[15]. This data is presented in three time periods in order to compare the reference period of this interim analysis with the two periods analysed in the MAPIS report. The data is ordered according to the most recent time period. The number of publications funded by the different organisations presented here refers to publications that mention this entity in the acknowledgments section of the article[16].

We can observe that there are two main funders that support research carried out in the PALOP countries – the Bill and Melinda Gates Foundation and the National Institutes of Health (NIH) –, with each funding around 13 per cent of all Health Sciences research in the PALOP countries[17], denoting the growing influence of the US in supporting and collaborating internationally with PALOP institutions. During this last period, the Portuguese Foundation for Science and Technology (FCT) emerged as the third most referenced institution in funding acknowledgements for Health Sicences publications in PALOP countries. These acknowledgements also reflect the impact of collaboration between Portuguese and PALOP institutions, and the centrality of the FCT in funding the national research system. It should be noted here that, in several cases, the funding used is not necessarily funding allocated directly to these collaborations, but may result from institutional funding for research centres or individual funding for scientific employment and research grants, in the context of which this collaboration is developed. In any case, the important contribution of FCT to these scientific collaborations should be noted. Despite this, and as shown in Table 6, these three institutions contributed financially on their own, without other funders acknowledged in the publications, in around 25 per cent of the publications that received their support, confirming their centrality to the development of this research.

[15.] It is important to recall that the indicators presented here only refer to the inclusion of different institutions among the acknowledgements presented in the publications, and there is no information on whether this funding is direct, for that specific research, or indirect, through structural funding to the institutions or researchers, nor on the volume of funding involved. Two institutions can be mentioned in acknowledgements, with very different levels of funding.

[16.] As mentioned in the methodology section, there are some limitations in the funding data recorded in scientific publications and collected in WoS. In particular, not all research projects that are funded end up in WoS publications, a substantial amount of publications do not have funding information and the data collected here identifies the existence of a contribution from each funding agency, not differentiating the corresponding financial contribution.

[17.] Around 35 per cent of our sample has no acknowledgements of funding (twice as many as in the MAPIS report) and we can't tell if this is "unfunded" research or if the article simply does not have a funding acknowledgements section.

The data from the reference period also shows some significant changes among the funding agencies, namely with the significant emergence of Spanish funding agencies in the areas of science, economics, international cooperation, health, the regional government of Catalonia and also through private foundations (Ramón Areces Foundation and La Caixa Foundation), to a greater extent than in previous periods[18]. Another new funding pattern can be identified with the growing presence of Brazilian agencies (CAPES, CNPq and FAPESP) among the research funding institutions in/with the PALOP countries, also reflecting the strengthening of South-South collaboration through Brazil. The strong presence of US agencies is also noteworthy, although it is not a new pattern, nor is the contribution of European agencies (European Commission and *European Research Council*) or Nordic agencies (public research funding agencies in Denmark, although only the DRF in the last period, and Sweden). In the Portuguese context, apart from the FCT, the presence of the Calouste Gulbenkian Foundation has increased, becoming one of the top 20 funding agencies, while the Camões Institute is no longer among the group of main funders.
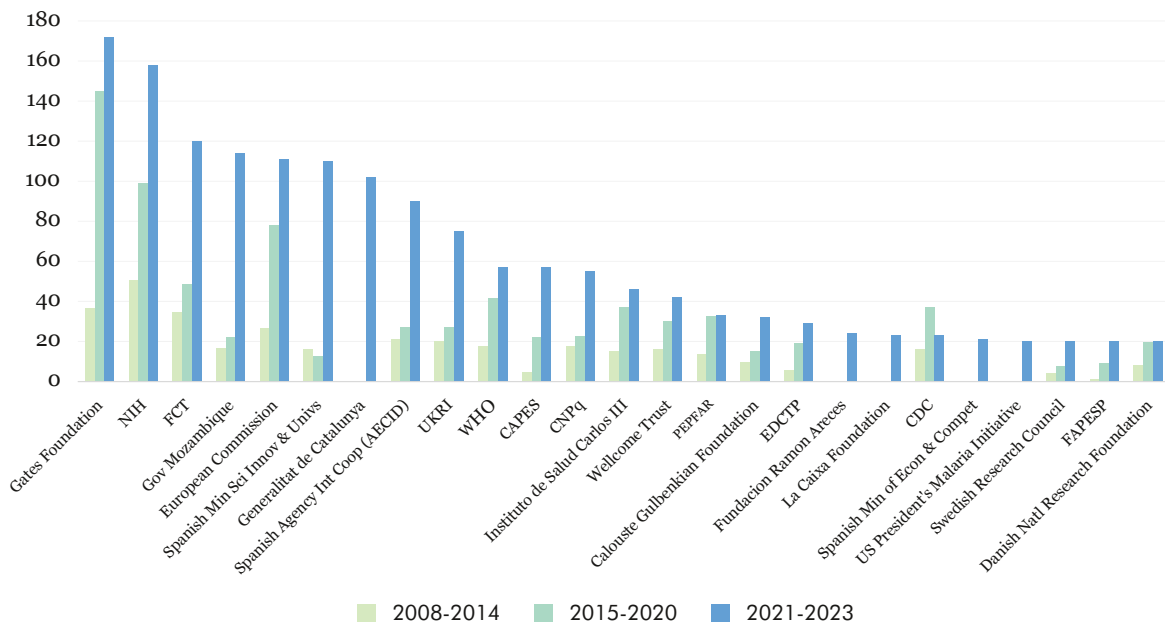
Figure 5. Top 25 recognised funders of health sciences research in the PALOP countries. 2008-2014/2015-2020/2021-2023.

Source: WoS.
Notes: Funders are ordered by total number of publications in 2021-2023. Articles and reviews only.

[18.] It was not possible to confirm that the classification of funding agencies was exactly the same when processing the data for the new period, given the time required to process this data and harmonise it with previously prepared data. The fact that there were no previous records for some of the public institutions (e.g. Ministry of Economy and Competitiveness) suggests the possibility of a different classification. Despite this, the growth in the number of publications from other institutions (notably the Spanish Agency for International Development Co-operation) confirms the existence of a significant change in the recent period.

Table 4 shows the activity of the different funding organisations in each of the five countries considered, according to the corresponding number of publications acknowledging the corresponding support. As might be expected, due to the significantly higher total number of publications, Mozambique registered contributions from a greater number of funding organisations. It is also the country where all but one of the funding organisations have a higher number of supported publications. The exception to this pattern is the *Danish Research Foundation*, which has all its support concentrated on research in Guinea-Bissau, reflecting the importance of collaboration with Denmark in Guinea-Bissau.

FCT and UKRI, public research funding agencies, have the most balanced weight of support among the five PALOP countries and the least concentration in a single country. We should also note the important role of the Calouste Gulbenkian Foundation in supporting health sciences research in Angola, where it is the funding institution with the largest number of interventions, followed by FCT (also reflecting cooperation between these two institutions) and two US agencies.

Table 4. Distribution, by country, of Health Sciences research in the PALOP countries supported by the main funding agencies. 2021-2023.

	Mozambique	Angola	Guinea-Bissau	Cape Verde	Sao Tomé and Principe	Total
Gates Foundation	96%	2%	4%	0%	1%	172
NIH	85%	8%	7%	4%	1%	158
FCT	51%	30%	7%	12%	5%	120
Gov Mozambique	100%	0%	0%	0%	0%	114
Spanish Ministry of Sci, Innov & Univs	97%	2%	0%	1%	0%	110
Generalitat de Catalunya	99%	1%	0%	0%	0%	102
AECID	99%	1%	0%	1%	0%	90
European Commission	67%	13%	15%	5%	0%	85
UKRI	67%	9%	16%	13%	4%	75
WHO	91%	7%	4%	2%	0%	57
CAPES	86%	9%	0%	5%	0%	57
CNPq	89%	7%	0%	5%	0%	55
Instituto de Salud Carlos III	89%	9%	0%	0%	0%	46
Wellcome Trust	74%	12%	12%	10%	0%	42
PEPFAR	100%	6%	0%	0%	0%	33
Calouste Gulbenkian Foundation	55%	45%	0%	3%	0%	31
ERC	53%	0%	43%	3%	0%	30
EDCTP	66%	3%	28%	3%	3%	29
Fundacion Ramon Areces	100%	0%	0%	0%	0%	24
La Caixa Foundation	96%	0%	4%	0%	0%	23
CDC	78%	26%	4%	4%	0%	23
Spanish Ministry of Econo. and Comp.	95%	5%	0%	0%	0%	21
US President's Malaria Initiative	75%	30%	0%	0%	0%	20
Swedish Research Council	60%	5%	35%	0%	0%	20
FAPESP	90%	5%	0%	5%	0%	20
Danish National Research Foundation	0%	0%	100%	0%	0%	20
Total	972	187	109	59	15	

Source: WoS.
Note: Only articles and reviews. The country is noted through the affiliation data.

5.2. Areas of research and collaboration with funders

It is also relevant to consider whether each funder has particular priorities reflected in specific research areas of support. Table 5 highlights the main research funders in the PALOP countries according to the research areas supported between 2021 and 2023. The research areas are generated by the InCites Meso citation topics, which are created based on the citation relationships, 'citations to' and 'citations from' between all the publications in WoS (this data, collected from the InCites platform, does not include, for an unknown reason, the topic 'Virology – General', which, as we saw above, was the topic with the most publications during this period, which is important to recall).

Table 5. Distribution, by topic, of Health Sciences research in the PALOP countries supported by the main funding agencies. 2021-2023.

PALOP Meso Citation Topics	Gates Foundation	NIH	FCT	Gov Mozambique	Spanish Ministry of Sci, Innov & Univs	Generalitat de Catalunya	Spanish Agency Int Coop (AECID)	European Commission	UKRI	WHO	CAPES	CNPq	Instituto de Salud Carlos III	Wellcome Trust	PEPFAR	Calouste Gulbenkian Foundation	EDCTP	Fundacion Ramon Areces	La Caixa Foundation	Total PALOP
Parasitology – Malária, Toxoplasmose e Coccidiose	23%	9%	4%	25%	29%	33%	34%	18%	16%	5%	9%	4%	13%	24%	0%	3%	17%	79%	61%	155
HIV	5%	21%	7%	4%	5%	3%	3%	4%	1%	2%	4%	4%	2%	0%	61%	9%	10%	0%	0%	144
Healthcare Policy	12%	3%	1%	4%	2%	3%	6%	1%	5%	4%	2%	0%	0%	2%	6%	13%	0%	0%	0%	116
Tuberculosis & Leprosy	2%	6%	1%	2%	6%	5%	2%	22%	7%	7%	2%	0%	4%	10%	3%	0%	34%	0%	4%	101
Antibiotics & Antimicrobials	6%	0%	4%	7%	5%	6%	8%	0%	8%	4%	2%	2%	2%	7%	0%	3%	3%	0%	0%	87
Diarrheal Diseases	13%	2%	3%	4%	7%	2%	7%	1%	5%	16%	9%	4%	26%	0%	0%	13%	0%	0%	0%	76
Nutrition & Dietetics	1%	1%	11%	2%	1%	0%	0%	4%	1%	18%	5%	5%	2%	5%	0%	6%	0%	0%	0%	66
Virology - Tropical Diseases	1%	1%	2%	2%	2%	2%	1%	4%	7%	2%	0%	2%	4%	7%	0%	0%	0%	0%	9%	47
Parasitology - General	1%	1%	3%	4%	6%	6%	7%	6%	3%	5%	0%	2%	7%	5%	0%	3%	10%	8%	0%	43
Urology & Nephrology - General	1%	2%	1%	0%	0%	0%	1%	1%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	37
Psychiatry	0%	9%	2%	0%	0%	0%	0%	0%	1%	0%	2%	2%	0%	0%	0%	0%	0%	0%	0%	36
Obstetrics & Gynecology	4%	2%	1%	0%	0%	0%	0%	0%	3%	2%	2%	4%	0%	0%	3%	0%	0%	0%	0%	35
Cardiology - General	0%	1%	0%	0%	0%	0%	0%	1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	33
Medical Ethics	2%	1%	1%	0%	1%	0%	0%	1%	1%	2%	0%	0%	2%	2%	3%	0%	0%	0%	4%	25
Oncology	1%	4%	0%	1%	1%	1%	0%	2%	0%	0%	0%	0%	2%	0%	9%	3%	0%	0%	0%	25
Bacteriology	3%	2%	2%	0%	0%	0%	0%	0%	1%	2%	7%	7%	0%	2%	0%	0%	0%	0%	0%	23
Ophthalmology	0%	1%	0%	1%	1%	1%	1%	0%	1%	0%	9%	7%	0%	7%	0%	0%	0%	0%	0%	23
Sports Science	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%	0%	0%	0%	15
Hematologic Diseases	0%	1%	6%	0%	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	3%	0%	0%	0%	0%	15
Genome Studies	0%	1%	3%	2%	0%	0%	0%	5%	1%	0%	0%	4%	0%	2%	0%	0%	0%	0%	0%	14
Zoonotic Diseases	0%	1%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	14
Neuroscanning	0%	0%	3%	0%	0%	0%	0%	2%	0%	0%	4%	0%	0%	0%	0%	3%	0%	0%	0%	13
Sexually Transmitted Infections	1%	1%	0%	0%	0%	0%	0%	2%	3%	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	12
Total	172	158	120	114	110	102	90	85	75	57	57	55	46	42	33	32	29	24	23	

Source: InCites/WoS.
Notes: Research areas are ordered by the total number of publications in 2021-2023. Funders are ordered by the total number of publications in 2021-2023. Only articles and reviews are considered.

These data indicate a differentiation between essentially two groups of funding agencies. One group of funding agencies focuses on specific research topics, as is the case with Spanish institutions and a group of US entities focused on research into 'Parasitology – Malaria, Toxoplasmosis and Coccidiosis', or the US Presidential Programme for Emergency Response to AIDS (PEPFAR), focused on HIV research. Another group of agencies support a more diverse set of research topics. These include the Gates Foundation, the Calouste Gulbenkian Foundation and public research funding agencies such as FCT, UKRI or the European Commission.

Another issue analysed in research funding refers to the co-funding patterns among different funding institutions. As we have seen above, there are agencies with more targeted intervention priorities, with a greater weight in the projects and countries supported, while others have a more distributed intervention. As analysed in the MAPIS report, the strategies of research funding agencies, in their international cooperation dimension, often followed political and cultural affinities with little local intervention, and, in this sense, greater autonomy. This pattern has largely been replaced by a process of greater local co-intervention. As a result, funding organisations rarely support research autonomously.

Table 6 shows how a number of funding agencies intervene in a collaborative way, either through formal partnerships, as is the case with a number of Spanish agencies whose intervention is mostly with four or more funding agencies, including the Mozambique government, and (almost) never autonomously, while others have a more autonomous intervention strategy and greater financial capacity, often emerging as the sole funders of research carried out in the PALOP countries. Examples of the latter are a group of North American agencies – PEPFAR being a highlight here, which focuses on HIV/AIDS research – and public research funding agencies such as the FCT, the European Commission and CAPES. The Calouste Gulbenkian Foundation also intervenes with a degree of autonomy, with 16 per cent of publications acknowledging Gulbenkian support alone and 45 per cent registering no more than two other funding agencies[19]. Curiously, Brazil's funding agencies rarely participate in larger funding consortia, and are the only ones (along with the U.S. President's Malaria Initiative) who have hardly intervened in research involving ten or more funding agencies. This may be due to a strategic interest in promoting South-South networks, and therefore, less interest in large-scale collaborations, as well as not being directly involved in large European consortia.

[19.] It should be noted that in the previous period, the Calouste Gulbenkian Foundation, the FCT and the Camões Institute were regularly referenced in their support for research at the Health Research Centre of Angola (CISA), while in the reference period of this analysis this tripartite configuration was recorded only four times.

Table 6. Co-Funding Patterns of the Top 25 Health Sciences Funding Agencies in the PALOP countries. 2021-2023.

	1	2 to 3	4 to 9	>9	Total
Gates Foundation	27%	33%	36%	4%	172
NIH	20%	34%	37%	10%	158
FCT	28%	39%	28%	5%	120
Gov Mozambique	4%	25%	57%	13%	114
Spanish Ministry of Sci, Innov & Univs	1%	16%	65%	17%	110
Generalitat de Catalunya	1%	15%	67%	18%	102
AECID	1%	14%	63%	21%	90
European Commission	11%	26%	40%	24%	85
UKRI	11%	32%	40%	17%	75
WHO	2%	33%	58%	7%	57
CAPES	25%	42%	33%	0%	57
CNPq	2%	45%	51%	2%	55
Instituto de Salud Carlos III	4%	26%	52%	17%	46
Wellcome Trust	7%	17%	50%	26%	42
PEPFAR	48%	33%	12%	6%	33
Calouste Gulbenkian Foundation	16%	29%	48%	6%	31
ERC	13%	20%	40%	27%	30
EDCTP	17%	24%	45%	14%	29
Fundacion Ramon Areces	0%	0%	50%	50%	24
La Caixa Foundation	4%	26%	61%	9%	23
CDC	22%	30%	43%	4%	23
Spanish Ministry of Econo. and Comp.	0%	19%	62%	19%	21
US President's Malaria Initiative	30%	45%	25%	0%	20
Swedish Research Council	0%	20%	45%	35%	20
FAPESP	5%	55%	40%	0%	20
Danish National Research Foundation	0%	10%	65%	25%	20

Source: WoS.

6. Conclusions

The analysis presented in the previous sections provides important follow-up contributions to the MAPIS Report, thus contributing to a process of monitoring health sciences research carried out in the PALOP countries in recent years. Two main issues should be noted regarding the analysis presented above. On the one hand, the reference period for the analysis developed here, the three-year period 2021-2023, is a period in which the effect of the pandemic may be most felt, since the inevitable reduction in scientific activity as a result of quarantine periods and other limitations resulting from the pandemic (mostly between 2020 and 2022) are reflected, with the corresponding delay resulting from the publication process, essentially during this period. Thus, some decrease in activity can be attributed to these impacts, although there has been some redirection of scientific activity towards scientific areas around the pandemic. On the other hand, there are some methodological effects that could affect a direct comparison of data from the most recent period with the longer period analysed in the MAPIS Report. The period during which the database was updated may also result in some data being revised at a later date, and this effect is all the more relevant the shorter the analysis period (in this case, a three-year period, when the period analysed in the MAPIS Report was over a decade). The characterisation of the institutional funding data, conducted in different periods and with new institutional configurations, may have some data with different specifications, although the data of the main funding institutions can be considered robust in its comparison.

In this context, we can present the main conclusions of this study. A first conclusion reflects the overall sicentific activity in the PALOP countries, which show significant growth in Angola and, less markedly, in Cape Verde, with stabilisation or decline in Mozambique and Guinea-Bissau, which may be the result of the impact of the pandemic, but also of other contextual issues in Guinea-Bissau, namely relating to the decrease in the intensity of collaboration with Danish partners. This general scientific activity in the PALOP countries continues to show the importance of international scientific collaboration, revealing, in this context, a growing scientific independence, albeit limited, of research conducted in international collaboration in these countries.

The research data in Health Sciences, the main subject of the MAPIS study, shows that this continues to be an area of special importance in Mozambique, Angola and Guinea-Bissau, within the context of different areas of scientific activity, particularly in relation to global standards and of other African countries. It should be emphasised that scientific activity in Health Sciences has grown significantly in the PALOP countries, and particularly in Angola. However, research in Health Sciences had a lower comparative impact (according to indicators of most cited publications) during this period.

As previously analysed in the MAPIS report, the topics with the highest research activity follow very closely the pattern developed in the period previously analysed, and the prevalence of different diseases at a local level. The main change in these profiles corresponds precisely to the topic that had the most research during the reference period, which is the topic of 'Virology – General'. Although this is a significant change, referring to the area that now has the highest number of publications, it is not surprising, as it reflects the research carried out in recent years in response to the Covid-19 pandemic caused by a coronavirus,

which has led all health research systems to prioritise research in this area. In the other topics, it should be noted that research in parasitology, predominantly into malaria, a disease that continues to have a high incidence in several PALOP countries, was the second most researched topic after virology, surpassing the number of publications on HIV.

As in the global scientific activity in the PALOP countries, international collaboration continues to be the central mode of scientific production in Health Sciences in the PALOP countries. There are, however, significant changes to be noted in the pattern of international collaboration in these countries. Among the countries with the highest number of international collaborations with each of the PALOP countries, the recent period shows that the USA has become a growing international partner in Health Sciences research in the PALOP countries, being one of the three main collaborators in this area for each of these countries, and Mozambique's main partner. On the other hand, Portugal has been losing some weight as a scientific partner of the PALOP countries. Although it is the main partner of Angola, Cape Verde and São Tomé and Príncipe, it is not among the five main partners of Mozambique or Guinea-Bissau. In this characterisation of international collaboration, it should also be noted that collaboration between the PALOP countries remains at a residual level.

In analysing research funding in the PALOP countries, an innovative contribution of the MAPIS Report, the aforementioned weight of international collaboration with the USA is framed here by the strong support of funding based in US institutions, namely through the Bill and Melinda Gates Foundation and the National Institutes of Health (NIH). It is also important to highlight the centrality of the Portuguese Foundation for Science and Technology (FCT), as the third largest funding agency, through various of its support mechanisms, from institutional support to dedicated projects. A number of Spanish entities, mostly acting in co-financing, have also played an important role, focusing on Health Sciences research in Mozambique (and also reflecting their institutional participation in CISM – Manhiça Health Research Centre). In a different way, Brazilian funding agencies have been supporting South-South partnerships involving institutions from the PALOP countries and Brazil. The European Commission also plays an important role with various mechanisms, from the Horizon Europe programme to specific instruments such as EDCTP or the European Research Council.

In the case of Portugal, it is also worth mentioning that the Calouste Gulbenkian Foundation had a more significant intervention in this period, with a distributed intervention, but standing out as the agency with the greatest focus of support in its portfolio for Angola. This is in contrast to the other support profiles, which are mostly centred on Mozambique. The Danish Research Foundation also from this pattern with support centred on Guinea-Bissau. It should also be noted that the research funding agencies with a transversal profile also have the most territorially dispersed support. The Calouste Gulbenkian Foundation's intervention is also more often mentioned individually or in limited partnerships (namely with the FCT and, more occasionally than in the previous period, with the Camões Institute), unlike the other funding agencies.

In conclusion, it can be seen that Health Sciences research in the PALOP countries continues to show a pattern of significant growth, with clear future potential, and also revealing to be of external growing interest, as reflected in different international collaborations and

international funding agencies. Although much of this support is channeled to research in Mozambique, it is clear that the research system in Angola is showing continued growth and may indicate forms of institutional consolidation that are becoming less vulnerable to external constraints. It is worth mentioning, for example, the development of activity through FUNDECIT (Foundation for Scientific and Technological Development) to support research in Angola, which is seeking greater consolidation, but also, in the case of the Health Sciences, the activity of CISA (Health Research Centre of Angola), with strong support from the Calouste Gulbenkian Foundation, and other institutions in the health ecosystem in Angola, such as the Agostinho Neto University, the National Institute for Health Research (INIS) and other units of the Ministry of Health.

Angola
Cape Verde
Guinea-Bissau
Mozambique
S. Tomé and Principe