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Article

Women in academia: Career development, inequality and other experiences of research scientists in Panama

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Abstract: Historically, women have faced progressive and persistent obstacles and prejudices preventing them from fully participating in and receiving recognition for scientific research in academia. In Panama, local gender studies specifically targeting the area of academia are scarce. However, to close the gender gap, this article tries to uncover the realities of women academics who dare to research and do science in Panama, beyond statistics. A virtual survey was distributed from May to August 2023, in which 921 academics (45% men and 55% women) affiliated with public universities in Panama were surveyed. Through an empirical analysis from a gender perspective, participants' attitudes and perceptions on the effects of the covid-19 pandemic on research, the quality of higher education in Panama, the dissemination and transmission of knowledge, and research as an adjuvant to higher education were revealed. Findings reiterate the gender bias and underrepresentation of women in Panamanian public universities and the lack of commitment to their capacity building, research, and dissemination of results. It also confirmed that, despite the covid-19 pandemic and its negative effects in all areas, the importance and recognition of scientific research were highlighted, allowing women academics to excel competitively and take advantage of new opportunities in their career development.

Keywords: academic women; career development; gender gap; inequality; scientific research

1. Introduction

The gender perspective in higher education aims to build a more equitable society in which men and women achieve equal rights and opportunities in the economic, labor, and educational domains (Suárez Amaya and Ganga-Contreras, 2022). Thus, the application of the gender perspective to the analysis of various phenomena and situations in universities has emerged as a highly relevant approach to the management and governance of this institution.

With regard to women in academia, Kam and Lee (2024), Parra-Valencia and Lizette-Massey (2023), Wang et al. (2024) and Yousaf and Schmiede (2017) assert that throughout history, women have faced a variety of obstacles and biases that prevent them from fully participating and receiving recognition for scientific research, among other issues within academia. Clark Blickenstaff (2005) and Cronin and Roger (1999) describe this situation as progressive and persistent.

While it is true that the measurement of the quality of universities is evident according to the cohesion between academic research, innovative scientific production, and the reputation acquired by the institution (Climent et al., 2013), the development of the culture of research and the participation of academics in the

scientific projects supported by the authorities remain very low in Panama (Lebrija, 2020), even when it is known that the exclusive dedication to research has a remarkable impact on the scientific production of the institution. In addition to this, Avolio et al. (2024), Begeny et al. (2020) and Huang et al. (2020) say that there is significant, although fragmented, evidence of gender inequalities in the academy in this regard. This implies that women are surpassed in most scientific areas.

In contrast, the number of women academics has grown in recent years, despite the fact that empirical data point to considerable gender variations in research productivity and the effect of academic careers (Cronin and Roger, 1999; IESALC, 2020). For the aforementioned reasons, this article aims to explore the inequalities and other experiences that Panamanian women academics have encountered in their academic and professional development.

1.1. Frame of reference

The underrepresentation of women in academia has been theorized and conceptualized by authors who argue for its causes. Sonnert (1995) comments on the gender-driven dynamics of women academics and offers the deficit model. This suggests that women's access to opportunities is limited and that these are viewed differently, resulting in collectively more difficult career outcomes. Also, the difference model asserts that women behave differently. That is, gender differences in attitudes, skills, values, and knowledge stand out. Finally, the kick reaction model, which demonstrates how the above two models could work together. It can be said that Schuster and Martiny (2017) agree with the gender-driven dynamics, as they posit that there is negative competence-related stereotyping towards women, which demotivates women academics to pursue the non-traditional disciplines. This is those disciplines that have been historically assigned to men.

Cronin and Roger (1999) address the underrepresentation of women in academia and develop five perspectives on this. 1) Science and technology should be presented to society in a more positive and accessible way, there being no difference between the scientific contributions of men or women. 2) Human capital theory, which sees the development of science as essential to a nation's global economic competitiveness. 3) Gender analysis in its assessment of the problem, focusing on structural obstacles to women's equity. 4) The perspective on the need to subject science and technology to critical analysis, to recognize how values and practices within the scientific community serve to exclude women. 5) The need to analyze the dialectic between the social construction of science and technology together with gender, pointing out that the marginalization of women is a product of the historical-cultural construction of women with only male perspectives. In their study, Schuster and Martiny (2017) support this last perspective as well, arguing that women are underrepresented in traditionally male-dominated fields due to the anticipated effect caused by this cultural construction. Ríos González et al. (2017) argue that the procedures of under-recognition that serve to defend the existing disciplinary and masculine order in academia are a manifestation of those conflicts due to women's access to the highest positions in the research hierarchy.

Concerning career development, it must be said that research has become essential to any academic (Barsallo et al., 2024). However, there is an assumption that women academics behave differently from men and that self-selection mechanisms permeate their preferences and choices in the choice of disciplines and research to pursue, the dedication of time to work, family, teaching, and research, research and publication strategies, and the inclination to hold high-demand hierarchical positions and others in the government sector (Cois et al., 2023). Rincon and Dominguez (2023) support this while arguing that the higher education system was designed focusing on men's career paths and without due consideration for the reproductive cycle of women academics. In a comparable manner, Butler (1993) presents the concept of "gender performativity," where she posits that social gender is a consequence of repeated improvisational performances and discursive processes, which imitate the behaviors and characteristics typically associated with women and men in a given culture. Consequently, it is emphasized the performative aspect of social gender, which is shaped by the prevailing cultural norms and social expectations that govern gender expression.

The popularization of science from a gender viewpoint and unconscious prejudice are both present as part of the gender gap in STEM (Ponce Dawson et al., 2020). According to Baeza Reyes and Lamadrid Álvarez (2019), Gonzalez and Vera Gajardo (2019) and Sanhueza et al. (2020), women in academia face horizontal segregation, which indicates the predominance of women in certain areas such as teaching, social work, nursing, and midwifery, which contrasts with the reality of STEM areas where men predominate. This may indicate that there is a tendency for women to opt for careers with lower earnings rather than those that are economically more highly valued in the labor market. In relation to scientific research, Bellotti et al. (2022) postulate that the greater the presence of women in tenured positions in a discipline, the more high-level positions they occupy and the more research projects they direct. That is, the greater the presence of women in senior positions, the more heterophilic men's collaborative networks are.

1.2. The Panamanian context

In Panama, as in many other countries, there are many factors that influence research. Particularly for women, these factors can be both challenges and opportunities that affect their participation, contribution, and progress in science (Rodríguez et al., 2018). It is known that there are significant disparities that differentially affect academics, both men and women, in various aspects, including their participation in academic research and their performance as university professors. This leads us to seek a deeper understanding of how research is currently conducted and thus to elucidate the true meaning of quality in university education, particularly in the context of Panama, where there is a notable lack in this aspect (Reisberg, 2021).

Some of the most relevant concepts on these issues supported by other authors are:

- Gender gap: There is a persistent gender gap in scientific areas of technology, engineering, and science. This is reflected in a lower representation of women in

leadership roles and participation in research projects (Cronin and Roger, 1999; Rodriguez et al., 2018).

- Gender stereotypes: Cultural and social stereotypes about gender roles can contribute negatively to the expectations and opportunities presented to women in science, leading to actions that are detrimental to women. This can lead to biases in the allocation of resources, recognition, and opportunities for collaboration (Llorens et al., 2021; Schuster and Matriny, 2017).
- Work-life balance: Many women academics face challenges in balancing professional and personal responsibilities, such as caring for family. Although men's and women's roles have become dynamic in today's changing societies, this issue can still influence women's availability to devote time to research and advance their careers (Benavides Rincon and Dominguez, 2023; Cronin and Roger, 1999; Gonzalez and Vera Gajardo, 2019; Khan and Siriwardhane, 2021).
- Access to resources: Access to resources such as funding for research projects, equipment, and adequate laboratories may be more limited for women scientists or principal investigators on projects, especially those in institutions with fewer resources (Llorens et al., 2021). Contrastingly, Gonzalez and Vera Gajardo (2019) posit that, regarding research production, the economic factor as an obstacle outweighs opinions among male researchers.
- Support networks: Having strong support networks, both within and outside the scientific field, can be crucial for women's success in research. Access to mentors, collaborators, and networking opportunities can make a difference in their career trajectory (Cronin and Roger, 1999).
- Recognition and visibility: The great importance of the achievements and contributions of women academics in inspiring future generations and breaking gender stereotypes in science. This requires a comprehensive approach that includes institutional policies, support programs, gender and equity awareness, and the promotion of female role models in science (Gonzalez and Vera Gajales, 2019; Rodríguez et al., 2018).
- Institutional culture: The institutional culture in universities, research centers, and scientific institutions can influence the valuing and support of the work of women scientists. Promote an inclusive and equitable culture to foster their participation and success (Gentili, 2012).

Another issue reported on the gender gap in academia with regards to salary and positions explains that in some Latin American countries, the gender gap widens as a result of contractual negotiations, which increase the salaries of male professors but not those of female professors (Benavides Rincón and Domínguez). In the case of Panama, the salaries earned by university professors correspond mainly to the merit-based criteria established in the regulations and statutes in accordance with the Constitution of the Republic, in which there is no distinction for any reason, be it sex, race, age, or creed. That is, to the extent that professors decide to pursue a university teaching career, they will develop competencies and carry out and participate in activities that will allow them to be eligible for professorships in the different established disciplinary areas. Salaries are established by teaching categories and regulated in the university statute.

2. Materials and methods

This article presents a qualitative exploratory-descriptive approach based on a review of secondary sources and data from the ENACT[1] survey. The information used is part of a broader study, which corresponds to the project titled 'Factors that Influence Academic and Scientific Research in Panama: From the Perspective of Professors and Researchers'. The project has produced four scientific articles that refer to different matters within the public university system in Panama, including the validation of the data collection instrument, a perspective on motivational factors that influence research production, gender inequality and career development issues faced by professors, and the promotion of research with regards to policy, incentive, and faculty participation. The present article is the third publication for this project.

The survey used was generated and conducted virtually during the period May to August 2023 and involved 921 professors and researchers affiliated with public universities in Panama. Out of the 921 professors and researchers, 45% self-identified as men and 55% as women.

The ENACT survey consisted of 39 questions, 6 of which were used to analyze the experiences of the participating women academics (Mendoza et al., 2025). Thus, for the purposes of this article, an empirical analysis of the experiences described by the participating women academics from a gender perspective is unveiled (Feria et al., 2019). Their responses allowed the collection of specific information about attitudes and preferences, including topics such as the effects of the pandemic on the development of research, the level of quality of higher education in Panama, the dissemination and transmission of knowledge, and research as an adjuvant to higher education.

3. Results and discussion

In the context of Panama, local gender studies specifically aimed at the academic area are scarce. This article aims to compile data that show the inequalities faced by Panamanian women academics and other experiences that also affect their production as scientists, not only by showing statistics but also through their own voices.

3.1. Inequity in academia

According to experimental research data provided by the UNESCO Institute for Statistics (UIS), it can be observed that in 2022 it is reported that in Panama there are approximately 142 researchers per million people. In other reports, women represent less than 30 percent of global researchers (UIS, 2019). By 2013, Panama had already reported 51.8% of women researchers (UIS, 2020). In addition, it was also highlighted that these women published their scientific advances in smaller numbers than men, received lower salaries for research, and did not manage to climb the career ladder compared to men (Cois et al., 2023; IESALC, 2021), reflecting a significant gender gap from which women academics in Panama still do not escape. These assertions are evidenced in **Figure 1**, which shows, as an example, the gender division of the members of Panama's National Research System (SNI).

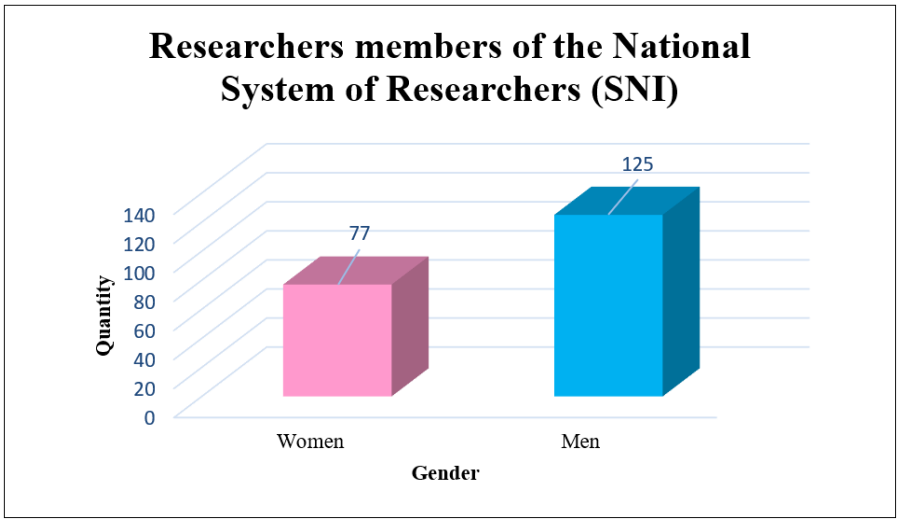

Figure 1. Total women and men members of the SNI by March 2022 (https://sni.senacyt.gob.pa/estadisticas-e-indicadores/#).

A closer look at this phenomenon revealed marked differentiated factors according to the areas of specialization (natural sciences and social sciences), specifically in which women researchers enter (**Figure 2**), including factors such as the history and tradition of each field, assessment criteria, funding, the diversity of profiles (academic), and the gender segregation that is evident in the different degree programs.

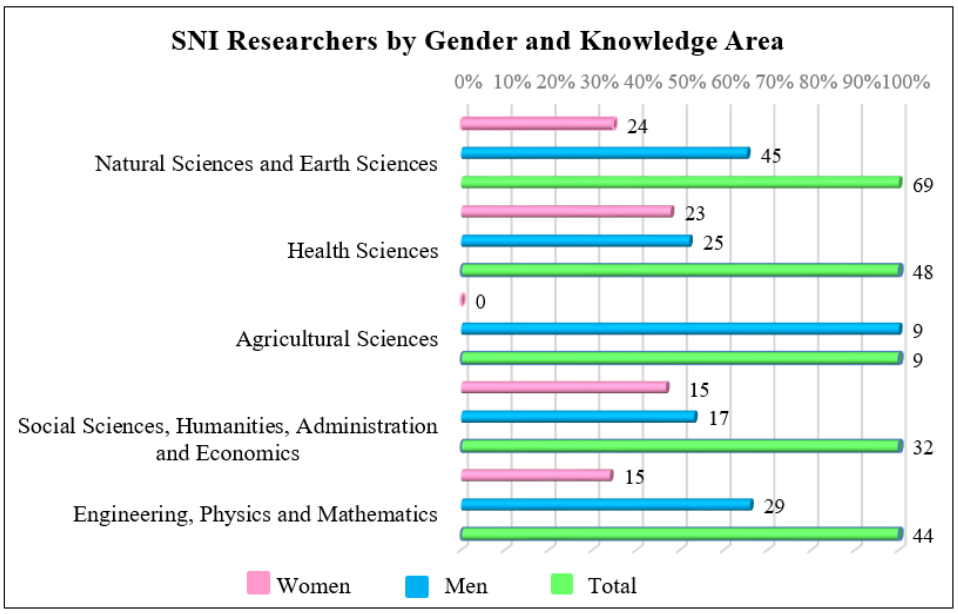

Figure 2. Amount of SNI researchers by gender and knowledge area (https://sni.senacyt.gob.pa/estadisticas-e-indicadores/#).

In addition to this, the recent crisis situation caused by the covid-19 pandemic also played a part in the processes of change that researchers in general had to make to their lifestyle (Barsallo and Mendoza, 2022; Svenson and De Gracia, 2020), working environment, and thus the way they conducted research, giving a character of greater accessibility to science (Xu, 2020). In fact, we take the opportunity to look at

present events to imagine the desired future, taking into account past experiences (Lo Vuolo, 2020), without forgetting that, as technologies are incorporated into all research activities, their processes will undergo permanent change and redirection (Cuenca and Schettini, 2020).

According to Murillo-González et al. (2023), in all scientific disciplines developed in the Panamanian academy, more than 60% of researchers are men, except in the humanities, where the trend is less pronounced. Even more so in STEM disciplines, where men constitute approximately 70% of the participants, whether they are professionals, researchers, or students. As researchers, scientific and technological personnel, men predominate by 52% over women (48%). The greatest disparity, however, is in the participation as principal investigator for research and development grant applications, where 68% are men and 32% are women, a trend that is accentuated by the National Research System's recognition of scientific work, where men (64%) outnumber women (36%). To truly narrow the gender gap, we must delve beyond statistics and explore the experiences of those women who dare to conduct research and science in Panama.

As of 2022, according to INEC (2024), the total number of university professors at the national level was 12,900, of which 6449 are men and 6451 are women. Of these, 51% were women and 49% were men. At the overall level of all universities, both public and private, the distribution of professors is practically similar. However, a limitation for this study was that precise information on how many of them are exclusively engaged in research is not available (Reisberg, 2021). In general, professors maintain a partial dedication to research, as they distribute their time between administration and university extension, with teaching being their main activity. This scenario is a key aspect that must be considered when analyzing the central role of Latin American universities in research and development (R&D).

According to Rodriguez-Ponce et al. (2024), the institution's management staff gender is an impacting factor in academic learning in universities. Llorens et al. (2021) compare statistics that confirm the existing gender disparity in the highest academic positions in academia in America and Europe, which is possibly due to gender bias. This supports the view that in society and in academia, the roles of women and men are still not equal. In the scientific and technological fields, these disparities persist.

Panama does not escape this phenomenon where 'the majority of university professors with stable contracts are still men, although there seems to be a trend towards parity, particularly in public universities' (Rodríguez et al., 2018, p. 3). In fact, at the most senior positions with respect to career stages, the ratio of women to men decreases progressively within the university/institutional ladder (Bellotti et al., 2022; Llorens et al., 2021); this is known as the 'scissors effect'. **Figure 3** illustrates this by showing the gender distribution of senior positions at the University of Panama as an example.

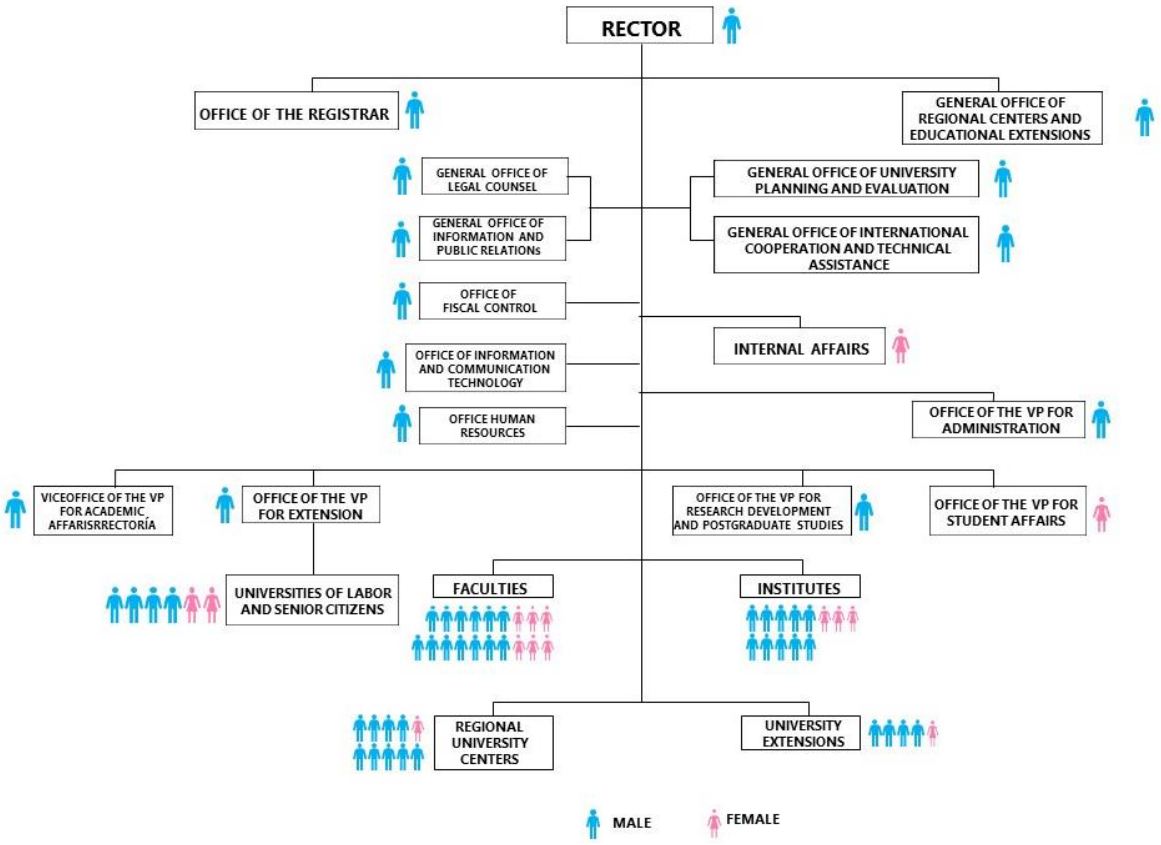

Figure 3. Men and women in main positions in the organizational chart of the University of Panama.
Source: Office of Statistics of the University of Panama. Own elaboration.

This example shows that, although these higher education institutions have a high proportion of women academics, there is a male dominance in senior positions. This could be associated with the arguments of Butler (1993), which support the concept of gender performativity, inferring the influence of a gender-biased discourse. Sonnert (1995) and Khan and Siriwardhane (2021) affirm that women are viewed differently and that access to opportunities, in this case access to hierarchical levels, is limited. Guizardi et al. (2024) attribute this to the phenomenon of 'The Female Advantage' postulated by Buchmann and DiPrete (2006), where even though women are more likely to enter and complete their education, this advantage is not transferred to the labor market.

According to UNESCO (2021), despite the fact that women constitute the majority of people who obtain university and postgraduate degrees, they only represent 33% of all professional researchers in all fields of science. In the Panamanian context and with respect to the different disciplines offered in Panamanian universities and the doctoral level, which represents a high academic level of research performance, the 2023 national census reports the total number of academics with doctoral degrees in the last reported census period (**Table 1**). In the latter, the largest numbers are grouped in the disciplines of education, administration and medicine. Of these, men predominate in the disciplines of Administration, Law, Political Science, and Medicine, while women outnumber men in Education, Administration, and Medicine. Of all the areas mentioned in **Table 1**, women only outnumber men in the disciplines of Education and Social Services. This is consistent with the postulations

of Baeza Reyes and Lamadrid Álvarez (2019), Sanhueza et al. (2020), and Gonzalez and Vera Gajardo (2019), with respect to horizontal segregation, and Cronin and Roger (1999) with respect to the historical-cultural construction of male perspectives in which our society has developed and the perception that STEM disciplines are masculine fields (Bezerra et al., 2019).

Table 1. Academics with a doctoral degree in Panama (own elaboration based on the national population census 2023, INEC).

Doctors By Study Discipline	Total				Men				Women				
	25–34	35–44	45+	Total	25–34	35–44	45+	Total	25–34	35–44	45+	Total	
	508	1097	4120	5725	179	524	2378	3081	329	573	1742	2644	
Education Sciences	16	96	537		5	42	166		11	54	371		↑↑
Arts	-	3	17		-	3	12		-	-	5		
Humanities	6	25	246		4	13	127		2	12	119		
Social and Behavioral Sciences	6	24	218		2	11	135		4	13	83		
Journalism and Information	-	2	11		-	1	8		-	1	3		
Finance education and information	21	95	360		9	49	191		12	46	169		
Law and Political Sciences	14	80	378		7	52	250		7	28	128		
Life Sciences	10	54	201		4	33	122		6	21	79		
Physical Sciences	2	10	47		1	7	37		1	3	10		
Mathematics and Statistics	4	5	34		2	3	23		2	2	11		
Computer Sciences	4	9	18		3	7	13		1	2	5		
Engineering and related professions	3	26	95		3	14	76		-	12	19		
Architecture and Construction	4	9	41		1	5	33		3	4	8		
Agriculture, Forestry, Livestock, and Fisheries	7	18	88		4	10	68		3	8	20		
Medicine	402	599	1710		129	253	1039		273	346	671		
Social Services	1	10	27		-	5	11		1	5	16		↑↑
Transportation and Logistics	1	5	15		1	2	11		-	3	4		
Environmental Sciences	1	8	21		-	5	15		1	3	6		
Security Enforcement	1	1	8		1	-	7		-	1	1		
Not specified	5	18	48		3	9	34		2	9	14		

↑↑ Women outnumber men Largest number per discipline Largest number per age group

3.2. Women academics' experiences

The information provided by faculty and researchers through ENACT, and specifically the views of women academics, falls into the following specific areas described below:

3.2.1. The pandemic: Disadvantages and opportunities

The COVID-19 pandemic highlighted many disparities and challenges in Panamanian society, especially in the educational and technological spheres. Digital divides and gaps in access to technology have become even more evident, as the world

has turned to the virtual and digital, transforming the way different activities are carried out (Svenson and De Gracia, 2024).

In the survey, the effects of the pandemic on research were questioned, seen as an opportunity or an advantage. 65% of academics identified the effects of the pandemic as a disadvantage in the conduct of research, 23% saw it as an opportunity, and 12% gave other opinions. This indicates that, for the most part, academics saw the situation as unfavorable to research, mainly due to limitations in access to their research environments, scarcity of resources, and lack of adequate technological infrastructure to continue research at the time. This resulted in consequences such as a 'change of research methodology' (Humanities, 11–15 years of teaching service).

It is true that the Covid-19 pandemic evidenced many realities of the way of doing research in the country's public and private universities, highlighting the need to improve these situations related to access to technology. And those who lacked reliable devices or a stable Internet connection faced greater obstacles, expanding the gap between those who could carry out efficient research and those who had difficulty doing so. In addition, in the workplace, the need to have technological skills and adapt to digital environments became even more crucial. This is consistent with what is stated by Svenson and De Gracia (2024), which indicates that academics who were not prepared for this new environment faced greater difficulties in staying competitive and taking advantage of the opportunities that arose, despite having to fulfill their academic responsibilities.

Among the perceptions expressed by academics about what was disadvantaged for research during the pandemic are:

"The pandemic was a limitation to access data collection or the application of instruments" (Humanities, 11–15 years of teaching service).

"Ignorance in the use of technologies" (Education, 6–10 years of teaching service).

"Disadvantages would be that we could not perform information searches in libraries and also apply surveys and other instruments necessary to achieve objective information from the researched subjects" (Languages, 11–15 years of teaching service).

According to Cabezas Sánchez (2022), during the Covid-19 pandemic, research in fields not related to health sciences was displaced or reduced in notable percentages due to the characteristics of the situation. However, participating academics recognized that the pandemic also brought some advantages, stating that they had more time to analyze fieldwork data, diversify, and generate new lines of research. In addition, they considered that, thanks to the pandemic, there was recognition of the importance of scientific research since they had more time to process the data and write fundamental aspects in the development and dissemination of knowledge: "It opened new fields of research and awakened interest in the need that exists about many areas of studies related to social interaction" (Natural Sciences, 6–10 years of teaching service).

"It was an opportunity because the pandemic forced us to face the new scenario generating skills, new attitudes that improved our professional practice, such as learning the use of technological tools, and that we are still using" (Humanities, 6–10 years of teaching service).

"It is an opportunity because the pandemic forced us to face the new scenario, generating skills and new attitudes that improved our professional practice, such as learning the management of technological tools that we are still using" (Humanities, 6–10 years of teaching service).

"An opportunity, since, being focused on teaching virtual classes, we had to research to expand both the resources and topics we present to students, in the same way to research on health" (Humanities, +20 years of teaching service).

> *"In the case of 2020, when we were at home. I feel that a lot of research was conducted through virtual media. Also, I would say that book publications increased; perhaps that time at home allowed availability to initiate or complete projects that had not ended due to the responsibilities of daily life"* (Natural Sciences, 6 to 10 years of teaching service).

Authors such as Tapia-Tapia et al. (2023) and Gómez-Suarez et al. (2022) reported that, during the pandemic, academics experienced professional stagnation due to the decrease in scientific production related to the unequal time distribution in home and academic work according to the roles of men and women during the period of lockdown. In contrast, although Panama was one of the countries with the period of confinement for a more severe and prolonged compulsory quarantine, necessary time to develop new and more investigations.

3.2.2. Development of opportunities in higher level research in Panama: Past, present and future

The university, as a training center, must house a close relationship between research and teaching in parallel. When examining the impressions of academics surveyed about the evolution of research opportunities in higher education in Panama when passing time, we reflect on the following:

In the past

Academics believe that research was limited compared to other countries in the region. "In the past, very few people in Panama took higher education courses with the help of technology, although in other latitudes it was developed many years ago" (Medicine, 16 to 20 years of teaching service).

The survey states that at that time there were significant deficiencies in infrastructure, human resources, and financing to carry out research projects. In universities, a more teaching-oriented approach predominated, which resulted in lower scientific and technological production in the country. However, some advances in specific areas, such as biodiversity research, take advantage of the natural wealth and strategic geographical location of the country.

"There was little promotion in the past. Currently, there is government and private financial support. Additionally, universities promote research" (Languages, 11 to 15 years of teaching service).

"Before, social sciences were not given any opportunity" (Languages, 16 to 20 years of teaching service).

"Everything was manual, which helps practice but delays the presentation of the results" (Administration, 1 to 5 years of teaching service).

In summary, the voices that are most read in the survey agree that in the past of the investigation in Panama "there were few open areas, little research training"

(Administration, +20 years of teaching service). On the other hand, they agree that, in the past, in the universities, the research was not encouraged, and there were fewer funds or support; therefore, few investigations were carried out because "there was not much emphasis" (Engineering, 6 to 10 years of teaching service).

In the present

Panama has made significant efforts to improve its higher research panorama with research support programs, graduate scholarships abroad, and international collaborations, which promote academics career development. For example, in some public universities, research is promoted as an integral part of its mission, resulting in an increase in scientific and technological production, especially in areas of health, sustainability, and technology.

Currently, universities in Panama have renewed their infrastructure to promote the participation of students and the teaching body in national and international research projects, contributing to strengthening the panorama of research in Panama and positioning the country as a relevant actor in regional and international science and technology.

To this, the respondents recognized that in the present there are advances and improvements in regards to the higher-level research. Some voices indicate:

"There are many opportunities to access information, to access different contexts. Research is promoted, and there is financial support and increased national research centers; the level of access to information is very easy." (Languages, 16 to 20 years of teaching service).

"Now there is more promotion of research scholarships and research projects." (Medicine, +20 years of teaching service).

"In the present it is more selective, and more support is received, but the one who supports wants to take over the research." (Nursing, 6 to 10 years of teaching service)

However, it is considered understandable that concerns arise on the training and dissemination of the results, such as these: "more dissemination and training for professors about the importance of researching." (Languages, 16 to 20 years of teaching service); "Now there are research funds at universities; you just have to make the most efficient and timely payments." (Social Sciences, +20 years of teaching service); "In the present there is a greater dissemination of these opportunities, but in many cases it is unknown how to apply to them." (Social Sciences, 1 to 5 years of teaching service).

In the future

It is encouraging to read that the surveyed see a promising future for research at a higher level in Panama. They highlight the importance of establishing continuous support from the government, emphasizing investment in infrastructure and human resources training. These are key measures to continue strengthening the research scenario in the country and ensuring sustained growth in the scientific and technological field.

They consider that the research "will improve, but still more improvement in research is required" (languages, 16 to 20 years of teaching service) and that "it is necessary to promote financing entities in different research areas. Increase the budget

that is destined for research, which will allow more research in different areas of interest in our country." (Engineering, 11 to 15 years of teaching service).

In summary, academics consider that in Panama, significant progress has been made in the development of opportunities in research at a higher level. However, they still face important challenges, such as the need for greater investment in research and the consolidation of an entrenched research culture, both in educational institutions and in society in general. These challenges are key to continuing to strengthen itself as researchers and scientists and therefore the research scenario in the country, in order to ensure sustained growth of women in the scientific and technological field.

3.2.3. The impacts of the pandemic to redirect research or opportunities in research in Panama

In March 2020, when the Covid-19 pandemic arrived in Panama, security measures began to implement their impact on social, economic, and political aspects (Barsallo and Mendoza, 2022). These impacts have also had an impact on research, development, and teaching in multiple areas of knowledge (IESALC and UNESCO, 2020; Svenson and De Gracia, 2020). This is why it was pertinent to ask how these impacts had redirected or provided opportunities.

The analysis of this section is closely linked to the perception of academics about the relevance of the redirection of the various lines of research and the opportunities generated by the pandemic, and it is emphasized that the pandemic has highlighted the importance and need to allocate funds for updated research and training (Ventura Montes, 2020). However, they have also highlighted the need for updating professionals dedicated to research, as these participating academics have expressed:

"I think that a slightly more research-oriented paradigm is being given; however, there is a lack of budget to dedicate more efforts to research." (Education, +20 years of teaching service) "The pandemic has made a reengineering because it has forced people to update." (Languages, 11 to 15 years of teaching service).

The pandemic has led to a redirection of research, but in the opinion of the surveyed, it has not yet been clearly defined what their role in these new scenarios will be. However, many highlighted the rapid learning of virtual techniques during this period and recognized that science and research have had a significant impact when reaching a greater number of people.

A professor commented on this:

> *"The pandemic has been a catalyst for accelerated learning of virtual technologies in the field of research. Our role as researchers is emerging towards greater integration of these tools in our working methods. This will allow us to be more efficient and reach a broader public without losing sight of the quality and scientific rigor in our projects"* (Exact Sciences, 11 to 15 years of service).

This perspective reflects the importance of adapting to changes and using technology as an ally in the research process, which could be a key aspect in the new scenarios after the pandemic. Finally, the following response from another professor is presented.

> *"In Panama we still have important challenges for research to become the most important tool to promote the development of the country, because we need to increase the number and research areas. In all sciences and disciplines, scientific*

curiosity is necessary for professionals to care about investigating the origin of the problems that afflict the population and the country in general" (Administration, 6 to 10 years of service).

3.2.4. Strategies that propitiate a scientific research and exchange environment

From the perspective of academics, the strategies that can be implemented are diverse (**Table 2**), with the most relevant to them being the formation of multidisciplinary research groups (*83.4%) and the financing that supports innovation (*76.4%).

Table 2. Strategies that favor the research and scientific exchange environment according to sex. ENACT, 2023.

Type of Strategies	Sex		Total
	Men	Women	
Institutional collaboration and coordination	77.3	73.5	75.3
Interventions among colleagues	60.3	57.5	58.8
International Cooperation Networks	72.9	69.6	71.2
Creation of interdisciplinary research groups	76.5	83.4*	80.2
Financing that supports innovation	71.5	76.4*	74.1
Total	100.0	100.0	100.0

In other comments that provide information on the listed strategies, the development of training to develop research was mentioned: "Participate massively in the scientific initiation day" (Engineering, 16 to 20 years of teaching service); "Training, updates in the right process to build the research protocol in addition to having the course of good practices that is indispensable" (Nursing, 20+ years of teaching service). "Learning the use of emerging technology that facilitates the work of researchers" (Social Sciences, 20+ years of teaching service).

The participants were not only direct in their appreciation of the need for specific training in research and technology but also highlighted the importance and acceptance of multidisciplinary research as an enriching entity of science and their results, in addition to the impulse that financing gives to these purposes. The last, in accordance with the historical global disparity in the financing of investigations made by women (Safdar et al., 2021; van der Lee and Ellemers, 2015).

3.2.5. The existence of challenges regarding the dissemination and transmission of knowledge. What solution do the researchers propose?

The generation and transfer of knowledge must be a mission established in all universities. The correct orientation is to seek solutions for these problems, which must be an objective of academic activities and their scientific and technological research groups.

Recognizing that the challenges regarding the dissemination and transmission of knowledge are many and their evolution to new approaches generated with the pandemic, the surveyed considered that technology plays a fundamental role for universities to be avant-garde academic institutions. Therefore, according to the analysis provided, not only must knowledge be generated, but also its adequate

transfer and application in society must be guaranteed, contributing to sustainable development and social welfare. In addition to this, there must also be a commitment: first with the training of capacities, then research, and in parallel the dissemination of the results of these projects.

Among the proposals provided by academics, we rescue these: training, creation of programs related to dissemination, generation of academic spaces (magazines, congresses, seminars), research financing, research incentives containing the dissemination component, and support for technological and "humanized" universities.

> *"Researchers must begin to be trained from the bachelor level, not at the end of it. If not incorporating subjects oriented to it throughout all careers, we will have more researchers, a network of robust institutions and companies that support them, and reduce these gaps in dissemination and transmission"* (Technology, 6 to 10 years of teaching service).

"Improve the Internet quality of state institutions, create alliances between journalists and universities for the dissemination of research activities" (Engineering, 11 to 20 years of teaching service).

> *"Innovation in communication and collaboration with media producers. Universities need less technical and more human language so that the product of their research has a value for the community. A budget for dissemination is needed, and not all square to the usual research areas. In languages, we have other needs"* (Social Sciences, 6 to 10 years of teaching service).

In other comments that provide information on the listed strategies, the development of training to conduct research was mentioned: "Participate massively in the Scientific Initiation Day" (Engineering, 16 to 20 Years of Teaching Service); "Training, updates in the right process to build the research protocol in addition to having the course of good practices that is indispensable" (Nursing, 20+ Years of Teaching Service). "Learning in the management of emerging technology that facilitates the work of researchers" (Social Sciences, 20+ Years of Teaching Service).

Research frequency reported by participants showed a greater propensity of women to do research sporadically or not at all, compared to men (**Table 3**). Also, they were not only direct in their appreciation of the need for specific training in research and technology but also highlighted the importance and acceptance of multidisciplinarity in research as an enriching entity of science and their results, in addition to the impulse that financing gives to these purposes. The last, in accordance with the historical global disparity in the financing of investigations made by women (Safdar et al., 2021; van der Lee and Ellemers, 2015).

Campos de Sánchez and Sánchez (2022) argue that there is a need to promote a culture of research, increase investment in science and technology, and strengthen national and international collaborations, these being key steps to consolidate this prominence and its long-term benefits. The importance lies in that through research, there is an advancement in studies and situations that help solve problems, and this was expressed by the respondents:

"I insist that we don't know how to investigate. The academy is held but produces low professional profiles" (architecture, 6 to 10 years of teaching service).

"Research projects must be oriented to solve a problem or make significant improvements in the sector in which it develops, seeking to attract more financing support from the local and international private sector" (Technology, 6 to 10 years of teaching service).

"There are areas of higher education that do not give the necessary importance to research. They consider that it is more important to saturate professors with more class hours with little scientific production" (Medicine, 1 to 5 years of teaching service).

These statements highlight the shortcomings of the understanding and practice of research in universities, indicating a deserved in-depth reflection given the implications of structural and cultural deficiencies with an effect on research practice. However, these assertions also highlight the need for studies like these where researchers are presented as insiders/outsiders in search of solutions to it (Ronconi et al., 2023).

Table 3. Research frequency by men and women. ENACT, 2023.

Research frequency	Sex		Total
	Men	Women	
Once a year	38.16	29.98	33.66
Twice a year	11.59	6.90	9.01
Once every two or three years	13.04	19.33	16.50
More than twice a year	12.56	6.51	9.23
Do not conduct research	16.67	27.22	22.48
No answer	7.97	10.06	9.12
Total	100.00	100.00	100.00

4. Conclusions

The development of new institutional structures in our universities demonstrates the direct strategic-level commitment necessary so that all the conditions experienced by academics in general can be seen and attended to. All this, depending on the unique requirements of each university, institutions must modify their hierarchical system and encourage the necessary cultural change. And, if something has been clear in the analysis of what is expressed by Panamanian academics, it is that there must be a greater commitment to the formation of capacities, research, and dissemination of research results.

With respect to the Covid-19 pandemic, it had an obvious effect on research execution and production, which has been reflected in many of the opinions of those surveyed as a significant delay. This, in turn, coincides with the little capacity of public universities to continue investigating during that critical moment and the limited access to economic and technological resources at that time. However, women academics asserted that this period of crisis was clearly seen as one of the most significant opportunities or benefits in terms of evolution in the technological field, access to digital resources, the time disposition applied to research, and competitive participation.

Regarding the assertion that research suffers from a lack of knowledge in execution, it is essential to address such failure through educational reform that

includes better training, greater financing, and an active promotion of research as a cornerstone of higher education. And, in this way, to be able to boost the rethinking of redistributive and equity processes in the academic hierarchy and the fulfillment and execution of the research work.

Gender bias and the sub-representation of women in the academy occur at all the professional stages of an academic. There needs to be a shift in discursive processes that encourage the imitation of gendered behaviors. The evolution of the system is essential, with concrete actions initiated by the institutions, from officials to departments, schools, centers, and all the professionals that make them up. These actions, combined with other structured models and participants in the promotion of change, will allow changing the culture of research and bringing a positive and transcendental change for the new generations of academics.

To counteract this and as a first step in a proposal supported by the findings of this article, we propose to make available to institutional information systems organization charts, statistics disaggregated by generating for free consultation, and procedures with a gender perspective in recruitment and selection of administrative and academic positions. This, coupled with the promotion of an institutional culture towards gender equality, non-discrimination, and values of respect and tolerance. However, we also consider that even when there are impulses towards improvements, governance models that really monitor gender bias and thus determine if the solutions are sufficient.

Recently, public policies for equal opportunities for women (PPIOM) were approved for the period 2024–2034 (MINJUP, 2024), where the 10 axes stand out: science, technology, research, and innovation with a gender approach, which intends to establish mechanisms, strategies, and interventions that promote and promote the integration of women in areas of science, technology, research, and innovation. Therefore, the issue about women in research is not completely closed, and this analysis may generate more questions for readers. However, it was considered relevant to understand how researchers and professors, academic women, perceive impulses and limitations regarding their performance. This has important implications for institutions and political leaders.

This exhaustive image of the imbalance between men and women in the academy and all the others exposed could help rethink the discussion about the viability of women's careers in the academy. However, investigations such as these allow for making visible changes with a view to promoting equity and diversity in all areas of research.

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Ethical approval: The study was conducted in accordance with the Declaration of Helsinki. The original study was approved by the Institutional Review Board of Universidad de Panama (No. CBUP/170/2022).

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Notes

[1] Survey on Academic and Scientific Research (Encuesta Sobre Investigación Académica y Científica).

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