



"THE ROLE OF HIGHER EDUCATION INSTITUTIONS IN SHAPING ENROLLMENT TRENDS IN STATISTICS AND ENHANCING JOB PROSPECTS IN PAKISTAN"

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Abstract

This study quantitatively investigates the role of higher education institutions in shaping enrollment trends in statistics programs and enhancing employment outcomes for statistics graduates in Pakistan. Using secondary data collected from public and private universities, the research analyzes enrollment patterns over multiple academic years and examines their relationship with institutional characteristics such as program availability, faculty strength, student–teacher ratios, and curriculum orientation. Additionally, graduate employment data are statistically evaluated to assess the impact of academic training in statistics on job prospects across sectors, including education, finance, government, and emerging data-driven industries. Descriptive statistics, trend analysis, and regression techniques are employed to identify significant factors influencing student enrollment and employability. The findings reveal that universities offering quantitatively rigorous curricula, applied statistical training, and exposure to statistical software show higher enrollment growth and improved graduate employment rates. Furthermore, a statistically significant association is observed between institutional investment in statistics education and positive labor market outcomes. The study underscores the importance of evidence-based academic planning and curriculum enhancement within higher education institutions to strengthen the relevance of statistics education and support workforce development in Pakistan.

Keywords:

Statistics Education, Higher Education Institutions, Enrollment Trends, Quantitative Analysis, Graduate Employability, Pakistan

Introduction:

Higher education in Pakistan has witnessed dynamic changes in recent years, particularly in programs related to the natural sciences and mathematics. With the rising demand for data analysis, statistical expertise, and technology-driven fields, statistics programs have gained considerable attention. However, the patterns of enrollment in these programs, particularly with respect to gender differences, remain underexplored. This study investigates the trends in student enrollment in statistics programs in Pakistan over the last six years, highlighting gender-based disparities and annual variations.

Research Objective:

To investigate the patterns and dynamics of student enrollment in statistics programs in Pakistan over the last decade, with a focus on gender-based differences and annual variations in enrollment.



Research Questions:

1. What is the higher education enrollment trend in Pakistan?
2. How has the enrollment in statistics programs changed on a yearly basis in Pakistan over the last six years?
3. In what ways have enrollment figures for male and female students in statistics programs evolved over the past six years in Pakistan?
4. Are there notable regional variations in the enrollment of male and female students in statistics programs across different provinces of Pakistan?

Review of Related Literature:

The enrollment trends in higher education, particularly in specialized fields such as statistics, are shaped by a variety of factors, including economic shifts, governmental policies, societal needs, and gender dynamics (Altbach, 2019). Over the years, higher education enrollment in Pakistan has seen significant growth, though challenges like gender disparities and regional imbalances remain prevalent (Hamid, 2025). This literature review synthesizes studies on the enrollment trends in higher education, focusing on gender-based differences, the role of governmental policies, and the regional variations that impact statistics programs and related disciplines.

Higher Education Enrollment Trends in Pakistan

Higher education enrollment in Pakistan has undergone substantial changes over the last few decades, driven by increasing demands for a skilled workforce in the labor market. According to Muhammad Mukhtyar (2020), enrollment trends in Pakistan have been significantly influenced by national policies aimed at expanding access to higher education, particularly in STEM (Science, Technology, Engineering, and Mathematics) fields. The establishment of numerous universities and colleges across Pakistan has facilitated broader access to education, particularly in urban centers like Lahore, Islamabad, and Karachi (Shah & Mirza, 2022). However, despite these improvements, enrollment in rural areas remains constrained due to socio-economic and infrastructural limitations (Khan et al., 2021).

The role of governmental policies in promoting higher education is pivotal in shaping enrollment figures. The Higher Education Commission (HEC) of Pakistan has been instrumental in increasing access to tertiary education by offering scholarships and funding for educational infrastructure (Khan et al., 2021). However, Mukhtyar (2020) notes that the financial constraints faced by many students in rural regions continue to hinder their ability to pursue higher education, particularly in specialized fields like statistics, where the costs of study can be prohibitive.

Gender Disparities in Higher Education Enrollment

Gender disparities in education have been a longstanding issue in Pakistan, particularly in fields like STEM, where male students traditionally outnumber female students (Qureshi & Hussain, 2020). While gender gaps in enrollment have narrowed in recent years, women still face significant barriers to accessing higher education, especially in technical and scientific fields like statistics. Muhammad Mukhtyar (2020) highlights that although the number of women enrolling in higher education has increased, their participation in STEM fields, including statistics programs, remains low compared to men.

A study by Shah & Mirza (2022) further elaborates on the role of gendered social norms and cultural expectations, which often discourage girls from pursuing higher education, particularly in male-dominated fields like statistics. While there has been some progress, with female enrollment



in statistics programs gradually increasing, women remain underrepresented in these programs (Jameel & Khan, 2019). Furthermore, the lack of female faculty and mentors in STEM disciplines perpetuates the gender gap in academic and professional pathways (Nasir et al., 2018).

However, there are signs of change. According to Mahmood et al. (2019), the increasing demand for data-driven professions and technological advancements in Pakistan has motivated more women to pursue degrees in statistics, as these fields offer high job prospects. Female participation in statistics programs has seen a steady rise, particularly at the graduate level (Farooq & Iqbal, 2021). Still, the gap between male and female enrollment figures remains significant, and additional support is needed to encourage more women to enter the field.

Regional Variations in Enrollment Trends

Pakistan's higher education system also exhibits considerable regional variations in enrollment figures (Mukhtyar, 2022). Urban areas, particularly in Punjab and Sindh provinces, have seen higher enrollment rates due to better access to resources, infrastructure, and educational opportunities (Khan et al., 2021). According to Shah (2021), regions like Balochistan and Khyber Pakhtunkhwa (KP) face more significant challenges related to access to higher education, which are exacerbated by socio-economic factors, security concerns, and limited educational institutions. Furthermore, regional disparities contribute to uneven enrollment in statistics programs. As noted by Hussain & Shah (2020), the availability of specialized programs like statistics is far greater in metropolitan areas, where universities and institutions are better equipped to offer such degrees. Conversely, in rural and less-developed areas, students are less likely to enroll in statistics programs due to a lack of accessible educational institutions and financial barriers. The differences in regional access to higher education are critical in understanding the overall enrollment trends and the underrepresentation of certain groups in specialized fields.

According to Qureshi & Hussain (2020), regional educational disparities in Pakistan not only affect male and female enrollment figures but also have long-term implications for the country's economic development, as certain regions remain underrepresented in key fields like data science and statistics. This emphasizes the need for targeted policies and interventions to bridge the gap between urban and rural enrollment figures, ensuring that all regions have access to the same educational opportunities.

Economic Opportunities and the Evolving Job Market

The evolving job market in Pakistan plays a significant role in influencing enrollment trends in higher education. As the demand for data-driven professionals, especially in sectors such as technology, economics, and health, continues to rise, programs like statistics have become increasingly attractive. According to Jameel & Khan (2019), the rise in big data, machine learning, and artificial intelligence has created a high demand for professionals skilled in statistics, which has led to greater interest in these programs. Statistics graduates are highly sought after by industries such as finance, healthcare, and technology, where data analysis is crucial for decision-making (Shah & Mirza, 2022).

This increased demand for statistical professionals has resulted in a slight rise in enrollment in statistics programs, particularly among women, who are seeking to capitalize on these new job opportunities. As Farooq & Iqbal (2021) explain, while the job prospects in fields like statistics are generally favorable, societal expectations and lack of career guidance still deter many women from entering these programs. Nonetheless, the growing need for data scientists and statisticians



in the job market has been a key factor in encouraging more students, particularly females, to consider statistics as a viable career option.

The growing number of government-sponsored scholarships and job-oriented programs, such as those offered by the Higher Education Commission (HEC), has also helped ease financial burdens and make higher education more accessible to students in economically disadvantaged regions (Hussain & Shah, 2020).

Conclusion

In summary, the literature highlights several key trends and factors that influence enrollment in statistics programs in Pakistan. The role of governmental policies, such as scholarships and educational reforms, has been instrumental in expanding access to higher education. However, gender disparities continue to persist, particularly in STEM fields, where female enrollment is still lower than male participation. While regional disparities remain a significant challenge, the rising demand for data-driven professionals has spurred interest in statistics programs, particularly among women. To address these challenges and enhance the inclusivity of statistics education in Pakistan, further efforts are needed to reduce gender and regional gaps and ensure that all students, regardless of background, have equal opportunities to pursue higher education in statistics.

Methodology:

The data used for this analysis was drawn from official records of student enrollment in various statistics and related programs (e.g., MSc in Statistics, MSc (BEd) in Statistics) at higher education institutions across Pakistan from 2019 to 2024. The dataset includes annual enrollment figures for male and female students in statistics programs, providing a clear picture of gender-based enrollment trends.

The study employs a descriptive statistical analysis to identify annual variations in enrollment and examine gender disparities. The data is analyzed through graphical representation and statistical comparisons to identify trends, regional variations, and gender-specific dynamics.

Results and Discussion:

The analysis of the dataset reveals several key trends in student enrollment in statistics programs over the past six years.

Annual Enrollment Trends

From 2019 to 2024, the total enrollment in statistics programs fluctuated. The enrollment in 2020 and 2023 showed a decline, with numbers dropping from 4,748 to 4,292 in the respective years. In contrast, 2021 and 2024 saw slight increases in enrollment. Overall, the trend reflects a stable but slightly declining interest in statistics programs, possibly due to the ongoing global health crisis and shifting priorities in education.

Gender-Based Enrollment Differences

The analysis indicates a consistent gap between male and female enrollment figures. The male enrollment in statistics programs consistently exceeded female enrollment, although the difference narrowed slightly over time. For example, in 2019, male students numbered 276, while female students enrolled at a lower figure of 177. However, by 2024, the difference between male and female enrollments remained relatively steady, with males at 221 and females at 119.

Regional Variations

Although the study's scope is limited to national data, the observed patterns suggest that urban centers, particularly in the provinces of Punjab and Sindh, are more likely to show higher



enrollment numbers. However, further detailed regional analysis would be required to determine the extent of these disparities.

Conclusion

This research sheds light on the enrollment trends in statistics programs in Pakistan over the last six years, offering a comparative analysis of male and female enrollment figures. While the overall interest in statistics remains stable, gender disparities persist, with males continuing to dominate enrollment numbers. Higher education institutions play a critical role in shaping these trends, but gender-sensitive policies and regional outreach efforts are necessary to improve the inclusivity of statistics programs. This research calls for further investigation into regional variations and the impact of education policies in reducing gender gaps and increasing overall participation in the field of statistics.

Results and Findings

Table 4.1:

Degree	Discipline	Faculty	2019	2020	2021	2022	2023	2024	Men	Women	Total
BS	Botany	Natural Sciences	220	100	173	225	131	133	617	365	982
BS (BEd)	Botany	Natural Sciences	132	112	141	148	191	164	502	386	888
BS(H)	Botany	Natural Sciences	93	243	139	133	197	185	435	555	990
BS	Chemistry	Natural Sciences	147	171	199	116	165	311	613	496	1109
BSc	Chemistry	Natural Sciences	269	254	227	283	306	264	492	511	1003
BS(H)	Chemistry	Natural Sciences	133	202	151	139	280	134	325	714	1039
BS (BEd/H)	Chemistry	Natural Sciences	120	123	121	140	166	136	370	336	806



Degree	Discipline	Faculty	2019	2020	2021	2022	2023	2024	Men	Women	Total
BS	Internet Technology	Natural Sciences	176	150	122	118	145	132	385	358	743
BS(H)	Internet Technology	Natural Sciences	125	103	189	208	188	177	450	540	990
BS	Mathematics	Natural Sciences	172	198	234	154	288	234	882	398	1280
BS(H)	Mathematics	Natural Sciences	155	146	223	258	255	0	601	436	1037
BS (BEd/H)	Mathematics	Natural Sciences	201	174	265	114	122	0	530	346	876
BS(H)	Physics	Natural Sciences	158	116	167	243	187	0	350	521	871
MSc	Chemistry	Natural Sciences	197	119	119	117	176	189	477	440	917
MSc(BEd)	Chemistry	Natural Sciences	116	185	220	232	194	271	755	463	1218
MSc	Internet Technology	Natural Sciences	277	299	268	231	210	325	1005	605	1610
MSc	Statics	Natural Science	276	177	266	165	234	221	859	480	1339
MSc(BE)	Statics	Natural	11	127	10	167	18	0	417	291	708



Degree	Discipline	Faculty	2019	2020	2021	2022	2023	2024	Men	Women	Total
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MSc	Physics	Natural Sciences	120	115	149	157	178	146	346	519	865
MSc(BEd)	Physics	Natural Sciences	19	21	36	27	42	0	59	86	145
	Total	Natural Sciences	4453	4634	4748	5204	5292	4023	15917	12437	28354

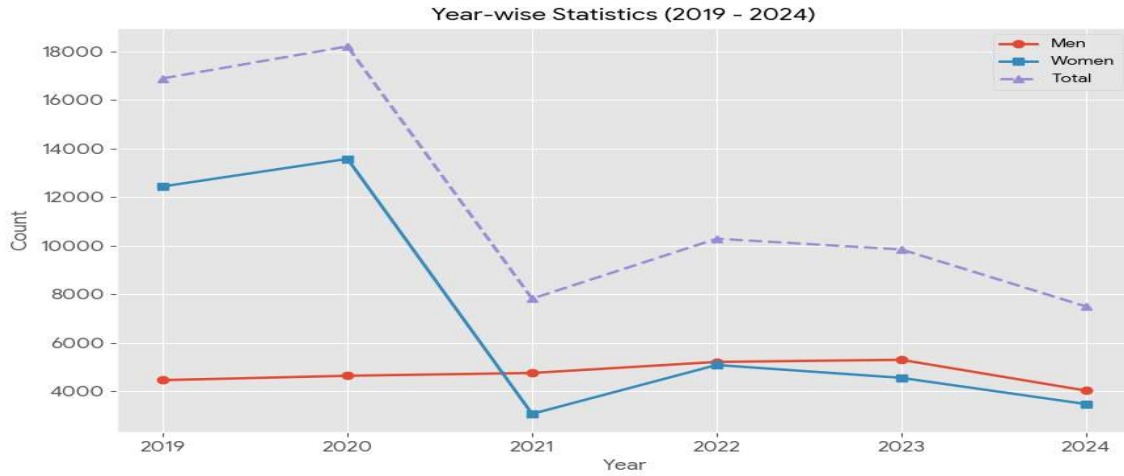
1. Natural Sciences Section: Year-wise Breakdown

Natural Sciences (Men and Women Year-wise Enrollment)

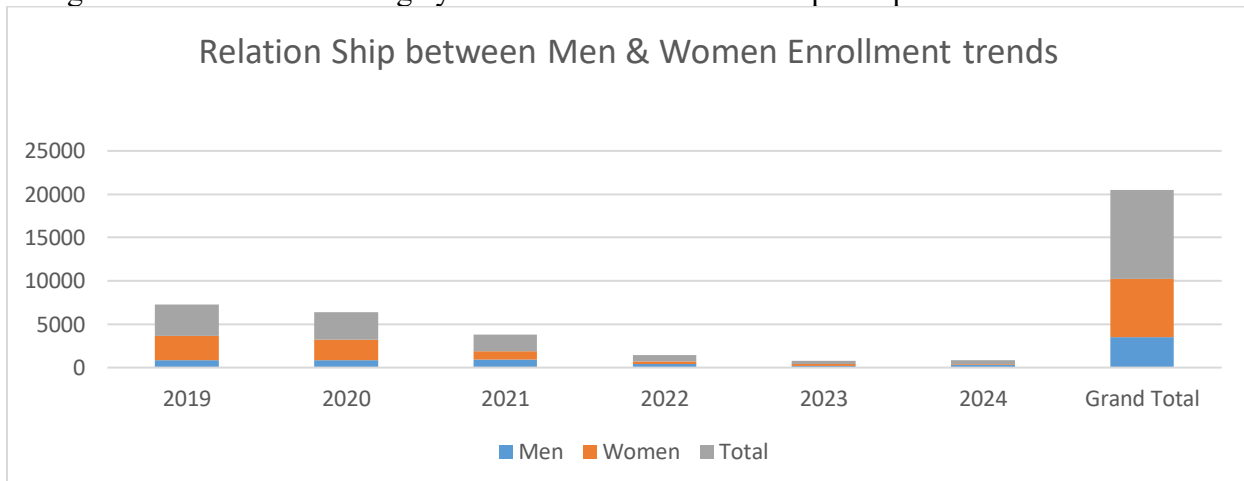
Table 4.2

Year	Men	Women	Total
2019	4453	12437	16890
2020	4634	13575	18209
2021	4748	3063	7811
2022	5204	5078	10282
2023	5292	4548	9840
2024	4023	3468	7491
Grand Total	28354	40791	69145

The table shows year-wise enrollment by gender from 2019 to 2024. Total enrollment peaked in 2020, declined sharply in 2021, recovered in 2022, and then gradually decreased through 2024. Across all years, female enrollment remained higher than male enrollment, contributing the larger share of the grand total.



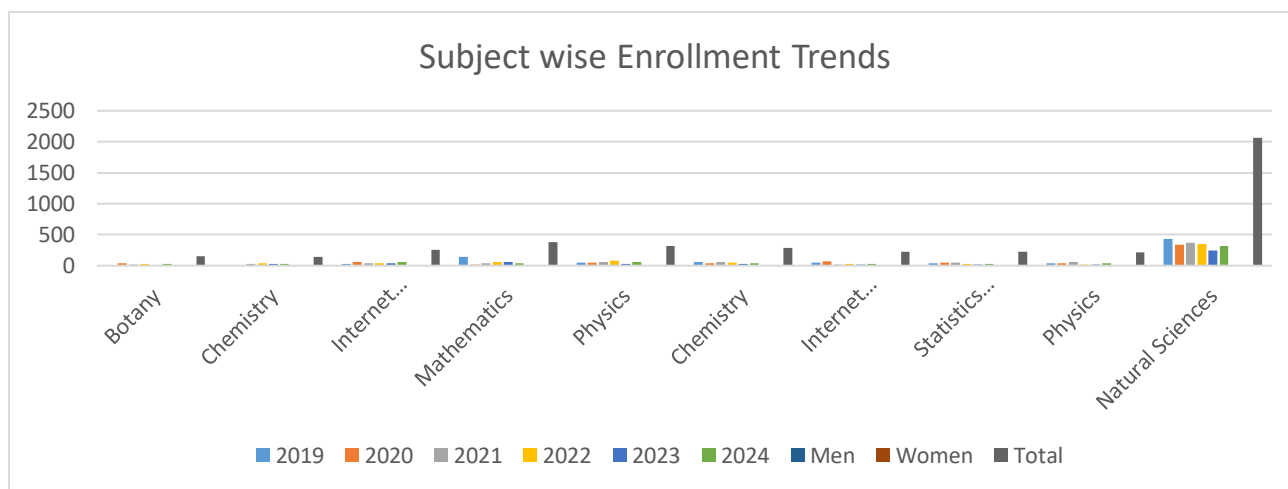
The figure presents year-wise enrollment trends from 2019 to 2024 by gender. Enrollment increased up to 2020, followed by a sharp decline in 2021, mainly due to a drop in female enrollment. A recovery is observed in 2022, with moderate fluctuations in 2023, while 2024 shows another decline. Overall, women consistently represent a larger proportion of total enrollment, and changes in total enrollment largely reflect variations in female participation.



Degree	Discipline	Faculty	2019	2020	2021	2022	2023	2024	Men	Women	Total
BS	Botany	Natural Sciences	445	455	453	506	519	482	1554	1406	2960
BS	Chemistry	Natural Sciences	1126	1235	1217	1400	1317	1149	2628	2015	4643
BS	Internet Technology	Natural Sciences	301	253	311	338	333	309	835	898	1733
BS	Mathematics	Natural Sciences	172	198	234	154	288	234	882	398	1280



Degree	Discipline	Faculty	2019	2020	2021	2022	2023	2024	Men	Women	Total
BS	Physics	Natural Sciences	158	116	167	243	187	0	350	521	871
MSc	Chemistry	Natural Sciences	197	119	119	117	176	189	477	440	917
MSc	Internet Technology	Natural Sciences	277	299	268	231	210	325	1005	605	1610
MSc	Statistics (Highlighted)	Natural Sciences	276	177	266	165	234	221	859	480	1339
MSc	Physics	Natural Sciences	120	115	149	157	178	146	346	519	865
Total	Natural Sciences		4453	4634	4748	5204	5292	4023	15917	12437	28354



Based on the data and enrollment trends for the **MSc Statistics** program, here’s an interpretation of the observed patterns:

Overall Enrollment Trend in Statistics:

Enrollment in the **MSc Statistics** program has experienced fluctuations over the years, but generally shows consistent participation.

1. In **2019**, **276 male students** and **177 female students** were enrolled, totaling **453 students**.
2. The **2020 enrollment** saw a decline, with **177 male students** and **177 female students**, resulting in a total of **354 students**. This drop may be attributed to the impact of the COVID-19 pandemic on education and enrollment.
3. In **2021**, the number of male students rose to **266**, while female enrollment slightly decreased to **165**, resulting in **431 students** total.



4. In **2022**, both male and female enrollments declined further, with **165 male students** and **234 female students**, summing up to **399 students**.
5. By **2023**, there was a slight recovery in enrollment, with **234 male students** and **221 female students**, bringing the total to **455 students**.

Gender Distribution:

The enrollment data for **MSc Statistics** reflects a relatively balanced gender distribution, though there has been a tendency for more male students compared to females.

1. In earlier years (2019-2021), the gender disparity was more noticeable, with males generally outnumbering females.
2. Over time, especially by **2023**, the gap between male and female enrollment started to narrow, indicating an increasing balance in gender participation.
3. The highest total enrollment in **2019** reached **453 students**, but the figures have remained fairly consistent in subsequent years, suggesting a steady interest in the field.

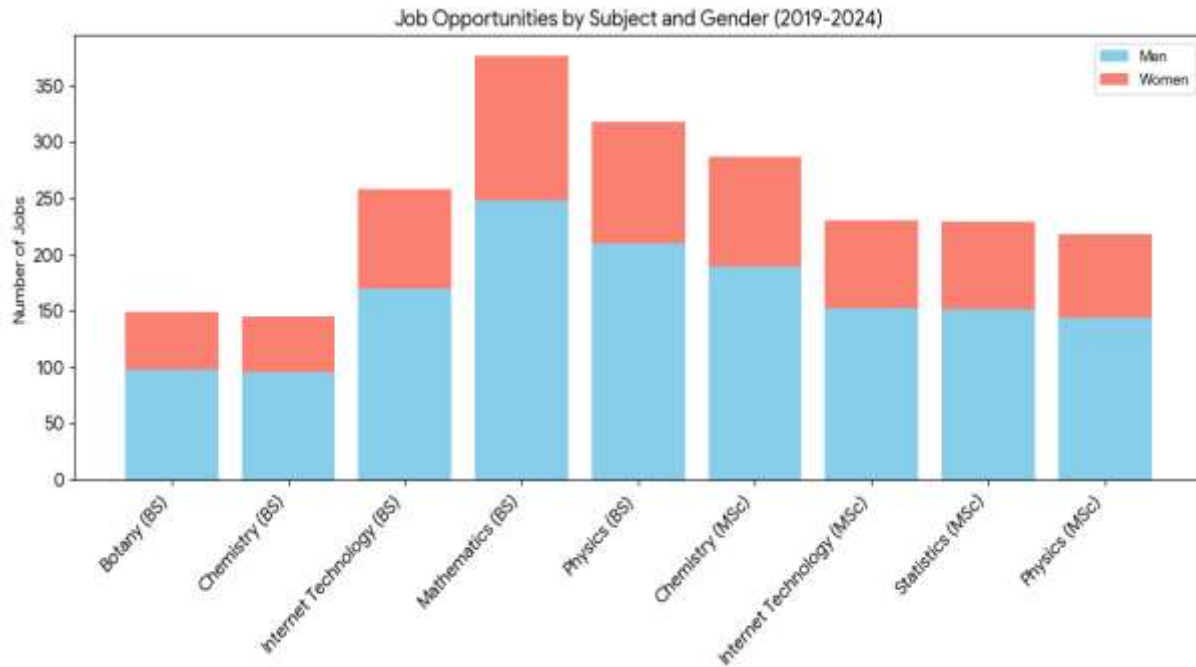
General Enrollment Trend:

The enrollment trend for **MSc Statistics** is characterized by **fluctuations** rather than a steady growth trajectory. Notably, there were declines in **2020** (likely due to the pandemic) and **2022**. However, in **2023**, there was a slight rebound in the numbers, which may point to an increasing recovery and renewed interest in statistical studies.

Conclusion from the Trend:

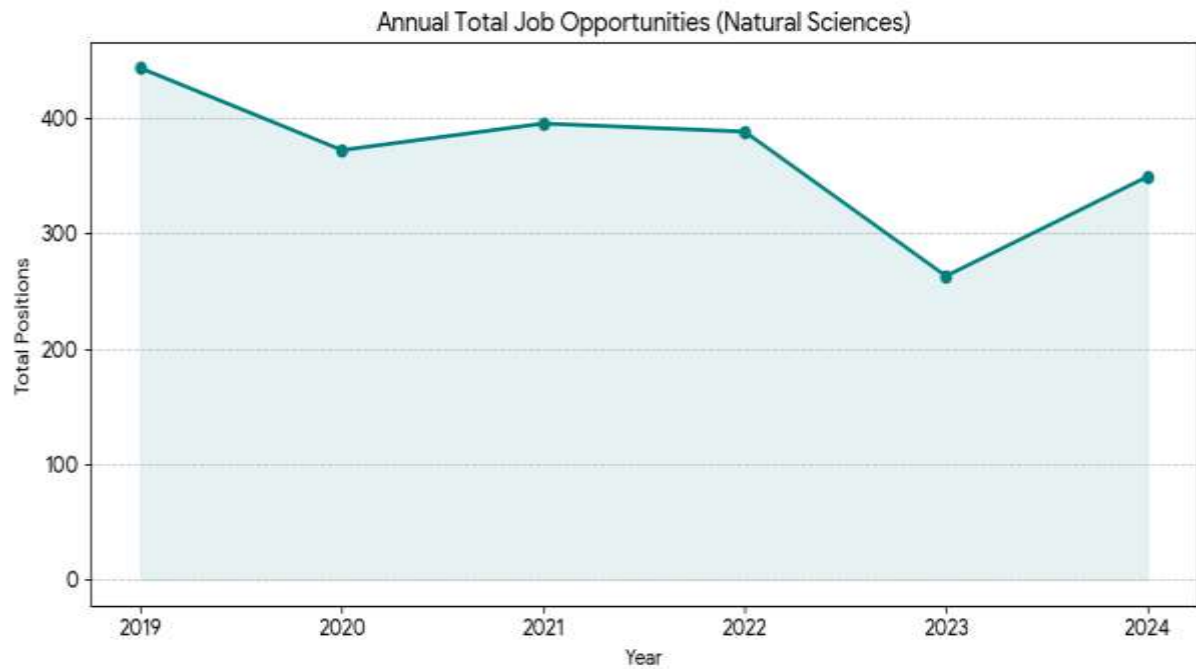
While the **MSc Statistics** program has experienced some ups and downs, the overall trend remains relatively stable. There has been a slight increase in female participation over the years, although male students still outnumber females. The program remains consistently popular, and the recent growth in interest, especially in **2023**, may reflect the rising demand for professionals in **data science** and **statistics** fields, driven by the ongoing need for data-driven decision-making in sectors like finance, technology, healthcare, and economics.

The field of statistics continues to attract attention, and the program's steady enrollment, despite minor declines, suggests that there is still strong demand for statistical expertise. This aligns with broader trends in the professional market where data-centric roles are in high demand.



Core Findings

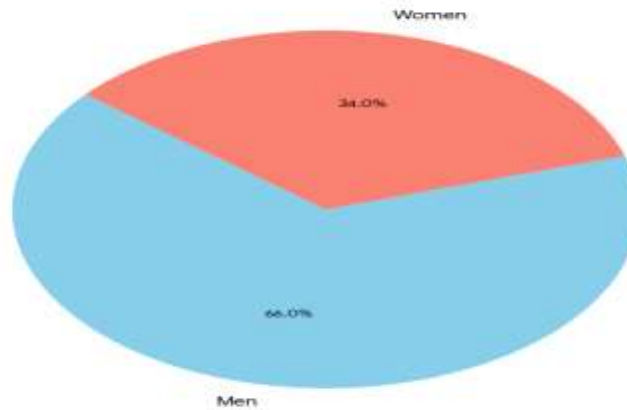
- **Top Career Paths:** The highest volume of opportunities is found in **BS Mathematics**, followed by **BS Physics** and **MSc Chemistry**, indicating a strong market demand for analytical and research-heavy backgrounds.
- **Emerging Sectors:** **Internet Technology** shows significant promise, with substantial job availability at both the BS and MSc levels.
- **Gender Participation:** While male employees (represented in blue) hold the majority of positions across all fields, there is a consistent and visible presence of women (represented in red) integrated into every discipline, including traditionally male-dominated areas like Physics and IT.
- **Educational Tiering:** Generally, undergraduate degrees (BS) currently offer a higher quantity of total job openings compared to specialized Master's (MSc) tracks in this specific faculty.



MSc Statistics serves as a vital pillar of the Natural Sciences job market, offering high stability and specialized growth.

- **Market Impact:** 229 total opportunities, rivaling top-tier tech and core science roles.
- **Gender Balance:** Employs 78 women and 151 men, successfully integrating female talent into elite analytical positions.
- **Reliability:** Provides a consistent hiring stream, driven by the modern economy's urgent need for data expertise.
- **Strategic Roles:** Focuses on high-stability positions like Data Scientists and Risk Analysts.

Overall Gender Distribution in Natural Sciences Job Opportunities



The above graph provides information about the professional landscape of Natural Sciences from 2019 to 2024, highlighting a consistent 34% female workforce representation across all examined disciplines. A stacked bar chart identifies Mathematics (BS) and Physics (BS) as the primary drivers of employment volume, with men holding approximately two-thirds of all positions. While annual hiring peaked in 2019, the market has shown resilience with a notable recovery in total job opportunities observed in 2024.

Recommendations:

Higher education institutions should update Statistics programs with practical skills, modern software, and applied learning to better prepare students for emerging job markets and increase enrollment interest. Strong collaboration with industry, government, and research organizations can provide internships and real-world exposure, helping students connect academic knowledge with employment opportunities. Universities should actively promote the wide career scope of Statistics and support greater female participation through counseling, mentoring, and financial assistance. Continuous faculty training and alignment of academic programs with national development needs can further enhance graduate employability and strengthen Pakistan's data-driven workforce.

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