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# Gender equity in university students in Mexico City, after 20 months of remote classes during the COVID-19 pandemic

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Several studies have reported that university students were affected during the months of confinement due to the COVID-19 pandemic. In Mexico, public and private universities were the last to resume face-to-face activities, so the students stayed in remote classes for almost 20 months. Because of gender inequities in higher education, it is essential to analyze the differential effects of remote learning on male and female students in terms of their physical and mental health, motivation, school achievement, and students' adaptation to changes. Here we surveyed 573 students from Universidad Autónoma Metropolitana, Campus Iztapalapa in Mexico City, using a self-administration survey online. Our results showed that female students had more work overload at home, and felt more affected in their physical and mental health compared to men. Despite these difficulties, women were more willing to get ahead in academic and work settings.

## KEYWORDS

gender, motivation, wellness, academic-self-efficacy, equity

## Introduction

Even though women's participation in academic positions and access to higher education has increased in recent decades, most countries still have a gender gap in access to science, technology, and engineering disciplines. Women are still a minority in universities and colleges as full professors and group leaders, as well as in academic and administrative senior positions (Niemeier and González, 2004; Winslow and Davis, 2016). According to the latest report from the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2019), only 28% of people hired as researchers worldwide are women.

The gender perspective is indispensable to understanding the inequity that occurs in all areas of women's life, including university education, not only in aspects such as access to education, gender stereotypes, discrimination, and gender biases, but also in relation to opportunities to advance in their career, the type of places they have access to, unequal participation in research spaces, and lack of representation in positions where relevant

decisions are made. All those matters prevail and mark the trajectory of women in university spaces (Leahey et al., 2008; Morley, 2013; Le Feuvre, 2015; Drew and Cavanan, 2021; Morales-Robles et al., 2023).

The gender perspective also makes it possible to understand the women students' inequity in universities as a problem that persists in many parts of the world, to identify the causes of this inequity, and at the same time develop arguments to address and study it. Among the important topics to study are: discrimination, gender-based bullying, and sexual harassment, lack of women representation in certain areas of knowledge, unequal assignment of roles and responsibilities in school projects, gender stereotypes, and biases, limitations in active participation in classrooms, and research projects, and underrepresentation in areas of knowledge in science, technology, engineering, and mathematics (STEM) (Acuña Kaldman and Román Pérez, 2018; Lechuga Montenegro et al., 2018; Dome, 2019).

When addressing the inequity of female university students and inequality in these spaces, it is essential to take into account the gender perspective. This implies not only recognizing gender differences but also understanding how these differences are the product of historical and structural power relations that are reflected in all spheres of life, including higher education (Collins et al., 2000).

It was reported that in Mexico, there were mainly no differences in the schooling of women and men at the elementary, middle, and high school levels. Though it has been reported that there has been a "feminization of higher education," equality but not equity has been achieved (Palomar-Verea, 2017). In 1984 only 18% of the members of the National System of Researchers (SNI)<sup>1</sup> were female, while in 2016, that proportion reached 36%. In other words, female recognition in science doubled in real terms in 32 years. Although, it is important to remark that the gender gap in the SNI is still wide when the degree of female and male consolidation and recognition is considered. At the lower levels, the female members represent between 35 and 40%, while at the highest level, where the consolidated and recognized investigators are located, only 20% are women (Cárdenas Tapia, 2015; Rodríguez, 2016). Hence, many inequities persist in academia, such as evaluations and promotions, the granting of recognition, and tenure attainment (Palomar-Verea, 2017). This gender inequity is a global concern, and can be exemplified considering that until 2020 less than 12% of all Nobel Prizes in chemistry, economics, physiology/medicine, and physics have gone to women (Lokman, 2021).

Concerning women's low participation in responsibility and leadership positions, it has been reported that many women drop out at different stages of professional development. Some causes that hinder women from job promotions are related to sexual harassment and discrimination, but also because of family and social pressures, such as not being able to combine academic or scientific work with domestic responsibilities and children or older adults' care, among others (Mercader et al., 2014; UNESCO, 2019).

It is known that the recent COVID-19 pandemic had a significant impact on all areas of our lives. In the last 2 years, a large number of studies have been published worldwide on its effects on school performance at all educational levels (Instituto Internacional de la

UNESCO para la Educación Superior en América Latina y el Caribe, 2020). At the university level, especially in disciplines in areas such as health sciences, most studies found that women reported greater adverse effects on mental health than men (depression, anxiety, loneliness, psychosomatic illnesses, etc.) (Essadek and Rabeyron, 2020; Gestsdottir et al., 2021; Paludo et al., 2021; Werner et al., 2021).

Several international studies, as well as those carried out in Mexico (Infante-Castañeda et al., 2021), were done during the strictest period of confinement, that is, in the first or second wave of the pandemic (between April and July 2020). In Mexico, both public and private universities were the last to resume face-to-face activities, so the vast majority of the students stayed with remote classes for around 20 months, and those effects have not yet been studied.

Another indirect effect of the pandemic was that women presented more significant job losses than men, which widened the gender gap in the labor force in Latin America, North Africa, and the Middle-East (Flor et al., 2022). In high- and middle-income countries, it was also observed that women highly reported dropping their job since they had to take care of others; in all the studied regions, an increase in housework was reported for women compared to men. Regarding school dropout, women from Asia and Sub-Saharan Africa reported a lower capacity for remote learning due to connectivity issues (Flor et al., 2022).

In Mexico, the situation was no different. In a study carried out by Osorio Vázquez and Bressers (2021), it was reported that undergraduate female students had a greater work overload compared to men since, in addition to attending academic activities, they had to take care of family members and do housework. Consequently, in that study, women expressed very little motivation to take classes online because they did not have adequate spaces. Most lived with relatives who did not allow them to concentrate on their classes, and also because they did not have access to necessary technological tools. The preceding was aggravated by the low availability of these tools in Mexico, since, according to data reported by INEGI (National Institute of Statistics and Geography) in 2019 (INEGI, 2019), the total proportion of households with a computer was 44.3%, and only 56.4% of households had an internet connection.

Hence, considering the situations experienced during the pandemic, it is important to mention that a relevant factor for student's adaptation to changes was resilience, which involves "the interaction of risk and protection processes, both internal and external to the individual, that are developed to modify the effects of adverse life events" (González-Arratia et al., 2011). Resilience is affected by multiple factors, like inadequate support, psychic strength, and interpersonal skills (González-Arratia and Valdez-Medina, 2013). Although resilience can depend not only on gender but also on the age and stage of life in which a person is; in youth, resilience is related to the development of autonomy and the ability to manage projects responsibly and diligently and to deal with problems appropriately, among others [Saavedra-Guajardo and Villalta-Paucar, 2008 in González-Arratia and Valdez-Medina (2013)].

Therefore, it is fundamental to understand the impact of the pandemic on academic performance and daily responsibilities, as well as the disposition and resilience of university students concerning gender differences in this long period of confinement, because this might be another factor that causes female students to abandon their academic and scientific careers. Although in this study we did not apply a resilience questionnaire as such, the evaluation of the various

<sup>1</sup> The SNI is an institution in which all scientific disciplines are represented and acknowledges the work of researchers dedicated to producing high-level scientific knowledge and technology.

indicators of motivation toward academic work, together with specific data such as the number of approved, abandoned, or failed subjects, allowed us to analyze the differences in resilience during the pandemic among university students, particularly those attending the Universidad Autónoma Metropolitana Unidad Iztapalapa (UAM Iztapalapa).

## Materials and methods

### Characteristics of the institution and student community

UAM Iztapalapa is a public university located on the east side of Mexico City, with an enrollment of around nineteen thousand students. It has an educational offer of 27 undergraduate and 22 graduate programs grouped into three divisions: Biological and Health Sciences (CBS), Social Sciences and Humanities (CSH), and Basic Sciences and Engineering (CBI). The percentage of women's submissions and admissions at the undergraduate level after the pandemic was similar to the rate before, around 60% for CBS and CSH and only 30% for CBI. However, the percentages of graduated females constituted 66, 56, and 37% of the total graduates for CBS, CSH, and CBI, respectively. During the pandemic, the number of applicants decreased, but the distribution by gender was maintained ([Universidad Autónoma Metropolitana Unidad Iztapalapa, 2022](#)).

### Participants

Five hundred and seventy-three students from UAM Iztapalapa with an average age of 23 years ( $SD = 5$ ; minimum = 17, maximum = 57) participated in the survey; 57.2% ( $n = 328$ ) were women, 36.1% ( $n = 207$ ) were men, 2.6% ( $n = 15$ ) self-identified as gender-fluid, 1.6% ( $n = 9$ ) as a non-binary gender, 1.2% ( $n = 7$ ) as queer, 0.7% ( $n = 4$ ) as transgender men, 0.2% ( $n = 1$ ) as demiboy, and 0.3% ( $n = 2$ ) said they did not know. Marital status was predominantly single (92%;  $n = 527$ ), 7.7% ( $n = 44$ ) were married, and 0.3% ( $n = 2$ ) were divorced. Of the total participants, 92% ( $n = 526$ ) were undergraduate students, 7.7% ( $n = 44$ ) were graduate students, and 2 (0.4%) had already graduated or had covered their credits. The five majors with the highest participation in the survey were: experimental biology (10.3%;  $n = 54$ ), industrial biochemical engineering (7.4%;  $n = 39$ ), biomedical engineering (7.4%;  $n = 39$ ), physics (5.9%;  $n = 31$ ), and social psychology (5.7%;  $n = 30$ ); the graduate courses with the highest participation were: master's degree in sciences [physics] (13%;  $n = 6$ ), doctorate in biological and health sciences (8.7%;  $n = 4$ ), doctorate in social psychology (8.7%;  $n = 4$ ), master's degree in experimental biology (6.5%;  $n = 3$ ), master's degree in science [chemical engineering] (6.5%;  $n = 3$ ), and master's degree in science [chemistry] (6.5%;  $n = 3$ ).

By academic divisions, the distribution was as follows: 35.1% ( $n = 201$ ) of the participants studied some discipline of Basic Sciences and Engineering (CBI); 28.5% ( $n = 163$ ) belonged to Biological and Health Sciences (CBS), and 36.3% ( $n = 208$ ) were from Social Sciences and Humanities (CSH); one person did not provide information on the career or graduate degree he was studying.

The inclusion criteria were: being an undergraduate or graduate student at UAM Iztapalapa, having access to an electronic device with an internet connection, and agreeing to participate in the survey.

## Instrument

The survey contained a set of closed questions explicitly developed for this study and included the following sections:

### General data

Age, sex-gender identity, marital status, number of daughters or sons, number of people with whom they share a home, state of residency, municipality, level of study, trimester (at UAM, the programs are quarterly), program, and employment status.

### Gender equity and the use of free time

It consisted of nine questions about the time the participants dedicated to university studies, the type of activities they carried out in their free time, and the management they made of their time.

### Academic self-efficacy

A Likert-type scale was developed with 16 items and five potential response points, ranging from 1 = Totally disagree to 5 = Totally agree. The Palenzuela Scale of perceived self-efficacy specific to academic situations ([Palenzuela, 1983](#)) was taken as a reference to develop the items.

### Motivation

It consisted of a scale with 15 Likert-type items with seven response points, ranging from 1 = Nothing to 7 = Totally, based on the Self-efficacy and Academic Motivation Scale by [Galleguillos-Herrera and Olmedo-Moreno \(2019\)](#), and the Scale of academic motivation of [Manassero and Vázquez \(2000\)](#).

### Health and wellness

Eight questions were written related to sleep habits, physical activity, exercise, health and disease conditions during the pandemic.

### Academic information

Eight questions were asked about subjects enrolled, studied, withdrawn, abandoned, approved, study conditions, and coexistence with classmates.

In addition, an introduction was written, in which the purpose of the survey was disclosed, confidentiality and anonymity were guaranteed, as well as the proper handling of the information, and the declaration of informed consent and the ethical criteria were also presented.

## Procedure

The survey was administered in electronic format, through the Google Forms platform, from November 29 to December 19, 2021. The invitation to the student community of UAM Iztapalapa was made by sending a message to the whole student community, through their institutional email, along with announcements on digital social networks such as Facebook and Instagram.

## Data analysis

The answers were downloaded in an Excel data sheet for information processing and later transferred to the SPSS program

(Statistical Package for Social Sciences) version 22. Once the database was reviewed and refined, frequency analyses, cross, descriptive tables, exploratory factorial analysis, reliability analysis, bivariate correlation analysis, and Student's *t*-test were performed.

## Results

The results described below were obtained considering only the groups of females and males who participated in the survey. Because, despite having information about other identity groups such as gender-fluid, non-binary, queer, etc., the proportion of students in those groups was low and insufficient to include them in the statistical analyses.

In the gender equity section, we found that 30.2% ( $n=99$ ) of the female students and 28% ( $n=58$ ) of the male students said they had a paid job. Regarding gender differences in housework, we found 36% ( $n=118$ ) of women and 51.2% ( $n=106$ ) of men spent less than 2 h a day doing housework; 48.8% ( $n=160$ ) of women and 40.1% ( $n=83$ ) of men dedicated between 2 and 4 h to that tasks; 15.2% ( $n=50$ ) of women and 8.7% ( $n=18$ ) of men spent between 4 and 6 h on housework. In addition, 30.5% ( $n=100$ ) of the women and 28.5% ( $n=59$ ) of the men declared that they actively participated in the distance education of their minor dependents. Of the 25 students who said they had children, 84% ( $n=21$ ) offered care to other members of their family; of these, 15 were women (60%), and 10 were men (40%). When considering the time spent caring for other people, 26.3% ( $n=86$ ) of the women and 18.3% ( $n=38$ ) of the men reported that they spent between 2 and more than 6 h a day caring for other people in their family, including those who may have a disability or suffer from an unspecified illness. Indeed, 52.2% ( $n=165$ ) of the women and 41.9% ( $n=83$ ) of the men reported having an increase in the time they spent caring for sick people in their families or minors during the pandemic.

Concerning the use of free time, the results showed that the time dedicated by women and men was different. It was observed that most of the participants dedicated less than 2 h to this activity, and very few students were able to invest more than 6 h in recreation, which showed that during the pandemic period, there was a significant work overload (Figure 1). In general terms, women dedicated less time than men to recreation, 60.7% spent less than 2 h, while more men answered that they were in the ranges of 2–4 h, 4–6 h, and more than 6 h.

When inquiring about the type of activities they carried out in their free time, it was found that more than 50% of the surveyed students mainly watched series, programs, or movies, listened to music, used social networks, spent time with the family, and exercised (Figure 2). As observed, the women's and men's dedication to the activities included in Figure 2 was similar. However, women reported a more significant proportion of watching series, programs, or movies, listening to music, spending time on social networks, spending time with the family, reading or writing non-academic texts, hanging out with friends, personal self-care activities, and outdoor recreation. In contrast, men had higher percentages in activities such as studying another language, video games, and cultural activities.

Regarding the scale of academic self-efficacy, the perception reported by the participants was very positive. When the questions were subjected to an exploratory factorial analysis using the varimax rotation with the principal component extraction method, it yielded

a single factor. Thus 12 of the 16 items remained and explained 51.4% of the total variance; items 3, 4, 8, and 10 were not included, as they were not part of the unidimensional factor (Table 1). The scale's reliability, measured by Cronbach's Alpha, was 0.91.

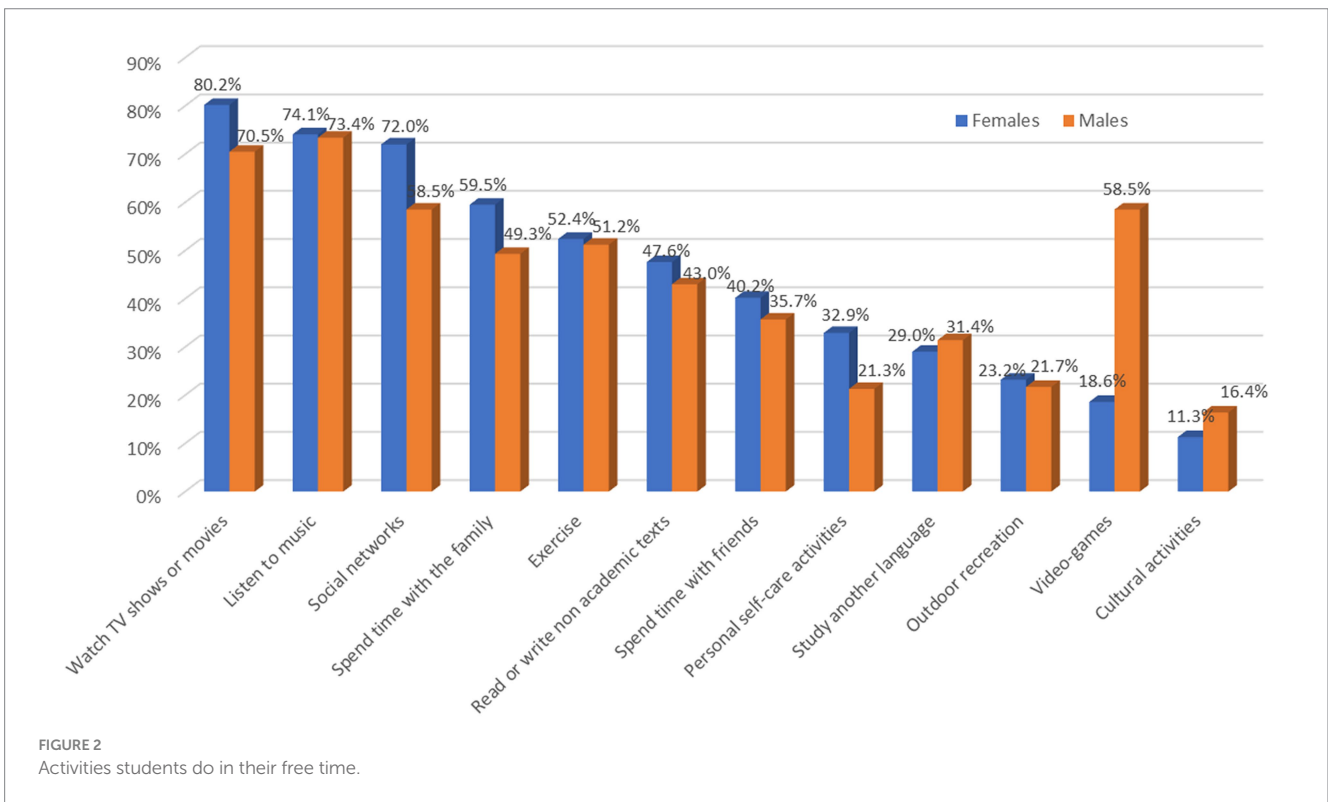
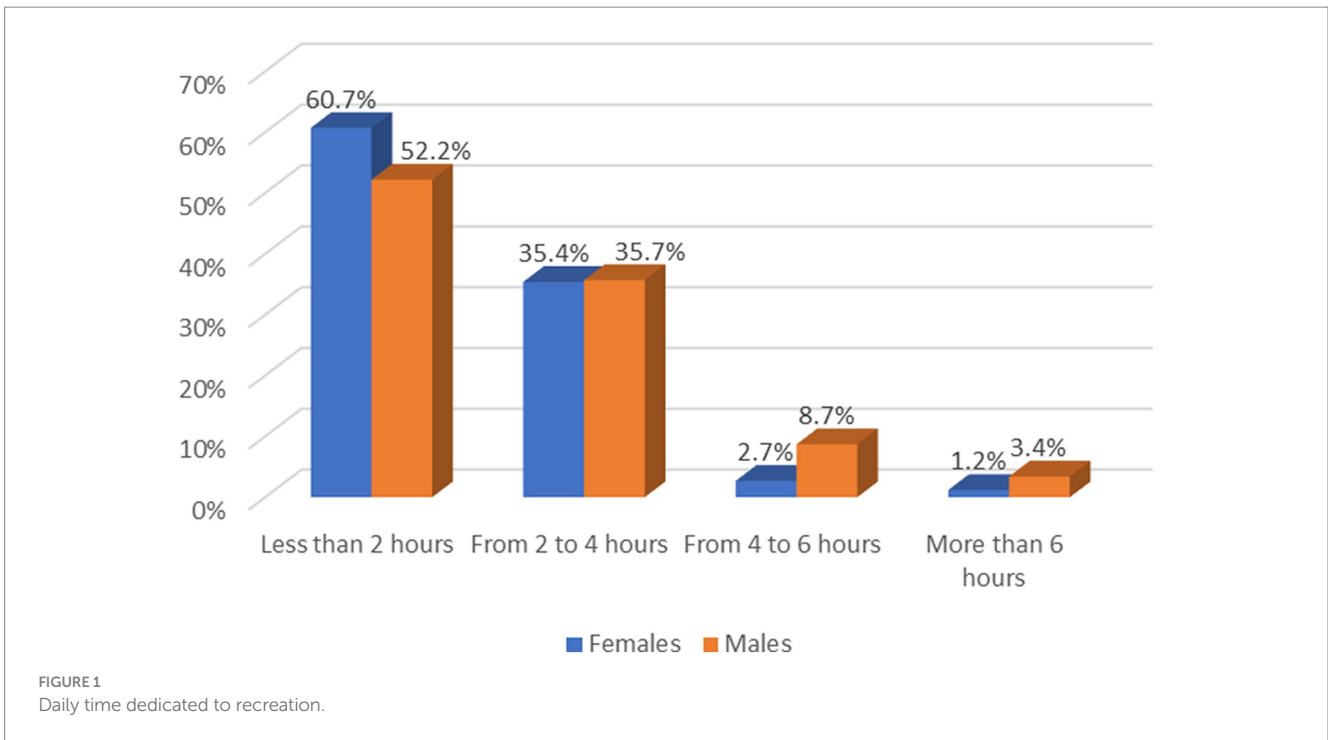
The means of the groups were homogeneous, with a value of 45.4 (SD=7.1) in the case of women and 45.6 (SD=8.6) for men, so differences were not statistically significant.

When contrasting the averages obtained by women and men according to the division branch at the university (CBS, CBI, and CSH), the male student's values were slightly higher than those of their female peers (Table 2). In the CBI division, corresponding to the disciplines of engineering and basic sciences, the differences between the averages of women and men were statistically significant.

Interestingly, in the academic information, we found that men dropped out of more subjects than women. The percentage of men who did not abandon any subject was 77.8% ( $n=161$ ), while for women, it was 83.8% ( $n=275$ ). In the case of 1–2 abandoned subjects, the proportion of men was 18.8% ( $n=39$ ) and of women was 13.4% ( $n=44$ ); while in the range of 3–4 subjects, the abandonment was 1.9% ( $n=4$ ) and 0.6% ( $n=2$ ) respectively; finally, three men (1.4%) and seven women (2.1%) abandoned all their subjects. Noteworthy, with the information obtained, it was not possible to evaluate how many subjects the students failed. However, we found a significant difference in subject approval in the last quarter; since 50% of the women declared having passed all of them, only 36.7% of the men did. On the other hand, of the students who reported not having approved any, 22.3% were women, and 24.6% were men.

The questions of the motivation scale by gender (Table 3) were also subjected to an exploratory factorial analysis, obtaining, as a result, three factors, called: "pleasure in learning" or intrinsic motivation, "lack of motivation," and "increasing job opportunities" or extrinsic motivation. The first factor, pleasure in learning, was made up of six items that referred to the intrinsic reasons the students had to continue their higher education. The reliability of this factor, indicated by Cronbach's Alpha, was 0.83. The second factor, lack of motivation, involved four items related to the little interest students had in continuing with their studies; the reliability of this set of items was 0.75. The third factor, increasing job opportunities, consisted of three statements related to an external source of motivation to stay in school, which was the possibility of improving their job options; its reliability was 0.72, according to Cronbach's alpha. Moreover, Pearson's product-moment correlation analysis showed links among several factors worth highlighting. For example, the *pleasure in learning* was positively and significantly related to extrinsic motivation ( $r=0.434$ ;  $p<0.01$ ), the *lack of motivation* had a negative and significant relationship with the *pleasure in learning* ( $r=-0.280$ ;  $p<0.01$ ); finally, there was no correlation between extrinsic motivation and *lack of motivation* (Table 4). Women obtained higher averages than men in the *pleasure of learning* and *increasing job possibilities* (extrinsic motivation). The differences by gender were statistically significant in the factors of *pleasure in learning* and *increased job opportunities* but not in the *lack of motivation* (Table 5). Finally, the self-perception of academic efficacy was positively related to intrinsic motivation ( $r=0.423$ ,  $p<0.01$ ) and negatively related to the lack of motivation ( $r=-0.397$ ,  $p<0.01$ ). Considering the academic division to which their careers or graduate degrees belonged, the averages obtained by women and men in the three factors of the motivation scale were compared (Table 6). The most remarkable differences between the averages were found in the division of basic sciences and engineering





(CBI), where, in each factor, women obtained the highest values. In CBS and CSH, the differences between means were so minor that they were not statistically significant, except in the *pleasure in learning* factor for CSH, where the average obtained by the women was higher than that of their male peers.

- Regarding health and wellness, 47.9% ( $n = 157$ ) of females and 46.9% ( $n = 97$ ) of males reported sleeping between 6 and 8 h per

day, and 50.6% ( $n = 166$ ) of women and 50.3% ( $n = 104$ ) of men slept less than 6 h per day. Also, 31.1% of women and 28% of men said they did not engage in physical activity; 17.7% of the women and 23.7% of the men declared that they performed physical activity more than 3 times per week. Concerning health, 25.6% of women admitted that they took less care of their health than before the pandemic, 30.2% did it the same as before, and 44.2%

TABLE 1 Descriptive analysis of the academic self-efficacy scale items.

Item	Media	Standard deviation	Factorial weight
13. I am prepared and sufficiently trained to succeed at my school	3.89	0.9	0.801
6. I feel good about my own school performance.	3.60	1.0	0.785
2. I consider myself capable enough to successfully face any school or academic task.	4.05	0.8	0.769
7. I can study alone and perform very well in any academic activity.	3.84	0.9	0.763
15. I can understand what any teacher teaches.	3.59	0.9	0.750
9. I feel satisfied with the learning I have had in my subjects.	3.71	1.0	0.722
16. I am able to understand the main idea of what my teachers explain or at a book or article says.	3.83	0.8	0.720
11. I have the ability to understand a subject well and quickly.	3.58	0.9	0.716
12. If I put my mind to it, I have enough capacity to build an excellent resume.	3.95	1.0	0.650
14. I always prepare well for my exams.	3.55	0.9	0.640
11 I try my best to solve difficult tasks.	4.31	0.8	0.632
5. I am not intimidated by the fact that teachers are demanding because I am very confident in my academic ability.	3.45	1.1	0.622

TABLE 2 Means comparison of academic effectiveness by gender and academic branch division.

Division branch	Women	Men	t Student test
CBI	M = 43.3 (SD = 6.9)	M = 45.8 (SD = 9)	F = 5.732; gl = 172.022; p < 0.05
CBS	M = 45.8 (SD = 7.3)	M = 45.2 (SD = 7.6)	F = 0.425; gl = 90.129; n.s.
CSH	M = 46.7 (SD = 7.0)	M = 45.8 (SD = 8.8)	F = 4.603; gl = 103.658; n.s.

took more care of it. Of the men, 22.7% took less care of their health than before the pandemic, 40.6% the same as before, and 36.7% more. More women than men said they used to have regular medical check-ups: 30.5% vs. 22.7%.

A slightly higher proportion of men acquired COVID-19 (33.3%) compared to women (30.2%). A higher proportion of women than men developed a disease different from COVID-19 (38.1% vs. 29%).

- Women's physical health during the pandemic was considered mainly mild (40.2%;  $n = 132$ ), but there was also a significant proportion who perceived it as good (38.1%;  $n = 125$ ); in the case of men, their physical health was evaluated as good (41.1%;  $n = 85$ ), and as mild (35.7%;  $n = 74$ ). Women's mental health in the first 2 years of the pandemic was mainly rated mild (42.4%;  $n = 139$ ), although there was also a significant proportion who said it had been poor (27.7%;  $n = 91$ ) or very poor (14%;  $n = 45$ ), and only a few (15.8%;  $n = 52$ ) reported that it was good or very good. The men reported having above all regular mental health (37.2%;  $n = 77$ ), and in equal proportion, they considered it poor and good (22.7%;  $n = 47$ ).

In summary, the survey applied among students of the UAM Iztapalapa showed that during the pandemic, a higher percentage of women than men had to enter the labor market, and increased the

time spent caring for their minor relatives and cohabitating with sick adults. In parallel, male participants reported having more free time during the pandemic than females. Regarding the self-perception of academic efficacy, no differences were observed between men and women. When separating the answers by areas of knowledge, the CBI students showed lower academic efficiency than the males. However, in the field of motivation, in general, women presented greater intrinsic and extrinsic motivation than men, which was confirmed by the difference found between the approved subjects, which was greater in women. Also, women dropped fewer subjects than men. Finally, a higher percentage of women reported poor and very poor mental health during the pandemic compared to men. A higher percentage of men than women developed COVID-19, but a higher percentage of women reported having an illness different from COVID-19 in the same period.

## Discussion

The participation of women in academic careers continues to be low, and even though the number of students at the undergraduate level has increased in recent years, there is still a gap at the graduate level and in academic decision-making positions (Danell and Hjerm, 2012; Palomar-Verea, 2017). Much has been written about why female students drop out of their academic careers. However, few studies investigate gender differences in the effects that the pandemic may have had on physical and mental health (Cao et al., 2020; Tibubos et al., 2021), in addition to studies that assess resilience to deal with the adversities arising from this difficult situation and thus continue with their careers.

In most studies on the pandemic's effects on university students, gender is considered binary (male/female) (Cao et al., 2020; Essadek and Rabeyron, 2020; Tibubos et al., 2021). Our survey included trans-female, trans-male, genderfluid, nonbinary, queer, and other gender identity options. Despite our intention to be inclusive, the percentage of participants who identified with those gender options was very low,

TABLE 3 Psychometric analysis of the motivation scale by gender.

Item	Media	Standard deviation	Factorial weight
<b>Factor 1: Pleasure in learning. Reliability 0.83</b>			
14. I find satisfaction in learning.	5.94	1.5	0.799
2. I like learning new things.	6.46	1.1	0.775
9. I feel that I improve myself through academic work.	5.35	1.8	0.694
5. It allows me to feel the pleasure of surpassing myself.	5.94	1.5	0.691
8. Because of the joy, it gives me to do difficult school tasks.	4.1	1.9	0.648
1. It allows me to communicate my ideas to other people.	5.0	1.8	0.615
<b>Factor 2: Lack of motivation. Reliability 0.75</b>			
4. I do not really know why I come to the university, and honestly, I do not really care.	1.37	0.9	0.842
3. I honestly do not know, I feel like I'm wasting my time.	1.79	1.4	0.826
10. I do not want to study anymore, but my family pressures me to do so.	1.35	1.0	0.747
6. I was excited before, but now I wonder if I should continue in this career.	2.6	2.0	0.697
<b>Factor 3: Increasing job opportunities. Reliability 0.72</b>			
11. To get a job of greater prestige and category.	5.17	1.9	0.788
13. To prove to myself that I can get a professional degree.	5.29	2.0	0.772
7. To prove to myself that I am an intelligent person.	4.73	2.1	0.645

so the statistical analysis was done only for women and men. In the few studies that included other (diverse) gender options, the percentage of people with non-binary gender was less than 1%, so they were also excluded from their statistical analyses (Gestsdottir et al., 2021; Werner et al., 2021).

In our study, although women had a greater workload due to entering the labor market while studying, in addition to spending more time caring for sick people, relatives, and minors, they had the same perception of academic efficacy as men, and greater motivation to complete their university studies. These data point toward greater resilience in participating women compared to men. A large number of studies analyze the differences in resilience by gender. In most of them, it is observed that men seem to have greater resilience than women (Peyer et al., 2022), mainly middle-aged men (Valiente et al., 2021). However, it is interesting to analyze the questionnaires that are carried out, especially the "Brief Resilience Scale" (BRS) by Smith et al. (2008), which is one of the most used. This questionnaire includes statements such as:

- I tend to bounce back quickly after hard times.
- I find it hard to get over stressful events.
- I usually get over hard times with few problems.

Therefore, the surveys where resilience is measured assess the perception or feeling of the people during difficult situations and do not directly analyze whether or how they actually got out of those crises. In addition, it is known that women tend to underestimate their achievements and strengths, and overestimate their weaknesses (imposter syndrome, sticky floor syndrome, glass ceiling syndrome, etc.) (Clance and Imes, 1978; Camarena-Adame and Saavedra-García, 2018; Aduna-Mondragón and Medina-Salgado, 2021). The above might have influenced the women answering this questionnaire, preventing their recovery from difficult events from being valued and recognized. The former

might explain why many women perceive themselves as less resilient. On the other hand, within gender mandates, men tend not to express vulnerability conduct but rather strength, while women have a greater capacity to manifest those states that affect them (López-Valero and Encabo-Fernández, 2002). Some studies have linked men's greater resilience with the existence of some positive resources to cope with stress, such as physical exercise (Prowse et al., 2021; Peyer et al., 2022). Likewise, it has been reported that men obtained higher scores than women in the standard measures of global self-esteem (Kling et al., 1999). Our survey included questions about the use of free time and physical activity; the results indicated that women exercised less, possibly because they had to prioritize other activities to do in their free time. The fact that women dedicated fewer hours of their free time to exercise could be a window of opportunity for them to better cope with stress. It was also found that 60.7% of the women dedicated less than 2 h a day to recreation vs. 52.2% of men; this could be associated with a more significant impact on mental health and physical fitness since a higher proportion of women developed a disease other than COVID-19 (38.1% vs. 29%).

It is known that there is a gender inequity for women in STEM disciplines (science, technology, engineering, and math), even though at the basic educational levels, girls have similar school performance to boys. Nevertheless, there is a progressive reduction in access to education at subsequent levels; that is, 80% of girls have access to primary education, 60% to secondary education, and only 40% to higher education, where only 30% study a STEM discipline (Cárcamo-Vergara and Mola-Ávila, 2012; Gomes and Soares, 2013; UNESCO, 2019).

In our study, a lower perceived academic efficacy was found by CBI female students (math, physics, and engineering) compared to men, but also greater intrinsic and extrinsic motivation. Being represented in smaller numbers, stressors and self-demand in that environment are greater (Settles et al., 2016). It is in this area where

TABLE 4 Correlations between the motivation scale factors.

		Pleasure in learning (intrinsic motivation)	Lack of motivation	Increasing job opportunities (extrinsic motivation)
Pleasure in learning (Intrinsic motivation)	Pearson correlation	1		
	N	573		
Lack of motivation	Pearson correlation	-0.280	1	
	Sig. (bilateral)	0.000		
	N	573	573	
Increasing job opportunities (Extrinsic motivation)	Pearson Correlation	0.434	0.083	1
	Sig. (bilateral)	0.000	0.047	
	N	573	573	573

TABLE 5 Comparison of means of the motivation scale factors.

Factor	Women	Men	Student's t
Pleasure in learning	M = 38.5 (SD = 7.4)	M = 36 (SD = 9.5)	F = 17.925; gl = 36.288; p < 0.05
Lack of motivation	M = 7.2 (SD = 4.2)	M = 6.9 (SD = 4.1)	F = 0.520; gl = 444.450; n.s.
Increasing job opportunities	M = 18.5 (SD = 6.0)	M = 17.2 (SD = 6.5)	F = 3.591; gl = 414.848; p < 0.05

the insertion of women has represented less progress, especially in disciplines related to engineering and computing.

In addition to evaluating the indicators of motivation toward study, an approach was also made to specific facts to validate resilience during the pandemic; for example, the number of approved subjects vs. abandoned or failed, etc. Interestingly, in our analysis, female students continued their studies more efficiently than men, so it can be inferred that they were more resilient (at least in terms of their school performance).

It is relevant to comment that gender roles and their impact on personal and professional development are a research topic that has been in force for many years. Positively valued masculine traits have been associated with characteristics such as competence, while feminine attributes are related with warmth and expressiveness (Eagly, 1987). Currently, there is an increasing similarity in the roles of men and women, mainly due to a more remarkable change in women's aspirations (Diekman and Eagly, 2000; Eagly and Wood, 2013). This situation has generated more pressure on women since they "added" roles to those they already had without losing their previous ones. For this reason, it is possible that female students feel more pressure to meet the expectations that they or their families have placed on their future employment and continue with their studies or jobs despite the adversities and stress that could be generated.

It has been reported that women's time spent on responsibilities and tasks at home and in family care was greater. However, free time and its use for self-care were less (Giurge et al., 2021), affecting their happiness and mental health during the COVID-19 pandemic. Hence,

more research is needed to understand the long-term differential effects of time use by gender during the pandemic.

In 2022, the National Association of Universities and Institutions of Higher Education of Mexico (ANUIES) presented the results of the National Survey COVID-19: "The Student Community in the face of the Health Emergency," whose data showed similar results to those in our study. In that survey, 140,387 women and 132,089 men participated; interestingly, 701 participants chose "other" for gender identity; still, they represented 0.26%, and therefore their responses were not used in the statistical tests either. ANUIES did not analyze gender differences in school dropout or return to frontal activities; they reported that more male students found a job during the pandemic than female students; however, more women undertook to start a business, although most did not prosper. Women reported studying in a noisier environment where it was more difficult to concentrate, and they spent more hours a day studying than men. Likewise, women reported suffering more significant depression, anxiety, and stress and increased gender-based violence. This data can be confirmed by other studies in Mexico, where anxiety, depression, and self-care symptoms were investigated during the COVID-19 pandemic. It was found that the factors that influenced higher levels of anxiety and depression were: being female, single, not having children, presenting medical comorbidity and having a history of mental health disorders (Galindo-Vázquez et al., 2020; Siguenza and Guzmán, 2022).

The high percentage of poor to very poor mental health reported among the women in this study may also be due to the uncertainty that prevailed during the start of the pandemic. A study showed that social networks were the primary means of information for higher-level students about COVID-19 (Vergara et al., 2019), and because these media presented unreliable and alarmist content, 82% of students surveyed in another study presented anxiety, pessimism, fear, insomnia, and worry (Wang et al., 2020).

During crises, changes and opportunities can upsurge, and despite the perpetuation of traditional gender stereotypes that still subsist in Mexico, we were able to show that female students wanted to get ahead in academic and work settings notwithstanding the work complications and health problems.

Finally, we acknowledge that our study has limitations since we only survived one university in Mexico City, and unlike other



TABLE 6 Comparison of means of the motivation scale factors, by gender and academic division.

Factor	Women	Men	Student's <i>t</i>
<b>CBI</b>			
Pleasure in learning	<i>M</i> = 38.2 (SD = 7.5)	<i>M</i> = 35.9 (SD = 10.1)	<i>F</i> = 8.989; <i>gl</i> = 169.644; <i>p</i> < 0.05
Lack of motivation	<i>M</i> = 8.1 (SD = 4.8)	<i>M</i> = 6.5 (SD = 4.4)	<i>F</i> = 2.266; <i>gl</i> = 185.137; <i>p</i> < 0.05
Increasing job opportunities	<i>M</i> = 18.9 (SD = 6.2)	<i>M</i> = 16.7 (SD = 6.9)	<i>F</i> = 4.031; <i>gl</i> = 183.551; <i>p</i> < 0.05
<b>CBS</b>			
Pleasure in learning	<i>M</i> = 38.5 (SD = 7.4)	<i>M</i> = 35.7 (SD = 9.0)	<i>F</i> = 3.382; <i>gl</i> = 80.083; n.s.
Lack of motivation	<i>M</i> = 6.5 (SD = 3.2)	<i>M</i> = 7.2 (SD = 4.0)	<i>F</i> = 4.086; <i>gl</i> = 78.513; n.s.
Increasing job opportunities	<i>M</i> = 18.7 (SD = 5.7)	<i>M</i> = 17.7 (SD = 6.0)	<i>F</i> = 0.054; <i>gl</i> = 90.387; n.s.
<b>CSH</b>			
Pleasure in learning	<i>M</i> = 38.8 (SD = 7.4)	<i>M</i> = 36.2 (SD = 9.2)	<i>F</i> = 3.192; <i>gl</i> = 104.310; <i>p</i> < 0.05
Lack of motivation	<i>M</i> = 7.1 (SD = 4.5)	<i>M</i> = 7.1 (SD = 4.0)	<i>F</i> = 0.460; <i>gl</i> = 138.044; n.s.
Increasing job opportunities	<i>M</i> = 18.1 (SD = 6.2)	<i>M</i> = 17.6 (SD = 6.3)	<i>F</i> = 0.269; <i>gl</i> = 123.039; n.s.

studies where the gender impact was analyzed in a great number of Australian universities (Sutherland et al., 2022), our main results regarding work overload and physical and mental health affections are similar. As Green et al. (2020) wrote in their paper, despite the very different parts of the world and particular positions concerning high education, numerous common themes reverberate about female students' condition during the pandemic. Another bias was that 57.2% ( $n = 328$ ) of the survey participants were female and only 36.1% ( $n = 207$ ) were male, so this could represent a potential preconception in the results. However, at the same time, it also shows that women are more participative and find time to get involved in extracurricular activities, even when they are overloaded with work.

We attempted to include sex-gender diversity in our study, however only 2.6% self-identified as gender fluid, 1.6% as non-binary, 1.2% as queer, 0.7% as male transgender, 0.2% as demiboy and 0.3% said they did not know, so it was not possible to include them in the statistics, but surely these cases of people with sex-gender diversity are very important and could provide valuable information, so they should be considered for future studies.

Before concluding, it is important to mention the constraints of data collection. Since the questionnaire was answered voluntarily through a Google form that was being promoted through various social networks, it is possible that not all of the university community would have been aware of it and therefore the opinion of these people was not taken into account. Also, 92% of the respondents were undergraduate students, so the results obtained cannot be extrapolated to graduate students.

## Conclusion

Our study confirmed that the COVID-19 pandemic negatively affected the school achievement of UAM-Iztapalapa students and their physical and mental health. Interestingly, female students, despite having more workload in the area of home and family, and reporting feeling affected by their physical and mental health compared to men, managed to pass a more significant number of subjects and dropped out of their studies less. The previous was associated with the results where the pleasure of learning was found to be positively related to the

expectation of increasing job possibilities in female students more than in male students, and in the positive relationship between academic efficacy and motivation. These results suggest that, despite the difficulties and even their health, women were more willing to get ahead in the academic and work environment. There is still a significant lack of gender sensitivity in the theoretical and methodological approaches used to define resilience as concurrent gender disparities in social position (for example, occupational status) and psychosocial responsibilities that can shape gender differences (Hirani et al., 2016).

Our study shows that female students experience greater work overload at home and face greater physical and mental health challenges compared to their male counterparts. Although these results are framed by what happened during the COVID-19 pandemic and remote education, they highlight the importance of considering gender-specific factors in education and health policies. Currently, remote learning is just one more alternative that students can take voluntarily, however, if the conditions that prevailed during the pandemic stage were to return, measures to reduce gender inequities should be considered. On the other hand, even in normal situations, these types of inequities prevail, so some measures that could help to contend with them are the installation of a department of psychological help, counseling, or mentoring for female students. In our institution, we have already initiated mentoring programs for female students in STEM graduate programs, in which personalized accompaniment is given to empower female students and help them balance academic and personal life (Stokes et al., 2021). It would be very useful to transfer these programs to female undergraduate students as well. Moreover, upon returning to face-to-face activities, the university rector took into account the results of this and other studies and formed a commission to address equity issues, whose objective is to treat university education from a gender perspective. The results of this effort will be worthy of future analysis.

In summary, this analysis reflects essential aspects that affect the development and decisions in the student's academic life for their professional life. More studies must be carried out and even follow up on these students to see if they continue their careers, especially in the STEM field, and if they reach authority positions or enter the SNI.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

## Author contributions

AS-G was involved in the analysis and interpretation of the data. All authors were involved in the study design, generation, collection,

discussion, and manuscript writing and approved the submitted version.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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