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Socio-environmental impacts of Covid-19 in an educational institution in the state of Pernambuco (NE – Brazil)

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Authors' notes'

The authors have no conflicts of interest to declare.

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Abstract

Aims: To assess the socio-environmental impacts of the Covid-19 pandemic on the academic community of the Federal Institute of Education, Science and Technology of Pernambuco (IFPE) - Cabo de Santo Agostinho *Campus*, through the analysis of possible changes in family occupation, income and monthly expenses, social distancing behavior, transportation, energy, water and internet consumption, food, waste generation and mask use.

Methodology: This exploratory and qualitative research was based on surveys with students, teachers, technical administrative education servers, and outsourced employees using structured questionnaires.

Relevance: Provide a deeper analysis of the pandemic's socio-environmental effects on an academic community at the local level.

Results: The data indicate that, during the Covid-19 pandemic (2020 and 2021), there was a drop in family occupation and income, an increase in water, energy, and internet consumption and an increase in both residential and transport expenses, an increase in low nutritional food consumption, and an increase in household waste production. Students comprised mostly of young people and women, were the most affected group.

Social contributions: This study reveals the need for the implementation of more effective social protection policies, especially for the most vulnerable groups, such as students, as well as the development of Environmental Education actions within the community aimed at reducing waste generation, to reduce the socio-environmental impacts of this period.

Keywords: Covid-19, lockdown, socio-environmental impacts, education, IFPE

Impactos socioambientais da Covid-19 em uma instituição de ensino do estado de Pernambuco (NE – Brasil)

Resumo

Objetivo: Avaliar os impactos socioambientais da pandemia de Covid-19 sobre a comunidade acadêmica do Instituto Federal de Educação, Ciência e Tecnologia de Pernambuco (IFPE) - *Campus* Cabo de Santo Agostinho, através da análise de eventuais mudanças na ocupação dos membros da família, na renda familiar e gastos mensais, na adesão ao isolamento social, nos meios de transporte utilizados, no consumo de energia, água e internet, na alimentação, na geração de resíduos e uso de máscaras.

Metodologia: A pesquisa, de caráter exploratório e abordagem qualitativa, foi baseada na aplicação de questionários estruturados aos discentes, docentes, servidores técnico administrativos de educação e colaboradores terceirizados.

Relevância: Proporcionar uma análise mais profunda sobre os efeitos socioambientais da pandemia em uma comunidade acadêmica em nível local.

Resultados: Os dados indicam que, durante a pandemia de Covid-19 (anos 2020 e 2021), houve queda na ocupação e na renda familiar, aumento do consumo de água, energia e internet e aumento dos gastos tanto residenciais quanto com transporte, aumento do consumo de alimentos de baixa qualidade nutricional, e aumento da produção de resíduos domésticos. Os discentes, compostos em sua maioria por jovens e mulheres, foram o grupo mais afetado pela pandemia.

Contribuições sociais: Este estudo revela a necessidade de implementação de políticas de proteção social mais efetivas principalmente aos grupos mais vulneráveis, como os discentes, bem como a elaboração de ações de Educação Ambiental junto à comunidade que visem a redução da geração de resíduos, a fim de minimizar os impactos socioambientais gerados nesse período.

Palavras-chave: Covid-19, lockdown, impactos socioambientais, educação, IFPE.

Impactos socioambientales del Covid-19 en una institución educativa del estado de Pernambuco (NE – Brasil)

Resumen

Objetivo: Evaluar los impactos socioambientales de la pandemia de Covid-19 en la comunidad académica del Instituto Federal de Educación, Ciencia y Tecnología de Pernambuco (IFPE) - *Campus* Cabo de Santo Agostinho, analisando posibles cambios en la ocupación y ingresos familiares, gastos mensuales, cumplimiento del aislamiento social, medio de transporte utilizado, consumo de energía, agua y internet, alimentación, generación de residuos y uso de mascarillas.

Metodología: La investigación, de carácter exploratorio y enfoque cualitativo, se basó en cuestionarios estructurados a estudiantes, docentes, servidores de educación técnica administrativa y empleados tercerizados.

Relevancia: Proporcionar un análisis más profundo de los efectos socioambientales de la pandemia en una comunidad académica a nivel local.

Resultados: Los datos indican que, durante la pandemia de Covid-19 (2020 y 2021), hubo una caída en la ocupación y los ingresos familiares, un aumento en el consumo de agua, energía e internet y un aumento en los gastos residenciales y de transporte, un aumento en el consumo de alimentos de baja calidad nutricional, y mayor producción de desechos domésticos. Los estudiantes, en su mayoría jóvenes y mujeres, fueron los más afectados por la pandemia.

Contribuciones sociales: Este estudio revela la necesidad de implementar políticas de protección social más efectivas, especialmente para los grupos más vulnerables, como los estudiantes, y el desarrollo de acciones de Educación Ambiental con la comunidad visando la reducción de la producción de residuos, para reducir los impactos socioambientales generados en este período.

Palabras clave: Covid-19, confinamiento, impactos socioambientales, educación, IFPE

Introduction

Covid-19 was discovered in January 2020 and declared a pandemic two months later, causing profound changes in the lives of everyone on the planet with major impacts on health, economy, and the environment. To halt the transmission of SARS-CoV-2, the new coronavirus, several health measures were implemented in several countries, such as social isolation or lockdown (WHO, 2020). These restrictive measures have had positive and negative effects, both in terms of socio-environmental and economic aspects (Behrwani et al., 2020; Malliet et al., 2020; Mousazadeh et al., 2021; Guenther et al., 2022).

The most obvious positive environmental impact of the lockdown was the improvement in air quality, when the reduction in fuel-based transportation and industrial activities led to a significant decrease in emissions of polluting gases such as nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and suspended particulate matter (PM). A decrease in air pollution has been detected in several countries, such as Italy (Donzelli et al., 2020), France (Malliet et al., 2020), the United Kingdom (Ali, Liu & Zhang, 2021), Spain (Baldasano, 2020), Argentina (Bolaño-Ortiz et al., 2020), Pakistan (Ali et al., 2021), India (Ambika et al., 2021), China (Ye et al., 2020), South Korea (Vuong et al., 2020), Egypt (Mostafa et al., 2021), USA (Straka et al., 2021) and Brazil (Dantas et al., 2020; Nakada & Urban, 2020).

Besides reducing atmospheric pollution, improvements in water quality due to reduced boat traffic have been reported in some regions of Italy (Braga et al., 2020), India (Prakash et al., 2021) and Central America (Callejas et al., 2021). The lower circulation of vehicles and boats has also led to a reduction in noise, both in terrestrial and aquatic environments (Kumar & Tyagi, 2020; Thomson & Barclay, 2020), allowing animals to appear in large cities (Newburger & Jeffery, 2020) and beaches (Ormaza-Gonzalez et al., 2021).

But the lockdown has also had negative environmental impacts, due to the increase in waste generation. Our consumption habits have been completely changed by social isolation, with the increase of online shopping and, as a result, a greater production of plastic and paper packaging (Graulich et al., 2021). Additionally, the increase in household waste generation as

people stayed home longer (Aldaco et al., 2020), along with the incorrect disposal of infectious waste such as masks and gloves (Kumar & Tyagi, 2020; Benson et al., 2021; Mejjad et al., 2021), have contributed to an increase in environmental degradation. Those materials have become a huge environmental problem.

The restrictive measures also directly affected the economy (Behrwani et al. 2020; Bolaño-Ortiz et al., 2020; Malliet et al., 2020; Bonardi et al., 2021), with negative impacts on global markets, from the stock exchange to supply chains, leading to an inflationary rise in food prices, to a threat to the solidity of small and medium-sized companies and to work retraction (Erokhin & Gao, 2020; Churchill, 2021; Goswami, Mandal & Nathy, 2021). Brazil, for example, suffered a loss in Gross Domestic Product (GDP) of *ca.* 140 billion dollars, while the GDP of Mexico suffered a loss of *ca.* 80 billion dollars, and India, of *ca.* 65 billion dollars, in 2020 alone (Behrwani et al., 2020).

Because of this financial crisis, the pandemic has accentuated social inequalities. The Economic Commission for Latin America and the Caribbean (ECLAC) together with the United Nations (UN) has shown that informal workers, women and young people, black and indigenous people, and migrants were the most affected by the unemployment rise. The unemployment rate for women in Latin America and the Caribbean rose by 12%, 4% more than for men. Unemployment among young people was double that of the adult population (UN & ECLAC, 2020b, 2021b, 2022).

A study on the socio-economic effects of the pandemic in 17 countries in Latin America and the Caribbean estimated that poverty would increase by 4.4% compared to 2019 if there were no mitigating action, which means that the poor population would represent 34.7% of the region (UN & ECLAC, 2020a). More than a third of formal jobs in this region come from the sectors critically affected by the pandemic, thus it has been estimated that 2.7 million formally established companies could close their doors, which means that 8.7 million people could become unemployed (UN & ECLAC, 2020c).

Some of the groups most affected by poverty and extreme poverty are children and adolescents, who represented 46.2% of the population living in poverty in 18 Latin American countries in 2018. It is estimated that the population of children living in poverty will increase by 76%, which means that one in two children and adolescents will be in this situation (UN, ECLAC, & UNICEF, 2020). In the projected scenarios for the increase in poverty and extreme poverty, Brazil ranked 2nd, with a poverty growth rate of between 22% and 25% and extreme poverty between 7% and 8%. The study also predicted a deterioration in the economic power of the middle and upper classes, where 6.7 million would suffer a decrease in purchasing power and 2.7 million would fall into poverty (UN & ECLAC, 2020a).

Another socio-economic effect of the pandemic is the increase in gender inequality. With the economic downturn and increased job insecurity, female participation in the labor market is expected to retreat to levels of over 10 years ago. This is because sectors with high risks of contraction and job losses, such as tourism, manufacturing, commerce (mainly small businesses), and paid domestic work, are mostly occupied by women. The wage gap between men and women exacerbates women's financial situation. In health, female workers earn at least a quarter less than men in countries such as Brazil, Panama, Chile, and Colombia (UN & ECLAC, 2021a).

This scenario has also been observed in other less favored regions such as Africa and South Asia (Chiwona-Karltun et al., 2021). In Pakistan, the pandemic has affected the livelihoods of over 7 million people (Rasheed et al., 2021). In South Asia, the most affected were young people and people in unfavorable socio-economic situations (Kusuma et al., 2021). In India, food insecurity was most aggravated during lockdown periods, when the suspension of the school feeding program affected millions of children and pregnant girls who were left without these benefits (Alvi & Gupta, 2020). The Indian regions most affected by Covid-19 and which were already experiencing economic problems, with the predominance of employment in the secondary and tertiary sectors, were the most impacted (Goswami, Mandal, & Nathy, 2021).

The overall health of the world population was also directly affected by the pandemic. In addition to the Covid-19 survivors who are still living with the after-effects of the disease (Proal & VanElzakker, 2021), social isolation has changed people's eating habits and exercise routines. Restrictions on movement combined with the psychological stress and boredom of isolation have led many people to consume more industrialized, ultra-processed products and alcoholic beverages (Bonaccio et al., 2021; Brandt et al., 2021, Marty et al., 2021; Robinson et al., 2021). On the other hand, countries with high rates of respiratory diseases due to air pollution, such as India, China, Mexico, and Brazil, have seen improvements in the health of their population due to the lockdown (Ye et al., 2020; Ambika et al., 2021; Behrwani et al., 2021).

Education has also been extremely impacted during the pandemic. School closures have affected 166 million students in Latin America and the Caribbean and have led to an education crisis. It is estimated that 24 million students worldwide will not return to school after the crisis. Digital technologies have become vitally important during periods of social isolation to ensure the continuity of remote learning, but many students in situations of social vulnerability have been unable to maintain their performance due to the difficulty of accessing the internet or acquiring digital devices such as cell phones, computers, or tablets (UN & ECLAC, 2020d, 2022; Besalti & Satici, 2022).

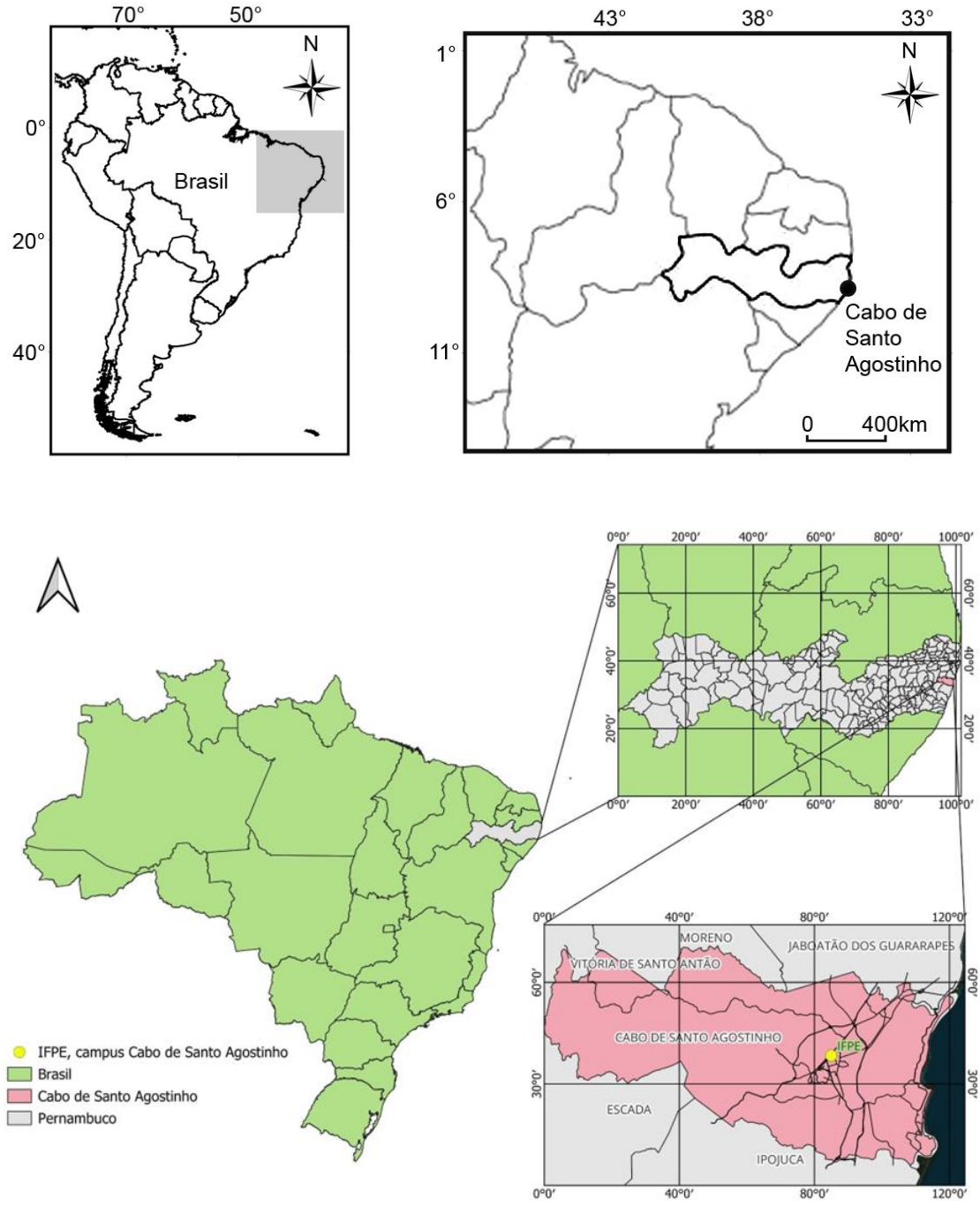
From a socio-environmental perspective, the impacts of the pandemic have therefore brought major challenges to the fulfillment of the Sustainable Development Goals (SDGs) of the 2030 Agenda (UN, 2015; UN & ECLAC, 2021b, 2022). The global health crisis has also resulted in a serious socio-environmental and economic crisis.

The impacts reported around the world prompted us to assess the socio-environmental effects of the pandemic at a local level, using the academic community of the Federal Institute of Education, Science and Technology of Pernambuco (IFPE) - Cabo de Santo Agostinho Campus as the target audience. Located in the municipality of Cabo de Santo Agostinho, state

of Pernambuco (Figure 1), the IFPE - Cabo de Santo Agostinho Campus occupies an area of 12,650 m², containing 01 administrative block, 02 classroom blocks with 15 rooms each, 01 library, 01 community center, 01 multi-sports gymnasium, 01 auditorium, 02 laboratory blocks and 01 canteen (IFPE, 2018). Currently, the academic community includes 526 students, 45 teachers, 37 technical administrative staff in education (TASEs), and 23 outsourced employees (IFPE, 2022a).

Figure 1

Study area



Source: The authors

Academic activities on campus were suspended on March 17, 2020, and resumed remotely in August 2020 (IFPE, 2020e). The next month, in September, in-office working hours were re-established, with staff working in shifts and all those in the at-risk group being kept in remote work (IFPE, 2020f). However, due to the worsening of the pandemic and the restrictions imposed by the Pernambuco state government, in-person activities were completely suspended in March 2021 (IFPE, 2021) and resumed in August 2021.

The aim of this research was therefore to assess the socio-environmental impacts of the Covid-19 pandemic on the academic community of IFPE - Campus Cabo de Santo Agostinho by analyzing possible changes in the occupation of family members, family income and monthly expenses, adherence to social isolation, means of transportation used, energy, water and internet consumption, food, waste generation and use of masks.

This study, which included students, teachers, technical staff, and outsourced employees, will provide a deeper analysis of the socio-environmental effects of the pandemic at a local scale, both in the short, medium, and long terms. This institution was chosen for this study because one of the authors of this research is an educational technical-administrative staff on this campus, and therefore had privileged access to contacting the academic community to carry out this research, additionally to having experienced the pandemic in her day-to-day work. The heterogeneous composition of the academic community at the IFPE Campus Cabo de Santo Agostinho allows us to assess how the impacts of the pandemic have been felt by the various social groups involved.

Methods

This exploratory and qualitative research was conducted using a social survey (Gil, 2008; Marconi & Lakatos, 2017) and was based on a structured questionnaire with 43 multiple-choice and one discursive question. Given that the total population is made up of four subgroups (students, teachers, technical-administrative staff in education (TASEs), and

outsourced employees) and that the proportion between them varies, a stratified sample was used to ensure greater representativeness for each subgroup (Barbetta, 2001; Gil, 2008).

The exclusion criteria used to define the total sample were: students who began in 2022, or who graduated before the questionnaire was administered, or who are pending completion and finished all due credits before 2020, or who did not have an email registered in the academic system and who were under 18, teachers, TASEs and outsourced employees who were away from their activities during the period in which the questionnaire was administered. The population at the time of the survey, after applying the exclusion criteria, was constituted of 383 students, 37 teachers, 31 TASEs, and 23 outsourced employees.

To calculate the ideal sample size, we used the formula defined by Gil (2008, p. 97-98) for calculating samples for finite populations, where the research population does not exceed 100,000 elements:

$$n = [(\sigma^2 * p * q * N) \div (e^2 (N - 1)) + (\sigma^2 * p * q)]$$

where N is the size of the total population, p is the percentage of verification of the phenomenon in the population, q is the complement of p (100 - p), σ^2 is the confidence level, and e^2 is the tolerated error. We used p = 50%, as it was not possible to estimate the percentage of the population interviewed for each option; σ^2 = 95% (standard deviation of two integers, equivalent to an average confidence level), e^2 = 5% (high maximum percentage error allowed, to reduce the necessary sample size and make the study viable).

The form was approved by the University of Pernambuco's Research Ethics Committee (CAAE: 52967221.1.0000.5192) and made available to the academic community via Google Forms, being sent both by email and via WhatsApp groups. The table below summarizes the topics and subjects of the questions that made up the form (Table 1).

Table 1

Summary of the topics and subjects of the questions in the form sent to the academic community of IFPE - Campus Cabo de Santo Agostinho

Topic	Subject
Sociodemographic data	Position at IFPE, gender, age, family size, COVID-19 deaths (6 questions).
Family members occupation	Changes in the amount of family members working (2 questions)
Family income and monthly expenses	Monthly family income and changes in monthly expenditure during the pandemic (4 questions).
Social isolation	Individual and family behavioral profile of social isolation measures in 2020 and 2021 (4 questions).
Transport	City of residence, commute to work, changes in transportation costs due to the pandemic (8 questions).
Energy, water, and internet consumption	Changes in consumption of energy, water, internet, and cell phone broadband with the pandemic (4 questions).
Diet	Changes in consumption of processed foods and alcoholic beverages, and shopping behavior with the pandemic (5 questions).
Household waste production and disposal	Changes in household waste generation and behavior regarding sorting and disposal (5 questions).
Mask use and disposal	Behavioral profile of the use and disposal of masks (6 questions).

Source: The authors

The form was available for 35 days, from March 26th, 2022 to April 30th, 2022. After this period, we had a total of 222 the population interviewed, 156 students, 22 teachers, 24 TASEs, and 20 outsourced workers. Although the total was relatively below the sample size needed for the expected level of confidence for students (n = 196), teachers (n = 34), TASEs (n = 28), and outsourced employees (n = 22), we decided to end the waiting period as we were unable to get any more responses after several attempts.

Results and Discussion

The answers to the forms are presented and discussed below, based on current literature, and divided into the following themes: a) sociodemographic data; b) family members occupation; c) family income and monthly expenses; d) social isolation; e) transport; f) energy, water, and internet consumption; g) diet; h) household waste production and disposal; i) mask use and disposal.

Sociodemographic data

The survey participants were 70% students, 10% teachers, 11% TASEs, and 9% outsourced employees, being 63.5% female and 36.5% male. Among the students, the majority defined themselves as female (72%), and 28% defined themselves as male. Among teachers and TASEs, the gender ratio was more balanced, with 55% female and 45% male among teachers and 50% of each among TASEs. Among outsourced employees, the majority defined themselves as male (80%) with only 20% female.

The predominant age group of the population studied was between 18 and 25 years old (43%), as students predominated, followed by the 31 to 40 age group (32%). Among students, as expected, the 18 to 25 age group predominated (60%), while among teachers, TASEs, and outsourced employees, the predominant age group is between 31 and 40 (55%, 67%, and 55%, respectively).

Considering family arrangements, 6% of the population interviewed live alone, 19% live with 1 person, 25% live with 2 people, 26% with 3 people, and 26% with 4 or more people. Most students live with 3 or more people (56%). Among teachers, the majority live with 2 people (27%) or 1 person (23%), among TASEs the majority also live with 2 people (25%) or 1 person (25%), and among outsourced employees, the majority live with 3 or more people (60%).

During the period studied, deaths from Covid-19 occurred in 27% of the interviewed population families. Among students, 28% reported that someone in their family died during the pandemic, and in 50% of cases the cause of death was Covid-19. Among teachers, 32% have

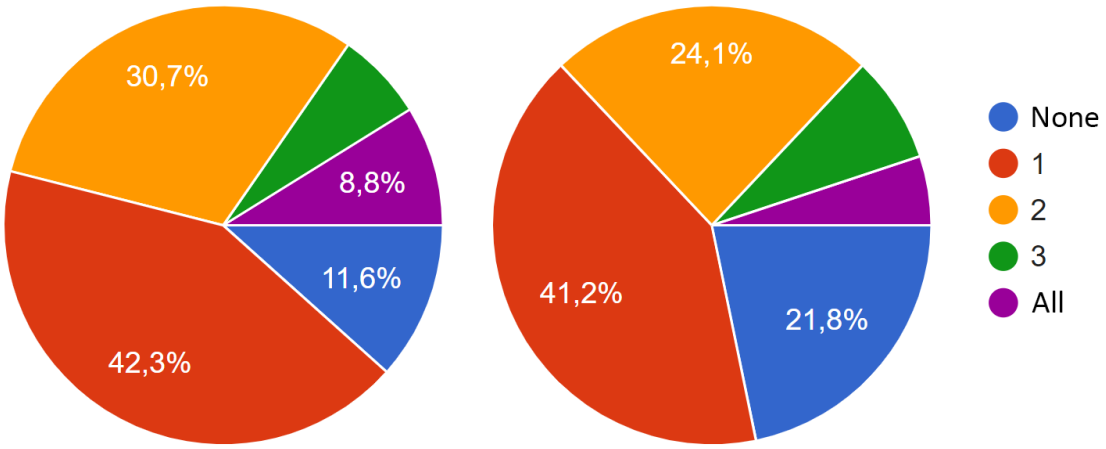
lost a family member, 57% of whom are due to Covid-19. In the TASE group, 17% lost a family member, 50% of which were due to Covid-19, and among outsourced employees, 20% lost someone in their family, all of which were due to Covid-19. These data indicate that at least 50% of the deaths recorded in the academic community were due to Covid-19.

Family members occupation

We observed a drop in occupation among the population interviewed. Before the pandemic, 42% of the interviewed population had one (1) person in the family working, 31% had two (2) people, 7% had three people and 9% had everyone in the family working. Only 12% of the interviewed population reported that none of their family members worked. With the pandemic, the proportion of families with no one working increased to 22%, while the proportion of families with two people working fell to 24%, and where all the people worked fell to 5% (Figure 2).

Figure 2

Number of family members working before (left) and during the pandemic (right).



Source: The authors

Among the students, 48% had one (1) person in their family working and 25% had two (2) people working. Currently, 45% of families have one person working and 16% have two people working. Only 14% of families did no member work before the pandemic. This rate rose to 29% after the pandemic. Among teachers and TASEs, there was no change in family occupation with the pandemic, but among outsourced employees, 35% of families had one (01) person working and 35% had two (02) people working before the pandemic. Currently, 50% of families have only one person working and 25% have two (2) people working.

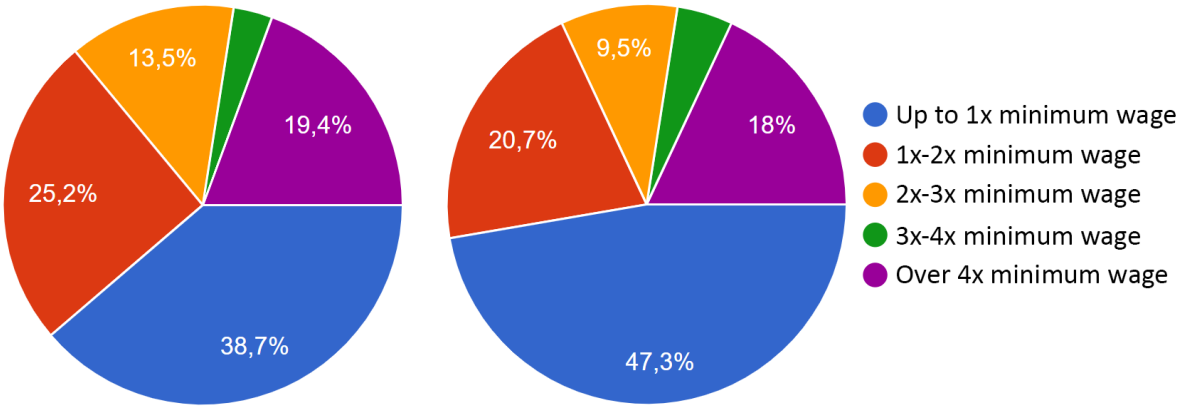
This data shows how the pandemic has affected the occupation of the IFPE - Cabo de Santo Agostinho Campus academic community, especially young people, and women, as observed in other regions of Latin America, Africa, and Asia (Chiwona-Karltun et al., 2021; Churchill, 2021; Kusuma et al., 2021; UN & ECLAC, 2021b, 2022; Rasheed et al., 2021). In the group of students, one of the most affected, the majority are within the age group of 18 and 25 (60%) and are women (72%), and in the case of outsourced employees, the majority of whom are men (80%), the drop in the occupation of their families from 2 people before the pandemic to 1 person after the pandemic shows the increase in unemployment among women. This data corroborates what the Social Panorama of Latin America 2021 (UN & ECLAC, 2022) points out about the setback of women's achievements in market participation during the pandemic.

Family income and monthly expenses

The drop in family occupation is reflected in a drop in monthly family income. Before the pandemic, 39% of the families of the population interviewed earned up to 01 minimum wage, 25% earned up to 02 minimum wages, 14% earned up to 03 minimum wages, 3% earned up to 04 minimum wages, and 19% earned more than 04 minimum wages. With the pandemic, the proportion of families receiving up to 01 minimum wage increased to 47%, while the proportion of families receiving up to 02 or 03 minimum wages fell to 20% and 17%, respectively (Figure 3).

Figure 3

Monthly family income before (left) and during the pandemic (right).



Source: The authors

Among students, there was a reduction in monthly income with the pandemic, consistent with the fall in family occupation. Before the pandemic, the monthly family income of 55% of students was up to 1 minimum wage, 25% was up to 2 minimum wages, 14% was up to 3 minimum wages, and 6% of students had 4 or more minimum wages. Currently, the monthly income of 61% of students is up to 1 minimum wage, 25% up to 2 minimum wages, 9% up to 3 minimum wages, and 5% of students are 4 or more minimum wages. We noticed a drop in the number of families with a monthly income of 3 or more minimum wages and an increase in those receiving up to 1 minimum wage.

Among teachers, there was no change in monthly family income with the pandemic, with 14% having a family income of up to 4 minimum wages and 86% having a monthly family income of more than 4 minimum wages. Among TASEs, there was a slight drop in monthly income. Before the pandemic, 83% had a monthly income of more than 4 minimum wages, 8.5% of up to 4 minimum wages, and 8.5% of up to 3 minimum wages. Currently, 75% earn more than 4 minimum wages, 12.5% earn up to 4 minimum wages and 12.5% earn up to 3

minimum wages. A slight drop in monthly income was also recorded among outsourced employees. Before the pandemic, 45% of the population interviewed had a monthly income of up to 1 minimum wage, 30% up to 2 minimum wages, and 25% up to 3 minimum wages. Currently, 5% of families earning up to 3 minimum wages now earn up to 2 minimum wages.

These data show, once again, that the group of students, mostly young and female, has been the most affected by the pandemic, with a significant drop in their monthly income, which was already low, with the majority surviving on up to one minimum wage. On top of this, most students (56%) live with 3 or more people, which further exacerbates the socio-economic situation of these families. These findings reinforce the need for social protection and food security policies inside and outside the institution, as pointed out in other studies (Alvi & Gupta, 2020; UN, ECLAC & UNICEF, 2020; UN & ECLAC, 2020a, 2021b, 2022). Indeed, some affirmative actions have been carried out by IFPE, such as solidarity campaigns, payment of benefits, and food distribution to students in social vulnerability, as well as social and pedagogical assistance (IFPE, 2020a, b, c, d).

Considering the perception of monthly income, 48% of the population surveyed perceived a drop in monthly income after the beginning of the pandemic, while for 41% monthly income remained the same. Only 11% perceived an increase in monthly income with the pandemic. As for the perception of spending, 81% perceived that monthly spending had increased, while only 10% perceived that it had decreased and for 9% it had remained the same.

The perception of a drop in monthly income and an increase in spending for most of the population interviewed corroborates the estimates of the UN and ECLAC (2020a) concerning the loss of purchasing power and the inflationary increase in food, also reported in other countries (Erokhin & Gao, 2020; Ma et al., 2020; Zhang et al., 2021). It also shows the great social and economic impact of the pandemic on the entire academic community of IFPE -

Campus Cabo de Santo Agostinho, especially on students, most of whom have a family income of up to one minimum wage.

Social isolation

During the first year of the pandemic (2020), 67% of the population interviewed left home only for essential activities (market, doctor, pharmacy), 19% stayed at home permanently and 13% went out exclusively to work. Only 1% said that they left home normally. Regarding the people in their family, the same pattern occurred: 67% went out only for essential activities, 14% stayed at home permanently, 14% went out exclusively to work and 2% went out normally.

In the second year of the pandemic (2021), there was a reduction in the proportion of those who stayed at home permanently (6%) and an increase in the proportion of those who left home normally (15%). Among those who went out only for essential activities and those who went out exclusively to work, the proportion remained similar to 2020 (63% and 16%, respectively). The same pattern of social isolation among those interviewed was observed for the other people in their families: 59% left home only for essential activities, 18% left normally, 16% left exclusively to work and 7% stayed at home permanently.

Analyzing the groups separately, in the first year of the pandemic (2020), the majority (75%) of students, teachers, and TASEs left home only for essential activities (market, doctor, pharmacy), while the majority (60%) of outsourced employees left home exclusively for work.

In the second year of the pandemic (2021), the same pattern was repeated, with the majority (69%) of students, teachers, and TASEs leaving home only for essential activities, and the majority (65%) of outsourced employees leaving exclusively to work. The difference was in those who went out normally in 2021 (19% of students, 5% of teachers, and 10% of TASEs) compared to those who stayed at home permanently in 2020 (20% of teachers and students, and 12% of TASEs).

The lower adherence to social isolation observed in 2021 reflects the reduction of restrictive measures with the resumption of economic and daily activities and vaccination

coverage increase among the population, as observed in other regions of the world (Straka et al., 2021; Winchester et al., 2021; UN & ECLAC, 2022).

Transport

Most students and outsourced employees live in Cabo de Santo Agostinho (63.4% and 55%, respectively), while most teachers live in Recife (54.5%). TASEs live in Recife (33.3%), Jaboatão dos Guararapes (29.1%) and Cabo de Santo Agostinho (29.1%). Others live in Barreiros, Camela, Escada, Ipojuca, Igarassu, Olinda, Paulista, João Pessoa and Maceió. Adding up the academic community groups, 54% of the total population sampled lives in Cabo de Santo Agostinho, 17% lives in Jaboatão dos Guararapes, 14% lives in Recife, and 9% lives in Ipojuca.

Considering the transportation used to get to work, 52% of the population interviewed has no private means of transport. Of those who do, 43% own a car, 28% own a bicycle and 16% own a motorcycle. For most of the population interviewed, commuting to IFPE - Campus Cabo de Santo Agostinho before the pandemic was by public transport (55%), followed by car (16%), on foot (7%), motorcycle (6%) or bicycle (3%).

During the pandemic, 50% of the population interviewed did not work, which corresponds to most of the students, 18% worked remotely, 12% worked in a hybrid mode and 20% worked in-person. Among the students, 69% answered that they did not work, 15% worked in-person, 11% worked remotely and 5% worked in a hybrid mode. Among teachers, remote work predominated (68%), among TASEs, hybrid work predominated (63%) and among outsourced employees, in-person work predominated (90%).

The reduction in the use of means of transportation during the pandemic led to a drastic improvement in air quality in several countries due to the reduction in the emission of polluting gases such as nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and suspended particulate matter (Behrwani et al., 2020; Bonardi et al., 2021; Zhang et al., 2021;

Guenther et al., 2022). In Brazil, this change has also been noticed in cities such as Rio de Janeiro and São Paulo (Dantas et al., 2020; Nakada & Urban, 2020).

Among those who worked in-person or in a hybrid mode during the pandemic, the predominant means of transportation used to get to campus was public transportation (36%) followed by car (23%), motorcycle (12%), and walking (8%). With the return of in-person activities, public transportation was used by 53% of the population interviewed, followed by cars (17%), walking (8%), and motorcycles (7%).

Among the students, 67% have no private means of transportation, and among those who do, 65% have a bicycle and 26% a car. To get to campus before the pandemic and when returning from in-person activities, most students use public transportation (73%) followed by walking (10%) or cycling (5%). Among the teaching staff, transportation by own car (75%) predominated both before the pandemic and after the resumption of in-person activities, followed by private transportation - Uber or cab (11%) and public transportation (5%) or carpooling (5%).

Among TASEs, their car predominated (56%), followed by public transportation (21%) and walking (4%), both before the pandemic and during and after the return to in-person activities. Bicycles and carpooling were used before the pandemic (4% each) and private transportation (Uber, cab) began to be used during the pandemic and after returning to in-person activities (12%).

Among outsourced employees, the use of their motorcycles (50%) predominated both before and during the pandemic and after the return to in-person activities, followed by their car (20%), public transport (18%), and carpooling (5%). It should be noted that 11% of students interviewed did not study on campus before the pandemic, 9% of teachers, 4% of TASEs and 5% of outsourced employees did not work on campus before the pandemic.

The expenditure on transportation increased for 86% of the population interviewed, while only 5% perceived a decrease and 9% could not say whether it had increased or decreased.

Analyzing by group, 83% of students, 95% of teachers, 100% of TASEs, and 85% of outsourced employees perceived an increase in transport costs.

In fact, during the years 2020 and 2021, fuel prices in Brazil suffered drastic increases, both due to pent-up demand with mobility restrictions at the beginning of the pandemic, and the rise in the dollar, causing major social impacts (Losekann et al., 2020; Cypreste, 2021; Vilela, 2021).

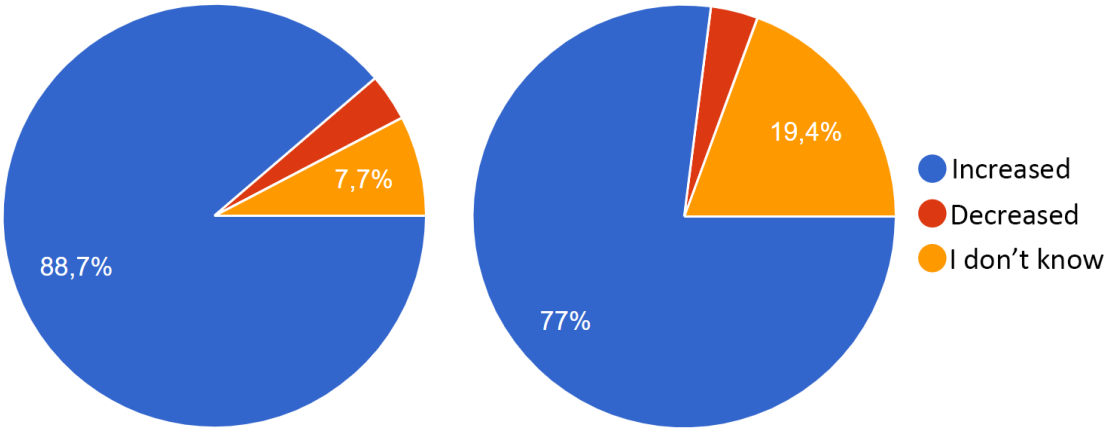
We also noticed a clear difference between the means of transportation used by each group interviewed. While public transport, mainly buses, is the main means of transportation for students, most teachers and TASEs travel by car, and most outsourced employees travel by motorcycle. Despite the change in family income, there has been no change in the type of transportation used, even with the rise in fuel prices. Even though most students and outsourced employees live in the municipality of Cabo de Santo Agostinho, few use bicycles as a means of transportation, which would greatly reduce fuel costs, not to mention it is a healthier and more sustainable way of traveling. However, this would require infrastructure work in the municipality to ensure safe travel for cyclists.

Energy, water, and internet consumption

The consumption of energy, water, and internet (both at home and on cell phones) increased for the majority of those interviewed. Regarding energy consumption, 89% saw an increase, while only 4% saw a reduction in consumption and 8% could not say whether it had increased or decreased. Regarding water consumption, 77% saw an increase, 4% saw a reduction and 19% could not say whether it had increased or decreased (Figure 4).

Figure 4

Change in energy consumption (left) and water consumption (right) during the pandemic.

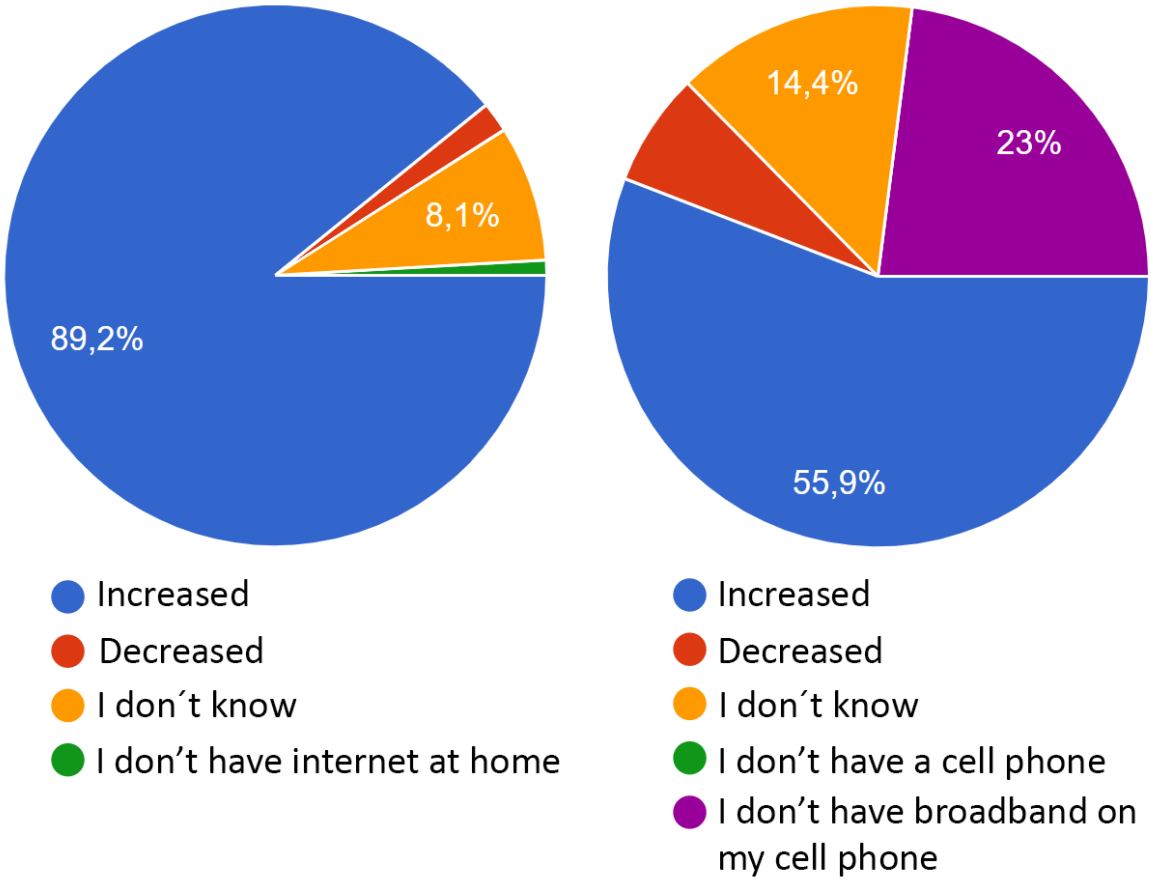


Source: The authors

Internet consumption also increased for the majority of those interviewed - 89%. Only 8% could not say whether it had increased or decreased, 2% reported a reduction in internet consumption and 1% do not have internet at home. The same pattern was observed with the perception of broadband consumption via cell phone, where 56% reported an increase in consumption, 14% could not say whether it had increased or decreased, 7% reported a reduction in consumption and 23% did not have a broadband contract via cell phone (Figure 5).

Figura 5

Change in internet (left) and mobile broadband (right) consumption during the pandemic.



Source: The authors

The increase in the consumption of water and energy, internet, and broadband due to the pandemic is the result of remote work. This pattern, observed in other countries (Krart & Aldubyan, 2021; Tleuken et al., 2021; Besalti & Satici, 2022; Cahill et al., 2022; Gudiño et al., 2022) has accentuated the financial crisis, as these are additional expenses that did not exist in in-person classroom conditions.

In addition to these expenses, many students have had to purchase electronic devices to attend remote classes, increasing the economic deficit generated by the pandemic. Many students do not have a broadband contract on their cell phones, which also hinders access to

digital technologies, as reported in other regions (UN & ECLAC, 2020d). to address this, IFPE opened a digital inclusion call to donate chips with data plans to students in social vulnerability situation to ensure the continuation of their studies during remote class periods (IFPE, 2020g).

Diet

Consumption of industrialized, processed, or ultra-processed foods has also increased with the pandemic for most of the population interviewed (63%). For 17%, consumption of these foods has decreased, for 16% it was not possible to perceive an increase or decrease and 5% do not consume this type of product. This pattern was also observed when analyzing the groups separately: 67% of students, 54% of TASEs, and 70% of outsourced employees perceived an increase in the consumption of these foods. Among the teaching staff, 36% saw an increase, and 36% saw a decrease in the consumption of these foods. The proportion of people who do not consume these foods is low in all groups: 5% of students, 9% of teachers, 0% of TASEs, and 10% of outsourced employees.

This same pattern has been observed in many countries such as Spain, Italy, Denmark, Germany, Slovenia, France, and the USA, and is related to various factors such as problems in going out shopping, increasing the consumption of delivered food, the difficulty of stocking up on fresh food for long periods, reduced purchasing power and therefore the need to reduce spending on fruit and vegetables, which are generally more expensive than processed, canned or sausage foods, as well as emotional and psychological issues such as boredom and stress leading people to neglect their diet (Aldaco et al, 2020; Bracale & Vaccaro, 2020; Bonaccio et al., 2021; Janssen et al., 2021; Marty et al., 2021; Zhang et al., 2021). Inadequate nutrition combined with the lack of physical exercise due to confinement and stress have increased the possibility of heart disease during the pandemic, especially for those who already have some comorbidity (Bonaccio et al., 2021; Robinson et al., 2021).

Regarding alcohol consumption, the majority of those interviewed (60%) do not consume alcohol. Of those who did, 38% saw an increase in consumption and 43% saw a decrease,

while 19% were unable to answer whether consumption had increased or decreased. Analyzing the groups separately, 67% of students do not consume alcoholic beverages, 13% noticed an increase in consumption, and 13% noticed a reduction. Among the teaching staff, 18% did not consume alcohol, 32% noticed an increase, and 36% noticed a decrease. Among TASEs, 46% do not consume alcohol, 29% noticed an increase, and 17% a decrease. Among outsourced workers, 70% do not consume alcoholic beverages and 25% perceive a decrease in consumption.

Shopping for food via app or phone delivery increased for 55% of the population interviewed. For 15%, consumption by delivery decreased and 30% did not know how to answer. The same pattern was observed when comparing the groups separately: 50% of students, 77% of teachers, 71% of TASEs, and 45% of outsourced employees noticed an increase in the use of this service during the pandemic. This data corroborates the increase in consumption of industrialized, processed, or ultra-processed foods, which are the types of food most requested in delivery services.

When food consumed by delivery before and after the pandemic was analyzed, snacks predominated (28% before and 23% after), followed by meals (20% before and after), fast food (17% before and 19% after) and items from the basic food basket (8% before and 11% after). Despite an increase in the consumption of food by delivery, there was no change in the proportion of items consumed by the population studied. Analyzing the groups separately, among students the consumption of snacks (48% before and 38% during the pandemic) and fast food (26% before and 34% during the pandemic) predominated. Meals accounted for 18% and 23% of student purchases before and during the pandemic, respectively. Among outsourced employees, snacks also predominated and among teachers and TASEs, meals predominated.

The analysis of the types of food consumed by delivery by most of the population interviewed corroborates the eating habits observed, with a low nutritional index and large

quantities of industrialized and ultra-processed foods. These habits have been exacerbated by the pandemic, both because of the lockdown and the reduction in people's purchasing power, which could increase future health problems. Remote activities during the pandemic led to an increase in the total workload, as commuting time was replaced by such activities. This also led to an increase in stress levels, which were already exacerbated by the health crisis.

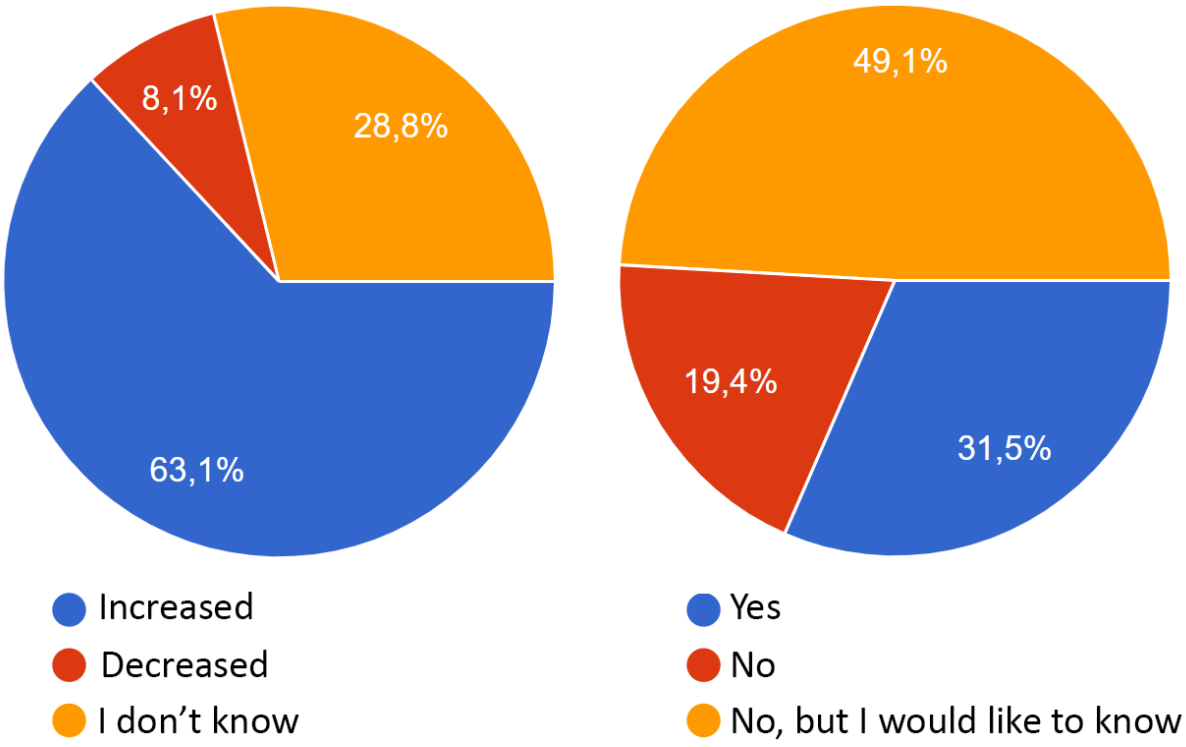
When we analyzed the type of food consumed by the group, we noticed that those with lower purchasing power (students and outsourced employees) consumed cheaper food with a lower nutritional index (snacks and fast food) while teachers and TASEs with higher incomes consumed more meals. This same pattern was observed in a study carried out in the USA which revealed a drop in the quality of food among the unemployed during the lockdown (Zhang et al., 2021). The increase in poverty and the retraction of work among young people and women in the aftermath of the pandemic tend to result in a worsening of food and nutritional insecurity (UN & ECLAC, 2021b).

Household waste production and disposal

Household waste production increased for most of the population interviewed (63%). Only 8% reported a decrease in waste production, while 29% were unable to answer whether it had increased or decreased. When asked if they knew of any way to reduce household waste production, 32% said yes, 19% said no and 49% said no but would like to know. Analyzing the groups separately, 28% of students, 55% of teachers, 29% of TASEs, and 40% of outsourced employees answered that they know of ways to reduce waste production, and 53% of students, 23% of teachers, 63% of TASEs and 30% of outsourced employees answered that they do not, but would like to (Figure 6).

Figure 6

Change in household waste production during the pandemic (left) and responses about knowledge of ways to reduce this production (right).



Source: The authors

Those who answered yes were then asked descriptively (without multiple choice options) what ways they use to reduce the production of household waste. The answers ranged from recycling, reusing, conscious consumption, reducing purchases, separating waste, using returnable or recyclable bags, reducing the use of disposable plastic bags, composting, reusing food for fertilizer or animal feed, reusing food, using packaging, reducing the use of disposable items, applying the 5R's policy, monitoring food in the fridge to avoid waste, buying products in large packaging, buying less packaged food, buying products in recyclable packaging.

When asked about the existence of selective waste collection where they live, 53% answered that there is selective collection and 40% answered that there is not. Only 7% do not know if selective collection takes place where they live. Analyzing the groups separately, 58% of students, 27% of teachers, 33% of TASEs, and 65% of outsourced employees confirmed the presence of selective collection where they live. However, when asked if they separate their waste at home, 54% of the population interviewed said that they do not, 30% separate it into wet (organic) and dry (the rest), and only 16% separate waste into types of material (glass, metal, plastic, and paper), in addition to organic waste. Analyzing the groups separately, only 26% of students separate into wet and dry and 15% separate into 5 types, 45% of teachers separate into wet and dry and 23% separate into 5 types, 38% of TASEs separate into wet and dry and 8% separate into 5 types, and 35% of outsourced employees separate into wet and dry and 20% separate into 5 types.

The increase in household waste generation observed by the interviewees is the expected result of the lockdown period, where meals are now produced and consumed at home, as observed in other studies (Aldaco et al., 2020). In addition, online shopping has significantly increased the amount of plastic and cardboard waste derived from packaging (Graulich et al., 2021). According to the Brazilian Association of Public Urban Cleaning and Waste Companies (ABRELPE), the generation of municipal solid waste (MSW) in 2020 was directly influenced by the COVID-19 pandemic, with estimates that each Brazilian generated an average of 1 kg of waste per day (ABRELPE, 2021).

The fact that most of the academic community is unaware of ways to reduce domestic waste production is striking, especially as this is an educational institution. On the contrary, among those who said they were unaware of ways to reduce waste, the majority were willing to learn, which indicates an openness to environmental education initiatives in the community. The only group in which more than 50% answered that they knew about ways to reduce waste was

teachers, showing that there is a need for greater transmission of this knowledge from teachers to the rest of the community.

As for selective waste collection, the majority (54%) do not separate waste at home, although the majority (53%) confirmed that this service exists where they live. This data again points to the need for education in the community, raising awareness of the problem of waste pollution and ways to reduce consumption, reuse, or recycle it.

Mask use and disposal

When asked about the types of masks used most often, 63% of the population interviewed wore cloth masks, 28% wore disposable surgical masks and 8% wore PFF2 or N95 masks. Analyzing by group, most students (70%) and outsourced employees (75%) used cloth masks most often, while most teachers and TASEs (50%) used disposable surgical masks. Only 6% of students, 14% of teachers, and 12% of TASEs used PFF2/N95 masks. As for how often they changed, 24% changed only once a day, 47% changed twice a day, 16% changed 3 times or more and 13% did not change their masks at all.

The safest and most efficient masks for containing the new coronavirus, according to the World Health Organization (WHO), are those of the PFF2/N95 type (WHO, 2022). However, they are more expensive and therefore difficult to access for most of the population. The data obtained in this research shows that most of the academic community uses fabric masks, which are not the most recommended, offering a less secure barrier, but which are more economically viable as they are reusable. The frequency of changing depends on the comfort of the user and the type of mask used, but it is generally recommended to change every 2-3 hours of use (WHO, 2022).

The use of masks by the community surveyed changed between the first and second year of the pandemic. In 2020, 95% of the population interviewed wore a mask to go anywhere. Only 3% only wore a mask indoors or in crowded places, 2% did not wear a mask, only when it was mandatory to access certain environments and 1% did not wear a mask at all. In 2021, the

number of people who wore masks anywhere fell to 77% of the population interviewed, while those who only wore them indoors or in crowded environments rose to 20%. Regarding the perception of the care taken when wearing masks, 54% stated that they remain as cautious, 35% stated that they have decreased their use of masks and 11% do not wear masks, only when it is mandatory.

The release of the mandatory use of masks in open places in the state of Pernambuco was decreed on March 29th, 2022, through Decree No. 52.504, of March 28th, 2022, and soon after, on April 20th, 2022, the use of masks in closed places ceased to be mandatory, through Decree No. 52.630 of April 19th, 2022 (Pernambuco, 2022a, b). However, we noticed that a portion of the population interviewed had already begun to relax their use in 2021, with the reduction in the number of cases and deaths and the increase in the population's immunization rate (Secretaria de Saúde de Pernambuco [SES-PE], 2022). This attitude, observed in several Brazilian states, as well as in various regions of the world, has contributed to an increase in the transmission of the virus and, therefore, its evolution, leading to the emergence of new variants (Centers for Disease Control and Prevention [CDC], 2022).

As for disposing of the masks, most interviewees (68%) stated that they dispose of them in the garbage can, while only 12% separate them to send to the infectious material collection, and 20% wash the masks because they are made of fabric. IFPE Protocol No. 28 states that disposable masks must be deposited in a specific place for infectious materials (IFPE, 2022b), however, most of the community does not practice these recommendations, disposing of the masks in any garbage can. This attitude has generated a large accumulation of this infectious and non-biodegradable material, which accumulates in the streets, rivers, and seas, causing a huge environmental problem (Kumar & Tyagi, 2020; Benson et al, 2021; Mejjad et al., 2021).

Conclusions

The study reveals that the socio-environmental impacts of the pandemic on the academic community of IFPE - Campus Cabo de Santo Agostinho have been heterogeneous. Although the drop in occupation and family income and the increase in spending during the pandemic have occurred to a greater or lesser extent, for all groups belonging to this community, students have been the hardest hit. This group, made up mostly of young people and women, has larger families and lower family incomes, greatly compromising their livelihoods.

The social vulnerability of the IFPE - Cabo de Santo Agostinho Campus student population coincides with the data obtained in several other regions of Latin America, Africa, and Asia, reinforcing the need for more investment in social protection and care policies aimed at young people and women in this community. Increasing the value of academic maintenance grants and expanding their coverage, for example, could help to reduce school dropout in the aftermath of the pandemic.

The social and environmental impacts of Covid-19 are inseparable, as this study has shown. The increase in waste generation and the community's lack of knowledge about how to manage it indicates the urgent need to develop effective Environmental Education actions with the community aimed at proper waste management, to minimize the socio-environmental impacts generated during this period. To this end, the implementation of selective waste collection on campus with colored containers for each type of waste will contribute to both better waste management and environmental awareness in the community.

It should be noted that this study represents a specific cross-section of an academic community at a public High Education Institution located in an area far from a major urban center, and although it shows behavior similar to that observed in studies carried out in other countries, it should not be extrapolated without a more critical analysis of the particularities of each location.

Long-term monitoring of this and other communities studied during the pandemic is necessary to assess the social and environmental impacts of Covid-19 on a more permanent basis. In addition, it is important to assess what actions have been taken and what policies have been implemented since then to provide greater social and environmental security, especially for the most vulnerable populations.

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