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University Restaurant and Food Security: A Case Study at the State University of Ponta Grossa[1]

Restaurante Universitário e Segurança Alimentar: Um Estudo de Caso da Universidade Estadual de Ponta Grossa

Restaurante Universitario y Seguridad Alimentaria: Un Estudio de Caso de la Universidad Estatal de Ponta Grossa

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Abstract: This study aimed to analyze the importance of University Restaurants (URs) in mitigating food insecurity (FI) among undergraduate students at the State University of Ponta Grossa (UEPG). The research was conducted with a stratified probabilistic sample of UEPG students between August and November 2023. The measurement of students' food (in)security was carried out using the FAO methodology, while the Propensity Score Matching method was used to analyze UR's impact on mitigating FI. The results indicated that students who use the UR tend to present a lower degree of food insecurity on average when compared to a similar group.
Keywords*:* Food (in)security; University Restaurant; Student Assistance; Propensity score matching.

Resumo: Este estudo teve como objetivo analisar a importância dos Restaurantes Universitários (RUs) na mitigação da insegurança alimentar (IA) entre estudantes de graduação da Universidade Estadual de Ponta Grossa (UEPG). A pesquisa foi realizada com

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uma amostra probabilística estratificada de estudantes da UEPG, entre agosto e novembro de 2023. A mensuração da (in)segurança alimentar dos alunos foi realizada utilizando a metodologia da FAO, e a análise do impacto do RU na mitigação da IA foi conduzida por meio do método *Propensity Score Matching*. Como resultado, observou-se que os estudantes que utilizam o RU, na média, tendem a ter um menor grau de insegurança alimentar quando comparados a um grupo similar.
Palavras-chave*:* (In)Segurança alimentar; Restaurante Universitário; Assistência Estudantil; *Propensity score matching*.

Resumen: Este estudio tuvo como objetivo analizar la importancia de los Restaurantes Universitarios (RUs) en la mitigación de la inseguridad alimentaria (IA) entre estudiantes de pregrado de la Universidad Estatal de Ponta Grossa (UEPG). La investigación se realizó con una muestra probabilística estratificada de estudiantes de la UEPG, entre agosto y noviembre de 2023. La medición de la (in)seguridad alimentaria de los estudiantes utilizó la metodología de la FAO, y el análisis del impacto del RU en la mitigación de la IA fue conducido mediante el método de *Propensity Score Matching*. Los resultados indicaron que los estudiantes que utilizan el RU tienden a tener, en promedio, un grado menor de inseguridad alimentaria en comparación con un grupo similar.
Palabras clave: (In)Seguridad alimentaria; Restaurante Universitario; Asistencia Estudiantil; *Propensity score matching*.

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Introduction

Food security is defined as the right to have regular and permanent access to sufficient quality food without compromising other essential needs. Food insufficiency has several harmful effects on the individual's life, including illnesses, body malformation, physiological obstacles to work, child and mother's death, and poor physical and mental development, which result in low school performance. To break the famine vicious cycle, specific policies are needed, with both short and long-term effect. The former include immediate actions with the purpose of changing poverty conditions. One way of breaking such cycle, according to the specific literature, refers to the inclusion of socially vulnerable populations in higher education (Blom *et al.*, 2002).

From the 2000s onwards, different policies have been implemented in Brazil (such as affirmative actions or quota policies), incentivizing the insertion of disadvantaged individuals in higher education. However, when low-income students enter university, their disconnection with the poverty cycle is not immediate. They start to form their human capital, which tends to improve their future socioeconomic conditions, but their current social vulnerability remains. In fact, while still in university, these students face several social

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precariousness such as low income, precarious jobs, little time for studies, long distance to the university, and lack of proper meals for efficient learning.

In the specific case of the latter issue, the University Restaurant (UR) might play a crucial role in the mitigation of food insecurity among low-income students, by offering affordable and nutritious food. URs are part of a set of actions resulting from student policies, which seek to optimize university students' social rights, mainly aiming to overcome food and nutrition insecurity (FNI).

Therefore, it is relevant to examine the URs' importance in university students' food security, with special emphasis on those that are most socially vulnerable. This is the objective of this research, namely, to analyze the UR importance in mitigating food insecurity among students at the State University of Ponta Grossa (UEPG). To achieve this aim, this study is organized in five sections including this introduction. The second section presents the origin and objectives of URs. It is followed by the methodology presented in the third section. Data analysis is found in the fourth sections, while the fifth section presents the final considerations.

University Restaurants: origin, objectives and their relation to food insecurity

The first Brazilian URs appeared in the 1950s and 1960s, inaugurated by the University of Brazil, in Rio de Janeiro (MEC, 1984), whose main purpose was to meet food requirements of students who stayed at the university for long periods. It was a response to the needs of a specific population, many coming from other cities, who shared accommodation in houses or apartments. Depending on limited financial support, those students sought low-cost food options, in an effort to save money for the maintenance of minimum expenses during their academic trajectory.

Only quite recently, the National Students' Assistance Policy (PNAES, Brazilian acronym for Política Nacional de Assistência Estudantil) [Law 14.914 of July 03, 2024] included a program that is specifically related to URs and is destined to promoting and guaranteeing students' food and nutrition security by developing teaching, research and outreach activities in the academic space. This program is called Healthy Food in Higher Education Program (PASES, Brazilian acronym for Programa de Alimentação Saudável na Educação Superior) (Brasil, 2024).

The law provides, in chapter IV, Art. 14, that:

> Federal higher education and federal professional, scientific and technological education networks must act to provide proper spaces for

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> the offer and consumption of food, by creating university restaurants and making them available to work as spaces of cultural education and citizenship (Brasil, 2024, p.1).

Therefore, URs are part of students' assistance (SA) in universities, and their purpose is to offer low-cost or free quality meals, to provide for the needs of the students' community aiming to guarantee their permanence (Souza, 2022). However, the law of 2024 is destined to federal higher education institutions, while in state, district or municipal institutions its application is conditioned to the availability of financial resources (as provided for in article 2nd - Brasil, 2024).

It seems relevant to highlight that apart from the supply of proper food, URs also contribute to the creation of a welcoming environment for social interactions among students, where resocialization might help to reduce stress and promote a feeling of belonging to the academic community, thus promoting their permanence at university (Souza, 2022).

Research has demonstrated the impacts of food insecurity on higher education students, as well as the relevance of URs in the reduction of such effects. In an international study, where students from a public university in the state of California were interviewed, Meza *et al.* (2019) analyzed the psychosocial impacts of food insecurity in the daily life of the participants, and reported feelings such as stress, sadness, fear, resentment, difficulty to establish social relationships and, mainly, a feeling of hopelessness and frustration with the lack of institutional support.

Regarding their impact on the participants' performance, those authors identified that physical symptoms of hunger and conflict between focusing on food or studies were situations frequently reported by those students.

In Brazil, a study carried out by Pereira and Alves (2022) revealed that during the Covid-19 pandemic, around 35% of students depended on the UR for their daily meals. Due to limited access during that period, many students lost this important source of food, which resulted in a significant increase in the cases of food insecurity and eating disorders. Researchers indicated that the fact that URs had to close during the pandemic, without a clear alternative for them, many severe eating disorders resulted, mainly for those that live away from their family homes. This fact shows the importance of URs in the context of student assistance policies.

As regards university students affected during the Covid-19 pandemic, Araújo *et al.* (2021) carried out a study aiming to assess the prevalence of food insecurity among students

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living in the students' home at the University of São Paulo (USP) and found out that 84.5% of them experienced food insecurity, which was worsened during the pandemic period.

This data shows that the need for social isolation added to the instability of income and work might have caused reduction in the access to food and nutritional quality by those students (Jaime, 2020). Therefore, university students who were already in a vulnerable situation before the pandemic experienced even harder times with the Covid-19, and consequently with the URs suspension during that period (Araújo, 2022).

Methodology

The data analyzed in this study was collected by means of research conducted by the Research Center "Environmental, Gender and Poverty Issues" (Núcleo de Pesquisa "Questão Ambiental, Gênero e Condição de Pobreza"), which belongs to the Social Sciences Graduate Program of UEPG.

The research was developed based on a stratified probabilistic sample of undergraduate students at UEPG, using a 99% confidence interval and a margin of error of 3.0 percentage points. The institution recorded 6,731 students enrolled in August 2023, the research selected a random sample of 1,435 students, considering the proportion of students in each course and study hours in relation to the total number of students in the institution. The questionnaire was applied using the google forms made available via institutional online access. The questionnaire was previously approved by the Ethics Committee with number 65555422.0.0000.0105.

Initially, the data analysis measured food (in)security of each student using the FAO methodology[6]. Chart 1 shows the questions used to measure food (in)security:

[6] The FIES methodology (*The Food Insecurity Experience Scale*) by FAO (United Nations Food and Agriculture Organization) is commonly evaluated by the Item Response Model (*Rasch*), a statistical approach that estimates parameters for items and respondents on a unidimensional scale. *Rasch* seeks to provide an accurate and comparable measurement of food insecurity, mainly in comparisons between populations or over time. In this article, we opted for a more descriptive approach due to the main objective of obtaining a general measurement of food vulnerability within the university students' population. We focused on broader insights, rather than on a scale detailed analysis, aiming to provide practical data to inform interventions or policies. Therefore, we chose a direct approach to favor the practical usefulness of the results in decision making.

ISSN 2238-8346
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Chart 1- Questions in the Food Insecurity Experience Scale (FI) -FAO

Question: "In the last 12 MONTHS, ..."	Description	FI
1. were you worried about not having enough food, lack of money or other means?	Uncertainty and concern related to food	Mild
2. weren't you able to have healthy and nutritious food due to lack of money or other means?	Food unsuitable quality	Mild
3. did you eat only few types of food, due to lack of money or other means?	Food unsuitable quality	Mild
4. did you have to skip some meals because you had no money or other means to obtain some food?	Insufficient amount of food	Moderate
5. did you eat less than you thought you should eat due to lack of money or other means?	Insufficient amount of food	Moderate
6. did you run out of food at home due to lack of money or other means?	Insufficient amount of food	Moderate
7. did you feel hungry, but did not eat because you had no money or other means to obtain food?	Insufficient amount of food	Severe
8. didn't you eat at any time of the day due to lack of money or other means?	Insufficient amount of food	Severe

Source: FAO (2018).

The answers to the questions listed in Chart 1 were analyzed to assess the level of food insecurity among undergraduate students at UEPG in August/November 2023. An affirmative answer by the respondent indicated the presence of food insecurity. Each question represents a degree of food insecurity, which broadens progressively towards the final questions. Thus, participants can be classified into groups called food insecurity, mild food insecurity, moderate food insecurity or severe food insecurity.

Apart from the questions related to food insecurity, participants were asked about their socioeconomic and demographic characteristics and the UR use. One of the points analyzed was the use of the UR as the place where students have their main meal of the day. After data collection, the Logit model was applied aiming to identify factors that increased the chance of the UR being the place where students had their main meal of the day, whose estimation details are explained below.

A frequency analysis was also carried out to relate each student's food (in)security with their UR use, as well as to analyze the weekly frequency of UR use by them in relation to different degrees of food insecurity. Finally, to identify the UR use impact on the mitigation of degrees of food insecurity, the Propensity Score Matching method was applied, which is also explained below.

ISSN 2238-8346
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- Logit model and empirical strategy

The Logit model is a statistical technique which allows the prediction of values of a categorical variable, which is frequently binary, based on continuous and/or binary explaining variables. This technique is useful to model the probability of occurrence of an event as a function of several factors (Wooldridge, 2017).

In the Logit model, the binary dependent variable is adjusted to a probability curve according to the logistic regression function (1). In this equation, the event occurrence probability is represented by P, while 1 - P represents the event non-occurrence probability. The Logit transformation of the dependent variable is given by ln(P/(1-P)), and the regression coefficients (bi) indicate the effect of the independent variables (X) on the event occurrence probability (Y).

$$\widehat{y}^{VD} = \underbrace{ln\left(\frac{P}{1-P}\right)}_{\text{logit}} = b_0 + b_1 X_1 + \cdots + b_i X_i \qquad (1)$$

It seems relevant to highlight that in the Logit model probabilities do not increase linearly with independent variables but follow an accumulated logistic function. Therefore, the chances of success increase or decrease with independent variables up to reaching a saturation point, in which few differences are observed.

Due to the impossibility of estimating directly Logit values for individual observations, estimates are obtained by means of the Maximum Likelihood method. To test the null hypothesis that all angular coefficients are equal to zero, the likelihood ratio statistics is used.

Therefore, a Logit model was estimated to analyze the chances of UEPG students using the UR (binary dependent variable: 1 if yes and 0 if no). The explaining variables used were as follows: Sex (1 for female and 0 for male); Age; Color (1 for white and 0 for non-white); Quotas (1 for quota beneficiary and 0 for non-beneficiary); Per capita income; Social Program (1 for beneficiary of social programs and 0 for non-beneficiary); Scholarship (1 for scholarship beneficiary and 0 for non-beneficiary); Living in Ponta Grossa (1 for living in the city and 0 if living somewhere else); Rented home (1 if paying rent and 0 if not); Teaching courses (1 if a student in a teaching course and 0 if non-teaching course); Children (1 if being a parent and 0 if no children); Woman with children (1 if woman with children and 0 if not).

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- Propensity Score Matching and empirical strategy

Propensity Score Matching is a statistical strategy employed to mitigate bias in observation studies, mainly when seeking to estimate the effects of an intervention or exposure of a certain population. In this study, Propensity Score Matching was used to balance the characteristics of students using the UR and those who did not use it, aiming to understand the UR impact on the food insecurity of UEPG undergraduate students.

To calculate the propensity score, we employed a Logit regression model in which "UR use" or not was a dependent variable (binary variable, whose values corresponded to 1 and 0, respectively), while being benefitted by some social program (binary variable, proxy for the poverty condition), studying in a teaching course (binary variable), paying rent (binary variable) and benefitting from scholarship (binary variable) were covariates. The propensity score was interpreted as the probability of UR use by students, considering their demographic and socioeconomic profile.

Next, students were paired based on the similarity of their propension scores, obtained using the Logit model. Pairing methods were employed such as the closest neighbor pairing (1 and 2 neighbors), caliper matching and Kernel, to create comparable groups of UR user and non-user students.

After grouping, we verified the quality of the covariate balance between groups. Mean tests were carried out for the control variables after pairing, with the null hypothesis that the treatment group and the control group were statistically equal. It seems relevant to highlight the need for absence of discrepancies between the covariables selected among groups after pairing, which was observed in this study (as shown in Appendix A), supported by the PS density function (Appendix B). Therefore, all variables met this criterion and were included in the pairing.

After pairing, students with similar propension scores were grouped for comparison. Next, we analyzed the levels of food insecurity between the treatment group (UR users) and the control groups (non-users). This allowed the verification of whether there were statistically significant differences of food insecurity levels between the two groups, considering the factors controlled by pairing.

University Restaurant and food (in)security among students at UEPG

The evaluation of food insecurity among university students plays a relevant role in the promotion of an academic environment that favors learning and human development and contributes to the promotion of equity and wellbeing in higher

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education. Among UEPG students, we found out that in 2023, around 35% of the students faced some degree of food insecurity, while 14% were at the most severe level, characterized by experiencing famine (Table 1).

In comparison with national data, which showed that 27.6% of Brazilian households were in a situation of food insecurity, and out of those 4.1% faced severe food insecurity (IBGE, 2024), we observed that food insecurity among UEPG students was relatively higher than the national average. Such contrast is particularly noticeable when considering the most extreme degree of food insecurity represented by experiencing famine.

Table 1 – Food (in)security among UEPG students – all students – August/November 2023

Food condition	All students
Food security	**65%**
Mild food insecurity	11%
Moderate food insecurity	10%
Severe food insecurity	14%
Total	100%

Source: Research results (2023).

One of the causes of higher prevalence of food insecurity among UEPG students, in comparison with the Brazilian population average, might be ascribed to the inclusion of more vulnerable groups in higher education by means of quotas and other access mechanisms. In 2023, the research data revealed that approximately 18% of the students were in poverty situation, with a per capita income below half of the minimum wage.

It is relevant to emphasize that, after entering university, students' socioeconomic condition does not improve immediately. On the contrary, their entrance in higher education results in new costs such as transportation to the institution, rent (mainly for those coming from other cities/states[7]), alongside the opportunity cost related to the time dedicated to studies, mainly for those who study during the day. In such context, many students are forced to conciliate study and work to make their higher education viable. However, in many cases, this double shift compromises their ability to obtain enough income to provide for their basic needs, including food.

Therefore, as seen in Table 2, among students who entered the institutions benefiting from the quotas for belonging to socioeconomic unfavored groups and/or those included in social programs, there is a high proportion facing food insecurity, which reaches 62%.

[7]It seems relevant to highlight that estimates show that in 2003, 37% of UEPG students did not live in Ponta Grossa before entering university. Among those, 64% decided to move to the city after entering the institution.

ISSN 2238-8346
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Table 2 – Food (in)security among UEPG students – quotas and universal system entrance – students in poverty condition – students assisted by social programs – August/November 2023

Students' characteristics:	Food security	Food insecurity		
		Mild	Moderate	Severe
Entrance via quota system	**58%**	**14%**	**11%**	**17%**
Entrance via universal system	69%	10%	10%	11%
Poverty condition *	**56%**	**15%**	**12%**	**17%**
Not in poverty condition	67%	11%	10%	13%
Not assisted by social programs	70%	10%	8%	12%
Assisted by social programs	**38%**	**21%**	**18%**	**23%**

Source: Research results (2023).
Note: * Poverty condition was considered when the students' per capita income was below half minimum salary.

Thus, university that was once associated with the privileged elite, currently welcomes a diversity of socioeconomic origins, including socially vulnerable groups. Such phenomenon reveals a change towards higher education democratization, where the inclusion of individuals from different social classes enrichens the academic environment, (Filipak; Pacheco, 2020). However, it is necessary to recognize that alongside this diversity, the urgent need appears to provide proper support to students who face socioeconomic adversities. Modern universities are then faced with the challenge of guaranteeing equal opportunities and access to resources to all their members, aiming at the fulfilment of their academic and personal potential.

Regarding UEPG, URs have the capacity of serving 124 people at the Central University Campus and 398 users at the Uvaranas University Campus, and they follow an in-rotation system and cater for 2,000 people daily.

In 2024, the university offered exemption to 339 students, aiming to cater for those in social vulnerability situations. There is also the option of partial discount favoring 98 students. Finally, the current value for students who are not exempt and are enrolled with the institution is BRL 3.80 per meal.

With the purpose of assessing UR relevance in UEPG students' nutrition, we asked them about the place where they have the main meal of the day (Table 3). Out of the total number of students interviewed, 30.9% indicated UR use as their main meal of the day, which highlights its importance in those students' diet.

ISSN 2238-8346
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Table 3 – Place where students have their main meal of the day (%) – UEPG – August/November 2023

Place	Percentage
At home or relative's home	46.8%
UR	30.9%
Work	15.0%
Restaurant/popular restaurant	2.8%
Did not answer	1.9%
Lunchbox	1.4%
UR and at home	0.2%
Others	1.0%

Source: Research results (2023).

Among participants, 31% reported using the UR at least once a week, while 23% of the students had meals at the UR more than three times a week. Furthermore, when correlating UR weekly use frequency with the fact of considering it the main place providing them with meals (Table 4), we observed that the group that mostly used it weekly is also the group with highest percentage of students who reported it as their main source of meals. This demonstrates the UR importance for an expressive part of UEPG students.

Table 4 – Percentage of UEPG students using the UR – weekly frequency – August/November 2023

Weekly use of UR	Percentage of students	UR is the place where they have their main meal of the day	
		No	Yes
Do not use	69.16%	100%	0.3%
Once a week	0.63%	0%	2.1%
Twice a week	0.76%	0%	2.5%
Three times a week	6.21%	0%	20.1%
Over three times a week	23.24%	0%	75.0%

Source: Research results (2023).

Several factors might influence the choice of the UR as the main provider of food for some students. As seen in Table 5, benefiting from scholarships and taking part in social programs is associated with greater probability of choosing the UR as the place where they have their main meals. This suggests that UR payment exemption for those socially vulnerable has been efficient in broadening their access to it.

Students residing in Ponta Grossa and those living in rented houses away from their parents' home, also showed some preference for the UR as the place where they have their main meal of the day.

ISSN 2238-8346
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However, among students in teaching courses, the preference for the UR was reduced. This might be due to time constraints faced by those students, who are often involved in internships during the course, which reduces the probability of choosing the UR as their main meal provider.

Moreover, older students presented lower chances of choosing the UR as the place of their main meals. Many of those students are already inserted in the job market and might have other food source alternatives. In addition, due to the UR opening and closing times, many are not able to take advantage of university meals since those times do not match their work routine[8].

Table 5 – Econometric estimates (Logit model) – choosing UR as the place where students have the main meal of the day– UEPG (binary variable: 1 for UR and 0 if not UR)

	Coefficient
Sex (1 for female; 0 if not)	-0.1606
Age	-0.0682*
Color (1 for self-declared White or Yellow; 0 if not)	0.1674
Quotas (1 for entrance via quota system; 0 if not)	-0.1468
Per capita income	-0.0001*
Social program (1 for benefiting from at least one social program; 0 if not)	0.5653*
Scholarship (1 for benefiting from scholarship; 0 if not)	0.9316*
Living in Ponta Grossa (1 for living in Ponta Grossa; 0 if not)	1.0048*
Rented house (1 for paying rent; 0 if not)	0.4105*
Teaching course (1 for studying in a teaching course; 0 if not)	-1.3948*
Children (1 for having children; 0 if not)	-0.4966

Source: Research results (2023).
Note: *5% level of significance.

When examining the relation between type of meal offered by the UR and levels of food (in)security (Table 6), we observed that students who "have lunch and dinner" at the UR are more likely to experience food insecurity (67%).

Furthermore, when investigating the weekly frequency of UR use (Table 7), we observed that among those who use the restaurant more than twice a week, there is a higher percentage of students facing food insecurity. This emphasizes the relevance of the meals offered by the UR to that group of students – since for many of them that is the main source of meals – and also demonstrates that the UR plays a significant role in assisting those with greater need for food support. In other words, although being available for all students, it serves mostly those who really need that food.

[8]In the questionnaire applied to the students, one of the open questions addressed possible improvements to the UR. Among the suggestions, extending the time it was open stood out, which reinforces the inference that some limitation in the UR use is directly related to opening and closing times.

ISSN 2238-8346
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Taking that into account, a correlation can be established with results obtained by Perez (2015), who reported that before a UR had been implemented at the State University of Rio de Janeiro, in 2011, many students often did not have a proper meal and after its installation at the institution, there was a significant increase in the students' diet quality, thus reducing food inequalities among students who entered via quotas system and those in the universal system.

Table 6 – Food (in)security among UEPG students *versus* UR use – August/November 2023

UR use	Food insecurity	Food security	Total
Do not use	32%	68%	100%
Only lunch	39%	61%	100%
Only dinner	29%	71%	100%
Lunch and dinner	67%	43%	100%

Source: Research results (2023).

Table 7 – Food (in)security among UEPG students *versus* UR use weekly frequency – August/November 2023

UR use weekly frequency	Food insecurity	Food security	Total
0	32%	68%	100%
Once a week	22%	78%	100%
Twice a week	36%	64%	100%
Three times a week	43%	57%	100%
More than three times a week	42%	58%	100%

Source: Research results (2023).

However, there is still a high percentage of students in food insecurity who do not use the UR (Table 8). In fact, out of the total number of students facing food insecurity, 69% do not use the university restaurant. This means that there is space to broaden the institutional action regarding the supply of food for more vulnerable students who face food insecurity.

Analyzing the group that present severe food insecurity and do not use the UR as the main source of meals, we saw (Table 8) that most of them (93%) either have their main meal at home (65%) or at work (28%).

ISSN 2238-8346
DOI: https://doi.org/10.14393/REPOD-v14n3a2025-76532

Table 8 – Food (in)security among UEPG students *versus* using the UR as their main source of meals – August/November 2023

UR use	Severe	Moderate	Mild	FS	Overall Total
No	69%	57%	63%	72%	69%
Yes	31%	43%	37%	28%	31%
Total	100%	100%	100%	100%	100%

Source: Research results (2023).

The analysis of UEPG students' characteristics, considering food security and RU use, reveals noticeable differences between those who use the UR as their main source of meals (TUR) and those who do not use it (NUR) (Table 9).

Among those in severe food insecurity, those who use the UR (TUR) have a lower mean per capita income in comparison to those who do not use it (NUR) in the same situation. In addition, there is greater participation of students in social programs among UR users, and a higher percentage of students looking for a job. Summarizing, among students found in severe food insecurity, those using the UR present greater social and economic vulnerability than those who do not use it, thus showing that the UR serves mainly those more socially vulnerable.

Another piece of data that called attention refers to students who did not live in Ponta Grossa and moved to the city after entering the university. This group is more inserted in situations of severe food insecurity and more intense UR use, as well as those who pay rent from their own pockets. Finally, students in full-time courses show an expressive higher degree of food insecurity when compared to those studying in part-time courses.

Therefore, we infer that the UR plays an important role in UEPG students' lives, mainly those who face difficulties guaranteeing a proper diet. The data revealed that students in severe food insecurity situation who use the UR show more unfavorable socioeconomic characteristics, which is mainly observed among students who did not use to live in Ponta Grossa before entering university and for those who study in full-time courses, thus indicating that these groups depend more on the UR to cater for their food requirements during the academic period.

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Table 9 – Characteristics of UEPG students who face food insecurity and "use the UR as their main source of meals" (TUR) or "do not use the UR as their main source of meals" (NUR) – August/November 2023

Characteristics	Severe		Other degree of FI		Food Security		All students
	TUR	NUR	TUR	NUR	TUR	NUR	
% in poverty conditions	28	21	20	23	18	14	18
% benefiting from social programs	37	25	35	27	12	9	17
% looking for a job	53	44	27	30	22	21	26
% working	7	31	6	28	6	26	21
per capita mean income (BRL)	1042.00	1157.00	1117.00	1261.00	1724.00	2119.00	1770.00
% who have children	5	12	3	13	1	7	7
Have children – % living with them	66	90	100	92	100	88	89
% did not live in Ponta Grossa before entering university	53	35	45	30	43	34	37
Did not live - % that moved to Ponta Grossa	100	53	87	70	82	45	64
% who live in rented houses	55	32	40	36	28	18	27
% who pay rent	22	14	14	12	4	4	8
Mean cost of rent (BRL)	402.00	241.00	304.00	338.00	265.00	298.00	297.00
Average time spent from home to university (minutes)	36	47	37	40	39	32	37
Average cost of transport (BRL)	141.00	304.00	127.00	160.00	157.00	187.00	183.00
% female students	60	66	69	72	57	60	62
% self-declared White	25	26	22	25	12	18	19
Mean age (years)	22	24	21	24	21	24	23
% studying in teaching courses	13	40	15	32	8	26	23
% studying in the evening	5	62	13	51	8	49	38
% studying full time	70	22	63	29	69	29	40
% entrance via quota system	53	50	45	48	35	37	41

Source: Research results (2023).

Considering previous results, we infer the existence of an association between UR use and higher levels of food insecurity, indicating that the UR is most frequently sought by students with higher food needs. However, we observed that not all individuals in food insecurity situations, mainly those in severe cases, use the UR. This information raises the following question: when comparing students with similar characteristics, except for the fact that one group uses the UR and the other does not, can we say that the UR contributes to food insecurity reduction?

To answer this question, we carried out the estimates of mean effect of UR use on food insecurity by means of the Propensity Score Matching. As a result, we observed the existence of a negative and statistically significant effect of UR use on food insecurity (Table 10),

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indicating that when we compare students who use the UR with similar pairs, they tend to present on average a lower degree of food insecurity. It seems relevant to mention that the difference might reach, on average, over a degree of food insecurity.

This shows that the UR has been serving mainly those who most need it, and its use partly mitigates food insecurity among UEPG students.

Table 10 – Mean effect of "UR use on food (in)security (0 refers to students in food security; 1 to those facing mild food insecurity; 2 to those in moderate food insecurity and 3 to those in severe food insecurity) – 2010 to 2017

Result variable	Algorithm	Mean effect	Standard error
Food (in)security	2 neighbors	-1.30	0.68
	1 neighbor	-1.80*	0.87
	Kernel	-0.74	0.40
	Caliper	-1.80*	0.86

Source: Research results (2023).
Nota: * statistically significant at 5%; ns not significant.

Final considerations

When analyzing the results of this research, we observed high indices of food insecurity among UEPG students. At the same time, we noticed the existence of a positive effect of UR use in the mitigation of food needs.

It is worth noting that students benefiting from programs derived from affirmative policies and social programs, inside or outside the university, use the UR as the place where they have the main meals of the day, which means that UR exemption for more socially vulnerable groups has been efficient in broadening their access to it.

This study did not ask the participants who did not use the UR the reason why they did not use it. Therefore, this issue should be addressed in further studies to understand the reasons why students in food insecurity do not use the UR to have meals.

The empirical data collection and analysis provided a detailed and contextualized view of the reality faced by students at the institution investigated. The results of this study aim to guide institutional managers in the implementation of actions who better cater for students' needs, mainly the most vulnerable ones', seeking better nutritional and food quality, and students' wellbeing.

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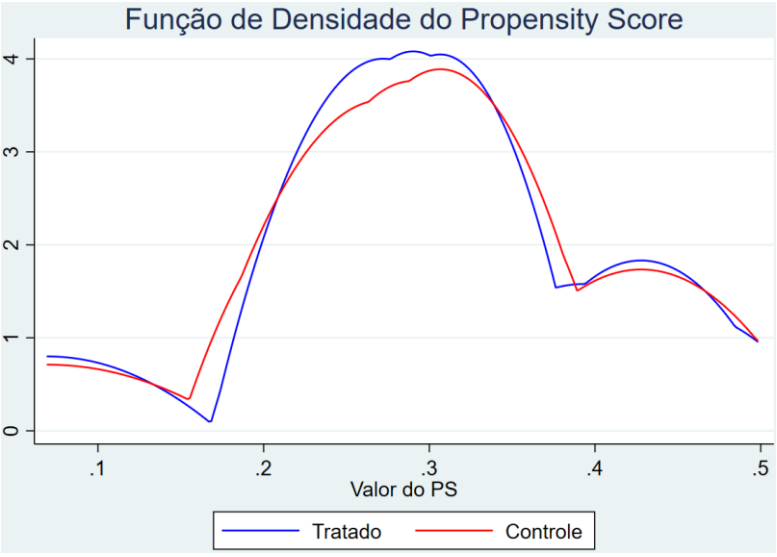
Appendices

Appendix A – Test of difference of covariate means prior and post-pairing

Covariates	Before/after pairing	Treatment	Control	p-value
Teaching courses	Before	0.11	0.29	0.00
	After	0.11	0.11	0.22
Social program	Before	0.11	0.14	0.00
	After	0.11	0.11	0.14
Paying rent	Before	0.11	0.23	0.00
	After	0.11	0.11	0.8
Scholarship	Before	0.11	0.15	0.00
	After	0.11	0.11	0.19

Source: Research results (2023).

Appendix B – PS density function after pairing



Source: Research results (2023).

Na figura:

Título: Propensity Score Density Function

Eixo horizontal: PS value

Azul: treated

Vermelho: control