

**Perfil e conhecimento em segurança dos alimentos de indivíduos que trabalham em  
caminhões de alimentos em uma capital no sul do Brasil**

**Profile and food safety knowledge of individuals who work in food trucks in a capital in  
southern Brazil**

**Perfil y conocimiento de seguridad alimentaria de las personas que trabajan en  
camiones de comida en una capital del sur de Brasil**

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## Resumo

O objetivo do estudo foi identificar o perfil socioeconômico e profissional dos proprietários e manipuladores de caminhões de alimentos em uma capital do sul do Brasil, bem como avaliar o conhecimento desses indivíduos em relação à segurança dos alimentos. Um total de 119 indivíduos em Curitiba, Brasil, participou do estudo. Para a coleta de dados, foi elaborado um questionário sobre o perfil sociodemográfico, profissional e de segurança dos alimentos, no qual foi preenchido pelos participantes durante os eventos. A maioria dos indivíduos era proprietário (75,63%), do sexo masculino (69,75%), com idade entre 30 e 44 anos (56,30%) e com ensino superior completo / incompleto (55,46%). Os participantes responderam corretamente às questões sobre segurança dos alimentos (76,63%). Houve diferença significativa quanto ao conhecimento sobre segurança dos alimentos entre os participantes em relação ao nível de escolaridade ( $p=0,0054$ ), tempo de serviço no segmento de alimentos ( $p=0,0267$ ) e participação de cursos relacionados à área de alimentação ( $p=0,0016$ ). Esses resultados enfatizam a necessidade de educação continuada e o desenvolvimento de novas estratégias para o treinamento em segurança de alimentos, a fim de melhorar o conhecimento dos trabalhadores de comida de rua.

**Palavras-chave:** manipulação de alimentos; comida de rua; comida rápida; segurança dos alimentos; higiene de alimentos.

## Abstract

The purpose of the study was to identify the socioeconomic and professional profile of owners and food handlers of food trucks in a capital in the south of Brazil, as well as to evaluate the knowledge of these individuals regarding food safety. A total of 119 individuals in Curitiba, Brazil, participated in the study. For data collection, was elaborated a questionnaire about the socio-demographic, professional profile and food safety knowledge, which was filled by the participants during events. The majority of the individuals were owners (75.63%), of the male gender (69.75%), aged between 30 and 44 years-old (56.30%) and with complete/incomplete higher education (55.46%). The participants answered of the questions of food safety correctly (76.63%). There was a significant difference regarding food safety knowledge among the participants related to the level of education ( $p=0.0054$ ), length

of service in the food segment ( $p=0.0267$ ), and the completion of courses related to the food area ( $p=0.0016$ ). These results emphasize the need for continuous education and for the development of new strategies for food safety training, in order to improve the knowledge of street food workers.

**Keywords:** food handling; street food; fast food; food safety; food hygiene.

## Resumen

El objetivo de este estudio fue identificar el perfil socioeconómico y profesional de los propietarios y manipuladores de camiones de alimentos en una capital del sur de Brasil, así como evaluar sus conocimientos sobre seguridad alimentaria. Un total de 119 personas en Curitiba, Brasil, participaron en el estudio. Para la recolección de datos, se elaboró un cuestionario sobre el perfil sociodemográfico, profesional y el conocimiento de inocuidad alimentaria, que los participantes completaron durante los eventos. La mayoría de los individuos eran propietarios (75,63%), del género masculino (69,75%), con edades comprendidas entre 30 y 44 años (56,30%) y con educación superior completa / incompleta (55,46%). Los participantes respondieron correctamente a las preguntas sobre seguridad alimentaria (76,63%). Hubo una diferencia significativa con respecto al conocimiento de seguridad alimentaria entre los participantes en relación con el nivel de educación ( $p=0,0054$ ), la duración del servicio en el segmento de alimentos ( $p=0,0267$ ) y la finalización de cursos relacionados con el área de alimentos ( $p=0,0016$ ). Estos resultados enfatizan la necesidad de educación continua y el desarrollo de nuevas estrategias para la capacitación en inocuidad alimentaria, con el fin de mejorar el conocimiento de los trabajadores de la comida callejera.

**Palabras clave:** manipulación de alimentos; comida callejera; Comida rápida; inocuidad de los alimentos; higiene alimentaria.

## 1. Introduction

Over the years, the commercialization of street food has grown exponentially in Brazil and throughout the world (Yoon & Chung, 2017). This can be attributed to the socioeconomic changes in the population, the low cost and easy access to these foods, as well as the industry's fast service (Bezerra, et al., 2014; Khongtong, et al., 2017). In Brazil, according to the Household Budget Survey, the out-of-home food expenses – from 2008 to 2009 – increased 31% in four years (Instituto Brasileiro de Geografia e Estatística, 2011). This growth was also observed in countries such as India, in which 20% to 30% of all food consumed in the country is street food (Kharel, et al., 2016). Another example is the United

States, where the out-of-home food expenses represented 43.1% of general food expenses in 2012 (United States Department of Agriculture, 2017).

The increase in out-of-home food consumption contributed to the development of new non-conventional sectors and new tendencies in the street food industry, such as food trucks (Bezerra, et al., 2014). The food trucks are considered large vehicles that are allowed to commercialize food produced in the vehicle itself or in operational bases. This trucks of food recently become a very popular and important part of the hospitality industry (Alfiero, et al., 2017), and have been experiencing drastic growth in the market (Martin, 2014).

Despite the growth and the benefits of street food consumption, food safety in this industry may be at risk (Asiegbu, et al., 2016; Khongtong, et al., 2017). According to the Center for Disease Control and Prevention (2017), in 2015 about 900 people presented outbreaks of Foodborne Diseases (FBD) and more than 15,000 individuals became sick after consuming contaminated food in the United States, among which 60% of outbreaks and 39% of diseases were caused by the consumption of contaminated street food. In Brazil, according to the data from the Ministry of Health, between 2009 and 2018, there were 12,584 outbreak cases of FBD, of which 16% were related to food services, such as street food (Brasil, 2019). Therefore, FBD are a widespread public health problem globally (Somda, et al., 2018).

The increase in the number of FBD outbreaks can be mainly related to the carelessness in food preparation, inappropriate food exposure, malfunctions in the physical structure of the establishment, and/or the absence of environmental and personal sanitization (Olmedo, et al., 2018; Serafim, et al., 2018; Rocha, et al., 2019). In addition, studies show that age, gender, level of education, mother/native language, professional training, the workplace, knowledge on food safety, and experience in the field can also influence attitudes and practices performed at work. Consequently, these practices may influence risks of FBD outbreaks in food establishments (Smigic, et al., 2016; Serafim, et al., 2018; Ribeiro, et al., 2018).

Although these topics has been analyzed in numerous nationally and internationally published articles related to food services in hospitals and schools (De Almeida, et al., 2014), few of these studies mention the street food segment, especially food trucks. This fact is due to their recent activity and/or expansion in the food market.

Therefore, this study aims to identify the socioeconomic and professional profile of owners and food handlers of food trucks in the capital in the south of Brazil, as well as to evaluate the knowledge of these individuals regarding food safety.

## **2. Materials and Methods**

## 2.1 Sampling Plan and Ethics Committee

This is a cross-sectional study, conducted with individuals who work in food trucks and who participated in open-air gastronomic events in the city of Curitiba between March 2016 and August 2017. This study was approved by the Research Ethics Committee (number: 105694/2015).

To determine the sample of the study, the number of food trucks registered in the Food Truck Association of Paraná (APFT) in the first semester of 2016 was collected, accounting for 124 records of food trucks. Based on this value, a prevalence of 50% was used, with a margin of error of 5 percentage points and a 95% confidence level, the study sample consisted of 94 food trucks. All registered food trucks were contacted by phone, and all of the on-site workers (over 18 years-old and of both genders) were invited to participate in the study, which resulted in the participation of 95 food trucks and of 119 individuals. All participants signed the Free and Clarified Consent Term (TCLE).

## 2.2 Assessment of the socio-economic, professional profile and knowledge

A questionnaire based on the instrument developed by other study (Ovca, et al., 2014), was used to evaluate the socioeconomic and professional profile of individuals who work in the food truck business, as well as their professional knowledge about food safety. The questionnaire was also based on the Resolution of the Collegiate Board of Directors (RDC), n° 216/2004 (Brasil, 2004), the RDC n° 43/2015 (Brasil, 2015), and law n° 14634/2015 (Curitiba, 2015) - ruled by Decree n° 1124/2017 (Curitiba, 2017).

The questionnaire consisted of two parts. The first assessed the sociodemographic and professional profile of the workers through 23 semi-structured questions, which covered gender, age, education, length of service in food and food truck industry, weekly working hours, monthly income, and participation in courses related to the food area.

The second part contained 41 questions that addressed knowledge about food safety and the following topics: physical structure of the establishment (n= 5); environmental hygiene (n=4); pest control (n= 2); water (n=4); food handling (n=7); raw material (n=6); food preparation stages (n=8); commercialization of ready-for-sale products (n=3); and responsibility and required documents (n=2). The questions related to knowledge about food safety had three alternatives: “correct”, “incorrect”, or “I do not know”. The participants were

oriented to indicate only one of the three options. To identify the business activity developed by these food trucks, the record in the National Classification of Economic Activities (CNAE) (Instituto Brasileiro de Geografia e Estatística, 2007) was verified. The values obtained in the study were converted into American dollars. To perform the currency conversion, the mean exchange rate from the Central Bank of Brazil (Brasil, 2017) was used, in which US \$1 = R\$ 3.7155.

The questionnaire, which was applied during street gastronomic events, was filled by individuals who work in food trucks, without the interference of the researcher.

### 2.3 Statistical analysis

To analyze the results, we used the Statistical Analysis System software version 9.2. Data were analyzed using simple descriptive statistics. In order to assess the level of knowledge of the individuals in food safety, along with the socioeconomic and professional variables, correct answers were attributed a score of 1, and incorrect answers or unanswered questions were attributed a score of 0. Hence, the score could vary from 0 to 41. Subsequently, analysis of variance (ANOVA) was applied, followed by the Duncan test, considering a statistically significant difference when  $p < 0.05$ .

## 3. Results

Of the 119 people working in food trucks, the majority were male (69.75%,  $n=83$ ) aged between 18 and 29 years old (32.77%,  $n=39$ ) and 30 and 44 years old (56.30%,  $n=67$ ) and with complete/incomplete higher education (55.46%,  $n=66$ ), and secondary school incomplete/complete (21.85%,  $n=26$ ).

The monthly income of people working in the segment was around \$236.84 to \$710.53 (31.93%,  $n=38$ ), and \$710.53 to \$2,368.45 (38.66%,  $n=46$ ). In addition, most of the participants (67.23%,  $n=80$ ) stated that they did not have any other source of income besides the food truck. Most participants owned the food truck themselves (75.63%,  $n=90$ ). The branch of activity of many food trucks was the service of cafeteria, tea houses, juices, and similar (59.66%,  $n=71$ ), followed by the manufacturing of pasta (15.97%,  $n=19$ ).

Regarding the working day, most participants (67.23%,  $n=80$ ) usually worked in the food truck 4 to 6 times a week, from Tuesday to Sunday, due to the greater amount of events that occur during these days. Additionally, 57.14% ( $n=68$ ) worked two shifts in a day, and the

workload varied from 7 hours up to 12 hours. Working hours could reach up to more than 12 hours according to the event.

As for the length of service in the food segment, 40.34% (n=48) of the participants had worked in the field for less than 1 year and 32.77% (n=39) from 1 to 5 years. Regarding the length of service in food trucks, the majority (71.43%, n=85) had worked in this segment for less than a year. When asked if they had ever taken courses in the food segment and if they had a certificate, 63.03% (n=75) reported never having attended courses or did not present proof.

Regarding food safety knowledge, in the overall average, people answered 76.63% of the questions correctly (Table 1).

Table 1 - Food safety knowledge of individuals who work in food trucks in Curitiba. Curitiba, Paraná, Brazil, 2017

| Variables                                    | Correct |       | Incorrect |       | Did not know |       | Did not answer |       |
|--|---------|-------|-----------|-------|--------------|-------|----------------|-------|
|  | n       | %     | n         | %     | n            | %     | n              | %     |
| Physical structure                           | 478     | 80.33 | 88        | 14.78 | 24           | 4.03  | 5              | 0.84  |
| Environmental hygiene                        | 392     | 82.35 | 51        | 10.71 | 28           | 5.88  | 5              | 1.05  |
| Pest control                                 | 204     | 85.71 | 21        | 8.82  | 11           | 4.62  | 2              | 0.84  |
| Water  | 415     | 87.18 | 24        | 5.04  | 33           | 6.93  | 4              | 0.84  |
| Food handling                                | 598     | 71.78 | 87        | 10.44 | 14           | 1.68  | 134            | 16.08 |
| Raw material                                 | 578     | 80.95 | 79        | 11.06 | 50           | 7.00  | 7              | 0.98  |
| Food preparation stages                      | 604     | 63.44 | 215       | 22.58 | 125          | 13.13 | 8              | 0.84  |
| Commercialization of ready-for-sale products | 251     | 70.30 | 27        | 7.56  | 35           | 9.80  | 44             | 12.32 |
| Responsibility and required documents        | 219     | 92.01 | 2         | 0.84  | 15           | 6.30  | 2              | 0.84  |
| Overall mean                                 | 3739    | 76.63 | 594       | 12.17 | 335          | 6.86  | 211            | 4.32  |

Note: n: number considering the questions from each topic, answered by 119 participants.

Although the level of knowledge about the hygienic-sanitary criteria was high, the questions related to the food preparation stage were the ones with the lowest accuracy rate (63.44%). This was also the stage in which the participants were less able to answer to the corresponding questions (13.13%). The topic related to food handling presented the highest number of unanswered questions (16.08%), followed by commercialization of ready-for-sale products (12.32%).

In this study, there was a significant difference between the level of knowledge regarding the variables schooling ( $p=0.0054$ ), length of service in the food segment ( $p=0.0267$ ), and attendance in duly proven courses in the food area ( $p=0.0016$ ) (Table 2).

Table 2 – Overall average of food safety knowledge of individuals who work in food trucks in the capital of Paraná, according to socio-demographic and professional characteristics. Curitiba, Paraná, Brazil, 2017

| Variables                                    | Description          | N  | Average of correct answers<br>± SD ** | p-value* |
|--|----------------------|----|---------------------------------------|----------|
| Activity in the food truck<br>(n = 118)      | Employee             | 28 | 31.60 ± 5.56                          | 0.4033   |
|  | Owner                | 90 | 32.62 ± 5.60                          |          |
| Gender (n = 119)                             | Female               | 36 | 31.22 ± 7.20                          | 0.1360   |
|  | Male                 | 83 | 32.87 ± 4.63                          |          |
| Age range (n = 119)                          | 18-29 years-old      | 39 | 31.23 ± 5.30                          | 0.0500   |
|  | 20-44 years-old      | 67 | 33.43 ± 4.39                          |          |
|  | 45-59 years-old      | 11 | 29.45 ± 10.31                         |          |
|  | 60 years-old or more | 2  | 35.50 ± 2.12                          |          |
| Level of education <sup>1</sup><br>(n = 119) | Basic Education      | 4  | 30.50 ± 2.88 <sup>ab</sup>            | 0.0054*  |
|  | Secondary School     | 26 | 32.57 ± 4.07 <sup>a</sup>             |          |
|  | Technical Degree     | 8  | 25.87 ± 11.39 <sup>b</sup>            |          |
|  | Higher Education     | 66 | 32.68 ± 5.00 <sup>a</sup>             |          |

|  |                             |    |                            |         |
|--|-----------------------------|----|----------------------------|---------|
|  | Graduate Program            | 15 | 34.66 ± 4.08 <sup>a</sup>  |         |
| Monthly income originating from the food truck (n = 114)                     | Up to \$236.84              | 11 | 30.63 ± 4.36               |         |
|  | From \$236.84 to \$710.53   | 38 | 32.00 ± 6.71               |         |
|  | From \$710.53 to \$2,368.45 | 46 | 32.78 ± 5.01               | 0.3619  |
|  | \$2,368.45 or more          | 19 | 34.05 ± 4.15               |         |
| Time of activity in the food segment (n = 118)                               | Less than a year            | 48 | 30.93 ± 4.43 <sup>ab</sup> |         |
|  | From 1 to 5 years           | 39 | 33.02 ± 4.53 <sup>a</sup>  |         |
|  | From 5 to 10 years          | 16 | 33.93 ± 4.69 <sup>a</sup>  | 0.0267* |
|  | From 10 to 20 years         | 11 | 35.27 ± 4.62 <sup>a</sup>  |         |
|  | More than 20 years          | 4  | 27.75 ± 18.57 <sup>b</sup> |         |
| Daily working hours (n = 118)  | Up to 6 hours               | 23 | 32.00 ± 4.02               |         |
|  | From 7 to 8 hours           | 28 | 30.92 ± 7.95               |         |
|  | From 9 to 10 hours          | 25 | 31.60 ± 5.46               | 0.1174  |
|  | From 11 to 12 hours         | 28 | 33.39 ± 3.96               |         |
|  | More than 12 hours          | 10 | 35.80 ± 3.11               |         |
|  | Other                       | 4  | 35.75 ± 3.30               |         |
| Participation in courses related to the food segment certification (n = 114) | Yes                         | 39 | 30.05 ± 4.84 <sup>b</sup>  | 0.0016* |
|  | No                          | 75 | 33.52 ± 5.69 <sup>a</sup>  |         |

Caption: n: frequency of participants who answered the questions. SD: standard deviation. <sup>1</sup> In the level of education section, complete and incomplete higher education were inserted in each group. \*Significant difference, the 5% of probability, by the analysis of variance (ANOVA). \*\* The Duncan Test = Same letters in the column do not differ statistically (p > 0.05)

Individuals with graduate level of education were the ones that presented the highest index of correct answers, not differing from the knowledge of other workers, except those with technical level. Those who worked in the food segment for less than 1 year had a similar

level of knowledge to those who worked in it for up to 20 years and those who worked in the industry for more than 20 years knew less than those who worked in it from 1 to 20 years ( $p=0.0267$ ).

Moreover, it was noticed that the individuals who reported not having taken courses related to the food segment or those who had not presented proof were those who displayed a greater level of knowledge about food safety (Table 2).

#### **4. Discussion**

A prevalence of males working in the food truck segment found in this study resembles other study (Cortese, et al., 2016) that investigate the characteristics of the street food segment. However, differs from most of the research on individuals involved in the stages of food preparation, in which there is a predominance of females (Da Cunha, et al., 2014; Samapundo, et al., 2016) possibly due to a woman's general familiarity with food handling and preparation (Da Cunha, et al., 2014). The specific results found in this research can be justified by the characteristic of the segment studied since in Brazil, working in gastronomic events may be considered more dangerous for women, as these events most often occur at night and on weekends. In addition, due to the fact that the workload in food trucks is high, as demonstrated in this study, may end up distancing women from the demands of family life.

In relation to education, more than half of the workers in the food truck segment had completed or still attended higher education. However, divergent results were found in other studies in the street food segment, who identified participants who had a low schooling level and even some who were illiterate (McKay, et al., 2016). This fact is justifiable by the characteristic of food trucks; although street food generally does not require great financial investment, the venture of food trucks is an exception due to the expensive structure of the vehicle and the differentiated sales model, which seeks to innovate, offering more sophisticated and low-cost food. Therefore, it demands better-prepared workers with a higher educational level, as evidenced in this study.

When evaluating the monthly income of food truck workers, the results demonstrate that the commercialization of foods in food trucks, represents a source of work for an economically active population. The income from this segment is both one of the advantages of the business, as well as a way of life for these people. Through food truck businesses, a

considerable source of income is provided, which supports these individuals and their dependent families (Sabbithi, et al., 2017).

This study outlines that most of the food truck segment workers were the owners themselves. These results are similar to those found in other studies (McKay, et al., 2016), and demonstrates that these establishments have been evolving exclusively around the managers themselves and their individual forces, thus the conclusion is that they manage both the business organization as well as the manipulation of food.

The fact that the owner manages most establishments is a positive factor, since the presence of managers is important to ensure the good performance of the establishment, providing support for food safety and consequently influencing the behavior of those involved in the stages of food preparation in favor of appropriate practices.

The assessment of knowledge, attitudes, and practices of food handlers has been much discussed in the international literature, since it is already known that the combination of these factors is what accounts for food safety in the food segment (Martins, et al., 2012; Asiegbu, et al., 2016). In this context, when assessing the professional knowledge regarding food safety, the most participants this study answered of the evaluated questions correctly, which is satisfactory, since it shows that these workers are aware of the risks in the preparation of the food and the criteria to be applied to ensure its safety.

The first and foremost step to improve the conditions of street food workers and to ensure that meals sold do not harm public health is to develop an awareness that these individual must maintain a certain standard of quality (Sabbithi, et al., 2017). This owes to the fact that imprecise knowledge can reduce the level of concern in food handling and systematize wrong practices, creating a false idea of safety (Martins, et al., 2012; Serafim, et al., 2018). Therefore, recognizing personal responsibility for food safety and the willingness to practice food safety is a prerequisite for improving the hygiene of establishments.

Regarding the association between knowledge in food safety and level of education, the workers who obtained the highest number of correct answers were those who reported having done a graduate program. Study (Smigic, et al., 2016) found that food handlers who worked in commercial establishments in Portugal, Serbia, and Greece, and claimed to have done a graduate program also presented a greater knowledge (69.8%) in food safety than the other participants. Other study also emphasizes that the average scores in food safety knowledge increased along with the level of education of the evaluators (Martins, et al., 2012). Which demonstrates that the continuous professional update and the search for knowledge can contribute to the improvement of food safety training since, due to the higher

level of education, these workers can better understand the importance of food safety and its applications.

In addition, when taking into account the length of service and the knowledge about food safety, it was found that those who had 1 to 20 years of experience in the food segment presented a similar level of knowledge, surpassing those who worked for than 20 years in the industry. This may be related to the publication of laws in Brazil since 2004 (Brasil, 2004, 2015; Curitiba, 2015, 2017) which determined the application of hygienic-sanitary criteria in food services, thus promoting greater instruction and knowledge about the subject.

This study found that most of the workers reported not having done or not having an appropriate certification for the completion of courses related to the food segment. However, these individuals were the ones who presented a greater knowledge in food safety. The most likely cause for this observation is the absence of a course certificate or an official document in the moment of the evaluation, since the completion of a course was not considered if the worker had not been able to attest for it. It is worth mentioning that the exchange of experiences with other worker of the area or during the sanitary inspections can contribute to a greater knowledge about the subject. Additionally, experience in the professional practice can lead to the improvement of hygiene procedures along the years, which consequently generates more learning. This fact is also found in other study (Martins, et al., 2012).

However, studies show that the completion of courses or training programs can help improve even more the workers' food safety knowledge (Oliveira, et al., 2020). Also, it can assist them in the application of new attitudes in food handling, consequently decreasing the susceptibility of food contamination (Ovca, et al., 2018; Serafim, et al., 2018). Therefore, the training of workers in the food truck industry becomes important, since the knowledge acquired in training can be implemented in their daily practices and consequently, contribute to the reduction of outbreaks and cases of FBD, which have currently become a public health concern due to the their increase in occurrence.

Additionally, constant training in this industry is essential to reinforce hygiene aspects that must be applied during the stages of preparation and commercialization of food. This training can represent the first awareness-raising discussion that these workers have ever had related to their profession, which can lead to the promotion of improvement in hygiene and cleaning habits.

Although the results of the present study are relevant, some limitations must be addressed. One of them is related to the fact that the research has only been carried out in the city of Curitiba, and it may not reflect the profile and knowledge in food safety of workers

from other cities or regions of the country. Additionally, the instrument proposed in the evaluation of knowledge of the workers about food safety has not been validated until the present moment.

### **Final considerations**

The results of this study conclude that the evaluated food truck workers are, in their majority, owners; male; aged between 30 and 44 years old; and with complete/incomplete higher education. Also, it was possible to identify that the predominant branches of activities of food trucks are those of diners, tea houses, juice bars and others, and that most workers obtain their income exclusively from the food truck.

The food safety knowledge of the workers is broad, but there was a significant difference among them when considering their levels of education, length of service in the food segment, and their participation in food area courses – with proper certification.

Further studies addressing the issue are needed, as well as the development of new continuing education and food safety training strategies to improve the knowledge of street food workers.

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