Factors associated with food insecurity among pregnant women assisted by Universal Health Care in Lavras - Minas Gerais State

Renata Oliveira Messina Costa [1]
https://orcid.org/0000-0001-9540-9551

Ana Poblacion [2]
https://orcid.org/0000-0002-5202-3728

Carolina Lourenço Giudice [3]
https://orcid.org/0000-0002-4182-3068

Lahis Cristina Morais de Moura [4]
https://orcid.org/0000-0002-4300-0524

Adriany Aparecida Roquini Lima [5]
https://orcid.org/0000-0002-4647-3220

Daniela Braga Lima [6]
https://orcid.org/0000-0002-6755-9744

Maysa Helena de Aguiar Toloni [7]
https://orcid.org/0000-0002-0297-0786

Lílian Gonçalves Teixeira [8]
https://orcid.org/0000-0003-4682-8594

[1,4,5,7,8] Department of Nutrition. Federal University of Lavras. Lavras, MG, Brazil

[2,3] Department of Pediatrics. Boston Medical Center, 801 Albany Street 3rd Floor Boston, Massachusetts 02119, United States. E-mail: carolina.giudice@bmc.org

[6] Faculty of Nutrition. Federal University of Alfenas.Alfenas, MG, Brazil

Abstract

Objectives: to investigate sociodemographic and economic factors associated with food insecurity among pregnant women assisted by the universal healthcare network of Lavras, Minas Gerais.

Methods: a cross-sectional study investigated socioeconomic and demographic, obstetric, and nutritional conditions experienced by pregnant women. Households in which pregnant women lived were classified as food secure or food insecure using the Brazilian Food Insecurity Scale. Prevalence estimates and prevalence ratios with 95% confidence intervals were generated to test for associations between food insecurity and several socioeconomic and demographic indicators using Poisson regression analysis.

Results: among 173 pregnant women who participated in the study, 48% lived in households with some level of food insecurity. Adjusted models showed that pregnant women living in food-insecure households had higher prevalence ratios of lower education attainment (aPR = 1.43, CI95% = 1.07-1.91), woman being the head of the household (aPR = 1.39, CI95% = 1.02-1.87), having family monthly income lower than 1 ½ MW (aPR = 1.68, CI95% = 1.11-2.52) and participating in the government cash transfer program (aPR = 1.47, CI95% = 1.08-1.99).

Conclusions: the high prevalence of food insecurity in pregnant women assisted by the public healthcare system was associated with structural social factors. Results of this study will contribute to develop an intersectoral health and nutrition policy in order to promote food security among marginalized communities and vulnerable populations, such as pregnant women.

Key words *Pregnancy, Public health, Nutritional status, Primary health care, Health status disparities, Public policy*

Introduction

During pregnancy, women go through several physical, psychological, emotional, and social changes that are essential for motherhood. Access to healthcare allows for health promotion, as well as prevention, diagnoses and treatment of diseases and conditions of the mother-fetus dyad.[1] Brazil has universal healthcare access, with special healthcare programs designed for pregnant women, which also include nutritional counselling. Despite having support from the healthcare system, other determinants such as socioeconomic and demographic factors might influence the health and well-being of pregnant women.

Food insecurity (FI), defined by the lack of access to sufficient, safe, and nutritious food to maintain a healthy and active life, has its roots in economic disparities and poverty, social inequities, health and educational disparities and fragile food systems.[1-3] In combination, all these elements are likely to influence food access and choices, which are especially important during pregnancy.[4] Independently of pre-existing structural contexts, food insecurity during pregnancy was shown to be associated with poor health outcomes such as anemia, high blood pressure, hyperglycemia, depression, stress, and anxiety.[1,5,6]

Given that food insecurity is detrimental to the health and well-being of pregnant women, the present study aimed to investigate factors associated with food insecurity during pregnancy among women who utilize the universal public healthcare system in Lavras, municipality of the state of Minas Gerais.

Methods

This study was conducted as part of an umbrella study that aimed to monitor the impact of the Brazilian social safety-net program "*Bolsa Família*" (BF) on health, food, and nutrition of participant families, as well as the perception of mandatory health conditions imposed on BF participants by the healthcare professional aiming to ensure quality improvement of nutritional care and consequently improvement of health indicators in the population. Data was collected using validated questionnaires, adapted to the needs of the study.[7,8]

The present study has a cross-sectional quantitative design, carried out from April to December 2018. The sample was composed of pregnant women assisted by the public healthcare system of Lavras, located in the south of Minas Gerais State - Brazil. Pregnant women were considered eligible in all stages of pregnancy who voluntarily accepted to participate in the study and signed the consent form.

Authors utilized a convenience sample, model also adopted by da Silva *et al.*[9] and Morais *et al.*,[10] given difficulties in locating records of pregnant women to make up for a random sample. The final sample was composed by 173 pregnant women, representing 64 percent of all pregnant women assisted in the primary care system of Lavras in 2018.[11] Recruitment was carried out through an active search with the help of Nurses and Community Health Workers in all 17 health centers of the city during prenatal appointments. After this initial contact, data collection happened either in the health center or in home visits, according to interviewee preference. The study was approved by the Institute of Review Board at the Federal University of Lavras - UFLA (CAEE n. 74972517.0.0000.5148) and funded by the National Council for Scientific and Technological Development - CNPq (408355/2017-4).

Household food insecurity was assessed by the Brazilian Household Food Insecurity Measurement Scale (EBIA). EBIA classifies a household in four levels according to the final score resulting from the sum of affirmative responses to each of the items. Fourteen questions are asked in households with children, classifying the household as food secure when scored zero affirmative answers, mild food insecure when scored 1-5 questions, moderate food insecure when scored 6-10 answers or severe food insecure when scored 11-14 answers. Households without children are asked 8 questions and classified in the same categories above, however with different scoring system. Inferential analyses were conducted using the food insecurity variable dichotomized as Food Security or Food Insecurity, which comprised Mild, Moderate and Severe Food Insecurity categories.[12,13]

Pregnant women provided information on their age, race, education attainment, marital status, number of residents in the household, presence of a minor at home, head of the household, family income, participation in the government cash transfer program and residential status.

Age was analyzed as a dichotomous variable (adolescent: <20 years, adult: ≥20 years). The category including pregnant adolescents up to 20 years of age was used as risk.[14] Race was classified according to the Brazilian national CENSUS guidelines in the following categories: white, black, brown, yellow or indigenous.[15] Given the small sample sizes allied with the unmatched socioeconomic status with other races, yellow (n=3) and indigenous race categories (n=1) were excluded from the sample. For bi and multivariate analyzes, race was dichotomized as black/brown or white.

Education attainment was based on responses to a direct question on years of schooling. For bi and multivariate analyzes, this variable was dichotomized in

≤8 years or >8 years, which corresponds to graduation in middle school. Marital status was referred as either as single, stable relationship, married or divorced options. For bi and multivariate analyzes, the answers were grouped into two categories: without a partner (single or divorced) and with a partner (in a stable relationship or married).

Number of residents in the household was collected through an open question "How many people live in the house?" For bi and multivariate analyzes, it was dichotomized in ≤4 residents or >4 residents, considering the average number of residents in this sample. Minor at home was defined and dichotomized as presence of a person under 18 years old at home or not. Head of household could be either a man or a woman who was responsible for the finances of the household. Family income was collected using the answer to "what is the total monthly family income?" After exploring the distribution of responses, the variable was dichotomized as up to one and a half minimum wages (≤1½ MW: R$ 1,431.00) or more than one and a half minimum wages (> 1 ½ MW: R$ 1,431.00). Minimum wage was R$ 954.00 in 2018 in Brazil, the equivalent to U$246.51. Cash Transfer Program (CTP) was labeled "yes" for households receiving cash transfers from the Brazilian social safety-net program *Bolsa Família*. Residential status was classified according to the following categories: owned, rented, assigned, invaded or other. For bi and multivariate analyzes, the residency status was dichotomized in stable (owned) or unstable (rented or assigned), since invaded or other had no responses.

Anthropometry data was assessed using weight and height measurements, following the guidelines proposed by the Brazilian Food and Nutritional Surveillance System (SISVAN - acronym in Portuguese).[16] Gestational age was calculated based on the gestational week, referred by the pregnant woman, which was confirmed through the pregnant woman's medical record health card and compared with the date of the last referred menstrual cycle. For analysis, gestational trimesters were dichotomized in 1st and 2nd versus the 3rd. Gestational Body Mass Index (BMI) classified women as underweight, adequate, overweight, or obese, dichotomized as adequate or inadequate (underweight, overweight or obese).

Descriptive analyzes included chi-square test to assess associations with the dependent variable. T-tests were performed in continuous variables (age, education attainment, income, residents of the household) and the means were compared between food-insecure groups. In both, variables were considered significant when $p < 0.05$. Poisson regression was used in bi and multivariate analyzes, considering variables with $p < 0.20$ in the bivariate eligible for inclusion in the multivariate. Variables with $p < 0.05$ remained in the final model.

Results were expressed in prevalence ratios (PR) and the respective confidence intervals (CI95%), treated and managed using the SPSS Statistics 20 software.

Results

A sample of 173 pregnant women utilizing Lavras' public healthcare network was studied. The average age was 25 years, with a minimum and maximum age of 12 and 42 years, 17.9 percent of them were adolescents. Close to half (45.5%) of the women self-referred as brown; 24.3 percent black; and 31.2 percent white. A greater proportion of women had less than high-school diploma (92.5%), and the majority of those were living in food-insecure households. In addition, more women were not living with a partner (58.4%), despite only 43.4 percent refer being the head of household. Two thirds of women described living with less than two MW, which in 2018 it amounted to almost $500. However, fewer woman mentioned participating in Cash Transfer Program (29.5%) (Table 1).

Almost 50 percent of pregnant women referred living in food-insecure households, 29.5 percent in mild food insecurity, 10.4 percent in moderate food insecurity and 8.1 percent in severe food insecurity. Among those living with food insecurity, 76 percent had at least one person under 18 years old living in the same household.

Despite gestational BMI showing no difference among food-secure groups, it is important to stress that only one third of pregnant women (34.1%) had appropriate weight for their gestational age. Overweight and obesity was found in 29.5% and 17.9% of the sample, respectively. On the opposite spectrum of the weight curve, one in five pregnant women was found to be underweight (20.5%).

Adjusted models showed that pregnant women participating in the government cash transfer program (*Bolsa Família* Program) were 47 percent more prevalent in FI households when compared with those who did not receive cash transfer [aPR = 1.47; CI95% = 1.08-1.99]. Also, 68 percent, 43 percent, and 39 percent more prevalent in FI households were pregnant woman with incomes of less than one and a half minimum wages [aPR = 1.68; CI95% = 1.11-2.52], with less than eight years of education attainment [aPR = 1.43; CI95% = 1.07-1.91] and being the main provider of family income [aPR = 1.39; CI95% = 1.02-1.87], respectively (Table 2).

Discussion

The transversal design of this research did not allow us to infer causality. However, associations found in this research contribute to the robust body of literature to affirm that food insecurity has its roots in the intergenerational cycle of poverty, which is perpetuated by socioeconomic and demographic factors. Despite well studied elsewhere,

Table 1

Demographics of pregnant women assisted by the public healthcare system by food security status. Lavras-Brazil, 2018.

Variables	Total (N=173)		Food Security (N=90)		Food Insecurity (N=83)		p^a
	n	%	n	%	n	%	
Age (years)							0.215
< 20	31	17.9	13	14.4	18	21.7	
> 20	142	82.1	77	85.6	65	78.3	
Age ($\bar{X}$ ± DP)[b]	25.45 ± 6.20		26.00 ± 5.77		44.85 ± 6.61		0.255
Race							0.074
White	54	31.2	35	38.8	19	22.9	
Black	42	24.3	20	22.2	22	26.5	
Brown	77	44.5	35	38.8	42	50.6	
Education attainment (years)							<0.001
≤ 8	39	22.0	12	12.2	27	32.5	
9 to 14	121	70.5	66	74.4	55	66.3	
≥ 15	13	7.5	12	13.3	1	1.2	
Education attainment ($\bar{X}$ ± DP)[b]	10.88 ± 2.80		11.78 ± 2.91		9.90 ± 2.33		0.449
Marital status							0.106
Single	99	57.2	45	50.0	54	65.1	
Stable relationship	21	12.1	11	12.2	10	12.0	
Married	51	29.5	32	35.6	19	22.9	
Divorced	2	1.2	2	2.2	0		
Number of residents							0.986
≤ 3	103	59.5	54	60.0	49	59.0	
4 - 6	58	33.5	30	33.3	28	33.7	
≥ 7	12	6.9	6	6.7	6	7.2	
Minor at home							0.052
Yes	119	68.8	56	62.2	63	75.9	
No	54	31.2	34	37.8	20	24.1	
Head of household							0.006
Woman	75	43.4	30	33.3	45	54.2	
Man	98	56.6	60	66.7	38	45.8	
Family income [c]							<0.001
<1/2 MW	13	8	3	3.5	10	13	
1/2 ⊢ 1 MW	15	9.3	3	3.5	12	15.6	
1 ⊢ 2 MW	80	49.4	37	43.5	43	55.8	
> 2 MW	54	33.3	42	49.4	12	15.6	
Family income ($\bar{X}$ ± DP)[b]	1,631 ± 1,158		2,064 ± 1,3323		1,153 ± 659		<0.001
Cash Transfer Program							<0.001
Yes	51	29.5	16	17.8	35	42.2	
No	122	70.5	74	82.2	48	57.8	
Residency Status							0.179
Owned	81	46.8	47	52.2	34	41	
Rented	70	40.5	35	38.8	35	42.2	
Assigned	22	12.7	8	8.9	14	16.8	
Gestational age							0.269
First trimester	31	17.9	20	22.2	11	13.2	

Second trimester	76	43.9	39	43.4	37	44.6
Third trimester	66	38.2	31	34.4	35	42.2
Gestational BMId						0.432
Low weight	32	18.5	15	16.7	17	20.5
Normal weight	59	34.1	33	36.7	26	31.2
Overweight	51	29.5	23	25.5	28	33.7
Obesity	31	17.9	19	21.1	12	14.5

Nota: [a] Pearson's chi-square test; [b]t-test; $\bar{X}$: Average; SD: Standard-deviation; [c] 11 missing responses; Minimum wage (MW) R$ 954.00 or U$246.51 in 2018; [d] BMI = Body mass index.

Table 2

Association of demographic, socioeconomic and biological variables with food-insecure households among pregnant women. Poisson Regression Model. Lavras-MG, 2018.

Variables (N=173)	Unadjusted analysis		Adjusted analysis	
	PR (CI95%)	p [d]	PR (CI95%)	p [d]
Age				
< 20 years	1.27 (0.89 - 1.79)	0.181		
Race				
Black and Brown	1.53 (1.02 - 2.27)	0.037		
Education attainment				
< 8 years	1.66 (1.24 - 2.21)	0.001	1.43 (1.07 - 1.91)	0.016
Marital status				
Without a partner	1.33 (0.95 - 1.85)	0.097		
Number of residents				
> 4 people	1.13 (0.80- 1.60)	0.501		
Minor at home				
Yes	1.43 (0.97 - 2.10)	0.070		
Head of household				
Woman	1.54 (1.13 - 2.11)	0.006	1.39 (1.02 -1.87)	0.036
Family Income [b]				
≤ 1 ½ MW	2.08 (1.40 - 3.08)	0.000	1.68 (1.11 - 2.52)	0.013
Cash Tranfer Program [a]				
Yes	1.74 (1.31 - 2.32)	0.000	1.47 (1.08 - 1.99)	0.014
Residency status				
Unstable	1.27 (0.92 -1.74)	0.144		
Gestational age				
Second and Third trimester	1.43 (0.86 - 2.36)	0.163		
Gestational BMI [c]				
Inappropriate	1.13 (0.80 - 1.59)	0.468		

[a] *Bolsa Família* Program; [b] Minimum Wage R$ 954.00 or U$246.51 in 2018; [c] BMI = Body mass index; PR = prevalence ratio; CI95% = 95% confidence interval; [d] Poisson regression model with robust adjustment of variance. Model adjusted by age, race, marital status, minor at home, gestational age and residency status.

this is the first study in the city of Lavras in which such conditions are investigated. Results are expected to contribute to the development of an intersectoral health and nutrition policy to promote food security among marginalized communities and vulnerable populations, such as pregnant women in the city of Lavras.

The present study showed that almost half of the pregnant women in this sample were living in food insecure households (48%), prevalence considered high compared with data from a Brazilian nationally representative survey (National Household Sample Survey – PNAD, 2013). In the Brazilian Southeast region - where Lavras is located - PNAD prevalence of food insecurity was 14.5%. The state of Minas Gerais had 18.4% of households with some degree of food insecurity.[13] Brazil is divided in five administrative geographical regions: North (N), Northeast (NE), Midwest (MW), Southeast (SE), and South (S). Regions contrast in terms of development. N and NE are deemed less developed than MW, SE and S regions. A study conducted with pregnant women in the NE found prevalence of 42.7% of food insecurity,[5] which is similar to the prevalence of food insecurity found in Lavras, located in the SE, a more developed Brazilian region.

It is also important to highlight the high prevalence of severe food insecurity in this sample (8%), which indicates that someone in the household may have experienced total

deprivation of food, experiencing hunger.[12] Hunger is a social problem not tied to the lack of food availability, but to the lack of access to food, which in turn is tied to the lack of financial resources to buy food. Brazil is a highly productive country but aims part of the food production at export, monoculture and agribusiness, therefore making harder for some people to secure their right to food. Having said that, agroecology and farmers' markets are still strong in Brazilian communities and remain a source of access to fresh foods based on sustainable productions.[17]

Lavras is an urban city. As such, food insecurity is primarily related to lack of financial means to buy food instead of food scarcity. Pregnant women living with family monthly income less than one and a half minimum wages was 68 percent more likely to experience food insecurity than those living with incomes higher than that amount. Despite being indirectly correlated, a low household income increases the likelihood of triggering food insecurity, since money available to buy food competes with other basic needs' expenses such as rent, energy, water, sewage, transportation, among other bills, which sets the scenario for an increased risk of giving birth and raise a child in a food-insecure environment,[18] which in turn interferes with fetal growth and development.[19]

The 2018 national survey (PNAD) disclosed that the average national monthly income was R$ 2,222 and in Minas Gerais it was R$ 1,950. The present study showed that the average household monthly income to which the pregnant woman lived with was R$ 1,631. It means 84 percent and 74 percent of the state and national averages, respectively. The *Bolsa Família* Program (PBF) is aimed at vulnerable populations, which in turn are more likely to be in food insecurity.[20] One third of the pregnant women interviewed, (29.5%) participated in the PBF. Pregnant women who participated in the program were 47 percent more likely to be living in food-insecure households when compared with those not participating in the cash assistance program. It shows the need to identify the most vulnerable families. Healthcare Centers are meant to inquire families of program participation. However, they are yet required to actively search households with people experiencing food insecurity. To ensure equity and improve food security indicators, the insertion of food security questions throughout prenatal appointments are necessary.[4]

The benefit of cash transfer program utilization is undeniable. Among the 51 pregnant women benefiting from the government cash transfer program, 59.6 percent spent the amount towards food, 57.7 percent reported an increase in the variety of foods, and 51.9 percent stated that the quantity of food consumed at home increased after receiving the benefit. The average benefit received by pregnant women was R$179 (U$46,25), ranging from R$39 to R$511 (U$10,07 to U$132,04). It is noteworthy that the average family income of pregnant women receiving cash from the government program was R$1,076 (±R$744) or U$278 (±U$192), the equivalent of almost 20 percent of their income.[21] The PBF is important and necessary, but the monetary value destined to families is insufficient to complement their income in order to pay for all basic needs, including food. Despite the increase in income coming from the benefit, social vulnerability due to poverty, will more likely perpetuate food insecurity.[20]

Social vulnerability could also be seen in other sample characteristics surveyed in this research. The role of women as the head of household (HOH) for example, was shown to be more prevalent in food insecure households (43.4%). Women have been recently inserted in a long-standing patriarchal society, which could be considered a bless or a curse. Women who are solely responsible for the household support the family financially and emotionally, the latter often considered an invisible job.[22] Ramalho *et al.*[23] also identified more severe levels of FI among households in which women were HOH. In this study, having a woman as HOH was associated with an increase in 39 percent of living in a food-insecure household when compared with men being HOH. It calls for an urgency in assuring better quality of life and opportunities during pregnancy and afterwards.[23]

Concomitant as being *inducted* to lead the household; women are also trying to gain space in society. It was only in the 1900s that women gained open access to schools and universities, and consequently increased their level of education. However, it does not mean that access to education is universal and equitable. Opportunities are not equal for all genders or races. According to the Brazilian Institute of Geography and Statistics (IBGE), when women do reach higher levels of education, they earn lower salaries (63.4%) compared to men with the same level of education attainment. Gender inequities are reflected in the trajectory of pregnant women, as it is their responsibility to raise a new generation and break the cycle of education attainment and poverty, which in turn are both directly reflected in their level of food security.[24]

Low education attainment is an indicator of endangered quality of life, especially in vulnerable populations, such families with children and pregnant women.[23,25] In this sample of pregnant women, one in five did not complete middle school. Compared with pregnant women with high education attainment (years of schooling higher than 8), pregnant women with low education attainment were 43 percent more likely to be living in food-insecure households. Low education attainment is an important socioeconomic indicator, as it reduces the opportunity for a well-paid formal job and the access to food, consequently

perpetuating the household condition of lack of access to food due to insufficient income.[25,26]

Even though the present study controlled the analysis by race, it is important to mention that food insecurity is often more prevalent among people of color.[13] Results showed that 77 percent of pregnant women experiencing food insecurity identified themselves as black or brown. Despite small advances in equity, poverty and food insecurity are still more prevalent among black, brown, Asians and indigenous people compared with white people, condition deeply rooted in social disparities.[23,27] In this sense, strengthening national datasets as well as hyperlocal ones will contribute positively to the body of literature that is likely to enable changes in systems that perpetuate food insecurity. Future studies should disaggregate food security data to promote thinking regarding more equitable nutrition public policies aimed at vulnerable populations.

Despite not being prevalent enough to reach statistical significance, BMI is an indicator of social vulnerability and health risk, especially among those living with food insecurity. Pregnant women that had adequate gestational BMI composed one third of the sample (34.1%), indicating that the remaining woman had inadequate BMI either as underweight or overweight. Food insecurity means that at any point in the previous three months of interview there was a decrease in quality and/or quantity of food available at the household. Inadequacies in food consumption are associated with changes in BMI. There is a burden posed on people who do not eat enough or eat ultra-processed foods. Those types of foods have in its composition disproportional high quantities of salt, sugar and/or fat. In addition, food insecurity is associated with lower consumption of fruits and vegetables, due to the affordability or accessibility,[5,18] which might aggravate an unhealthy weight. Maternal malnutrition is associated with an increased risk of maternal morbidity and mortality with several adverse pregnancy outcomes such as low birth weight and preterm birth.[28] Obesity during pregnancy is associated with increased risk of miscarriage, birth defects among newborns, and adult obesity among offspring.[29]

Nonetheless, the study had a limitation. This is a non-probabilistic sample chosen by convenience. The reason behind it relates with the non-consonance between data on pregnant women registered in the Social Development Department system with those registered with the Health Department of Lavras city hall, which made random sampling impossible. Despite these limitations, the present study has its strengths. To our knowledge, this is the first study of pregnant women seen in the public healthcare network of Lavras. Its results will lay grounds to structure services and programs aimed at promoting maternal and child health, with specific activities of disease prevention and access to safe and adequate food. Despite that, there is need for more studies in Lavras, focusing on the multifactorial characteristics of food insecurity. Promoting the food security theme ceaselessly will maybe change the scenario for the future of children of these pregnant women.

Food insecurity was highly prevalent among this sample of pregnant women seen in the public healthcare network of Lavras, Brazil. Almost half of them lived in households with some degree of food insecurity, and it was associated with structural social factors such as participation in the government cash transfer program, having low income, having less than 8 years of study and the woman being the main provider of family economic support. Thus, it is necessary not only to formulate public policies to mitigate food insecurity, but also to include a look of equity in these policies where everyone can obtain the same opportunities to live in food security.

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Author's contribution

Costa ROM: data collection; conception, analysis, interpretation of data, writing and critical review of the manuscript. Poblacion A: conception, interpretation of data, writing and critical review of the manuscript. Giudice CL and Lima DB: writing and critical review of the manuscript. Moura LCM: data collection, writing and critical review of the manuscript. Lima AAR: data collection and critical review of the manuscript. Toloni MHA: project management, funding acquisition, and critical review of the manuscript. Teixeira LG: conception, and critical review of the manuscript. Project management.

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