

# Food Security in Acajete, Veracruz

Seguridad alimentaria en Acajete, Veracruz

Segurança alimentar em Acajete, Veracruz

Sécurité alimentaire à Acajete, Veracruz

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## Abstract

**Objective:** To determine the dietary diversity, the level of food security and its relationship with living conditions in families in Acajete, Veracruz.

**Materials and methods:** Proportional stratified sampling, with 95% confidence, 5% error, and 50% response distribution. Household selection was made randomly, resulting in 211 dwellings as a sample.

**Results:** Marginal food security with 40.3% (n = 85), followed by 32.7% of families with food security (n = 69). Regarding the nutritional status of surveyed people, the mode and median was normal weight (57.7%), overweight and obese 25.5% and underweight 16.8%.

33.6% of the people consume three food groups throughout the day, 27.5% four groups, 15.2% two groups, and the same percentage five food groups. There were significant differences (p=0.039) between the education level of the respondents in relation to their food security status, where 84.2% of the illiterate population has some degree of food insecurity, and 15.8% are in Food security.

**Conclusions:** The housing characteristics considered in this study are not a determinant risk factor for Food Insecurity; no significant differences were found with overcrowding (p=0.239), housing ownership (p=0.987); and an unsafe source of drinking water (p = 0.973). The average scores of the Mexican Food Security Survey (EMSA) were statistically significant, therefore it is observed that lower food diversity results in lower food security. The inhabitants of Acajete who are in low or very low food security, only feed on two food groups: cereals or tubers; and legumes, nuts or seeds. When there is marginal food security add meat or fish.

**Keywords:** Dietary diversity; Education level; Food groups; Food security; Nutrition.

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## Resumen

**Objetivo:** Determinar la diversidad alimentaria, el nivel de la seguridad alimentaria y su relación con las condiciones de vida en familias en la localidad de Acajete, Veracruz.

**Materiales y métodos:** Muestreo estratificado proporcional, con una confianza del 95%, un error del 5%, y un 50% de distribución de respuesta. La selección de los hogares se realizó de manera aleatoria, resultando 211 viviendas como muestra.

**Resultados:** Inseguridad alimentaria leve con un 40.3% (n=85), seguido del 32.7% de las familias con seguridad alimentaria (n=69). Respecto al estado nutricional de las personas encuestadas, la moda y mediana fue de normopeso (57.7%), en sobrepeso y obesidad 25.5% y en bajo peso 16.8%.

El 33.6% de los encuestados consume tres grupos de alimentos durante todo el día, 27.5% cuatro grupos, 15.2% dos grupos, y con el mismo porcentaje cinco grupos de alimentos.

Se encontraron diferencias significativas ( $p=0.039$ ) entre el nivel de educación de los encuestados en relación con su estado de seguridad alimentaria, donde el 84.2% de la población analfabeta cursa con algún grado de inseguridad alimentaria, y el 15.8% se encuentra en seguridad alimentaria.

**Conclusiones:** Las características de la vivienda que se consideraron en este estudio no son un factor de riesgo determinante para la Inseguridad Alimentaria, no se encontraron diferencias significativas con el hacinamiento ( $p=0.239$ ), propiedad de la vivienda ( $p=0.987$ ); y fuente insegura de agua para beber ( $p=0.973$ ). Los puntajes promedio de la Encuesta Mexicana para la Seguridad Alimentaria resultaron estadísticamente significativos, por consiguiente se observa que una menor diversidad de alimentos resulta en mayor inseguridad alimentaria. Las familias en Inseguridad Alimentaria Moderada o Severa, se alimentan únicamente de dos grupos de alimentos: cereales o tubérculos; y de legumbres. Cuando hay inseguridad alimentaria leve agregan la carne o el pescado.

**Palabras clave:** Diversidad alimentaria; Grupo de alimentos; Nivel educativo; Seguridad alimentaria. Nutrición.

## Resumo

**Objetivo:** Determinar a diversidade alimentar, o nível de segurança alimentar e sua relação com as condições de vida das famílias na cidade de Acajete, Veracruz.

**Materiais e métodos:** Amostragem estratificada proporcional, com uma confiança de 95%, um erro de 5%, e distribuição de resposta de 50%. A seleção dos agregados foi realizada de forma aleatória, resultando invólucro 211, como mostrado.

**Resultados:** Insegurança alimentar leve, com 40,3% (n = 85), seguido por 32,7% das famílias com segurança alimentar (n = 69). Com relação ao estado nutricional dos entrevistados, moda e mediana foi de peso normal (57,7%) em sobrepeso e obesidade de 25,5% e 16,8% abaixo do peso. 33,6% dos encuestados consomem três grupos de alimentos ao longo do dia, quatro grupos de 27,5%, 15,2% dois grupos, e a mesma percentagem de cinco grupos de alimentos.

Diferenças significativas ( $p = 0,039$ ) entre o nível de escolaridade dos entrevistados sobre sua situação de segurança alimentar, onde 84,2% da população analfabeta apresenta com algum grau de insegurança alimentar foram encontrados, e 15,8% estão em segurança alimentar.

**Conclusões:** As características da habitação que foram considerados neste estudo não são um factor determinante para o risco de segurança alimentar, não há diferenças significativas com a superlotação ( $p = 0,239$ ), a posse ( $p = 0,987$ ) que foram encontrados; e a fonte de água não potável ( $p = 0,973$ ). Os escores médios do Inquérito de Segurança Alimentar mexicano foram estatisticamente significativos, portanto, mostra que menos diversidade de alimentos resulta em maior insegurança alimentar. Famílias insegura alimentar moderada ou grave, são alimentados apenas dois grupos de alimentos: cereais ou de tubérculos; e leguminosas. Quando há ligeira insegurança alimentar, eles adicionam carne ou peixe.

**Palavras-chave:** Consumo de alimentos; Diversidade alimentar; Grupo de alimentos; Educação; nutrição; Segurança alimentar.

## Résumé

**Objectif:** Déterminer la diversité et le niveau de sécurité alimentaire, ainsi que leur relation avec les conditions de vie de familles résidant à Acajete, Veracruz.

**Matériaux et méthode:** Échantillonnage stratifié proportionnel, avec un intervalle de confiance de 95%, une marge d'erreur de 5% et 50% de distribution des réponses. La sélection des ménages a été faite au hasard et a donné lieu à un échantillon de 211 logements.

**Résultats:** 40,3% des familles (n=85) ont indiqué une insécurité alimentaire légère et 32,7% (n = 69) une sécurité alimentaire. En ce qui concerne l'état nutritionnel, 57% des personnes interrogées ont présenté un poids normal (valeur du mode et la médiane), 25,5% surpoids ou obésité 25,5% et 16,8% une insuffisance pondérale. 33,6% des personnes interrogées consomment trois groupes alimentaires dans la journée, 27,5% quatre groupes, 15,2% deux groupes, et 15,2% également cinq groupes. Des différences significatives ( $p = 0,039$ ) de niveau d'éducation ont été trouvées en relation au statut de sécurité alimentaire: 84,2% des analphabètes expérimentent un certain degré d'insécurité alimentaire et 15,8% sont en sécurité alimentaire.

**Conclusions:** Les caractéristiques du logement prises en compte dans cette étude ne sont pas un facteur de risque déterminant d'insécurité alimentaire. Aucune différence significative n'a été observée en fonction du surpeuplement ( $p = 0,239$ ), de la propriété du logement ( $p = 0,987$ ); et de l'existence d'une source non fiable d'eau pour boire ( $p = 0,973$ ).

Les valeurs moyennes de la Encuesta Mexicana para la Seguridad Alimentaria (EMSA) se sont révélés statistiquement significatifs ; on a ainsi observé qu'une moindre diversité alimentaire entraîne une insécurité alimentaire majeure. Les familles en situation d'insécurité alimentaire modérée ou sévère ne se nourrissent que de deux groupes d'aliments: céréales et tubercules, et légumineuses. Dans les cas d'insécurité alimentaire légère, à cela s'ajoute de la viande ou du poisson.

**Mots-clés:** Diversité alimentaire; Groupes d'aliments; Niveau d'éducation; Sécurité alimentaire; Nutrition.

## Introduction

Food Security goes back to the "Universal Declaration of Human Rights", which recognized the right to food as the central axis of human well-being<sup>1</sup>. Then, the Food and Agricultural Organization states that Food security (is) a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life<sup>2</sup>.

In Latin American countries, the rural poor face grappling with food shortages and malnutrition, while their urban peers face the challenge of increasing levels of obesity caused by sedentary professions and diets with more calories. Malnutrition and its effects on health and education translate into significant economic costs for society. The total costs derived from food and nutritional problems are a function of higher expenses for health treatments, inefficiencies in educational processes and lower productivity<sup>3</sup>.

According to the FAO Regional Office for Latin America and the Caribbean, the increase in food prices in 2011 sharpened the economic and social risks of the most vulnerable population<sup>4</sup>.

As reported by the National Survey of Housing Conditions applied in Guatemala, the food insecurity is higher in households with children under 18 years old. In addition, the number of inhabitants per household increases as food insecurity becomes more severe<sup>5</sup>.

The proportion of households with a perception of food security at the national level was 30% while 70% were classified in any of the three categories of food insecurity<sup>6</sup>. The capital region of the state of Veracruz has 17.9% of its municipalities in high and very high degree of marginalization, related to economic income<sup>7</sup>.

To perpetuate the conditions of marginalization, poverty and food insecurity, malnutrition can not be eradicated by avoiding optimal human, social and economic development; generating in this way the economic backwardness of the state and therefore of the country. That's why it is considered important to determine food safety in Acajete, as well as its relationship with living conditions and dietary diversity.

## Materials and methods

The present investigation was carried out in March 2014 with Acajete families in the state of Veracruz. It was used a stratified proportional sampling for the selection of families, with a 95% confidence, 5% error, and 50% response distribution. The household selection was randomized. In the town of Acajete there are 465 homes, resulting in 211 homes as a sample.

**Objectives:** to determine the dietary diversity, the level of food security and its relationship with living conditions in families in Acajete, Veracruz.

Specific objectives:

- To determine the degree of food insecurity in the town of Acajete, in the state of Veracruz.
- To determine the dietary diversity in families of Acajete.
- To identify the relationship between food insecurity and nutritional condition.
- To identify the relationship between food insecurity and living conditions in families in Acajete, Veracruz.

The study variables considered for food security are describe in Table 1.

**Dietary Diversity:** It is a qualitative measure of food consumption that reflects household access to a variety of foods, and it is also a proxy for nutrient adequacy of the diet of individuals. The Women's Dietary Diversity Score (WDDS) is a qualitative 24-hour recall of all the foods and drinks consumed by the respondent (individual level); which are subsequently classified into groups of Standard food. Considering the food groups of the questionnaire to obtain the WDDS. 1.- Cereals and tubers. 2.- Dark

green leafy vegetables. 3.- Other vitamin A rich fruits and vegetables. 4.- Other fruits and vegetables. 5. Organ meat. 6.-Meat and fish. 7.- Egg. 8.- Legumess, nuts and seeds. 9.- Milk and milk products<sup>8</sup>.

**Nutrition status:** To identify the nutritional condition of the respondent, data on age, height and weight were taken, applying the following criteria: under weight < 18.4, Normal weight from 18.5 to 24.9, Overweight from 25 to 29.9, Obesity grade I from 30 to 34.9, Obesity grade II from 35 to 39.9, Obesity grade III more than 40)<sup>9</sup>.

**Living conditions in families:**

- Economic Condition of Households.
- Number of family members.
- Education.

**Economic Condition of Households:** The levels established by the Mexican Association of Market Research Agencies and Public Opinion were applied to classify households according to their socioeconomic status (Table 2).

**Table 1.** Cut-off points for the measurement of Food Security.

Level of food security		Number of affirmative answers
Households made up of adults	Food security	0
	Marginal food security	1-2
	Low food security	3-4
	Very low food security	5-6
Households with children under 18 years old	Food security	0
	Marginal food security	1-3
	Low food security	4-7
	Very low food security	8-12

**Source:** Escala Mexicana para la Seguridad Alimentaria (EMSA)

**Table 2.** Classification of households by monthly economic income.

Level	Minimum Income	Maximum Income	Class
A/B	\$85,000.00	+	Rich
C+	\$35,000.00	\$84,999.00	Upper medium
C	\$11,600.00	\$34,999.00	Medium
D+	\$6,800.00	\$11,599.00	Low medium
D	\$2,700.00	\$6,799.00	Lower
E	\$0.00	\$2,699.00	Extreme poverty <sup>10</sup>

**Source:** Authors

**Family Composition:** According to the number of family members: The number of members per family was divided into three categories and used to determine if it was related to the level of food insecurity. Very extensive: more than 6 members. Extensive: from 4 to 5. Not extensive: less than 3 members.

#### Methods of statistical analysis:

The results are expressed through frequencies, percentages, mode, median, minimum and maximum, as well as the use of contingency tables and Chi2. An ANOVA test was performed to analyze the information obtained from the dietary diversity format and its relation with food security.

## Results

It was observed that of the 211 people surveyed, 71.1% were female, the median age was 44 years  $\pm$  16.9, the mode was 39 years old, minimum 17 and maximum 91.

In terms of food security measurement in the town of Acajete, mode and the median were marginal food security with 40.3% (n=85), followed by 32.7% of families that had food security (n=69). Regarding the nutritional status of the people surveyed, it was found that the mode and median was normal weight (57.7%), overweight and obese 25.5% and in under weight 16.8% (Figure 1).

In relation to the composition of the family, according to the number of members, it was found that 26% of families are made up of three members; followed by 25.1% with four members. The average of the members was of 3.7, the minimum of one and the maximum of eleven members. It

was observed that within Food Insecurity, 52.1% (n = 74) of families were composed of less than Three members, 35.2% (n = 50) from four to five people, and 12.7% (n = 18) by more than six members.

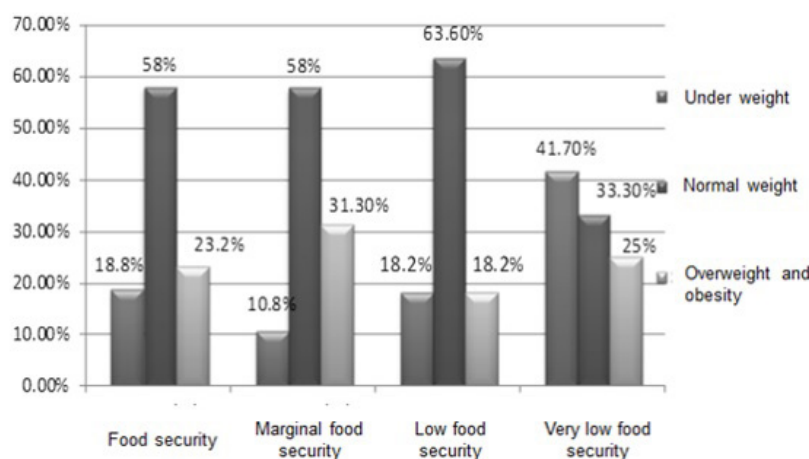
As for monthly economic income, mode fell to the lowest social class (48.82%), having a similar value to the low class segment (47.39%), the rest being the lower middle class (3.31%) and average (0.47%).

80.1% of the families have a basic education (preschool, primary and secondary education), with a lower percentage of the illiterate population (9%) and upper secondary and higher education (10.9%).

A contingency table was drawn between the education level of the respondents in relation to their food security grade and significant differences were found ( $p = 0.039$ ), where 84.2% of the illiterate population had some degree of food insecurity, and the 15.8% of the illiterate are in food security. Meanwhile, 47.8% of the inhabitants with higher education, and higher are in food insecurity, and 52.2% are in food security.

**Dietary diversity:** 33.6% of the population consumed three food groups throughout the day, 27.5% four food groups, 15.2% two food groups and the same percentage five food groups. Of these groups 99.05% of the families consume cereals and tubers, 72.51% consume legumes, nuts or seeds. The third group of food most consumed in Acajete, is meat or fish with 51.18%. The egg and milk were consumed in about 36.5% each. Dark green leafy vegetables are consumed by only 2.84% of families, and the rest of fruits and vegetables by 15%.

**Figure 1.** Food security and nutritional condition in families in Acajete, Veracruz.



Source: Authors

The prevalence of consumption of the food groups is as follows: cereals and tubers 99.05%, dark green leafy vegetables 2.84%, fruits or vegetables rich in vitamin A 12.32%, other fruits or vegetables 15.66%, organ meat 2.37%, meat or fish 51.18%, egg 36.49%, legumes, nuts or seeds 72.51%, milk or dairy products 36.97%.

It was observed that 14.22% of the foods are of vegetable origin rich in vitamin A, 61.22% foods of animal origin rich in vitamin A, 65.40% foods rich in vitamin A, and 51.66% foods rich in iron heminic.

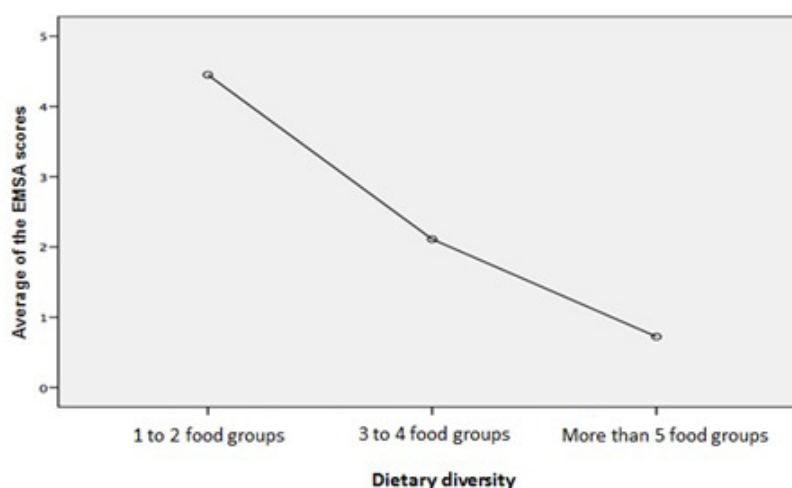
When the Dietary Diversity and Food Security of the surveyed families were related, it was obtained that the greater the insecurity, the less dietary diversity, and the incorporation of the different food groups in the daily diet, taking for example that meat and fish in Food Security reach 66.7% and in very low food security is only 16.7% (Table 3).

According to these results, it can be established that the average EMSA scores (in the form of means or medians) are statistically significant, graphically we would have the following figure where it is observed that a lower food diversity results in greater food insecurity (Figure 2).

**Table 3.** Group of foods that families consume, according to the grade of food insecurity.

Food groups	Food security	Marginal food security	Low food security	Ver low food security
Cereals or tubers	100%	98.8%	97.8%	100%
Dark green leafy vegetables	5.8%	0%	4.4%	0%
Other vitamin A rich fruits and vegetables	21.7%	9.4%	6.7%	0%
Other fruits or vegetables	81.2%	48.2%	26.7%	0%
Organ meat	7.2%	0%	0%	0%
Meat and fish	66.7%	51.8%	35.6%	16.7%
Egg	43.5%	38.8%	26.7%	16.7%
Legumes, nuts and seeds	63.8%	76.5%	75.6%	83.3%
Milk and milk products	75.4%	21.2%	13.3%	16.7%

Source: Authors



**Figure 2.** Graphic of the means Dietary Diversity with Food Security in families with members under 18 years old.

Source: Authors



## Discussion

The National Health and Nutrition Survey 2012 estimates that 30% of the Mexican population has food security and marginal food security 41.6%<sup>11</sup> meanwhile, in Acajete locality was observed that 32.7% attended with food security and 40.3% of marginal food security, reason why it is considered that the food security in Acajete, Veracruz is representative and that follows the same national tendency.

The same representation is observed if the information is compared by geographic region. ENSANUT points out that households in the south of the country has a marginal food security prevalence of 42.1% (40.3% in Acajete), 21.5% low food security (21.3% in Acajete), 12.4% very low food security. This degree of insecurity is double the prevalence in Acajete (5.7%). On the other hand, the nutritional condition of Acajete inhabitants is not representative at the national level, that's because the combined prevalence of overweight or obesity ( $BMI \geq 25 \text{ kg / m}^2$ ) in women is 73.0%, and in men (69.4%), Nevertheless, in Acajete its 25.5% in men and women. The results of ENSANUT are a national average, and it is difficult to generalize when there is big inequality in the complexion between regions, urban and rural areas. In the North of the country, there is a prevalence of overweight that it is -10% lower than other regions, but it has a prevalence of obesity higher than the Center<sup>6</sup>

In relation to very low food security and the nutritional condition of the families, the highest percentage of these families (41.7%) are underweight, and 24% are overweight and obese. In the category of marginal food security 10.8% presents underweight and increases overweight and obesity to 31.30%; Observing that the lower food security, lower weight.

The significant differences that were found with the Chi-square test can affirm that health and education level are intimately linked in the correct decision making with the modification of food consumption. Similar results were found in a study conducted in Venezuela, where as the level of maternal schooling decreases, the child is more likely to suffer malnutrition ( $p=0.01$ ). Literacy in women and the continuation of their studies at the levels of the educational system are the key factor for the structuring of healthy environments for the education of their family<sup>12</sup>.

It is observed that in households with children under 18 years old, 33.33% have food security, 8.33% have marginal food security; 24% low food security; and 3.33% very low food security. Whereas in families formed only by adults was found that 32.22% have food security; 43.33% marginal food security; 15.56% low food security; and

8.89% very low food security. These results are not related to what was done in Guatemala in which it is pointed out that there are always more households in food insecurity, in the three categories, among households with children under 18 years old<sup>5</sup>. In this regard, it should be mentioned that in Acajete, the variable of participation in social assistance programs was not included, which may be influencing the results found, which is why it is proposed to consider this variable of interest in future research.

As mentioned previously, each region of Mexico has specific characteristics but there is always a pattern of food: maize, beans and chili.

Regarding dietary diversity, it was observed that almost three-quarters of the families of Acajete consume cereals (mainly corn, tortilla and potatoes). The 72.51% also consumes legumes, nuts or seeds (usually boiled or refried black beans). That's the reason why it can be inferred that the base of the feeding of the locality of Acajete in the state of Veracruz is corn, tortillas and black beans. The third group of food most consumed in Acajete, is meat or fish with 51.18%, then one of two families obtain the proteins of animal origin, reason why the rest of the population obtains them by vegetal origin (black beans). From the nutritional point of view, a balanced diet should include 55 to 65% of carbohydrates, the tortilla being the main source of these. It is also rich in calcium, fiber and potassium.

It is important to note that eggs and milk consumed about 36.5% each one, considering that these products are widely popular for improving the nutritional condition of the general population.

Although the promotion of consumption of fruits and vegetables with the motto "Eat five fruits and vegetables per day", in charge of the Foundation 5 x day, has not increased in Mexico, the impact in this locality is not reflected, due to fruits and vegetables are consumed by 15% of the population.

Dark green leafy vegetables are consumed by only 2.84% of families, so there is a high risk of vitamin A deficiency (eye diseases, low immune system) vitamin C (linked to scarring, bone and teeth), antioxidants (which prevents cell aging and deterioration), and chlorophyll (a stimulant for the production of red blood cells and activates the cellular mechanism).

By using qualitative dietary diversity data, it is not possible to set thresholds below which the population does not consume enough vitamin A or iron. However, a low percentage of individuals consuming food groups that contain these micronutrients on a given day may be

indicative of severely inadequate diets. That's the case of the group of foods of plant origin rich in vitamin A, with a percentage of 14.22%.

With the results of one-way ANOVA, we observed that in families formed of adults, and in families with a member under 18 years of age, the lower the dietary diversity, the greater the likelihood of being in a situation of food insecurity.

## Conclusions

The town of Acajete is made up of small families (three members on average), who have generally been dedicated for generations to work as farmers. Many of the men look to be hired on a daily basis, causing concern about the economic access to food, reflected in the presence of marginal food security (40.30% of families). The average scores of the Mexican food security survey (in the form of means or medians) were statistically significant, therefore the lower food diversity results in greater food insecurity.

The habitants of Acajete who are in low or very low food security, only feed on two food groups: cereals or tubers, and legumes, nuts or seeds. While there is marginal food security add meat or fish. A little more than half of the population is in normal weight,; and contrary to the tendency that Mexico has as a country, in the nutritional transition (referring to the malnutrition produced as much by lack of food as by excess) the locality of Acajete does not face at present problems with overweight and obesity.

In the locality of Acajete, the characteristics of the house considered in this study are not a determinant risk factor for food insecurity, because no significant differences were found with overcrowding ( $p=0.239$ ), property of the dwelling ( $p=0.987$ ) and safe or unsafe source of drinking water ( $p=0.973$ ).

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