

Effects of Environmental Pollution Generated by the Garbage Dump on the Population of Centro Pobladochilla, Juliaca - Peru

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ABSTRACT

The objective of the investigation was to determine the effect of environmental pollution generated by the garbage dump on the population in the Chilla Town Center. The research design is non-experimental, descriptive and correlational, the econometric model Logit Multinomial was applied. It was determined that the effect of the existing contamination in the Chilla Town Center due to the dump is high, because 55.77% of those surveyed consider the same, the level of existing contamination that directly affects the health of the population has a probability of 63.85% and this responds to a medium level of involvement. The most contaminating resource that has been identified is groundwater (69.71% of those surveyed affirm the case), this because of the existing dump, where there is no adequate treatment of solid waste, the same one that concentrates all types of waste, such as heavy metals, organic compounds, nitrogenous compounds, waste from health centers, etc., that these have been generating a decomposition of toxic substances that the soil absorbs, thus contaminating the groundwater that the population consumes, affecting their population health.

Keywords

Dump, Environmental Pollution; Multinomial Logit; Water Resource; Solid Waste.

Introduction

Solid waste is defined as those substances, products or by-products in a solid or semi-solid state available to their generator, or is obliged to dispose of, in accordance with national regulations or the risks they cause to health and the environment to be managed through a system that includes, as appropriate, the following operations or processes: waste minimisation, segregation at source, reuse, storage, collection, marketing, transport, treatment, transfer, final disposal (Agunwamba et al., 1998; Alcántara Román et al., 2018). Waste is waste or leftover from human activities. It is classified into gases, liquids and solids; and because of their origin, in organic and inorganic (Agunwamba et al., 1998; Karak et al., 2012; Mahfuzur et al., 2017; Moy et al., 2008). In recent years, the nations of the industrialized world have quadrupled their domestic waste production, increasing this figure by two or three percent per year. In this sense, it is known that the environmental effects by inadequate management of solid waste, this due to the lack of collection systems and adequate final disposal of solid waste, where from it there are a number of negative impacts to the environment (Henry et al., 2005; Jiménez Guethón et al., 2020).

Among the main negative impacts to the environment we can mention, for example, the odors generated by the process of rotting organic solid waste; when this is dispersed by not being

collected or by not having any treatment, such fetid odors emanate (Karak et al., 2013). It may also be the case with the combination of such odors with chemicals that are poured into open pit dumps (Murphy et al., 2004; Neog, 2020). Gas can also be generated, which occurs due to the decomposition of organic waste, either by its direct contact with air (aerobic) or by being buried and without contact with air (anaerobic). Depending on the type of waste and the climatic conditions of the place, gases are produced, among the main ones: carbon dioxide, methane and nitrogen. Because the disposal of solid waste is not carried out in a controlled manner, the emanation of methane gas increases its concentration causing explosions and these in turn cause fires and smoke (Adrián, 2015; Ofori-Boateng et al., 2013; Rawat & Ramanathan, 2011).

In addition, a leaching process is generated, this when organic solid residues enter a rot process, the moisture they contain is converted into a very acidic liquid (organic acid containing among other elements: iron, zinc, nickel, copper and chlorides) (Cheela et al., 2019). This liquid drains through the trash and filters through the ground until it reaches groundwater contaminating it. Its generation influences the amount of rain, the type of land on which the dump has been built or enabled, the plant species that are nearby, in addition to the suning that determines the level of evapotranspiration (Armijo et al., 2008; Bai et al., 2007).

Likewise, air pollution is generated that occurs for two reasons: by the emanation of odors and gases, which when produced by decomposition rise and are carried by wind currents and by the generation of suspended particles; when soil is laid to coat the waste dump or as a product of the deterioration suffered by the natural environment, the dust found in the soil is lifted. These negative impacts on the environment are more serious when they happen in urban areas (Chen et al., 2020; Omoleke, 2004).

It can also generate fires, by generating gases and leachates, both interrelate to create conditions favorable to the appearance of this phenomenon. This means that whenever the stabilization process exists, solid waste will generate two important elements: Leachate and gases; both components interact and generate pressure; it causes the gas that is produced to seek to expand where it is contaminated. In clandestine dumpsters or controlled dumps, gaseous formations emerge to the surface and set fire to air oxygen by existing anaerobic metallization at concentrations greater than 5%. On the surface of the dumpsters there is an oxidation process that is also susceptible to burning when some other flammable object or material is nearby (Chen et al., 2020; González-Osorio et al., 2011).

It is important to note that it also attracts pests or disease-transmitting vectors, this when you do not have an adequate system for the final disposal of solid waste, it creates an appropriate habitat for the reproduction of animals, which we call vectors because it has the peculiarity of transporting diseases of all kinds (Omoleke, 2004). The most dangerous vector is the fly that precisely needs humidity and temperature to reproduce. Once turned into a plague the fly has an action radius of 7.00 km (Gutierrez, 2020).

It also leads to the deterioration of the Landscape, this when there is no adequate system of solid waste management and they are scattered in the environment, cause a deterioration of the landscape, due to the degradation of the natural environment and the bad appearance that produce the observer villager or the tourist (Alshuwaikhat & Abubakar, 2008; Hameed et al., 2021).

However, social problems also arise, given that the economic situation has led a large section of the population to extreme poverty levels and among this sector is a high percentage that reaches destitution. Some of these people and sometimes families have found a way of survival in solid waste collection, whether for their self-subsistence collecting household trash or for the sale of recyclable materials, because they do not have access to goods and services, their educational level is low and they easily fall into violence, crime, drug addiction, alcoholism and prostitution (Boadi & Kuitunen, 2005; Maheshwari et al., 2020). In addition, their constant exposure to a polluted environment can lead to diseases of all kinds and this is confirmed by Garcca & Padilla (2015), who states that exposure to the dump is associated with a higher likelihood of developing respiratory symptoms and higher family costs related to the development of these symptoms in children, so exposure to the dump has negative effects on child respiratory health and family costs related to the care of symptoms (González-Osorio et al., 2011; Halla, 2007; Kapadia & Agrawal, 2019).

Which is why the environmental situation in the city of Juliaca is an alarming problem. This is because it is a city in which commercial activity has developed enormously, above all other cities in the Puno region; as a result of this commercial growth there has been a lot of employment and therefore migration, as a result a lot of waste is generated every day that they go to the squeaky dump, but the emission of waste is so much that the collection trucks are not overflowing and the dump has reached the limit, but still every day the collection trucks will leave the garbage is so that the dump has become a infectious focus of the Chilla Populated Center(Huamaní et al., 2020; Quispe Mamani et al., 2020). According to the San Román Office of Health Network Statistics, the inhabitants of the populated centre have contracted diseases because of the presence of solid waste and the breakdown of solid waste, which influence the quality of air and water, thus affecting the quality of life of the inhabitants. In addition, the nauseating smell that fires the garbage and the large number of flies that seriously affects the population (Huamaní et al., 2020).

Thinking about garbage gives us an immediate rejection of this, however, we have to live with it and not only in our homes, but around any corner, on streets, on the shores of roads, in parks, in markets, etc. All this because we live in an eminently consumerist society in which the waste we generate has become a serious problem for the environment; because we have a culture of use and throwing. In addition, domestic and industrial activities, which generate excessive waste production, which become a major inconvenience when storing, disposed of or disposal. One of the final forms of garbage disposal is dumps, where much of the garbage produced by cities comes to a stop (Huamaní et al., 2020).

One of the most serious problems related to solid waste management in Peru is its final disposition; it is common to note that cities, even if they have an appropriate solid waste collection system, have their waste in rivers, ravens, hillsides and public spaces (Huacani & Mamani, 2017; Quispe et al., 2020; Ramos, 2006; Salinas, 2019).

The practice of disposed of waste in open places, commonly referred to as dumps, is highly harmful to the environment and puts the health of the population at serious risk; because they are infectious pockets. In recent years the Juliaqueña population has increased considerably, in fact, which has generated, the uncontrolled increase in solid waste; why the trash can has collapsed; generating a social and environmental effect in Chilla, which in turn has caused unrest in the population (Asqui & Willer, 2015; Huacani, 2013).

In Peru there are several dumps that do not meet the right conditions for their operation, among them is the Chilla-Juliaca dump that you have with a population of 449 people and 277 homes (INEI-National Census 2017), under relatively stable economic conditions; located around the dump, which represents an infectious focus on health due to the proliferation of infectious diseases; affecting the surrounding population; these problems arise as a result of poor disposal of waste and a lack of environmental culture by citizens; therefore, the final poor disposal of solid waste is one of the environmental problems affecting the city of Juliaca, since more than 90% of the total garbage generated daily by the Juliaqueña population are deposited in the Chilla sector (Condori, 2015). There are important aspects that aggravate this problem, such as the burning of litter, the production of all kinds of toxic pollutants, and the proliferation of vectors that become causing various diseases (Huamaní et al., 2020; Salinas, 2019).

In this sense we consider it of utmost importance to know the effects generated by the dump in the Centro Poblado de Chilla-Juliaca, in order to amend damages for future generations and avoid possible social conflicts. Identified the problem, we raise the following question: What is the level of environmental pollution generated by the garbage dump in the population in Chilla - Juliaca?, What is the environmental effect of the garbage dump on the health of the population in Chilla?, What mechanisms exist to reduce the contamination of the garbage dump in Chilla? and what policies should be proposed and implemented to reduce solid waste generation?

The scenario of Chilla is alarming as the existence of a high level of environmental pollution due to the dump of solid waste affects the population generating a proliferation of insects, rodents and dangerous compounds that are not treated that are polluting vectors that generate pathogenic microorganisms causing discomfort in the population with different types of diseases such as gastrointestinal , thus increasing health spending for the treatments they demand, thus reducing the budget that families can designate in their basic family basket and causing a decrease in quality of life, on the environmental side the quality of the soil and groundwater putting at risk the safety of families.

The objective of the research was to determine the effect of environmental pollution generated by the garbage dump on the population in Chilla, determine the environmental effect of the garbage dump on the health of the population in Chilla, evaluate the existing mechanisms to reduce the environmental pollution of the garbage dump in Chilla and propose and implement policies to reduce the environmental pollution of the garbage dump. Of which the hypothesis to be checked was the existence of a high level of environmental pollution due to the garbage dump on the population in Chilla.

Method

Model method to multinomial logit to estimate: for the first specific hypothesis, a diagnosis will be made based on primary source information through random surveys of a sample in the Populated Center of Chilla(Wooldridge, 2006). To verify this hypothesis, a regression will be performed with the multinomial logit model; where the dependent variable will be population health, it will be represented by the variable level of pollution of the dump to the population of Chilla these will agree if the pollution is high, medium or low, that is, they have three categories, 1 if it is low, 2 if it is average and 3 if it is high.

Equations 1, 2 and 3 show the models for the 3 categories.

$$\begin{aligned}
 & \text{Impact on the health of the population} = f(\text{Family income, Perception of bad odors,} \\
 & \text{Drinking water and drainage service, Pollution level in your Populated Center} \\
 & \text{due to the dump, Main pollutants from the Chilla landfill}) \\
 & \ln\left(\frac{P_{\text{Impact on the health of the population} = 1}}{1 - P_{\text{Impact on the health of the population} = 1}}\right) \beta_0 + \beta_1 \text{Family income} \\
 & \quad + \beta_2 \text{ Perception of bad odors} + \\
 & \beta_3 \text{ Drinking water and drainage service} + \beta_4 \text{ Pollution level in your Populated Center due} \\
 & \text{to the dump} + \beta_5 \text{ Main pollutants from the Chilla landfill} + u \\
 & \ln\left(\frac{P_{\text{Impact on the health of the population} = 2}}{1 - P_{\text{Impact on the health of the population} = 2}}\right) \beta_0 + \beta_1 \text{Family income} \\
 & \quad + \beta_2 \text{ Perception of bad odors} + \\
 & \beta_3 \text{ Drinking water and drainage service} + \beta_4 \text{ Pollution level in your Populated Center due} \\
 & \text{to the dump} + \beta_5 \text{ Main pollutants from the Chilla landfill} + u \\
 & \ln\left(\frac{P_{\text{Impact on the health of the population} = 3}}{1 - P_{\text{Impact on the health of the population} = 3}}\right) \beta_0 + \beta_1 \text{Family income} \\
 & \quad + \beta_2 \text{ Perception of bad odors} + \\
 & \beta_3 \text{ Drinking water and drainage service} + \beta_4 \text{ Pollution level in your Populated Center due} \\
 & \text{to the dump} + \beta_5 \text{ Main pollutants from the Chilla landfill} + u
 \end{aligned}$$

The research carried out, is both documentary and field, since to identify the effect of pollution on the population of Chilla, we seek both primary and secondary information. The surveys were conducted in the same populated centre using the field technique, which will contribute to the regression database, and identify conclusions and contribute to possible policies and projects that benefit the population and the environment in general. Secondary information was also used to contrast the results with different authors (Mendoza, 2014).

Methodology

This research work concerns whether there is a high level of environmental pollution due to the garbage dump, in addition if the effect of environmental pollution due to the garbage dump directly affects the health of the population of Chilla and finally how these can be used, according to the rules that exist such as the integral management of solid waste. In this sense, a descriptive and correlational methodologist was applied (Hernández, Fernández & Baptista, 2010).

Data Analysis

Effect on population health: the survey obtained the effect of the garbage dump on people's health: this variable has three categories 1 if it is low, 2 if average, 3 if high. Average household income: is according to the results, from which average income of S/ 800 soles, S/ 1200 soles, S/ 1500 soles and more than S/ 1500 soles was obtained. Perception of odors: the variable has two categories, if the respondent perceives odors is 1 and if he does not perceive odors it is 2.

Drinking water and drainage service: the variable is binary, if the surveyed has drinking water service is 1 and if the respondent does not have drinking water service it is 2.

Pollution level in its center populated by the dump: this variable has three categories, 1 if low, 2 if medium, 3 if high.

Main pollutants of the Chilla dump: This variable has 6 categories; 1 for fumes, 2 for leachates, 3 for faecal residues, 4 for solid waste, and 5 for all previous ones.

Population and Sample

The population in Chilla is 449 people according to the 2017 National Census. The research sample is sampling with a confidence level of 95% (Solano & Álvarez, 2005).

$$n = \frac{Z^2 * N * p * q}{e^2 N + Z^2 * p * q}$$

Where: n = Sample size, Z = Confidence level, P = Proportion of the population (success), Q = Proportion of the population (failure), E = Level of error willing to commit and N = Population size.

Replacing values has a sample size of 208 people to survey in the field of Chilla.

Results

Socioeconomic characteristics of the study population

Considering the socioeconomic characteristics of the population under study, of the total of those surveyed in the Chilla population center, 56.73% were male and 43.27% female; Of which, in terms of the ages of the respondents, it was highly variable, their ages ranged from 14 years to more than 65 years, the highest percentage of respondents, answered that their ages are between 25 to 30 years, then there are respondents aged 42 to 45 years, followed by people 35 to 38, to a lesser extent there were people 46 to 50 years, 23 to 25 years, 52 to 60 years, and the rest of 14 to 22 and finally to people over 60 years of age. The ages are varied since in this way there are different perspectives about the effect of the dump on the population. In this sense, of the total respondents, 44.23% studied 11 years, 27.88% studied 14 years, 15.87% studied 6 years and 12.02% studied 16 years, determining that the population has an intermediate level of educational training (between primary and secondary) (Figure 1).

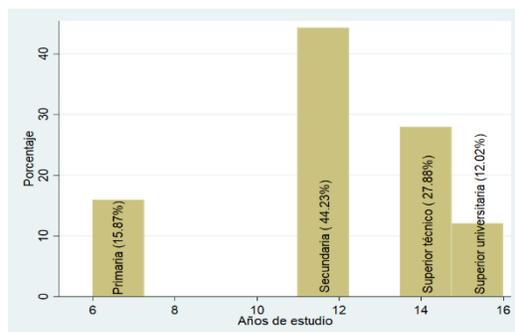


Figure 1. Level of educational training

In addition, of the total respondents 47.12% of respondents said that their monthly household income is between 1200 and 1500 soles, 26.44% indicated that their monthly household income is between 800 and 1200 soles, 14.42% responded that their income is between 1500 and more and 12.02% responded that their monthly household income is between 500 and 800 soles (Figure 2). Of which, it coincides with the number of members of their families that consists of 4 people (41.6%), 26.09% responded that their family is made up of 5 people, 19.81% said their family is made up of 3 people, 7.73% said their family is made up of 2 people and 5.31% of respondents responded that their family is made up of more than 5 people, the evidence in this way that those living in these areas are low-income and with a high rate of population growth.

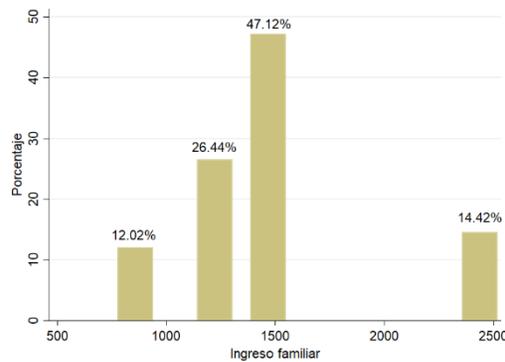


Figure 2. Family economic income

According to the characteristics of the city of Juliaca, this is at its greatest commercial magnitude, where when consulting on this, 50.0% of respondents responded that they are engaged in the activity of trade, 21.15% responded that they are engaged in the activity of civil construction these were male, 10.58% are professional technicians and dedicate the same, 8.17% of those surveyed are engaged in livestock, 7.22% responded that they are engaged in cosmetology, nursing, dentistry, teaching, electrician and are students, 2.88% of respondents are engaged in livestock (Figure 3).

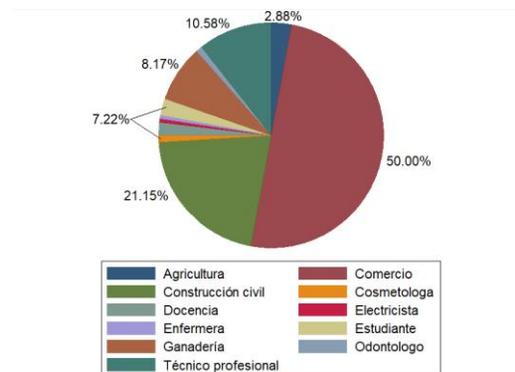


Figura 3. Tipo de actividad en la que se desempeña

Analysis of the level of environmental pollution in the study area

It is necessary to have the perception of the population of the study area on the perception of environmental conditions in the Chilla garbage dump, where it was determined that, of the total number of respondents, 78.74% of respondents signed that they perceive odors due to the dump,

21.26% of respondents responded that they do not perceive odors. In addition, the level of pollution in this Poblado Center because of the existence of the dump is high, since 55.77% of respondents responded that the level of pollution is high, 31.73% said the level of pollution is average and 12.50% of respondents responded that the level of pollution is low.

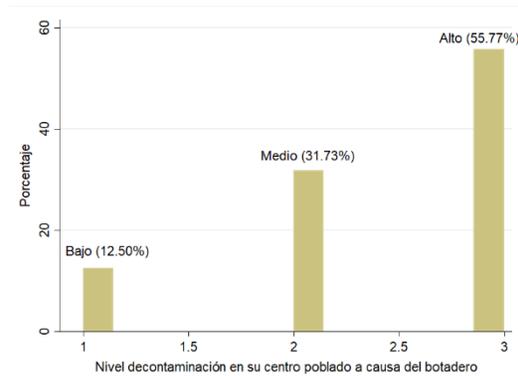


Figure 4. Pollution level of the Poblado Center due to the dump

Considering the resource or element most affected in this Population Center due to the existence of the dump, the response obtained is critical, given that 62.62% of respondents do not have drinking water and drainage services and 37.38% have drinking water and drainage services, thus demanding to go to the consumption of river water or wells, where 95.24% of respondents said they get water from wells (traditional and tubular) and 4.76% of respondents responded that they get from the river. Determining in this way that 69.71% of respondents show increased water pollution, 15.38% of respondents receive increased soil pollution and 14.90% of respondents receive increased air pollution (Figure 5).

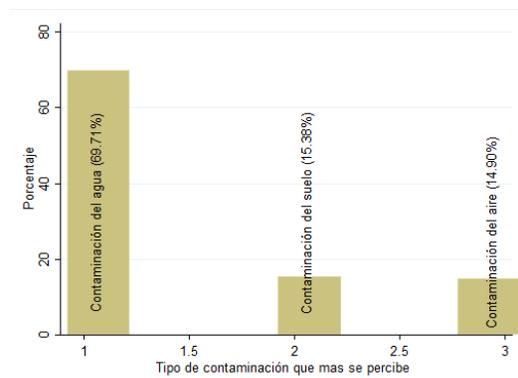


Figure 5. Perceived types of pollution

In this sense of everything considered in the previous points, the population of Chilla shows to this day its discomfort and discomfort, where, in consultation, 83.65% responded that there are permanent conflicts between the population of the community with Municipal Authorities, 12.95% answer that there are conflicts between the population, the regional government, 0.96%, responded that there are conflicts between the population and the national government and 2.4% of respondents are not interested because of the authorities' conflicts with the population. So the position they hold is that 92.79% of the population surveyed wants it closed and 7.21% of respondents show an uncertain position about the closure of the dump.

Analysis of the effects of pollution on population health in the study area

This aspect is highlighting in this research, in view of the fact that 57.69% of respondents indicated that contamination from the dump does not affect their economic activities; on the contrary, 49.04% indicated that they were affected in their health at an average level due to the dump, 39.42% of respondents indicated that they were affected in their health at a high level and 11.54% of respondents indicated that they were affected at a low level (Figure 6).

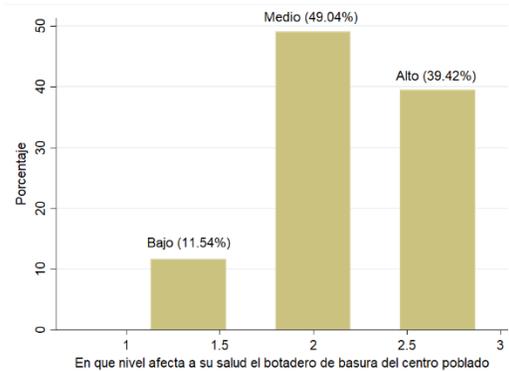


Figure 6. Health affectation levels

In addition, in conducting the analysis at the social group level, 61.54% responded that the most vulnerable to disease, due to environmental problems are children, 23.08% consider that the most vulnerable to disease, due to environmental problems are older adults, 12.98% responded that the most vulnerable to disease, due to environmental problems are pregnant mothers, and 2.4% responded that young people are the most vulnerable to disease due to environmental problems.

As a concentration of waste and waste dumped in this area is generated, it becomes the main cause of environmental pollution, which is claimed by 37.98% of respondents, 32.69% of respondents consider that what is most polluted are existing solid waste, 24.04% say that the main pollutant of the dump is smoke, 3.37% of respondents responded that the main pollutant of the dump is faecal waste, 1.92% of respondents responded that the main pollutant of the dump is leachates (Figure 7).

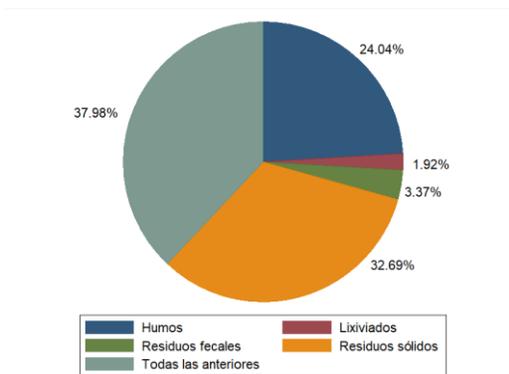


Figure 7: Main pollutants in the dump

Of the above, what generates environmental pollution are negative effects of different aspects, and when consulting the population of that area, 49.52% of respondents indicated that contamination of the dump causes digestive diseases, 30.77% considered that pollution of the dump causes respiratory diseases, 10.10% of respondents responded that contamination of the dump causes parasitic diseases, 6.25% of respondents responded that the contamination of the dump does not affect their health, 2.4% said that contamination of the dump causes nutritional diseases, and finally 0.96% responded that contamination of the dump causes skin diseases (Figure 8).

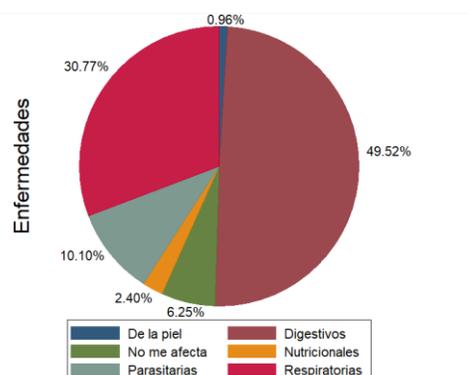


Figure 8. Types of pollution-related diseases

As a result of this environmental pollution, 62.02% of respondents consider that their families come to the health center, while the rest have to use other care or perhaps only endure their improvement with natural medicine through medicinal herbs; every time you demand a health expense, an issue that is not included within your family basket. The amounts incurred for family health due to environmental pollution vary, for example 25% of those surveyed consider that they spend an average of S /. 20 soles on medicine to be treated, 20% of those surveyed spend an average of S /. 60 soles, 15% of those surveyed indicate that they spend on average between S /. 20 to S /. 30 Soles, 10% spend between S /. 50 to S /. 60 soles, 7% consider spending more than S /. 80 soles, 5% of those surveyed spend S /. 40 soles, 4% spend between S /. 110 to S /. 120 soles in medicine to be treated and 4% make expenses in an amount of S /. 100 soles.

Econometric analysis of the proposed model (hypothesis contrast)

As detailed in the previous points, below is the results obtained by applying the multinomial Logit model, where the marginal effects in its three categories when the level at which the garbage dump affects people's health is 1st, 2nd and 3rd high are as follows:

Table 2: Marginal effect when the effect on the health of the population = low

Variable	Coefficient	Standard error	Z	Confidence interval (95%)	
Family income	-0.0000156	0.00002	-0.79	-5.5E-05	0.000023
Perception of bad odors	-0.0578876	0.03021	-1.92	-0.11711	0.001332
Drinking water and drainage service	0.0255519	0.02097	1.22	-0.01556	0.06666
Pollution level in your Populated	-0.0488886	0.02229	-2.19	-0.09258	-0.0052

Center due to the dump					
Main pollutants from the Chilla landfill	0.0052738	0.00638	0.83	-0.00724	0.017784

In this sense, analyzing the coefficients of the marginal effects when the effect on the health of the population is low, it considers a probability of 3.21% due to the dump. Therefore, it can be established that if the inhabitants improve their family income by 1 sol, then the probability that the effect of the contamination of the Chilla dump on the health of the population is low will not decrease; if the residents still perceive bad odors in the study area, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be low will decrease by 5.78%; If the residents already have basic water and adequate drainage services, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be low will decrease by 2.55%; If the level of contamination in the Population Center continues to occur due to the dump, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be low will decrease by 4.88%; and if the amount of solid waste, leachate, fecal waste, and the fumes that come out of the dump continue to increase, then the probability of generating an effect on the health of the population will be low, it will increase by 0.52% (Table 3).

Table 3. Marginal effect when the effect on the health of the population = medium

Variable	Coefficient	Standard error	Z	Confidence interval (95%)	
Family income	0.0002543	0.00009	2.96	0.000086	0.000423
Perception of bad odors	-0.3874266	0.14463	-2.68	-0.67089	-0.10396
Drinking water and drainage service	0.3337205	0.08265	4.04	0.171736	0.495705
Pollution level in your Populated Center due to the dump	-0.0903508	0.07061	-1.28	-0.22875	0.048052
Main pollutants from the Chilla landfill	0.0253387	0.02448	1.04	-0.02264	0.073317

In this case, when considering the coefficients of the marginal effects when the effect on the health of the population is medium, consider a probability of 63.85% due to the dump. Therefore, it can be established that if the inhabitants improve their family income in 1 sol, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be medium will increase to 0.025%; If the residents perceive bad odors in the study area, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be medium will decrease by 38.74%; If the inhabitants already have basic water and adequate drainage services, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be medium will increase by 33.37%; If the level of contamination in the Population Center continues to occur due to the dump, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be medium will decrease by 9.03% and if the quantity continues to increase discharge of solid waste, leachate, fecal waste, and the fumes that come out of the dump, then the probability of generating an effect on the health of the population will be medium, will increase by 2.53% (Table 3).

Table 4. Marginal effect when the effect on the health of the population = high

Variable	Coefficient	Standard error	Z	Confidence interval (95%)	
Family income	-0.0002387	0.00009	-2.74	-0.00041	-6.8E-05
Perception of bad odors	0.4453142	0.14639	3.04	0.158388	0.73224
Drinking water and drainage service	-0.3592724	0.08257	-4.35	-0.5211	-0.19745
Pollution level in your Populated Center due to the dump	0.1392394	0.06921	2.01	0.003594	0.274884
Main pollutants from the Chilla landfill	-0.0306125	0.02453	-1.25	-0.07869	0.01746

Finally, when considering the coefficients of the marginal effects when the effect on the health of the population is medium, consider a probability of 33.83% due to the dump. In addition, it can be determined that, if the inhabitants improve their family income by 1 sol, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be high will decrease by 0.023%; If the residents perceive bad odors in the study area due to environmental contamination, then the probability that the effect on the health of the population will be high will increase by 44.53%; If the residents already have basic water and adequate drainage services, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be high will decrease by 35.97%; If the level of contamination in the Population Center continues to occur due to the dump, then the probability that the effect of the contamination of the Chilla dump on the health of the population will be high will increase by 13.92% and if the quantity continues to increase discharge of solid waste, leachate, fecal waste, and the fumes that come out of the dump, then the probability of generating a high effect on the health of the population will decrease by 3.06% (Table 4). In this understanding, it can be determined that if there is a high level of environmental contamination due to the garbage dump on the population in the Centro Poblado Chilla.

Discussions

In this sense, our research is consistent with what is determined by Chávez & Leonardo (2018), since in the same city under study, it determines that there is no awareness of the management of solid waste, especially plastics, which even represent a commercially exploitable alternative that solves the environmental problem and the loss of natural resources. By contrast, in developing countries such as Peru, there is no awareness of the culture of recycling, which causes environmental pollution and the wasting of its potential use.

In addition, just as determined by Quispe (2020), the process of collecting and final disposal of solid waste is important, since as in Juliaca, the population of Tulumayo, meets its obligations to pay taxes and arbitrations, for the provision of public services, but the solid waste collection service is poor, there is a lack of solid waste management in the source segregation program, limited storage of waste, inadequate collection and transport units, lack of treatment and finally lack of adequate final disposal.

It is very consistent with the results obtained by Condori (2015), in view of the study of the garbage dump in the city of Puno, it was able to determine that 80% and 20% of families state that animals (cattle, sheep) consume solid waste, plastic material and metals (wires, needles, nails) respectively from the dump. It was also able to determine that 85% of sheep and 15% of cattle were sick from solid waste consumption. The cause of sheep disease is mostly due to diarrhoea by 45%, 44% by obstruction of the digestive tract by foreign bodies, and 11% by traumatic reticulitis, mainly in cattle. It found a mortality of 20% in sheep, 11% in cattle and 0% in South American camels and pigs. In addition, 50% of families suffer from headaches, and 30% from stomach disorders (diarrhoea and stomach pains).

Conclusion

The level of pollution that exists in Chilla due to the dump is high, because 55.77% of respondents consider it, therefore it is contrasted with the hypothesis raised, since it is claimed that there is a high level of pollution due to the garbage dump on the population in the PobladoChilla center.

The existing level of contamination that directly affects the health of the population has a probability of 63.85% and this responds to a medium level of affectation, in addition that 49.04% of those surveyed indicated that it affects their health and the 62.62% responded that they do not have drinking water and sewage services in the ChillaPoblado Center, therefore a large part of the population is affected because there is no proper access to basic services, and to a large extent those that affected are children, pregnant women and older adults. The most common diseases contracted by residents are mostly digestive, because residents consume water from wells, which are not treated and contain all kinds of dangerous compounds, mainly disease-bearing insects and insects, also generating parasitic diseases. On the other hand, we also identify that garbage fires generate toxic gases (fumes, dust and the bad smell of the dump because there is no adequate treatment of solid waste, causing respiratory diseases. Therefore, the maximum permissible limits for solid waste in general, according to the regression, they exceed 2.53%, worsening people's health.

The type of contamination that has been identified is mainly from the groundwater resource, where 69.71% responded that the most perceived contamination is from the water, due to the dump, because there is no adequate treatment of solid waste, the dump contains all kinds of residues such as heavy metals, organic compounds, nitrogenous compounds, residues from health centers containing viruses and bacteria, etc., dissolving all the contaminants and toxic substances that the soil absorbs, therefore polluting the groundwater that the population consumes therefore affecting their health.

According to people's perception, existing mechanisms such as laws that have both national, international and local PIGARS are not complied with, and therefore 83.65% of the population considers that there are conflicts with municipal authorities, and 12.95% stress that there are permanent conflicts with the regional government. But today local and regional authorities in conjunction with those involved have been proposing some alternatives for a solution, given that it is a priority issue in the country.

Limitations and Future Studies

The limitations are oriented towards the difficulties encountered in the field for gathering information, where in many cases the population living in said area does not have the will to provide information.

The limitation aimed at the search for similar research or with quantitative indicators is important, so it is necessary to continue developing similar research that shows certain problems faced by families who live near the places where solid waste is concentrated, since they are those directly affected in their entirety.

It is necessary to recommend to the local authorities that they establish solution proposals through projects or investment programs that help them to remedy the damage that they are currently perceiving, since these families need to have the quality of life that is required for their harmonious coexistence.

Acknowledgement

Acknowledgments is aimed at the National University of the Altiplano, the Economic Faculty of Engineering, which until now has been promoting the development of scientific research. In addition, we are grateful to the National Amazonian University of Madre de Dios for contributing to this research.

To the authorities of the Provincial Municipality of San Román - Juliaca and the District Municipality of San Miguel for their support towards the development of this research.

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