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## Sociodemographic factors and feelings of guilt in household waste management in Peruvian households

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### Abstract

The purpose of the study was to identify the sociodemographic factors that influence the feeling of guilt about recycling household waste in Peruvian families living in Sullana. The rapid generation of waste in urban and rural areas leads to the development of multidisciplinary research to mitigate environmental pollution, which not only affects tourism but also the quality of life of the population. The study design was non-experimental, descriptive, causal, and explanatory. The research approach was quantitative. The instrument was validated (Cronbach's alpha = 0.932), and it was observed that age, employment status, educational level, income, and professional career were significantly related ( $p < 0.05$ ) to the feeling of guilt for recycling. There is a high level of guilt about recycling household waste related to an attitude of success and social norms, and a mild level related to an attitude of failure. The sociodemographic profile of Peruvian families living in Sullana is characterized by an average age of 35 years, employment, secondary, technical, and higher education, as well as income between S/500 and 1500 soles and living in a family nucleus composed of 3-5 people. These findings are important for the elaboration of public policies in the environmental management of solid waste and in the academic sphere to raise awareness among the different actors to mitigate climate change and contribute to the sustainability of natural resources. It is recommended to apply compensatory incentives to families to achieve positive changes in household waste management.

**Keywords:** Consumer behavior, Environmental pollution, Environmental protection, Guilt, Heritage conservation, Household waste, Population of Sullana, Waste management.

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**Competing Interests:** The authors declare that they have no competing interests.

**Transparency:** The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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## 1. Introduction

Household waste management is a latent problem in different parts of the world because of its impact on the environment, public health, and natural resources. The collaboration of households in the management of household waste is essential to promoting good environmental practices and thus reducing the negative effects on the environment.

For this reason, people's willingness and social norms are key factors that facilitate household recycling. This is a necessary reason for politicians and environmental activists to develop and implement participatory strategies that encourage behavioral change towards household waste separation [1].

Attitudes towards the environment are positively related to the 3Rs of waste management [2]. Therefore, as subjects assimilate knowledge about the environment, they become more interested in the potential risks of the environment and have optimistic perceptions through pro-environmental behaviors [3]. Pro-environmental behaviors involve various activities aimed at improving the environment and reducing its negative impact [4]. Therefore, recycling household waste is a pro-environmental activity that aims to reduce the increase in landfills.

On the other hand, the relationship between attitudes and behaviors influences society and the environmental worldview because people become aware of their environment in order to have a healthy life [5]. The feeling of guilt that a person accepts can be a mechanism that drives the decision to try to recycle household waste [6]. Therefore, it is essential to identify the characteristics of the population and their motivations to recycle, because each territory has its own diversity [7]. A previous study by Li, et al. [8] reported that personal norms are closely related to social responsibility and pro-environmental attitudes and that the environment indirectly affects a person's individual behavior [9]. For this reason, the behavior of people in favor of recycling increases when they think that others act in favor of the environment. Similar results have shown that the communication of social standards for waste separation facilities has a positive effect on recycling [10]. Trying theory (TT) [11] and subsequent studies [6] based on TT have argued that publicity linked towards a positive and successful attitude influences the attempt to favorably change a negative habit, whereas attitude toward failure negatively influences the overall attitude toward the attempt. This is consistent with empirical research conducted, which reports that attitude toward recycling is a predictor of intention to recycle [9].

Peru, which generates more than 23,000 metric tonnes of solid waste per day and has 52 landfills, has an 85% deficit (more than 344 landfills are needed to meet demand) [12], a situation that is detrimental to the municipal service delivery system [13]. The district of Sullana reports the highest daily solid waste collection rate of 139 440 kg, followed by Bellavista 10 000 kg, Ignacio Escudero 10 000 kg, Lancones 3 200 kg, Marcavelica 15 656 kg, Miguel Checa 3000 kg, Querecotillo 7 850 kg, and Salitral 3810 kg [14]. This may be because the city has a larger population; however, it is evident that many sectors do not comply with collection due to budgetary factors, inadequate infrastructure, scarce financial resources, limited personnel, lack of training, poor planning and management, logistical problems, lack of citizen awareness and participation, corruption and bad practices, as well as cultural and social barriers, demographic changes, weak legislation and regulation, among others, which shows a city full of waste in its different streets, particularly in newly urbanized areas. The scenario without intervention is extremely worrying. According to the Organization for Environmental Assessment and Control [15], the city of Sullana is one of the 24 most critical landfills in Peru.

Faced with similar situations, scientists have conducted studies to reduce these pollutants, ranking the most representative cities in China. The results have shown that, from 7.49% to 13.07%, dioxin emissions can be reduced by 2030 through timely recycling management [16]. Social and behavioral research methods, as well as quantitative methods, are needed to better understand the perceptions and behavior of households related to the impact of household waste towards the environment, as subjective norms play an important role in pro-environmental behavior [17]. Moreover, if scientific information is effectively disseminated, it is likely to increase public awareness and understanding of public or private actions to combat pollution [18].

For this reason, the aim of the present study is to identify the sociodemographic factors that influence the feelings of guilt to recycle household waste in Peruvian families residing in the town of Sullana. Feelings of guilt about recycling household waste are emotional responses that are evident in people in the process of attempting to recycle [19]. Guilt is an unpleasant emotional state resulting from the self-evaluation of negative outcomes caused by an individual's action or inaction [20]. Some authors, Issock Issock, et al. [21], justify attitude in two aspects: firstly, it involves the feelings of the person, and secondly, it includes the knowledge of the person to adopt a particular behavior. Thus, there are positive feelings that can lead to self-transformation. Guilt increases irritation when participants previously engage in a moral act [22]. As a result, one's level of knowledge (cognition), attitudes, and behavior regarding sustainability issues all influence one's feelings of guilt [23].

The problem of guilt for recycling household garbage is related to a lack of information and understanding, as people may feel bad because they are unsure how to correctly separate materials for recycling [1]. Trying theory (TT) was designed to understand complex or 'problem' behaviors [11], in which the subject explicitly recognizes that his or her behavior may be frustrated by external aspects due to the type of disposal (dumping in landfills) and other resources (containers), as they do not allow any type of recycling or energy or material recovery, which makes it the least advantageous solution for the good of the environment [24]. Trying is part of this theory, which consists of achieving intermediate objectives and making a series of sequential steps towards achieving the final goal [25]. As a result, intent attitude, subjective norms, and observed behavioral control are linked to the desire to recycle, but they are not enough to cause timely behavioral outcomes [26]. The (TT) recognizes that failure and success are two possible outcomes; e.g., separating household waste before disposal is an intermediate goal to preserve the environment.

Feelings of guilt are relevant when adopting a behavior; as people who recycle convey a positive message to others and may increase empathy from bystanders by positively associating them with feelings of guilt [27]. It is important to

remember that feelings of guilt are not necessarily productive when they are negative. If the feeling has an "attitude towards success," the individual will try to recycle and succeed [28], but these attitudes to recycle require continuous effort [29], so as not to litter in the absence of garbage cans, causing them feelings of guilt [30].

Even those with doubts about recycling efficiency may question the effectiveness of recycling and believe that people's efforts do not contribute significantly to recycling [2]. Therefore, the role of emotional aspects is important in supporting environmentally friendly behavior, encouraging a positive attitude towards choosing easy methods of solid waste disposal [31, 32], and managing waste to improve people's quality of life through a multidisciplinary approach [33].

Household waste management is one of the problems that has become more prominent in recent years because it has altered the environment and climate globally [33]. Industrialization, globalization, and economic development influence the quality of the environment and have a negative impact on society [34], and the quality of life [35]. In addition, inefficient municipal management [1] waste management, and recycling, specifically in developing countries [36], have generated concerns in the face of environmental pollution, and this brings a sense of guilt from sustainability-conscious people because they feel that they are not doing enough to reduce the negative impact on the environment [37]. Therefore, it is important to assess and mitigate the obstacles that people face in recycling, such as a shortage of recycling facilities, a lack of time, or inconvenience in managing garbage [38]. There are few studies about emotions affecting household waste recycling behavior, although there is a consensus that positive attitudes towards the environment are strongly associated with a high emotional response to green actions [39] as well as sustainable consumption in the sector [40].

## **2. Methodology**

The research was descriptive, correlational, causal, and quantitative in nature.

### *2.1. Population, Sample, and Sampling*

The population consisted of 311,000 families in the city of Sullana. A representative sample of 455 families was estimated, with a 95% confidence level and a 5% margin of error. The estimated sample was stratified, applying probability sampling to a finite population.

### *2.2. Methods, Techniques, and Instruments*

#### *2.2.1. Methods*

The study adopted a quantitative approach and used the hypothetico-deductive method. In terms of Šaumjan [41], its procedure goes from general and logical reasoning to a concrete fact; in this sense, particular processes were developed to deduce facts from general principles, assumptions, or widely applicable theories with the purpose of arriving at specific conclusions. Likewise, an explanatory causal descriptive design was applied according to a previous study [42].

#### *2.2.2. Techniques*

The data were collected using an online survey technique. According to Alvira [43], the fundamental characteristic of online surveys is the use of the Internet to send the information and the hosting of the data received on a dedicated server for this purpose. In our case, the form was self-administered via personal e-mail, and respondents answered via the Internet.

#### *2.2.3. Instrument*

The online survey technique (Google Drive questionnaire) was used to obtain information from the study population [43]. The questionnaire was used to assess the guilt feelings of families about household waste recycling [6]. This instrument was organized into two sections; the first part was to assess the sociodemographic factors according to gender, age, occupation, employment status, educational level, monthly income, area or sector of residence, and number of people in the household.

The second part collected information on feelings of guilt in recycling household waste; the questionnaire was organized into 19 items and 6 dimensions distributed in the following order: attitude towards success (1 item), attitude towards failure (1 item), social norms (3 items), feelings of guilt (8 items), previous trials (2 items), and attempting to recycle (4 items). The application of the instrument lasted approximately 22 minutes, with Likert-type response scales according to dimensions: For "attitude towards success and attitude towards failure," a scale was used: very satisfied (5), satisfied (4), neutral (3), dissatisfied (2) for "social norms," a scale was used: Very satisfied (5), Satisfied (4), Neutral (3), Dissatisfied (2) and very dissatisfied (1). For the dimension "Feelings of guilt," Yes (3), Somewhat (2), and No (1). For the dimensions "Past trials and trying to recycle," the scale was used: Always (4), Often (3), Seldom (2), Rarely (1) and Never (0). Where (0) was the lowest score for feelings of guilt in recycling household waste and 5 is the most optimal score. Then these scores were placed on scales according to each dimension: AF1 (2 Mild, 3 Moderate and 4 High); AF2 (2 Mild, 3 Moderate, and 4 High); AF3 (3-7 Mild, 8-11 Moderate and 12-15 High); SC4 (8-13 Mild, 14-19 Moderate, and 20-24 High); for EA5 (2-4 Mild, 5-7 Moderate and 8-10 High) and TR6 (4-9 Mild, 10-15 Moderate and 16-20 High). The Cronbach's Alpha statistic value was 0.932, which was suitable for further research.

### *2.3. Data Analysis*

The data were organized in Excel sheets version 2019 and processed with the statistical software Minitab v.19, SPSS-27, and 2 types of statistical analysis were applied: on the one hand, descriptive through the presentation of information in tables and graphs that allow comparing the variables and dimensions of the study. On the other hand, inferential statistics

were considered; correlation analysis was used to statistically test a dependency relationship between categorical variables such as the chi-square  $X^2$  statistic as well as Somer's D statistic as a cause-and-effect directional measure of sociodemographic factors in the feeling of guilt. On the other hand, Spearman's correlation for the scores and the bivariate correlogram were applied to visualize the correlations between variables and dimensions, as well as the Anderson-Darling test to evaluate the normality of the variables and dimensions.

### 3. Results

It is evident that the level of feelings of guilt about household waste recycling among Peruvian families is high (65%), moderate (34%), and slight (1%). The level of feelings of guilt in household waste recycling according to the dimension of success is high (94%), moderate (4%), and slight (2%). For the attitude towards failure dimension, it is high (9%), moderate (10%), and mild (80%). For the social norms dimension, it is high (71%), moderate (25%), and mild (4%). For feelings of guilt, it is high (77%), moderate (20%), and mild (3%). In previous tests, it was high (60%), moderate (31%), and mild (10%), and for the dimension trying to recycle, a high (58%), moderate (34%), and mild (8%) level was observed in [Table 1](#).

**Table 1.**  
Level of feelings of guilt in household waste recycling according to variables and dimensions in Peruvian families.

Variable/ Dimensions	Level	N°	%
Feelings of guilt in waste recycling	High	296	65
	Moderate	154	34
	Low	5	1
Attitude towards success	High	426	94
	Moderate	20	4
	Low	9	2
Attitude towards failure	High	43	9
	Moderate	47	10
	Low	365	80
Social norms	High	322	71
	Moderate	113	25
	Low	20	4
Feelings of guilt	High	351	77
	Moderate	91	20
	Low	13	3
Previous tests	High	272	60
	Moderate	139	31
	Low	44	10
Trying to recycle	High	262	58
	Moderate	156	34
	Low	37	8
Total		455	100

The Anderson-Darling (AD) normality test was performed to verify the distribution of the data, and the results indicate that the data do not follow a normal distribution ( $p < 0.05$ ).

A weak correlation is observed with the dimension of attitude towards success ( $r = 0.248$ ), while a slight negative correlation is found with the dimension of attitude towards failure ( $r = -0.149$ ). In contrast, moderate to high-level correlations are evident with the dimensions of social norms ( $r = 0.586$ ), feelings of guilt ( $r = 0.731$ ), past trials ( $r = 0.807$ ), and trying to recycle ( $r = 0.855$ ); see [Table 2](#).

**Table 2.**  
Correlogram of the guilt feeling variable and its dimensions.

Bivariate correlation of the variable and dimensions	Attitude towards success	Attitude towards failure	Social norms	Feelings of guilt	Previous tests	Trying to recycle
Attitude towards failure	-0.163					
Social norms	0.223	-0.185				
Feelings of guilt	0.204	-0.234	0.32			
Previous tests	0.136	-0.142	0.348	0.496		
Previous tests	0.141	-0.138	0.345	0.452	0.689	
Feelings of guilt in general	0.248	-0.149	0.586	0.731	0.807	0.855

**Table 3.**

Test of independence of cause and effect of sociodemographic factors on feelings of guilt in household waste recycling by dimensions in Peruvian families.

Sociodemographic demographic factors	Category	Level of guilt								Measure of association			Directional measure Cause - Effect																																																																																																																																																																																																																																																																																																																			
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Gender	Female	208	46	104	23	2	0	314	69	4.56	2	0.853	0.056	4.04	0.841																																																																																																																																																																																																																																																																																																																	
	Male	88	19	50	11	3	1	141	31							Age	18-27	92	20	44	10	1	0	137	30	500.4	8	0.000*	0.463	34.65	0.000*	28-37	74	16	37	8	2	0	113	25	38-47	80	18	46	10	1	0	127	28	48-57	41	9	18	4	1	0	60	13	58-67	9	2	9	2	0	0	18	4	Employment status	Unemployed	89	20	61	13	1	0	151	33	421.1	4	0.000*	-0.731	-30.48	0.000*	Employed	164	36	69	15	4	1	237	52	Underemployed	43	9	24	5	0	0	67	15	Grade of instruction	Incomplete elementary school	2	0	1	0	0	0	3	1	625.8	12	0.000*	0.567	28.58	0.000*	Primary complete	5	1	3	1	0	0	8	2	Secondary incomplete	14	3	11	2	0	0	25	5	Secondary complete	75	16	44	10	0	0	119	26	Higher non-university	74	16	39	9	1	0	114	25	Higher university	117	26	56	12	4	1	177	39	Other	9	2	0	0	0	0	9	2	Revenues	S/. 300 to S/. 500	83	18	43	9	1	0	127	28	324.8	10	0.000*	0.454	23.79	0.000*	S/. 500 to S/. 1000	61	13	29	6	0	0	90	20	S/. 1000 to S/. 1500	58	13	30	7	1	0	89	20	S/. 1500 to S/. 2000	31	7	20	4	0	0	51	11	S/. 2000 to S/. 3000	44	10	18	4	1	0	63	14	S/. 3000 to more.	19	4	14	3	2	0	35	8	Number of persons living in the household	1-2 persons	20	4	9	2	1	0	30	7	5.28	4	0.872	0.0458	5.22	0.868	3-5 persons	202	44	92	20	5	1	299	66	6 to more persons	74	16	31	12	0	0	105	23	Professional career	Housewife	66	15	38	8	1	0	105	23	567.40	12	0.000*	0.487	34.65	0.000*	Teacher	25	5	12	3	0	0	37	8	Administration	18	4	10	2	1	0	29	6	Salesperson	17	4	10	2	0	0	27	6	Nursing	17	4	8	2	0	0	25	5	Other	153
Age	18-27	92	20	44	10	1	0	137	30	500.4	8	0.000*	0.463	34.65	0.000*																																																																																																																																																																																																																																																																																																																	
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Note: \*p<0.001.

It is evident that the level of feelings of guilt in household waste recycling for the female gender in Peruvian families residing in Sullana is high (66%), moderate (33%), and low (1%). For the male gender, feelings of guilt about household waste recycling are high (62%), moderate (35%), and low (2%).

The sociodemographic characteristics of the study indicate that 69% were female; the ages ranged from 18-37 years in greater proportion, and the most significant occupation was housewife (23%). It is evident that according to the Somer's D test statistic, applied to the 7 characteristics evaluated, only 5 presented a moderate degree of cause-and-effect ( $p < 0.05$ ) in the feelings of guilt about household waste (age, employment status, educational level, income, and professional career). Greater feelings of guilt about household waste recycling were observed in families with low socioeconomic status, higher levels of university education, female gender, employees, and housewives (see [Table 3](#)).

#### 4. Discussion

When analyzing the sociodemographic characteristics of the families, it was observed that the majority are headed by women, representing 69% of the total, with a higher proportion between 18 and 37 years of age. The predominant occupations were housewife, teacher, and administrative. In terms of employment, 55% were working at the time of the study, while 27% of the people were unemployed and 18% were underemployed. In terms of education, 30% of the respondents had non-university higher education, 25% had university higher education, and 5% of the respondents had completed secondary education. In terms of monthly income, 20% had a low income, ranging from S/500.00 to S/1000.00 soles, and only 8% had an income higher than S/3000.00 soles. Within the population studied, 60% of the families reside in human settlements (HA) on the urban periphery; these HA are organized groupings of the population, which can be located in a rural or urban area. The remaining 40% of the population resides in the center of the urban area of the city. The family life pattern is mostly characterized by the nuclear family model, which represents 60% with 4 to 5 members, followed by the family with 2 and 3 members. Higher levels of guilt in relation to household waste recycling were identified in those families with a disadvantaged socioeconomic status, a higher level of university education, those belonging to the female gender, employees, and housewives.

There are similarities with a previous study by [Coronel-Chugden, et al. \[44\]](#) since sociodemographic factors had a significant association ( $p < 0.05$ ) with solid waste recycling behavior (age, economic situation, educational level, occupation, area of residence, monthly income, and number of people in the household). The Theory of Planned Behaviour (TPB) argues that socio-economic and demographic variables provide insight into food waste recycling behaviour [\[45\]](#).

Furthermore, compared to another report by [Hatab, et al. \[46\]](#), sociodemographic characteristics and food purchasing habits are significant predictors of food waste behaviors, evidencing that the more an individual feels compelled to throw away less food, the greater the likelihood of reducing the amount of food wasted in the household. Therefore, knowledge of the contamination generated by food waste and the ability to interpret the information on food product labels are associated with a decrease in the amount of food wasted in the household. There is a need to explore effective ways of designing promotional messages (e.g., guilt feelings) that can encourage the intention to recycle to mitigate pollution [\[47\]](#).

Some authors, [Mak, et al. \[45\]](#) support the conclusion that the better the educational preparation, the better the assimilation of knowledge and satisfaction with life and connection with nature, the more likely it is to recycle. However, in this research, it was observed that families with low socioeconomic status, higher levels of university education, female gender, employees, and housewives are those who, in greater proportion, associate their feelings of guilt with recycling. However, other studies have found that both gender and the number of people living in the household are not significantly related to feelings of guilt [\[48\]](#).

According to research conducted by [Jiang, et al. \[49\]](#), residents' participation increased by 107.1% in 2019, when the government adopted a new environmental management policy. Meanwhile, waste collection increased by 114.5% in the same year, although it took about a year for the policy to regain positive user sentiment. We agree with other authors, [Aloysius, et al. \[50\]](#), who state that it takes a mix of personal psychological and lifestyle factors to drive waste reduction behaviours in the household. Focusing on knowledge and awareness is not sufficient as a behavior change strategy in this area. Interventions can be expected to involve "persuasion," "training," and "environmental restructuring" activities to encourage recycling behaviors. The issues that can be addressed in these actions should be related to the social, environmental, cultural, and tourism consequences and the incentives that the population can access by valuing environmental resources. Thus, the construct "feeling of guilt" is an emotional mechanism in the process of social transformation for solid waste recycling [\[6\]](#).

The study also found that females have greater feelings of guilt about recycling household waste than males. These data are comparable to those of an earlier study by [Maduku \[51\]](#) that looked at food waste behaviour; its findings suggest that in terms of food waste, ecological values strengthen the relationship between personal norms, ecological self-identity, and perceptions of the impact of food waste on the environment. Numerous variables, including education, culture, personal experiences, individual beliefs, and social norms, may have an impact of feelings of guilt or any other behavior. In our case, we consider that women's feelings of guilt may be related to personal experiences that link them to a variety of daily activities they develop in households in a Peruvian context (cooking and food preparation, cleaning and maintenance, packing and packaging, personal care, shopping and consumption, furniture and discarded objects, recreational activities, mail and documents, pet care, etc).

Although the population participated in the sorting and recycling of municipal solid household waste, it represents a critical factor in the success of waste management. Some authors suggest [Razali, et al. \[52\]](#) that moral norms have the greatest influence on waste separation behavior; this can be useful information for the government to develop effective management strategies to motivate recycling intention as well as to better understand households' intentions to recycle

waste [53] because attitudes remain determinants for families to recycle at home [52]. In addition, the moral norm is a determinant for adopting pro-environmental behavior [54]. One practical way to increase the recycling rate and reduce the level of contamination is to motivate the population towards environmentally friendly behavior, the key predictors of which are attitudes, feelings, convenience, and moral obligation [55]. There are also other factors, such as social norms, moral standards, and control of the population's behavior, that positively influence formal recycling for the sake of the environment [56]. Furthermore, in a town like Sullana, Piura, it is important to develop, conserve, and rejuvenate resources and tourist attractions by improving the dissemination and communication of environmental protection and cultural heritage [57].

## 5. Conclusion

The level of feelings of guilt in the recycling of household waste in Peruvian families is high, linked to an attitude towards success, social norms, previous trials, and trying to recycle. There is a feeling of guilt of a slight level towards an attitude of failure in the families. The feeling of guilt in the female gender is greater than that of the male for recycling domestic waste in households.

Sociodemographic factors such as age, employment status, educational level, income, and professional career are related to and have a significant cause-effect on feelings of guilt in household waste recycling in Peruvian households.

The sociodemographic profile of Peruvian families residing in Sullana is characterized by having an average age of 35 years, being employed, having secondary, technical, and higher education, as well as having an income between S/500 and 1500 soles and living in a family nucleus composed of 3-5 people.

This study has limitations because no information has been collected about the quality of life of the people or the frequency of waste collection by the municipality. Nor has there been an in-depth study of the change in the behavior of families when faced with compensatory stimuli for attempting to recycle household waste.

In the future, it is recommended that rewarding incentives be applied to families to achieve positive changes in household waste management. It is necessary that the local authorities implement solid waste management policies with the participation of the families to promote awareness and citizen control of field activities, which allows the conservation of resources in the territory.

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