
Factors Associated With Community Behavior In Household Waste Management In Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency

Dhea Amanda Putri¹; Solihin^{*2}; Asnita Yani³; Balqis Nurmauli Damanik⁴

¹Undergraduate Public Health Study Program, Universitas Bunda Thamrin

²⁻⁴Lecturers, Public Health Study Program, Universitas Bunda Thamrin
Jl. Sei Batang Hari No. 42-44, Medan, North Sumatra, Indonesia

**Corresponding Author: Solihin*

**Email: solihinamril@gmail.com*

Abstract . Household waste management behavior is an important factor in maintaining environmental cleanliness and preventing various public health problems. This study aimed to determine the factors associated with community behavior in household waste management in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency. This study employed a quantitative method with an analytical observational design using a cross-sectional approach. The study involved 96 respondents selected through convenience sampling. Data were collected through interviews using questionnaires and direct observation, while data were analyzed using univariate and bivariate analyses with the Chi-Square test. The results showed significant associations between educational level ($p = 0.002$), knowledge ($p = 0.014$), attitude ($p = 0.001$), and waste management facilities and infrastructure ($p = 0.000$) and community behavior in household waste management. In conclusion, educational level, knowledge, attitude, and waste management facilities and infrastructure were significantly associated with household waste management behavior in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency. The community is encouraged to improve household waste management practices by separating waste at its source, reducing the habit of burning waste around the home, and implementing the 3R principles (Reduce, Reuse, and Recycle).

Keywords: Education, Knowledge, Attitude, Facilities and Infrastructure, Community Behavior

INTRODUCTION

Household waste management is an increasingly important environmental problem in line with population growth and changes in community consumption patterns. Household waste includes food residues, plastics, paper, and packaging materials. Improper waste management can cause water, soil, and air pollution and adversely affect public health. Data used in this study indicate that households are among the largest contributors to waste generation in Indonesia [1].

According to 2022 data from the World Health Organization (WHO), more than 2 billion tons of municipal solid waste, including waste from households, small businesses, and institutions, are generated annually. Poor waste management can result in contamination of water, soil, and air and contribute to diseases such as malaria, dengue fever, and respiratory disorders. The United Nations Environment Programme (UNEP) reported that approximately 54 million tons of electronic waste (e-

waste), including televisions, computers, and telephones, were generated, and this amount is projected to reach 75 million tons by 2030. In 2022, only approximately 17% of e-waste was documented as being properly collected and recycled [2].

According to the World Bank's What a Waste 3.0 report, global waste generation reached approximately 2.56 billion tons in 2022 and is projected to increase to 3.86 billion tons by 2050. Asia, particularly South Asia and East Asia, contributes substantially to global waste generation as a result of population growth, urbanization, and economic activity [3].

At the national level, Statistics Indonesia (BPS) in 2025 reported that approximately 83.75% of households had not yet separated their waste, whereas 16.25% had implemented basic separation of organic and inorganic waste [4]. Based on SIPSN KLHK 2025, recorded waste generation from 278 regencies/cities in Indonesia reached 29.2 million tons per year. In North Sumatra Province, waste generation was estimated at approximately 10,091 tons per day or 3,683,135 tons per year, with only a limited proportion being properly managed. Deli Serdang Regency was recorded as generating approximately 1,024 tons of waste per day [5].

The indicators of household waste management behavior examined in this study included waste separation, collection, processing, and disposal [6]. Theoretically, health behavior is influenced by predisposing, enabling, and reinforcing factors. This study focused on educational level, knowledge, and attitude as predisposing factors and facilities and infrastructure as enabling factors [7].

Several previous studies have demonstrated associations between these factors and waste management behavior. Norasari, Takaeb, and Anakaka (2023) found associations between education, income, and knowledge and household waste management behaviour [8]. Nuryani and Mindiharto (2023) reported an association between knowledge and waste management behaviour [9]. Rahmawati and Wijayanti (2024) found relationships between knowledge, attitude, infrastructure availability, access to information, family support, and waste management behaviour [10]. Andriyanto et al. (2022) also reported associations between education, knowledge, attitude, infrastructure, and household waste management behaviour [11].

Conditions in Paya Bakung Village indicate that household waste management has not been optimal. An initial survey in 2026 estimated household waste generation at approximately 0.6 kg/person/day. Waste was generally collected around household yards and then burned. Observations in several hamlets also found waste being disposed of in drainage channels, ditches, and vacant land. Some food residues were used as animal feed, whereas other waste, such as plastics, leaves, and packaging materials, was still burned without separation into organic and inorganic waste [12].

The research gap addressed by this study lies in the rural context of Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency, which has social characteristics and access to waste management services that differ from those of previous study locations. This study specifically analyzed the associations of educational level, knowledge, attitude, and facilities and infrastructure with community behavior in household waste management. The objective was to determine the factors associated with community behavior in household waste management in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency, particularly the relationships between educational level, knowledge, attitude, facilities and infrastructure, and such behaviour.

METHODS

This study used a quantitative method with an analytical observational design and a cross-sectional approach. The study was conducted in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency, from January to July 2026. The study population consisted of 2,395 heads of households. The minimum sample size was estimated using the Slovin formula with a 10% margin of

error, resulting in a minimum sample size of 96 respondents. The formula was used only to estimate the minimum number of respondents required for the study. Subsequently, respondents were recruited using convenience sampling based on accessibility and the predefined eligibility criteria. This non probability sampling approach was selected because of field accessibility and the availability of eligible household representatives during the data collection period. If a selected head of household could not be contacted or had died, another eligible family member could serve as a representative of the head of household [13]. Primary data were collected through interviews using questionnaires covering educational level, knowledge, attitude, and facilities and infrastructure. Facilities and infrastructure were also assessed through direct observation. Secondary data were obtained from the village office or relevant agencies, as well as relevant literature and reports. Household waste management behavior was measured using questions concerning waste separation, collection, processing, and disposal. The total behavior score was converted into a percentage of the maximum possible score. A cutoff of 75% was predetermined as an operational criterion to distinguish relatively good adherence to the assessed household waste management practices from poorer adherence. Respondents with scores $\geq 75\%$ were categorized as having good behavior, whereas those with scores $< 75\%$ were categorized as having poor behavior. Knowledge was categorized as good when $\geq 75\%$ of the questions were answered correctly and poor when $< 75\%$ were answered correctly. Attitude was measured using a Likert scale and categorized as positive or negative based on a 50% cut off point. Facilities and infrastructure were categorized as adequate when the score was $\geq 75\%$ and inadequate when the score was $< 75\%$. Data were analyzed univariately to describe the frequency and percentage distributions of each variable. Bivariate analysis was performed using the Chi Square test at a 95% confidence level ($\alpha = 0.05$). A p-value ≤ 0.05 was considered indicative of a statistically significant association [13]. Because the study used a cross-sectional design and convenience sampling, the findings were interpreted as associations observed among the study respondents and were not intended to establish causal relationships or to be generalized beyond the study population without caution.

Ethical Considerations, This study was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from Komisi Etik Penelitian Kesehatan Politeknik Kesehatan Kemenkes Medan with approval number No. 437/KEPK/POLTEKKES MDN/2026. Before data collection, all respondents were informed about the purpose and procedures of the study, the voluntary nature of participation, confidentiality of information, and their right to decline participation or withdraw at any time without consequences. Written informed consent was obtained from each respondent before the interview. Respondents' anonymity and confidentiality were maintained throughout the research process.

RESULT

The results of the study are presented in the following tables. Overall, the findings indicate that household waste management behavior in Paya Bakung Village was associated with both individual and enabling factors. The analysis further showed statistically significant associations between education, knowledge, attitude, facilities and infrastructure, and household waste management behavior ($p < 0.05$). These findings provide the basis for the detailed analysis presented in the following tables.

Table 1. Respondent Characteristics

Characteristic	Frequency	Percentage (%)
Male	35	36.5
Female	61	63.5
20-23 years	3	3.1
24-27 years	6	6.3
28-31 years	7	7.3
32-35 years	5	5.2
36-39 years	8	8.3
>39 years	67	69.8
Housewife	48	50.0
Self employed	31	32.3
Farmer	9	9.4
Private sector employee	8	8.3
Junior high school	14	14.6
Senior high school	51	53.1
Higher education	31	32.3
Total	96	100

Based on Table 1, among the 96 respondents, the majority were female (61 respondents; 63.5%). The largest age group was respondents aged >39 years (67 respondents; 69.8%). Regarding occupation, 48 respondents (50.0%) were housewives. In terms of educational attainment, 51 respondents (53.1%) had completed senior high school.

Table 2. Univariate Analysis

Variable	Category	f	%
Educational level	Low	65	67.7
	High	31	32.3
Knowledge	Good	64	66.7
	Poor	32	33.3
Attitude	Positive	38	39.6
	Negative	58	60.4
Facilities and infrastructure	Inadequate	33	34.4
	Adequate	63	65.6
Behavior	Good	52	54.2
	Poor	44	45.8

Based on Table 2, among the 96 respondents, most had a low educational level (67.7%), good knowledge (66.7%), a negative attitude (60.4%), and perceived waste management facilities and infrastructure as adequate (65.6%). Regarding behavior, 54.2% of respondents demonstrated good household waste management behavior, while 45.8% demonstrated poor behavior. These findings indicate that although most respondents had good knowledge and perceived the facilities and infrastructure as adequate, these conditions were not fully accompanied by positive attitudes toward household waste management.

Table 3. Bivariate Analysis

Variable	Category	Good Behavior	Poor Behavior	p-value
		f (%)	f (%)	
Education	Low	28 (43.1%)	37 (56.9%)	0.002
	High	24 (77.4%)	7 (22.6%)	
Knowledge	Good	29 (45.3%)	35 (54.7%)	0.014
	Poor	23 (71.9%)	9 (28.1%)	
Attitude	Positive	13 (34.2%)	25 (65.8%)	0.001
	Negative	39 (67.2%)	19 (32.8%)	
Facilities and infrastructure	Inadequate	5 (15.2%)	28 (84.8%)	0.000
	Adequate	47 (74.6%)	16 (25.4%)	
Total		52 (54.2%)	44 (45.8%)	

Based on Table 3, the Chi-Square analysis showed significant associations between education and community behavior in household waste management ($p = 0.002$), knowledge and behavior ($p = 0.014$), attitude and behavior ($p = 0.001$), and facilities and infrastructure and behavior ($p < 0.001$). The row percentages indicate the distribution of good and poor behavior within each category of the independent variables. Poor behavior was more prevalent among respondents with low education (56.9%) than among those with high education (22.6%). For facilities and infrastructure, poor behavior was substantially more prevalent among respondents reporting inadequate facilities (84.8%) than among those reporting adequate facilities (25.4%).

DISCUSSION

1. Association Between Education and Community Behavior in Household Waste Management

The results showed a significant association between educational level and community behavior in household waste management in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency. The Chi-Square test yielded $p = 0.002$ ($p < 0.05$), indicating that the hypothesis stating an association between educational level and household waste management behavior was supported. Among the 65 respondents with a low educational level, 28 (43.1%) demonstrated good waste management behavior, while 37 (56.9%) demonstrated poor behavior. In contrast, among the 31 respondents with a high educational level, 24 (77.4%) demonstrated good behavior and only 7 (22.6%) demonstrated poor behavior. Thus, poor behavior was more prevalent among respondents with lower educational attainment than among those with higher educational attainment.

Consistent with this perspective, Notoatmodjo (2014) explained that educational level can influence an individual's ability to receive information and expand knowledge. Individuals with higher educational attainment generally have better abilities to receive and process information, making it easier for them to understand health related messages [6].

These findings are consistent with Adhyatma and Harnia (2025), who reported a significant association between educational level and household waste management behavior ($p = 0.000$) [14]. Their study explained that people with higher educational attainment tend to have a better understanding of the effects of waste on health and the environment and are therefore more capable of implementing appropriate waste management practices. This similarity strengthens the finding that education is one factor associated with household waste management behavior in Paya Bakung Village. The findings are also supported by Andriyanto et al. (2022), who obtained $p = 0.004$, indicating a significant association between educational level and household waste

management behavior [11]. The study explained that education can facilitate people's acceptance of information and encourage changes in habits toward better waste management practices. In addition, Adreyan et al. (2024) reported that education was one of the factors influencing household waste management behavior, with $p = 0.001$ [15]. Their findings indicated a tendency for people with higher educational attainment to demonstrate greater concern for environmental cleanliness and more active participation in household waste management.

The implication of these findings is that improving waste management behavior cannot rely solely on formal education. Environmental education needs to be delivered through approaches that are acceptable to people with different educational backgrounds. Educational materials should use simple language, examples that are relevant to everyday life, and an emphasis on actions that households can implement directly. Such materials should particularly address waste separation at the source, the impacts of improper waste disposal and burning, and the implementation of the 3R principles. Through this approach, information is expected not merely to increase understanding but also to encourage changes in habits toward better waste management behavior.

2. Association Between Knowledge and Community Behavior in Household Waste Management

The Chi-Square test yielded $p = 0.014$, indicating a significant association between knowledge and community behavior in household waste management. Among the 64 respondents with good knowledge, 29 demonstrated good behavior, whereas 35 demonstrated poor behavior. Among the 32 respondents with poor knowledge, 23 demonstrated good behavior and 9 demonstrated poor behavior. These findings indicate that the relationship between knowledge and behavior did not entirely follow a pattern in which good knowledge was always accompanied by good behavior. A considerable proportion of respondents with good knowledge still demonstrated poor behavior. This condition suggests that knowledge is one aspect associated with waste management behavior, but its application in everyday life is not straightforward and may be related to other conditions experienced by the community. According to Notoatmodjo (2014), knowledge results from an individual's sensory process concerning an object and represents an important domain underlying human action. In household waste management, knowledge can provide an understanding of waste types, the impacts of improper disposal, and appropriate waste management practices. Such understanding provides a basis for determining actions related to waste management in the household [6].

The findings are consistent with Nuryani and Mindiharto (2023), who also found an association between knowledge and waste management behavior ($p = 0.009$). However, the present findings also demonstrate that knowledge alone does not guarantee good behavior [9]. Respondents with good knowledge who nevertheless demonstrated poor behavior suggest that the application of knowledge in practice may be influenced by attitudes, motivation, established habits, the social environment, and the availability of supporting waste management facilities. Knowledge can provide a foundation for behavior formation, but supportive conditions are still required for knowledge to be translated into actual behavior.

The implication is that efforts to improve community knowledge need to be conducted continuously and should not focus solely on information delivery. Education should be directed toward enabling people to apply knowledge in their daily activities. Educational activities can focus on recognizing types and characteristics of waste, implementing the 3R principles (Reduce, Reuse, Recycle), understanding the health and environmental impacts of waste, and applying appropriate household waste management practices. Information should also be accompanied by

simple and practical examples that can easily be implemented at the household level, so that knowledge does not remain at the level of understanding but can develop into better waste management habits.

3. Association Between Attitude and Community Behavior in Household Waste Management

The Chi-Square test showed $p = 0.001$, indicating a significant association between attitude and community behavior in household waste management. The study included 38 respondents with positive attitudes and 58 with negative attitudes. Among respondents with positive attitudes, 13 demonstrated good behavior and 25 demonstrated poor behavior. Among those with negative attitudes, 39 demonstrated good behavior and 19 demonstrated poor behavior. This distribution indicates that waste management behavior did not always correspond directly to respondents' attitudes. Nevertheless, the statistical analysis showed that the behavioral patterns between the two attitude groups were significantly associated. Attitude is therefore one aspect that needs to be considered in understanding community behavior in household waste management.

Attitude refers to an individual's tendency to accept or reject an object and can develop through experience and interaction with the surrounding environment. In household waste management, attitude can be reflected in people's acceptance of the importance of maintaining cleanliness, separating waste, and being willing to manage waste appropriately. These findings are consistent with Sari and Bahrina (2024), who found an association between housewives' attitudes and 3R-based waste management behavior [16]. The findings are also consistent with Rahmawati and Wijayanti (2024), who reported an association between attitude and waste management behavior [17].

However, the presence of 39 respondents with negative attitudes who nevertheless demonstrated good behavior indicates that attitude is not the only condition shaping community behavior. In practice, individuals may engage in good waste management because of applicable rules in their residential environment, family habits, community mutual help activities, or social influences from the surrounding environment. This suggests that waste management behavior can develop through interactions between individual attitudes and the social and environmental conditions encountered in everyday life.

The implication is that efforts to improve waste management behavior should not only focus on increasing knowledge but also on developing and strengthening positive attitudes toward waste management. These efforts can be implemented through health education, environmental campaigns, 3R-based waste management training, and community empowerment involving residents directly. A participatory approach is important so that community members not only understand the importance of waste management but also develop concern and willingness to apply appropriate practices consistently. Behavioral change can be reinforced through a supportive social environment, shared habits, and active community participation in maintaining environmental cleanliness.

4. Association Between Facilities and Infrastructure and Community Behavior in Household Waste Management

The Chi-Square test yielded $p = 0.000$, indicating a significant association between facilities and infrastructure and community behavior in household waste management. Among the 33 respondents who considered the facilities and infrastructure inadequate, only 5 demonstrated good behavior, whereas 28 demonstrated poor behavior. Conversely, among the 63 respondents who considered the facilities and infrastructure adequate, 47 demonstrated good behavior and 16 demonstrated poor behavior. This difference indicates a clear pattern: among respondents supported by adequate facilities and infrastructure, the proportion demonstrating good behavior

was considerably higher than among those reporting inadequate facilities and infrastructure. These findings suggest that the availability of waste management facilities is important in facilitating appropriate waste separation, collection, temporary storage, and disposal.

These findings are consistent with the concept of enabling factors in Lawrence W. Green's theory, which explains that facilities and infrastructure constitute enabling factors that allow individuals to realize desired behaviors. In this study context, the availability of waste bins, collection and separation facilities, transportation systems, temporary waste disposal facilities, and other supporting infrastructure can reduce barriers to proper waste management. Thus, knowledge and attitudes are more readily translated into action when supportive environmental conditions are available [7].

The findings are consistent with Hidayah et al. (2025), who found a significant association between facilities and infrastructure and waste management behavior [18], as well as Francisia et al. (2025), who reported that communities supported by adequate facilities tended to demonstrate better waste management behavior [19].

This condition indicates that the availability of facilities does not automatically ensure that all community members will use them optimally, because behavior may also be related to awareness, established habits, supervision, and community participation in maintaining environmental cleanliness. Therefore, the Paya Bakung Village Government needs not only to maintain and improve the availability of waste collection points, waste separation facilities, and routine waste transportation services, but also to accompany these efforts with continuous education and socialization so that available facilities are properly utilized by the community.

CONCLUSION

There were significant associations between educational level ($p = 0.002$), knowledge ($p = 0.014$), attitude ($p = 0.001$), and facilities and infrastructure ($p = 0.000$) and community behavior in household waste management in Paya Bakung Village, Hamparan Perak Subdistrict, Deli Serdang Regency. Facilities and infrastructure had the smallest p -value in the Chi-Square analysis. Efforts to improve household waste management behavior should therefore include increasing community knowledge and strengthening positive attitudes, together with the provision of adequate waste management facilities. Community members are encouraged to separate organic and inorganic waste at the source, reduce the practice of burning waste, and implement the 3R principles. The village government is encouraged to improve waste collection, separation, and transportation facilities and to provide sustainable education and socialization on household waste management.

ACKNOWLEDGEMENTS

Acknowledgments are primarily addressed to research funders or donors. Acknowledgments can also be conveyed to those who helped carry out the research. Lecturers / researchers listed in the author list do not need to be thanked in this section.

REFERENCES

1. Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia. Sistem Informasi Pengelolaan Sampah Nasional (SIPSN) [Internet]. Jakarta: KLHK; 2025 [cited 2026 Sep 2]. Available from: <https://sipsn.menlhk.go.id/>
2. World Health Organization. Guidance on solid waste and health [Internet]. Geneva: WHO; 2022 [cited 2026 Sep 2]. Available from: <https://www.who.int/>
3. World Bank. What a Waste 3.0: Global snapshot of solid waste management toward circularity

- until 2050 [Internet]. Washington, DC: World Bank; 2025 [cited 2026 Sep 2]. Available from: <https://www.worldbank.org/en/publication/what-a-waste>
4. Badan Pusat Statistik. Statistik lingkungan hidup Indonesia 2025. Jakarta: BPS; 2025.
 5. Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia. Sistem Informasi Pengelolaan Sampah Nasional: data timbulan sampah Indonesia dan Sumatera Utara [Internet]. Jakarta: KLHK; 2025 [cited 2026 Sep 2]. Available from: <https://sipsn.menlhk.go.id/>
 6. Notoatmodjo S. Ilmu perilaku kesehatan. Jakarta: Rineka Cipta; 2014.
 7. Green LW. Health education planning: a diagnostic approach. Palo Alto: Mayfield Publishing Company; 1980.
 8. Norasari TC, Takaeb AEL, Anakaka DL. Factors associated with household mothers' waste management behavior in Satar Nawang Village, Congkar Subdistrict, East Manggarai Regency. *SEHATMAS*. 2023;2(4):903-911.
 9. Nuryani S, Mindiharto S. Factors associated with waste management behavior among household mothers in Bandungrejo Village, Plumpang Subdistrict, Tuban Regency. *J Public Health Sci Res*. 2023;4(1).
 10. Rahmawati AW, Wijayanti Y. Factors associated with waste management behavior. *Indones J Public Health Nutr*. 2024;4(1):18-24.
 11. Andriyanto R, Fajrini F, Romdhona N, Latifah N. Factors associated with household waste management behavior in Cilandak Barat Urban Village, Cilandak Subdistrict. *J Kesehat Lingkung*. 2022;14(2):120-130.
 12. Pemerintah Desa Paya Bakung. Data hasil survei awal pengelolaan sampah rumah tangga Desa Paya Bakung. Deli Serdang: Pemerintah Desa Paya Bakung; 2026.
 13. Arikunto S. Prosedur penelitian: suatu pendekatan praktik. Jakarta: Rineka Cipta; 2010.
 14. Adhyatma, A., & Harnia. (2025). Perilaku masyarakat terhadap pengelolaan sampah rumah tangga (Studi analitik di Desa Tertap Kecamatan Jirai Kabupaten Lahat Provinsi Sumatera Selatan). *Jurnal Dinamika Kesehatan Masyarakat (JDKM)*, 3(1). <https://jpii.upri.ac.id/index.php/jdkm/article/view/230>
 15. Adreyan MAA, Damris M, Safri M. Socioeconomic factors influencing household waste management behavior in Muara Bulian Subdistrict. *J Ilm Univ Batanghari Jambi*. 2024;24(2).
 16. Sari E, Bahrina I. Factors associated with household mothers' behavior in 3R-based waste management (Reduce, Reuse, Recycle). *Antigen J Kesehat Masyarakat dan Ilmu Gizi*. 2024;2(1):114-121.
 17. Rahmawati AW, Wijayanti Y. Factors associated with waste management behavior. *Indones J Public Health Nutr*. 2024;4(1):18-24.
 18. Hidayah AK, Marlinae L, Khairiyati L, Waskito A, Husaini, Rahmat AN, et al. The role of knowledge, attitudes, facilities and infrastructure, and policies in household waste management behavior in Karang Intan Subdistrict, Banjar Regency. *J Kesehat Indonesia (JURKESSIA)*. 2025;15(3):145-152.
 19. Francisia SD, Sarli D, Yanti M. Factors associated with household waste management behavior in Lubuk Buaya Urban Village, Padang City, 2025. *Appicare J*. 2025;2(4):247-258.