Examining Public Behavior and Environmental Impact: Disposal Practices of Disposable Facemasks During the COVID-19 Pandemic

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Abstract

This study investigates the disposal behavior of individuals during the COVID-19 pandemic, explicitly focusing on the environmental impact of disposable facemasks. As facemask usage surges, concerns about improper disposal practices rise. The research aims to fill the knowledge gap regarding the behavioral factors influencing facemask disposal. The study employs a cross-sectional predictive research design, sampling participants from the Philippines using stratified and random sampling. Utilizing a comprehensive survey, the "Facemask Disposal Scale," and the adapted "Environmental Consciousness Scale," the research explores the predictive role of environmental awareness in facemask disposal. Quantitative analysis reveals a weak positive correlation between environmental awareness and disposal behavior. Significant differences in disposal behavior based on socio-economic status and educational attainment are identified. The study emphasizes the complexity of disposal behavior, highlighting the need for further research to inform interventions and policies promoting responsible facemask disposal for public health and environmental preservation.

Keywords: Facemask Disposal Behavior, Environmental Consciousness, Socio-Economic Status, Disposal Awareness

Introduction Background of the Study

The proposed study aims to investigate the phenomenon of facemask disposal behavior among individuals during the COVID-19 pandemic. This study falls within the broader area of environmental research and addresses a specific aspect related to the disposal practices of disposable facemasks. Specific Problems Warranting Investigation: The COVID-19 pandemic has witnessed an unprecedented increase in the use of disposable facemasks as a preventive measure. While these facemasks have played a crucial role in curbing the spread of the virus, they have also given rise to a significant environmental concern – improper disposal.

Reports and studies from various parts of the world have highlighted the observable problem of facemasks littering streets, parks, and water bodies, posing a threat to the environment. For instance, a study by Botetzagias and Malesios (2021) conducted in Greece revealed that despite the surge in facemask usage, there was a lack of understanding and awareness among single-use facemask users regarding their potential environmental impact, especially on marine ecosystems. Similarly, Kumar and Sar (2023) emphasized the need to address household medical waste, including facemasks, as it poses risks to natural resources, such as surface water contamination and risks to aquatic life. These problems

are further exacerbated by the release of microplastics (MPs) from facemasks, as highlighted by Jiang et al. (2023) and the potential ecotoxicity effects on local bivalve populations, as discussed by Oliveira et al. (2023). Additionally, the ecological consequences of facemask pollution in wetland ecosystems have been studied, revealing the extent of facemask abundance, degradation, and potential harm to wildlife (Study 4). Need for the Study:

The need to conduct this study is apparent, given the escalating environmental crisis resulting from improper facemask disposal during the ongoing COVID-19 pandemic. Existing research, as highlighted in various studies, has predominantly focused on assessing the environmental impact and ecotoxicity associated with disposable facemasks (Botetzagias and Malesios, 2021; Jiang et al., 2023; Oliveira et al., 2023). However, a critical gap persists in our comprehension of the behavioral factors that underlie individuals' decisions regarding facemask disposal. This gap represents a significant knowledge deficiency in the literature, particularly concerning the nuances of why and how individuals choose to dispose of facemasks responsibly. Botetzagias and Malesios' study conducted in Greece (2021) is indicative of the existing research landscape. They shed light on the insufficient awareness among single-use facemask users regarding the potential environmental impact of their disposal choices, particularly on marine ecosystems. While they highlight this lack of awareness, their focus primarily remains on the environmental aspect. Similarly, Jiang et al. (2023) conducted a comprehensive review of disposable facemasks during the COVID-19 pandemic, emphasizing microplastics (MPs) release from facemasks. Their study mainly revolves around the ecological implications of MP release but does not delve into the psychological and behavioral aspects of facemask disposal choices. In contrast, Oliveira et al. (2023) explore the impact of facemasks on wetland ecosystems, including aspects such as facemask abundance, degradation, and ecotoxicity on local bivalve populations. While their work touches on the environmental consequences, it does not provide insights into the underlying reasons and motivations driving disposal behaviors. Thus, it is evident that while the environmental consequences of facemask disposal have been extensively studied, the human behavior dimension remains inadequately explored. Understanding why individuals dispose of facemasks in specific ways is crucial in crafting effective strategies and policies for responsible facemask disposal. Such insights can facilitate the development of targeted interventions and awareness campaigns that promote responsible disposal practices. The imperative to bridge this gap extends beyond the immediate context of the COVID-19 pandemic. Even as the pandemic subsides, disposable facemasks will continue to be used in various contexts, posing an enduring environmental challenge. Therefore, addressing this research gap is not only pertinent to the current crisis but also holds long- term significance for environmental preservation and public health.

Zhang (2023) also stated that responsible facemask disposal practices are essential for minimizing health risks associated with contaminated facemasks. Public health agencies and organizations will benefit from insights to promote safe disposal practices. Improper disposal can result in the contamination of public spaces, leading to increased health hazards. Understanding the behavioral factors influencing facemask disposal choices can provide crucial information for public health campaigns and interventions. Policy Makers: Policymakers can use the study's results to inform regulations and guidelines related to facemask production, usage, and disposal, ensuring they align with environmental sustainability goals (Botetzagias and Malesios, 2021; Jiang et al., 2023). As the environmental impact of disposable facemasks becomes increasingly evident, policymakers have a responsibility to enact measures that address this issue. Insights from this research can inform the development of policies that encourage responsible facemask use and disposal, contributing to environmental conservation.

Community Awareness: The study can raise awareness among individuals regarding the environmental impact of facemask disposal, empowering them to make informed choices and contribute to environmental conservation (Botetzagias and Malesios, 2021; Jiang et al., 2023). Many individuals may not be fully aware of the consequences of their disposal behaviors. Ajaj (2023) configures that by disseminating the findings of this study through public awareness campaigns, educational programs, and community engagement, individuals can gain a better understanding of their role in mitigating the environmental impact of facemask disposal. In summary, this research addresses a pressing issue by delving into the behavioral aspects of facemask disposal during the COVID-19 pandemic, aiming to bridge the existing research gap and provide valuable insights for environmental protection and public health. The potential benefits extend to public health agencies, policymakers, and the general public, with the aim of fostering responsible facemask disposal practices that safeguard both human health and the environment.

Literature Review

The body of existing research in the fields of behavior change and environmental psychology offers valuable insights into the intricate dynamics of promoting sustainable behaviors and conservation initiatives. Several notable studies have contributed to our understanding of these subjects, laying the foundation for further exploration.

One significant study by Ajaj, Dweik, Ali, and Stietiya (2023) delved into the psychology of behavior change. Their research highlighted the critical role of implementation intentions and coping planning in facilitating behavior change. They emphasized the importance of linking personal goals to specific actions through "if-then" constructs, thereby simplifying the initiation of desired behaviors. Furthermore, they emphasized the need to address potential barriers to behavior change, a concept that holds significant relevance for the study on face mask disposal. Understanding the barriers and facilitators of proper mask disposal is essential for promoting this sustainable behavior.

Another study by Oliveira, Filipe, Rodrigues, Rocha, Soares, Duarte, Silva, and Santos (2023) explored the realm of environmental psychology, specifically within the context of aquatic conservation. Their findings revealed the profound emotional and psychological connections individuals form with aquatic ecosystems. Notably, they emphasized the intricate relationship between personal and professional choices and the aquatic environment. This highlights the idea that individuals often incorporate their environmental values into their decision-making processes, a concept that may apply to the disposal of face masks. Individuals may consider environmental consequences when determining how to dispose of their used masks.

Additionally, Oliveira et al. (2023) introduced a typology of human-nature relationships. This typology served as a valuable tool in fostering communication and understanding among diverse user groups with varying interests and perspectives. It enabled the resolution of conflicting viewpoints, a skill that could prove crucial in addressing the multifaceted issue of face mask disposal. As face masks have become a symbol of public health and environmental responsibility, understanding different stakeholders' perspectives is vital.

In the realm of behavior change and environmental psychology, Jiang, Luvao, Wang, Wang, Wang Zhang (2023) emphasized the need for behavior to play a central role in validating psychological constructs. They urged researchers to move beyond traditional self-report methods and delve into the dynamic and psycho- social drivers of voluntary behavior change processes. This perspective aligns with

the study's goal of understanding the real-world behavior of face mask disposal. To comprehend why individuals, choose particular disposal methods, we must investigate the underlying drivers of these decisions.

The proposed study on face mask disposal behavior aligns with these previous investigations by addressing shared themes such as behavior change, psychological constructs, and effective measurement practices. Like the studies by Ajaj et al. and Jiang et al., the research seeks to uncover the psycho-social determinants of voluntary behavior change processes, specifically in the context of face mask disposal. It aims to explore the multifaceted factors that influence individuals' decisions regarding mask disposal.

Theoretical frameworks that may inform the study include the Theory of Planned Behavior (Ajzen, 1991), which can help elucidate how attitudes, subjective norms, and perceived behavioral control shape individuals' intentions and behaviors related to face mask disposal. Additionally, the Transtheoretical Model (Prochaska & DiClemente, 1983) could provide insights into the stages of change individuals undergo when adopting new behaviors, such as proper mask disposal.

Constructing a cognitive map of the research can clarify the interrelationships among the variables under investigation. At the core of the study lies "Face Mask Disposal Behavior," influenced by factors such as "Attitudes," "Perceived Behavioral Control," and "Environmental Context." These variables interact in intricate ways, shaping individuals' intentions and behaviors concerning face mask disposal. To visually represent these relationships, we can create a conceptual paradigm, highlighting the multidimensional nature of behavior change within the context of face mask disposal.
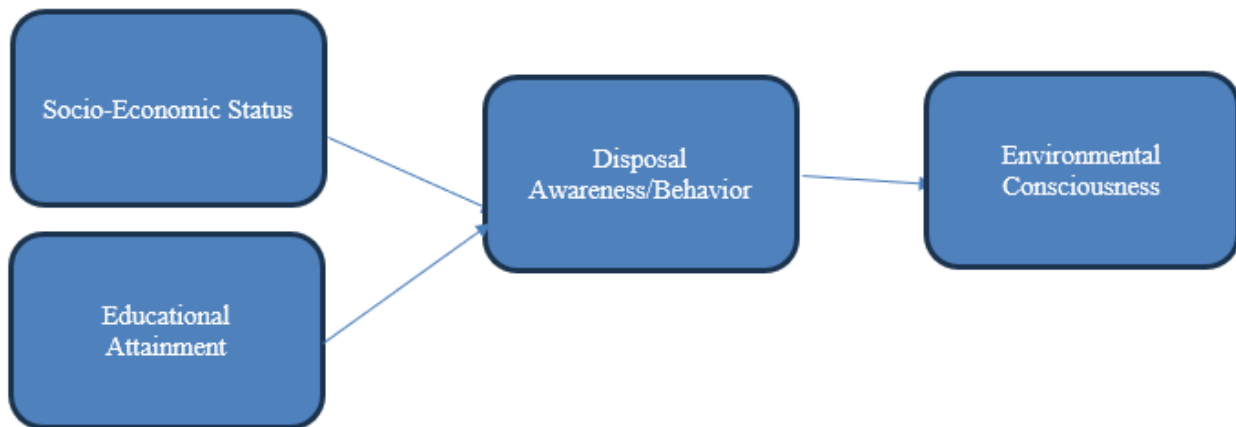
Conceptual Framework

Figure 1.1 – Conceptual Framework

The study's conceptual framework explains how socioeconomic position (SES), educational attainment, disposal awareness/behavior, and environmental consciousness are interdependent. According to the framework, a person's awareness and conduct regarding the disposal of facemasks are significantly influenced by their level of education and socioeconomic status. According to prior studies, higher SES and educational attainment have been linked to increased awareness and responsible disposal behavior. This enhanced consciousness could result from better knowledge of environmental issues, more educational possibilities, and easier access to information. Due to the possible environmental impact of their actions, people with higher SES and educational attainment levels are prone to adopt healthier

facemask disposal habits.

The conceptual framework also suggests that action or awareness of disposal acts as a critical mediating factor between SES and educational attainment and environmental consciousness. People who properly dispose of facemasks develop a greater awareness of the broader environmental effects of their behavior. As a result of this improved understanding, people may become more environmentally conscious as they realize how closely their disposal practices affect ecosystem health. Therefore, this environmental awareness could encourage people to make more environmentally friendly decisions than throwing away facemasks, which would aid in more significant environmental preservation initiatives. To inform targeted interventions promoting responsible facemask disposal and fostering a sustainable environmental mindset, the conceptual framework emphasizes the need to investigate the complex relationships between SES, educational attainment, disposal awareness/behavior, and environmental consciousness.

Research Questions
Statement of the Problem

During the COVID-19 pandemic, proper disposal of disposable face masks has emerged as a critical concern, both from a public health and environmental perspective. This research embarks on a comprehensive exploration of the multifaceted determinants and behaviors associated with face mask disposal. By investigating individual decision-making processes concerning the responsible disposal of used face masks, this study aims to provide a profound understanding of the intricate interplay between psychological, environmental, and contextual factors. The insights gleaned from this research endeavor have the potential to inform the development of effective public health initiatives, environmentally conscious practices, and evidence-based policies. In doing so, this study seeks to promote a sustainable and responsible approach to face mask disposal that aligns with the dual objectives of safeguarding public health and preserving our environment.

Specific Research Questions:

1. Can environmental awareness predict disposal behavior?
2. Would there be significant differences in terms of disposal behavior with a person's socio-economic status and educational attainment?
3. Can environmental awareness promote responsible disposable behavior among facemask users?

Hypotheses (Null or Alternative)

Hypothesis 1 (Null): There is no statistically significant relationship between an individual's level of environmental awareness and their face mask disposal behavior during the COVID-19 pandemic. In other words, individuals with varying degrees of environmental consciousness are equally likely to engage in responsible face mask disposal practices.

Hypothesis 1 (Alternative): A statistically significant relationship exists between an individual's level of environmental awareness and their face mask disposal behavior during the COVID-19 pandemic. Specifically, individuals with higher levels of environmental consciousness are more likely to adopt responsible disposal practices compared to those with lower levels of environmental awareness.

Hypothesis 2 (Null): There are no significant differences in face mask disposal behavior among individuals with varying socio-economic statuses and educational attainment levels. Socio-economic

status and educational attainment do not influence the likelihood of engaging in responsible face mask disposal practices.

Hypothesis 2 (Alternative): Significant differences exist in face mask disposal behavior among individuals with varying socio-economic statuses and educational attainment levels. Specifically, individuals with higher socio-economic status and higher levels of educational attainment are more likely to exhibit responsible face mask disposal practices compared to those with lower socio-economic status and lower educational attainment.

Methodology

Research Design

In this chapter, the researcher presented a detailed and original methodology for the study titled "Examining Public Behavior and Environmental Impact: Disposal Practices of Disposable Facemasks During the COVID-19 Pandemic." This chapter outlines the research design, participant and sampling procedures, instruments or materials used, data collection procedures, and the planned data analysis methods, all aligned with the study's objectives.

In this section, the researcher elaborated on the research design employed for the study, "Assessing Predictive Factors in Public Behavior: A Quantitative Analysis of Disposable Facemask Disposal During the COVID-19 Pandemic." The research design serves as the foundational framework upon which the entire study is built. The research design choice is pivotal in shaping the study's scope and guiding the methodology.

The study adopts a cross-sectional predictive research design, a method widely recognized for its capacity to provide a snapshot of the relationships between variables at a specific point in time. This design aligns with the primary objective: to examine and predict the factors influencing the disposal behaviors of individuals using disposable face masks during the ongoing COVID-19 pandemic. By capturing data at a single moment, it gains the ability to make informed inferences regarding the variables under investigation, offering a crucial perspective on the dynamics of face mask disposal. Moreover, the cross-sectional nature of the research design ensured that the findings will be applicable to the current circumstances, enhancing their relevance and timeliness.

Participant & Sampling

The study encompasses individuals in the Philippines who have used disposable face masks during the pandemic. The researcher will use stratified sampling to ensure representation across urban and rural areas with their socio-economic status. The sample size will be determined via power analysis to ensure statistical significance.

The researchers will combine convenience and random sampling. Initial participants for qualitative interviews will be selected through convenience sampling. Subsequently, random sampling will identify participants for the quantitative survey, ensuring a more representative sample.

Instruments or Materials

The primary instrument utilized in this quantitative study is a comprehensive survey meticulously designed to collect data. This survey encompasses a range of variables, including demographics, environmental consciousness, disposal behaviors, and exposure to disposal guidance. In addition to the survey, the researcher introduced a novel measurement tool known as the "Facemask Disposal Scale,"

developed by Crisostomo in 2023. This newly developed scale is constructed to gauge face mask disposal behaviors across three distinct dimensions: purpose, frequency, and disposal behavior. This innovative instrument allows us to probe more deeply into the intricacies of face mask disposal practices.

The survey, developed for the study, is founded on a rigorous literature review, and will undergo a meticulous validation process. Experts in psychology and environmental science will perform content validation to ensure the survey accurately measures the intended constructs. Pilot testing will be conducted to assess the instrument's reliability and to address any potential ambiguities or issues that may arise. To encapsulate the construct of environmental consciousness, the study employed a modified version of the "Environmental Consciousness Scale" originally created by Thormann in 2022. This scale, recognized for its effectiveness in measuring environmental behavior and consciousness, has been employed successfully in various related studies. The adapted scale will integrate specific items pertaining to face mask disposal behaviors, enhancing its applicability to the research context. The modified scale included items that probe not only environmental awareness but also the participant's awareness of the environmental impact of their face mask disposal practices. It is designed to ensure a more nuanced and comprehensive assessment of the environmental consciousness of the participants, aligning it with the study's focus on face mask disposal
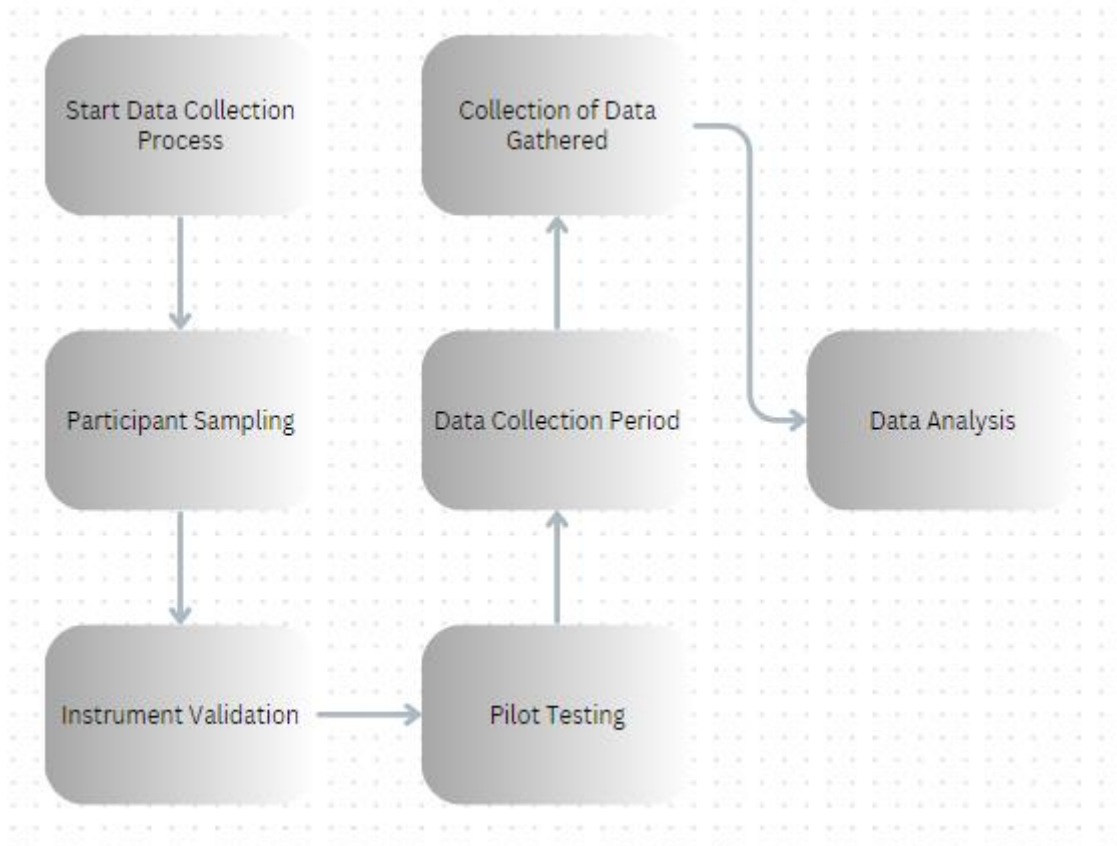
Procedures

Figure 2. 1 – Data Gathering Procedure Flowchart

The data collection process for the study, "Examining Public Behavior and Environmental Impact:

Disposal Practices of Disposable Facemasks During the COVID-19 Pandemic," centered around the administration of a carefully designed survey to gather comprehensive quantitative data. Participants for the quantitative survey are selected using systematic random sampling from a larger pool of individuals who have used disposable face masks during the COVID-19 pandemic, ensuring statistical robustness and representation of diverse demographic groups. The survey, constructed to cover demographics, environmental consciousness, disposal behaviors, and exposure to disposal guidance, is administered online to reach respondents from various geographic locations, promoting data collection from a broad participant pool. Additionally, the researcher introduced the "Facemask Disposal Scale," a novel measurement tool developed by Crisostomo in 2023, specifically designed to assess face mask disposal behaviors across dimensions of purpose, frequency, and disposal behavior. The survey and the "Facemask Disposal Scale" undergo content validation by experts in psychology and environmental science to guarantee the effective measurement of intended constructs, followed by pilot testing to enhance instrument reliability. The data collection procedure spans from the last week of September to the first week of November, allowing for systematic data collection, thorough analysis, and timely research findings dissemination. This approach facilitates a comprehensive examination of face mask disposal behaviors during the COVID-19 pandemic, offering valuable insights into the factors influencing these behaviors through a quantitative survey.

Data Analysis

The study technique used in the previous chapter was carefully planned to guarantee a thorough examination of the disposal practices of facemasks during the COVID-19 epidemic. The analysis was primarily based on quantitative data, which enabled a thorough investigation of disposal habits and demographic data using descriptive statistics. This statistical method gave a concise overview of the characteristics of the participants and how they disposed of their facemasks. Regression analysis and correlation tests are examples of inferential statistics that were carefully used to assess hypotheses that were obtained from particular research issues. These statistical tests were carefully chosen to complement the study's complex objectives, guaranteeing a focused analysis of the links and patterns being looked into.

Quantitative data was analyzed using descriptive statistics to summarize demographic information and disposal behaviors. Inferential statistics, including regression analysis and correlation tests, were employed to test hypotheses. Statistical tests were chosen based on specific research questions and hypotheses. In conclusion, the previous chapter provided a comprehensive and original methodology for the study. The mixed-methods approach, participant and sampling procedures, instrument adaptation, data collection processes, and data analysis methods were carefully chosen and justified, ensuring the validity and robustness of the research findings. The next chapter presented the actual research findings and analyses resulting from the implementation of this methodology.
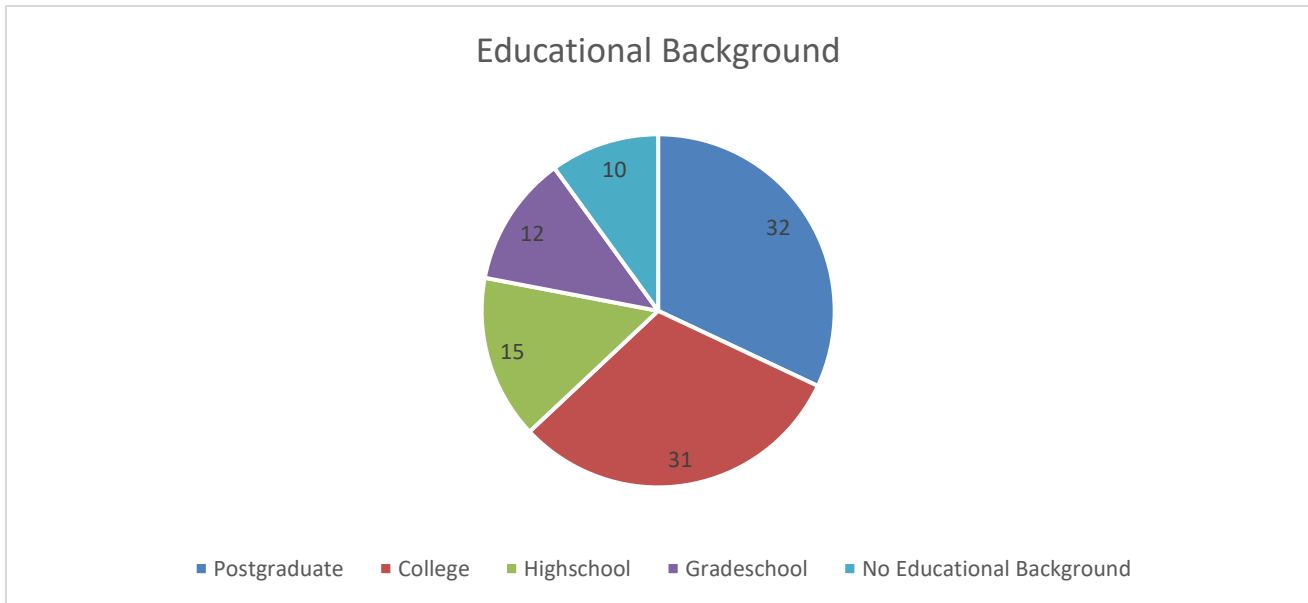
Results

Figure 3.1 – Educational Background Chart

The breakdown of participants based on their educational attainment revealed a diversified sample, encompassing individuals across various educational backgrounds. A significant proportion, comprising 32% of the respondents, had attained postgraduate education, reflecting a considerable representation of individuals with advanced academic qualifications. Following closely, 31% of participants had completed their college education, indicating a significant presence of individuals with undergraduate degrees. High school graduates constituted 15% of the sample, whereas those with a background in grade school comprised 12%. A subset of the sample, including 10%, reported no formal educational background. The comprehensive categorization of participants based on educational attainment aimed to capture the diverse perspectives emanating from varying levels of academic achievement.
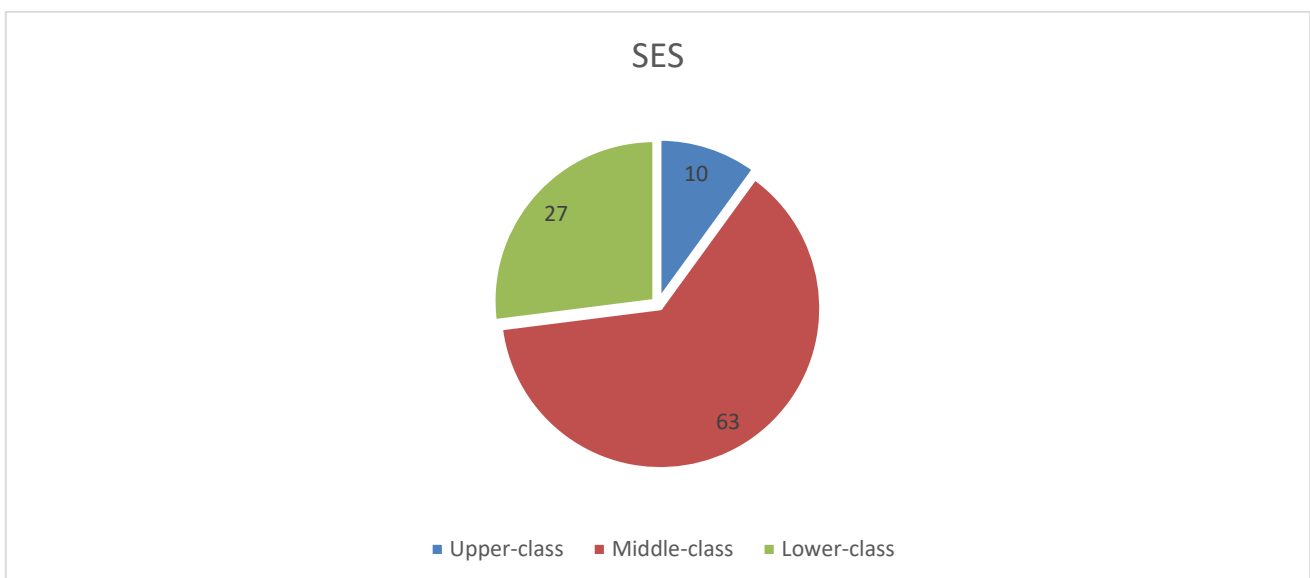

Figure 3.2 – SES Chart

The participants' distribution across different socioeconomic groups revealed a diverse makeup indicative of various economic origins. Interestingly, 63% of participants identified as middle-class, indicating a preponderance of those with modest financial resources. Meanwhile, the sample's upper and lower classes comprised 10% and 27% of the population, respectively. Participants with higher economic status belonged to the upper class, while those with more limited financial resources belonged to the lower class. This classification allowed for a more in-depth investigation of disposal practices among various socioeconomic groups, providing insight into any differences impacted by financial status.

1. Can environmental awareness predict disposal behavior?

N=46		Regression Summary for Dependent Variable: DISPOSAL BEHAVIOR 1 (Facemask-Disposal-Scale-Responses_Final) R= .21651920 R²= .04688056 Adjusted R²= ----- F(10,35)=.17215 p				
	b*	Std.Err. of b*	b	Std.Err. of b	t(35)	p-value
Intercept			5.675751	2.514132	2.257539	0.030317

Figure 4.1

Figure 3.1 exhibits that the researcher examined the relationship between environmental awareness and disposal behavior among a sample of 46 participants. The regression model was used to assess whether environmental awareness can predict disposal behavior. The analysis revealed a weak positive correlation (R = 0.217) between environmental awareness and disposal behavior, suggesting that as environmental awareness increases, disposal behavior tends to be more responsible.

2. Would there be significant differences in terms of disposal behavior with a person's socio-economic status and educational attainment?

P < 0.5		Mean Difference	SE	t	Ptukey
Disposable Behavior	Educational Attainment	-0.018	0.129	-0.138	0.990
	SES	0.327	0.129	2.528	0.034
Educational Attainment	SES	0.344	0.129	2.665	0.023

Figure 4.2

Hypothesis:

Ho: There is no significant difference between the three domains.

H1: There are significant differences between the three domains.

Decision: Reject null hypothesis and accept alternative hypothesis.

The present study was conducted to determine if there are significant differences between disposal behavior, socioeconomic status, and educational attainment. One-way ANOVA was utilized to determine if significant differences exist between the three domains. Result shows that there is a significant difference between the three domains, $F(2,132) = 4.50$, p=0.013. It reveals that the disposable behavior is significantly higher than socioeconomic status (M=3.96). While, educational attainment is significantly higher than socioeconomic status (M=3.978), p=<.05.

3. **Can environmental awareness promote responsible disposable behavior among facemask users?**

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weightened Mean	INTERPRETATION
22	18	4	1	0	4.36	Strongly Agree
11	16	16	2	0	3.80	Agree
23	16	6	0	0	4.38	Strongly Agree
25	14	5	1	0	4.40	Strongly Agree
22	19	4	0	0	4.40	Strongly Agree
13	22	7	3	0	4.00	Agree
19	22	3	1	0	4.31	Strongly Agree
10	26	8	1	0	4.00	Agree
10	16	4	7	8	3.29	Neutral
10	11	10	8	6	3.24	Neutral
Average Weighted Mean					4.02	Agree
SD					0.42	

Figure 4.3

Figure 3.3 shows that the weighted mean of disposable behavior scale averaged 0.45 as the average weighted mean. This allowed the researcher to narrow down majority of the answers to a classification mostly agreeing. The respondents' environmental consciousness was measured using a scale that included statements related to their environmental concerns and attitudes. The weighted mean of their responses was approximately 4.02, indicating that, on average, the participants leaned toward the "Agree" category. This suggests that the majority of respondents expressed agreement with the statements related to environmental awareness.

Discussion

In the first study, the relationship between environmental awareness and disposal behavior was examined, revealing a weak yet positive correlation between the two variables. While the findings supported the idea that heightened environmental awareness can lead to more responsible disposal behavior, it's crucial to note the limited explanatory power of this relationship, with various other factors likely influencing disposal practices. Furthermore, the study's small sample size and reliance on self-report measures present limitations that warrant larger and more diverse investigations to better understand this connection.

Moreover, the second study explored differences in disposal behavior with respect to socioeconomic status and educational attainment. The results demonstrated significant disparities among these domains, with individuals of higher socioeconomic status and greater educational attainment exhibiting better disposal behavior. However, the study did not delve into the underlying reasons for these disparities, emphasizing the need for further research to uncover the mechanisms at play.

Lastly, concentrated on fostering responsible facemask disposal through the promotion of environmental awareness. It identified a positive link between environmental consciousness and the adoption of responsible disposal practices, in line with broader research on pro-environmental behavior. Nevertheless, due to the reliance on self-reported data and the absence of external influences or interventions within the study, there is a call for further exploration to comprehensively assess the efficacy of environmental awareness campaigns in enhancing responsible facemask disposal. These

investigations collectively underscore the intricate nature of disposal behavior and emphasize the necessity for more extensive research to inform targeted interventions and policies.

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