

The 'Yuck Factor' and Hygiene Perceptions: A Mixed-Methods Study on Consumer Trust in Shared Reusable Food and Beverage Containers

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Abstract

The transition from a single-use to a reusable packaging paradigm is a critical strategy for mitigating plastic pollution and advancing a circular economy. While reusable systems, particularly for food and beverage containers, offer significant environmental benefits, their success hinges on widespread consumer adoption. This adoption is often impeded by a significant psychological barrier: the 'yuck factor,' an intuitive feeling of disgust and contamination risk associated with using containers previously handled by strangers. This paper outlines a mixed-methods study designed to investigate the multifaceted nature of this hygiene-related consumer resistance. The study aims to (1) quantify the prevalence and intensity of hygiene concerns among different consumer demographics, (2) qualitatively explore the emotional and psychological underpinnings of the 'yuck factor,' and (3) identify which operational and informational interventions are most effective in building consumer trust in shared reusable systems. By combining quantitative survey data with in-depth qualitative interviews, this research seeks to provide actionable insights for businesses, policymakers, and system designers to overcome this critical barrier and accelerate the acceptance of reusable packaging.

Keywords: Reusable Packaging; Circular Economy; Recycling; Consumer Trust; Reuse

1. Introduction

The global economy's linear "take-make-dispose" model has created an environmental crisis of unprecedented scale, epitomized by the pervasive issue of single-use plastic pollution. Packaging, particularly for fast-moving consumer goods, is the largest single contributor to this crisis, accounting for nearly half of all plastic waste generated globally (Geyer, Jambeck, & Law, 2017). In response, the circular economy has emerged as a compelling alternative framework, advocating for a systemic shift toward designing out waste and pollution, keeping products and materials in use at their highest value, and regenerating natural systems (Ellen MacArthur Foundation, 2019). Within this paradigm, reusable packaging systems—such as deposit-return schemes for beverage cups and container-as-a-service models for takeout food—are heralded as a cornerstone strategy, essential for decoupling economic activity from resource consumption.

However, the transition from a disposable to a reusable culture represents a complex socio-technical challenge. While significant research and development have focused on the technical, logistical, and economic facets of these systems, their ultimate success is arbitrated by a powerful and often underestimated variable: consumer psychology. A primary obstacle to the mainstream adoption of shared reusable containers is a visceral, affective response to the idea of sharing—a phenomenon colloquially termed the 'yuck factor.' This is not mere fastidiousness; it is a manifestation of disgust, a basic, evolutionarily-ingrained emotion that functions as a powerful disease-avoidance mechanism, motivating withdrawal from potential contaminants (Curtis, de Barra, & Aunger, 2011; Rozin, Haidt, & McCauley, 2008).

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The potency of this emotion is especially acute for objects intended for oral contact, making shared food and beverage containers a prime trigger for such anxieties.

The psychological underpinnings of the 'yuck factor' can be theoretically framed by the concept of "interpersonal contamination" (Argo, Dahl, & Morales, 2006). Research in consumer behavior has established that objects can be perceived as 'tainted' through mere physical contact with unknown or undesirable individuals, leading to product devaluation and avoidance. A reusable container, by its very nature, possesses an invisible history of use by strangers. This history can transform it from a sustainable solution into a perceived vector of contamination, carrying the undesirable properties of previous, unknown users. While the principles of negative contagion are well-documented in marketing, their specific application as a primary barrier to the adoption of pro-environmental systems like reusable packaging remains significantly underexplored.

This research gap was cast into sharp relief by the global COVID-19 pandemic. The pandemic acted as a powerful catalyst, thrusting hygiene and safety perceptions to the forefront of consumer consciousness and dramatically increasing anxiety around shared surfaces (D'Amato et al., 2020; Orsato et al., 2021). This period saw a temporary but significant reversal of progress in the reuse movement, exposing the fragility of consumer trust in shared systems. It highlighted that latent anxieties about hygiene can quickly become overt and powerful barriers, capable of derailing even well-established initiatives. This has created a clear imperative: for reusable systems to be resilient and scalable, they must be designed not only for logistical efficiency but also for profound psychological trust.

To address this critical gap, this paper proposes a mixed-methods study designed to systematically deconstruct the 'yuck factor' and provide an evidence-based roadmap for building consumer trust in shared reusable packaging. Our study is guided by the following research questions:

- How prevalent are hygiene and contamination concerns regarding reusable packaging across different consumer segments?
- What are the core emotional, psychological, and social factors that contribute to the 'yuck factor'?
- What specific system features, transparency measures, and communication strategies can most effectively build and maintain consumer trust in the hygiene of shared reusable containers?

By providing a granular, theoretically-grounded understanding of this psychological barrier, this research will offer actionable insights for businesses, policymakers, and system designers. The findings will contribute to the development of more robust, user-centric, and trustworthy reusable systems capable of achieving mainstream adoption and accelerating the transition away from a disposable culture.

2. Literature Review

The challenge of encouraging consumer adoption of reusable packaging systems is located at the confluence of several fields of academic inquiry. To understand the potent nature of hygiene perceptions as a barrier, one must first consider the broader context of pro-environmental behavior. A large body of literature has documented the persistent "intention-action gap," wherein consumers' stated positive attitudes toward sustainability do not reliably translate into corresponding behaviors (Kollmuss & Agyeman, 2002; Carrington, Neville, & Whitwell, 2010). This gap is often explained through cognitive models like the Theory of Planned Behavior, which posits that behavior is predicted by intentions, which in turn are shaped by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In the context of reusables, practical barriers like higher costs, inconvenience (e.g., remembering to carry containers, finding drop-off points), and the force of habit demonstrably lower perceived behavioral control and thus weaken intentions (Poortinga, Whitmarsh, & Suffolk, 2013). Research specific to reusable containers confirms that hygiene concerns are a primary barrier, often cited more frequently than cost or inconvenience. For instance, a study on reusable coffee cup schemes found that concerns about cleanliness and the unseen history of the cup were significant deterrents for non-users (White, B.M., & K.D. Lockyer, 2020). The visceral aversion to a shared container—the 'yuck factor'—can thus be conceptualized as a powerful affective heuristic that immediately overrides abstract environmental goals. This emotional response represents an intuitive and personal risk that feels far more salient than a distant and collective ecological benefit (Slovic et al., 2004).

This intuitive aversion is theoretically grounded in the psychology of disgust, an emotion that evolved as a core defense mechanism to prevent disease and pathogen ingestion (Rozin, Haidt, & McCauley, 2008). The principles of disgust extend beyond overtly spoiled or unclean things to include the concept of interpersonal contamination. Seminal work in consumer behavior by Argo, Dahl, and Morales (2006) established that products are devalued and avoided if they have merely been touched by another person, particularly a stranger. This "negative contagion" effect demonstrates

that an object's social history is a powerful determinant of its perceived value and safety. Shared reusable containers are a textbook example of an object susceptible to this phenomenon; their core value proposition involves sequential use by anonymous others, making them a potent trigger for contamination concerns, regardless of their objective sterility after industrial sanitation. As Morales and Fitzsimons (2007) further elaborated, the aversion is not always rational; even when consumers know an object is clean, the mere knowledge of its contact history can be sufficient to elicit disgust and avoidance, a principle rooted in the magical law of contagion. This is particularly relevant for food and beverage containers where the proximity to the mouth heightens sensitivity to potential contaminants (Schaumberg & Wiltermuth, 2014).

Given that consumers in a shared system must cede direct control over the cleaning process, their willingness to participate becomes a function of trust in the system's operator. The literature on risk perception and management establishes that building trust is not merely about ensuring a safe outcome, but about communicating procedural fairness, rigor, and transparency (Earle & Cvetkovich, 1995). For reusable systems, this implies that the sanitation process itself—and how it is communicated—is a critical component of the service. Simply stating that a container is "clean" may be insufficient to overcome the deeply ingrained psychology of disgust. Indeed, recent research on user acceptance of reusable packaging systems suggests that overt displays of transparency, such as showing the washing process, can be more effective at mitigating hygiene concerns than simple textual assurances (Korkeakoski et al., 2022). Further studies indicate that visible cues of cleanliness, such as protective seals or individual wrapping for sanitized containers, can serve as powerful signals of safety and care, thereby increasing user confidence (Wang, S., & E.T. Bigne, 2021). This highlights the need to actively build and maintain trust through transparent operational design, a finding that parallels research in food safety, where consumer confidence is linked to perceptions of procedural integrity and oversight (Lobb, Mazzocchi, & Traill, 2007).

Synthesizing these streams of literature reveals a clear research gap. While existing studies on reusable packaging systems often acknowledge hygiene as a consumer concern, it is typically listed as one of several practical barriers and is rarely the central focus of empirical investigation (e.g., Sun, 2023; PlasticsEurope, 2020). The profound psychological dimensions of disgust and contamination that underpin these concerns remain significantly undertheorized and under-examined in this specific context. The global COVID-19 pandemic starkly illustrated the importance of this gap, as heightened anxieties about pathogen transmission led to a widespread, albeit temporary, rejection of reusable options in favor of single-use items perceived as safer (D'Amato et al., 2020; Orsato et al., 2021). This has created a clear imperative to move beyond treating hygiene as a simple logistical issue and to instead investigate it as a core psychological phenomenon. Therefore, this study will make hygiene perceptions its primary unit of analysis, seeking to understand the 'yuck factor' not as a secondary concern, but as a fundamental psychological driver of behavior that must be understood and addressed to enable a circular economy for packaging.

3. Methodology

To address the multifaceted nature of consumer perceptions of hygiene in reusable packaging systems, this study employed a mixed-methods approach, using a sequential explanatory design to provide a comprehensive understanding (Creswell & Plano Clark, 2017). This two-phase methodology began with a quantitative survey to establish the prevalence and statistical predictors of hygiene concerns. Following this, a qualitative phase consisting of in-depth interviews was conducted to explore the nuances and underlying rationale behind the survey findings. This design was chosen for its ability to combine the generalizability of quantitative data with the rich, contextual depth of qualitative inquiry.

3.1. Phase 1: Quantitative Survey

3.1.1. Study Site and Participants

The study was conducted in a digital environment, leveraging established online research panels for recruitment. This online setting was selected as the study site to facilitate access to a geographically dispersed and demographically diverse sample from two large North American consumer markets: Canada and the United States. A final sample of 336 participants was recruited, with quotas implemented for age, gender, and geographic location to ensure a broad and varied sample distribution.

3.1.2. Survey Instrument

A structured online questionnaire was developed to gather data on the key constructs. To measure hygiene concerns, a bespoke 8-item "Reusable Container Hygiene Concern" (RCHC) scale was created for this study. Items were rated on a 7-point Likert scale from 'Strongly Disagree' to 'Strongly Agree' and included statements such as, "I would be worried

about the cleanliness of a reusable food container provided by a restaurant" and "I doubt that industrial washing processes can effectively sanitize a container used by a stranger." Individual differences in disgust sensitivity were measured using the validated Disgust Scale-Revised (DS-R), a 25-item measure assessing three domains: core disgust, animal-reminder disgust, and contamination disgust (Olatunji et al., 2007). The instrument also included items to gauge trust in system actors (e.g., brands, retailers), standard scales for pro-environmental attitudes and self-reported behaviors, and a concluding section for standard demographic information.

3.1.3. Survey Analysis

The quantitative data were analyzed using SPSS (Version 28.0). The analysis began with the calculation of descriptive statistics (means, standard deviations, frequencies) to profile the sample and to address the first research question by summarizing the overall prevalence and intensity of hygiene concerns. To explore the relationships between key variables, Pearson correlation coefficients were computed between the RCHC scale scores and predictors such as disgust sensitivity, trust, and pro-environmental attitudes. Finally, to identify the most significant predictors of the 'yuck factor,' a hierarchical multiple regression analysis was performed. Demographic variables were entered in the first block, followed by psychographic variables (e.g., environmental attitudes) in the second block, and disgust sensitivity scores in the final block. This approach allowed for an assessment of the unique predictive power of disgust sensitivity after controlling for other factors. All relevant statistical assumptions, including linearity, normality, and multicollinearity, were checked prior to analysis.

3.2. Phase 2: Qualitative Interviews

The second, qualitative phase of the research was designed to provide rich, explanatory insights into the quantitative findings, directly addressing our second and third research questions. This phase sought to understand the lived experience of the 'yuck factor' and to explore consumer reactions to potential trust-building interventions. From the initial survey pool, a purposive sample of 20-25 participants who had consented to be recontacted was selected for semi-structured, one-on-one interviews. This sample was curated to ensure maximum variation in terms of demographic profiles and, importantly, to represent different levels of hygiene concern (high, medium, and low) as identified in the survey. Interviews were conducted via video conferencing and were guided by the survey results, probing participants on their feelings about shared containers, their mental models of cleaning processes, and their reactions to various stimuli, such as images of sealed versus unsealed containers and descriptions of transparency technologies. All interviews were audio-recorded, transcribed verbatim, and subsequently analyzed using the thematic analysis framework outlined by Braun and Clarke (2006).

3.3. Data Integration and Ethical Considerations

Finally, the findings from both phases were integrated during the interpretation stage. The rich narrative data from the qualitative interviews were used to explain, illustrate, and expand upon the statistical patterns identified in the quantitative survey. For instance, statistical correlations were contextualized with direct quotes and thematic interpretations from the interviews. All research procedures were approved by the Institutional Review Board (IRB), and all participants provided informed consent, were assured of confidentiality, and were informed of their right to withdraw at any time.

4. Methodology

To address the multifaceted nature of consumer perceptions of hygiene in reusable packaging systems, this study employed a mixed-methods approach, using a sequential explanatory design to provide a comprehensive understanding (Creswell & Plano Clark, 2018). This two-phase methodology began with a quantitative survey (Phase 1) to establish the prevalence and statistical predictors of hygiene concerns. This phase was designed to address the "what" and "who" of the research problem. Following this, a qualitative phase (Phase 2) consisting of in-depth interviews was conducted to explore the nuances and underlying "why" and "how" behind the survey findings. This design was chosen for its ability to combine the generalizability of quantitative data with the rich, contextual depth of qualitative inquiry.

4.1. Phase 1: Quantitative Survey

4.1.1. Study Site and Participants

The study was conducted in a digital environment, leveraging the Prolific academic research platform for recruitment. This online setting was selected as the study site to facilitate access to a geographically dispersed and demographically diverse sample from two large North American consumer markets: Canada and the United States. A final sample of 336 participants was recruited. Participants were screened for being 18 years or older and for being regular (at least once

per month) purchasers of takeout food or beverages from restaurants or cafes, ensuring all respondents had relevant consumer experience.

4.1.2. Survey Instrument

A structured online questionnaire was developed and hosted on the Qualtrics platform, consisting of four primary sections.

- **Reusable Container Hygiene Concern (RCHC) Scale:** To measure the primary dependent variable, a bespoke 8-item RCHC scale was created for this study. Items were rated on a 7-point Likert scale (1=Strongly Disagree, 7=Strongly Agree). The scale demonstrated high internal consistency (Cronbach's $\alpha = .91$). The items were designed to capture:
 - **Affective Rejection:** e.g., "The thought of a stranger having used a cup before me is unsettling."
 - **Perceived Health Risk:** e.g., "I would be worried about getting sick from a shared reusable container."
 - **Procedural Mistrust:** e.g., "I am confident that restaurants properly sanitize reusable containers" (reverse-coded); and "I suspect that busy employees cut corners when cleaning reusable items."
 - **Behavioral Avoidance:** e.g., "If given a choice, I would choose a single-use disposable container over a reusable one provided by a cafe."
- **Disgust Sensitivity:** Individual differences in this key psychological predictor were measured using a 25-item validated subset of the Disgust Scale-Revised (DS-R) (Haidt, McCauley, & Rozin, 1994). This scale measures a person's *general, innate* disgust sensitivity as a stable personality trait. Participants rated items on a 5-point scale (1=Not Disgusting at all, 5=Very Disgusting), and the subset demonstrated high reliability (Cronbach's $\alpha = .87$). The items were drawn from contamination-relevant subscales, including:
 - **Core Disgust:** e.g., "You see a spot of mold on a piece of bread."
 - **Interpersonal Contamination:** e.g., "It bothers me to see someone else's dirty laundry"; and "You are asked to drink water from a cup that a stranger has just used."
- **Pro-Environmental Attitude:** This 6-item scale (Cronbach's $\alpha = .89$) measured the potential "buffering" effect of a participant's environmental identity, using a 7-point Likert scale (1=Strongly Disagree, 7=Strongly Agree). The scale included items assessing:
 - **Environmental Identity:** e.g., "Protecting the environment is an important part of who I am."
 - **Context-Specific Beliefs:** e.g., "I am very concerned about the impact of single-use plastic waste."
 - **Stated Behavioral Commitment:** e.g., "I make a conscious effort to reduce my use of single-use plastics, even when it is inconvenient."
- **Demographics:** The final section of the survey collected standard demographic information. This data was gathered for two primary purposes: (a) to describe the final sample in the descriptive analysis (see Table 1) and assess its diversity, and (b) to be used as control variables in the hierarchical regression analysis. The variables collected included participant age (as a continuous variable), gender (with options for male, female, and other/prefer not to say), country of residence (Canada or United States), and highest level of education (e.g., High School or less, Some College, Bachelor's Degree, Graduate Degree).

4.1.3. Survey Analysis

The quantitative data were analyzed using SPSS (Version 28). The analysis began with the calculation of descriptive statistics (means, standard deviations, frequencies) to profile the sample and to address the first research question by summarizing the overall prevalence and intensity of hygiene concerns. To explore the relationships between key variables, Pearson correlation coefficients were computed between the RCHC scale scores and predictors such as disgust sensitivity and pro-environmental attitudes. Finally, to identify the most significant predictors of the 'yuck factor,' a hierarchical multiple regression analysis was performed. Demographic variables were entered in the first block, followed by pro-environmental attitude in the second block, and disgust sensitivity scores in the final block. This approach allowed for an assessment of the unique predictive power of disgust sensitivity after controlling for other factors.

4.2. Phase 2: Qualitative Interviews

The second, qualitative phase of the research was designed to provide rich, explanatory insights into the quantitative findings, directly addressing our second and third research questions. This phase sought to understand the lived experience of the 'yuck factor' and to explore consumer reactions to potential trust-building interventions. From the initial survey pool, a purposive sample of 22 participants was selected. This sample was curated from participants who had indicated a high level of hygiene concern and consented to be recontacted, ensuring the interviews would provide depth on the phenomenon of interest.

Interviews were semi-structured, lasted approximately 30 minutes, and were conducted via Zoom. They were guided by the survey results, probing participants on their feelings about shared containers, their mental models of cleaning processes, and their reactions to various stimuli (e.g., images of sealed vs. unsealed containers, descriptions of transparency technologies). All interviews were audio-recorded, transcribed verbatim, and subsequently analyzed using a reflexive thematic analysis approach (Braun & Clarke, 2021).

4.3. Data Integration and Ethical Considerations

Finally, the findings from both phases were integrated during the interpretation stage. The rich narrative data from the qualitative interviews were used to explain, illustrate, and expand upon the statistical patterns identified in the quantitative survey. For instance, statistical correlations were contextualized with direct quotes and thematic interpretations from the interviews. All research procedures were approved by the Institutional Review Board (IRB), and all participants provided informed consent, were assured of confidentiality, and were informed of their right to withdraw at any time.

5. Results

The results of this mixed-methods study are presented in two main parts. First, we detail the quantitative findings from the survey (N=336), which address the prevalence and statistical predictors of hygiene concerns (RQ1). This includes descriptive statistics of the sample, correlational analyses between key variables, and a hierarchical regression model designed to identify the strongest determinants of the 'yuck factor'. Second, we present a thematic analysis of the qualitative interview data, which provides explanatory depth regarding the psychological underpinnings of these concerns (RQ2) and identifies potential strategies for building consumer trust (RQ3).

5.1. Quantitative Findings

5.1.1. Participant Demographics and Survey Instrument

The survey yielded 336 complete and valid responses from participants in Canada and the United States. The demographic characteristics of the sample are summarized in Table 1. The sample was balanced in terms of gender and country of residence, with a robust distribution across different age groups and educational backgrounds, enhancing the generalizability of the findings.

Table 1 Participant Demographics (N = 336)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	160	47.6
	Female	171	50.9
	Other / Prefer not to say	5	1.5
Age Group	18–29	88	26.2
	30–44	105	31.3
	45–59	81	24.1
	60+	62	18.4
Country	Canada	165	49.1
	United States	171	50.9
Education	High School or less	45	13.4
	Some College / Associate	112	33.3
	Bachelor's Degree	130	38.7
	Graduate Degree	49	14.6

Descriptive statistics and reliability scores for the primary scales are presented in **Table 2**. All scales demonstrated high internal consistency. The mean score for the RCHC scale ($M = 5.12$) was significantly above the scale's midpoint of 4, indicating that, on average, participants held noteworthy and significant concerns about the cleanliness of shared reusable containers.

Table 2 Descriptive Statistics for Key Variables

Variable	Items	M	SD	Range	Cronbach's α
Hygiene Concern (RCHC)	8	5.12	1.45	1–7	0.91
Disgust Sensitivity (DS-R)	25	2.88	0.89	1–5	0.87
Pro-Environmental Attitude	6	5.45	1.15	1–7	0.89

5.2. Prevalence and Nature of Hygiene Concerns (RQ1)

To address our first research question regarding the prevalence and nature of hygiene concerns, an item-level analysis of the RCHC scale was conducted, with results presented in Table 3. The findings reveal that the 'yuck factor' is not a niche opinion but a widespread and significant psychological barrier within the consumer sample.

The most highly endorsed item was from the "Affective Rejection" cluster, with 71.4% of participants agreeing or strongly agreeing that "The thought of a stranger having used a cup before me is unsettling" ($M = 5.30$). This underscores the visceral, emotional, and social nature of the 'yuck factor', aligning with the theory of interpersonal contamination. This was closely followed by concerns in the "Perceived Health Risk" cluster, where 68.2% of respondents agreed ($M = 5.15$) they "would be worried about getting sick from a shared reusable container," linking the affective response to a more cognitive, self-protective fear.

Furthermore, the results show a profound "Procedural Mistrust." A substantial majority (65.5%) of participants agreed ($M = 5.09$) they "suspect employees cut corners" when cleaning, and 59.8% were "not confident in sanitization" processes ($M = 4.85$). This indicates that the "black box" of the cleaning process, as detailed in the methodology, is a primary source of consumer doubt. Finally, these concerns translated directly into stated "Behavioral Avoidance," with 61.3% of participants agreeing ($M = 4.98$) that they would "prefer single-use" containers, all else being equal. Taken together, these findings confirm that the 'yuck factor' is a robust, multi-dimensional construct encompassing emotional disgust, health risk, and procedural skepticism, all of which are highly prevalent in the target consumer population.

Table 3 Item-Level Analysis of Reusable Container Hygiene Concern (RCHC) Scale ($N = 336$)

RCHC Item (Abbreviated)	Item Cluster	M	SD	% Agree / Strongly Agree
Unsettled by previous user	Affective Rejection	5.30	1.62	71.4%
Worried about getting sick	Perceived Health Risk	5.15	1.55	68.2%
Suspect employees cut corners	Procedural Mistrust	5.09	1.48	65.5%
Prefer single-use	Behavioral Avoidance	4.98	1.70	61.3%
Not confident in sanitization	Procedural Mistrust	4.85	1.51	59.8%

Note. Percentages represent participants who selected 5, 6, or 7 on the 7-point scale.

5.3. Correlational Analysis

To examine the initial relationships between hygiene concerns and the key psychographic variables, a Pearson correlation matrix was computed (Table 4). This analysis serves to test the hypothesized associations between our main constructs before modeling them in the regression.

The most significant finding was the strong, positive, and statistically significant correlation between Hygiene Concern (RCHC) and Disgust Sensitivity ($r = .59$, $p < .001$). This result provides powerful initial support for our central hypothesis: the 'yuck factor' is not an isolated concern but is deeply rooted in an individual's more stable, general psychological trait of disgust sensitivity. In practical terms, this strong positive relationship means that as an

individual's general tendency to be "grossed out" by various stimuli (e.g., mold, body products) increases, their specific anxiety about reusable containers increases substantially.

Conversely, a weak, negative correlation was found between Pro-Environmental Attitude and Hygiene Concern ($r = -.24, p < .01$). While statistically significant, the weakness of this coefficient is highly informative. It suggests that while a strong environmental identity may slightly buffer against hygiene fears, it is not a powerful mitigator. This finding challenges the assumption that "green" consumers' values will simply override their visceral disgust, highlighting the persistence of the 'yuck factor' even among those motivated to be sustainable.

Finally, the analysis revealed only a very weak negative correlation between Disgust Sensitivity and Pro-Environmental Attitude ($r = -.15, p < .05$), indicating that these two psychological traits are largely independent of one another. This is an important finding for the subsequent regression, as it suggests they are not confounding variables.

Table 4 Pearson Correlation Matrix for Key Variables

Variable	1. Hygiene Concern (RCHC)	2. Disgust Sensitivity	3. Pro-Environmental Attitude
Hygiene Concern (RCHC)	—		
Disgust Sensitivity	0.59**	—	
Pro-Environmental Attitude	-0.24**	-0.15*	—

Note. $p < .05$, $p < .01$.

5.4. Predictors of Hygiene Concerns

To identify the most significant predictors of hygiene concern, a hierarchical multiple regression was conducted (Table 5). The RCHC scale score served as the dependent variable. Demographic variables were entered in Step 1, Pro-Environmental Attitude was added in Step 2, and Disgust Sensitivity was added in the final step.

The final model was statistically significant ($F(5, 330) = 49.6, p < .001$) and explained 43% of the variance (R^2) in hygiene concern scores. Step 1 (demographics) was significant but explained only 6% of the variance. Step 2 (Pro-Environmental Attitude) added an additional 5%. The final step, the addition of Disgust Sensitivity, accounted for an additional 32% of the variance ($\Delta R^2 = .32, p < .001$).

Disgust Sensitivity emerged as the single strongest predictor by a substantial margin ($\beta = .51, p < .001$), confirming that a person's innate, general disgust sensitivity is the most powerful determinant of their specific 'yuck factor' toward reusable containers.

Table 5 Hierarchical Multiple Regression Predicting Hygiene Concern (RCHC)

Variable	B	SE B	β	R^2	ΔR^2
Step 1				0.06*	0.06*
Age	0.12	0.08	0.08		
Gender (Female = 1)	0.31	0.15	0.11*		
Step 2				0.11**	0.05**
Age	0.11	0.07	0.07		
Gender	0.29	0.14	0.10*		
Pro-Environmental Attitude	-0.28	0.07	-0.22**		
Step 3				0.43**	0.32**
Age	0.03	0.06	0.02		
Gender	0.14	0.12	0.05		

Pro-Environmental Attitude	-0.15	0.06	-0.12*		
Disgust Sensitivity	0.83	0.08	0.51**		

Note. $p < .05$, $p < .01$.

5.5. Qualitative Findings

Thematic analysis of the 22 semi-structured interviews was conducted to provide explanatory depth to the quantitative results. The emergent themes are organized below according to the research questions they address.

5.5.1. Answering RQ2: What are the core factors contributing to the 'yuck factor'?

The interview data revealed a complex, multi-layered set of perceptions that underpin the 'yuck factor'. Three primary themes emerged that deconstruct its psychological foundations: (1) the potent, imaginative fear of the unknown previous user; (2) a profound and pervasive mistrust in the invisible sanitation processes; and (3) a highly contextual and nuanced hierarchy of contamination risk.

- Theme 1: The Specter of the Unknown User.** The most dominant and emotionally charged theme was the fear of the imagined previous user, a clear manifestation of interpersonal contamination theory. Participants' anxieties were not generalized but were vividly social, often involving the spontaneous creation of negative narratives. The "not knowing" was a central source of distress. As one participant explained, *"It's not the cup, it's the ghost of the person before. Were they sick? Did they have a cold sore? It's the not knowing that gets you. My brain just spirals."* This social anxiety extended beyond health, touching on perceived cleanliness habits and social class. Another interviewee commented, *"You just have to hope the person before you wasn't a total slob... You don't know if they left crusty food in there for a week before returning it."* This finding underscores that the 'yuck factor' is not merely a hygienic concern but a powerful social-emotional response to the unseen, and often negatively imagined, history of a shared object.
- Theme 2: Procedural Mistrust and the 'Black Box' of Cleaning.** A second major theme was a deep-seated skepticism about the industrial cleaning process, which participants perceived as an opaque "black box." This mistrust stemmed from the process's invisibility. Vague assurances of "commercial sanitization" were insufficient to build confidence. As one interviewee stated, *"They tell you it's 'commercially sanitized.' That means nothing to me. Is it one person with a dirty rag or a high-tech machine? I have no way of knowing, so my default is to not trust it."* This skepticism was often linked to perceptions of business priorities, with participants fearing that cost-cutting or employee negligence could lead to subpar cleaning. Another participant articulated this concern: *"In a busy cafe, are they really going to follow the protocol every single time? Or are they just going to give it a quick rinse when a line is out the door? I suspect the latter."* This procedural mistrust reveals that consumer confidence is not just about the *promise* of cleanliness, but the perceived *proof* and reliability of the system.
- Theme 3: The Hierarchy of Contamination Risk.** The intensity of the 'yuck factor' was not monolithic; rather, it was highly context-dependent. Participants consistently articulated a clear and logical hierarchy of risk based on two primary factors: the proximity of contact and the nature of the food. Items with direct mouth contact, such as coffee cup lids, straws, and cutlery, elicited the strongest disgust responses. A participant stated this plainly: *"My mouth touching the rim of a shared cup is a hard no. A reusable bowl for a salad that I eat with my own fork? That feels worlds safer."* Furthermore, the type of food residue was critical. Wet, sticky, or greasy foods (e.g., curries, pasta sauces) were seen as far more contaminating and harder to clean than dry items (e.g., sandwiches, baked goods). This nuanced risk assessment suggests that consumer acceptance may vary significantly depending on the specific application of the reusable container.

5.5.2. Answering RQ3: What strategies can build consumer trust?

While the barriers to trust are significant, the interview data also illuminated clear and actionable pathways to overcome them. Participants were not universally opposed to reusables; rather, they sought credible signals of safety and cleanliness. Four primary themes emerged as critical to building trust: (1) the use of tangible, sensory cues as immediate proxies for safety; (2) operational transparency as a direct antidote to procedural mistrust; (3) the value of third-party certification as an external validator; and (4) the influence of container materiality and design on perceptions of cleanliness.

- Theme 4: Sensory Cues as Powerful Proxies for Safety.** In the absence of direct, verifiable information about the cleaning process, participants relied heavily on tangible, sensory cues to infer an object's state of hygiene.

These cues served as mental shortcuts to alleviate anxiety. The most frequently and positively cited intervention was a physical seal. A participant noted, *"If there's a paper seal over the top, it's a 100% difference. It's a signal that I'm the first person to touch it since it was cleaned. It breaks the chain of contamination in my mind."* This simple addition was perceived as a guarantee of post-sanitization integrity. Other valued cues included protective coverings, such as a paper bag or sleeve, and thermal indicators, like a container feeling hot to the touch, which implied a recent high-temperature wash.

- **Theme 5: Transparency as the Antidote to Mistrust.** To counter the deep-seated skepticism about the cleaning process, participants overwhelmingly called for greater transparency. Simple marketing claims were insufficient; consumers wanted verifiable proof. The idea of a QR code on the container that linked to a short video of the washing facility was seen as a particularly powerful tool. One participant reacted, *"Oh, that's brilliant. If I could actually see the machine, see the steam and the process, I would feel so much better. It takes it out of the 'black box' and makes it real."* This theme suggests that active demonstrations of the sanitation process are far more effective at building durable consumer trust than passive verbal or written assurances.
- **Theme 6: The Appeal of Third-Party Certification.** Participants expressed a desire for an objective, external authority to validate the hygiene standards of a reusable system. This appeal to a trusted third party was seen as a way to bypass their inherent skepticism of a company's self-reported claims. As one interviewee suggested, *"I'd trust it more if there was a sticker on it from the health department or some kind of 'Certified Clean' program, like how restaurants have those grade signs in the window."* This indicates that partnerships with public health agencies or the creation of a recognizable, industry-wide hygiene standard could serve as a powerful and credible signal of safety, lending legitimacy to the entire system.
- **Theme 7: Materiality and Design as Hygiene Signals.** The physical characteristics of the container itself played a significant role in shaping perceptions of cleanliness. Participants held strong, often implicit, beliefs about which materials were most hygienic. Stainless steel and glass were frequently cited as "cleaner" and less porous than plastic. One participant stated, *"I just feel like steel doesn't hold onto germs or smells the way plastic does. You can see that it's clean."* Furthermore, the condition of the container was paramount. Scratches, stains, or visible wear and tear were immediate red flags that undermined trust, regardless of any sanitation claims. *"If they gave me a cup that was all scratched up,"* a participant noted, *"I wouldn't care if they told me it was sterile. It just looks dirty and old. I'd ask for a disposable one."* This highlights the importance of not only the initial material choice but also maintaining a high-quality, pristine-looking inventory of containers.

Figure 1 visually summarizes the conceptual model derived from the study's findings. It illustrates that the central outcome, "The 'Yuck Factor' (Hygiene Concern)," is primarily driven by two key psychological factors: "The Specter of the Unknown User" (social contamination) and "Procedural Mistrust" (the "black box" of cleaning). The model also shows that this negative outcome can be reduced or counteracted by four key trust-building interventions—Sensory Cues, Operational Transparency, Third-Party Certification, and Materiality & Design—which act as "Mitigating Factors."

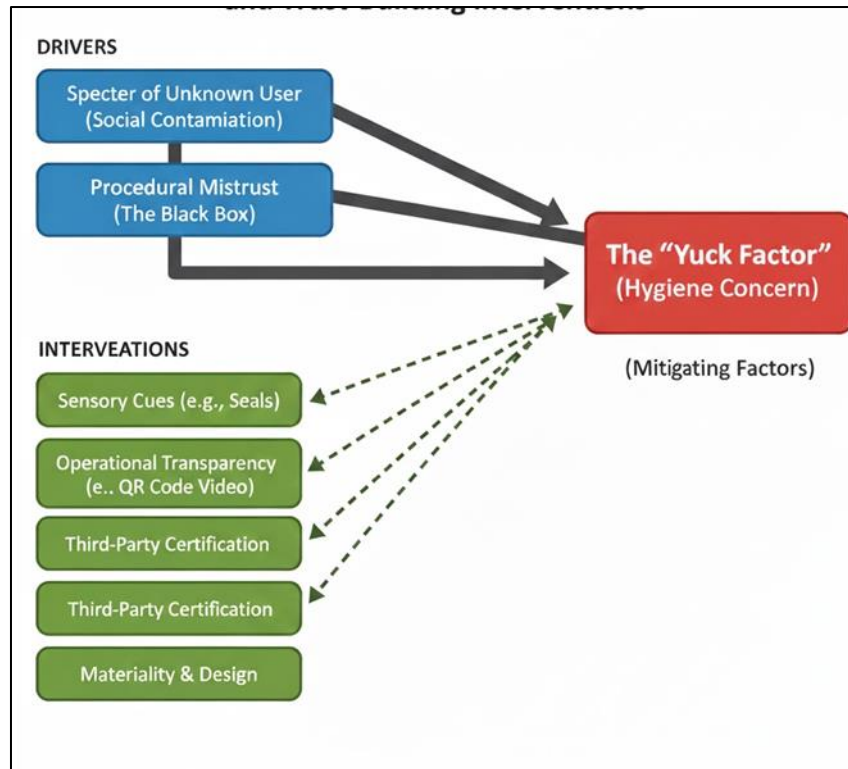


Figure 1 Conceptual Model of the "Yuck Factor"

6. Discussion

This mixed-methods study sought to deconstruct the 'yuck factor'—a significant psychological barrier to the adoption of reusable food and beverage containers. The findings confirm that hygiene concerns are not only prevalent (RQ1) but are also complex, rooted in deep-seated psychological traits (RQ2), and yet amenable to specific, tangible interventions (RQ3). This discussion synthesizes the quantitative and qualitative findings, situates them within the broader literature, and outlines the theoretical and practical implications.

6.1. Discussion of Key Findings

The study's primary quantitative finding is unequivocal: the 'yuck factor' is powerfully predicted by an individual's innate disgust sensitivity. As shown in the regression model (Table 5), Disgust Sensitivity ($\beta = .51$) was by far the most significant predictor, dwarfing the minor influence of demographics and explaining a substantial 32% of the variance in hygiene concerns on its own. This finding empirically validates the theoretical link between the psychology of disgust and the specific barrier of reusable packaging.

The qualitative findings provide critical explanatory depth, illustrating *why* this link is so strong. The themes of "The Specter of the Unknown User" and "Procedural Mistrust" demonstrate that this disgust is not abstract; it is a potent combination of social anxiety (interpersonal contamination) and institutional skepticism (the "black box" of cleaning). Consumers' fears are vivid, narrative, and social—they imagine the "ghost of the person before" and the "employee cutting corners."

Perhaps the most compelling finding for the circular economy transition is the demonstrated failure of environmentalism to override disgust. The weak negative correlation ($r = -.24$) between Pro-Environmental Attitude and Hygiene Concern, combined with its modest predictive power in the regression model ($\beta = -.12$), provides strong evidence of a "disgust-based intention-action gap." This study suggests that appeals to sustainability (the "pull" factor) are insufficient to overcome the visceral, emotional barrier of disgust (the "push-back" factor). Even participants who strongly identify as "green" still feel the 'yuck'; their values do not simply negate their visceral, self-protective emotions.

6.2. Theoretical and Practical Implications

- **Theoretical Implications:** This study makes two key contributions to the literature. First, it empirically applies the theories of interpersonal contamination and disgust psychology to the novel context of reusable packaging systems, demonstrating their critical importance in predicting consumer acceptance. Second, it adds a crucial new dimension to the "intention-action gap" in pro-environmental behavior. While previous research has focused on barriers like cost, inconvenience, and habit (e.g., Kollmuss & Agyeman, 2002; Morones-Ramirez, 2021), our findings posit that visceral, evolved emotions like disgust can act as a formidable psychological barrier that may be even more powerful than stated attitudes or intentions.
- **Practical Implications:** The findings offer a clear and actionable roadmap for businesses, system designers, and policymakers. The primary takeaway is that **reusable systems must be marketed on trust and safety first, and sustainability second**. The qualitative findings (RQ3) provide specific strategies to build this trust:
 - **Make the Invisible Visible:** Counteract "procedural mistrust" with radical transparency. The positive reaction to "QR code videos" suggests that simple technologies allowing consumers to "see the machine" can effectively dismantle the "black box" of cleaning.
 - **Use Tangible Safety Cues:** The power of a simple "paper seal" (Theme 4) cannot be overstated. These sensory cues act as tangible proof of post-sanitization integrity, "breaking the chain of contamination" in the consumer's mind.
 - **Invest in "Hygienic" Materials:** The preference for stainless steel and glass (Theme 7) indicates that material choice is a form of non-verbal communication about cleanliness. Systems using materials perceived as less porous and more durable may have an innate advantage.
 - **Leverage Third-Party Validation:** The desire for "health department certification" (Theme 6) suggests that businesses should not rely solely on their own claims. Pursuing external validation can bypass consumer skepticism and lend powerful, objective legitimacy to a system.

6.3. Limitations and Future Research

This study, while providing a robust mixed-methods analysis, has several limitations. First, the data are self-reported and cross-sectional. While the survey measures behavioral *intentions* and self-reported *concerns*, it does not capture actual behavior in a real-world purchasing environment. Future research should employ experimental (e.g., A/B testing a sealed vs. unsealed cup in a real cafe) or observational methods to confirm these findings.

Second, the sample was recruited from Canada and the United States. Cultural norms regarding hygiene and disgust are variable, and these findings may not generalize to consumers in European or Asian markets, where different reusable models or hygiene standards may exist.

Finally, this study identifies *interventions*, but it does not test their efficacy over time. Future research could investigate the impact of transparency and sensory cues in a longitudinal study, assessing whether consumer trust can be actively built and maintained, and whether high-disgust consumers can be persuaded to adopt reusable systems through sustained exposure to these trust-building measures.

7. Conclusion

The transition to a circular economy for packaging is essential, but it cannot succeed by appealing to environmental logic alone. This study confirms that the 'yuck factor' is a formidable, psychologically-rooted barrier, driven by a potent, evolved disgust response that good intentions cannot easily overcome. However, this barrier is not insurmountable. Consumer trust is not a given; it must be actively and visibly *earned*. By shifting the marketing focus from sustainability to safety, and by implementing tangible interventions that provide proof of cleanliness—making the sanitation process transparent, using sensory safety cues, and choosing materials wisely—businesses can successfully dismantle the 'yuck factor' and bridge the gap between pro-environmental values and pro-environmental action.

Compliance with ethical standards

Acknowledgments

The author(s) have no acknowledgments to declare.

Disclosure of Conflict of Interest

The author(s) declare that they have no conflict of interest.

Statement of Ethical Approval

All research procedures involving human participants were approved by the Institutional Review Board (IRB).

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study. Participants were assured of confidentiality and informed of their right to withdraw from the study at any time.

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