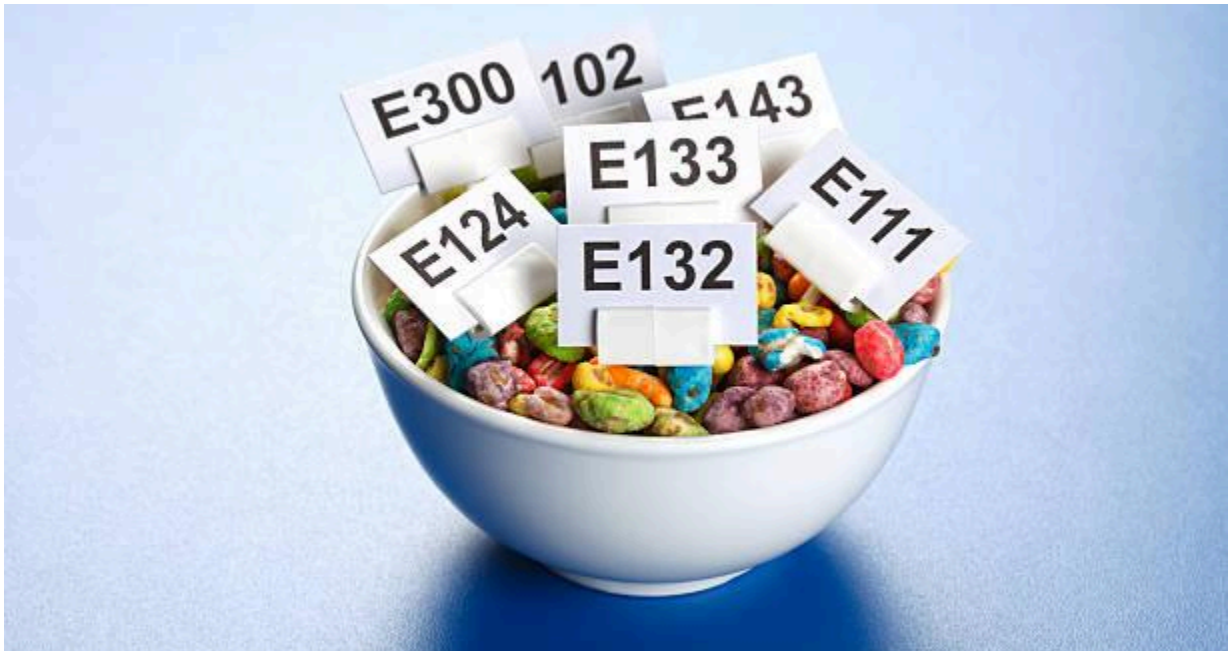

Regulating the Invisible: Applying Behavioral Insights to Improve U.S. Consumer Awareness of Food Additive Risks and Drive Regulatory Reform

London School of Economics and Political Science (LSE)
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Introduction

Picture this: A mother in 1975 suburban America notices a troubling pattern. Every time her son eats bright red candy, snacks on coloured popcorn, or drinks cherry-flavoured soda, his behaviour takes a noticeable turn – for the worse. He's bouncing off the walls, throwing tantrums, unable to sit still. After keeping a food diary for several weeks and reading *Why Your Child is Hyperactive (1974)* by Ben Feingold,[1] she becomes convinced that Red Dye No. 2 is to blame for her son's frenzied behaviour. At the next Parent Teacher Association (PTA) meeting, she shares her findings with other parents. Soon, a wave of concern spreads. A petition circulates. Local news picks up the story. It doesn't take long before the public demand for safety studies on artificial food colours (AFCs) increases, and food retailers are besieged by requests for AFC-free choices.

While this particular scenario is fictional, it mirrors real events that have unfolded repeatedly over the past several decades. Was the concern over Red Dye No. 2 justified?[2] Yes, as it was eventually shown to be carcinogenic. However, the link between Red Dye No. 2 and ADHD remains debated, as ADHD is considered a "multifaceted disorder with both biological and environmental underpinnings," and thus cannot be solely attributed to dye consumption (Kanarek, 2011). Red Dye No. 2 was banned in 1976 and is no longer in American food products (United States General Accounting Office, 1977). However, the greater concern may not be the dyes that make headlines.[3] The real issue lies in the countless additives that still go largely unexamined.

[1] Ben Feingold, a pathologist, hypothesized that certain food additives—particularly salicylates, artificial colors, and artificial flavors—were linked to hyperactivity in children. His writings stirred public concern and led to the widespread adoption of the Feingold diet (see Smith, 2009 for a comprehensive overview of its rise). The diet advocated the elimination of these additives in favor of a more 'natural' diet. However, a meta-analysis by Kavale and Forness (1983) of 23 studies testing the Feingold hypothesis found no evidence that such diet modification effectively treated hyperactivity. Overtime, in part due to the lack of scientific evidence for its efficacy, the diet has declined in popularity.

[2] While both food additives and dyes are governed by the Federal Food, Drug, and Cosmetic Act (FFDCA) in the U.S., they are subject to different regulatory procedures.

[3] Philip M. Boffey, "Red No. 2: A Century of Testing and Uncertainty," The New York Times, February 29, 1976.

Background

The Role of Food Additives and Challenges Assessing Risk

In the U.S., the Federal Food, Drug, and Cosmetic Act (FFDCA) defines a food additive as “any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food” (United States Code, 2025; Maffini et al., in Maffini & Vogel, 2021, p. 295). This includes both ingredients added during processing and substances absorbed from packaging. Food additives are not a modern invention; Ancient Egyptians used them for preservation and flavor as early as 1500 BC (Asif et al., 2020). After World War II, the rise of petrochemicals transformed food manufacturing, embedding additives into production to enhance flavor, texture, shelf life, and appearance (Maffini & Vogel, 2021, p. 295). Additives also help prevent spoilage and foodborne illness, with some even promoting health (Pasca, Coroian, & Socaci, 2018). However, by the late 1940s, safety concerns sparked a debate that continues to shape food regulation (Maffini & Vogel, 2021).

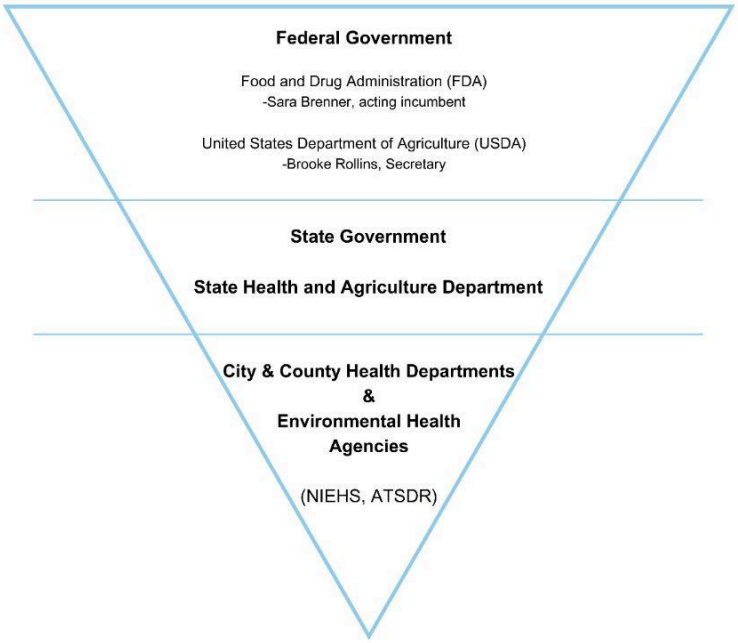
Determining the safety of additives is complex. Traditional risk assessments rely on toxicological studies in animal models to set acceptable daily intake (ADI) thresholds (Blaauboer et al., 2016). However, these studies have limitations in predicting long-term human exposure, as they often fail to account for cumulative effects, interactions between multiple additives, and real-world consumption patterns. Additionally, physiological differences between rodents and humans further challenge their applicability (Schmeisser et al., 2023), though some industry experts suggest that much of the doubt surrounding these studies, particularly in the context of food regulation, is fabricated (Maffini, personal communication, March 18, 2025). Overall, assessing food risks is challenging because evolving scientific knowledge, emerging technologies, and flawed yet widely accepted assessment practices create uncertainties. This complexity makes it difficult to clearly communicate to consumers what is truly "safe" and what constitutes a potential risk (for a more in-depth exploration of the challenges involved in food risk assessment, refer to Creager & Gaudillière, 2021). Regulatory frameworks and public messaging must navigate both evolving scientific uncertainties and the reality that food choices are often driven by personal preferences as much as by precaution. However, the U.S. has struggled to effectively balance these factors, leading to regulatory shortcomings that fail to protect consumers fully.

Regulatory Challenges in the U.S. Food System

The Food and Drug Administration (FDA) plays a central role in regulating food safety, with its processes influencing state and local governance (see Figure 1). Before the mid-20th century, the FDA’s authority over food safety was limited, and concerns about the safety of additives in food began to surface. As these concerns grew, it became clear that the FDA's regulatory framework needed reform to address potential risks to public health more effectively. This led to significant government action, including Congressman James Delaney’s leadership of a Select Committee from 1950 to 1958 to investigate the presence of chemicals in the U.S. food supply and their effects on human health. This investigation ultimately laid the groundwork for the 1958 Food Additives Amendment to the Federal Food, Drug, and Cosmetics Act, which aimed to

balance technological innovation with consumer safety (Maffini & Vogel, 2021). The amendment required manufacturers to prove their safety before introducing them into the food supply. By shifting the burden of proof to the industry and granting the FDA oversight, the legislation aimed to establish a system of checks and balances that reduced the FDA's workload while upholding consumer safety. However, over time, the regulatory framework has weakened, allowing industry interests to dominate and leaving the FDA with a diminished ability to intervene (Neltner et al., 2011). This shift has cast doubt on the transparency and rigour of food safety assessments.

Figure 1: *U.S. Food Safety Governance Hierarchy*



Building on the original legislation, there are now three primary approval pathways through which additives can enter the U.S. food supply: (1) the FDA's formal petition process, (2) the Food Contact Notification (FCN) program, and (3) the Generally Recognized as Safe (GRAS) designation. The petition process, while the most rigorous, has become relatively rare due to its high cost and lengthy approval process. The FCN program, introduced in 1997, allows for an expedited review of additives used in food packaging and contact materials. However, the GRAS pathway has become the dominant route today, allowing manufacturers to self-certify through expert consultation without needing FDA approval (Neltner et al., 2011; Tulleken, 2023; Maffini & Vogel, 2021).

Originally, GRAS status applied to substances with a long history of safe use, such as common ingredients like salt. Over time, however, the GRAS framework has evolved. Today, it allows manufacturers to determine the safety of any food additive without FDA oversight. As a result,

an estimated 66% of current additives on the market have not undergone formal FDA review (Tulleken, 2023). Additionally, since 2000, the chemical and food industries have self-approved 99% of chemicals (Wittenberg, 2022). Consequently, consumers are unknowingly ingesting additives that have not undergone rigorous safety evaluations, all while assuming the FDA is ensuring their protection.

Our Approach

Due to the challenges in assessing additive risks and a flawed regulatory system, food consumption in America has become confusing. For those unconcerned about health risks, this leads to uncritical consumption that could harm long-term health. For those more cautious, it may result in relying on flawed assumptions about food additives, like thinking "natural" is always safer or that all additives are harmful. Due to challenges in assessing additive risks and a flawed regulatory system, food consumption in America has become confusing. For those unconcerned about health risks, this leads to uncritical consumption that could harm long-term health. For the more cautious, it may result in relying on flawed assumptions about food additives, such as believing that 'natural' is always safer or that all additives are harmful. In this unregulated environment, avoiding additives may seem like a safer choice, but it also means disregarding additives that are low-risk or beneficial due to the lack of proper oversight and consumer guidance. This pervasive confusion highlights the multifaceted nature of food behaviour, as consumers evaluate products through diverse lenses shaped by their distinct personal values, motivations and goals.

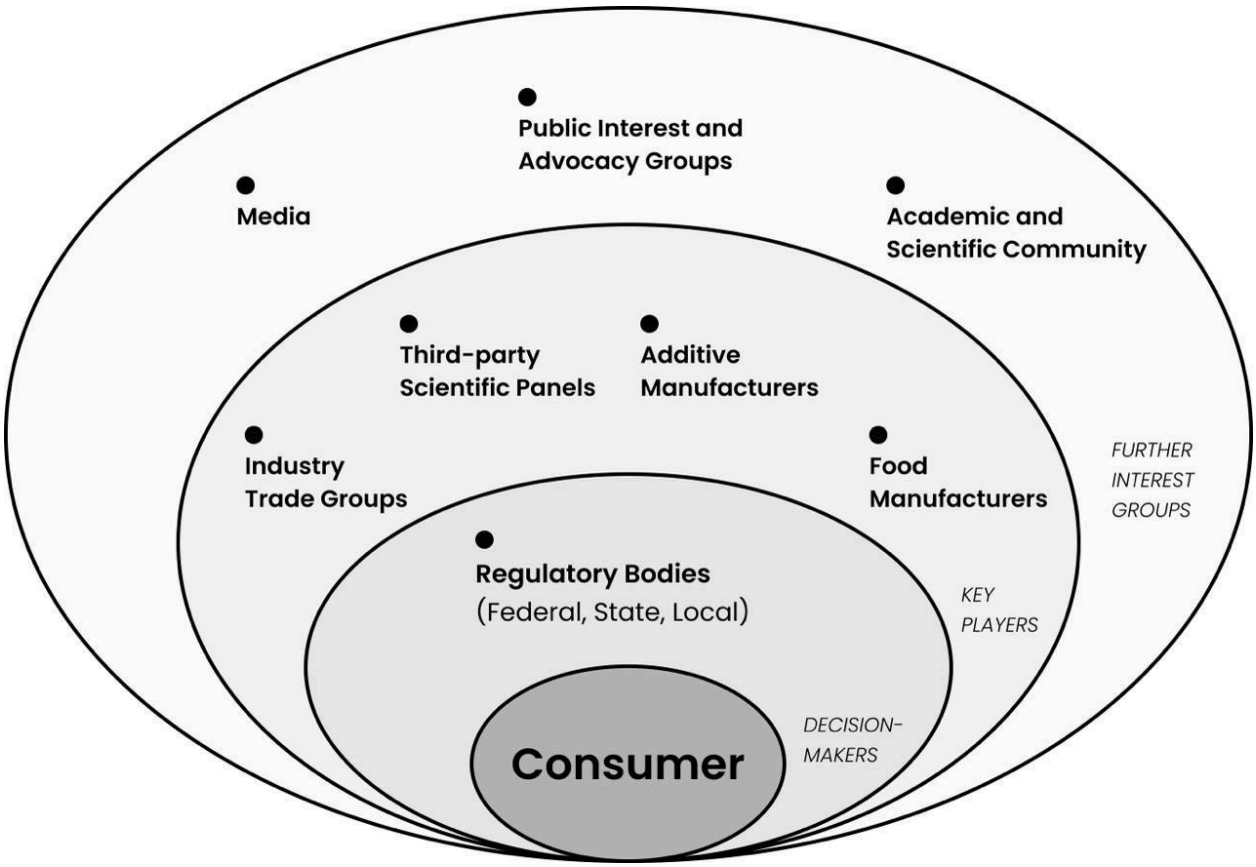
To develop solutions to address this confusion, we conduct a stakeholder analysis to map the roles and interactions of regulatory agencies, industry actors, scientific communities, and consumers. While our primary focus is on the American context, we incorporate comparisons to the European Union’s precautionary regulatory approach to highlight alternative governance models. To further structure and inform our discussion, we apply Activity Theory (AT) to examine how consumer motivations – shaped by their food-based consumer profiles – impact their navigation of the supermarket environment. Building on this, we apply Installation Theory (IT) to assess how physical and social norms, as well as individual capacities, influence decision-making processes. Based on these behavioural analyses, we develop consumer-focused solutions designed to enhance transparency and empower informed choices regarding food additives. Ultimately, our broader goal is to drive market and public pressure for stronger regulations.

Stakeholder Analysis

The interests of various stakeholders are crucial in shaping effective regulation of food additives. Figure 2 displays the decision-makers, key players, and interest groups, categorized by their influence on consumer behaviour. By mapping these interconnected roles, we can identify

conflicts, collaboration opportunities, and barriers to stricter food additive regulations aimed at protecting public health.

Figure 2: *Stakeholder Analysis*



Regulatory Bodies

Regulatory bodies, including the FDA, USDA, and state-level agencies, are central to overseeing the safety of food additives. The FDA is the primary regulator, ensuring safety under the Federal Food, Drug, and Cosmetic Act, requiring evidence of safety before approval. The USDA handles certain food safety aspects such as meat and poultry(Nestle, 2013). State agencies, such as those in California and New York (California Assembly Bill 418, 2023; New York Senate Bill S6055A, 2023), have recently initiated bans on specific additives, creating a patchwork of regulations. Their goal is to protect public health, ensure compliance with safety standards, and balance economic and practical considerations, though criticisms, such as the GRAS loophole, suggest systemic challenges in oversight.

Food Additive Manufacturers

Food additive manufacturers, such as Archer Daniels Midland, DuPont, Ingredion Inc., Tate & Lyle, Kerry Group, DSM, just to name a few, play a pivotal role in producing and selling food additives. Their primary interest is to maximize sales and market share, ensuring their products are deemed safe under current regulations. They may resist stricter regulations that could limit their product offerings or increase compliance costs.

Food Manufacturers

Food manufacturers, including PepsiCo, Nestle, Kraft Heinz, General Mills, Kellogg's, Coca-Cola, Mars, etc., use food additives in their products to improve taste, texture, and shelf life, catering to consumer demand for processed and convenience foods. Their interests lie in producing safe, appealing, and profitable products. While they may support regulations that maintain consumer trust, they could oppose changes that increase costs or limit formulation options, especially given recent state-level bans in food additives creating regulatory challenges (California Assembly Bill 418, 2023; New York Senate Bill S6055A, 2023). Their market power and lobbying through trade associations can shape regulatory outcomes (Nestle, 2013). Trade groups like the Grocery Manufacturers Association (GMA) have historically opposed transparency initiatives, as seen in their 2016 lawsuit against Vermont's GMO labeling law (Center for Food Safety, 2016). However, rising consumer demand for "clean label" products that are free from synthetic additives has prompted voluntary reformulations, demonstrating the power of consumers to push for regulatory reforms (Asioli et al., 2017).

Consumers

Consumers, as end users, purchase and consume products containing food additives and influence market demand through their choices. They seek safe, healthy, and transparent food options, with growing awareness of risks driving demand for cleaner labels (Asioli et al., 2017). Their behaviour can pressure companies and regulators for reform, especially through advocacy and market shifts, such as preferring additive-free products.

Further Interest Groups: Amplifiers and Mediators

Advocacy groups like the Environmental Working Group (EWG) and Center for Science in the Public Interest (CSPI) play pivotal roles in bridging gaps between consumers and policymakers. By translating academic research into accessible resources such as the EWG's "Dirty Dozen" guide to food additives (Environmental Working Group, 2024), these groups reduce cognitive barriers to risk perception. Healthcare professionals further amplify public concern; for instance, the American Academy of Pediatrics' 2018 policy statement on food additives reflects the invocation of medical authority in ongoing policy discussions (Trasande et al., 2018).

The Need for Consumer-Driven Reform

The U.S. food safety regulatory system has needed reform for decades; however, as the stakeholder analysis demonstrates, significant barriers to change persist. With limited support from both governance and industry levels, consumer-driven reform is imperative. Traditional

regulatory and industry mechanisms have proven insufficient in addressing the complexities and shortcomings of food additive safety. Regulatory bodies and industry players often prioritize economic incentives and profit motives over public health, resulting in a system that perpetuates the status quo despite clear evidence of risks and widespread consumer confusion. Additionally, the fragmented oversight – exemplified by issues such as the GRAS loophole and inconsistent state regulations – creates significant gaps in consumer protection. In this environment, consumers hold a pivotal role: their purchasing decisions and increasing demand for transparency and cleaner labels can serve as a powerful counterbalance to entrenched interests. By leveraging consumer preferences and market trends, grassroots reform has the potential to compel both industry and regulators to adopt more rigorous safety standards and transparent practices, ultimately fostering a more accountable and health-focused food safety framework.

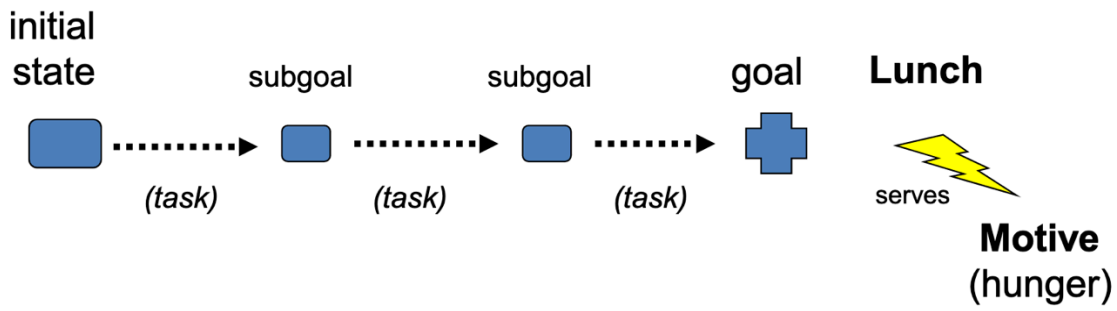
Moreover, with the establishment of the Make America Healthy Again Commission, led by HHS Secretary Robert F. Kennedy Jr., there is a unique moment of bipartisan support for food regulatory reform, presenting a critical window of opportunity for meaningful change (Ahmed Aboulenein, 2025; Maffini, personal communication, March 18, 2025). Kennedy's call to revise the GRAS rule and eliminate the self-affirmation loophole represents a crucial step toward rectifying systemic flaws in the current regulatory framework (Reuters, 2025). Grassroots reform can build off of this momentum by amplifying consumer demand for transparency and safer food additives, pushing industry leaders and regulators to align their practices with public health priorities.

Application of Theoretical Concepts

Activity Theory

AT analysis places the subject's perspective at the core of its framework, distinguishing between activity and behaviour. Activity is defined as "what subjects do, experienced from their own perspective," while behaviour refers to "what subjects do, as described from the outside by an external observer" (Lahlou, 2017, p. 346). The theory explains how individuals or groups pursue goals and fulfill underlying motives through a series of interrelated tasks and sub-goals. A single motive can be fulfilled through multiple goals, and a single goal can serve various motives. Moreover, the trajectory of an activity can change depending on contextual conditions, recognizing the influence of external factors on an individual's efforts to achieve their goal (Lahlou, 2017). To ensure the most accurate application of AT, the following section applies the theory to consumers, drawing on the research findings of Brunsø et al. (2021).

Figure 3: *Simplified Version of Activity Theory*

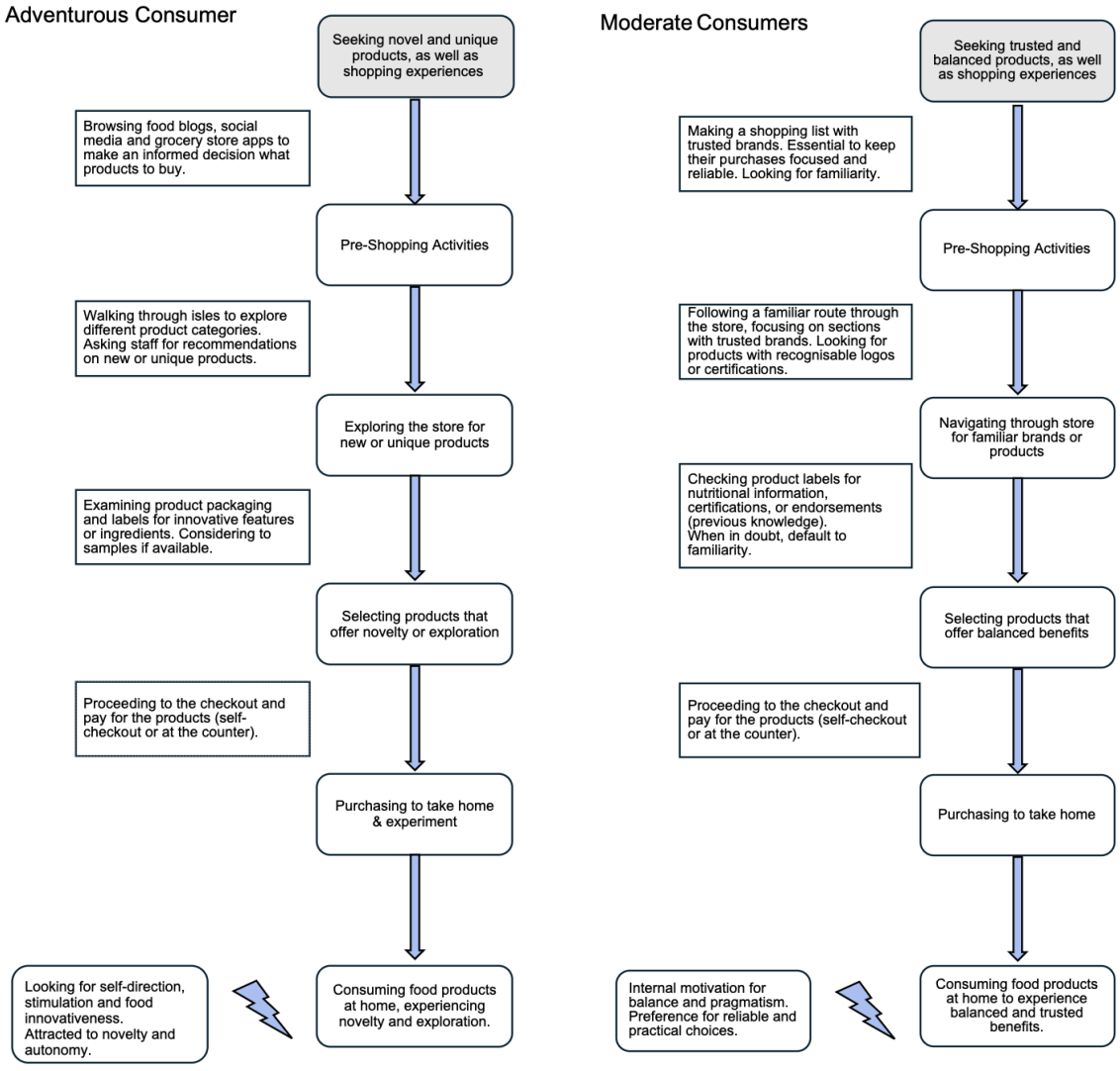


Bridging Food Additive Confusion and Consumer Profiles

To better understand the factors influencing food-related behaviour, numerous frameworks have been developed to classify these influences. One such framework is Brunsø et al. (2021), which first classified food consumers into five broad categories: Foodies, Moderates, Adventurous, Uninvolved, and Conservatives. The results show that the two dominant consumer segments in the U.S. are Adventurous (45%) and Moderates (38%), with a combined market share of 83%. By focusing our interventions on the two segments, we can develop targeted solutions with the highest impact while minimizing intervention costs. Secondly, Brunsø et al. (2021), categorised these segments on three key lifestyle dimensions along the Modular Food-related Lifestyle Model (MFRL) (see Appendix B). The MFRL includes: food involvement (which shows the level of importance food has in consumers life) (Bell & Marshall, 2003), food innovativeness (is the tendency of consumers to purchase and adapt to new products more often and quickly compared to other members in the social system) (Roehrich, 2004), and food responsibility (which focuses on the importance of interest in ethics and sustainable food) (Brunsø et al.,

2021). Thirdly, Schwartz's Theory of Basic Values (2012) was incorporated to further refine these segments by examining and quantifying the values that guide consumer behavior (see appendix B). Understanding the consumer's values is essential in applying AT. Personal values express motivation (Feather, 1995). Therefore, personal values serve as guiding principles for behavior and directly influence motivation. Based on these values we tailored our AT's motivation to our targeted consumer segments (see Figure 4). Lastly, Brunsø et al.'s (2021) consumers self-reported data on food-related behaviours was used to identify the contexts in which our target consumer segments are most likely to purchase food products, which are supermarkets.

Figure 4: *Activity Grid for Adventurous and Moderate Consumers*



The analysis of the activity grids (see Figure 4) it becomes evident that throughout the customer journey of purchasing food, several intervention points can be tackled to increase the awareness of food additives. Our AT analysis reveals key differences between adventurous and Moderate consumers in their shopping behaviours. Adventurous consumers are motivated by novelty and exploration of new products and routes. In contrast, Moderate consumers are motivated by reliability and practical choice, which leads to using shopping lists and familiar routes, as well as checking labels and choosing unknown brands. Despite these differences, both consumer groups face a common challenge: food labels often fail to provide the necessary information to assess additive risks, and supermarket layouts do little to mitigate that confusion. This challenge sets the stage for applying IT, which further explores how the material, embodied, and social layers within the shopping environment influence consumer behaviour.

Installation Theory

IT, developed by Saadi Lahlou (2017), outlines three interrelated layers that structure behaviour within specific settings, or 'installations': the material environment (physical layer), embodied competencies (embodied layer), and social regulation (social layer). The physical layer includes material objects or affordances designed to inform or constrain behaviour, such as product packaging or ingredient labels. The embodied layer encompasses the individual's competencies – both innate and learned – that shape their interaction with the environment. The social layer refers to social norms and expectations that regulate behaviour, which can be internalized or explicitly communicated by society.

In the context of food additives, IT provides a structured framework for understanding how consumers navigate food choices. Building off our AT, we applied IT to the in-person shopping experiences of both Moderate and Adventurous consumers (see Appendix C). In comparing the experiences of Moderate and Adventurous consumers in supermarket settings using IT, we observed distinct patterns across the stages of their shopping behavior. For Moderate consumers, the physical environment is structured around standardized layouts and familiar brands, with limited engagement in specialty sections. Their embodied competence is rooted in efficiency, with basic skills in price comparison and label reading. Social regulation is influenced by mainstream health messaging and peer norms, focusing on practicality, affordability, and responsible consumption. They are motivated by convenience, balancing ethical consumption with cost-effectiveness, and tend to follow broader market trends. Post-purchase, they rely on family and social circle recommendations and rarely engage in deep product analysis.

In contrast, Adventurous consumers are driven by a desire for novelty and ethical consumption, with a keen interest in emerging food trends and niche products. Their physical environment is characterized by unique product placements and specialty sections, which they navigate with expertise in recognizing ethical claims and alternative certifications. Their social regulation is shaped by trends from food influencers and peer recommendations, and they prioritize discovering new, responsible products. Their embodied competence extends to advanced digital literacy, while social norms encourage them to seek authenticity and ethical choices. Adventurous consumers engage deeply with post-purchase platforms, sharing their experiences

on social media and receiving validation from their online networks. Overall, while both groups value responsible consumption, Adventurous consumers display a greater propensity for exploration and deeper engagement with product narratives and social influences.

Solutions Proposal

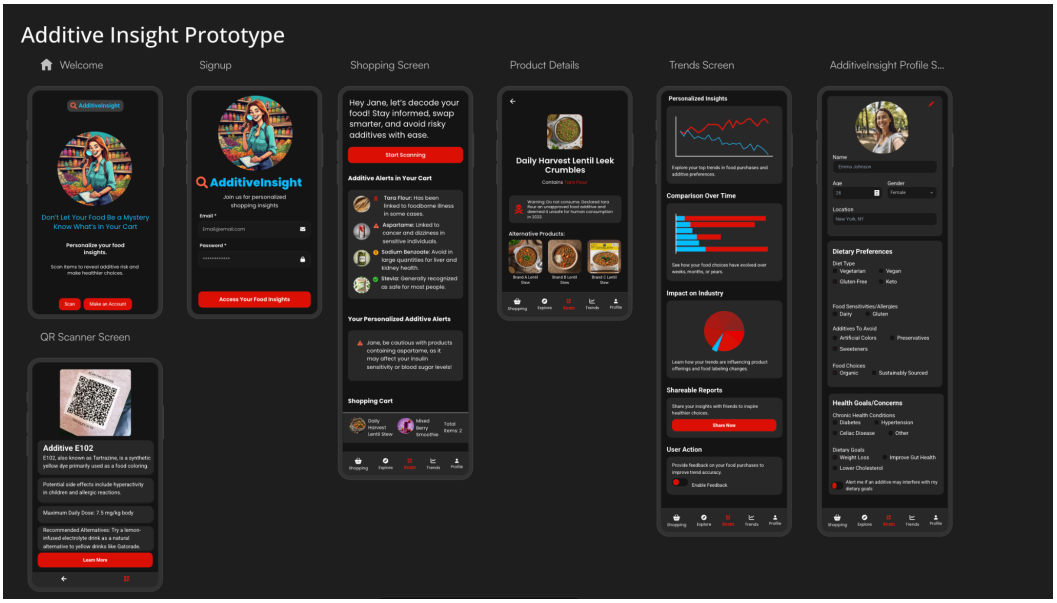
To bridge the gap in consumer awareness of food additives, our solutions leverage insights from AT and IT to target key intervention points in the supermarket shopping experience. By tailoring strategies to the behaviours and motivations of Moderate and Adventurous consumers, we can enhance their ability to make informed choices. The following proposals optimize the environment, strengthen competencies, and leverage social regulation to enhance informed decision-making on additive risk while empowering consumer-driven transparency and policy change.

1. AdditiveInsight

An analysis of the activity grid highlights challenges in supporting healthier food choices through packaging. While consumers rely on labels, FOP labeling, though promising in lab settings. has shown limited real-world impact (Dubois et al., 2020). BOP labels, while detailed, often confuse consumers due to high cognitive load (FDA, 2018; Persoskie et al., 2017). Stricter labeling policies also face industry resistance and regulatory barriers. Given these limitations, packaging alone is an inadequate solution. However, these challenges present an opportunity for intervention, offering a more effective approach to guiding consumer decision-making during the AT.

We propose Additive Insight (see Figure 5), a barcode-scanning app providing real-time insights into food additives. Unlike existing tools (Appendix D), it will be developed in close collaboration with regulatory bodies, health organizations, industry groups, and tech partners to ensure accurate, research-based data from sources like the FDA, EFSA, and WHO. Academic partnerships will further enhance scientific rigor. To secure funding and support, we will engage public interest groups. As Lahlou (2024) notes, these stakeholders share a commitment to consumer well-being, forming a social contract that ensures effective, sustained collaboration.

Figure 5: *Additive Insight's Prototype*



Users can personalise the app to align with their dietary needs (e.g., allergies, vegan, gluten-free) and health conditions (e.g., heart disease, diabetes). This allows personalized additive alerts based on these needs, extending beyond general warnings. Instead of simply flagging harmful additives, it will also suggest healthier alternatives, such as additive-free or organic products. By tracking user interactions and purchasing trends, the app will generate valuable data on consumer demand for additive-free options. This information could be leveraged to influence manufacturers and retailers, encouraging greater transparency and policy shifts in the food industry.

Additive Insight embodies Distributed Cognition theory, which posits that decision-making while scanning food packaging extends beyond the individual mind to include people, surroundings, and symbolic structures (Hutchins, 1995). By structuring ingredient information in a user-friendly format, our app enables cognitive offloading, allowing users to rely on technology rather than processing complex data themselves (Risko & Gilbert, 2016). While initially designed for in-store shopping, future developments may include a web plug-in for online shopping, aligning with evolving consumer habits.

For Adventurous consumers, typically younger and driven by novelty and autonomy (Bunsø et al., 2021), the app enhances decision-making with instant, personalized insights while preserving autonomy. It builds competence in identifying safer additives and incorporates social features like user discussions and expert endorsements to align novelty-seeking with food safety norms. By making additive information accessible and easy to understand, the app overcomes labeling constraints. However, Moderate consumers, who rely on store labels and trusted brands, may be less inclined to adopt it. The next section explores strategies to engage them.

2. In-Store Additive Transparency Aisle & Zones

Modern supermarkets pose challenges for consumers seeking healthy choices (Van Bussel et al., 2022). An overwhelming number of products, unclear labeling, and technical ingredient lists hinder decision-making (Piqueras-Fiszman & Spence, 2014; FDA, 2018). Additives are often listed under complex chemical names, and supermarket staff rarely provide guidance. These environmental and informational barriers particularly affect Moderate consumers, who rely on familiar products and in-store cues rather than digital tools, making it difficult to identify or avoid harmful additives (Zafar et al., 2022). While the previous section outlined interventions designed for Adventurous consumers, it remains unclear how to effectively engage Moderate and other less Adventurous segments, who may be more influenced by in-store environments and habitual choices.

To address these limitations, we propose the implementation of Additive Transparency Zones within supermarkets. These are clearly demarcated sections of the store dedicated to products free from inadequately tested or self-affirmed GRAS additives. The physical design of these zones serves as a navigational aid, drawing on the concept of affordances from Installation Theory (Lahlou, 2018), which suggests that the physical environment can guide behavior by making certain actions more visible and easier to perform. The clear spatial separation of

additive-free products offers consumers an immediate and intuitive cue to safer choices, reducing cognitive effort and information overload.

This initiative would be led by progressive supermarket chains with an existing focus on health and quality, such as Whole Foods Market in the USA. Launching the intervention in such stores can build early credibility and consumer trust, while also creating a ripple effect for broader industry adoption. These retailers would collaborate with public health agencies like Centers for Disease Control and Prevention (CDC) and consumer advocacy organizations like Center for Science in the Public Interest (CSPI) to ensure transparency, accountability, and alignment with consumer well-being.

Figure 6: *Image of Additive Transparency Isles. Edited in Figma. Originally generated using OpenAI's DALL·E via ChatGPT on March 20, 2025. Full generation details are available in Appendix E.*

Equally important is the training of staff assigned to these zones. Knowledgeable and helpful employees in retail settings have been seen to have a significant influence on consumer trust and confidence (Berry et al., 2002). Staff would be equipped not only with knowledge about food additives and relevant dietary needs (e.g., allergies, vegan, gluten-free), but also with the communication skills necessary to guide and reassure customers. To support this, technology and design firms could be engaged to develop interactive training modules and user-friendly visual systems that help both staff and shoppers navigate the space. In addition, incorporating interactive displays and sample tables can captivate Adventurous consumers by offering hands-on experiences. These interactive elements not only make product information more

accessible but also encourage exploration. This aspect of the intervention enhances what IT describes as the embodied layer – the skills and competencies required to act within a given environment (Lahlou, 2018).

People are more likely to adopt behaviors when they are visible, valued, and part of a group identity (Morley, 1982). These zones help shape social norms around additive-aware shopping. As shoppers observe others engaging with the section and see stores publicly prioritizing additive safety, a normative standard begins to form – in this case, a growing awareness around clean and informed eating. This also speaks to the social layer, in which behaviors are reinforced by cultural cues and community expectations.

By integrating additive-aware choices into the everyday supermarket experience, this intervention not only supports individual consumers but also begins to shape a broader shift in how food safety is understood and valued. As these zones become more visible and accepted, they create a strong foundation for public conversations beyond the store. The following section explores how this shift can be amplified through social media to raise awareness, build community, and support wider regulatory change.

3. #WeedOutGRAS Campaign

Growing media coverage, including from well-known channels like Fox News, has contributed to the public's rising worry about food additives. While traditional media outlets like Fox News serves as a powerful tool to raise consumer awareness, social media's decentralized, user-generated content (UGC) model has experienced exponential growth, with 76.4% of U.S. internet users aged 15+ (176.45 million individuals) engaged on social networks in 2023 (NTIA, 2024). Therefore, in the contemporary landscape of digital communication, social media stands out as a powerful mechanism for raising public awareness and catalyzing regulatory reform (Rutsaert et al., 2013).

Our solution is the digital campaign #WeedOutGRAS, which is designed to expose the failures of the FDA's approval process and spark grassroots pressure for reform as well as raising awareness for our previous interventions. Unlike current media efforts or top-down public service announcements, #WeedOutGRAS will harness user-generated content (UGC), influencer partnerships, and interactive challenges (e.g., "Additive-Free Week") to generate viral momentum and public scrutiny. Drawing from evidence that digital activism can influence regulatory practices (Rutsaert et al., 2013), the campaign will strategically target food additive controversies, transparency gaps, and scientific uncertainty to get attention and drive demand for systemic change. These strategic choices are not just about reach - they are rooted in behavioral science. By tapping into the psychology of social influence, #WeedOutGRAS uses established social norm mechanisms to shift perceptions and behavior around food additives. Social norms, as explained by Goldstein & Cialdini (2009), operate through two dimensions: descriptive norms, reflecting what is commonly done, and injunctive norms, indicating what is socially approved. The #WeedOutGRAs campaign leverages descriptive norms by framing food additive concerns as a widespread trend, featuring social media influencers and real user testimonials that spotlight the *AdditiveInsight* app (solution 1) as an essential tool for making

informed food choices. This fosters bandwagon effect, encouraging individuals to align with perceived majority behavior, a phenomenon supported by Festinger's (1954) social comparison theory. Simultaneously, injunctive norms are activated through endorsements from authoritative figures, scientists, health experts, and public advocates, framing participation as ethically commendable. Central to the campaign's success is its collaboration with influencers and bloggers, who amplify its message and act as norm entrepreneurs (Sunstein, 1996). Health and parenting influencers share relatable stories that enhance norm adherence through similarity (Goldstein et al., 2008), while bloggers add depth through expert interviews and analyses. Consistent messaging creates a unified narrative, fostering a social environment where awareness and advocacy are normalized, ultimately boosting the campaign's impact.

Figure 7: TikTok Mock-Up for the #WeedOutGRAs Campaign. Created using Figma. Includes a photograph by Chris Van Tulleken. Retrieved from https://www.express.co.uk/life-style/diets/1991506/dr-chris-van-tulleken-ultra-processed-food.

Building on IT the campaign builds on the physical layer by using social media platforms for broad outreach, delivering content from infographics to expert insights and compelling narratives that simplify complex topics, while leveraging algorithmic recommendations to enhance accessibility and influence behavior (Chen et al., 2025). Second, embodied

competences are built by educating consumers on GRAS risks and app usage, fostering informed choices, resonating with insights on norm-driven learning (Miller & Prentice, 2016). Finally, social regulations emerge through the campaign's community-building efforts, such as unifying hashtags (#WeedOutGRAs) and shared narratives that forge a collective identity, as well as previously mentioned norms. This aligns with Tajfel's (1981) social identity theory, which suggests that group affiliation strengthens norm adherence, thereby sustaining engagement and momentum.

The campaign targets Adventurous consumers and Moderate consumers, both of whom are increasingly reachable through social media's expanded user base (NTIA, 2024). For Adventurous Consumers, descriptive norms are activated via influencer partnerships and user testimonials that frame additive avoidance as a trending movement. Moderate Consumers are engaged through norms: endorsements from trusted experts (e.g., pediatricians, nutritionists) validate the campaign's credibility and frame participation as both what's commonly done and a moral duty.

Discussion and Limitations

Food additives present a complex and potentially hazardous issue for consumers. By examining this challenge through Stakeholder Analysis, a comparison to EU regulatory approaches, AT, Consumer Segmentation, and IT we identified feasible points of intervention. However, the effectiveness of these interventions is contingent on overcoming several barriers and limitations.

While the proposed interventions – Additive Insight, In-Store Additive Transparency Zones, and the #WeedOutGRAS social media campaign – offer a multifaceted approach to addressing the loopholes in food additive regulation in the U.S., several critical limitations merit discussion. A primary constraint lies in regulatory inertia and industry resistance. The GRAS framework is entrenched within a regulatory landscape that affords considerable autonomy to food manufacturers (Neltner et al., 2013). As a result, the interventions proposed, even through voluntary measures like in-store signage or QR-codes, may face opposition from industry stakeholders who benefit from the opacity of current practices.

The Additive Insight app, while addressing key cognitive burdens associated with ingredient scanning (Risko & Gilbert, 2016), presumes a level of technological access and literacy not uniformly present across demographic segments. This creates an inclusivity gap, particularly for older populations or individuals from lower socioeconomic backgrounds who may lack access to smartphones, data connectivity, or comfort navigating health tech (Smith, 2014). The feasibility of the App will be challenging due to the need for vast, up-to-date data from sources like safety studies, regulatory reports, and post-market surveillance. Integrating and maintaining this data will require partnerships with regulatory bodies and scientific experts. The app will also need sophisticated algorithms to interpret user data and provide accurate, personalized recommendations. This requires expertise in food safety, toxicology, and data science. Additionally, balancing technical accuracy with user-friendly design is key to making the app accessible and useful for consumers.

Although the in-store solutions attempt to mitigate these limitations through staff training and analog signage, their efficacy is contingent upon consistent execution, retailer cooperation, and ongoing maintenance, which may vary significantly across locations. Additionally, the #WeedOutGRAS social media campaign, though powerful in shaping norms and amplifying public discourse, is inherently limited by the ephemeral nature of digital attention and the risk of misinformation spread on unregulated platforms. The success of such campaigns is also closely tied to influencer participation and algorithmic visibility, both of which are volatile and subject to shifting online trends.

In the long term, we envision a fundamental overhaul of the FDA's regulatory framework for food additives to ensure public health and rebuild consumer trust. We advocate for an elimination of the GRAs pathway, coupled with a return to more stringent enforcement of the original regulatory framework for food additives, which ensures that all food additives undergo rigorous, independent safety evaluations before being approved for use. A useful point of reference for this shift is the European Union, which already operates under a significantly more precautionary model.

The European Union employs a stricter, more precautionary approach to food regulation (Pettoello-Mantovani & Olivieri, 2022; Tulleken, 2023). In the EU, all food additives must be authorized and listed on a "positive" list under Regulation (EC) No 1333/2008. To be added to this list, each additive must undergo a comprehensive safety assessment, demonstrate a clear technological need, and be used in a manner that does not mislead consumers (European Union, n.d.). The European Food Safety Authority (EFSA) leads these evaluations, mandating independent reviews of all new additives without any self-certification (see Appendix A). Moreover, EFSA periodically reevaluates approved additives, adjusting regulations or banning substances as new scientific evidence emerges (Cheeseman, 2014). While the EU model still has its flaws, it offers a more robust, precautionary regulatory framework for ensuring food safety through independent evaluations and regular reviewals, from which the U.S. could benefit by adopting certain elements. Furthermore, emerging blockchain and AI technologies present an opportunity to streamline the additive review process, making it less time-consuming and more transparent. A centralized, publicly accessible database could be established, potentially utilizing blockchain to track approvals, safety data, and post-market surveillance reports (Haleem et al., 2021). Nevertheless, such reforms face significant resistance, as discussed in the stakeholder analysis.

While the proposed interventions offer a multi-pronged and thoughtful approach to addressing the issue of food additive transparency, it is important to acknowledge the limitations of this paper. Firstly our interventions focus only on the Adventurous and Moderate consumer segments. Future research should therefore analyze and tailor interventions based on the remaining segment. Furthermore, a conceptual and academic exercise, the scope of this work is largely theoretical. We rely on behavioural science frameworks, stakeholder analysis, and secondary literature to design our interventions – but we do not test these solutions on the ground. As a result, we cannot fully account for the real-world challenges of implementation, such as logistical barriers in retail environments, regulatory pushback, or the variability in consumer engagement across different demographic groups. We also recognise that

interventions like in-store labelling or mobile apps require continued upkeep, funding, and coordination across multiple actors. Therefore, future work must include piloting, evaluation, and stakeholder co-design to understand their practical effectiveness and long-term impact.

That said, to truly address the lack of transparency in the regulatory system and empower consumers to make informed food choices, these ideas need to move beyond theory and be tested where they matter most: in stores, on shelves, and directly in consumers' hands.

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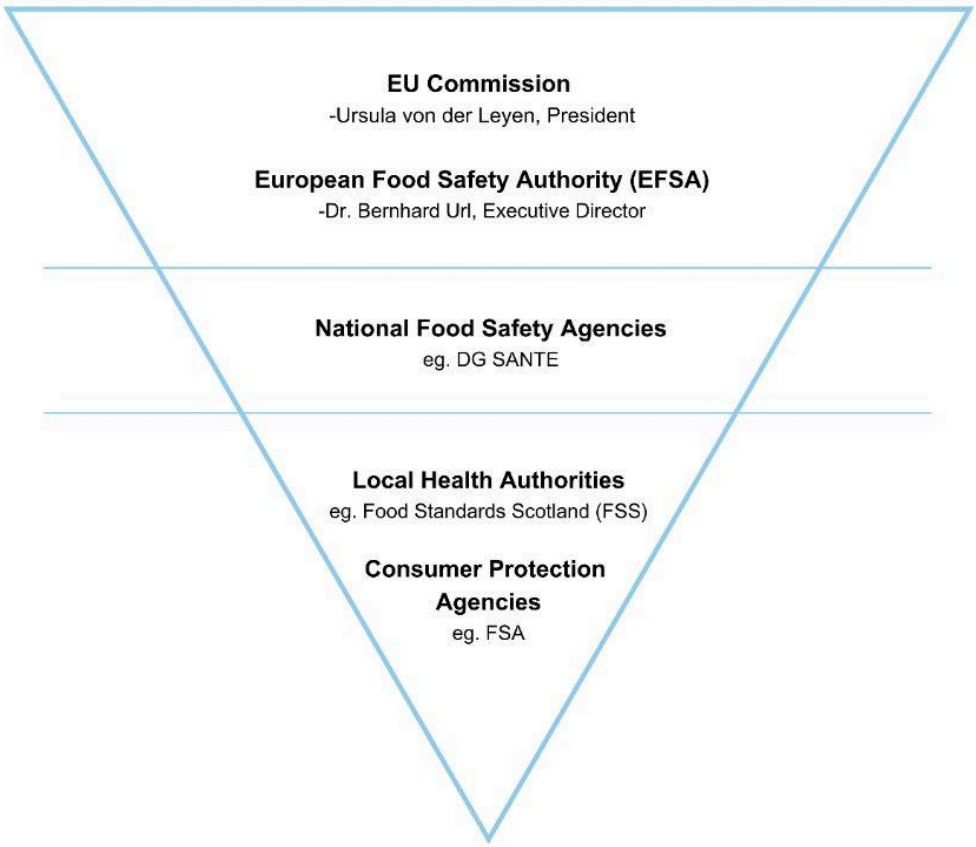
Appendices

Appendix A: EU Governance Structure



Appendix B: Consumer Segments Research Findings

Table B1: *Modular Food-related Lifestyle Model (MFRL)*

	Moderate	Adventurous
Involvement	4,43	5,79
Innovation	4,15	5,45
Responsibility	4,02	4,90

Likert Scale: Range 1–7, higher values indicate more involvement, more innovativeness, more responsibility. Data adapted from Brunsø, K., Birch, D., Memery, J., Temesi, Á., Lakner, Z., Lang, M., Dean, D., & Grunert, K. G. (2021). Core dimensions of food-related lifestyle: A new

instrument for measuring food involvement, innovativeness and responsibility. *Food Quality and Preference*, *91*, 104192. https://doi.org/10.1016/j.foodqual.2021.104192

Table B2: *Schwartz's Basic Values for Moderate & Adventurous Consumers*

Value Type/ Consumer Segment	Moderate	Adventurous
Benevolence	0.63	0.63
Universalism	0.43	0.49
Self-direction	0.29	0.41
Stimulation	-0.28	-0.13
Hedonism	-0.03	-0.08
Achievement	-0.48	-0.40
Power	-0.75	-0.82
Security	0.42	0.33
Conformity	0.04	-0.15
Tradition	-0.26	-0.43

Value scores have been standardized for mean 0 and SD 1 across scores for each respondent. Different superscripts indicate statistically significant differences between cluster means for the domain, $p < .05$, Scheffé test. Data adapted from Brunsø, K., Birch, D., Memery, J., Temesi, Á., Lakner, Z., Lang, M., Dean, D., & Grunert, K. G. (2021). Core dimensions of food-related lifestyle: A new instrument for measuring food involvement, innovativeness and responsibility. *Food Quality and Preference*, *91*, 104192. https://doi.org/10.1016/j.foodqual.2021.104192

Appendix C: Installation Theory Diagrams

Table C1: *Installation Theory Analysis for Moderate Consumers in Supermarket*

Stage	Physical Environment	Embodied Competence	Social Regulation
Motive	Desire for balance between convenience, affordability, and responsible consumption.	Moderate interest in food trends, prioritization of practicality and trusted sources over novelty.	Influenced by mainstream health messaging, affordability concerns, and general responsible consumption norms.
Initial State	Physical presence in a supermarket, typically visiting standard grocery sections with occasional interest in organic or health-focused areas.	Ability to navigate supermarkets efficiently, relying on familiar brands while occasionally exploring healthier alternatives.	Family and social circles encourage purchasing from familiar, trusted brands with moderate interest in ethical consumption.
Pre-Shopping Preparation	Availability of store promotions, loyalty programs, familiar brand offerings, and easy access to price comparisons.	Skills in comparing product prices, reading labels for basic certifications, and recognizing marketing claims.	Influence of mainstream advertisements, loyalty programs, and retailer-driven promotions.
In-Store Exploration	Standardized store layout, clearly labeled product categories, recognizable brands, and moderate engagement with specialty sections.	Preference for clear, recognizable health and safety indicators rather than deep research into niche certifications.	Social norms around making practical, informed choices without being overly experimental.
Product	Product labels with clear certifications (FDA, USDA Organic), pricing details, and	Decision-making is influenced by price, perceived quality, and	Tendency to follow broader market trends rather than niche or alternative product movements.

Evaluation	front-of-pack health indicators.	familiarity, with openness to responsible choices when easily accessible.	
Purchase Decision	Checkout counters, digital payment integration, availability of discounts or promotions.	Comfort with traditional checkout systems, occasional use of self-checkout, and preference for simple payment processes.	Expectations of convenience, efficiency, and cost-effectiveness in purchasing habits.
Post-Purchase Engagement	Product reviews, word-of-mouth recommendations from family and friends.	Occasional discussion about purchases, primarily influenced by household preferences and peer recommendations.	Discussions around food choices are typically limited to practical considerations like affordability, taste, and health benefits.

Table C2: *Installation Theory Analysis for Adventurous Consumers in Supermarket*

Stage	Physical Environment	Embodied Competence	Social Regulation
Motive	Desire for novelty and ethical consumption, influenced by exposure to unique food trends.	High knowledge of food trends, ethical considerations, and desire for personal discovery.	Influenced by emerging food trends, social norms around responsible consumption, and desire for social validation.
Initial State	Physical presence in a supermarket with specialty sections (organic, local, global foods).	Ability to navigate specialty sections, familiarity with niche product indicators.	Expectations from social circles to explore unique and ethical products.

Pre-Shopping Preparation	Availability of product catalogs, social media food trends, in-store promotions.	Skills in seeking novel food information, recognizing ethical product claims, digital literacy for online research.	Influence of food influencers, peer recommendations, trending hashtags related to ethical consumption.
In-Store Exploration	Store layout, unique product placements, eye-catching packaging, specialty signage.	Critical analysis of product narratives, interpreting non-mainstream certifications, understanding sustainability labels.	Social pressure to avoid mainstream options, desire to discover lesser-known brands that signal authenticity.
Product Evaluation	Product labels, ingredient lists, alternative certifications, interactive product kiosks.	Decision-making based on multi-layered value assessments—novelty, ethics, and product uniqueness.	Norms around responsible purchasing, social encouragement for ethical consumption choices.
Purchase Decision	Self-checkout stations, payment interfaces, product sampling stations.	Competence in using self-checkout systems, handling digital payment methods.	Perception of responsible consumer behavior, cultural acceptance of self-service technologies.
Post-Purchase Engagement	Social media platforms, product review spaces, community groups for sharing experiences.	Skills in articulating and sharing unique experiences, creating engaging content, connecting with peer networks.	Desire for social engagement, validation through sharing unique finds, influenced by online food communities.

Appendix D: Interview

Table D1: *Thematic Analysis Codebook*

Theme	Code	Description	Example
Inadequacy of Current U.S. Food Additive Regulations and the Need for Reform	Outdated Scientific Methods	Maricel criticizes the FDA's reliance on old science that doesn't reflect modern risks.	"If that doesn't happen, there are few things that FDA could do. First of all, improve the science they use. The science is just so old. They're working on principles from the fifties." (20:37 Maricel)
	Failure to Assess Cumulative Effects	She stresses that the FDA hasn't implemented required assessments of additive combinations.	"So they don't look alike, but they all affect the thyroid or the liver or the kidney. And that provision the assessment, safety assessment considering the cumulative effect of substances was never implemented. Nobody has ever done anything like that. FDA has never asked companies when they send them their safety assessments to comply with the law." (22:03 Maricel)
	Learning from EU Models	She talked about the EU's transparent, science-driven system with ongoing reviews.	"I wish we would have the system closer to them. I'm going to just talk about EFSA. What I like about it is that there is a constant look back based on scientific knowledge." (28:56 Maricel)

Consumer Awareness and Education	Difficulty in Assessing Risk	She observes that consumers often trust companies over government oversight, unaware of potential dangers.	"Yeah. When, when I started working on this project, we had a couple of years into it, that was in 2010, we had some focus groups and a lot of people you are from here, you are from Texas in particular, people were very comfortable that the companies are deciding and the government has no business in it." (18:48 Maricel)
	Need for Better Tools	She suggests tools like apps could empower consumers with accessible information.	"There is a group here called Food Fight USA. They are mostly focused on ultra processed foods and things like that. And they've been trying to popularize this European app called Yucca." (39:15 Maricel)
	Consumer Perceptions	She points to surveys showing chemicals in food as a top consumer worry, signaling rising awareness.	"No, we actually use it to show that chemicals are always on the top of, of mind for consumers. Yeah. They were some, some surveys, the earlier ones where they actually asked for a specific opinions on a specific chemicals <affirmative>. They had BPA in one of the surveys." (08:53 Maricel)

Political and Social Dynamics Influencing Reform	Bipartisan Support	She notes rare political unity as a driver for reform.	"There is a lot of energy. Yeah. And in many cases it's bipartisan, which is unheard of." (10:12 Maricel)
	Media Influence	She credits conservative media, like Fox News, for amplifying food safety concerns.	"Fox News, that is the main source of information for most of conservative Americans have been talking about this consistently. So there are people now regular folks in red states that are asking, why do we have carcinogens in our coffee?" (11:16 Maricel)
	Public Perception Shift	She observes a major change in how people view food safety and the FDA, even if trust in the agency remains shaky.	"We see this complete 180. I don't know if people are actually convinced that FDA has a role in it. But they know that what is happening is wrong." (19:18 Maricel)

D2: Interview Cover Sheet

Interviewee: Dr. Maricel V. Maffini

Date and time: March 19, 2025

Duration: 49.32 mins

Place: Online (Zoom)

Education / employment status: Independent Consultant/Research in DC Area

Relation to the topic: Dr. Maffini co-authored Chapter 10, Defining Food Additives: Origins and Shortfalls of the US Regulatory Framework, in the comprehensive volume Risk on the Table, which played a significant role in our research. Her broader work centers on human and environmental health, chemical safety, and related regulatory and policy issues. Prior to her consulting career, Dr. Maffini served as a senior scientist at the Natural Resources Defense Council and The Pew Charitable Trusts, and as a Research Assistant Professor at Tufts University School of Medicine.

D3: Interview Transcript (5 page excerpt)

Legend:

- (?) / (!) / (,) for natural speech punctuation
- (.) = Short pause (primary for readability)
- Brands, and media names are in italic (i.e. , *FDA*, *Fox News*, *Environmental Health News*)
- orthographic – only verbal utterances, minimal cleanup for readability

[…]

R: Risk is so complex (.) you have to balance pleasure and all the other aspects you might get from a food that's (,) quote-unquote (,) more unhealthy (.) But I think that *GRAS* (,) focusing on the *GRAS* loophole (,) basically makes any assessment of risk impossible because because there are no studies done on these additives (.) Whereas if these additives went through a more extensive review process (,) there'd be more information for consumers and other stakeholders to say (,) This is somewhat bad (,) this is good

Dr. MM: Exactly (.) One last question for you before you start asking me questions (.) Are you familiar with the surveys by the *IFIC* group (?) *International Food Institute (?) International Food Council Institute (?) I-F-I-C*

R: *IFIC* (?)

Dr. MM: They have been running these health and wellness surveys for probably close to 20 years now (.) So (,) they usually ask a minimum of a thousand people (.) In the last two years (,) they increased it to 3000 people and they asked them all kinds of things related to food (,) food purchases (,) what their concerns are about food safety (,) whether they are taking sweeteners (,) and what they think about sugar (,) etcetera (.) Yeah (.) You know (,) all those sorts of things (.) So (,) it may give you an idea also of what some in the food industry are doing there

R: Great (.) That's really helpful (.) Do you have any concerns about the surveys or critiques of them (?)

Dr. MM: No (,) we actually use it to show that chemicals are always on the top of mind for consumers (.) Yeah (.) There were some surveys (,) the earlier ones (,) where they actually asked for specific opinions on specific chemicals (.) They had *BPA* in one of the surveys (,) carcinogens (,) pesticides (,) *GMOs* (,) and all sorts of things

R: Yeah.

Dr. MM: And of course (,) pathogens (.) But when you look at all the breakdown and all the different chemicals (,) the chemicals are always the first concern

R: Interesting (.) That's really good to know (.) I guess kind of getting back to what we were talking about earlier (,) what is the state of things since (,) you know (,) the administration change (,) and what do you see as happening in terms of regulatory reform (?) Do you think that this call to revoke the *GRAS* loophole is going to lead to any substantial action (?)

Dr. MM: There is a lot of energy (.) Yeah (.) And in many cases (,) it's bipartisan (,) which is unheard of

R: Yeah

Dr. MM: A lot is going on at the state level (.) There are red states that have seen regulations of chemicals (.) West Virginia (,) I think it took both votes were either unanimous for both parties (,) or in one case (,) I think one senator voted yes (,) and one senator voted no (.) But everything is passing at incredible speed

R: Yeah

Dr. MM: Some of the legislators are actually fighting each other to see who's gonna put their name on the bill (.) So I don't think they fully understand what they're doing

R: Yeah

Dr. MM: But there is also part of it (,) and this is mostly my approach to understanding why it's happening (.) *Fox News*(,) which is the main source of information for most of conservative Americans (,) has been talking about this consistently (.) So there are people now (,) regular folks in red states (,) that are asking (,) why do we have carcinogens in our coffee (?) What is this methylene chloride thing (?)

R: Mhm

Dr. MM: We are telling pregnant women to drink decaf coffee (,) but now we have there is a carcinogen there (,) what is happening (?) So I think part of the information bubble broke (,) I guess (.) Yeah (.) And a lot more people are getting to understand (,) or at least to learn about the problems with the *FDA*

R: What do you think besides *RFK Junior*'s push through this (?) Like (,) why do you think the bubble has broken (?) I guess my hypothesis would be that health is a primary concern for everyone regardless of party lines (.) But what do you think is driving this conservative interest (?)

Dr. MM: I think it's because it's coming from a Republican administration.

R: Yeah

Dr. MM: And the main arm of the propaganda (,) because I cannot think of *Fox News* any other way (.) It is informing everybody now (.) Yeah (,) everybody's getting that information (.) Before it was always (,) you know (,) the progressives (.) Oh (,) they are the nanny states (,) you know (,) the food police (,) all those types of things (,) that is gone (.) So that is my very narrow assessment of why things are happening.

R: Yeah

Dr. MM: And some people started to speak up (.) Before it was (.) you didn't want to perhaps lean on the progressive side (.) For whatever reason (.) Now (,) you see an opening (.) And the gates are just flooding

R: Well (,) exciting in one way (,) even though it's coming kind of chaotically

Dr. MM: Yes (.) The issue of *GRAS* (.) I don't know where it could go (,) but I was at a meeting this week no (,) was it last week (?) the *Consumers Federation of America* had the annual food policy meeting (,) and it was the day after *RFK* announced the potential opening of the *GRAS* rule (.) So it was all about that (.) And we heard from people in the industry that the industry is freaking out (.) They are very close to essentially agreeing to sit at the table

R: Wow (.) Wow

Dr. MM: Yeah (.) They continue to say that (,) oh (,) we do everything by the book (.) We tell *FDA* (,) all the responsible companies do that (.) We don't do anything until we get a *No Question Letter* from *FDA* (,) which is (,) you know (,) not true (.) And they don't know how to deal with all the *GRAS* determinations that are announced in press releases and magazine articles where they said (.) Oh (,) we earned the *GRAS* certification (.) Oh (,) a panel of experts told us that (.) Yeah (.) So (,) I think they're going to (,)I heard from somebody else yesterday that somebody in industry said (,) we support closing (,) we support mandatory notification to *FDA* (.) But that doesn't mean that they would allow the *FDA* to do more than just collecting the information

R: Yeah (.) Because that's the secondary pathway versus the full review (.) If they would allow *FDA* to review everything that goes through the agency

Dr. MM: Probably not (.) But that (,) that is the absolute bare minimum

R: Yeah

Dr. MM: Providing information to the agency is crucial so it can make informed decisions when issues arise (,) like the health concerns linked to *Tarah* flour and the mushroom extract that was intoxicating people (.) These incidents sent individuals to the hospital (,) and (,) tragically (,) a few people died (.) The mushroom extract in question was classified as self-*GRAS* and therefore did not go through *FDA* review (.) This highlights a significant issue (.) In just four years (,) we've seen two striking cases (,) the *Tarah* flour and this mushroom extract (,) where serious health risks emerged (.) Before these incidents (,) the main concerns were local cases

involving alcohol and caffeine (,) which also led to illnesses and fatalities (.) In between (,) the only major regulatory action was the *FDA*'s finalization of the trans fat regulation

R: Yeah

Dr. MM: Basically (,) after twenty-something years (,) they finally concluded that there was no general recognition anymore (.) There were so many questions that they removed that part of the trans fats (.) But everybody I talk to (,) first of all (,) they don't believe it (.) What do you mean the *FDA* doesn't know (?) They're shocked that someone is making decisions about what we eat (,) and nobody knows anything about it (.) And the second reaction is (,) well (,) how many of those secret things are out there (?) I don't know (,) you tell me

R: Yeah (,) I know (.) I first came across it in *Ultra-Processed People* when it was first released (.) When I read it (,) I thought (,) oh wow (,) no one knows about this (.) You just assume the *FDA* is regulating these things (.) It's insane

Dr. MM: Yeah (.) When I started working on this project a couple of years in (,) around 2010 (,) we held some focus groups (.) Back then (,) especially in *Texas* (,) people were very comfortable with the idea that companies should make these decisions and that the government had no business interfering (.) But now (,) we're seeing a complete 180

R: Yeah

Dr. MM: I don't know if people are actually convinced that the FDA has a role in it (.) But they know that what is happening is wrong

R: Mhm

Dr. MM: And they see people sick all around us (.) It has to come from somewhere (.) And now they found a potential answer is diet

R: Yeah (.) So (,) obviously (,) if *GRAS* status was revoked (,) there's still the barrier that a notification doesn't necessarily mean these additives are being thoroughly reviewed (.) What other barriers do you see to improving the regulatory process (?) One that stands out to me is the sheer administrative burden (.) Reviewing all these additives would be incredibly difficult if we shifted to a more extensive review process

Dr. MM: Yeah (,) I think a permanent fix would require legislation (.) As long as that provision remains in the law (,) people will continue to find ways to work around it (.) If that doesn't happen (,) there are a few things the *FDA* could do (.) First (,) they could improve the science they use (.) The current science is just so outdated (;) they're still relying on principles from the 1950s

R: Okay

Dr. MM: They assume that a little bit of everything is fine (,) that there's no problem with small amounts of carcinogens (,) endocrine disruptors (,) or other harmful substances (.) They consider those levels insignificant (.) I don't know how familiar you are with the law (,) but there's

one key point *Congress* added (:) when anyone conducts a safety assessment (,) they must consider three factors (.) First (,) potential exposure (.) Second (,) safety factors (,) because the data is never perfect and usually comes from animal studies (.) And third (,) they must account for the cumulative effect of chemicals already present in the diet that are chemically similar (.) If these chemicals share a similar structure (,) their toxicity and hazards may also be similar (.) But you should also consider those that have similar biological effects

R: Yeah

Dr. MM: So (,) while these substances may not look alike (,) they all affect organs like the thyroid (,) liver (,) or kidneys (.) The provision requiring safety assessments to consider the cumulative effect of substances was never implemented (.) No one has ever done anything like that (.) The *FDA* has never asked companies to comply with this aspect of the law when submitting their safety assessments (.) In my view (,) this is the key provision that could protect us all from chronic diseases (.) If you have fifteen things that are all hitting the same organ (,) that organ is gonna break (.) Sooner rather than later

R: Yeah (,) because you don't know how much you're adding to it

Dr. MM: The *FDA* wrote an entire regulation on how to do this (.) They essentially stated that if chemicals have similar biological effects (,) they must be considered as a class (.) Then (,) you identify the safe amount for the entire class and determine which one is the worst offender (.) After that (,) you ask yourself (,) do we really need this stuff in our products (?)

R: Yeah

Dr. MM: You can remove it (,) or not add it in the first place (,) if that's the case (.) So (,) that's one of the major issues (.) They never implemented a measure that was specifically designed to protect us over time and help prevent chronic diseases

R: Wow (.) I had no idea about that (.) Thank you so much

Dr. MM: My colleague Tom Nellner and I reviewed almost 900 *GRAS* notifications and found only one instance where there was an attempt to do this (.) However (,) it was done incorrectly (.) They merely listed all the similar artificial sweeteners with comparable effects (,) but they did not conduct a comprehensive assessment of the class or determine a safe consumption level for the group

R: Wow (!)

Dr. MM: We published that in *Environmental Health News* some time ago (.) I can send you that information

R: Yeah (,) I appreciate that […]

Appendix E: Generative AI and Image Editing Log

Step 1: AI-Generated Image
Tool Used: OpenAI ChatGPT (DALL·E)
Date of Generation: March 20, 2025
Chat History: https://chatgpt.com/share/67dece54-c7d4-8008-814a-9b470fc979d8 (the exact text entry was accidentally deleted but it was the same prompts as inputted and then edited via Figma)

Step 2: Image Editing
Software Used: Figma
Modifications Made: Adjustments to composition and texts on the image.