

Evolution of eating behavior and its relationship with mental health in young people and adults in Santa Marta, Colombia (2020–2025): a longitudinal study.

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Abstract: *This longitudinal study examines the evolution of eating behavior and its relationship with mental health in young and adult residents of Santa Marta, Colombia, during 2020, 2021, and 2025. Using a non-experimental, quantitative design, the Overeating Questionnaire (OQ) was administered at three key points, capturing the onset, peak, and post-pandemic phases. Repeated measures ANOVA revealed statistically significant differences in nine out of eleven dimensions. Variables such as overeating, rationalization, social isolation, and affective disturbance peaked in 2021 and, in some cases, remained elevated in 2025. Conversely, dimensions like anticipation and correction showed temporal stability. These findings are interpreted through theoretical lenses including the Health Belief Model, Theory of Planned Behavior, and Coping Theory, offering insights into how the pandemic differentially shaped emotional and behavioral patterns. The study concludes that public health interventions must address both structural and individual factors to be effective, particularly in socioeconomically vulnerable settings. This research provides critical empirical evidence to inform the design of sustainable nutrition and mental health policies.*

Keywords: *eating behavior; mental health; COVID-19; longitudinal study.*

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I. INTRODUCTION

The COVID-19 pandemic caused significant changes in global and regional dietary consumption patterns. International studies indicate that in Latin America, the consumption of unhealthy foods (sugar-sweetened beverages, snacks, fast food) increased during lockdowns, while the intake of fruits and vegetables decreased. Food and Agriculture Organization of the United Nations (2017) reported increases in the consumption of sugary drinks, snacks, and processed foods, alongside a reduction in fruit and vegetable intake among young people during the health crisis (Giordani et al., 2023). Due to this preventive isolation and the prevailing sense of uncertainty, individuals' well-being and mental health were negatively affected. Studies by Rajkumar (2020), Lozano-Vargas (2020), and Ramírez-Ortiz et al. (2020) evidenced how a problem that had always been latent became more visible, highlighting the growing importance of mental health.

Similarly, Pérez-Rodrigo et al. (2020) pointed out that during the pandemic, there was a significant increase in the consumption of healthy or less processed foods such as vegetables, fruits, fish, legumes, and yogurt in Spain. In contrast, in Latin America—particularly in Argentina, Uruguay, and Ecuador—research by Sudriá et al. (2020), Piquinela-Averbug & Boragnio (2023), and Diaz-Sozoranga et al. (2020) concluded that there was an increase in the consumption of unhealthy foods, including ultra-processed and carbohydrate-rich products.

In Colombia, there was a sustained increase in the consumption of ultra-processed edible products, particularly during unstructured eating moments such as snacks and in-between meals. According to Madrid &

Cediel (2023), in regions such as Antioquia, sweet and salty snacks, sugary drinks, and ready-to-eat foods represented up to 20.4% of daily caloric intake in Medellín, while in other subregions, 17% of consumed calories came from these products, with a marked prevalence between main meals. In parallel, Dueñas Quintero et al. (2024) emphasize that social isolation, along with emotional and economic factors, exacerbated dysfunctional eating patterns among young Colombian adults, reflected in increased consumption of high-calorie, sugar-rich, and saturated fat foods.

In response, the approval of Ley 2120 de 2021, which established measures such as front-of-package warning labeling on ultra-processed products, seeks to counteract these trends by promoting healthy food environments and strengthening nutrition education in Colombia (García & Contreras, 2022). However, as both studies warn, these regulatory efforts need to be accompanied by comprehensive interventions that consider structural inequality, the social determinants of health, and the post-pandemic emotional environment in order to effectively modify risky eating behaviors.

In Santa Marta (Magdalena), a coastal city on Colombia's Caribbean coast, the social and economic impact of the pandemic has been particularly severe. The tourism sector, central to the local economy, faced prolonged shutdowns, increasing informal employment and socioeconomic vulnerability (Rodríguez-Fernández & Nuñez-Castillo, 2023). Similarly, Orozco-Morales et al. (2023) revealed that approximately 35% of children under five years old present some type of nutritional alteration, including risk of malnutrition, established malnutrition, overweight, and obesity. This figure reflects a concerning scenario, considering that early childhood is a critical stage for physical and cognitive development. The study also highlighted that most of the children evaluated lived in socially vulnerable conditions, were affiliated with the subsidized health system, lived in basic housing, and belonged to socioeconomic groups A and B of Sisbén. This situation suggests that structural inequalities continue to affect the nutritional well-being of children in Santa Marta—and, by extension, their families.

From a theoretical perspective, psychological models have provided key tools to understand the adoption of eating behaviors, especially in crisis situations such as the COVID-19 pandemic. The Health Belief Model proposes that health-related decisions, including those related to diet, depend on individuals' perceptions of their susceptibility to risk, the severity of the problem, the perceived benefits of preventive action, and the perceived barriers to adopting it (Rosenstock, 1974, cited in Limbu et al., 2022). This model has been used to explain why, during the pandemic, many people modified their eating habits based on their perceptions of the risks associated with overweight or obesity and the severity of COVID-19.

In turn, the Theory of Planned Behavior (Ajzen, 1991, cited in Nickell & Hinsz, 2023) argues that behavioral intentions are influenced by personal attitudes, perceived social norms, and perceived behavioral control. In contexts such as social isolation—where environmental influences are limited—perceived individual control becomes especially relevant in determining whether individuals manage to maintain healthy eating habits.

Likewise, the Lazarus and Folkman's Coping Theory (1984, cited in Li et al., 2024) is particularly useful for understanding the emotional strategies that emerge during prolonged stress. This theory distinguishes between emotion-focused and problem-focused coping strategies. During lockdown, various studies documented an increase in emotional eating as a coping mechanism for anxiety, loneliness, and loss of control, particularly among young women (Hernandez-Florez et al., 2023). In contrast, individuals who adopted more active coping strategies, such as maintaining structured routines or engaging in regular physical activity, were more likely to sustain a balanced diet.

In this context, the present study evaluates the eating behavior of young adults aged 18 to 40 in Santa Marta across three phases: the first in March 2020 (early pandemic), the second in March 2021 (during the pandemic), and the third in March 2025 (four years after the previous phase, representing a post-pandemic context). It is important to note that the same subjects participated in all three phases. Over the course of five years, their eating behaviors may have been influenced not only by the pandemic but also by multiple other factors. Therefore, the central research question is: How have eating habits and their relationship with mental health evolved among young adults (18–40 years old) in Santa Marta between 2020 and 2025, considering the socioeconomic context and the public health interventions implemented?

II. MATERIALS AND METHODS

A non-experimental descriptive study with a quantitative approach was conducted under the empirical-analytical paradigm. A longitudinal cohort design was used to assess the evolution of the same population at three different points in time as previously described (Phase 1: 2020; Phase 2: 2021; Phase 3: 2025).

Population and Sample

A non-probabilistic sampling criterion was applied, selecting participants who voluntarily agreed to participate and met the following inclusion criteria:

1. Current age between 18 and 40 years.
2. Continuous residence in the city of Santa Marta throughout the three study phases.

The exclusion criteria were as follows:

1. Having experienced one or more physiological illnesses that could alter eating behavior.
2. Following a specific dietary regimen prior to participation in the study.

Procedure

Following biosecurity and distancing protocols during Phase 1, a voluntary participation call was made through digital platforms such as WhatsApp, Instagram, Twitter, and other online contacts. Participants meeting the inclusion criteria completed a virtual version of the questionnaire. The research team digitized the original paper instrument and adapted it to an online format. All participants provided informed consent electronically.

At the beginning of Phases 2 and 3, each participant was contacted virtually and invited to continue their participation. All 179 subjects from Phase 1 took part again, achieving full test-retest consistency.

Instrument

The instrument used was the Overeating Questionnaire (OQ), a self-report questionnaire composed of 80 items divided into 11 dimensions (see Table 1). Responses are rated on a Likert scale ranging from 0 ("Not at all") to 4 ("Very much"). The estimated completion time is 15–20 minutes.

Table 1. OQ Questionnaire Subscales

Defensiveness (DEF)	Consists of 7 items that reflect idealized self-affirmations, such as "I am always in a good mood."
Overeating (SOB)	Refers to the tendency to continue eating even after feeling full.
Food Cravings (ANT)	Food cravings are a recurrent experience for individuals who are trying to lose weight.
Eating-Related Expectations (EXP)	Relates to the positive outcomes that individuals expect as a result of eating.
Rationalizations (RAC)	Aims to reflect the tendency to rationalize in order to avoid taking responsibility for maintaining a healthy body weight.
Motivation to Lose Weight (MOT)	Indicates the degree to which an individual is willing to make efforts to lose weight and maintain a healthy body weight.
Health Habits (SAL)	In this subscale, a high score represents strengths, while a low score reflects weaknesses in health-related habits.
Body Image (COR)	The items in this subscale point to a positive body image. Individuals with low scores often link their personal appearance to their sense of personal identity excessively.
Social Isolation (AIS)	This subscale aims to indicate a relative lack of social resources.
Affective Disturbance (AFE)	Reflects the presence of stress, depression, or anxiety that may undermine efforts to maintain a healthy weight.

Likewise, the internal consistency alpha estimates ranged between .79 and .88, with a median value of .82. The median item–total correlations ranged from .46 to .72 (median = .55). Regarding test–retest reliability, a subgroup of 24 individuals aged between 27 and 64 years completed the OQ on two occasions, with a one-week interval between administrations. The test–retest correlations for this group ranged from .64 to .94 (median = .88).

III. RESULTS

To analyze the evolution of eleven psychological dimensions over time (2020, 2021, and 2025), a Repeated Measures ANOVA was conducted using the statsmodels statistical package in Python (v0.14). This technique was chosen because the study employed a longitudinal design in which the same participants (N = 180) were evaluated at three different time points, meaning the data were paired or related within each individual.

For context, repeated measures ANOVA is the appropriate statistical procedure when comparing the means of a single dependent variable across three or more conditions or time points, provided that these measurements come from the same participants (Yu et al., 2022). Unlike the traditional one-way ANOVA, which is used with independent groups, this approach controls for within-subject variability, increasing statistical power and reducing error.

This analysis was conducted for each of the following variables: Overeating (SOB), Defensiveness (DEF), Underestimation (SUB), Anticipation (ANT), Expectation (EXP), Rationalization (RAC), Motivation (MOT), Health (SAL), Body Image (COR), Social Isolation (AIS), and Affective Disturbance (AFE). Each variable was structured in long format to meet the input requirements of the AnovaRM function from the statsmodels.stats.anova module, with “Subject ID” defined as the between-subjects factor, “Time” (2020, 2021, 2025) as the within-subject factor, and the evaluated variable as the dependent variable. This allowed us to determine whether there were significant time effects on each psychological dimension, which was the central objective of the analysis.

The results of the repeated measures ANOVA applied to each of the eleven variables are presented in Table 2. The F values, degrees of freedom (df) for both between conditions (df num) and within subjects (df den), and significance levels (p) are reported. The analysis allowed us to identify whether there were statistically significant differences in the means of each variable across the three time points evaluated: 2020, 2021, and 2025.

Table 2. Repeated Measures ANOVA

Variable	F(2, 358)	p-value
SOB	F(2, 358) = 97.51	< .001
DEF	F(2, 358) = 23.24	< .001
SUB	F(2, 358) = 42.03	< .001
ANT	F(2, 358) = 2.10	.1245
EXP	F(2, 358) = 22.91	< .001
RAC	F(2, 358) = 203.93	< .001
MOT	F(2, 358) = 38.51	< .001
SAL	F(2, 358) = 77.51	< .001
COR	F(2, 358) = 2.45	.0873
AIS	F(2, 358) = 191.68	< .001
AFE	F(2, 358) = 58.55	< .001

Note. The F value represents the main effect of time on each variable. A significance level of $\alpha = .05$ was used as the criterion.

The results obtained indicate that, for most of the dimensions analyzed, there were significant changes over time. Specifically, statistical differences were identified in nine of the eleven variables assessed between at least two of the three years of the study (2020, 2021, and 2025). These dimensions include Overeating, Defensiveness, Underestimation, Expectation, Rationalization, Motivation, Health, Social Isolation, and Affective Disturbance. This finding indicates that the participants’ eating and emotional behaviors were significantly influenced by the contextual changes experienced during this period.

Among these, some variables stand out due to the magnitude of their variations—particularly Rationalization, Social Isolation, and Overeating—which showed notably high values in the statistical analyses. This suggests that these areas were especially sensitive to the effects of time and, likely, to the conditions imposed by the pandemic and its aftermath. In contrast, the Anticipation and Body Image dimensions did not show significant differences across the three time points, suggesting greater stability in these variables. Despite the social and emotional changes experienced, these dimensions appear to have maintained a more consistent trajectory.

Finally, these results reinforce the idea that the year 2021 represented a turning point in the habits and emotional states evaluated. It was in this year, coinciding with the most acute stage of the pandemic, that the

most pronounced alterations were observed. What happened during this period left measurable—and, in many cases, lasting—marks on the participants' eating and emotional behavior.

The results of the post hoc comparisons revealed that the impact of time on the different variables was not uniform but instead followed diverse trajectories throughout the 2020–2025 period (Figure 1). In some dimensions, such as Overeating (SOB), a transient change was observed: levels increased significantly during 2021, coinciding with the most critical phase of the pandemic, but later decreased, reaching values in 2025 similar to those observed before the event. This pattern of alteration followed by full recovery suggests a high adaptive capacity to stressful conditions in this specific dimension.

In contrast, other variables such as Defensiveness (DEF) and Underestimation (SUB) showed a different dynamic. Although they also presented significant increases in 2021 compared to 2020, these changes remained stable in 2025, with no evidence of reversal. This behavior indicates that some psychological responses or coping styles may have become more enduring, extending beyond the immediate context.

A third trajectory was observed in variables such as Expectation (EXP), Rationalization (RAC), Motivation (MOT), Health (SAL), Social Isolation (AIS), and Affective Disturbance (AFE). These dimensions reflected a significant impact in 2021, followed by a partial recovery in 2025. Although the 2025 levels were lower than those in 2021, they did not fully return to the baseline values of 2020, suggesting a more prolonged but not irreversible effect.

On the other hand, some dimensions remained stable. Anticipation (ANT) did not show significant differences across the three years, suggesting resistance to change in this cognitive capacity or disposition. Similarly, Body Image (COR) did not show statistically significant variations after Bonferroni correction, although its change pattern was less clear than that of ANT.

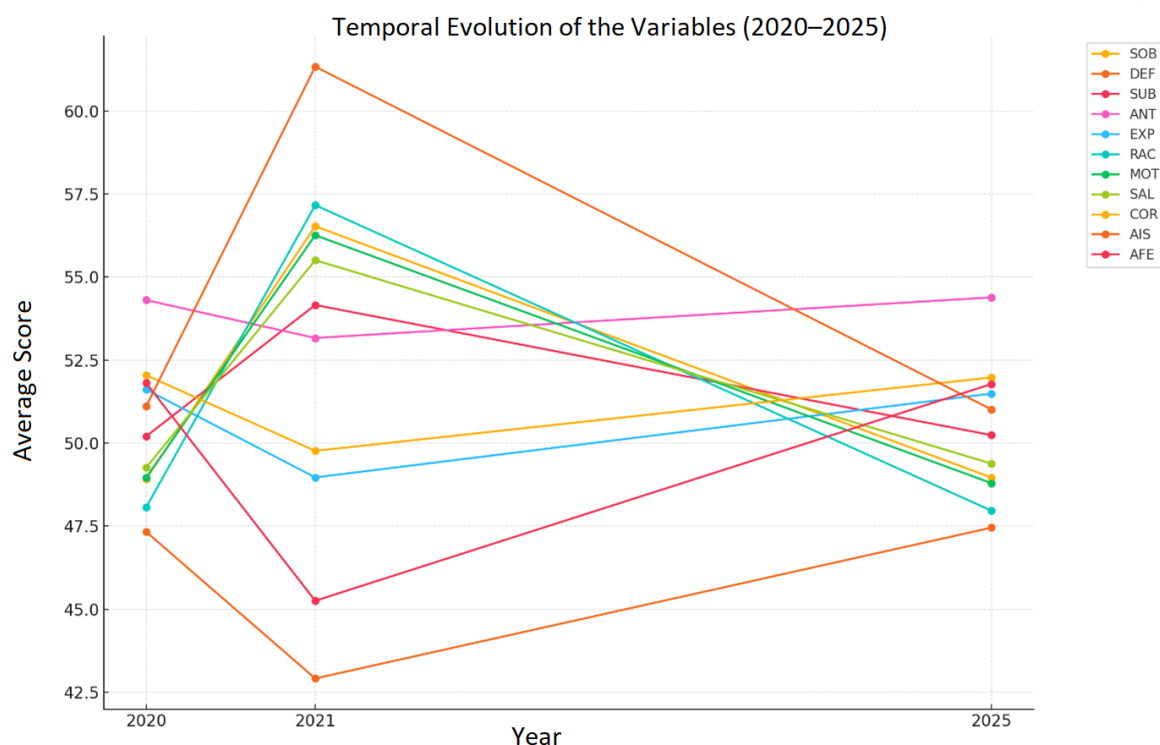


Figure 1. Temporal evolution of the variables (2020–2025).

Overall, these results reflect a diversity of adaptive responses to the pandemic context, where some emotional or behavioral dimensions were particularly vulnerable to social and health-related changes, while others remained more stable or even reorganized in a persistent way. This variability provides important insights for understanding psychosocial recovery in the context of prolonged crises.

Furthermore, examining Figure 2 allows for a visual follow-up of the evolution of scores across each of the eleven analyzed subscales, corresponding to the years 2020, 2021, and 2025. Through boxplots, the ranges in which most responses are concentrated (from the first to the third quartile) are displayed, while the central line represents the median. The extremes of the plot—whiskers and outliers—reflect the dispersion and help identify variations or atypical responses that enrich the interpretation of the data.

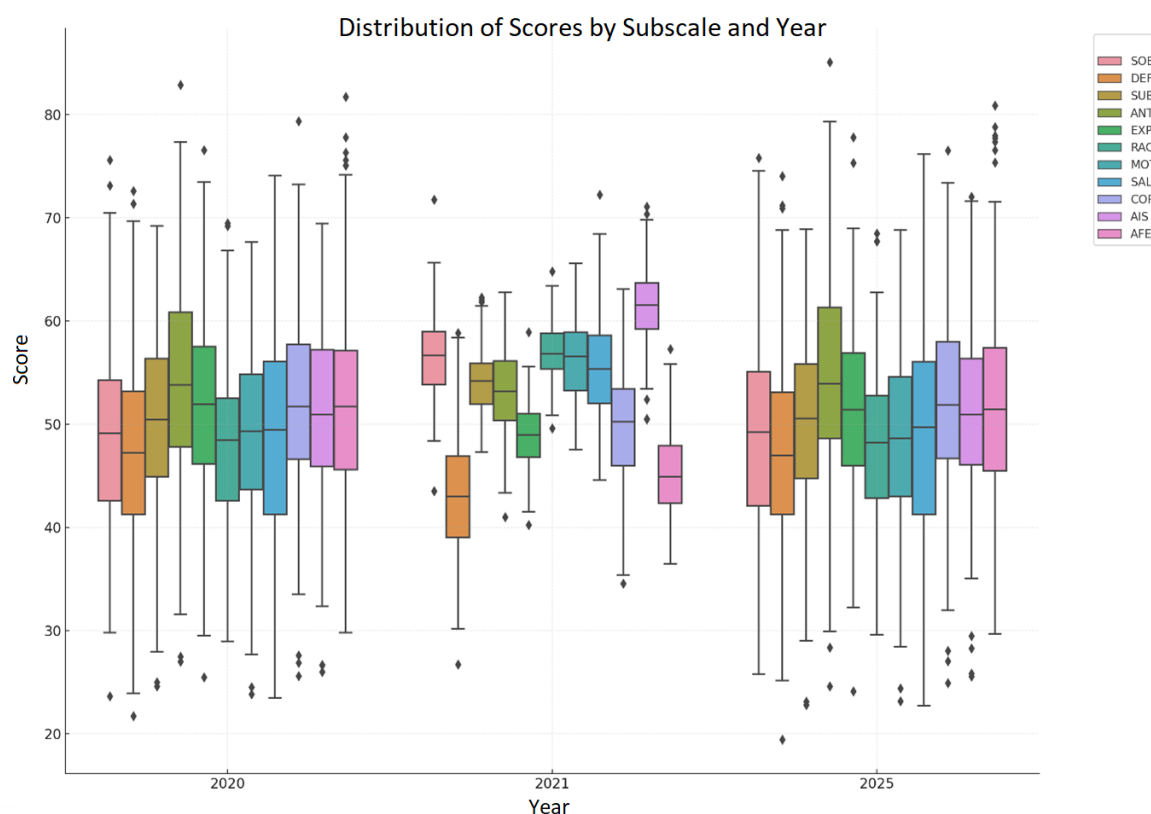


Figure 2. Distribution of Scores by Subscale and Year

A notable trend in the figure is observed in subscales such as Overload (SOB), Rationalization (RAC), Isolation (AIS), Motivation (MOT), and Health (SAL). In these dimensions, scores increase visibly in 2021, a year marked by the most intense effects of the pandemic, likely leading to higher levels of stress, anxiety, and changes in daily habits. By 2025, however, a decrease in these scores can be seen, which may be interpreted as a process of emotional adjustment or partial recovery. This visual pattern aligns with the statistical analyses performed, particularly the ANOVA and post-hoc test results, which confirmed significant differences across the different time points.

In contrast, subscales such as Anticipation (ANT) and Correction (COR) maintain fairly similar distributions across the three years. This stability suggests that, despite the pandemic context, certain traits or cognitive processes remained steady, without substantial changes. This observation is also reflected in the statistical analyses, where no significant differences were found for these dimensions.

Lastly, dimensions such as Defense (DEF) and Underestimation (SUB) display a distinctive trajectory: scores increase in 2021 and remain elevated in 2025, without a clear sign of reversal. This continuity suggests that, for some individuals, certain emotional changes may have become consolidated over time. The graph, therefore, not only supports the statistical findings but also visually illustrates how each subscale follows its own path in response to a collective event such as the pandemic.

IV. DISCUSSION

Throughout this study, relevant changes in the eating and emotional patterns of young people and adults in Santa Marta became evident, especially as the pandemic unfolded and transitioned into the post-pandemic period. As anticipated, the year 2021 — when restrictions were strictest — stands out as a critical point in this evolution, significantly affecting various evaluated dimensions.

In particular, the results show that variables such as food overload, rationalization, social isolation, and affective alteration intensified during that year. This increase seems to directly reflect the emotional impact of the health crisis: accumulated tension, loss of control over daily life, and economic hardship likely triggered coping responses such as emotional eating or social withdrawal. This type of reaction has been widely described in coping theory proposed by Richard S. Lazarus and Susan Folkman, which states that under sustained stress, individuals tend to seek immediate mechanisms to relieve emotional burden, even if they are not always functional in the long term.

However, not all variables follow the same pattern. In the case of Defense and Underestimation, scores remain elevated even in 2025. This suggests that certain ways of interpreting or coping with emotional reality — more closely related to self-evaluation or rigidity toward change — can persist even after the initial crisis has passed. In this regard, Theory of Planned Behavior helps explain how beliefs formed in critical moments can continue to influence behavior long after the external situation has changed.

Another noteworthy finding is the stability of some dimensions, such as Anticipation and Correction, which show no significant variation over time. Their consistency may be related to cognitive characteristics that are less permeable to immediate environmental factors. From the perspective of the Health Belief Model, this could be explained by how certain mental schemas remain constant, even under prolonged pressure.

These findings reinforce the idea that changes in eating behavior do not occur in isolation, nor can they be addressed with one-size-fits-all solutions. Beyond public policies such as front-of-package labeling established by Ley 2120 de 2021 (Colombia), interventions must also address the emotional dimension: psychological support programs, community support spaces, and strategies to restore healthy habits, especially in populations already facing vulnerability.

Ultimately, this research not only documents the evolution of specific indicators during an unprecedented period but also provides insights into how prolonged crises shape human behavior. In the case of Santa Marta, a city already facing economic and social challenges, the pandemic exacerbated pre-existing processes. Therefore, sustainable solutions must look beyond visible symptoms and take into account both structural conditions and individual responses.

V. CONCLUSIONS

This longitudinal study provides clear evidence of the sustained impact that the COVID-19 pandemic had on various psychological dimensions related to eating behaviors among young people and adults in Santa Marta. By analyzing data collected at three key time points (2020, 2021, and 2025), it becomes evident that the effects of the crisis were not merely temporary. On the contrary, in many cases they left lasting marks on individuals' emotional and behavioral patterns.

From a theoretical perspective, these findings reinforce and complement frameworks such as the Health Belief Model, the Theory of Planned Behavior, and Coping theory. Together, these perspectives help explain how individual perceptions interact with emotional strategies that, depending on the context, may result in either functional or dysfunctional responses (Da Silva & da Silveira, 2024). When emotions such as underestimation or isolation persist even after the end of the health emergency, it becomes evident that the change was not merely situational. This suggests that any mental health or nutritional intervention must go beyond normative guidelines and also consider the personal and emotional histories of those receiving it.

Moreover, the use of a longitudinal methodological design, with the same participants over a five-year period, represents a significant contribution to public health and eating behavior research in Latin American contexts. This approach makes it possible to understand both the cumulative and transient effects of a complex phenomenon, beyond one-time or cross-sectional measurements.

Finally, the study concludes that while certain dysfunctional eating patterns tend to revert over time, others persist or evolve, highlighting the need for sustained and context-sensitive preventive strategies that address both the behavioral and emotional dimensions of eating well-being. This knowledge is crucial for designing effective and culturally relevant public policies in scenarios of prolonged crises and recovery.

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