

“Healthy is fresh”: A participatory study of meal ideals and barriers shaping food choice in rural Colombia

Abstract:

People often use simple rules of thumb to decide what to eat, yet these “healthy eating” beliefs can drift away from everyday constraints. In rural Colombia, we explored how adults define healthy eating, what an “*ideal day of eating*” looks like in practice, and which barriers shape food choice and intake. We conducted participatory co-design workshops with 41 adults (18–70 years) across three rural subregions of Antioquia. Using visual food models, groups built ideal meals and menus, rated how closely their usual diets matched those ideals (1–5 scale), and discussed what helps or hinders alignment. We then used Colombian food composition data to benchmark the co-designed menus against national food-based dietary guidelines and recommended nutrient intakes. Participants consistently framed healthy eating as “fresh” and “home-prepared,” but their ideals often left less room for vegetables and dairy than guidelines suggest and tended to exceed recommended sodium limits. Self-ratings clustered around 2.5–3.5/5, pointing to a perceived gap between intentions and everyday eating. Barriers were described less as a lack of knowledge and more as affordability, limited access and time, entrenched habits, and emotional strain. Pairing participatory elicitation of meal ideals with nutritional benchmarking helps identify decision rules and real-world constraints that interventions can target to support healthier food choices in rural settings.

Keywords: food choice, healthy eating perceptions, meal ideals, participatory co-design, food choice barriers, rural food environment, Colombia

I. INTRODUCTION

People seldom convert nutrient-based dietary advice into everyday food choices by tallying grams of fat, carbohydrates, or protein. Instead, they rely on simple decision rules and shared cultural meanings (“fresh is healthy,” “home-made food is best”) to balance taste, cost, time, and ingredient availability (Furst et al., 1996). In this way, individuals construct “personal systems” of ideals, resources, social norms, and practical constraints that guide meal planning and food-choice trade-offs over time.

Recent qualitative research further shows that “*healthy eating*” does not represent a single, stable construct. Rather, people shift among ideas of “more good, less bad,” notions of balance, and broader concepts of nourishment and well-being, while imbuing foods with symbolic and moral values (Hazley et al., 2024). Yet we know little about how these abstract meanings map onto concrete meal patterns—what an “ideal day of eating” actually looks like—and how everyday constraints make people perceive a gap between their ideals and their real diets. This gap may be especially pronounced in rural settings, where infrastructure, affordability, and market access differ sharply from urban environments and are often underrepresented in national surveys (FAO et al., 2023).

These issues are particularly urgent in rural low- and middle-income countries (LMICs), where resource scarcity, time pressure, and emotional stress frequently dictate food decisions, and where “healthy” ideals must be negotiated against stark affordability and access constraints (Choudhury et al., 2025).^a As González et al. (2022) argue, food practices and routines cannot be understood apart from their physical, social, and economic contexts. Concurrently, participatory and co-design approaches are gaining traction for surfacing locally relevant priorities and for generating intervention targets that go beyond mere information delivery (Cena & Calder, 2020; Klink et al., 2024).

In Colombia, dietary patterns are shaped by social, economic, and territorial inequalities that structure food access and everyday choices, with rural communities facing persistent constraints related to infrastructure, healthcare access, and food availability. National Food-Based Dietary Guidelines (FBDGs) provide an important reference point, but their relevance depends on how they intersect with local meanings, routines, and constraints that shape food choice on the ground.

Against this backdrop, this study examines how rural adults in Antioquia, Colombia (i) define and operationalize “healthy eating,” (ii) translate these meanings into co-designed “ideal” meals and daily menus, and (iii) describe the barriers and enablers that shape food choice and intake. We

pair participatory co-design workshops with nutritional benchmarking—using Colombian food composition data to compare co-designed meal patterns with national FBDG and Recommended Intake of Energy and Nutrients (RIEN) benchmarks as an external reference—so that divergences can be interpreted as a perception–practice gap arising from decision rules and constraints, rather than as a purely informational deficit.

The remainder of this article is structured as follows. Section 2 describes the study setting, participants, and mixed-methods design. Section 3 presents the findings, integrating qualitative themes with nutritional benchmarking of co-designed menus. Section 4 discusses implications for understanding food choice under rural constraints and for designing context-sensitive interventions. Section 5 concludes with brief recommendations.

II. MATERIALS AND METHODS

A. Study design and setting

We used a convergent mixed-methods design, combining participatory qualitative elicitation of “healthy eating” meanings and barriers with quantitative nutritional benchmarking of co-designed meal patterns. Data were collected between June and December 2024 in three rural subregions of Antioquia, Colombia, selected to capture geographic and agroecological diversity and variation in socioeconomic vulnerability. The study was coordinated by Universidad EAFIT in partnership with the Food and Agriculture Organization of the United Nations (FAO) and local community organizations.

B. Participants and recruitment

Participants were recruited using purposive sampling to capture heterogeneity in gender, age, education, and occupation. Eligibility criteria were: (1) age ≥ 18 years, (2) residence in a rural area of the selected subregions, and (3) affiliation with a local cooperative. Community leaders supported recruitment to facilitate trust and participation.

The final sample comprised 41 adults (21 women; 20 men) aged 18–70 years, including students, farmers, self-employed workers, professionals, and community employees, with education ranging from primary school to postgraduate studies. Participants were organized into age-based workshop groups—18–35, 36–55, and ≥ 56 years—to explore generational differences in healthy-eating meanings and food choice constraints.

We monitored thematic saturation during data collection and analysis; saturation was considered achieved when no substantively new concepts emerged within the analytic categories across successive sessions. Findings should be interpreted as representative of cooperative-affiliated adults in the participating rural areas.

C. Participatory co-design workshops: procedures and materials

Workshops were designed to elicit both individual meanings and collective meal ideals for healthy eating, and to identify perceived barriers shaping food choice and intake. Sessions were conducted in Spanish by trained facilitators, lasted approximately two hours, and followed a standardized facilitation guide. At the start of each session, participants completed a short sociodemographic questionnaire and provided written informed consent. Workshop outputs are treated as perceived/aspirational meal ideals rather than measures of usual dietary intake.

Each workshop included three components:

(1) *Individual elicitation of healthy-eating meanings.* Participants completed a brief written/drawn reflection on what they considered a healthy diet for different eating occasions (e.g., breakfast, lunch, dinner, snacks). Prompts encouraged free expression (e.g., “What do you believe is a healthy breakfast?”). The reflection templates are provided in the Supplementary Materials (see Supplementary Figure S1).

(2) *Group co-design of an “ideal daily menu.”* Participants shared individual reflections and collaboratively assembled “ideal” meals using visual food models and locally relevant food cards. Food portion models were adapted from established materials, and used to specify foods, portion sizes, and approximate weights for each eating occasion (Nelson, M. et al., 1997). This activity produced group-level “ideal plates” and an “ideal day” menu for each age group (examples shown as Figure 1).

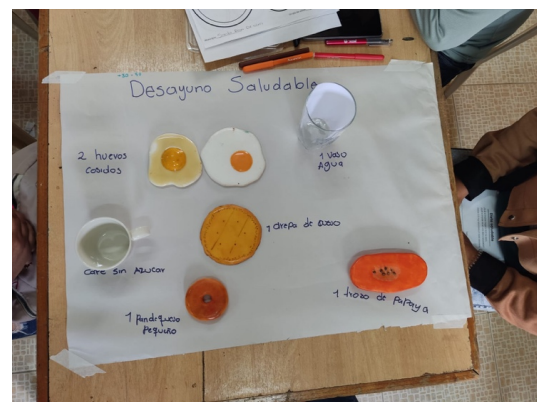


Figure 1. Group-designed “ideal” meal plates created during participatory workshops using visual portion aids. Within each age-based group, participants jointly selected and arranged foods to represent their ideal meals across eating occasions, indicating portion sizes and approximate weights using adapted portion models (Nelson, M. et al., 1997). Labels in the photographs are in Spanish; examples include “Desayuno saludable” (healthy breakfast), “Media mañana” (mid-morning snack), “Merienda saludable” (healthy snack), and “Media tarde” (mid-afternoon snack).

(3) *Perceived alignment and barriers.* Participants rated how closely their current diet aligned with their group’s co-designed ideal menu using a 1.0–5.0 scale (5.0 = fully aligned). Participants then discussed barriers and enablers shaping alignment (e.g., “What prevents you from reaching 5.0?”). The rating and barrier prompts are included in the Supplementary Materials (Supplementary Figure S2).

All sessions were audio-recorded with permission and supplemented with facilitator field notes documenting group dynamics and contextual observations (e.g., local availability, price considerations raised by participants).

D. Nutritional benchmarking of co-designed menus

Menus produced during workshops were digitized and classified into the seven Colombian Food-Based Dietary Guidelines (FBDGs) food groups: (1) fruits, (2) vegetables, (3) cereals and tubers, (4) legumes, (5) animal-source proteins, (6) dairy, and (7) fats and sugars. Food items were assigned to groups using pre-specified classification rules.

Nutrient composition was estimated using the Colombian Food Composition Tables. Portion sizes were derived from participant-specified quantities and the visual food models. Co-designed menus were then benchmarked against national FBDG recommended servings and the Recommended Intake of Energy and Nutrients (RIEN) for energy, macronutrients, and selected micronutrients (calcium, iron, sodium). Benchmarking was applied to co-designed idealised menus to characterise the nutrient profile of perceived healthy eating, not to infer usual intake or adequacy.

All quantitative processing and visualization were conducted in R (v4.5.1). Classification rules and analytic scripts are provided in the Supplementary Materials / OSF repository (see Data availability).

E. Qualitative data analysis (NVivo; double coding; trustworthiness)

Audio recordings were transcribed verbatim in Spanish and de-identified prior to analysis. We conducted an inductive thematic analysis, focusing on (i) meanings and decision rules used to define “healthy eating,” (ii) features of co-designed meal ideals, and (iii) perceived barriers and enablers shaping food choice and intake.

Coding was performed in NVivo. Two analysts independently coded an initial subset of transcripts to develop a shared codebook and align on coding boundaries (double coding). The codebook was then iteratively refined through regular team meetings as analysis progressed, and the remaining transcripts were coded using the agreed codebook. Discrepancies were resolved by discussion; unresolved cases were adjudicated by a third team member. Analytic memos were used to document evolving interpretations and reflexive considerations (e.g., how facilitator roles or prior assumptions could shape theme development). We considered thematic saturation reached when new transcripts did not add substantively new codes within the established thematic structure.

Reporting follows key items from COREQ/SRQR; a completed checklist is provided in the Supplementary Materials (Tong et al., 2007).

F. Quantitative summaries and mixed-methods integration

For the quantitative strand, we summarized (i) the frequency and servings of each FBDG food group represented in co-designed menus and (ii) RIEN-based adequacy for energy, macronutrients, calcium, iron, and sodium, stratified by subregion and age group.

Integration followed a convergent logic: qualitative and quantitative analyses were conducted in parallel and then brought together using joint displays that aligned themes (e.g., affordability, access, habits, emotional strain) with observed deviations from FBDG/RIEN benchmarks. This enabled us to interpret where and why meal ideals and reported practices diverged and to identify actionable intervention targets that reflect both culturally grounded meanings and structural constraints.

G. Ethical approval

The study was conducted in accordance with the Declaration of Helsinki and approved by the Research Ethics Committee of Universidad EAFIT (protocol code Comité de Ética-2022-07, approved 5 September 2022). All participants received study information, including confidentiality safeguards and the right to withdraw, and provided written informed consent.

H. Data availability

De-identified quantitative datasets derived from co-designed menus (food-group servings and nutrient estimates), study materials (templates), and analytic scripts (R) are available in an OSF repository. De-identified qualitative outputs are available on reasonable request, subject to ethics approval. Full transcripts and audio files are not publicly available due to the risk of re-identification in small rural communities.

I. Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the authors used Microsoft Copilot and Grammarly to improve readability and language. The authors reviewed and edited all AI-assisted content and take full responsibility for the content of the publication.

III. RESULTS

A. Workshop outputs and overview

Across participatory workshops, participants produced (i) individual written/drawn reflections on what constitutes “healthy eating” across eating occasions, (ii) group co-designed “ideal” meal plates and an “ideal day” menu for each age group, and (iii) self-ratings (1.0–5.0) of how closely their usual diets aligned with the group’s ideal, followed by facilitated discussions of barriers and enablers. Results are presented around (a) meanings and decision rules associated with “healthy eating,” (b) the structure and content of co-designed meal ideals, (c) perceived alignment between ideals and everyday eating, and (d) barriers shaping food choice and intake.

B. “Healthy is fresh”: meanings and decision rules for healthy eating

Participants consistently defined healthy eating through practical and culturally salient decision rules rather than nutrient targets. “Healthy” was most commonly linked to freshness, minimal processing, and home preparation, and was often discussed in relation to illness prevention. Alongside “fresh,” participants frequently invoked broader principles such as moderation and balance, typically framed as “doing a bit of everything” rather than as specific proportions across food groups. This framing positioned healthy eating as a set of everyday heuristics—what foods “feel safe,” “natural,” or “appropriate”—that guide food choice within constraints.

C. Co-designed meal ideals and nutritional benchmarking

The co-designed “ideal” meal plates largely reflected familiar Colombian meal structures. Plates commonly centered on a starchy base (e.g., cereals/tubers) combined with a protein source (often legumes and eggs), sometimes complemented by fruit. Vegetables appeared less prominently and, when included, were often limited to a narrow range (e.g., simple salad components) rather than broader variety. Dairy products were infrequently incorporated into ideal plates across age groups.

When benchmarked as an external reference against the Colombian Food-Based Dietary Guidelines (FBDGs), co-designed “ideal day” menus diverged most consistently in the representation of vegetables and dairy. Vegetables were included less prominently and with limited variety; when present, they were often simple preparations (e.g., tomato, lettuce, onion). Fruits appeared more frequently (commonly bananas, citrus, or papaya), but typically in small portions and not across all eating occasions. Dairy foods were rarely incorporated into ideal plates—particularly among older adults—whereas legumes and eggs were commonly selected, reflecting their cultural salience and accessibility. Although sugary drinks and ultra-processed snacks were usually excluded from ideal plates, participants described them as part of everyday consumption during group reflections. Nutritional benchmarking against the Recommended Intake of Energy and Nutrients (RIEN) provides an additional external reference (Figure 2): across age groups, percent RIEN achieved was highest for fats and sodium and lowest for calcium and iron.

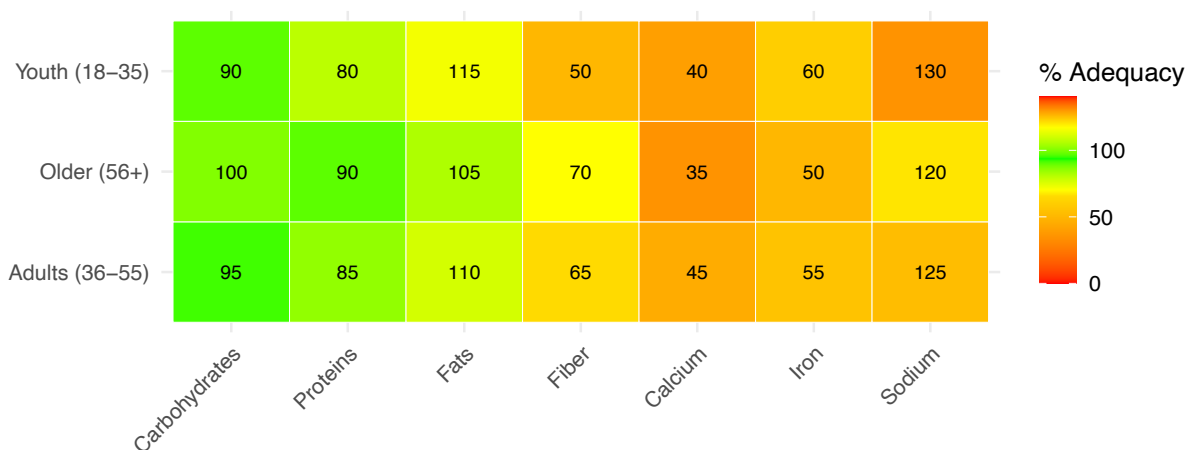


Figure 2. RIEN benchmarking of co-designed “ideal day” menus by age group. Heatmap showing the mean percent adequacy relative to the Recommended Intake of Energy and Nutrients (RIEN) for carbohydrates, proteins, fats, fiber, calcium, iron, and sodium in the co-designed “ideal day” menus.

Values are summarized by age group (18–35, 36–55, ≥56 years). Each cell displays the mean percent RIEN achieved; the colour scale indicates lower to higher adequacy (legend).

D. Perceived alignment: the ideal–practice gap

When participants rated how closely their usual diets aligned with their group’s co-designed ideal (1.0–5.0 scale), ratings clustered around 2.5–3.5/5, suggesting a perceived gap between intentions (or ideals) and everyday eating. Participants typically framed this gap as a function of feasibility: even when the ideal felt clear and desirable, day-to-day constraints shaped what was selected, prepared, and eaten.

E. Barriers shaping food choice and intake (themes with illustrative quotes)

Barriers were described as multi-layered and often interacting, rather than as single isolated obstacles. Five themes dominated across groups:

(1) Sensory preferences and food enjoyment.

Taste and preferred preparation methods were repeatedly described as pulling choices away from ideals, especially toward fried or highly seasoned foods. One participant summarized this bluntly: *“Everything tastes better when it’s fried”*. Another illustrated aversions to foods they associated with “healthy” routines: *“I don’t like fruits, I don’t eat eggs in any form... I don’t like healthy breakfasts, so I just skip them... I eat arepas sometimes, but to me, what’s the point of an arepa?”*

(2) Affordability and the perceived cost of healthy eating.

Healthy eating was often perceived as expensive and linked to “special” products (e.g., sugar-free or whole grain items): *“Healthy eating is expensive. If you want a healthy diet, it requires a budget, because everything that’s sugar-free or whole grain is costly.”* A contrasting view emerged among some participants, who emphasized cooking skills and planning rather than income per se: *“It’s not really about money. We came up with a lot of meals today that most people already have at home. Maybe we just don’t know how to use them properly.”*

(3) Uncertainty about what to eat and in what amounts.

Participants described confusion about what is healthy, how to structure meals, and portion size. This was expressed as: *“We just don’t know what we’re supposed to eat, when, how much, or even what’s considered healthy.”* Some also noted limited motivation or time to engage with nutrition information (including front-of-pack warnings).

(4) Food environments beyond the home.

Participants frequently reported being more able to eat closer to their ideal at home than when traveling or working outside. One older adult noted: “When I’m at home, I can eat well. But when I’m on the move, it’s hard to find healthy options.” This pointed to constraints tied to availability and convenience within everyday routines.

(5) Time pressure and emotional strain.

Time constraints were described as limiting cooking, planning, and consistency. Emotional factors were also explicitly linked to departures from ideals, particularly sugary or salty snacks and soda: “What limits me from eating healthy is anxiety. That’s when I drink soda or buy sweets—it’s emotional... when anxiety hits, I break the rules.” Participants also described snacking episodes as difficult to regulate: “Sometimes you overdo it just snacking—chips, cupcakes, candies... we know it’s not good, but it happens,” and emphasized routine disruption on weekends: “Weekends are the hardest... I just break from the routine completely.”

F. Mixed-methods integration

Taken together, the qualitative and benchmarking strands suggest that “healthy eating” is organised around a small set of locally credible decision rules (most prominently “fresh” and “home-prepared”) while the ideal–everyday gap reflects how affordability, access (especially away from home), and time pressure interact with taste, comfort, and emotional strain. Nutritional benchmarking against Colombian FBDG/RIEN functions here as an external reference to locate where divergences in the co-designed ideals clustered (notably vegetables, dairy, and calcium/iron alongside higher sodium; Figure 1). The qualitative themes, in turn, help explain why these divergences persist in routine food choice and intake. To make this integration explicit, we present a joint display aligning key themes and illustrative quotes with the corresponding benchmarking patterns.

Table 1. Joint display integrating qualitative themes with FBDG/RIEN benchmarking (external reference)

Qualitative theme	Illustrative participant quote	Benchmarking pattern	Integrated inference
Knowledge/portion uncertainty	“We just don’t know what we’re supposed to eat, when, how much, or even what’s considered healthy.”	Divergences cluster in food-group composition (e.g., vegetables/dairy) and micronutrient-related adequacy.	“Healthy eating” is action-making lacks actionable portion/structure anchors, aligning with persistent divergence under benchmarking.

Qualitative theme	Illustrative participant quote	Benchmarking pattern	Integrated inference
Low engagement with nutrition information (label warnings)	"Even with all the warnings like 'high in sodium,' people just don't read them."	Sodium-related patterns remain elevated relative to external benchmarks.	Information availability does not translate into use at poated divergence persists.
Taste/sensory preference	"Everything tastes better when it's fried".	Patterns consistent with higher reliance on preparation styles associated with higher fat/salt exposure.	Sensory rewards compete w benchmarking patterns that concentrate around fat/sodium-related divergence.
Food dislikes and "healthy eating" aversion	"I don't like fruits, I don't eat eggs in any form... I don't like healthy breakfasts, so I just skip them... I eat arepas sometimes, but to me, what's the point of an arepa?"	Divergences cluster in fruit/vegetable inclusion and meal structuring.	The gap is not only constraint-driven; it is also preferentially sustain as "ideal."
Affordability (perceived cost of healthy eating)	"Healthy eating is expensive. If you want a healthy diet, it requires a budget, because everything that's sugar-free or whole grain is costly."	Divergences cluster in foods perceived as costly/less accessible (e.g., vegetables/dairy) and related micronutrient adequacy.	Co "fresh" in principle but remain limited in diversity/coverage under benchmarking.
Counter-narrative: affordability vs skills/planning	"It's not really about money. We came up with a lot of meals today that most people already have at home. Maybe we just don't know how to use them properly."	Divergence is not uniform; some participants frame the gap as a "food literacy/skills" issue.	Mixing indicates heterogeneity: foanslation of existing foods into "ideal" meals is a capability/planning problem.
Time/attention scarcity for learning	"The time it takes to study this stuff is probably the biggest barrier,"	Persistent divergence points (e.g., vegetables/dairy, sodium-related patterns) despite awareness.	Limited time for learning/plannin and helps explain why divergence remains stable even when "healthy" is valued.
Contextual constraint: outside-home environments	"When I'm at home, I can eat well. But when I'm on the move, it's hard to find healthy options."	Divergence is plausibly reinforced by convenience-oriented options linked to sodium-related exposure.	Benchmarking locates divergen is negotiated (home vs "on the move").
Emotional drivers and rule-breaking	"What limits me from eating healthy is anxiety. That's when I drink soda or buy sweets—it's emotional. I usually eat healthy, but when anxiety hits, I break the rules,"	Divergence clusters in "less desirable components" (e.g., sodium/sugary products discussed in narrative) relative to benchmarks.	Miive states can override decision rules ("fresh/home-prepared"), sustaining divergence even when ideals are clear.
Everyday snacking as routine disruption	"Sometimes you overdo it just snacking—chips, cupcakes, candies... we	Patterns consistent with higher exposure to	The qualitative strand explains the *mechanisme accumulates across the day.

Qualitative theme	Illustrative participant quote	Benchmarking pattern	Integrated inference
	know it's not good, but it happens,"	snack-type foods linked to sodium/sugar.	
Weekends and routine breakdown	"Weekends are the hardest. That's when I eat pizza, hamburgers, or heavy stews. I just break from the routine completely,"	Divergence is episodic (routine-dependent), not constant.	Integration highlights temporal patterning: divergence is concentrated innable for interpretation/discussion.

Notes: Qualitative themes derive from workshop reflections and discussions; benchmarking patterns summarize where results diverged when referenced to Colombian FBDG/RIEN (reported directionally here). Integration occurs at interpretation via this joint display, which directly arrays themes/quotes against benchmarking patterns to make convergence and complementarity transparent. Joint displays are explicitly recommended for communicating mixed-methods integration.

IV. Discussion

This study examined how rural adults in Antioquia, Colombia understand “healthy eating,” and how co-designed meal ideals compare with national guidance when used as an external reference (Colombian FBDG/GABA and RIEN). Participants’ accounts consistently organised healthy eating around accessible decision rules (most notably “fresh” and “home-prepared”) and around broad virtues such as balance and moderation rather than explicit nutrient targets. When benchmarked against Colombian FBDG/RIEN, divergences clustered most consistently around limited vegetable variety and low incorporation of dairy, alongside sodium- and micronutrient-related patterns (Figure 2). These findings reinforce that lay concepts of healthy eating are culturally constructed and often broader than nutrient composition alone.

Building on prior qualitative work, our findings suggest that participants’ accounts of “healthy eating” function less as nutrient-based models and more as culturally grounded ways of making sense of food. Bisogni et al (2012) argue that people’s meanings of healthy eating are shaped by personal, social, and cultural experience and are “*broader than the food composition and health outcomes considered by scientists.*” Consistent with this, participants in our study frequently invoked non-specific virtues such as “balance” and “moderation,” often understood as doing “a bit of everything” while avoiding excess. Similar concepts appear repeatedly in qualitative syntheses of lay views of healthy eating, although “balance” is interpreted in multiple ways and does not necessarily map onto guideline notions of including food groups in appropriate proportions. A food-choice perspective helps clarify why such broadly endorsed ideals can coexist with routine practices that diverge under benchmarking: rather than reasoning in nutrients, participants relied

on heuristics such as “fresh,” “home-prepared,” and “avoid excess” to simplify everyday decisions, while affordability, limited access—especially outside the home—time pressure, and the pull of taste and comfort shaped what was feasible in practice. This pattern aligns with the Food Choice Process Model’s emphasis on value negotiations and behavioural strategies operating within specific social and food contexts (Furst et al., 1996).

At the same time, participants’ co-designed “healthy” day menus often retained patterns consistent with higher sodium- and added-sugar exposure, even as participants explicitly identified these components as ones to “eat less” for health. This coexistence of endorsement and divergence is compatible with broader evidence that sodium and sugar-sweetened beverages are consumed above optimal levels in most world regions, and with accounts of food systems that increasingly make processed, affordable, and heavily marketed products the default option in everyday eating (Afshin et al., 2019). In this context, the ubiquity and normalisation of ultra-processed products can tilt routine intake toward higher salt/sugar even when people aim to eat “fresh” and “home-prepared,” reinforcing the gap between subjective meanings of healthy eating and the nutritional profile of the diets people consider “healthy.” Age-patterning in the workshops further suggests that these tensions are negotiated through different life-course scripts: younger adults more often drew on restriction-oriented language, whereas older adults grounded healthy eating in familiar local foods and trusted preparation practices. Importantly, both scripts can coexist with divergence under benchmarking—restrictive framings may not translate into broader dietary variety, and tradition-based ideals may underweight food groups that are not central to local repertoires. To make this integration transparent, Table 1 presents a joint display aligning these qualitative themes and illustrative quotes with the corresponding FBDG/RIEN benchmarking patterns.

A. Implications for intervention design in rural food environments

In rural Colombia, the pathway from “knowing” to “doing” appears to run through how food choice is made feasible in daily routines, not through information alone. Participants already hold a locally credible definition of healthy eating—“fresh” and “home-prepared”—that works as a practical decision rule. What limits enactment is less the absence of a concept than the frictions that accumulate around it: the time and effort required to cook, the cost and uncertainty of accessing diverse foods, and the constraints of eating beyond the home. This profile of friction is characteristic of rural food environments where distance, transport, and seasonal supply can structure availability and affordability in ways that differ from urban settings (Choudhury et al., 2025).

That contrast matters for intervention design. In urban contexts dietary change often hinges on navigating a high-choice environment saturated by convenience outlets and marketing, where ultra-processed options are highly visible and time-saving (Westbury et al., 2021). In rural settings, the challenge is often the reverse: choice is constrained, variety is harder to secure consistently, and the “healthiest” version of local eating can still fall short on specific food groups simply because those foods are not routinely present, affordable, or socially embedded. Evidence on rural LMIC food environments similarly emphasizes the growing presence of processed foods alongside persistent constraints on access to diverse outlets and markets (Choudhury et al., 2025).

A “rural-first” implication, then, is to work with the heuristic people already trust (“fresh/home-prepared”) and make it operational under real constraints. Rather than translating guidelines into nutrient targets, interventions can translate fresh into actionable meal scripts that fit local dishes: what “fresh” looks like when vegetables are limited; how to expand vegetable variety without breaking routine; and how to incorporate culturally acceptable calcium sources when dairy is not a default. Because affordability and mobility structure feasibility, it is also critical to reduce friction at the point of choice—especially for “on-the-move” contexts where participants reported the steepest constraints. This aligns with evidence that accessibility differs markedly by transport modes and distance across rural versus urban settings, shaping what people can plausibly do day-to-day (Losada-Rojas et al., 2021).

Importantly, the mechanisms participants described were not only structural. Taste, comfort, and routine disruption (including emotional strain) were central to how ideals were negotiated. Design choices that acknowledge sensory satisfaction—rather than treating it as a barrier—are therefore more likely to “travel” in this setting: practical flavour strategies compatible with lower sodium, satisfying substitutions that remain culturally normal, and coping-friendly routines for high-stress moments (Furst et al., 1996).

Finally, implementation in rural settings can be strengthened by building on existing delivery infrastructure (e.g., cooperatives, community networks, local markets) and by sequencing change—starting with feasible, low-friction scripts and substitutions, while longer-horizon improvements target supply and access (Gregório et al., 2017). Across the rural–urban continuum, urbanization is reshaping food supply and demand in ways that affect affordability and

access to healthy diets; making rural adaptation explicit helps avoid assuming that urban-facing guideline formats will function similarly in rural routines.

What is transferable beyond this case is not a single set of foods, but a design logic: in resource-constrained rural contexts, interventions are more likely to succeed when they align with locally meaningful heuristics and then directly target the frictions—distance, access, cost, time, and the pull of taste/comfort—that determine feasibility in everyday eating. This complements what we see in urban LMIC settings, where the dominant friction is often not scarcity of options but the density and convenience of ultra-processed options within complex retail environments.

B. Strengths and limitations

This study has several strengths for understanding how rural residents construct “healthy eating” and translate those meanings into meal ideals. Participatory co-design workshops elicited culturally grounded “ideal day” menus and made visible the decision rules participants use to organise healthy eating in everyday life. The convergent mixed-method approach strengthened interpretation by using benchmarking against FBDG/RIEN strictly as an external reference to locate where divergences clustered in the co-designed ideals, while qualitative accounts clarified how participants reason about and negotiate those divergences through affordability, access, time pressure, mobility, taste, and emotional strain (Guetterman et al., 2021). Integration is made explicit in Table 1, which aligns illustrative quotes with corresponding benchmarking patterns using a joint display (a recognised approach for communicating mixed-methods integration). Sampling across three rural subregions and age strata further captured heterogeneity in norms and constraints, supporting ecological validity.

Several limitations should be considered. First, the study is primarily about perceptions and aspirational meal ideals rather than measured dietary intake. The co-designed menus represent what participants collectively constructed as “healthy eating” in the workshop setting, and benchmarking characterises the nutritional profile of these perceived ideals; it should not be interpreted as an estimate of participants’ usual intake or population nutrient adequacy. Relatedly, self-ratings of ideal–usual alignment reflect subjective appraisal rather than validated dietary assessment. Seasonality may also have shaped availability and the ideals participants constructed, particularly for fruits and vegetables. Recruitment through cooperative networks may underrepresent residents without organisational affiliation, and the focus on mountainous agroecological zones of Antioquia limits transferability to rural settings with different ecologies,

market access, or conflict exposure. Finally, portion estimation using food models—while valuable for engagement and comparability—is subject to measurement error that can propagate into the benchmarking strand and, by extension, integrated inferences; maintaining the “external reference” role of benchmarking helps mitigate over-interpretation.

V. Conclusion

This study shows that, in rural Antioquia, “healthy eating” is primarily constructed through culturally meaningful decision rules—especially “fresh” and “home-prepared”—and through broad virtues such as balance and moderation. Importantly, our findings speak to perceptions and aspirational meal ideals elicited in participatory workshops, rather than measured dietary intake. When these co-designed ideals are benchmarked against Colombian FBDG/GABA and RIEN as an external reference, divergences cluster most consistently around vegetable variety, the limited salience of dairy, and sodium- and micronutrient-related patterns.

Methodologically, the participatory co-design approach proved feasible for engaging rural communities as active partners in articulating meal ideals and the reasoning that underpins them. Combining these elicited ideals with benchmarking provides a replicable way to locate where perceived healthy eating diverges from guidance and, crucially, to identify why those divergences are likely to persist in routine food choice under constraints such as affordability, mobility, time pressure, and taste/comfort.

Taken together, the contribution of this study is not a rural “deficit” story but a design-relevant insight: rural healthy-eating communication and intervention strategies may be more effective when they build on locally credible heuristics and reduce the frictions that shape feasibility in everyday routines, rather than assuming that information alone is the binding constraint. Future research should test this logic across more diverse rural ecologies and populations beyond cooperative-affiliated adults, incorporate seasonal replication, and use longitudinal or intervention designs to examine how shifts in routines, environments, and decision rules translate into changes in observed intake over time.

VI. Author contributions (CRediT)

Conceptualization: A.M.A.-A., M.C.M.-G., T.O.-P.; Methodology: M.C.M.-G., T.O.-P., A.M.A.-A.; Software: J.C.M.-M.; Validation: A.M.A.-A., J.C.M.-M., A.S.H.-C.; Formal analysis: A.M.A.-A., J.C.M.-M.; Investigation: M.C.M.-G., T.O.-P., A.S.H.-C.; Resources: H.C.-T.; Data curation: A.S.H.-C.; Writing – original draft: A.M.A.-A., H.C.-T., J.C.M.-M.; Writing – review & editing: A.M.A.-A., J.C.M.-M., A.S.H.-C.; Visualization: A.M.A.-A., A.S.H.-C.; Supervision: A.M.A.-A.; Project administration: H.C.-T. All authors have read and agreed to the published version of the manuscript.

VII. Funding

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VIII. Ethics approval

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Universidad EAFIT (protocol code Comité de Ética-2022-07; approved 5 September 2022).

IX. Consent to participate

Written informed consent was obtained from all participants.

X. Data availability statement

De-identified quantitative data derived from the co-designed “ideal day” menus (food-group servings and nutrient estimates), the analytic code (R scripts), and study materials (templates) are available in an OSF repository ({{AUTOR APORTA: OSF DOI/URL}}; {{AUTOR APORTA: access status—open/embargo/restricted}}). De-identified qualitative outputs (e.g., written/drawn workshop materials) are available from the corresponding author upon reasonable request and subject to ethics approval. Full workshop transcripts and audio files are not publicly available because they may contain potentially identifiable information about participants and communities.

XI. Conflicts of interest

The authors declare no competing interests.

XII. Acknowledgments

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XIII. Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used Microsoft Copilot and Grammarly to improve readability and language. The authors reviewed and edited all AI-assisted content and take full responsibility for the content of the publication.

XIV. Abbreviations

FBDGs, Food-Based Dietary Guidelines; GABA, Guías Alimentarias Basadas en Alimentos (Colombian Food-Based Dietary Guidelines); RIEN, Recommended Intake of Energy and Nutrients; EAR, Estimated Average Requirement; RDA, Recommended Dietary Allowance; LMICs, low- and middle-income countries; FAO, Food and Agriculture Organization.

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