



From 'Meal Crisis' to 'Dietary Wellness': Integrating the Spanish Longevity Diet into Catering Service Innovation and Culinary Education in China

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Abstract. This study addresses prevalent issues in China's elderly tourism catering, such as high levels of oil and salt, poor digestibility, and neglect of dietary contraindications for chronic diseases. It introduces the Spanish "Longevity Diet" concept and the Mediterranean dietary model to construct an integrated innovation framework combining menu design, nutritional assessment, and culinary education. Through experimental replication and age-friendly adaptation of four representative Spanish longevity dishes, and by adhering to the principles of "low salt, low fat, soft texture, high protein, and easy digestion," a 7-day prototype menu for elderly-friendly tourism meals was developed. Evaluations involving participants aged 55 and above through trial tastings and semi-structured interviews suggested that the proposed cross- culturally integrated menu demonstrates preliminary feasibility and potential acceptability. Given the small sample size and exploratory design, findings should be interpreted as preliminary. Furthermore, the study proposes integrating these findings into the vocational culinary education curriculum system by promoting the development of a "Silver-Haired Diet Design" micro-course, thereby providing a viable pathway to enhance the quality of elderly tourism catering and support healthy longevity.

Keywords: Longevity diet, Elderly tourism catering, Dietary wellness, Culinary education, Menu innovation.

1 Introduction

1.1 Background

China is undergoing one of the world's most rapid population aging processes. It is projected that by 2025, the population aged 60 and above will exceed 300 million, accounting for over 21% of the total population (Liu et al., 2022). Concurrently, the proportion of older adults participating in domestic tourism continues to rise, making "age-friendly catering" a focal point of market demand. However, traditional group tour meals often suffer from problems such as excessive oil and salt, insufficient dietary fiber, overly hard textures, and a lack of targeted design for dietary restrictions related to chronic conditions like hypertension and diabetes. Research indicates that a reasonable dietary structure

significantly impacts health maintenance, chronic disease prevention and control, and travel experience for the elderly (Beard et al., 2016).

1.2 Opportunity

International "Blue Zones" research points out that regional longevity is closely linked to traditional dietary patterns. Spain preserves this dietary tradition, integrates it into catering and culinary innovation, and forms a combined development model. This provides valuable reference for the development of elderly tourism catering in China.

1.3 Research Gap

Existing research in China has predominantly focused on the behavior and service satisfaction of elderly tourists (Bao & Zhu, 2016), while systematic menu innovation from the perspectives of nutritional science and culinary practice remains scarce, and few studies have addressed the localized adaptation of cross-cultural dietary concepts (Kim & Eves, 2012). Furthermore, domestic culinary vocational education generally lacks courses for the elderly's diet, causing a gap between talent supply and market demand. Thus, integrated research combining related concepts, development, assessment and curriculum construction is needed.

1.4 Research Objectives

This study aims to:

1. Design a catering innovation menu prototype applicable to Chinese elderly tourism scenarios based on Spanish Longevity Diet principles.
2. Validate the performance of dishes in terms of flavor, texture, and acceptance through sensory evaluations by participants aged 55 and above.
3. Analyze the menu's alignment with common elderly health needs in terms of nutritional composition through clinical nutritional assessment.
4. Transform the research outcomes into culinary professional education content by developing and piloting a "Silver-Haired Diet Design" course to promote the construction of a relevant teaching system.

2 Literature Review

2.1 Healthy Aging and Lifespan Innovation

Healthy ageing has become a core goal of international ageing policy and gerontology research, focusing not only on disease prevention, but also on maintaining functional capacity and quality of life in old age. The World Health Organization explicitly defines healthy ageing as the process of developing and maintaining functional ability that enables wellbeing in older age (World Health Organization, 2015). Building on this foundation, contemporary discussions of lifespan innovation advocate an interdisciplinary approach that integrates health promotion, lifestyle optimization, service system design, and educational development, with the objective of extending healthy life years rather than solely increasing chronological lifespan (Beard et al., 2016; Cherbuin et al., 2021). In this integrated framework,

dietary systems and catering services are increasingly seen as strategic tools for lifespan innovation, especially for older people at higher risk of chronic disease. Evidence from nutritional epidemiology and systematic reviews shows that sticking to healthy dietary patterns like the Mediterranean diet rich in plant foods, healthy fats and fiber is linked to better functional health and lower mortality among aging populations (Trichopoulou et al., 2014; Domínguez et al., 2022).

2.2 Diet, Longevity, and the Mediterranean Model

Extensive epidemiological studies confirm a significant association between dietary patterns and longevity. The Mediterranean diet, characterized by a high intake of vegetables, legumes, whole grains, olive oil, moderate consumption of fish, and low levels of saturated fat, has been shown to reduce cardiovascular disease risk, improve metabolic health, and significantly lower mortality rates among elderly populations (Trichopoulou et al., 2014). Research on Blue Zones further indicates that traditional Mediterranean dietary practices represent a key contributor to exceptional longevity (Buettner, 2016).

Beyond individual food items, the Mediterranean diet is a systematic nutritional model centered on plant-based foundation, functional lipid sources and moderated diversified protein intake. Its health benefits come from the synergistic interaction of dietary components, food preparation methods and cultural eating practices, rather than isolated nutrients alone. In Spain, this dietary logic has formed mature practice models combining longevity-oriented eating patterns with related catering and tourism services.

2.3 Nutritional Challenges in Elderly Tourism Catering

With the rapid expansion of the silver tourism market, catering services have become a critical factor influencing both travel experience and health outcomes among older adults. International health policy and gerontological research consistently emphasize that inappropriate dietary intake may exacerbate chronic conditions, impair functional ability, and reduce quality of life in later years (World Health Organization, 2015). During travel, older adults are particularly vulnerable to nutritionally imbalanced meals due to standardized group catering arrangements, limited menu flexibility, and reduced opportunities for individual dietary adjustment.

Existing tourism catering research focuses more on service, cost and operation, and less on nutrition, digestibility and age-adaptive menus. From the lifespan innovation perspective, this imbalance leaves a structural gap between tourism services and healthy ageing goals. The lack of systematic dietary frameworks for elderly tourism catering requires nutrition-sensitive models that integrate health into routine catering rather than treating it as supplementary.

2.4 Culinary Education and Age-Friendly Dietary Design

Vocational culinary education plays a pivotal role in translating nutritional science into practical food service solutions. Interdisciplinary research suggests that culinary training should evolve from a narrow emphasis on taste, efficiency, and technical proficiency toward a comprehensive educational model integrating nutritional literacy, population-specific dietary design, and public health awareness (Sun & Li, 2023). Such a transformation is particularly important in ageing societies, where culinary

professionals are increasingly expected to support disease prevention and the maintenance of functional health through diet.

However, age-friendly dietary design is underrepresented in China's vocational culinary education. Limited relevant curricula restricts the catering industry's ability to meet demands of the silver economy and health-oriented tourism. Thus, strengthening this education is essential for innovating elderly catering services and aligning culinary training with healthy ageing strategies.

2.5 Research Gaps and Theoretical Contribution

A critical review of the existing literature reveals three key limitations. First, although longevity-oriented dietary patterns, such as the Mediterranean diet, have been extensively examined within public health and nutritional epidemiology, their systematic application within elderly tourism catering contexts remains limited (Trichopoulou et al., 2014; Domínguez et al., 2022). Second, relevant empirical research is scarce, restricting validation of age-friendly catering models. Third, the transformation of research outcomes to vocational education is insufficient, causing a disconnect between academic output and professional culinary training.

To address these gaps, this study proposes an integrated framework linking diet principles, elderly catering innovation and culinary education reform. It provides both theoretical insights and practical paths for the innovation of tourism services and vocational education.

3 Methodology

3.1 Research Design

This study adopts an applied research design and is explicitly positioned as an exploratory feasibility study rather than a confirmatory empirical investigation. Iterative dish adaptation and expert-informed evaluation were employed to examine the feasibility of age-friendly dietary innovation within real-world catering contexts. The research integrates dish replication, nutritional assessment, and educational translation within a unified analytical framework.

3.2 Experimental Dish Replication and Age-Friendly Adaptation

Building upon the structural dietary logic of the Mediterranean Longevity Diet, this study selected and reconstructed four representative dishes as experimental cases. The selection process was guided by three criteria:

1. consistency with Mediterranean dietary characteristics, including a high proportion of plant-based ingredients and the use of olive oil as the primary fat source;
2. suitability for the digestive and physiological characteristics of older adults;
3. feasibility of implementation within the practical constraints of vocational culinary education.

Dish preparation was conducted in a standardized culinary training kitchen by a research team comprising culinary instructors and enrolled students. During the reconstruction process, a series of age-friendly adaptations were systematically applied, including:

Table 1. Four Representative and Replicated Dishes

N o.	Dish Name	Nutritional Value	Core Longevity Concept	Age-Friendly Adaptation Points
1	Slow-cooked sea bass fillets with a gentle orange aroma	High-quality protein: 30 grams Monounsaturated fatty acids (Omega-3) : 200-350 milligrams	Rich in monounsaturated fatty acids and high-quality protein	Reduce the citric acid content, use low-temperature stewing to make the fish meat more tender, and strictly control the amount of salt added.
2	Braised Chinese cabbage with thyme, and button mushrooms	Dietary fiber: 3.5-4.5 grams	High in dietary fiber and plant protein, the button mushroom is rich in β -glucan, which has the functions of regulating immunity and prebiotics. The potassium content in Chinese cabbage is also high	Use "stir-fry and then cover and simmer" instead of stir-frying quickly over high heat. The steam is used to fully soften the cell walls of the cabbage leaves, reaching the standard that they can be easily picked up with chopsticks or the back of a spoon and do not require much chewing in the mouth. The natural umami flavor is constructed with button mushrooms.
3	Stewed beef shank with tomatoes and soybeans	High-quality protein: 40-45 grams Iron: 5-6 milligrams Calcium: approximately 140-160 milligrams	High-density high-quality protein, high-bioavailability nutrients, perfect complementarity of animal and plant nutrients, rich in calcium, and rich in lycopene	Long periods of gentle stewing have solved the physical problem of "inability to eat", and the scientific application of flavor substances has addressed the sensory problem of "not wanting to eat".
4	Roasted lamb cheese with vanilla nuts and mixed vegetable puree	High-quality protein: approximately 12 to 15 grams Calcium: approximately 250-320 milligrams	Dense calcium and high-quality protein, dense healthy fats (unsaturated fatty acids), and dense plant antioxidant nutrients	The vegetable purée is smooth and creamy. After baking, cheese turns soft, and chopped nuts add textural contrast. This dish needs little chewing and is safe to swallow, and fits the main health needs of the elderly, covering bone health, muscle maintenance, antioxidant intake, gut health and cardiovascular well-being.

This process served not only as a source of research data but also as a practical teaching component within the culinary professional curriculum.

3.3 Construction of the Elderly Tourism Catering Innovation Menu

Building on dish replication and conceptual analysis, this study developed a seven-day prototype menu for elderly-friendly tourism catering. Menu design was informed by longevity-oriented dietary principles and age-related physiological characteristics, with particular attention to moderated sodium levels relative to conventional group catering, reduced fat content through Mediterranean-style cooking methods, texture modification to support chewing and swallowing capacity, sufficient protein provision, and overall digestibility.

At the same time, the menu retained the basic structure and familiar flavor profiles of Chinese catering services. Key nutritional elements associated with the Mediterranean diet were selectively integrated in a contextualized manner rather than directly transplanted. This approach sought to balance nutritional suitability, cultural acceptability, and operational feasibility, thereby supporting the practical application of the prototype menu in elderly tourism catering contexts.

Table 2. Example of the 7- Day Prototype Menu Design (Day 1)

Meal	Dish Name	Main Ingredients	Design Rationale and Integration Concept
Lunch	Slow-cooked sea bass fillets with a gentle orange aroma	Sea bass, oranges, broccoli, low-erucic acid rapeseed oil	The low-temperature sous-vide cooking technique preserves high-quality protein, while canola oil contributes beneficial unsaturated fatty acids. This flavor profile, enhanced by the subtle citrus note of orange, is intentionally aligned with Chinese taste preferences, particularly appealing to the elderly palate.
	Braised Chinese cabbage with thyme, and button mushrooms	Chinese cabbage, button mushrooms, thyme	Fresh shiitake mushrooms were used to provide natural umami flavor, supporting a significant reduction in added salt. Napa cabbage, rich in nutrients and widely favored in Chinese cuisine, further enhances the dish's alignment with the tastes and dietary patterns of the elderly.
	Quinoa rice	Quinoa, indica rice	Quinoa mixed with rice, infused with higher-quality protein, dietary fiber and trace elements, serves as a solid foundation for the longevity diet structure of the Mediterranean.
	Steamed pumpkin	Old pumpkins, wolfberries	This dish embodies two core principles of the Mediterranean diet: the abundant use of colorful vegetables and the application of gentle cooking methods. It provides elderly individuals with a nutrient-dense, easily digestible option that poses minimal dietary burden.
Dinner			Pork cartilage, rich in collagen, and lotus root, known in traditional dietary therapy for its moistening and spleen-supporting properties, are simmered together for an extended period. This preparation directly addresses several common elderly needs: supporting joint lubrication, promoting digestive comfort, and providing a warm, soothing eating experience.
	Lotus root and cartilage soup	Lotus root, pig cartilage	

3.4 Nutritional Assessment

Nutritional values were estimated based on standard portion sizes and calculated using the China Food Composition Table. The assessment relied on comparative analysis rather than laboratory measurement. A certified nutrition professional conducted the evaluation, focusing on key indicators including energy, protein, fat composition, sodium, and dietary fiber.

3.5 Elderly Sensory Evaluation

The study recruited eight volunteers aged between 55 and 70 to participate in structured tasting sessions which was introduced to improve methodological transparency. Participants were asked to rate key attributes including flavor, texture, ease of chewing, and overall acceptance using a 5-point Likert scale (1 = very poor, 5 = very good). Due to the limited sample size, only descriptive statistics (mean scores and standard deviation) were calculated, and no inferential statistical tests were conducted.

3.6 Development of the 'Silver-Haired Diet Design' Course

The research is embedded in culinary professional education, ensuring relevance to teaching practice. Based on the research findings, the course module "Silver-Haired Diet Design" was developed, which systematically covers core contents of senior diet design. It aims to convert research findings into structured transferable knowledge and competencies. Relevant teaching materials have been compiled into a resource handbook, forming a complete pedagogical toolkit for training catering professionals to meet the demands of the silver economy.

4 Results and Discussion

4.1 Nutritional and Age-Friendly Analysis of Replicated Dishes

After the above experimental processes, analysis of the replicated dishes found potential advantages. The four adapted Spanish longevity dishes outperform conventional tourism group meals in nutrition and age-appropriate design. By cutting salt and oil and using gentle cooking, the dishes gain lower sodium, better fat composition and improved texture and digestibility. Blind tasting results show these health modifications do not reduce elderly participants' flavor acceptance, proving nutritional optimization and sensory appeal can be successfully combined in practice.

4.2 Thematic Analysis of Elderly Trial Tasting Feedback

The study involved eight local residents aged 55 and above in a series of trial tastings and semi-structured interviews. A thematic analysis of the interview transcripts, conducted following blind tastings, identified three predominant themes in participant feedback: a perception of lightness and lack of greasiness, an appreciation for the soft and easy-to-chew texture, and a reported low physical burden after the meal. Notably, several participants specifically mentioned not feeling thirsty after consumption, which indirectly validates the effectiveness of the implemented sodium control measures. This in-depth qualitative feedback suggests that the Mediterranean-inspired, age-adapted modifications are not only sensorily acceptable but are also perceived by the elderly participants as contributing to enhanced post-meal comfort and well-being. These findings are based on qualitative feedback and descriptive comparison rather than statistical validation.

4.3 Professional Verification Based on Nutritionist Assessment

A certified clinical nutritionist was engaged to perform a systematic nutritional analysis of the replicated dishes and the 7-day prototype menu, utilizing the ‘China Food Composition Table’ as the primary reference. The assessment verified that the designed meals complied with key elderly dietary guidelines, particularly in terms of controlled sodium content and adequate supply of high-quality protein. Furthermore, the analysis indicated a favorable shift toward a higher proportion of unsaturated fatty acids within the fat profile, alongside sufficient dietary fiber content. Although each nutritional indicator was assessed individually, the observed improvements should be interpreted within the context of the overall dietary structure, in which interactions among ingredients, cooking methods, and menu composition jointly contribute to nutritional suitability and elderly acceptability. This independent expert evaluation provided objective validation of the menu's health-promoting attributes, thereby reinforcing the credibility of the study's findings.

Table 3. Comparative Analysis of Key Indicators: Replicated Dishes vs. Traditional Tourism Group Meals (Based on expert assessment and qualitative feedback; no statistical testing applied)

Comparison Dimension	Common Issues in Traditional Group Meals	Core Improvements in Replicated & Adapted Dishes	Significance and Empirical Basis
Sodium Intake Control	Generally high, reliant on soy sauce, MSG, etc. for seasoning	40-50% salt reduction, using natural herbs, vegetable or fruit for flavoring	Tasting feedback: "not feeling thirsty after meal"; Nutritionist assessment confirms compliance with low-sodium dietary advice.
Fat Quality & Quantity	High cooking oil use, high proportion of saturated fat	Introduce extra virgin olive oil and use low-erucic acid rapeseed oil that suits Chinese tastes to reduce the total amount of cooking oil used	Increases proportion of monounsaturated fatty acids, beneficial for cardiovascular health and metabolic regulation
Texture Age-Friendliness	The standardization of ingredient cutting and cooking time is insufficient, and the texture is relatively hard	The system employs softening techniques such as stewing, braising, and low-temperature slow cooking to achieve a unified soft quality standard	Tasting feedback: "Soft texture, easy to chew." Adapt to the common situation of declining chewing function among the elderly
Protein Supply	It mainly consists of pork and contains less plant protein such as soy products	A balanced combination of fish, and beans can enhance the diversity of high-quality protein	Nutritional analysis shows that the protein supply is sufficient and the source is reasonable, in line with the principle of high-protein design
Dietary Fiber Content	The variety of vegetables is limited and they are mainly stir-fried in oil, resulting in significant losses	The intake of beans, whole grains and multi-colored vegetables has significantly increased, and light cooking is adopted	Nutritional assessment confirmed that an increase in dietary fiber content is beneficial for digestion and blood sugar stability

Subjective feelings after meals	Common feedbacks include "greasy, bloated, and strong in taste"	Tasters generally described it as "light and not greasy, with a light burden on the body".	Verify the effectiveness of low- fat, low-salt and soft design in enhancing the comfort of elderly people's eating
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4.4 Feasibility and Structural Evaluation of the 7 -Day Prototype Menu

The overall structure of the seven-day prototype menu was developed in accordance with five predefined principles: low sodium, low fat, soft texture, adequate protein provision, and ease of digestion. Daily alternation between animal- and plant-based protein sources, together with diversified vegetable selection and cooking methods, was employed to reduce both sensory and nutritional monotony commonly observed in conventional group catering.

From an operational perspective, the selected ingredients are widely available within standard catering supply chains, while the cooking procedures remain relatively simple and amenable to standardization. Portioning and serving processes were designed to be time-efficient and manageable within group meal settings. These characteristics indicate that the prototype menu demonstrates structural feasibility and practical potential for scaled implementation in elderly tourism catering scenarios.

4.5 Discussion: Dual Significance for Lifespan Innovation and Culinary Education

The findings suggest that catering services may serve as a potential intervention pathway for supporting healthy ageing. However, these implications should be interpreted cautiously due to the exploratory nature of the study.

5 Conclusion

5.1 Summary of Research Conclusions

This study provides preliminary insights into how longevity-oriented dietary principles may be adapted within elderly tourism catering contexts in China. Improvements in perceived healthfulness and acceptability were observed; however, these findings remain exploratory.

These conclusions should be interpreted cautiously due to the limited sample size and absence of statistical validation.

5.2 Practical Contribution to Lifespan Innovation

The practical contribution of this study lies in re-framing catering services from a supplementary component of the tourism experience to a potential intervention point for supporting healthy ageing. By proposing and empirically examining a seven-day prototype menu together with a standardized operational framework, the research demonstrates how key elements of the Mediterranean diet can be contextually integrated with established Chinese dietary practices in elderly tourism catering.

The findings suggest that nutrition science-informed, age-friendly dietary design can be operated within routine catering services in a manner that is both replicate and scaled. Rather than relying on individualized medical interventions, this approach highlights the capacity of everyday food service systems to contribute meaningfully to the extension of healthy life years.

5.3 Significance for Translation into Culinary Professional Education

Beyond menu innovation, this study demonstrates the feasibility of systematically translating applied research outcomes into culinary professional education. The developed “Silver-Haired Diet Design” course module integrates longevity-oriented dietary concepts, analysis of age-related nutritional needs, and age-friendly cooking techniques into a coherent instructional framework. Through this integration, research findings are transformed into structured educational content rather than remaining at the conceptual or experimental level.

This approach contributes to addressing structural misalignment between evolving market demands in elderly-oriented catering services and existing vocational training content. By embedding nutrition-informed and age-sensitive design principles into professional education, the study highlights a pathway for cultivating culinary practitioners equipped with both technical competence and health-oriented service awareness. In this respect, the research illustrates how applied academic inquiry can generate sustained value through educational system adaptation.

5.4 Limitations

This study is limited by its small sample size, lack of statistical testing, and reliance on expert-based nutritional estimation. Future research should incorporate larger samples, control groups, and longitudinal health outcome measurements.

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