

Research Report

How to preserve healthy aging through nutritional strategies: The new approach of the Food Social Network (Food NET) project

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Abstract.

BACKGROUND: Aging is a process that does not refer only to the accumulation of damage in a human being over time but rather to individual changes determined by genetic, lifestyle, social and environmental factors. Aging is one of the greatest known risk factors for most human diseases. An older person in good health has a good level of independence, weighs less on the national health system and plays a productive and active role in his/her community; thus, the concept of “healthy aging”, reflecting older adult-environment fit should be promoted. The interactions between lifestyle, including nutrition, and health play a fundamental role in the aging process; eating habits and eating behaviours are recognized as important modifiable factors potentially leading to a healthy “phenotype”.

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OBJECTIVE AND METHODS: A multidisciplinary consortium with three Italian universities (the University of Milano-Bicocca, University of Pavia and University of Calabria) and Italian Small-Medium Enterprises proposed the Food Social Network (Food NET) project. Food NET overall outcome is to achieve target-specific guidelines and exact technologies for accessible functional foods, aimed at improving the quality of life and nutritional status of citizens (aged>65) of the Metropolitan City of Milan (Italy).

CONCLUSIONS: This project is part of the “Smart Living” and food-related strategies aimed at responding to the needs of this target population, developing new food products, appropriate to meet the specific requirements and ensuring and promoting sustainable diets for healthy aging by effective food policy approaches.

Keywords: Food insecurity, functional food, healthy aging, nutrition assessment, nutrition policy

1. Introduction

Population aging is one of the most significant demographic phenomena of the 21st century all over the world [1]. Demographic change is an undeniable reality especially in Europe [2]. Indeed, at the beginning of 2018, 101.1 million older people (over 65 years) lived in the EU, equivalent to nearly one fifth (19.7%) of the total population [2]; this trend is expected to rise over the next three decades, reaching a peak of 149.2 million inhabitants in 2050, with a relative share of the total population projected to reach 28.5% [2].

Aging is a process that does not refer only to mere personal data but rather to genetic, lifestyle, social and environmental factors [3]. From a biological point of view, aging is characterized by i) progressive loss of cellular functionality and disadvantage resulting from environmental stress maladjustment and defence reduction; ii) decrease of functional reserves capacities and compensation mechanisms efficiency [3]. Aging, despite being a physiological condition, is responsible for body composition modification with muscle mass and strength decrease, which affects motor capacity leading to a consequent reduction of spontaneous and planned physical activity [3]. Aging also results in loss of sensorial functions that in turn may also increase cognitive impairment and impact motor capabilities [3]. Furthermore, defences disruption makes aging a high-risk phenomenon for the onset of numerous diseases, negatively affecting physical, psychological and social well-being [3].

Even if demographic changes severely affect society, especially public health and the retirement system, as reported by the European Commission [2] on the other hand they offer great opportunities for social interactions and aspirations [4]. Indeed, a longer lifespan represents an important window of opportunity, not only for the older adult and their families but also for societies as a whole, since longevity offers a unique chance to set new goals, including higher education or long-neglected wish fulfilment, making a valuable contribution to families and community [1].

However, it is important to acknowledge that the achievement of these goals is largely subordinate to health [1]. An older person in good health has a high level of independence, weighs less on the national health system (NHS) and plays a productive and active role in the membership community [5].

Therefore, the concept of “healthy aging”, reflecting older adult-environment fit, plays a key role in our society and should be promoted [5].

Over the years, there have been numerous attempts to give a clear definition of healthy aging that was defined as “*the process of developing and maintaining functional capacities that enable well-being in old age*” [5]. WHO report [4] also stresses that “functional capabilities” are determined by “intrinsic capabilities” (e.g. physical, mental and psychosocial abilities of the individual) and “environmental characteristics” (e.g. political, economic and social norms, values and resources, presence/absence of inequalities, accessibility to health systems) interactions. This definition recognizes healthy aging as a dynamic process rather than a threshold state of presence/absence of health [5].

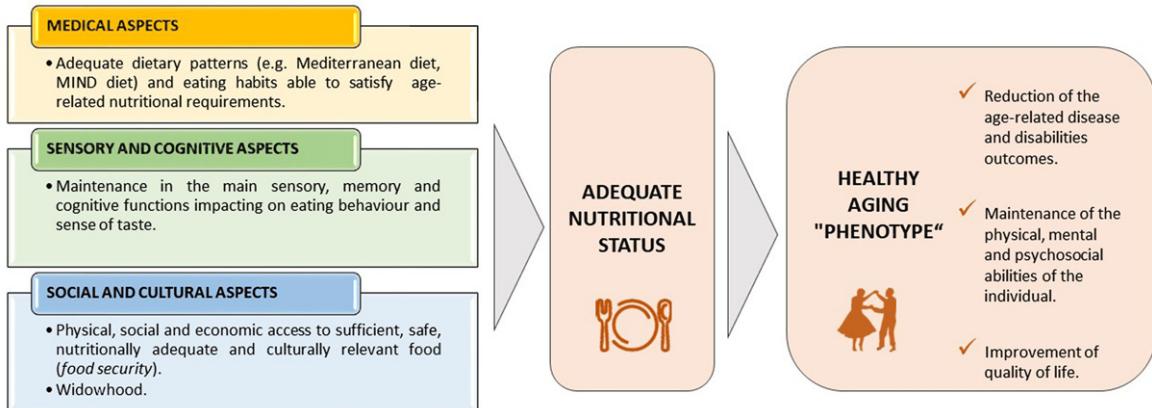


Fig. 1. Nutrition and healthy aging. Nutrition in the older adult plays a pivotal role in achieving and maintaining a healthy aging “phenotype”. To ensure the health and minimize diseases and disability outcomes, specific medical interventions are needed, including dietary recommendations and nutrient intake goals. However, to preserve an adequate nutritional status in the older adult numerous factors should be additionally considered such as sensory and cognitive aspects, as well as social and cultural factors.

Today, nutrition and health interactions, as parts of the aging process, are broadly investigated both from a scientific and clinical perspective and dietary habits as well as eating behaviour is acknowledged as important modifiable factors that can help to achieve and maintain a healthy aging “phenotype” [6]. Indeed, in modern society, the older adult, which embodies people aged 65 and older [4] is considered more vulnerable to inadequate nutrition than younger adults, since dietary intake in this target population is strongly influenced by clinical, social, environmental and economic factors [6].

From a biological perspective, aging is characterized by a low-grade inflammation, supported by altered oxidative balance and endocrine patterns modification contributing to significant changes in body composition, metabolism, immune response, neurocognition, and atherosclerosis and insulin resistance resulting in an increased risk of cardiometabolic diseases [7]. According to the Academy of Nutrition and Dietetics [8], the whole older adult, and not just the fragile, malnourished or sick ones, should have access to adequate nutrition and appropriate nutritional services. To ensure healthy aging and minimize diseases and disability outcomes, specific medical interventions are needed, including dietary guidelines and recommended nutrient intake fulfillment. However, to preserve an adequate nutritional status in the older adult, numerous other factors should be considered, such as sensory and cognitive aspects, as well as social and cultural factors [9] (Fig. 1), which finally impact the quality of life (QOL).

Studies so far conducted on QOL perception in this population showed that social condition and physical living environment play a key role, alongside health [9]. Evidence underlines that the context, which the older adult lives, does matter. Furthermore, the urban food system and food choices relationship based on expected health benefits have an intricate and multidisciplinary connotation inextricably knitted to the cultural background, which must be considered whether there is an intention to identify target-specific and effective public health interventions.

The Food Social Sensor Network (Food NET) project aims at satisfying the nutritional requirements of urban senior citizens by providing new food products more adequate to target specific consumers’ needs, as well as short-term and long-term food policies to reduce the risk of food insecurity in the older adult. This manuscript provides a brief overview of the novel approach for healthy aging promotion embedded in the Food NET project.

1.1. Healthy aging and nutrition: Medical aspects

Epidemiological evidence suggests that optimal nutrition plays a beneficial role in healthy aging and age-related disorders, also called Non-Communicable Diseases (NCDs), including cardiometabolic, neurodegenerative diseases and cancer [9].

However, as previously described [6], studies conducted on nutrients, single foods or food groups are very challenging starting from the possible endless interactions between dietary components that complicate the interpretation of outcomes both in prevention and treatment. Indeed, the isolated effect of a single food or nutrient may not be valid when it comes to maintaining a healthy aging phenotype as this can cover a combination of different pathways [6]. Again, in metabolic processes, foods and nutrients interact, acting in synergy or antagonism [6]. For this reason, nutritional studies have shifted focus from individual nutrients or food components to whole diets or dietary patterns, as they better account for interactions that are often difficult to identify [6, 9]. For instance, it has been well established [10] that Mediterranean dietary pattern (Mediterranean Diet, MD) has a beneficial impact also in the older adult suffering from chronic conditions related to cardiometabolic disorders as well as in mitigating risks related to mood disorders, including depressive symptoms [10]. Similarly, adherence to the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet, combining characteristics of the Dietary Approach to Systolic Hypertension diet (DASH), for blood pressure reduction and the MD with increased consumption of berries and green leafy vegetables, reported to be associated with a lower incidence of Alzheimer Disease, cognitive decline and subjective memory complaints [11]. Besides the importance of specific dietary patterns to reduce the age-related disease risk, the use of functional foods also looks promising in the older adult [12]. It is well known that functional foods, defined as any food in which definite macro- or micro-nutrients have been added for a specific functional purpose, may prevent or mitigate some pathological issues [12]. In the older adult, functional foods are often perceived as healthier than conventional ones and the willingness to consume them is generally high [12]. As previously hypothesized [12], this may be explained by the higher concern of the older adult with health and awareness of the beneficial impact of nutrition on health, however, there are also several barriers to functional food acceptance that should be acknowledged, including consumer's expectation on taste, cost of the products and presence of non-natural ingredients.

Based on this knowledge, one of the Food NET main objectives was to identify different types of nutritional needs, considering also health status and other lifestyle variables (e.g. quality of sleep, physical activity and smoking habits) of a cohort of 1066 senior citizens (active and independent people) over 65 years of age, living in the metropolitan area of Milan, Italy. To achieve this goal, different lifestyle variables were considered, by using previously validated questionnaires [13–15] while general information, including health status (medical history and medications), methods of food preparation and smoking habits, have been proposed to be investigated using a structure interviewed with multiple-choice/open-ended questions under the supervision of trained personnel. Adherence to a specific dietary pattern, including the Mediterranean Diet and the MIND dietary pattern, has been proposed to be investigated by validated questionnaires [11, 16]. Moreover, anthropometric variables, body composition and muscle strength were assessed.

The collected data were used to profile the nutritional status of the senior citizen, assessing macro or micronutrient deficiencies or inadequacies useful to identify functional foods not only to supply vitamins and minerals requirements but also to support their overall health status. Indeed, in Food NET, particular attention was given to innovative food fortification, exploiting plant matrixes rich in phytochemicals able to prevent phenomena associated with aging processes such as inflammation, oxidative stress and/or immune system response modulation. Specifically, the project envisages an agrifood sustainability approach aimed at the exploitation of minor agricultural species and food waste rich in compounds of nutraceutical interest. The selection of phytochemicals was carried out by targeting the nutritional needs of the senior citizen, while the extraction of the compounds was based on modern destructive technologies. More specifically, secondary metabolites such as glucosinolates and polyphenols have been selected for their anti-oxidant and anti-inflammatory activities and extracted from

different plant matrixes to empower a circular economy perspective of by-products valorisation, but also considering their bio-availability while targeting specific organs or tissues (e.g., after being processed by digestion). The ultimate goal is to design functional foods to be enriched with these phytochemicals, once their ability to reach specific tissues and to exert their nutraceutical properties has been verified.

1.2. Healthy aging and nutrition: Sensory and cognitive aspects

The binomial nutrition- *healthy aging* should not only consider dietary intake and nutritional requirements also but also sensory, cognitive and emotional functions.

The older adult presents a progressive decline in the main sensory, memory and cognitive functions, which has a strong impact on eating behaviour and the sense of taste [17]. It is worth noting here that our sense of taste should be considered within a multisensory context. In other words, what we consider taste is a complex process derived from the interaction between chemical (taste and olfaction), visual, tactile and auditory information in our brain [18]. Moreover, taste does not only depend on the food itself but also the eating context and people expectations [19]. Therefore, it becomes clear that in healthy aging multiple factors may affect people's dietary habits and perceptions. Aging may coincide with a declining gustatory function that can affect food choices at first and thus dietary intake with potentially negative health consequences [17]. Loss of taste is mainly caused by physiological changes (e.g., impaired olfactory acuity) and sometimes worsened by age-related events, such as polypharmacy and chronic diseases [20]. Although researchers are still debating on the degree and type of taste loss experienced by an older adult, they all agree that sour and bitter tastes are likely the most affected [20]. Again, several nutritional surveys have reported a significant prevalence of sweet foods (often soft and palatable) in the older adult habitual diet with possible health consequences due to excessive intake of sugars and energy leading to hyperglycaemia, obesity and related metabolic diseases [21]. Likewise, it has been reported that older adults who have difficulty detecting salty flavours increase their consumption of salty foods and season with more salt [21]. Noteworthy, the experience of taste arises from multiple sources of information and sensory impairments in sight, hearing and smell and can contribute to a deterioration in taste perception [21]; the loss of the visual, tactile and auditory components of the perception of food, as well as the loss of smell, significantly affect appetite, nutrition, physical and mental well-being [21].

Cognitive and emotional aspects also affect people's diet and food-related behaviours. For example, it has been shown that memories of past eating experiences affect food preferences, consumption and emotions and are likely to influence attitudes toward foods as well as everyday food-related behaviours [22]. Scientific results have even shown that attention, memory, language and metacognitive knowledge of personal capabilities can influence the results of sensory evaluations about food [23]. Once again, the relationship between cognitive functions and food behaviour is reciprocal, with dietary habits and food choices also affecting these functions. Although several studies concentrated on the effect of poor diets in the early stage of life (prenatal or first months of life) [24], growing evidence suggests significant effects of this variable during life span [25]. For example, it has been reported that short-term consumption (1–7 days) of an unhealthy diet (e.g., high saturated fat and/or high sugar) triggers neuroinflammatory processes in adults [25]. Similarly, adults who consumed a high-fat diet showed a reduction of focused attention and deficit of episodic retrieval (ER) and working memory (WM), after just 5 days from dietary change compared with those who consumed a standard diet [26]. Perhaps the passage of long-chain saturated fatty acids into the hypothalamus - one of the main brain structures of our memory system – also contributed to this phenomenon, ensuing an inflammatory response [27].

The above-mentioned evidence supported the integration of sensory, cognitive features and memory among the medical aspects to be considered in this cohort of *free-living* older adult volunteers enrolled in the Food NET project, suggesting that the assessment of neuro-cognitive and historical-biographical factors related to nutrition would help to design personalized tailored interventions, effective for improvement of health and wellbeing. In particular, neuropsychological and psychometrical tests [28] are useful to identify how age and cognitive decline might affect taste detection, unisensory, and multisensory flavour perception (throughout the combination of

visual, olfactory, acoustic and gustatory stimuli). Furthermore, it is worth verifying whether food choices are more influenced by emotional rather than rational variables.

Changing people's behaviour (and maintaining such change) is not a simple matter [29]; changing eating habits, especially in older adult, requires a deep consideration of a large number of variables, including sensorial, cognitive, motivational and emotional ones. This is why the investigation of such factors has been included in the Food NET project to complete senior citizens profiling and tailor effective strategies to improve people's diets, throughout the historical-biographical assessment, including interweaving of representations, experiences, images and memories that substantiate the experience of the older adult and guide their eating habits and dietary patterns. The survey, based on semi-structured questionnaires and medical history on a subsample of the target population, aimed at identifying how internalized educational models, experiences and emotional processes affect dietary pattern and quality of life.

These data are essential not only to tailor adequate nutritional interventions for citizens over 65 but also to promote healthy habits and provide a continuous care model establishing and maintaining a dynamic, flexible and continuous track to improve the citizens' lifestyle.

The results are also useful to define the most accepted palatability characteristics, considered pleasant by the subjects, to design functional foods that will likely be consumed to ensure greater effectiveness, affecting marketing methodologies.

1.3. Healthy aging and nutrition: Social and cultural aspects

Another important dimension to be considered, while discussing nutrition and the healthy aging domain, is food insecurity that affects food choices and dietary habits.

Food insecurity is described as the uncertain or limited physical, social and economic access of individuals and families to sufficient, safe, nutritionally adequate and culturally relevant food [30]; it affects not only low-income countries but also developed ones, especially in some vulnerable groups, such as the older adult [31]. Food security is closely linked to well-being as nutrition, food and food activities are associated with benefits in terms of health, identity-building processes and social participation [30]. The older adult may experience several constraints that hinder their ability to access healthy foods, such as physical and mental disabilities that prevent them from accessing food, due to decreased mobility [31], or long walking distance from the markets, as well as a lack of private transport mode or a reliable and efficient public transport [32]. A growing body of evidence also links food insecurity to higher rates of certain mental and physical health conditions, including depression, anxiety, diabetes and hypertension, as well as higher health care costs [33]. Food insecurity worsens the nutritional status, leading to negative health outcomes, especially in people where some diseases are strictly diet-dependent, such as diabetes or high cholesterol, which are more common in the older adult [33]. Additionally, individuals living in food-insecure households have cost-related non-adherence to medication, which likely reflects trade-offs between food purchases and other basic needs, such as medication [33].

Among the various factors to guarantee access to food, there is a widespread presence on the territory of markets in which to obtain fresh food [34]. However, when this is not guaranteed, food desert occurs [35], described as geographical areas where residents' access to affordable and healthy food options (especially fresh fruit and vegetables) is limited or non-existent due to the absence of grocery stores within walking distance [34]. Other studies suggest going beyond a simply transportation perspective and to put more emphasis on the social, subjective and cognitive aspects of being mobile. Besides spatial accessibility and geographical distance, other studies highlight the importance of the social, subjective and cognitive dimensions of access to food [36]. For instance, the perception of insecurity, the loss of cognitive familiarity with the residential environment are factors that can hinder the movement of the elders and their access to food. In this sense, the older adult's ability to reach affordable and healthy food is more related to the age-friendly degree of the residential environment [37].

Besides, the eating habits of older adult are also influenced by other factors, such as the grief for the loss of life companions. Such kind of event has been related to subsequent poor nutrient intake and diet quality [32];

older adult widowers are indeed at greater nutritional risk than married ones [38]. Furthermore, socioeconomic status affects dietary habits with lower incomes associated with reduced diet quality [39]. Economic and public health evidence suggests a relationship between food prices and dietary patterns [39]; indeed, based on the price per calorie, fresh products are more expensive than energy-dense processed foods [39]. Furthermore, previous results highlighted that food price impacts food choice and greatly affects individuals from low-income areas [32].

Starting from this knowledge, the Food NET project aimed at assessing food insecurity in the metropolitan city of Milan by identifying the barriers that hinder senior citizen's food access, according to their characteristics. In particular, in the analysis of food accessibility, a location-based specific walkability index [40] was adopted and applied. Briefly, the index synthesises the main factors associated with pedestrian mobility, such as food stores density and attractiveness of services for older people (e.g. pharmacies, community and social centres, unions of pensioners, physicians, green areas), the connectivity of the road network and the incidence of walkable roads within distances accessible on foot (the maximum threshold used corresponds to a 12-minute trip at a speed of 0.9 m/s) [40]. In the Food NET research, information on food accessibility and environmental perceptions, the commute modes to reach food destinations as well as the relational context of commuting, purchasing and consuming food, have been collected on a representative sample of volunteers. Senior citizens profiling was completed by the analysis of social participation and other socio-demographic variables (e.g., age, sex, household type, socio-economic status). The results were then exploited to support urban food policy by identifying potential food deserts within the metropolitan city as well as the age-friendliness of the residential food environment. Furthermore, the attention paid to the social and individual dimensions of food access has favoured the definition of more appropriate interventions for improving access to food and QOL of senior citizens.

2. Methods: The food NET project

Food Social Sensor Network (Food NET) (<http://www.food-net.it/>) is a multidisciplinary project bringing together three Italian Universities (University of Milano-Bicocca; University of Pavia; University of Calabria) and nine Small-Medium Enterprises (SME) of Lombardia Region (Aton Informatica, <http://www.atoninformatica.it> ; Amita Health Care Italia, <https://www.amitahc.com> ; Balance, <https://balanceconsulting.it> ; Complife Group, <https://complifegroup.com>; Design Group Italia, <http://www.designgroupitalia.com> ; EPO-Estratti Piante Officinali, <http://www.eposrl.com>; FEM2-Ambiente, <https://www.fem2ambiente.com> ; Flanat Research Italia, <http://www.flanat.com>; IT Food).

The overall outcome is to achieve specifically targeted guidelines and exact technologies for accessible functional foods, aimed at improving the quality of life and nutritional status of the free-living older adult (aged>65) in the Metropolitan City of Milan (Italy).

The project benefits from a well-constructed *consortium* with many universities with expertise in the field of nutrition, sociology, botany, chemistry, cellular biology and psychology as partners, besides some small and medium enterprises with competencies in different fields, such as medicinal plants, molecular identification of species, nutraceutical products formulations, design, informatics and digital technologic processes.

2.1. How food NET preserve healthy aging through nutritional strategies?

The "World Report on Aging and Health" [5] not only defined healthy aging but also identified the actions necessary for its achievement or maintenance through the improvement of intrinsic and functional capabilities. Among these actions, the report indicates the importance of i) aligning health systems to the real needs of the older adult population, building multidimensional and integrated systems able to take into account the frequent

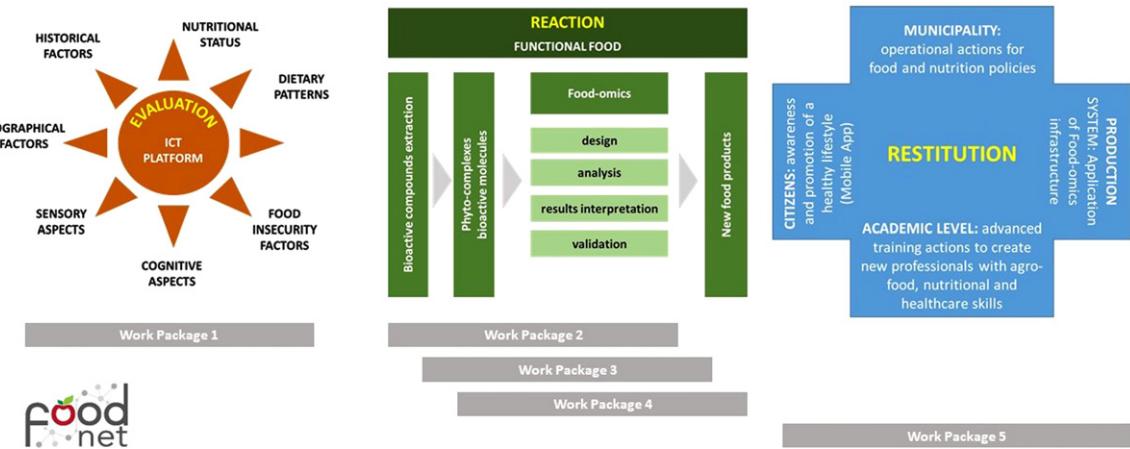


Fig. 2. Food NET project structure: three phases and five work packages. The Food NET project comprises three phases, i) Evaluation, ii) Reaction and iii) Restitution, besides five WP. Evaluation (WP1) aimed at the targeting nutritional status of the free-living older adult and at developing context-specific indicators, that measure healthy aging. This activity is planned to be supported by an ICT platform able to interpret the senior citizens' nutritional needs. Reaction (WP2-WP4) aimed at structuring an organized industrial chain from raw materials to finished food products (functional food) for the specific requirements of the free-living older adult-specific requirements, as well as measuring the impacts of dietary efficacy and lifestyles changes over time. Restitution (WP5) aimed at tackling several aspects, including food policy, education, academic training and public engagement.

comorbidities occurring in the older adult and ii) including them in intervention and observational studies to monitor their health status and needs [5].

Food NET aims to undertake both actions through i) identification and interpretation of specific target consumers' nutritional needs ii) identification of novel favouring process and product innovation by agro-food companies and iii) implementation of both nutritional status and quality of life of senior citizens through functional foods, nutritional models and educational processes aimed at achieving and maintaining healthy aging.

To achieve these objectives, the project comprises three phases, i) Evaluation, ii) Reaction and iii) Restitution, besides five work packages (WPs) (Fig. 2).

2.2. Phase 1: Evaluation

This phase was planned to address the nutritional status of the senior citizen and develop context-specific indicators, including dietary, nutritional, cognitive, emotional, cultural and socio-territorial features that measure healthy aging. All these activities were supported by an ICT platform containing and interpreting the older adult nutritional needs (e.g. nutritional status, dietary patterns and food insecurity aspect) and other cognitive, sensitive, personal, historical aspects obtained through surveys. These data were then standardized and aggregated into a single dataset to allow the execution of scripts that calculate statistical indices on the answers provided by each user. A fixed score was assigned to each answer for the calculation of further statistical indices. Besides, the ICT platform contains a series of data that have been appropriately collected, modified and integrated through more than 30 automatic processes developed to collect different types of information. For example, data about large and medium-sized authorized sales structures, pharmacies, food groceries store and markets, public transport in Milan (e.g. surface line stops and timetables, underground stops and routes) were collected, filtered, cleaned of non-essential information and saved.

2.3. Phase 2: Reaction

The *Reaction* phase was planned to design, implement and evaluate the efficacy of functional foods able to address specific target nutritional needs identified in the *Evaluation* phase as well as measuring the impact of food efficacy and lifestyle changes over time. In this context, the acceptability and hedonic aspects of food have been also taken into account in the design of functional food.

The overall purpose was to structure an organized industrial chain from raw materials to food products to provide and test new foods (functional food) for consumers' specific requirements. Secondary objectives i) to identify and extract bioactive phytochemicals (also from waste vegetable matrices) to produce functional foods; ii) to identify eco-sustainable procedures to optimize bioactive compounds extraction also from industrial waste; iii) to build innovative technical-scientific infrastructure, named "Food-omics platform" to identify and develop functional foods.

The Food-omics platform was made up of analytical facilities aimed at isolating and testing the efficacy of nutraceutical products of plant origin (i.e., high throughput extraction systems of secondary compounds from plant wastes or raw matrixes; mass spectrometry and NMR based analytical systems for the chemical detection and quantification of phytochemicals; *in vitro* and *in vivo* model systems to investigate the bioactivity of isolated compounds and/or phytocomplexes). Food NET suggests sustainable solutions to improve nutritional status in the older adult, using new healthy safe and palatable food products (e.g. snacks, supplements, etc.), in response to market demands by ensuring access to nutritious foods through a personalized nutritional approach.

2.4. Phase 3: Restitution

The *Restitution* phase was planned to tackle several aspects, including food policy, education, academic training and public engagement. For this reason, Food NET intends to i) defining operational actions for territorial governance, supporting the Municipality of Milan in the field of food and nutrition policies; ii) applying the Food-omics infrastructure through the spread of best practices and expertise for food safety control in the production system supporting product innovation activities; iii) developing advanced training actions to create new professionals with agro-food, nutritional and healthcare skills; iv) targeting specific educational software packages for smart devices (e.g. mobile-app) at the population-wide level to increase the awareness and to promote a healthy eating and lifestyle (smart living). In particular, the mobile app was conceived with the dual purpose of increasing food awareness redefining the eating habits of the senior citizen and creating social engagement by providing information and encouraging their sharing. Indeed, introducing a social engagement component makes it possible to build a community focused on food wellbeing and a healthy lifestyle; sharing and discussing with other people is considered as an engaging element able to support users in improving their habits.

3. Conclusion

In summary, interactions between nutrition and health play a fundamental role in the aging process; eating habits and behaviours are acknowledged as important modifiable factors that help in achieving and maintaining a healthy "phenotype". The Food NET project fits perfectly into the context of healthy aging taking care to prevent or slow down the development of NCDs and to increase awareness of the importance of healthy habits in the population. The project takes up the challenge by contributing to developing smart living environments for aging people who are the most exposed to inaccessibility to food resources and malnutrition risk, with serious effects on health, well-being and social participation.

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Conflict of interests

Rachele De Giuseppe is an Associate Editor of this journal, but was not involved in the peer review process, in fact she wasn't yet an Associate Editor at the time of submission of the paper.

Ethics

Within the Food NET framework, activities involving human subjects were approved by the Ethics Committee of the University of Milano-Bicocca (protocol 410LABRA, 09/21/2018).

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