

Assessing and Improving Older People's Food Accessibility: The Case of the Food-NET Project in the Metropolitan City of Milan

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Abstract

The paper presents the main results of “Food Social Sensor Network - Food NET”, a R&I project supported by the Lombardy Region (POR FESR 2014-2020) that aims to build a platform to provide guidelines and technologies to improve food access and to create functional food for over 65 years old citizens living in the Metropolitan City of Milan. Access to healthy food, defined as the ability of people to consistently acquire, both physically and economically, sufficient amounts of healthful food, significantly affects older people's wellbeing and quality of life. In recent years, there has been an increasing awareness of the key role played by urban environment in influencing the level and quality of food access and older people's quality of life. In this framework, Food-NET evaluated the conditions of older people's food access in the Metropolitan City of Milan from different perspectives (e.g. spatial, socio-economical, medical-nutritional). The aim has been to identify the factors on which to intervene to ensure food accessibility and healthy aging through flexible and socially acceptable interventions. In this sense, the outcomes of the project will also be made available to policy makers, stakeholders and over 65 years old citizens through the development of an ICT platform and a Mobile App.

Keywords: Older People, Food, Accessibility, Milan, Policies, ICT

Introduction

The paper presents the main results of “Food Social Sensor Network - Food NET”, a R&I project in the domain of “Smart Living and Communities” supported by the Lombardy Region (POR FESR 2014-2020) that aims to build a platform to provide guidelines and technologies to improve food access and to create functional food for over 65 years old citizens living in the Metropolitan City of Milan.

Access to healthy food significantly affects older people's wellbeing and quality of life (Zajczyk, 2018). In fact, nutrition and food activities are associated to benefits in terms of health, identity-making processes and social participation. In recent years, there has been an increasing awareness of the key role played by urban environment in influencing the level and quality of food access (Moragues-Faus and Morgan, 2015) and older people's quality of life (WHO, 2007).

Food access is the ability of people «to consistently acquire, both physically and economically, sufficient amounts of healthful food» (Armstrong et al., 2009: 4). Older people may experience several barriers that hinder their ability to access to healthy food. These are due mainly to the physical impediments caused by the process of body's common biological decline, but a relevant role is also played by the relation between these physical constraints, specific of the individuals, and the urban's time-space characteristics, acting as a further determinant factor, able to enhance or limit individual functionings reach.

In this framework, Food-NET evaluated the conditions of older people's food access in the Metropolitan City of Milan in order to identify the factors on which to intervene to ensure food accessibility and healthy aging through flexible and socially acceptable interventions. In the evaluation phase food stores' availability, pedestrian accessibility and walkability, motility, physical activity and eating habits were considered as well as social participation and capital, and other socio-demographic variables (age, sex, household type, socio-economic status). After discussing the results of the analysis, the paper ends with the presentation of the way in which the outcome will be returned to policy-makers, stakeholder and the older people. Namely, the

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outcomes will also be made available to policy makers, stakeholders and over 65 years old citizens through the development of an ICT platform and a Mobile App.

1. Literature review

1.1 – Food access and older people's quality of life

Access to healthy food significantly affects the wellbeing and the quality of life of individuals (Bell et al., 2013; Corvo and Fassino, 2015), as nutrition and eating are associated to benefits in terms of health conditions, identity-making processes (Caplan, 1997) and social participation (King et al., 2004). In recent years, food access has been acknowledged as a fundamental human right ([Charter of Milan, 2015](#)) and there has been an increasing awareness of the key role played by urban environment in influencing the level and quality of food access (Morgan, 2009).

In an ageing society, the promotion of older people's access to food opportunities is an issue that needs to be addressed. Ageing is a universal, progressive, endogenous and degenerative process, which limits the autonomy of people. It manifests itself with the difficulties to move and carry out the activities of the everyday life, such as to reach, purchase, prepare and eat adequate food.

Access to food is a topic of particular concern to the older people, given that nutrition plays a major role in active aging, that is the «process of optimising opportunities for health, participation, and security in order to enhance quality of life as people age» (WHO, 2002: 12). An adequate nutrition is able to enhance the quality of life by preventing diseases. Furthermore, meals provide a central context for social interaction (Moss et al., 2007) and food is involved in many older people's meaningful activities (Plastow *et al.*, 2015). At the same time, the progressive decline of older people's autonomy and independence may limit their ability to access to food activities, restrict their participation in situations involving food, and increase the risks of malnutrition (Chung *et al.*, 2012). Among older adults are those who are 75 years old or older that are more exposed to the risks of inaccessibility due to their greater frailty. However, it would be a mistake to interpret old age only in terms of frailty and vulnerability. As a matter of fact, due to the ageing of society, the older population is becoming more numerous, but also more varied. In other words, despite being exposed to the risk of inaccessibility and worsening quality of life, the older people, even those aged 75 and above, have different competences and resources to access to food.

1.2 - The dimensions of food accessibility for older people

Accessibility is the «ability of people to reach and engage in opportunities and activities» (Farrington and Farrington, 2005: 2). In these terms, food access can be defined as the ability of people «to consistently acquire, both physically and economically, sufficient amounts of healthful food» (Armstrong et al., 2009: 4).

In the Western capitalist advanced societies, the issue of inaccessibility to food opportunities first emerged in Anglo-Saxon countries. It was here that scholars first referred to food deserts (Walker et al., 2010): areas where the physical access to food opportunities by different modes of transportation is difficult due to the absence or scarcity of food stores and of transport opportunities.

The attention gradually shifted to the issue of economic accessibility (affordability), given that food, which is otherwise accessible, may not be purchased because of financial obstacles. In this sense, a food environment characterized by a good supply can transform into a food mirage (Breyer and Voss-Andreae, 2013), especially for the most deprived groups.

More in general, food mirages also include inaccessibility to food opportunities caused by an array of factors, such as a loss of cognitive familiarity with the urban environment (Ramadier, 2010), a weak mobility capital, or motility (Kaufmann et al., 2004), or a weak purchasing and consumption awareness, that is information, knowledge or skills necessary for locating, buying, and cooking food. Armstrong et al. (2009) identify five main variables (5-As) that contribute to define the individual food-ability:

- 1) availability, in the urban food system of sufficient food and shops to meet the population's nutritional needs;
- 2) accessibility, i.e. older people's capacity to reach food resources in appropriate times;

- 3) affordability, which results from the relationship between food prices and purchasing power of households;
- 4) awareness, i.e. knowledge and skills needed to identify, reach, acquire, cook and consume food;
- 5) appropriateness, or the capacity of food to meet specific needs or preferences (e.g. diabetes, gluten-free, functional foods, veg, etc.).

Older people may experience several barriers that hinder their ability to access to healthy food. These are due mainly to the physical impediments caused by the process of body's common biological decline, but a relevant role is also played by the relation between these physical constraints, specific of the individuals, and the urban's time-space characteristics, acting as a further determinant factor, able to enhance or limit individual functionings reach. The peculiar features of the built environment can in fact act enlarge or restrict the amount of personal capabilities, as conceived in the Capability Approach (Sen, 1985) proper of the actors, being included among the "conversion factors" (personal, social and environmental) able to transform resources into functionings (Kuklys, 2005).

Firstly, they face several barriers to mobility (Risser et al., 2010). They may have more problems to reach food opportunities due to physical disabilities or impairments (Huang et al., 2012). Senior citizens are also one of the most vulnerable mobile populations in the urban traffic according to road accident data. Older people have more security- safety-related issues and they are more likely to lose cognitive intimacy with the urban landscape (Susilo et al., 2012). Consistent with these observations, urban studies devote increasing attention in how to make cities enabling environments, able to guarantee accessibility to opportunities and the elderly people's quality of life, in spite of their reduced autonomy and capacity for mobility. For instance, the World Health Organization has highlighted the need to build age-friendly cities and communities (WHO, 2007). In this direction are also the studies on pedestrian environments or communities (Litman 2003), healthy neighborhoods (Barton et al., 2003) or therapeutic landscape (Doughty, 2013). As all the studies show, enhance the walkability of the urban environment and strengthen the ability of people to reach (food) opportunities is crucial to improve the elderly people's quality of life (King et al., 2011).

Furthermore, food affordability can be a concern for older people. The elders' frailty could also manifest itself in the difficulties to cook, eat/digest healthy food (Bales and Ritchie, 2002). Finally, the frailty of the older adult could be even greater for seniors living alone, who can not benefit from the support of family and social networks to carry out the activities of the everyday life.

1.3 – Methods for the evaluation of food accessibility

The methods for detecting accessibility to food follow the multifactorial nature of the concept of accessibility (Neckerman et al., 2009; Black et al., 2014; Shannon, 2016). Among these it is possible to distinguish between *location-based* approaches, in which accessibility refers to places taking into consideration spatial distribution, distances and travel costs, the type of food products and stores available, and *individual-based*, which focus on the subject taking into account individual's needs, space-time constraints, financial resources, cognitive and physical skills.

By limiting attention to the location-based approaches - and referring to other works for a more in-depth review (Geurs and van Wee, 2004) - it is then possible to distinguish between subjective methods, such as the surveys on individual perception of the availability and accessibility of neighbourhood food resources, and objective, such as the analyses using GIS (Charreire et al., 2010).

Within the latter group, food accessibility to food is defined in terms of density or proximity of the stores or by integrating the two perspectives. Density-based approaches analyse the availability and features of stores and food products within delimited areas (e.g. neighbourhood, census section, buffer built around the home or store) through measures such as: the total number of food stores, stores per inhabitant or per sq. km or the Kernel Density Estimation (Boffi, 2004). The proximity approach, on the other hand, assesses the accessibility of the food supply from the residential locations by means of geographical distance (as the crow flies or Euclidean) or temporal (access times based on the actual transport network and mode of mobility).

2. The FoodNET project: aims, methods and outcomes

[Food Social Sensor Network](#) (Food NET) is a R&I project supported by the Lombardy Region in the framework of the program *POR FESR 2014-2020 - Agreements for Research and Innovation* and involves 3 Universities and 9 SMEs. The project aims to respond to the needs of the territory and its inhabitants by building an ICT platform capable of collecting, processing and interpreting information on accessibility to food, consumption behavior, eating habits, health conditions and the lifestyle of citizens with 65 years and more residents in the metropolitan city of Milan.

For the promotion of the well-being of older citizens through effective interventions, it is essential to integrate into consideration the dietary-nutritional, socio-territorial, psychological and cultural dimensions linked to the nutrition of the older population. This is the key element for planning smart cities strategies of resilience and reaction, in order to define specific, culturally acceptable policies, recommendations, educational processes and process and product innovations. In this sense, the project is structured in three phases (Fig. 1): 1) Evaluation, 2) Reaction, 3) Restitution of results.

Fig. 1 - The phases of the FoodNET project (Source: authors' elaboration)



In this paper, the attention will be focused on the evaluation phase (Food Sensor) and, in conclusion, on the methods and content of the phase of restitution of results to the territory and citizens.

The project is based on a GIS-based spatial analysis of open data about territorial and food environment features and a survey conducted by the University of Milan Bicocca and the University of Pavia in which 800 interviews were collected with questionnaires from over 65 residents in the metropolitan city of Milan. The non-probabilistic sample was divided by gender and according to three age groups (i.e. 65-74, 75-84, 85 and over) and reflects the characteristics of the older population in Milan. In this paper the focus concerns the following indexes considered during the project's evaluation phase:

- 1) *food availability* through a location-based index that synthesises the amount, size and variety of food stores (Daconto, 2017);
- 2) older people's *perceptions* regarding *pedestrian accessibility* and *walkability* of the food environment, collected by adapting the ALPHA environmental questionnaire (Assessing Levels of PHysical Activity, Spittaels et al., 2010)²;
- 3) *motility* (Kaufmann et al., 2004) and *mobility* (Colleoni, 2016), that is: a) the mobility capital at disposal of older individuals ; b) the travel modes used to reach food resources; c) the places, times and frequency of food purchase; d) the relational context of travel, purchase and consumption;
- 4) the *lifestyles* by assessing the level of older people's physical activity using the International Physical Activity Questionnaire - IPAQ (Mannocci et al., 2010);
- 5) the *eating habits* through the analysis of food consumption frequencies and an index of Healthy Food Habits (ISA) constructed on the basis of the guidelines of CREA (2018).

² We included 25 items (out of the 49 total) on the following dimensions: a) distance to local food facilities; b) neighbourhood's walking infrastructure; c) maintenance of neighbourhood's walking infrastructure; d) neighbourhood safety; e) pleasure and aesthetics.

Older population profiling is completed by the analysis of social participation and other socio-demographic variables (age, sex, household type, socio-economic status).

The aim of the analysis is three-fold: 1) to define the features' of the food environment older people have access to in the Metropolitan City of Milan; 2) to identify the barriers that hinder older people's food access according their characteristics; 3) to assess the influence played by the features and perceptions of the food urban environment on the mobility, lifestyles and eating habits of the older population.

3. Results

3.1. Potential food deserts, mirages and oasis in the Metropolitan city of Milan

The joint spatial analysis of the index of Food Availability (Fig. 2) with those of Socio-Economic Status and Older People's Density (Fig. 3) made it possible to identify different types of food environments within the metropolitan city of Milan to which individuals, especially the older ones, potentially have access to. Specifically, the following type of food environment were identified:

1. *potential food desert*, which can be defined as the areas that have the lowest values of the food availability. Considering the characteristics of the resident population, these can be found in areas with a lower socioeconomic status, as in the case of many municipalities in Alto Milanese and Magentino Abbiatense. Others can be also found in high-status areas, such as in the case of Basiglio (Sud Ovest). It should be noted that some of the potential food deserts are also areas of concentration of the older people, as in the case of the municipalities located in the northern part of Alto Milanese;
2. *potential food mirage*, defined as the areas that despite having high values of food availability, have lower values of the SES index and, therefore, are more exposed to the risks of financial inaccessibility. Following these criteria, within the metropolitan city potential food mirages are found in Rho (Nord Ovest), Noviglio (Magentino Abbiatense), S. Giuliano (Sud Est), Pioltello (Adda Martesana) and many municipalities in the homogeneous area Nord Milano;
3. *potential food oasis*, or the areas where there are the best accessibility conditions. These areas are located in the most inner parts of the metropolitan city, in particular in the municipality of Milan and in those bordering it. In socioeconomic terms, these areas are characterised by the prevalence of higher status. In addition, these are territories where there are concentrations of residents aged 65 and over.

Fig. 2 - The distribution of the Food Availability index in the Metropolitan city of Milan (Source: authors' elaboration on data Regione Lombardia, 2019)

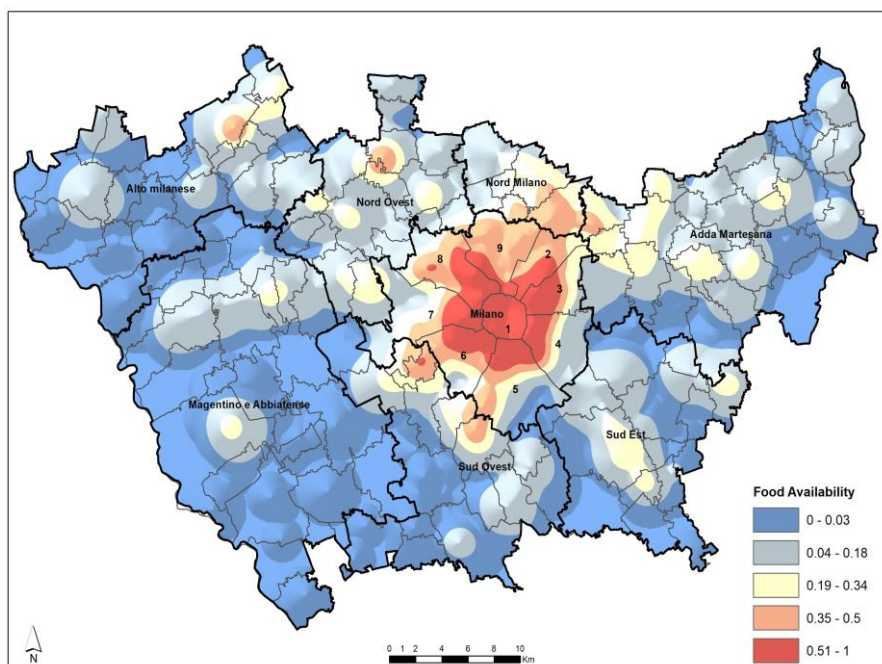
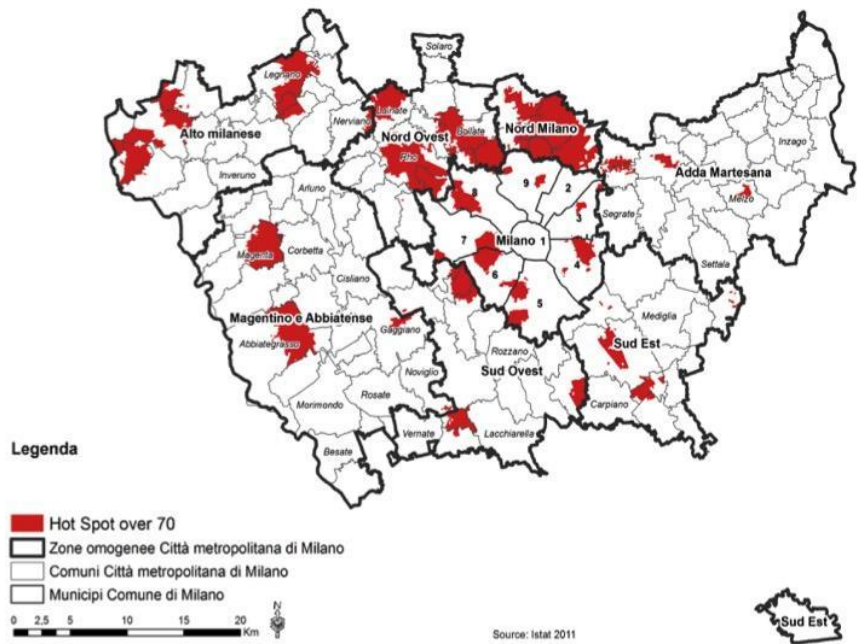


Fig. 3 - The hotspots of older people in the Metropolitan city of Milan (Source: authors' elaboration on data ISTAT, 2011)



3.2. Food accessibility: the older people's perception about the food supply and the walkability of residential environments

The respondents' perception about the accessibility of the food supply is generally good. The main critical aspects detected refer to the number of accessible food stores and to the affordability of food (Fig. 4), especially for the respondents aged 85 and over and for the residents in the peripheral areas of the Metropolitan city. From a spatial perspective, therefore, the question is not that of food deserts, but that of a poor food environment, where the choice of food stores is limited. The good spatial proximity of the food environment is confirmed by the times declared for reaching by foot the different food stores (Fig. 5).

Fig. 4 - The older people's perception about the food environment (Source: authors' elaboration)

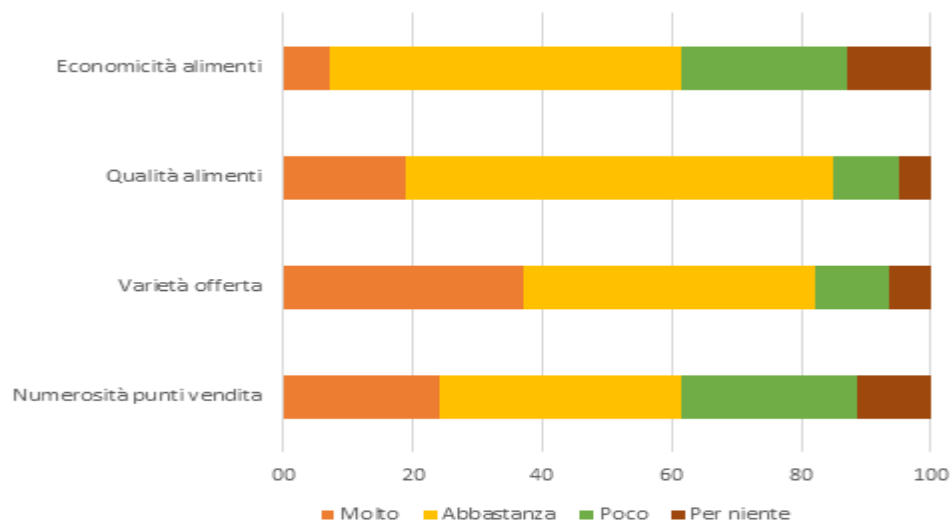
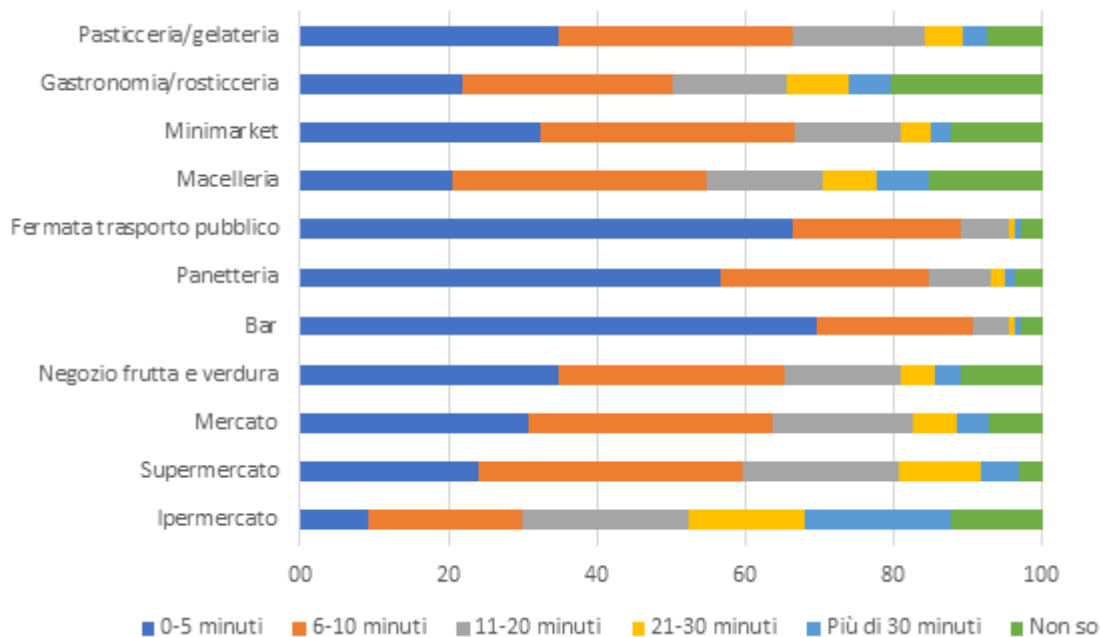


Fig. 5 - The perceived walking times for reaching various food stores (Source: authors' elaboration)



Considering the relevance of mobility and walking in particular for the older people's quality of life, we decided to deeper analyze the respondents' perceptions related to the walkability of their daily life contexts: even if we did not mean to perform a causal analysis the study of relations between the Alpha Index, measuring the perceived walkability of life contexts and other socio-demographic properties could give us some insights regarding the drivers promoting or limiting active mobility (and so accessibility to near food opportunities). The analysis showed the existence of a relation between the perceived walkability and several other variables, describing interesting scenarios and opportunities for further studies. A significant positive relation for example exists between the Alpha Scale and the perceived health status of the respondents, highlighting the relation between personal physical conditions and propensity to walk. This trend is somehow supported by the negative relation between perceived walkability and age: older the person (and so potentially lower the health status), lower the level of walkability as perceived by the respondent. Also the BMI seems to be related to the Alpha Scale, showing that underweight and obese people (so the pathologic categories of the BMI scale) perceive more often their living context as poorly walkable. The relations between BMI, age and perceived health are in fact quite strong and highlight the collinearity of these dimensions. As an example about half of the sample is normal weight (47%), but the share of over 65 overweight (41%) is significant, just as the obese population (10%) is not negligible.

Besides physical issues, those who are more socially integrated in the local context record usually a higher degree of perceived walkability, at least this is what emerges from the analysis of the relation between the indicator of Social Participation³, for which higher the frequency of participation, higher the perceived walkability. A positive link exists also with the educational level: respondents with higher degrees score also higher on the perceived walkability. Of course there is also a potential correlation between physical and social conditions if we consider that the proportion of older and lower educated individuals that declares a bad health is double with respect of those between 65-74 years of age and with higher education.

No significant differences are recorded from the correlation analysis between perceived walkability and gender, the level of social capital⁴ and the household composition.

³ the indicator, based on the answers given to the question "During the past month, how often have you ever participated in a cultural, membership, political, social or recreational activity?", consists of a 5 steps scale going from "never" to "many times a week".

⁴ this property is measured through an index, ranging from 0 to 4, composed by 4 dichotomous items detecting the existence of anyone in the social network of the respondents able (1) to "give advice on important matters"; (2) "take care of themselves in case of serious health problems"; (3) "help in daily activities (housework, shopping, travel)"; (4) "be with them to talk about the day or chat".

From our data a last positive, even if weak ($P= 0,143$, $\alpha=0,01$), relation can be detected with the mobility capital index⁵, when weighted for the declared physical capacity to manage daily activities⁶, that we considered as a further component of the mobility capital detecting the *Competences* dimension, able to translate into reality the potential mobility given by the availability of means and services (Kaufman et al., 2004). According to our results higher the motility, and so the possibility to move, higher the perceived walkability of the living environment.

3.3. Older people's motility, styles of access and eating habits in the Metropolitan city of Milan

From the motility point of view the sample is characterised by a wide amount of people (84,5%) able to access to at least one mobility solution among those considered in the interviews: car, bicycle, public transport (PT). At a deeper look anyway the figure shows a higher complexity if we consider the effects of other variables like sex (females scores more often lower levels of motility than males), age (the older the person, the lower its motility) or educational level (that is linked often to the social status), with low educated elders scoring lower levels of motility. Almost the 71% of the sample (more among the males than females) has got a driving licence (even if only the 63,6% declared to have concretely access to a car), but the sample shows as well a good potential to access to active mobility if we consider that half of it declare to potentially use it (49,2%). Regarding the use of PT only 1/3 of the sample has a seasonal ticket (33,2%), more females, while no (significant) differences are recorded according to other variables like the age.

The food stores reached by the interviewees, especially supermarkets (78%), represent a reference in the daily life of older people since they reach them, especially by car as a driver or passenger (58%) and on foot (33%), several times a week (62%). The relationship between modal choices is significant from a statistical point of view with respect to respondents' age, sex, household type and residential location. Specifically, young elders (65-74 years, 67%), men (72%) and those who live with their partner (72%) or with their children (82%) access with private motorized modes. Active mobility, in particular on foot, is instead a characteristic of subjects aged 85 and over (62%), women (40%), those who live alone (51%) and in contexts with a higher residential and food supply densities.

Beyond the different modal choices and frequencies of access to food stores, solitude is an element that distinguishes the relational context of this food activity. 52% of the sample goes shopping alone and this percentage increases significantly for those who live alone, with increasing age, for women and for those with a lower social capital. This relational poverty is also confirmed by including the social context in which the main meal is eaten.

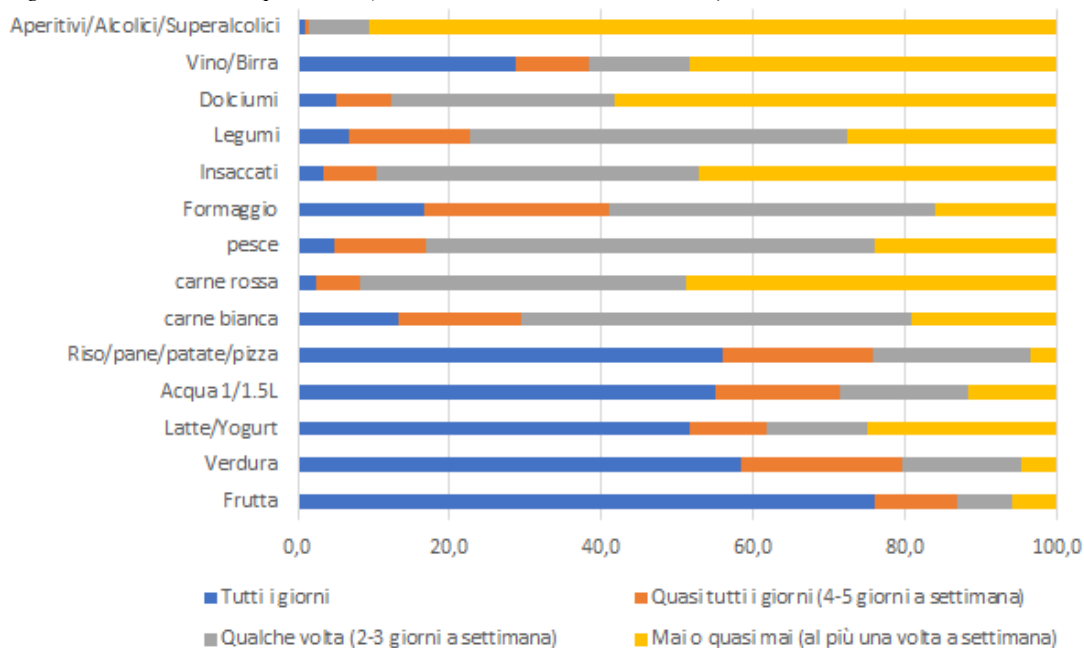
Considering the products purchased and consumed by older people, the average weekly food and drink expenditure is in line with those released by ISTAT and is mostly between 25 and 100 euros: 27% 26-50 euros and 40% 51-100 euros. The most thrifty are individuals aged 85 and over (59% spend less than 50 euros per week and 10% spend less than 25 euros) and, of course, those who live alone. However, the cases of food insecurity are rare and especially temporary: 7% of the interviewees who claim to have sometimes had to reduce their food consumption. Food insecurity for these people is therefore a temporary and not absolute condition and represents a temporary strategy of adaptation to a condition of economic precariousness.

In general, the interviewees follow good eating habits, preferring the purchase of fresh products and adopting a typical Mediterranean diet (Fig. 6). Healthy eating habits distinguishes in particular the most educated elders, young older people who live with their partner and women.

⁵ the property has been measured through a 3 items additive index, ranging from 0 to 3, composed thanks to the following dichotomous questions: (1) "Do you have the possibility to use cars regularly?"; (2) "Do you have the possibility to use bicycles?"; (3) "Do you have at least a monthly subscription to urban public transport?", then weighted by the question described in footnote n.6.

⁶ the questionnaire include a further form of measure of the perceived health status, asking "In the last month, have the indicated diseases limited/changed your usual daily activities (domestic, leisure, mobility)?".

Fig. 6 - The Food Frequencies (Source: authors' elaboration)



Conclusion and discussion: how to improve the food accessibility for older people

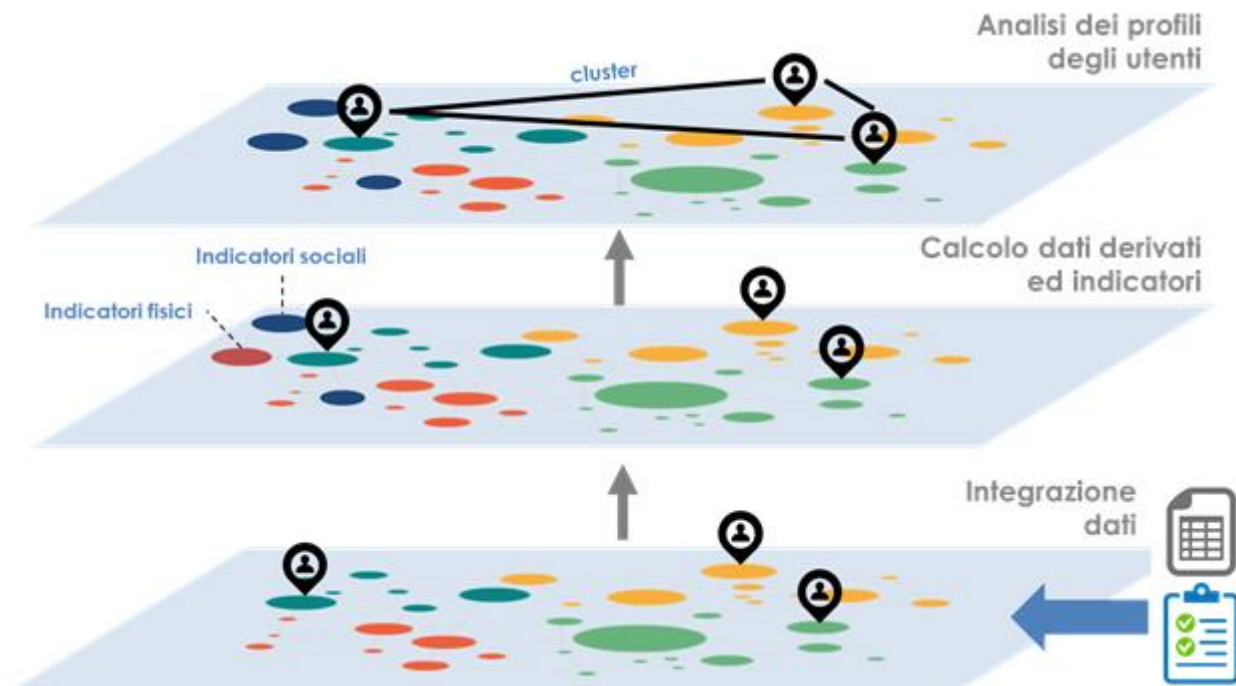
As seen, the socio-territorial profiles that emerge from the analysis of the factors that influence access to food and therefore the well-being and quality of life of older populations are very different. From residing in potential food deserts, mirages and oases, further differentiated in terms of socioeconomic status, functions and populations, to the personal, economic, social and relational differences that affect the ability of the elders to reach, buy and consume healthy food and their quality of life. Despite this diversity, analyses have shown that risk factors emerge in particular for older people, who live alone, not in good health and with lower levels of social participation. Not only actual behaviours are impacted by this figure but also from the analysis of the perception of the environment (in particular in terms of pedestrian friendliness and walkability) emerges a relation between that and several socio-demographic properties. This has an effect also on the perspectives of a behavioural change, since the perceptions and beliefs regarding the mobility contexts contribute to the construction of people's representation of urban spaces, of their opportunities, and their "control beliefs" (Ajzen). However, the heterogeneity of the access conditions invites to define and implement specific and appropriate interventions for the different individual and territorial profiles. This is a key issue in order to prevent the emergence of stronger risk and frailty factors.

In this context, the project intends to return the project results to different targets, such as policy-makers, stakeholder and the older people. Besides the "classic" dissemination tools (such as publications, events, involvement of stakeholders, inclusion of the topic in existing education programmes, e.g. master ADA), the project is developing an ICT platform, an App for the food awareness and a functional food. First of all, the mapping of food accessibility and older people's food access in the Metropolitan city of Milan will be made available through dashboards and analytics services included in the ICT platform to any public decision makers in order to plan initiatives aimed at improving accessibility to food and older people's quality of life. In particular, this information is of particular strategic interest for Urban Food Policy.

In addition, the data collected, properly processed, and the analysis performed will also be offered to citizens aged 65 and over. In particular, information services relating to an adequate food style will be provided through smart devices in the form of mobile application that will have as main functionality to offer food awareness. The use of new technologies and social media is indeed spreading among the older population (e.g. internet use = 31% of italians aged 65 to 74) and the trend will strengthen in the future, as the younger generations enter in the third age. With this app the user, an older adult or a caregiver, will be provided with a method for the semi-automatic identification of the factors on which to intervene in order to achieve healthy ageing in relation to any needs explicitly expressed by the user. The application will also guide the citizen

through an adequate nutritional strategy by encouraging a redefinition of food styles and consumption and inform about opportunities and activities related to healthy ageing carried out in the local community centres.

Fig. 7 - The profiling of users for appropriate advices (Source: TSP & DISCO, 2019)



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