A FORECASTING MODEL FOR THE ITALIAN LOCAL PUBLIC DEMAND AND EXPENDITURE OF SERVICES FOR THE SENIOR AGE. THE IMPACT OF DEMOGRAPHIC AGING[1]

Monica Carbonara, Agata Maria Madia Carucci, Giovanni Vannella

Abstract. This paper proposes the use of a forecasting model to estimate the Italian public spending on services for the elderly, which is affected by the demand change due to demographic aging that will affect Italy in the coming decades. This phenomenon is to be addressed both at a national level and at a territorial one, through an estimate of expenditure according to different scenarios of public policy choices characterized by a marked proactivity or a simple desire for equal distribution.

1. Introduction

The persistently low fertility that has characterized Italy in the last 40 years, combined with the higher survival rate, have led to the current Italian high aging process.

Future prospects will largely derive from the current breakdown by age of the population, and only to a lesser extent by the changes in the evolution of the fertility, mortality and migration dynamics. The strong aging together with the decrease of the population between 15 and 64 years, will force the public decision-maker and the entire production system to respond to the new needs of a completely changed population, in which it will be necessary to foresee more and more services dedicated to the elderly and the necessary resources for their supply/provision. This topic has been widely investigated by the literature that has examined the relative problems such as active aging (Barslund *et al.*, 2019; Capellari *et al.*, 2018) or social costs (Cerea, 2021; De Nardis and Alteri, 2012; Monteduro *et al.*, 2021).

This paper proposes an estimate of the number of users who in the next few years will require assistance services provided by the municipalities and the related public expenditure. To do so, we used a statistical economic forecast model applied to the data collected with the Survey on interventions and social services of

[1] Corresponding author: Giovanni Vannella, e-mail giovanni.vannella@uniba.it. Although this paper is the result of the joint work of the three authors, paragraph 2.2 is attributed to M. Carbonara, A.M.M. Carucci paragraphs 1, 2.3 and 4, to G. Vannella paragraphs 2.1, 3 and 5

individual and associated municipalities and on the basis of population forecasts to 2070 disseminated at regional level by ISTAT. In order to consider the effects of the autonomy of the regions in terms of service supply/provision, a comparison between different territorial areas with a specific focus on a divisional basis has been proposed.

2. Data

2.1. General aspects

With reference to the demographic data used in this paper, among the experimental statistics disseminated by Istat, the regional demographic forecasts of the population occupy a leading role. They depict the possible future trend of the population, both in terms of total number and in terms of structure by age and gender and demographic indicators. The information produced represents an important tool to support decisions concerning economic and social policies, such as those relating to pension, health, education and housing systems. The forecasts are periodically updated by reformulating the hypotheses underlying fertility, survival, international and internal migratory movements.

In September 2022, Istat released forecasts for the country's demographic future, updated to 2021, by region, gender and age group up to 2070.

On the other hand, with reference to the socio-economic variables taken into consideration, the survey on social interventions and services of individual or associated municipalities (conducted in collaboration with the Ministry of the Economy and Finance, the Regions and the autonomous provinces) collects information on the annual welfare policies managed at the local level. In particular, the available data are the number of users and the costs incurred for the social services managed by the Municipalities (individually or in association), by the Provinces, Regions and other territorial bodies which support or replace the Municipalities in this function.

Since 2011 Istat has disseminated data on users and expenditure on social welfare interventions by individual municipality, category of expenditure and type of user. The latest year for which data is available is 2020 (ISTAT, 2018; 2020; 2023). Due to the associative nature of the phenomenon, the disaggregation of data at the municipal level requires the introduction of an estimation component: the number of users, expenses and related percentage of each service, they include both the supplies made individually by the Municipalities, and the additional fees deriving from the Associations which they belong to. The data collected at the associative bodies are divided among the Municipalities that belong to them in

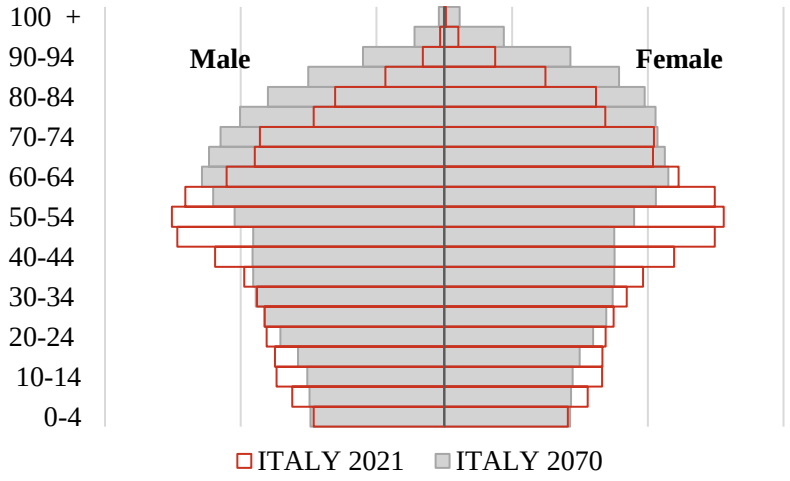
proportion to the reference population of the services.

2.2. Some elements of analysis: the demographic forecast

The new forecasts on the Italian's demographics, updated to 2021, confirm a potential crisis scenario.

The resident population is decreasing from 59.2 million as of 1st January 2021 to 57.9 million in 2030, to 54.2 million in 2050 up to 47.7 million in 2070 with a progressive reduction in the weight of the population 14- 50 years and a greater weight of the elderly population (Figure 1).

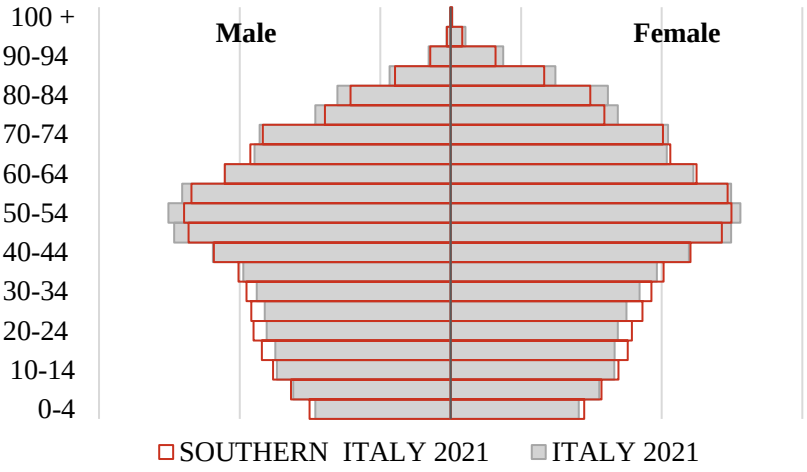
Figure 1 – *Population pyramid – Italy. Years 2021 e 2070.*



Elaborations on ISTAT data

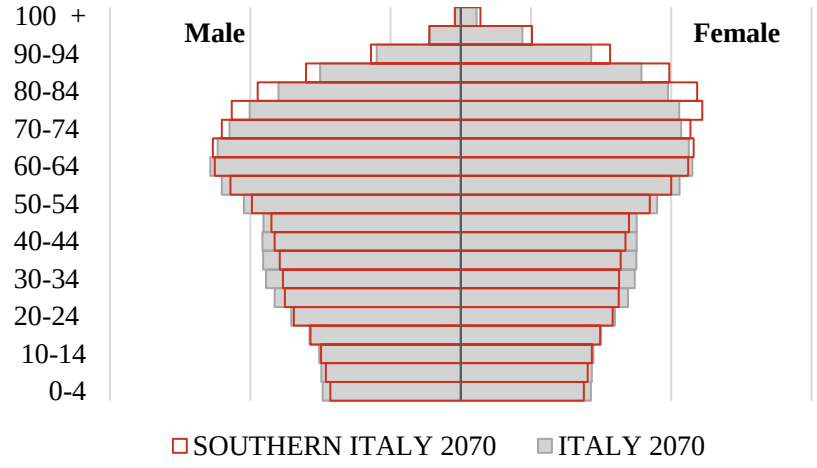
Such a decrease presents a strong heterogeneity among the macro-areas of the country, in particular the aging phenomenon that particularly affects Southern Italy. In fact, comparing the population pyramid of the South with the one of whole country in 2021 and 2070 (Figures 2 and 3), the former changes from being younger than the national average to significantly older in 2070.

Figure 2 – *Population pyramid – Italy and Southern Italy. Year 2021.*



Elaborations on ISTAT data

Figure 3 – *Population pyramid – Italy and Southern Italy. Year 2070.*

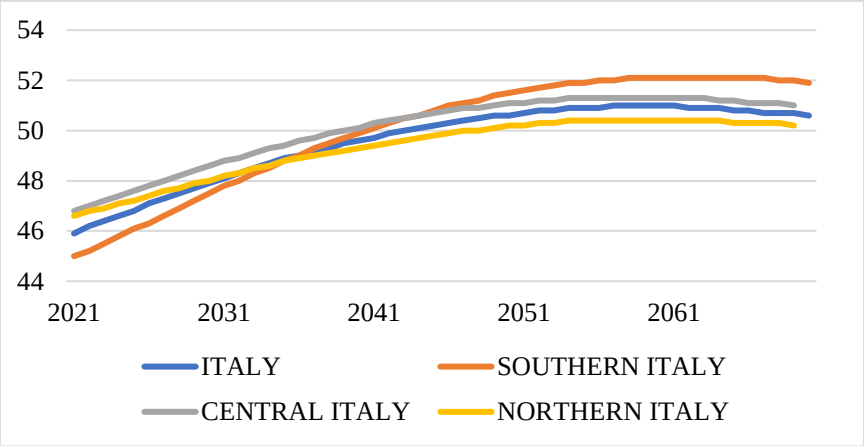


Elaborations on ISTAT data

This trend is confirmed by the historical series of the average age (Figure 4) and the incidence of the over 65 population (Figure 5). This also highlights the

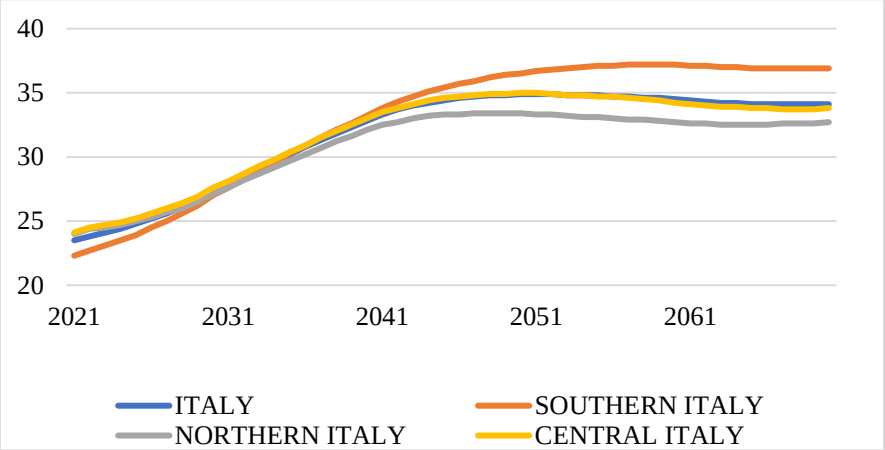
peculiarity of the South that, despite being the only younger macro-area with respect to the national context in 2021, sees the projection completely reversed in 2070, becoming the area with the greatest gap compared to the whole of Italy.

Figure 4 – *Forecast: mean age. Years 2021-2070. Italy and Southern Italy*



Elaborations on ISTAT data

Figure 5 – *Forecasts: Incidence of population over 65. Years 2021-2070, Italy and Southern Italy*



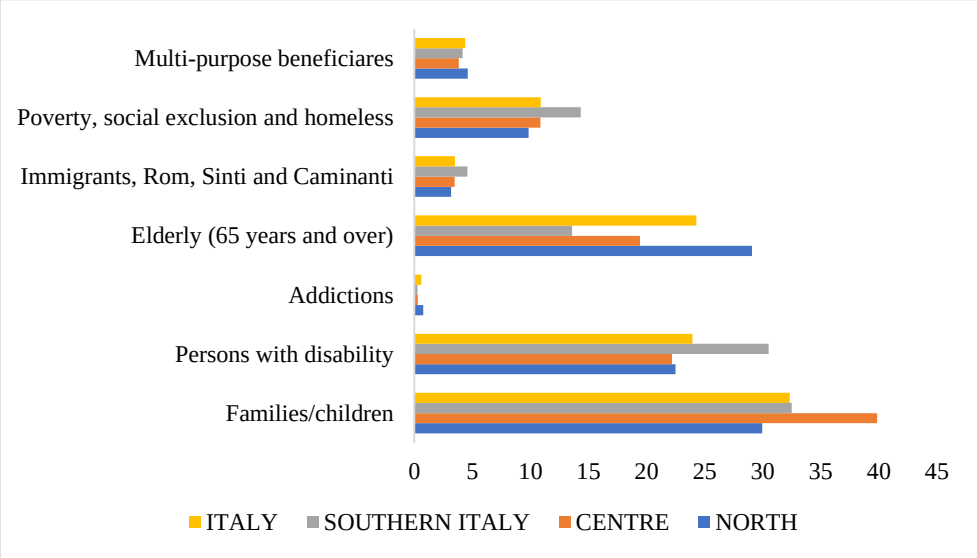
Elaborations on ISTAT data

2.3. Some elements of analysis: the Assistance expenditure

In 2020, 24.3% of the expenditure of municipalities for social welfare services was destined to elderly users (population over 65), with an incidence of over 29% in the North and about 13% in the South (Figure 6).

The supply of care services is characterized by very large territorial differences, in terms of both the type of service user and the services supplied (Table 1), and of the economic resources allocated to them (Table 2).

Figure 6 – *Assistance expenditure by category users – % Incidence - Year 2020*



Elaborations on ISTAT data

Table 1 – *Number of services provided for the elderly. Years 2015-2020.*

TERRITORY	SERVICES FOR ELDERLY (65 years and over)					
	2015	2016	2017	2018	2019	2020
NORTHERN ITALY	1.214.176	1.172.587	1.242.369	1.161.858	1.156.917	959.746
CENTRAL ITALY	370.182	319.708	418.604	380.144	368.418	249.059
SOUTHERN ITALY	334.773	321.353	336.341	292.536	285.615	219.779
ITALY	1.919.131	1.813.648	1.997.314	1.834.538	1.810.950	1.428.584

Elaborations on ISTAT data

Table 2 – *Expenditure on care for the elderly. Years 2015-2020.*

TERRITORY	EXPENDITURE ON CARE FOR THE ELDERLY (millions of euros)					
	2015	2016	2017	2018	2019	2020
NORTHERN ITALY	1.798.	1.769.	1.638.	1.711.	1.708	1.742
CENTRAL ITALY	423	375	418	423	405	363
SOUTHERN ITALY	268	284	289	289	255	251
ITALY	2.490	2.429	2.344	2.423	2.368	2.355

Elaborations on ISTAT data

Table 3 – *Services provided to the elderly on the elderly population. Percentage Incidences. Year 2020.*

CATEGORY OF SERVICE	NORTHERN ITALY	CENTRAL ITALY	SOUTHERN ITALY
Professional social work	5,3	3,0	1,7
Social home care	1,3	0,7	0,7
Aggregation and social centers	0,8	1,8	0,5
Recreational social cultural activities	0,8	0,5	0,6
Home care integrated with health services	0,7	0,3	0,2
Social transport	0,8	0,2	0,1
Contributions and additions to the fee for residential structures	0,7	0,4	0,1
Social and health vouchers	0,6	0,2	0,1
Residential structures	0,5	0,3	0,1
Distributing meals and / or home laundry	0,6	0,1	0,0
Day centers	0,2	0,3	0,3
Contributions for personal services	0,2	0,2	0,0
Remote assistance	0,3	0,1	0,1
Contributions to support the family income	0,2	0,2	0,0
Other activities of social inclusion	0,2	0,0	0,1
Other interventions of home care	0,2	0,0	0,0
Activities for the social inclusion of weak people	0,1	0,1	0,1
Proximity services (neighborly)	0,2	0,1	0,0
Contributions for transport	0,1	0,0	0,0
Contributions for housing	0,1	0,1	0,0

Elaborations on ISTAT data

(a) the colour of the cell identifies the presence of the supply of services in the territory, where the green colour represents a relatively present service and the red colour a relatively absent service, the yellow colour a value in line with the average presence

In 2020, in fact, the municipalities spent a total of around 2 billion euros on social welfare services for the elderly and over 70% of these resources were used by the northern municipalities which supplied around 1 million Euros of services.

An indicator of the territorial disparity that has already emerged in the use of services is given by the ratio between the number of services supplied and the reference population (over 65). In the South, despite the lower incidence for each type of service, practically no attention is paid to services that are not strictly "healthcare" (Table 3) such as recreational or proximity services.

3. Methodology

The expenditure of the municipalities for the assistance of the elderly can be classified in:

- Measurable determinants: Municipality's demographic weight, % Population over 65, Family structure typology, Change in the population, Individual well-being, Historical expenditure
- Non-measurable determinants: Political choices, Individual and collective behaviours, Access to services.

First, in order to be able to predict the level of the demand for services in terms of public expenditure, a regressive model was used as a forecasting tool (Figure 7).

Figure 7 – *Output of Regressive-Model*

Dependent Variable: Expenditure

R-Square	Coeff Var	Root MSE	Mean
0.8109	58.35978	59716950	102325526

Parameter estimates

Variable	Parameter estimates	Standard Error	T Value	Pr > |T|
Population	15.10776	1.79835	8.40	<.0001
Population 65 and over	3648845	346324	10.54	<.0001
Population growth rate	10676162	1065808	10.02	<.0001

However, this model was not able to measure the numerous factors such as individual behavior and policy choices, but helped highlighting the potentially significant variables to describe the relationship between socio-demographic aspects and expenditure, and the most appropriate explanatory methodologies to apply.

We therefore opted for the RUN RATE model or EXECUTION RATE usually

used to demonstrate key performance metrics, such as revenue or profit, for a year based on monthly or quarterly data. This method has also been widely used to create the tables of the supply and use of the national accounts, instead of constant technical coefficients.

The Revenue Execution Rate (also known as Sales Execution Rate), for example, forecasts future revenue over a longer period assuming that sales will remain constant. Of course, this simplistic approach assumes that nothing will change in the next period: churn, revenue expansion and growth rate changes, seasonal changes in consumer demands or changes in the market and political changes are all conveniently excluded. The run rate gives an extrapolation of current performance and assumes that current conditions will continue.

Using the RUN RATE model to predict the expenditure for social welfare services of the municipalities in the next decades, the expenditure in year *t* by a territorial area is estimated for each service *i* by applying to the expected population in year *t* three different hypotheses.

In the first hypothesis, defined as "inertial method", the macro-areas will not change their policy behaviour despite the changes in the world. The expenditure in year *t* by territorial area *R* ($Z_{t,R}$) is estimated for each service *i* by applying to the expected population in year *t* (x_{tR})

- the area's average expenditure per capita (R=territorial area)
- the average coefficient of use of the service in the area k_{iR}

$$Z_{t,R} = \sum_i w_{iR} k_{iR} x_{tR} \quad (1)$$

In the second hypothesis, defined as "equality method", the distributions will adapt to a national average behaviour and the expenditure in year *t* by territorial area *R* ($Z_{t,R}$) is estimated for each service *i* by applying to the expected population in year *t* (x_{tR})

- the average expenditure per capita ITALY (N=national)
- the average coefficient of use of the ITALY service k_{iN}

$$Z_{t,R} = \sum_i w_{iN} k_{iN} x_{tR} \quad (2)$$

The third hypothesis, defined as “best practices method”, the divisions use the spending model considered more efficient and the expenditure *R* ($Z_{t,R}$) is estimated with

- the average per capita expenditure of the NORTH (S=North, considered more efficient)
- the average coefficient of use of the NORTH service k_{iS}

$$Z_{t,R} = \sum_i w_{iS} k_{iS} x_{tR} \quad (3)$$

4. Results

The "inertial" forecast hypothesis highlights how, compared to 2020, Italy would need additional public expenditure, of around 900 million euros for 2050 and around 500 million euros for 2070.

Given that the spending behaviour remains constant in the three divisions (North, Center and South), in absolute values it would be the Northern one that needs around 500 million in 2050 and 300 million in 2070. Around 130 and 70 million more than in 2020 would be necessary in the South to cope with the increase in the elderly population expected in 2050 and 2070 (Table 4).

In relative terms, the three macro-areas would therefore require an increase in economic resources of 32.5% and 17.8% respectively for 2050 and 2070 for the North, 54.5% and 32.2% for the Center and 54.6% and 27.5% for the South.

Table 4 – *Expenditure forecast: first scenario*

TERRITORY	2020	2030	2040	2050	2060	2070
NORTHERN ITALY	1.742	1.933	2.267	2.308	2.156	2.052
CENTRAL ITALY	363	461	545	561	520	480
SOUTHERN ITALY	251	328	382	388	358	320
ITALY	2.355	2.723	3.194	3.257	3.034	2.853

Elaborations on ISTAT data

The forecast "equalization" hypothesis obviously does not envisage an increase in the overall requirement (Table 5) but a different requirement between the three macro-areas: if the North were aligned with the national average behaviour, it would need 11% and 21% less resources while the Center 89.5% and 62.3% more resources while the South should, compared to 2020, increase its resources allocated to social-welfare services for the elderly four times as much in 2050 and three times as much in 2070.

Table 5 – *Expenditure forecast: second scenario*

TERRITORY	2020	2030	2040	2050	2060	2070
NORTHERN ITALY	1.742	1.296	1.520	1.548	1.446	1.376
CENTRAL ITALY	363	566	669	688	637	589
SOUTHERN ITALY	251	895	1.041	1.059	976	874
ITALY	2.355	2.757	3.229	3.294	3.059	2.838

Elaborations on ISTAT data

The third and final forecasting model (that of the best practices), based on the hypothesis that the macro-areas must "replicate" the spending model of the most efficient macro-area (the North), obviously does not determine changes in incremental needs for the North compared to what expected with the inertial model, but presents a significant increase in the need for additional resources with for central Italy equal to 182.6% for the period 2050/2020 and 141.9% for the period 2070/2020.

With reference to the South, over 1 billion and 200 million more would be needed in 2050 to guarantee its population the same Northern standards and over 1 billion in 2070 (Table 6).

Table 6 – *Expenditure forecast: third scenario*

TERRITORY	2020	2030	2040	2050	2060	2070
NORTHERN ITALY	1.742	1.933	2.267	2.308	2.156	2.052
CENTRAL ITALY	363	844	997	1.026	951	878
SOUTHERN ITALY	251	1.336	1.552	1.580	1.456	1.303
ITALY	2.355	4.113	4.816	4.914	4.563	4.233

Elaborations on ISTAT data

5. Conclusions

The strong aging of the Italian population is redesigning social and economic structures, with consequences that are reflected in the field of production, consumption, the labor market and, above all, local welfare, with the obvious effects in reference to public spending, effects in which the forecast is undoubtedly extremely complex as it depends on various factors, such as: the quality of ageing, the efficiency of public spending, the choices of economic policy and the possibility of finding the necessary resources.

The different perspective in the supply of services and in the procurement of resources will have to be integrated with the new constitutional provision on differentiated autonomy which has expressly linked the recognition of autonomy to the LEP, i.e. the essential level of services: “The attribution of further forms and particular conditions of autonomy referred to in article 116, third paragraph, of the Constitution, relating to subjects or areas of subjects referable [...] to civil and social rights which must be guaranteed throughout the national territory, it is permitted subject to the determination of the relevant essential levels of performance (LEP)."

In order to be able to establish even just the trend of the forecast of the

necessary resources, it is important to understand the impact that choices such as those of historical, average or best practice expenditure can have on the forecast of demand and therefore subsequently on the consequent economic coverage.

With reference to this last aspect, the present study has illustrated how the combination of non-homogeneous aging methods for macro-areas, combined with the different attention and resources that the same areas have for assistance to the elderly population, calls for a profound reflection on the impressive consequences that the various choices of economic policy and welfare models could have in the near future.

References

BARSLUND M., VON WERDER M., ZAIDI A. 2019. *Inequality in active ageing: evidence from a new individual-level index for European countries*. Cambridge, Cambridge University Press.

CAPELLARI, L., LUCIFORA C., ROSINA A. 2018. *Invecchiamento attivo, mercato del lavoro e benessere. Analisi e politiche attive.* Bologna: il Mulino

CEREA S. 2021. *Le reti familiari e il senso di solitudine degli anziani*, «I luoghi della cura rivista online, 12 gennaio.

DE NARDIS P., ALTERI L. 2012. *I costi sociali dell'essere "un paese di vecchi"*. In Treu, T. (a cura di), L'importanza di essere vecchi. Politiche attive per la terza età. Bologna: il Mulino - AREL.

ISTAT. 2018. *Rapporto annuale 2018–La situazione del Paese*, Roma.

ISTAT. 2020. *Invecchiamento attivo e condizioni di vita degli anziani italiani.*

ISTAT. 2023. *La spesa dei comuni per i servizi sociali.* Comunicato stampa 6 aprile 2023.

MONTEDURO G., BERTANI M., NANETTI S. 2021. *Tra invecchiamento e fragilità, le spese per interventi e servizi sociali agli anziani* LAVORO SOCIALE: 21-44 [http://hdl.handle.net/10807/198904]

Monica CARBONARA, Istat, mocarbon@istat.it
Agata Maria Madia CARUCCI, Istat, carucci@istat.it
Giovanni VANNELLA, University of Bari, giovanni.vannella@uniba.it