HOME ALONE, THE ONE-PERSON HOUSEHOLDS AT THE ITALIAN 2021 PERMANENT CENSUS. WHO ARE THEY? WHERE DO THEY LIVE?[1]

Angela Chieppa, Silvia Dardanelli, Simona Mastroluca

Abstract. From 2011 to 2021 in Italy households increase by 6.4% but they are getting smaller. The average number of components drops from 2.40 in 2011 (3.35 in 1971) to 2.24; census data show that people are more likely to live alone and the prevalence of one-person households is unprecedented historically. In 2021 they amount to 9,636,232 and represent 36.8 percent of total households compared to 31.2 percent ten years earlier.

The rise of one-person households reflects later marriage, longest stay in the family of origin, delayed childbearing, higher divorce rates, living-apart-together relationships, longer life spans, and, probably, also a growing desire for individual autonomy and independence. There are also socio-economic features that could lead to the choice of living alone as well as conditions or habits that are related to the place in which a person usually lives.

The aim of this work is twofold. The first one is to provide the main figures of the presence and amount of one-person households in Italy making use of the 2021 Permanent Census data; the territorial distribution and the evolution through the last census rounds are focused. Then, the objective of going deeper into the description of conditions and determinants of the phenomenon is pursued through a multidimensional analysis that takes into account demographic variables at individual and at regional/municipal level. The assumption is that the choice to stay alone is determined by individual characteristics but also by some general ones and local lifestyle habits. The census variables considered are sex, age, and citizenship while the surrounding conditions are expressed through some regional indicators such as the urbanization degree. The association between the one-person household status and the other variables considered is studied through an exploratory analysis, with unsupervised methods and then through a supervised model to statistically test specific effects in order to identify individual and territorial conditions that possibly determine the option of living alone.

1. Introduction

The reduction in household size is one of the most apparent findings of family change in recent decades. Between 1971 and 2021, the reference year of the last decennial Population Census, the average number of members in Italy fell from 3.35

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[1] Although the paper is the result of joint work, paragraphs are attributed as follows: paragraphs 1 and 4 to Simona Mastroluca, paragraph 2 to Silvia Dardanelli, paragraphs 3, 3.1 and 3.2 to Angela Chieppa.

to 2.24. Thus, it is an increasingly smaller family affected by an aging population, declining birth rates and lively migration movements to and from abroad.

Changing lifestyles, times and ways of making a family. The difficulties of young people entering the labour market or simply opting to stay alone longer without starting a couple or parenting project, have led to a rise in one-person households that has never occurred in the history of our country. The growing trend of Living apart together (LAT), couples who are in an intimate relationship but choose to live separately for financial or personal reasons, contributes to the expansion of the phenomenon. The spread of living alone during later life is another outcome of the last census enumeration. The living arrangements of the elderly, and more specifically living alone, are the result of the preferences and resources people have, together with the constraints they face as they age (Reher and Requena 2018).

On December 31, 2021, in Italy one-person households represent 36.8 percent of total households and over the past 20 years they have grown by more than 20 percentage points: they were 24.9 percent in 2001.

Persons living alone are becoming increasingly common across Europe where, on average, the share is 35.9 percent (Istat, Rapporto Annuale 2022). Historical records show that this 'rise of living alone' started in early-industrialized countries over a century ago, accelerating around 1950. In countries such as Norway and Sweden, at the time, one-person households were rare, but today they account for nearly half of all households. (Esteban Ortiz-Ospina 2019). In Germany and France the share stands at 41.0%.

In Italy, since 2011, the number of male living alone increased relatively more steeply than female, even though in 2021 men living alone (46.3%) are still fewer than women (53.7%). The geography of households tells different stories in terms of the magnitude of the phenomenon but with one common denominator: the increase in one-person households is constant over time and spread across the country although with different intensities depending on the region of residence and the urbanization degree of the municipality.

## 2. Individual characteristics and territorial issues

The condition of living alone varies greatly according to sex and depending on the age of individuals. One-person households are mostly composed of women and 42.6% are 65 years of age or older. Naturally, this is associated also with the gradual ageing of the population that results in a high proportion of elderly people compared to young people.

Analysing the living conditions of women and men, large differences are observed in the group of 65 years and over: among women this percentage rises to

56% and is almost double that of men for whom it stops at 27%. Women who form one-person households are mostly in the older age group, peaking between the ages of 75 and 84; significantly younger are men, with the highest incidence reaching in the age group 45-54 (Figure 1).

These different situations could be explained by the fact that in old age the condition of "home alone" is a female prerogative: women continue to live with their children at a younger age (also forming "Lone parent households") following a divorce and live alone when they become widowed or divorced and their grown-up children leave the family nucleus; the opposite is true for men, they live alone at a younger age when they are economically independent and even after a separation from partner do not live with their children. Moreover, men have a tendency to remarry as soon as possible when they are widowed.

Figure 1 – *One-person households by sex and age.*
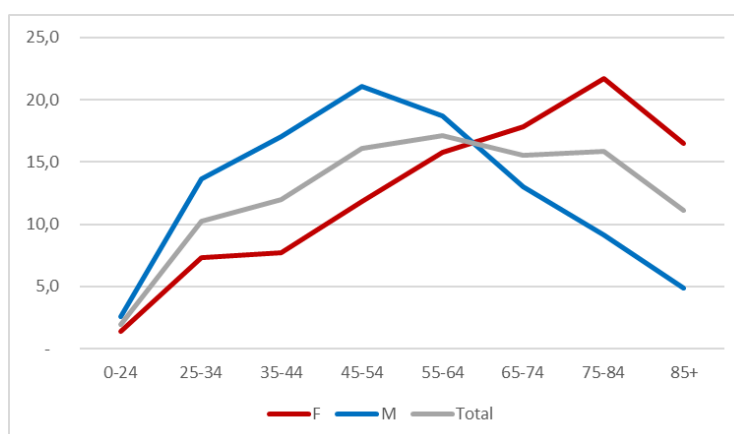
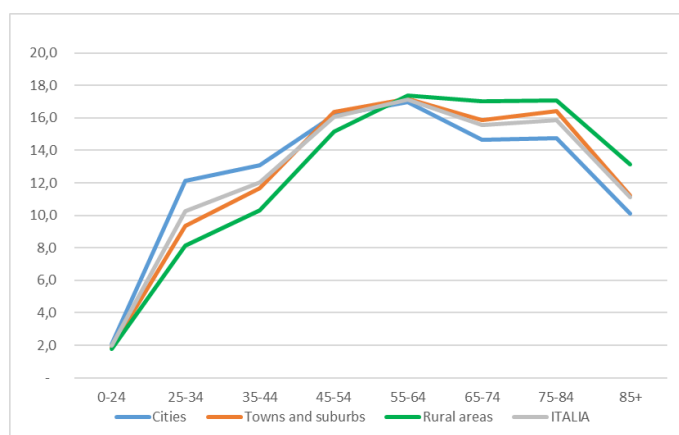*Source: Permanent Census 2021.*

Among regions, age distribution of one-person households does not differ substantially; however older one-person households characterize mainly the South and the two major Islands while younger living alone prevail in the North and Center of Italy.

More than administrative territorial classification, an interesting dimension that could be helpful in analyse possible territorial peculiarities is the "degree of urbanization" of each Municipality (EUROSTAT, 2018). This variable classifies municipalities into three classes:

- cities - densely populated areas,
- towns and suburbs - intermediate density areas
- rural areas - thinly populated areas.

There are more apparent differences by degree of urbanization of municipalities: older individuals tent to live in rural areas rather than in cities, the reverse for youngest (Figure 2). In cities, in fact, there are greater possibilities for economic independence and relatively young people who move away from their family nucleus for work, for long-term training periods or for cultural choices of independence and autonomy, or even for the termination of previous marital ties, are more likely to live alone (Tomassini C., Vignola D., 2023).

Figure 2 − *One-person households by age and degree of urbanization.*
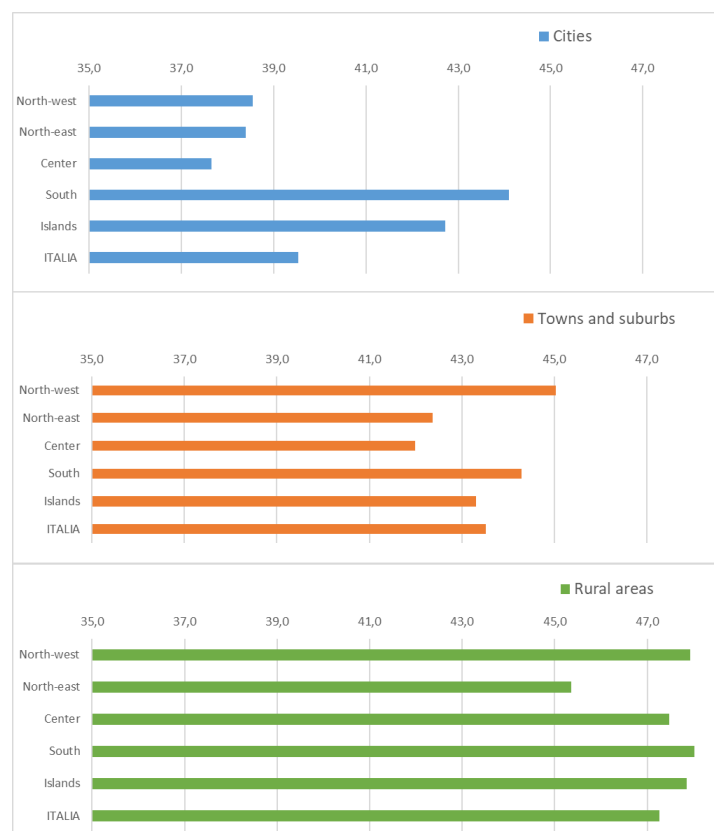

Source: Permanent Census 2021.

The distribution of the educational attainment of one-person households approximates that of the total resident population even if people living alone have a lesser share of lower and upper secondary education in favour of tertiary degrees. In 2021, the employment rate related to the population 15-64 is 60.6% while the share of employed one-person households out of the total one-person households in the same age group stands at 70.2%. 28.7% of employed living alone aged 15-64 have got a university degree compared with 24.5% observed for the total employed 15-64 years old.

Going into the details of the Italian regions, persons living alone show different settlement behaviour in cities, in towns and suburbs and in rural areas, presenting a certain variability among the different areas of the country especially between North and South (Figure 3). One-person households aged 65 and over tend to reside especially in rural areas and in town and suburbs rather than in cities, and this trend is particularly evident in the North and Central regions where persons living alone are mostly composed of young people who find in cities greater employment opportunities.

Figure 3 – *One-person households 65 years or over out of the total one-person households by regions and degree of urbanization.*

Source: Permanent Census 2021.

High shares of one-person households aged 65 and over out of the total one-person households characterizes especially the provinces of the South of Italy where the exodus of young people results in an increase of elderly people living alone. It is possible to hypothesise that the conspicuous presence of one-person households in urban contexts, made up mainly of people of working age, leads to the exodus of young people from rural areas of the South contributing to the generation of smaller and smaller households tending to be made up of elderly people who remain alone and therefore form single-person households not by choice.

3. Multidimensional analysis to derive patterns and determinants of living alone

To better describe conditions and determinants of the phenomenon, a multidimensional analysis is needed that takes into account simultaneously variables at individual and at regional/municipal level, while results of previous paragraph are mostly univariate or bivariate. The assumption is that the choice to stay alone is determined by individual characteristics as well as by some general ones and local lifestyle habits. In this paragraph the results of an analysis on some basic individual and territorial (local) classifications are described.

The dataset set up for this analysis is derived from the 2021 Italian Permanent Population Census database that contains one occurrence for each person usually resident in Italy; for the purpose of this study, only people aged 18 years old or more are taken into account. At individual level, the target variable is the dichotomic attribute (Yes/No) express the "Living Alone condition". At aggregate level, the response variable consists of the rate of people living alone on the total amount of resident people with same age. This rate could be read as the probability for an adult person to live alone and could be evaluated and studied at each possible level determined by each combination of the categories of other variables entering the analysis. The census individual variables considered are sex, age and citizenship; the territorial classifications used are the local administrative divisions (Municipalities, Provinces and Regions) and the urbanization degree.

The goal of the analysis is pursued through different techniques aimed at studying and verifying the main associations between the condition of living alone and the other variables. Furthermore, the analysis aimed at identifying which are the main groups of individuals with similar profiles that could significantly represent the patterns of people living alone. The first techniques used are unsupervised ones, that explore the complete association structure of data regardless of the specific impact on living alone probability. Then, a classification tree technique is performed where the target variable of Living Alone condition is used to "supervise" the classification algorithm to depict only the patterns relevant to explain the distribution of the living alone probability.

3.1. Significant dimensions and clusters detected on living alone population dataset: first results

A multiple correspondence analysis (MCA) is firstly used to undercover the associations between different variables and categories and detect more relevant dimensions that explain association structure in the analysed dataset (Greenacre et

al., 2006). Then the K-means clustering technique (Wu, 2012) is performed to partition the dataset in groups of similar cases. When using unsupervised methods, that undercover all multiple associations in the data, the original dataset (resident people with aged 18 or older) is filtered to extract only the entries related to individuals who live alone, in order to get significant results for the specific target population of this study.

The MCA computes the quantifications (dimensions) that explain most of the variability of the data. The discrimination measures of variables, representing the variance of quantified variables, are computed for each dimension. The first dimension resulting from MCA explains 30% of total variance in the data; the Age of individuals is the variable that shows the highest discrimination measure (0.62) of this dimension, followed by Sex and Citizenship (0.35 for both). The second dimension resulting explains 23% of total inertia; the Degree of Urbanization of the individual place of residence is the more discriminated variable along this dimension (0.43 of discrimination measure) together with Region of residence (0.37).

In the graphical representation (Figure 5), the horizontal axes is the first dimension resulting from the MCA, the one associated with the individual demographic characteristics. The vertical axes is the second dimension, associated with the territorial variables. The quarters above in the quadrant are related to cities and associated categories, while the opposite quarters, at the bottom, refer to rural areas. In the right half of the quadrant, the elderly population, mostly Italians, is plotted, while on the left there are the younger people. Foreigners are positioned on the left because of the high proportion of young foreigners.

The k –means clustering technique has been used to derive homogenous groups of cases. The resulting clusters are plotted in the same MCA scheme (Figure 4).

There are five clusters:
- Cluster 1: 22% of cases. 2,123,222 individuals. Modal values: women, large cities, north-west regions.
- Cluster 2: 9% of cases. Modal values: men, Italian, aged 65 years old or more, living in rural areas, north-east regions.
- Cluster 3: 17% of cases. Modal values: men, foreigners, adults, living in cities, concentrated in north-west and central Italy regions.
- Cluster 4: 30%. Modal values: women, older ages, intermediate density areas, south and major islands regions.
- Cluster 5: 22% of cases. Modal values: men, adults, intermediate density areas, south and north-west regions.

Figure 4– *Living along clusters by age, sex and territorial condition.*
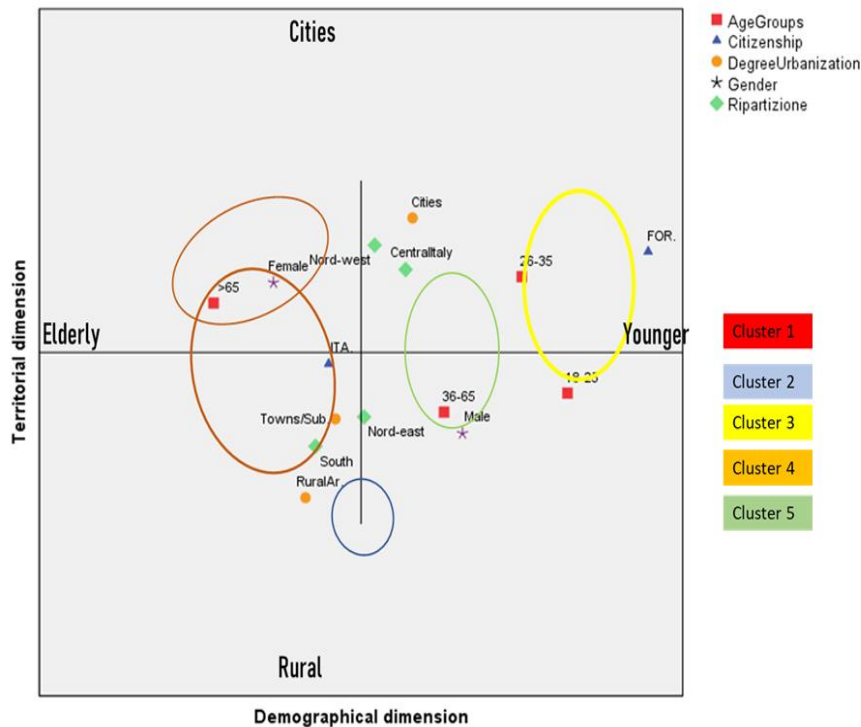
Source: Permanent Census 2021

3.2. Detecting groups and patterns by comparing living alone population versus not alone: classification tree technique.

Decision tree classifiers are supervised techniques, i.e. guided by a response variable whose values represent the target classes; the goal is to assign/label each unit in one of these classes, according to the values observed for the same unit on the other independent variables (classification features). Starting from a complete study dataset, the algorithm operates through successive partitioning steps (nodes) where the first step (root node) is the one in which all the elements are in the same set and are labeled with the modal value. At each successive step, a new partition is determined, based on rules expressed through the classification features, which produce subsets that maximize the association with the response variable. The algorithm used in the analysis presented below is CHAID (Ritschard, 2013), in which the measure of association used is the chi-square statistic.

Figure 5 – *Adult people living alone: comparison of decision tree results for people aged 26-35 years old and over 65 years old ones*
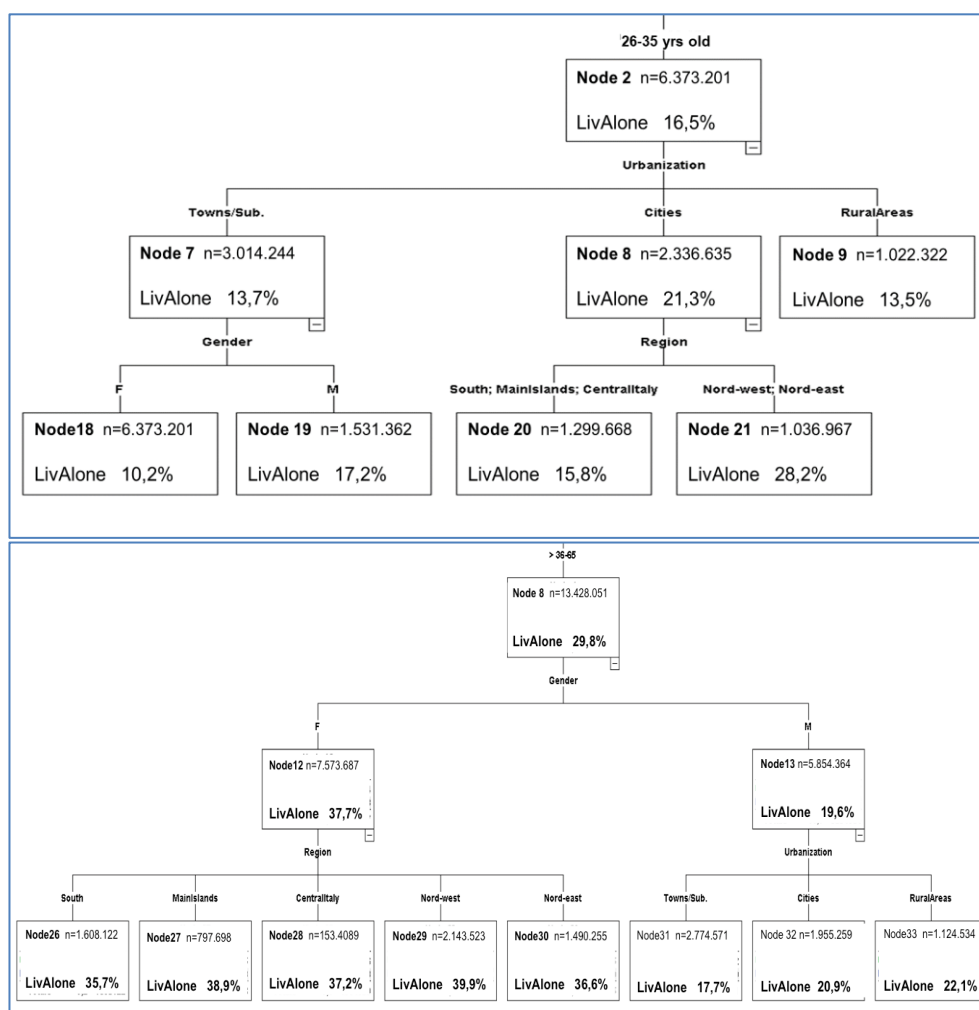
Extract from decision tree results, filtered by age
Source: Permanent Census 2021

Classification trees are predictive statistical models, but they are also very useful as a descriptive tool to identify the relationship between variables and to help determine how variables best merge to explain the outcome. The results of a classification tree (CHAID) applied to our analysis dataset are very useful for reading in a multidimensional way how the probabilities of living alone vary,

overcoming the univariate approach. The percentage of adult individuals living alone among all adult people residing in Italy (from now on: percentage of people living alone) is 19.60% but this value changes significantly according to some individual and territorial characteristics. The highest probability of being a person who lives alone is that relating to women 65 years old or over (37.70%), while the lowest one is that of the 18-25 age group (6.0%). Territorial breakdowns, representing specific socio-economic conditions and possibly cultural ones, show that the percentage of people living alone is higher in cities and that the probability for a young adult (26-35) to live alone is almost the half that in the North West (11.30% vs 20.20%). The tree model does not succeed in identifying rules to accurately predict the living alone condition, because all subsets detectable with the independent variables considered in this experimentation show a higher percentage of people not alone (always predicting "living not alone"). Nevertheless, the results are very useful in detecting different combinations of individual and territorial determinants associated with the choice of living alone. In Figure 5 there is an insight into the results of the classification tree, filtered for people aged 26-35 compared with people aged 65 years old or more.

For the ages between 26 and 35, the tree algorithm identifies 5 possible profiles, determined in the first level by the degree of urbanization of the territory in which they live. Urbanized areas show a significantly higher percentage of people living alone (21.3% against approximately 13% in all areas with different degrees of urbanization):

- in towns/suburbs sex significantly affects the probability of living alone: 17.2% for men against 10.2% for women.

- in highly urbanized cities/areas, the region of origin is the most determining factor: 15.8% probability of living alone, for the age group considered, in the South and Islands against 28.2% in the regions of Northern Italy.

For people over 65, the results show that what firstly determine different patterns is the sex: women have a percentage of 37.7% against 19.2 for men. Beside this general determinant, affecting the entire population of people of this age group, territorial (cultural/socio-economic) determinants enter to definie final choice:

- for women, the territorial variable that determine different subgroups is the region in which one lives; for women from the North-West the probability of living alone is about 39%, while in the South is 35.7%.

- for men, on the other hand, it is the degree of urbanization that distinguishes the profiles with the lowest probability: medium towns and suburbs are the areas with lowest probability for an old men to live alone, againtst more than 20% for who live in cities or rural areas.

4. Conclusions

The results of the first analysis on one-person households, based on 2021 Population Census data, clearly show different patterns of individual and territorial determinants. The basic demographic variables and the territorial ones appear to be strongly associated with living conditions choice. Unsupervised techniques help in confirming that urbanization degree is more relevant than regions, while age is the individual attribute that clearly identifies specific patterns and subgroups. Supervised classification tree is very useful in identifying these patterns: for younger people the surrounding urbanization conditions determine the choice of living alone, regardless sex or regions; on the contrary, for older people, sex is the stronger determinant of decision. Then, for men, probably also for socio-economic reasons, the degree of urbanization of the municipality has the greatest influence, while for women, by tradition and cultural background, the most relevant factor seems to be the region of residence. The stages of producing, validating and disseminating estimates for additional variables included in the survey design of the 2021 edition of the Permanent Population Census are underway. It will then be possible to use more data and variables to further characterize those who, out of necessity or choice, decide not to share housing with other people by pursuing a life project of independence and sometimes loneliness. Moreover, an evaluation of available administrative sources, such as, for example, GDP per capita and average housing cost, is underway, to improve the description of the surrounding determinants at municipal level. In addition, 2021 census data on other types of households and family nucleus will also be disseminated by March 2024, which, together with information on one-person households, will help to more precisely define the profile of Italian households and their evolution over the twenty-first century.

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Angela CHIEPPA, Istat, chieppa@istat.it
Silvia DARDANELLI, Istat, dardanel@istat.it
Simona MASTROLUCA, Istat, mastrolu@istat.it