Research paper

Deindustrialisation, demographic decline, aging, economic crisis and social involution in a metropolitan area analysed by applying Socio-Economic and Health Deprivation Indices

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Keywords

Metropolitan area • Deindustrialization • Socio-economic crisis • Aging • Deprivation • Deprivation indices

Summary

Aims. *Genoa is a city hit by a strong economic, demographic and social involution. The changes in the demographic and socio-economic (SE) situation were analysed and the capacity of two Socio-Economic and Health Deprivation Indices (SEHDI) in describing the evolutions of the recent period were verified.*
Material and methods. *The data about the evolution of demographic and SE situation in Genoa came from publications of Statistics Offices of Genoa Municipality and Liguria Region and from published analyses of Bank of Italy. The two SEHDIs, referring to 2001 and 2011 population, were computed at census tract level by linear regression, factor and clusters analyses and had been already validated and published.*
Results. *Wide transformations in aging and population composition by age groups and gender occurred in Genoa between 1951 and 2016. Internal (from other Italian regions) and external (from other countries) migrations concurred to change the profile of Genoese population. These changes followed the industrial history of city and its deindustrialization occurred since 2001. A progressive SE involution, worsened by the Italian and international crises, carried out the recent impoverishment of the city. Between 2001 and 2011 the population at medium-high deprivation increased and the SEHDIs 2001 and 2011 contributed to describe the population distribution by deprivation groups, either geographically, and by groups of citizenships (Italians and Foreigners). The first identified in 2001 some aspects of a well-off society regarding education, labour market and characteristics of the family and housing structure. The second depicted in 2011 an impoverished society in aging, lack of family support and of property of the main house, diminishing of educational level.*
Discussion. *Genoa city demonstrated an its own specific decline. Starting from the deindustrialization, a worsening of welfare, independently from the national and international economic troubles, was evident. The aging and the changed equilibria among age groups testified the growing difficulties of society in keeping up with the deep social and economic changes. The results demonstrated that specific deprivation indices aid to better define the populations under analysis, because they identify the subpopulations that could have the maximum benefit from investments of resources targeted to the correction of inequalities.*

Introduction

The city of Genoa is an emblematic example of a metropolitan area hit by a wide deindustrialisation and a deep socio-economic (SE) involution, accompanied by demographic crisis and extreme aging.
In this paper the changes in demographic and SE situation were displayed and the capacity of two socio-economic status (SES) indices in describing the evolutions of the recent period were analysed.
This description was preparatory to a next article describing the effects of this decadence on the health of residents and on their different capacity to care the disease diversified by SES.
This analysis was conducted in the belief that the Genoese experience could represent both a warning and an incentive not to delay the adoption of policies aimed at tackling inequalities.

Materials and methods

The data about the historical evolution of demographic and SE situation in Genoa came from publications of the Statistics Offices of Genoa Municipality and Liguria Region and from analyses of the Bank of Italy [1-3].
About the Socio-Economic and Health Deprivation Indices (SEHDI) 2001 and 2011, their composing variables came from the 2001 and 2011 censuses [4, 5]. They were built at Census Tract (CT) level by performing the following steps [6-9]: 1) selection of composing variables by Pearson's Correlation between the demographic and SE variables 2001 and 2011 and the mortality 2000-2003 and 2009-2013 respectively (statistical significance at $p < 0.05$); 2) exclusion of the collinear variables by tolerance check ($p < 0.001$); 3) factor analysis (Principal Component Analysis or PCA; conditions: eigenvalues > 1, varimax orthogonal rotation) in order to extract the independent factors which composed the final indices; 4) linear combination

of the extracted factors, standardising the resulting quantitative index on a percentage scale.
The CTs were classified in five normalised groups at growing deprivation, applying a cluster discriminant analysis [10], which allowed to aggregate cases maintaining one or more clustering variables with a quite normal distribution through the generated clusters (normalisation level tested at $p < 0.05$). This classification choice was made to respect the normal distribution of deprivation phenomena in the population [11, 12]. All the analyses were performed by statistical software SPSS 19.0 and Stata 13.0. The indices were already validated and published [6-9].

Results

Demographic and socio-economic trends after the 2nd World War [1]

To understand the involution of the city, we briefly analysed the demographic and SE trends after the 2nd World War. From 1951 to 1965, year of the historical maximum of 848,121 inhabitants, the resident population of Genoa increased (+23.2%). The baby boom, occurred in the 1961-65 period, contributed to the positivity of the natural balance, even if the real boom was due to internal migration, especially from the Southern regions, which flowed to the cities of the "industrial triangle" (Turin, Milan, Genoa) (Fig. 1). All this accounted for 95% of the overall population growth. Since 1966, after twenty years of continuous increase, an uninterrupted phase of decrease began. In the 1971-81 period, the natural and migratory balances were constantly negative and the population decreased (-6.6%). In the 80s and 90s, the industrial and port crisis (80s) worsened and the long transition/transformation of Genoa (90s) developed.
The watershed between the two periods was the end of the state industry (IRI, Istituto per la Ricostruzione Industriale - closed in the summer of 2000), which concluded a phase of more than 70 years of industrial, social and political life in Genoa.
The employment figures faithfully recorded the breadth and depth of mutation. Between 1981 and 2001 the workers reduced by 40,000 units (-15.7%). The downsizing concerned only the male employment, while the female one grew by almost 10,000 units (+11.9%, from 16.7% in 1951 to 28.6% in 2001). The drop in employment concerned the industry, which lost more than 30,000 units (-15.2%, from 38.1% in 1971 to 22.9% in 2001).
Between 1965 and 2006, over 230,000 Genoese people "disappeared": the negative natural balance accounted for 61.4%, the "residence transfers" for the remaining 38.6% [2].
When in 2008 the Italian economic and financial crisis arose, in a first phase the Genoese economy was less harshly hit than other areas, as testified by the Figure 2. The trends were upward in all Italian areas up to 2008. Therefore, following the economic crisis, the slope in 2009 changed, with small fluctuations at the national and North-Western regional levels, and wider oscillations in Liguria until 2014, while in Genoa province the descent continued in a steeper way. This happened, despite that some structural factors tended to reduce the sensitivity of Genoa to the economic cycle, such as the very relevant transformation from industry to tertiary sector, the lesser opening to international trade, the large share of family income deriving from pensions and public salaries [3].
With the prolongation of difficulties and their extension from the financial to the real economy, in the city even the local productive factories were greatly affected. This led to contractions in consumption, investments and employment, to a reduction in disposable income

Fig. 1. Natural and migratory balance (in percent) in the period 1951-2015.

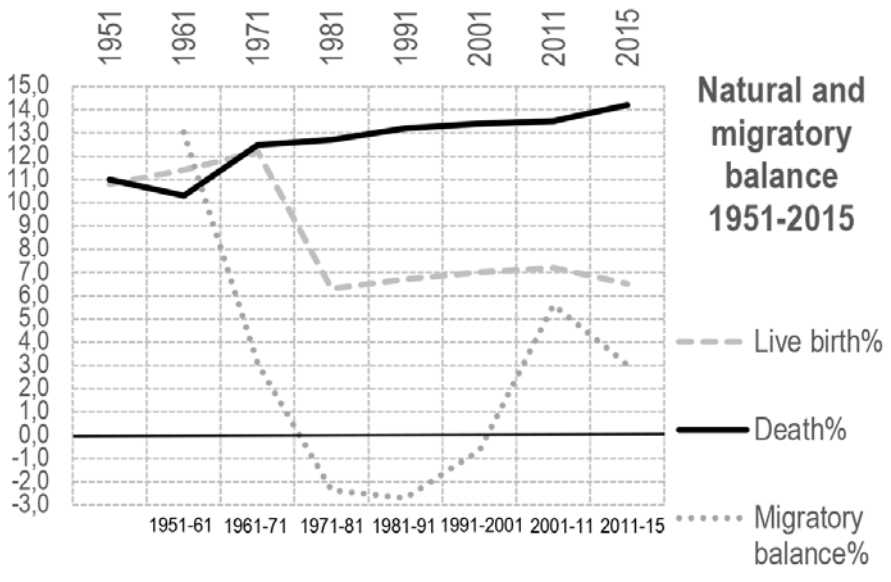
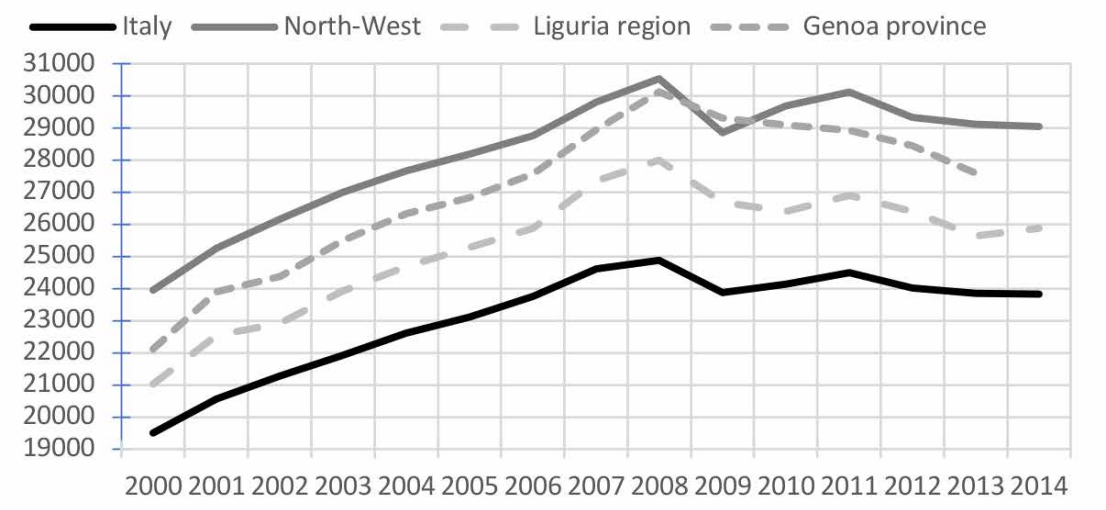


Fig. 2. Gross value added (in €, at basic prices for inhabitant) in Italy, North-West regions, Liguria region and Genoa province in the period 2000-2014.



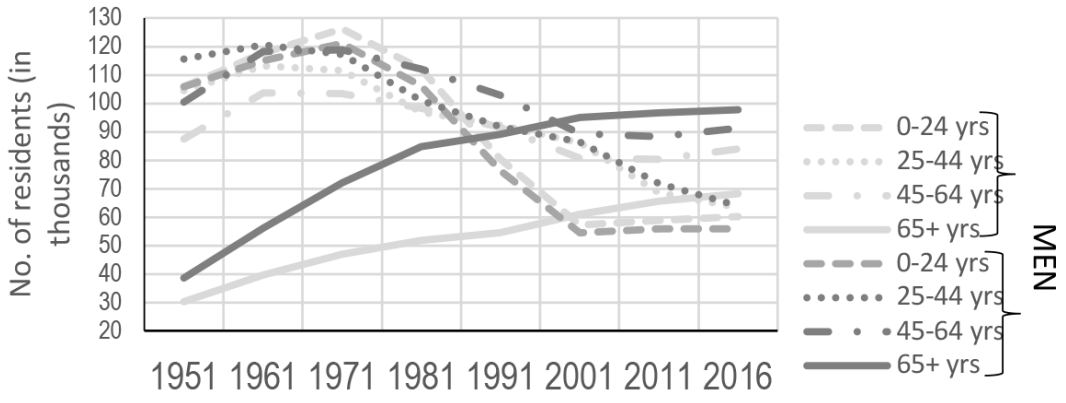
for households, to a fall in bank credit and a substantial increase in impaired loans that continue until now [3].
Another aspect which could be particularly relevant for the Genoese case is the collapse in the price of real estate. As an example, over the last 10 years the real estate prices of Genoa have decreased by -52.6%, with a worse trend than the national average which stands at -30.8%. To penalize the capital was above all the quality of the houses as well as the above cited economic and structural issues and the natural events that affected the town in recent years.

The demographic changes in the 1951-2016 period [1, 2].

The events described above was accompanied by a deep demographic change, as described in Figure 3 which shows the residents by age groups and gender from 1951 to 2016.

Four age groups were chosen in order to describe the demographic trends of Genoese population: 0-24 years (the young), 25-44 years (the young adults), 45-64 years (the middle age adults) and ≥ 65 years (the elderly) (in the description that follows the values are in thousands).
The two younger age classes predominated in the period 1951-71 in both sexes.
The young started from 106 in both sexes in 1951, rose to 126 in men and 121 in women in 1971, decreased to 54-57 in 2001 and grew to 56-60 in 2016. The young adults started from 115 in women and 105 in men in 1951, gone up to 121 and 113 in 1961, then fell to 63-64 in 2016.
The middle-aged women from 100 of 1951 grew to 119 in 1971, decreased to 88 in 2011, rose to 91 in 2016.
The middle-aged men from 88 of 1951, rose to 103 in 1961-71 period, descended to 80 in 2011, grew to 84 in 2016.
The elderly, starting from 39 in women and 30 in men

Fig. 3. Residents in Genoa by age groups and gender between 1951 and 2016.



in 1951, grew continuously until 2016, reaching 98 in women and 68 in men.

The arrival and integration of foreign migrants [1, 2]

A third aspect must be taken into consideration: the arrival of foreign migrants. From the early 70s, the port of Genoa became the first for the arrival of thousands of foreigners, even though it was often just a point of passage for other destinations. The phenomenon of foreign immigration, starting from the second half of the 80s, rarely caused problems of intolerance [13], even if established in the most difficult years of the industrial and port crisis. The main relevant intolerance action against immigrant was to the constitution of many "neighbourhood watch" groups (the so-called "ronde"). And this was the very first case in Italy. After that, in several Italian cities similar movements raised.

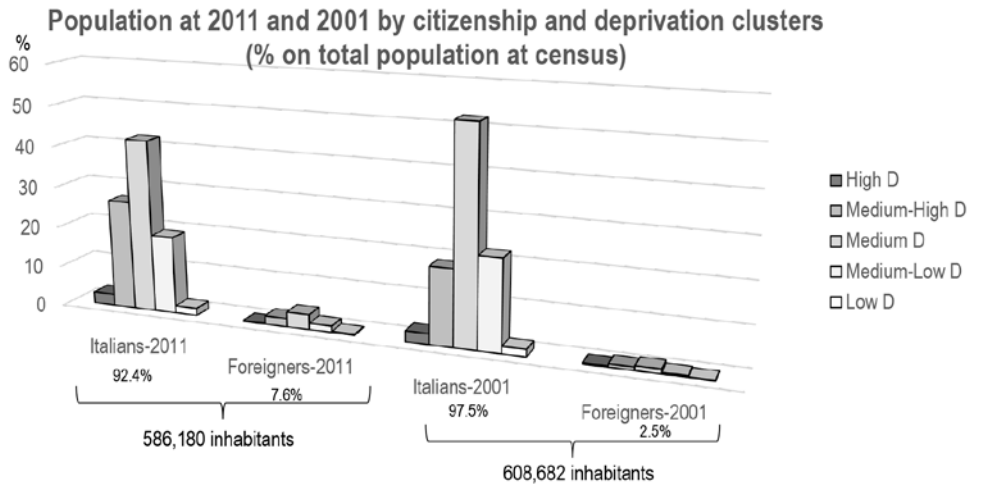
The waves of migration followed, one after another, from different countries of origin. Since the early 1990s, a sharp increase in arrivals was observed, especially from Latin America (Ecuador in particular) and a strong female presence established. This accentuated female prevalence was linked to the growing demand for home and personal services, effect of the extraordinary aging of the native population [14, 15].

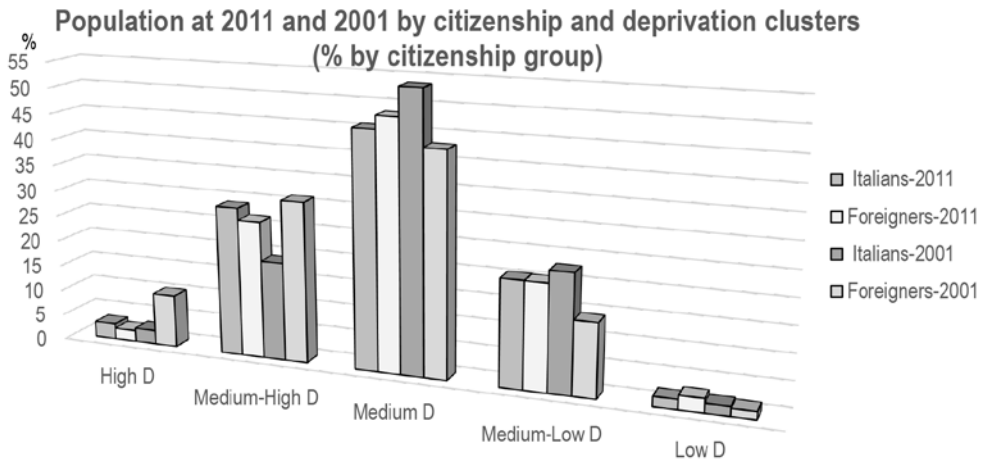
After taking up residence, a small part of migrants integrated into the population, as illustrated in Figure 4, which shows residents in 2001 and 2011 by citizenship and deprivation groups.

The first graph highlights the numbers of Italian and foreigners in population as derived by the 2001 and 2011 censuses; the figure below illustrates the distributions of the two group by deprivation.

The decrease of Italian citizens and the growth of the foreigners are evident. Among Italians the shift towards poverty was broad (the medium and medium-low deprivation groups decreased, the medium-high deprivation groups increased). Instead, in the foreigners there was a shift towards medium-deprived classes, due to their integration in the Genoese society.

Fig. 4. Distribution of Genoa's population at 2001 and 2011 census by citizenship and SEHDI's deprivation clusters.





The SEHDI 2001 and SEHDI 2011 composition

In Table I the composition of the SEHDI 2001 and SEHDI 2011 factors and the percentages of variance explained by each factor is described.

The chosen variables for the indices pertained to the same four domains: education, labour market, family structure, characteristic of the house [6-9].

The total explained variance by the two indices is analogous (72 *vs* 72.2%), but the composing variables presented a deep variation, sharing only two items between them (the percentage of married, the percent of 2-members families).

The differences between the indices were relevant. The first identified aspects of a well-off society regarding education, labour market and family and housing structure.

The second depicted an impoverished society. The factors were composed by variables which stressed the ageing, loneliness and dependence of elderly (factor 1), the need of family assistance (factor 3), the poverty of the youngest and even of foreigners also in the field of education (factors 2 and 4).

The distribution of the population by SEHDI clusters 2001 and 2011

The distributions of population at censuses 2001 (609,682 inhabitants) and 2011 (586,180 inhabitants) are illustrated by deprivation groups in Table II.

The changes between periods were wide. The clusters at medium and medium-low deprivation diminished (-7.4 and -2.1%), the cluster at medium-high deprivation notably increased (+8.3%), while those in high deprivation and the ones in low deprivation increased only imperceptibly (+0.1 and +0.2%).

As regards age and gender distribution, the total amounts of children (0-14 years) has been similar between periods, while differs by gender (males from 12 to 13%, females from 9 to 10%).

The two clusters at higher deprivation and the two richer ones increased in both sexes (around +2-3%); the group at medium deprivation negligibly decreased (males -6%, females -5%).

The young (15-34 years) diminished (males from 23 to 19%, females from 20 to 16%). The ones at higher deprivation stayed quite stable (from 5 to 6%), those at medium deprivation decreased (from 11-12 to 8-9%) and even the richer diminished (from 5 to 3-4%).

The adults (35-64 years) stayed quite stable (42-44%), but the distribution by deprivation changed.

The share of deprived increased (from 9-10 to 13-14%), with a higher rise for those at medium-high deprivation; the individuals at medium deprivation decreased (from 22-23 to 19-21%); the richest stayed quite stable (10-11%).

For the older groups analogous changes in distributions by group were evidenced.

The younger elderly (65-74 years) represented 12.5% of men and 14% of women. A rise in the more deprived (from 2-3 to 4-5%), a decrease of people at medium deprivation (from 7-8 to 6%) and a diminishing of the richest (from 3-4 to 2.5%) were observed.

The older elderly (75+ years) increased (men from 9 to 11.5%, women from 15 to 17.5%). A rise of people at higher deprivation was evident in women (men from 1.5 to 4%, women from 3 to 6%), the group at medium deprivation stayed stable (men 5, women 8%) and a fair decrease of the richest was recorded (men from 2.5 to 2%, women from 4 to 3%).

Family structure and educational level distribution by deprivation at the 2001 and 2011 censuses [4, 5].

To reinforce the meaning of changes between SEHDI 2001 and SEHDI 2011, in Table III, the percentages of single-parents families, unmarried, divorced and separated as regards the family structure, the graduates (adding the higher university degrees) and the individuals who have achieved only the lower license or no license as regards the educational level, were distributed by deprivation group.

The amount of single-parent families was present only for 2011 census, because the variable was not freely available for 2001 census. Their amounting in 2011 was 10.5 as average, but the trend is increasing with deprivation and the percent of the most deprived was 4.6 times higher than for the richest one.

Tab. I. Factors of the SEHDI 2001 (total explained variance 72%) and SEHDI 2011 (total explained variance 72,2%). Percent of total explained variance and variables composing each factor.

2001	Factor 1 = 26,8%	Factor 2 = 15,2%	Factor 3 = 15,0%	Factor 4 = 15,0%
	% entrepreneurs and professionals % high school diploma and university degree	% married	% 2-members families	% of house with very small kitchen or kitchenette
2011	Factor 1 = 21,2%	Factor 2 = 21,2%	Factor 3 = 16,0%	Factor 4 = 13,8%
	Index of structural dependence Old age index % widowers/windows	% single-parent families % single-parent families with children < 15 years	% married % 2-members families	% rented homes % lower secondary school

Tab. II. Population distribution by SEHDI 2001 and SEHDI 2011: number and percent of resident in 2001 (applying SEHDI 2001) and in 2011 (applying SEHDI 2011) by deprivation groups.

Year	High deprivation		Medium-high deprivation		Medium deprivation		Medium-low deprivation		Low deprivation	
2001	17.503	2.9%	118.237	19.4%	325.250	53.3%	137.967	22.6%	11.025	1.8%
2011	17.380	3.0%	168.228	28.7%	268.861	45.9%	120.169	20.5%	11.542	2.0%

Tab. III. Family structure and educational level by deprivation group at the 2001 and 2011 censuses.

Deprivation groups	Family structure					Educational level			
	% single-parent families	% unmarried		% divorced & separated		% graduates & other university degree		% up to the lower license	
	2011	2001	2011	2001	2011	2001	2011	2001	2011
High deprived	19.8	49.1	38.8	7.9	8.0	5.7	8.6	71.3	63.3
Medium-high deprived	12.3	39.0	37.1	5.2	6.6	5.8	10.2	67.2	56.7
Medium deprived	10.2	34.3	38.7	4.4	7.0	8.3	14.1	59.6	49.8
Medium-low deprived	8.8	33.4	41.2	4.2	7.0	18.8	18.8	43.6	43.1
Low deprived	4.3	29.3	46.7	4.0	6.6	30.8	20.1	33.2	39.5
All population	*10.5*	*36.0*	*39.4*	*4.8*	*6.9*	*10.4*	*14.3*	*58.1*	*50.0*
Trend	L↑	L↑	L↓	L↑	NS	L↓	L↓	L↑	L↑

The unmarried represented more than a third of population, but trends were linearly positive in 2001, linearly negative in 2011, testifying SES-determined different behaviours in population.
The divorced and separated presented low, but increasing, percentages between censuses. The percent became a little bit higher at decreasing deprivation, so the trend, previously positive, became not significant.
About education level, the two opposite were considered. The graduates or with other university degree represented the 10.4% of population in 2001, growing up to the 14.3% in 2011, but the little increasing regarded the groups at more deprivation and the wide decreasing those at low deprivation, -10.7%. The trends were linearly positive, but the ratio between the richest and the poorest decreased from 5.4 to 2.4.
The individuals up to the lower license or those with no license represented more than 50% of population. The trends were linearly negative in both periods, with a higher gap in 2001 and an improvement in all groups in 2011, except those at low deprivation, which worsened of 6.3%.

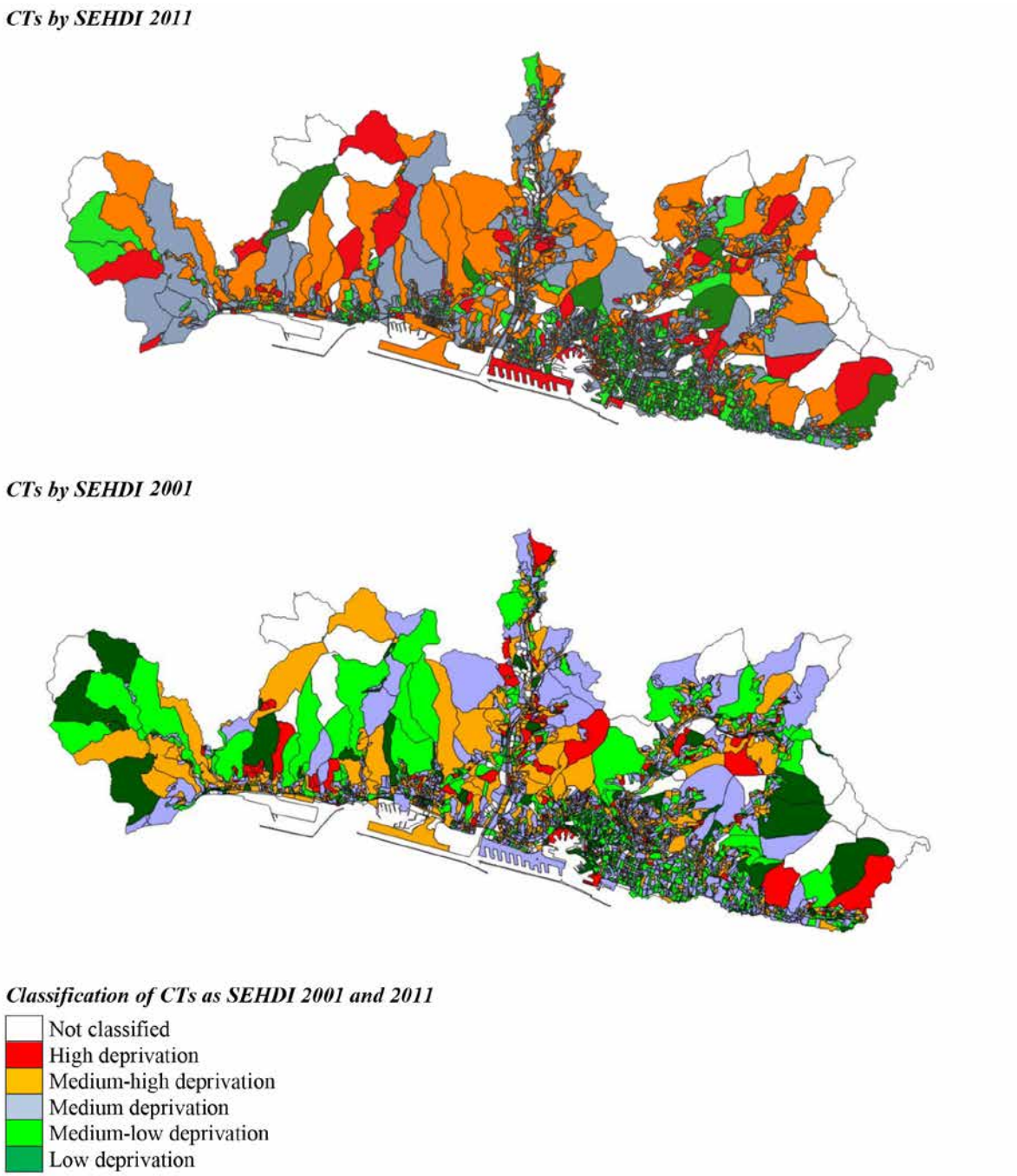
Maps of deprivation 2001 and 2011

In Figure 5 the changes in distribution of deprivation between the maps of 2001 and 2011 are displayed.
The differences between the maps are evident, seeing in 2011 the spreading of CTs at medium-high and high deprivation in some not expected parts of the city, as in the central parts and even in the eastern area of the city, previously richer than the rest of municipality.

Discussion

The temporal variations in the distribution by gender and age groups of population, described in Graph. 3, show the cross between the curves by age, which testifies the aging and the changed balance between age groups, making tangible the growing difficulties of society in keeping up with the deep social and economic changes. The curves of younger cross early with the one of elderly women. This testifies that the problem of aging emerged in Genoa sooner than in other Italian metropolitan areas [1, 2].
Moreover, the graph shows that the elderly in Genoa were mostly represented by women, who are at the same time "the strong sex", the one having more chances to survive [16], and "the weak link" of society, because often more subjected to disabling diseases [17] and to economic discriminations [18, 19]. At this purpose, the intersection between the curves of elderly and those of middle-age adults also becomes important, because it testifies the lack of support from the adults, which have decreased numerically over time. This aid is decisive when the aging growth, most of all in the case of illness. Furthermore, this lacking affects more the older women, due to their longer survival.
The "demographic fall" (Fig. 1) has given rise to a long-lasting debate on the "Genoese case", with the comparison of two theses. The first accentuates the "physiological" aspects of the population diminishing in large cities [20]. The second accentuates the more specific decline of Genoa city. Indeed, starting from the deindustrialization, this continued with a worsening of welfare independently from the national and international economic troubles (Fig. 2). This situation is still going on, even if, recently, the productive system attempted to re-start on a restructuring industrial path towards high-tech [3].
Figure 4 reinforces the problematic nature of the above results, displaying the decrease of Italian citizens and the modest, but evident, growth of the foreigners in the population. It underlines even that the shift towards poverty regards more the Italians, while the foreigners, starting from a poor situation in 2001, experienced an improvement, with a shift towards medium-deprived classes related to their increasing inclusion in the context. In this regard, it should also be considered that

Fig. 5. Distribution by deprivation groups in Genoa city by census sections classified on the basis of SEHDI 2001 and SEHDI 2011.



they often reside with those who are helping, who often live in the wealthiest areas.

The SEHDIs 2001 and 2011 (Tab. I) put in evidence the decline of welfare and health in Genoa city.

The difference between the two indices is relevant. The SEHDI 2001 pictured a city in economic growth, whose population, although it was decreasing and more aged than most of Italy, enjoyed a moderate widespread prosperity as regards education, labour market and characteristics of the family and housing structure. Instead, the SEHDI 2011 depicts aspects typical of an impoverished society, in aging, the lack of family support, the decreases of house property and of educational level. It describes a thinning of the population in average conditions and a shift towards poverty, which particularly affects women. In fact, Table II shows the decreasing population in the groups at medium deprivation and the increasing of those at medium-high deprivation.

As for the family structure, Table III shows the crisis of the traditional family. Between the two censuses the opposite tendencies of the share of unmarried, with the highest values in the poorest in 2001 and in the richest

in 2011, represent the increasingly widespread habit of living together outside of marriage, which reduces the costs of formation and dissolution of families. This, together with the greater diffusion of divorces and separations in all strata of society, testifies the spreading of unstable models of life, due mostly to the precarious prospects for work. Furthermore, this have favoured the increase of single-parent families, whose economic situation often become precarious and slip into poverty.
Likewise, the degree of education, which increases weakly in disadvantaged individuals in the first period, shows a significant weakening in the wealthiest in the second, bringing the population that has only the compulsory education qualification to almost 50%. This decrease is reinforced by aging, since the increase in the percentage of elderly people in the population also increases the number of individuals who in the past had been able to reach a lower level of education. Furthermore, the growing percentages of foreign immigrants, whose educational level is mostly very low, has contributing to a further lowering.
Finally, the differences between the maps, which are evident in Figure 5, testify that the loss of high-prestige appeal and residential tourist attraction is added to the other negative features previously highlighted, with a consequent decrease of the profitability of the real estate market. This consideration is confirmed by the specific aspects of the loss recorded by the real estate market in such areas in the last decade: for instance, the eastern part of the city (Quarto, Quinto and the well-known area of Nervi) remarked an average loss of value of 4.4%, although it is one of the most affluent part of the city in material terms, historically characterized by the highest values in real estates.

Conclusions

The results of this study reinforce the correlation between the impoverishment of population and the worsening of living conditions when they are related to the low level of education. The latter greatly influences the health aspects, since it determines the quality of life level, the level and the remuneration of one's own job, the lower availability of an own home and/or its location in disadvantaged areas, closer to polluting sources. Moreover, more often it is associated with unhealthier lifestyles (smoking habits, alcohol consumption, unbalanced diets) [21, 22] and determines how people deal with health in preventive aspects and in avoiding risky lifestyle habits [23, 24].
Furthermore, the strong aging, increasing the needs for social support and assistance [25, 26], is a difficult challenge for public welfare policies aimed at contrasting the contemporary effects of impoverishment and aging on the population.
The use of specific socio-health indices (such as SEHDI) is probably a useful tool for guiding local intervention policies. These results demonstrate that local deprivation indices should be used to specifically help the populations, as these allow identifying the subgroups that could benefit most from the investment of resources dedicated to correcting inequalities.

Ethical statement

No need of ethical approval was requested, because no personal sensitive information was used.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

Both authors equally contributed to define the theoretical framework and the methods, to perform the statistical analyses, to write the text and to the process of revision and editing. No funding was provided for this study.

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