Gender Dis-equality and Urban Settlement Dispersion: Which Relationship?

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Abstract. In the last 50 years, the phenomenon of urban land occupation in Europe has become increasingly relevant, leading to the development of low-density and highly dispersed settlements. The shapes and extensions of urban settlements have moved away from the more traditional and recognized dynamics of urban expansion, acquiring different forms and very low values of settlement density. These are models of unsustainable development because they tend to consume a limited resource, converting those soils intended for other uses or with a different natural vocation into artificial soils. In addition to the direct negative effects related to the amount of land consumed, the indirect effects are related to the total dependence on private cars for daily commuting, resulting in increased pollution, overall economic and social inefficiency, dependence on fossil fuels and minerals and services deficiency.

The shape of the urban settlement inevitably influences the quality of life of men and women, and if we consider that, in Italy, there are still important differences in terms of gender equality, we propose the first developments of a research project in which we want to investigate whether and how the dispersion of urban settlement affects and influences the quality of life of women.

Keywords: Urban dispersion · Gender gap · Urban sprinkling

1 Introduction

The issues of low-density cities characterized by phenomena of urban sprawl or urban sprinkling, have been highlighted in different studies and mainly concern the uncontrolled consumption of land [1, 2], the inefficient use of energy sources [3], and the higher economic and social costs that they involve [4–6]. These phenomena of dispersed expansion, in fact, compared to the phenomena of compact expansion, require a greater amount of infrastructure with consequent exploitation of agricultural or natural areas and increased costs of management of technological networks and transport [4].

As evidenced by Romano et al. (2017) [7], urban sprinkling generates effects significantly more critical than urban sprawl because of its irreversible character (except in the medium to long term). This uncontrolled land consumption leads to a landscape fragmentation that affects the reduction of the resilience of habitats, populations and more

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generally the ecosystem services loss [8–11]. In addition to these direct negative effects, the indirect effects are related to the total dependence of mobility on private cars, resulting in increased pollution, overall economic-social inefficiency, and dependence on fossil and mineral sources [12, 13]. In fact, the sprawl and sprinkling models are characterized by very different parameters, i.e. 10–20 build/hectares and 20–50 inhabitants/hectares for international sprawl and 0.1 built/hectares and 0.2–0.5 inhabitants/hectares for urban sprinkling [14]. The compact settlement is characterized by very high value of population and building densities.

The irreversibility of the land consumption phenomenon and the poor effectiveness of urban and territorial policies aimed at limiting its progression are elements of considerable importance [15, 16] and the high-density city characterized by a more compact spatial configuration (monocentric development) remains today the most sustainable form of development [17]. It follows that: a dispersed settlement is extremely dissipative compared to a compact one. If urban planning and political choices affect spatial transformations, these in turn affect the quality of life of men and women, then the question of this research is: is it possible to assess how spatial transformations and settlement patterns affect the quality of life of women?

The women's quality of life can not depend only on economic indicators such as the flattening of salaries of men and women or the presence of female figures in positions of value work but also from the provision of services, access to career and employment opportunities, contractual and tax benefits, gender violence, performance in sports and other.

Statistically, women take longer to travel by transport than men, who on average use faster means of transport such as private cars rather than public transport [18]. Women's trips are also characterized to be short but more numerous (multi-stop) since, compared to men whose trips are mostly for work reasons, they tend to perform diversified activities [19, 20]. According to Italian Statistical Institute (ISTAT) the employment rate of women (between 25 and 49 years of age) with pre-school children is 53.3% in Italy and only 35.2% in the regions of Southern Italy, which, except for a few cases, are characterized by strong settlement dispersion. In addition, family aspects have a differential influence on the lives of women and men, affecting accessibility to basic services and, consequently, on the quality of life.

Assuming this, the basic hypothesis is that a dispersed and low-density settlement context generates negative effects on the quality of life of women resulting from the dilatation of travel time to access basic services and the reduced availability of services (nurseries, sports facilities, hospitals, collective spaces and so on) with all the resulting consequences. In this contribute we will show the first results obtained in a research project aimed at investigating the existence of a relationship between urban settlement dispersion and women's quality of life.

The activities of the project include the application of geostatistical analysis to identify the relationship between the phenomena described above in the Italian territory. To start we will employ in these article: (i) the data already analyzed (of urban settlement dispersion), in the contribution presented in the annual report on land consumption ISPRA 2021 [21] (by the same authors); (ii) the data of the quality of life of women developed by the "Il Sole 24Ore" on the basis of statistical ISTAT data.

2 Research Goals and Innovativeness

Overcoming the Gender Gap is one of the Agenda 2030 goals (Goal 5 - Gender Equality) as well as a central position in post-pandemic recovery and relaunch policies [22].

In these relaunch policies, issues concerning the leveling of salaries to shorten the gaps due to gender differences are addressed more than anything else. In contrast, this research aims to demonstrate how the shape of an urban settlement affects women's quality of life. In this analysis, a fundamental role is played by land management policies that could act on factors related to gender differences, with well-designed and appropriate land transformations to ensure a high quality of life for both women and men. The innovative character of this research lies precisely in the intention to investigate the relationships existing between spatial planning and human behavior, a factor that both are reflected in the quality of life. In fact, the territorial strategies that are apparently unrelated to certain phenomena, on the contrary, deeply affect the choices and daily behavior of human beings, improving or worsening all those parameters intrinsically linked to the quality of life.

In order to highlight how a dispersed urban context contributes to increasing gender inequality, the methodology proposed in the research project is based on quantitative indices that, independently of subjective perceptions, scientifically identify the phenomenon that we want to examine. Through the available data (both open source and proprietary) composite indicators will be tested and, through spatial autocorrelation analysis, will be related to the values of settlement dispersion. As for women's quality of life, indicators derived from official data sources at national and international level such as ISTAT [23], The World Bank [24], Eurostat will be considered [25].

The work plan of the research is articulated in the following points: (i) recognition of data and indicators useful to express the relationship between gender dis-equality and urban settlement dispersion; (ii) experimentation of composite indicators and spatial autocorrelation analysis that allow to represent the phenomenon exposed above; (iii) proposal of addresses of land management and urban transformations, which allow to cancel/reduce gender dis-equality in dispersed urban settlements.

We are at the initial point of the development of research and therefore in this article we will present the first results obtained that already show a certain relationship between the two phenomena.

3 Women Quality of Life and Urban Settlement Dispersion

At the methodological level, it is proposed to analyze the relationship between urban settlement dispersion and women quality of life through indices of spatial correlation. Specifically, we will use: the LISA index (Local Indicator for Spatial Association) [26, 27] for the local scale, and in the next stages of the research, we will use the Moran I index for analysis on a global scale, as well as other indices of spatial autocorrelation such as Geary [28, 29]. These indices, given a set of variables, allow us to analyze the shape of spatial patterns and their relationships in the space.

LISA index (Ii) is expressed with the following formula (1):

$$I_i = Z_i \sum_{j=1}^{N} w_{ij} Z_j \tag{1}$$

where: Zi represents the ratio of the difference between the i-th element x and the mean of all elements divided by the standard deviation, Wij is the standardized weight matrix representing the degree of similarity of places i and j.

In this initial phase of the research, the LISA index has been experimented in order to preliminarily identify the relationships between the phenomena to be analyzed. The first results reported in Fig. 1 show the existence of a dependence between the index of women quality of life (Fig. 1(b)) and the index of urban settlement dispersion (Fig. 1(a)).

The index of women quality of life derives from the data elaborated by "Il Sole 24 Ore", the quality of life of women grows as the index increases. The index is composed of 12 indicators, including: life expectancy at birth; women's employment rate; youth employment; gender employment gap; job non-participation rate; gender pay gap; number of women-owned businesses; women administrators in businesses; women administrators in municipalities; gender violence; performance in sports; Olympic performance.

The index of urban settlement dispersion has been evaluated with the Moran I index and has a range of values between 0 and 1 where higher values correspond to urban compact settlement and lower values to urban dispersed settlement.

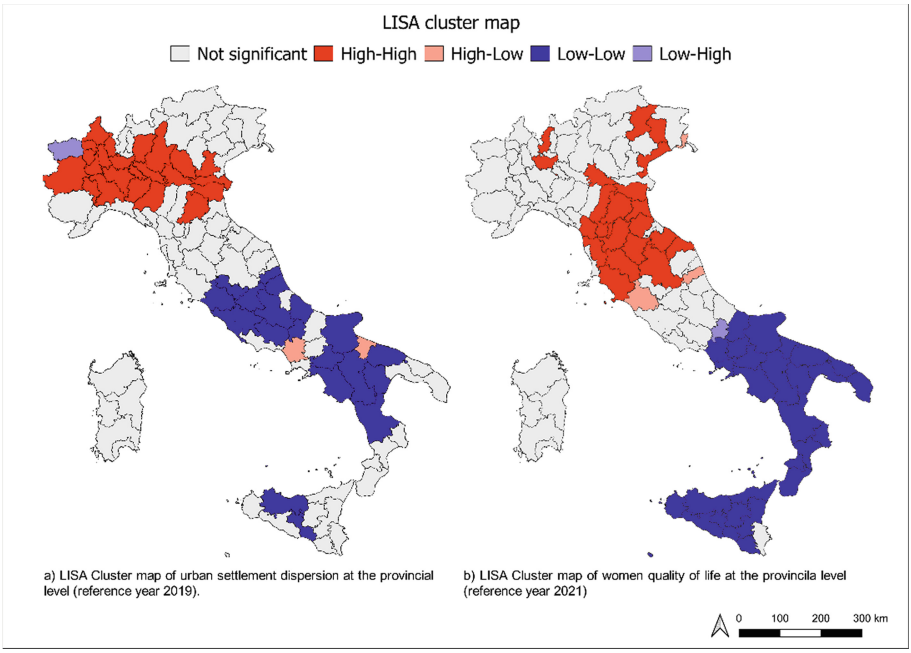


Fig. 1. LISA cluster map: relationship between women quality of life and urban settlement dispersion.

Cluster values indicate respectively:

LOW-LOW: this cluster identifies provinces with low values of the index of women quality of life adjacent to provinces characterized by low values of the same index. The same is valid for urban settlement dispersion, for which a low Moran index corresponds to high urban settlement dispersion;
HIGH-HIGH: this cluster identifies provinces with high values of the index of women quality of life adjacent to provinces characterized by high values of the same index. This applies also to the settlement dispersion, for which a high Moran index corresponds to low urban settlement dispersion, i.e. a compact form of urban settlement;
HIGH-LOW and LOW-HIGH: these clusters identify provinces with high/low values of the index of women quality of life and urban settlement dispersion adjacent to provinces with low/high values of the indices and vice versa.

The results of this first analysis show the presence, in southern Italy, of a cluster of LOW-LOW values while in north-central Italy there is a cluster of HIGH-HIGH values with respect to both variables.

Therefore, to the question "Gender dis-equality and urban settlement dispersion: which relationship?" posed in the title, for now we can only answer: "YES, there is a clear relationship between the gender dis-equality and urban settlement dispersion".

4 Discussions and Future Developments

LISA index and geo-statistics in general, turned out to be useful to describe several spatial phenomena including the study of migration flows in Italy [30], the identification of urban and peri-urban areas [31], the identification of clusters of indicators for sustainable development policies in France [32] and recently, in investigating the relationships between the COVID-19 spread and environmental components, climate factors and territorial management instrument [33].

In this research, to investigate the relationship between urban dispersion and women's quality of life, the LISA index has been utilized. It is evident, as stated in the introduction, how gender differences can increase in dispersed urban contexts. Starting from the initial results of this research, we want to investigate the causes/effects of this relationship by going to investigate those variables that contribute to a low quality of life of women and that may be strongly dependent on the urban settlement structure.

To this end, in the subsequent phases of the research, data concerning: the number of driving licenses issued at the provincial level divided by gender in order to relate them to the urban settlement dispersion; the number of daily trips for work or study divided by gender; the employment rate of women divided by jobs in public and private institutions; the supply of day-care centers, requests for access to maternity leave, the share of women time dedicated to unpaid work, domestic work and care, will be analyzed.

This research aims to investigate how spatial planning and strategic choices can affect women's quality of life, considering that in dispersed urban contexts travel time to reach basic services is longer and that these services are in turn not uniformly distributed throughout the territory. The organization and the structure of the urban settlement could have a significant impact on gender issues, increasing dis-equality.

An urban planning aimed at the development of a sustainable city as much as possible (non-dissipative system) in terms of optimization of routes, efficiency of services, improvement of the 'training/work offer and effective and efficient organization of urban spaces can only positively affect the women's quality of life by contributing to the levelling of the gender gap that can not depend only on economic indicators such as the flattening of salaries of men and women or the presence of female figures in positions of value work.

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