The Urban One Health Approach for the Planning of Effective Interventions on Territory: A Systematic Analysis of the Scientific Literature

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Abstract. The aims of this research is to conduct an analysis of the existing scientific literature on the concept of Urban One Health that is an innovative and integrated approach that connects human, animal and environmental health within urban planning and development processes. This multidisciplinary paradigm is a concrete and necessary response to the challenges posed by contemporary urbanisation, environmental sustainability and the well-being of populations.

The Urban One Health approach promotes an holistic vision that recognises the interconnection between urban ecosystems and public health.

The main purpose of this study is to expand the theoretical and practical knowledge and understanding of the Urban One Health concept, highlighting its main implications for contemporary urban planning. For this scope, the analysis focuses on identifying interdisciplinary tools, strategies and methodologies that can support a more resilient, inclusive and conscious urban transformation in line with the principles of sustainability.

Through the examination of the scientific literature, it was possible to identify three criteria that characterise the Urban One Health approach: firstly, the definition of specific research objectives focused on the integration of health and urban planning; secondly, the analysis of the context as a field of interaction between biological, social and environmental factors; and finally, the use of interdisciplinary research methodologies, capable of understanding the complexity of the issue.

Keywords: One Health · Urban One Health · Sustainable Cities · Urban planning · Review

1 Introduction

In the 20th century the exponentially growing world population connected to the increasing urbanization have profoundly transformed the cities and have proposed new challenges for the management of public health and environmental sustainability.

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Demographic surveys show that by 2050 the world population could exceed 9.7 billion people, with over 70% of the global community concentrated in urban areas [1]. It is currently evident that the intensive expansion of the territories causes different socio-environmental critical issues that require rethinking urban planning strategies and health policies, in order to ensure more sustainable, healthy and resilient cities. In this framework, the concept of One Health is increasingly crucial. In particular, this innovative model addresses the interconnections between human health, animal health and environmental health, highlighting the need for territories governance of the interventions to be carried out that is integrated with multidisciplinary measures. In 2021, the World Health Organization (WHO) defines the health as the result of a holistic balance between people and environment, in natural terms but also in the urban dimension. This notion is consistent with the attested increase in awareness of necessarily redesigning cities by ensuring more sustainable and healthy living conditions.

Furthermore, in 2015, the United Nations has pointed out the urge of introducing among the 17 Sustainable Development Goals (SDGs) a specific objective aimed at transforming cities in order to make them more inclusive, sustainable and safe, emphasizing the simultaneous need to analyze and manage progressive urbanization [2].

In this sense, effective strategic actions on the territories able to address the global issues in a systematic manner for the increase of communities well-being should be implemented. Among them, the strengthening of public health on a international, national, regional and local scale represents a key factor to prevent future pandemics and support scientific research for creating safer and more resilient perspectives. To ensure the development of urban environments (built and unbuilt) as a generator of factors of well-being in line with a salutogenic approach [3], the promotion of a holistic vision for a effective balance between human, environmental and animal health is essential. From this point of view, cities should be rethought to reduce environmental risk and improve air quality in a context of healthy lifestyles.

Moreover, the establishment of successful collaborations between government entities, local authorities, health agencies, academics, public and private research institutes, professionals and companies becomes a fundamental pillar. These synergies are central to address critical phenomena such as the increased contact between wildlife and population in urban areas, climate change and pressure on biodiversity. Through the application of a multidisciplinary criterion, it will be possible to identify and control, since the beginning, the emergence and spread of new infectious agents, in order to limit the risk of new pandemics and protect global health.

In addition, urban health should be oriented to equal access to care, diagnostics and health treatments for the entire population: territorial inequalities in health care cause relevant questions that are reflected also in waiting times and perceived quality of health services, especially for the most vulnerable population groups. During the last decades, the strengthening of the prevention of chronic non-communicable diseases (tumors, diabetes, cardiovascular, respiratory and neurodegenerative diseases) has assumed a significant role in the debates on human health. A key policy to be applied in all urban areas can be the creation of a broad and homogeneous care network: this strategic measure would reduce the financial burden of chronic diseases on public health expenditure, over and above the improvement of communities life quality.

The definition of social and health policies for fovouring the health as a 'common good' and its integration into all development sustainable cities initiatives is the main aspect on which the Urban One Health approach is based.

For raising awareness among the population to contribute to the creation of a preventive culture consistently with the One Health principles, the implementation of multidisciplinary training of health professionals, urban planners and public administrators should be promoted. Given the close relationship between population health and urban territories in which the people live, the scientific debates on the topic are mainly focalized on the definition of guidelines for interventions able to improve the citiziens weel-being (of which the health represents a essential sphere).

For exemple in the reference literature, [4] highlights that the emergence of new infectious diseases (such as zoonosis) is greatly linked to urbanization, changes in land use and the loss of biodiversity. According to [5], the adoption of the One Health approach has accelerated due to the increase in global health crises (especially the last caused by the COVID-19 pandemic). The emergencies have confirmed the strong interconnession between people, animals, plants and envirorment into the macrosystem in which are included and that the single elements health depends on from that of all the others. In 2022 the Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) have developed a joint and participation-based action plan to address threats to the ecosystems health (of humans, animals, plants and environment) aimed at creating a framework in which systems and capabilities to better prevent, predict, detect and respond to crisis are integrated. Thus, the plan focuses on the strengthening of the fair international cooperation between all sectors that involve the global health [6], setting operational goals and collective actions to be taken.

In this scenario, the Urban One Health approach should guide the correct management of the territories, stimulating the implementation of regeneration strategies targeted at rehabilitating the urban ecosystem of future cities, focusing on biodiversity and ecosystem services within the design of healthy and sustainable urban spaces.

Currently, the Urban One Health application faces some important obstacles from an operational point of view: legislative fragmentation, difficulties in coordination between different sectors and scarce awareness of this importance by citiziens [7]. Furthermore, [8] underlines that the transition towards the urban models from the prespective of One Health implies significant initial investments, although economic and health benefits high and considerable.

The definition of public policies in line with this approach presuppones the integration between science, technology and political decisions [9] in order to guarantee healthy and resilient cities ready to face the global challenges of the 21st century.

2 Aim

The research is part of the outlined framework. In particular, the work aims to provide an analytic framework of the main aspects connected to the notion of Urban One Health covered by the reference literature. The analysis intends to highlight the ever-increasing role of the approach in the development of strategic urban policies for the effective

management of the cities with a view of a synergistic integration between public health, environmental sustainability and communities quality of life [10, 11].

The Urban One Health approach represents a holistic model of contemporary city planning. It includes an innovative paradigm that redefines the notion of health related to urban design, overcoming the ordinary sectoral vision to encompass a multidisciplinary approach in which urban planning, epidemiology, ecology and governance are projected towards the creation of healthier and more resilient cities.

Through the analysis of the reference literature, in the present research the interpretation of the looking for healthy urban governance models is carried out, to point out the the benefits deriving from the adoption of One Health-based tools and to provide evidence for supporting the planning oriented towards the communities well-being improvement [13]. The identification of factors and best practices from the literature contributes to outlining the interventions capable of directing wider urban strategies, improving their effectiveness and promoting models of sustainable development. The high attention of the scientific and institutional community towards Urban One Health confirms, in fact, the need to implement and favour innovative approaches aimed at addressing the challenges of urban health, with particular attention to climate change, socio-economic inequalities and equitable access to territorial resources (i.e. the available environmenatal, cultural, social, economic factors) [9, 12].

In this sense, this study tries to provide an additional contribution to the existing knowledge on the topic, for the future development of methodological and operational tools to support urban management as well as to promote a more holistic vision of health as a fundamental element in planning policies and the consequent development of cities [7].

The following part of the paper is organized as described below. Section 3 describes the methodology developed for the systematic analysis of the relevant literature, with the aim of selecting the contributions that discuss the main aspects in the various geographical contexts to investigate the topic. Section 4 is dedicated to the presentation of the results and a summary of the main issues deal with by the different Authors is outlined; in addition, the main trends and critical issues in the relationship between urban planning and health are highlighted. Finally, in Sect. 5 the conclusions are discussed. Therefore, the practical implications of the research and further insights are illustrated.

3 The Methodology Adopted for the Literature Review Development

In order to carry out a systematic analysis of the scientific literature related to the concept of Urban One Health, 57 documents [14–70] have been collected and chosen through the consultation of the main academic databases, including Scopus and Google Scholar.

Urban One Health is part of an emerging research field that connects territorial planning, public health and environmental sustainability, recognizing the crucial role of the urban space on the well-being of communities [14, 15]. The exponential increase in the urban population – associated with a growing exposure to pollutants - has made the need for integrated approaches to mitigate the connected risks and improve the quality of life in cities, evident. During the last decades, the health implications of urban planning

have been particularly recognized as a priority within the public policies. Furthermore, the focus on the strategies for adaptation and reduction of environmental impacts of interventions on territories has assumed a fundamental importance, by attesting the urge to implement solutions based on urban sustainability and resilience [16, 17].

To ensure a wide and in-depth analysis of the scientific literature consistent with the general topic covered in the present research, the keywords representative of the question have been identified. These are: *urban one health, urban health, urban sustainability, environmental health, public health policies, urban planning and well-being, ecosystem services in cities, green infrastructure and health, climate change and urban health, socio-environmental determinants of health.* The synergic and combined use of these keywords in the consulted databases have allowed to select several scientific contributions, guaranteeing a broad and representative coverage of the different disciplines involved in the discussion, including the environmental epidemiology, the territorial planning and the Medicine. In Fig. 1 a scheme of the main keywords used for the papers selection is shown.



Fig. 1. Keywords used for the collection of the papers analysed in the review

From the first set of 187 papers collected through the databases consultation, only the contributions with scientific relevance and thematic consistency have been selected. In particular, the studies that addressed the interconnections between human, environmental and animal health within urban contexts, with reference to planning strategies or sustainability goals, have been included in the final papers set. Conversely, off-topic documents or focused exclusively on rural contexts, or lacked an interdisciplinary perspective, or not available in full text, have been excluded.

Figure 2 shows the flow chart of the phases carried out for the contributions selection process.

The identified literature articles are referred to a publication period of the last two decades and include different documents aimed at highlighting the role of environmental, social and economic factors in determining urban health.

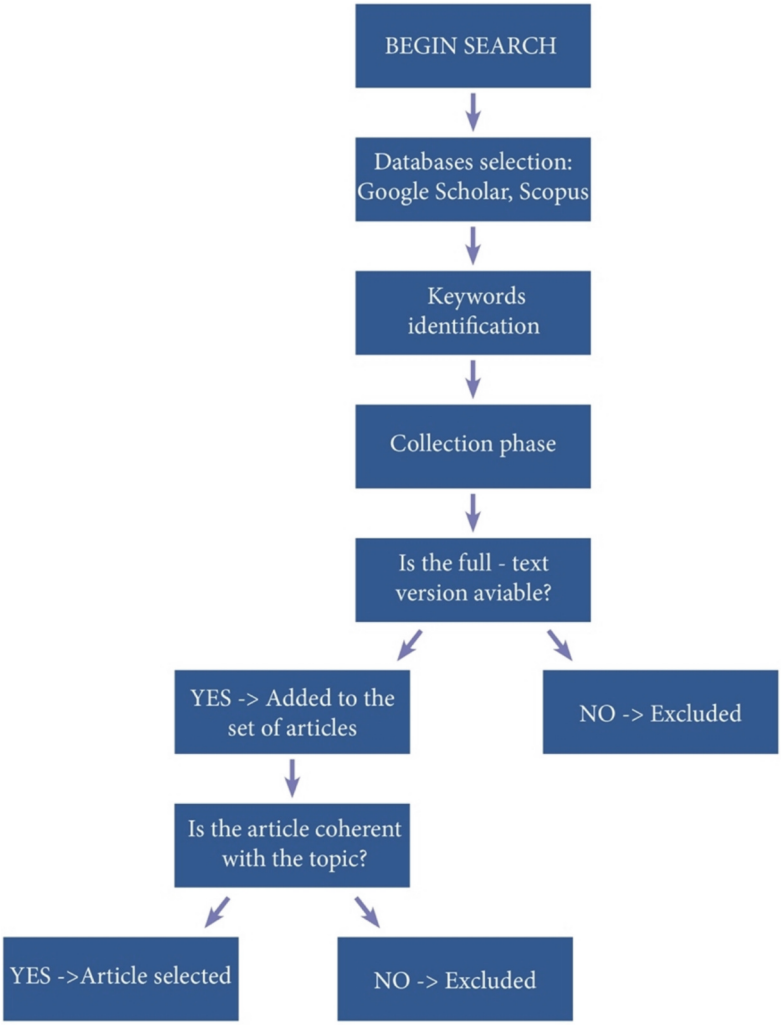


Fig. 2. Main steps for the selection of the 57 papers analysed in the review

By recalling the aim of the research (i.e. to investigate the scientific literature on the topic of Urban One Health), three main criteria have been identified to classify and examine the selected records: i) the specific research objectives, ii) the context of analysis, iii) the methodologies adopted. This tripartite classification has led to a structured interpretation of the literature results, highlighting recurring patterns and emerging directions in the field.

Specifically, the analysis of the research objectives allows to focus the several purposes for which each study has been developed, in terms of innovative contribution to the existing knowledge and of practical implications, as the definition of new tools to be used in the decision-making processes related to the urban interventions.

The identification of the contexts of analysis is connected to the different aspects on which the academic has placed greater attention, highlighting the issues related to the general topic of Urban One Health mostly discussed within various geographical territories.

The investigation of the methodological approaches implemented in the selected papers for specific objectives allows to identify any recurring techniques applied with reference to targeted goals and contexts (Fig. 3).

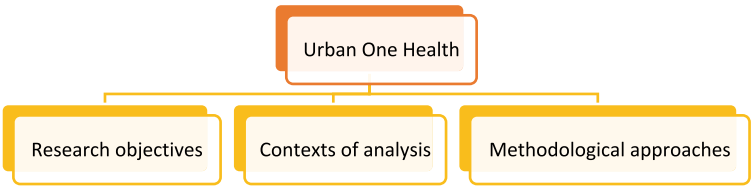


Fig. 3. Criteria used for the classification and the analysis of the collected papers

4 Results

Based on the three criteria used for the classification and analysis of the papers collected for this literature review, the discussion of the results is structured into the three main sections outlined below: research objectives, contexts of analysis and methodological approaches.

4.1 Research Objectives

In general terms, the research objectives of the collected 57 papers are all linked to highlight the relevance of the inclusion of the Urban One Health approach in the urban planning operations. The most frequent goal identified in the literature papers sample concerns the analysis of how the urban environment influences public health. In this sense, integrated strategies can promote equitable and sustainable communities well-being. The most recent studies point out the role of local governance in the urban health policies management, and underline the importance of evaluation tools - such as the Health Impact Assessment (HIA) - to promote informed decisions based on scientific evidence [18]. Furthermore, a growing interest for the synergic integration between urban planning, public health and ecology is attested, with the aim of developing territorial strategies targeted to sustainable and resilient cities [19].

Furthermore the influence of the environment on public health is increasingly acknowl-edged through studies emphasizing how air quality, green spaces, accessibility to resources, and built environment characteristics significantly impact on physical and mental health outcomes. Addressing environmental determinants such as pollution, urban heat islands, and noise exposure through integrated urban planning strategies not only improves overall community health but also contributes to reducing health inequities among urban populations. Consequently, multidisciplinary approaches that

connect urban design with environmental health considerations emerge as essential for achieving healthier, more inclusive urban settings [17].

Figure 4 summarizes the main research objectives of the 57 studies of the detected sample.



Fig. 4. Research objectives of the analysed studies

4.2 Contexts of Analysis

With regard to the contexts of analysis examined by the 57 researches, several key themes are found.

The aspects mostly deal with within each study represent the main declinations of the more general topic of the Urban One Health. Among the issues, the relationship between access to green spaces and mental health, the role of urban pollution on the human health, the socio-spatial inequalities in determining the communities well-being, the importance of urban planning focusing on public health constitute the most common questions of the relevant literature [20–22]. In this framework, different Authors conclude that air pollution, soil degradation and the lack of green spaces are the main factors that influence the spread of chronic diseases, with a greater impact on the most vulnerable population groups. Moreover, the role played by air quality, noise pollution and urban heat islands is explored as determinant variable of public health [23, 24].

The case studies of the different analyzed researches show that prolonged exposure to high levels of air pollution is associated with an increased risk of cardiovascular and respiratory diseases [15, 25]. In addition, the lack of green infrastructure in cities contributes to the increase in stress-related disorders, obesity and metabolic diseases

[26, 27]. In this sense, the socio-spatial inequalities are also relevant in the relationship between the human health and urban planning, as the uneven distribution of green spaces and health services significantly affects the territorial gap in urban health [28]. Moreover, recent studies indicate more equitable levels of well-being in cities with planning focalized on health and social inclusion [29].

Among the urban factors examined in the set of papers related to the Urban One Health approach, housing quality and sustainable mobility are fundamental aspects of quality of life in urban areas. Building density and traffic conditions have a direct influence on the perception of well-being and the risk of exposure to pollutants [30]. At the same time, recent studies have highlighted how an active integration between sustainable transport and territorial planning can drastically reduce toxic gas emissions, improving public health [31]. From a practical point of view, numerous examples demonstrate the effectiveness of the Urban One Health approach in different urban contexts. Lyon (France) leads the One Health 4 Cities network, which develops tools to increase the positive impact of urban projects on the health of people, animals and the environment [32]. Lahti (Finland) has implemented the Nature Step to Health program, which integrates health into urban policies through initiatives such as the Health Forest that promotes the mental and phisical well-being of the visitators through sensorial paths [33]. Accra (Ghana) shares the WHO Urban Health Initiative [34], adopting measures to reduce deaths and diseases associated with air and climate pollutants. Kathmandu (Nepal) is involved in a pilot project that monitors the health and economic burden of air pollution for improving urban health [35] (Fig. 5).



Fig. 5. Main topics addressed in the analyzed papers

4.3 Methodological Approaches

The documents examined in the reference literature implement a variety of methodological attitudes to analyze the Urban One Health approach in line with specific objectives. These methodologies reflect the multidisciplinary nature of Urban One Health, integrating perspectives from urban planning, epidemiology, environmental sciences, and public health policies.

A significant number of studies develop systematic reviews on the topic to provide a critical overview of the scientific debate and to define the main conceptual and applicative models related to Urban One Health [16, 18, 19, 28, 36, 37]. These reviews highlight the multidisciplinarity as a central aspect for the study of interactions between the urban environment and public health. By analyzing a broad set of scientific suggestions, they contribute to establishing a solid theoretical framework that allows the creation of interpretative and predictive models, as well as operational guidelines to support urban policies [38]. The systematic literature reviews serve as an essential reference for identifying best practices, common challenges, and emerging research trends in the field of Urban One Health.

In addition to systematic reviews, many studies apply quantitative and empirical analyses by using environmental, epidemiological, and socioeconomic datasets to investigate the relationship between urban factors and public health [20]. The integration of big data analytics and machine learning algorithms has enabled researchers to extract insights from large-scale datasets, identifying hidden patterns and correlations between urban design and health outcomes [39–41]. For instance, statistical models applied to air pollution data have demonstrated a strong link between urban emissions and increased rates of respiratory and cardiovascular diseases, reinforcing the necessity of policy interventions [31].

Among the most widely used analytical tools, Geographic Information System (GIS) techniques play a crucial role in understanding spatial dynamics in urban health. Spatial regression models and time series analysis allow researchers to identify spatial patterns, long-term trends, and geographic disparities in exposure to environmental risk factors [31, 42]. These approaches facilitate the development of forecasting tools that can be used to monitor health and environmental risks in cities, providing decision-makers with evidence-based information for urban planning and public health management [22]. The integration of remote sensing technologies and satellite imagery further enhances the ability to track urban environmental changes in real time, enabling the rapid assessment of interventions' effectiveness [43].

The development of experimental approaches in some research is intended to test innovative strategies aimed at managing air quality, sustainable mobility, and green infrastructures [26]. These experiments include the implementation of urban pilot projects to evaluate the impact of green urban designs, low-emission zones, and renewable energy-based transportation systems on public health [44]. Additionally, some studies use behavioral experiments to understand how urban residents respond to environmental changes, such as the introduction of pedestrian-friendly areas or expanded cycling networks.

A particularly increasing area of research focuses on the validation of Nature-Based Solutions (NBS) as an effective means of promoting urban health and sustainability.

NBS refer to strategies that leverage on natural processes and ecosystem services to address urban challenges while providing social, environmental, and economic benefits. Studies have demonstrated that interventions such as the creation of urban forests, green roofs, vertical gardens, and permeable pavements can significantly reduce air pollution, mitigate urban heat islands, and enhance mental well-being [27]. Furthermore, urban planning strategies incorporating green corridors, wetlands restoration, and biodiversity conservation have been shown to increase resilience to climate change while fostering a healthier urban environment [40, 41, 45, 46].

A significant contribution to the understanding of Urban One Health comes from studies on the evaluation of urban ecosystems' health, which propose a series of indicators to measure the social and ecological well-being of cities [17]. These indicators can be grouped into three main categories: environmental indicators (assessment of air and water quality, urban biodiversity, and pollution levels), economic indicators (analysis of public health expenditures, cost of urban interventions, and financial efficiency of green projects), social indicators (evaluation of healthcare accessibility, quality of public spaces, urban mobility infrastructure, and socio-spatial inequalities) [20, 43, 47, 48].

By integrating these indicators into urban policies, researchers propose new frameworks based on the One Health approach, emphasizing the synergistic relationship between biodiversity, green infrastructures, and sustainable urban planning [49, 50].

A further methodological aspect concerns the evaluation of the Health Impact Assessment (HIA), an analytical tool designed to connect health with environmental sustainability and urban planning [38]. Despite its effectiveness in informing evidence-based decision-making, its application remains limited in practice due to regulatory barriers and lack of standardized assessment criteria [51]. To address these challenges, researchers advocate for greater integration of HIA into policy frameworks, emphasizing its role in evaluating the health consequences of urban development projects before their implementation. [52–54].

Finally, to obtain a dynamic and predictive vision of the health of cities, advanced mathematical models are proposed to track trends, anticipate health risks, and identify critical issues over time [22]. These models use longitudinal data, multi-variable forecasting algorithms, and real-time environmental monitoring to assess the complex interactions between society, the environment, and the economy. The adoption of artificial intelligence (AI)-driven analytics is further expanding the possibilities of real-time health risk assessment, allowing urban planners to design proactive rather than reactive health policies [41, 55, 56].

The combined use of these methodologies confirms that Urban One Health is not just a theoretical framework but an operational approach capable of guiding concrete urban interventions. The growing body of research supports the adoption of holistic planning models, where public health considerations are integrated with ecological and urban development strategies [57, 58].

In Fig. 6, the main methodological approaches used for the analysis of Urban One Health concepts in the analyzed research are summarized.

A cross-analysis of the reviewed studies reveals that empirical and spatially-based methods - such as GIS modelling - are mainly used in the documents that seek to inform



Fig. 6. Methodological approaches mostly implemented in the collected studies

planning and policy decisions. In contrast, conceptual contributions often rely on systematic reviews and theoretical frameworks to consolidate the epistemological foundations of Urban One Health. This dual orientation confirms the progressive integration between research and practice, where interdisciplinary approaches are increasingly adopted to connect scientific evidence with territorial governance. The most effective contributions emerge from hybrid approaches that link spatial, social and health data, paving the way for future experimentation.

5 Conclusions

Within the definition of public policies for the cities development, the adoption of the Urban One Health approach is no longer an optional choice. It represents an essential strategy to address the actions of territorial governance and health protection by promoting the regeneration processes. Cities, from simple agglomerations of infrastructures and buildings, should be converted into resilient ecosystems, capable of fitting to environmental changes, by successfully ensuring the communities well-being. This requires an innovative paradigm in urban management that overcomes the traditional separation between sectors in favor of integrated models.

In this context, the role of digital technologies and big data in monitoring urban health becomes crucial. Environmental sensors, artificial intelligence systems for the adequate urban resources use and forecasting analysis platforms allow to facilitate informed and timely decisions. The creation of virtual models for simulating the impact of urban policies on public health constitutes a turning point for evidence-based planning, that ismainly aimed at improving the citizies well-being [71].

Furthermore, the communities involvement in decision-making mechanisms for urban planning, through participatory tools and urban co-design initiatives, favours the implementation of strategies targeted for health and for the creation of more liveable cities. The empowerment of the population in identifying healthy options – from sustainable mobility to the use of green spaces – assumes a relevant role to making Urban One Health approach effective.

A critical point currently widely debated concerns the operational implementation of this approach. In this sense, the integration between public and private sectors, the activation of financial incentives for cities that adopt One Health models and the development of regulatory tools for making these principles mandatory are decisive elements in moving from theory to practice [72]. Without an adequate economic and legislative formalized support, the risks of remaining applied only to experimental projects without structural impact are significant.

In addition, the challenge of integrating the One Health approach into educational models is still open [73]. The training of multidisciplinary professionals should be combined with the active participation of citizens in new models of coexistence with the surrounding urban environment and biodiversity. The inclusion of the Urban One Health approach into the schools and universities formation could help to build more aware communities able to face the urban health challenges.

In future, the positive outcome of Urban One Health application to the urban policies will depend on the ability of cities to experiment it, with integrated and flexible solutions based on a holistic vision of human, animal and environmental health [74]. Therefore, the future of urban areas should be based on a dynamic balance between environment, health and economic development [75].Through the analysis of the reference scientific literature, the present research has aimed to highilight the increasing importance assumed by the Urban One Health concept for the definition of tools to support the territorial governance [76]. The decision-making processes related to the operations of urban interventions planning should be based on a effective cooperation between different disciplines (including human health, veterinary medicine, environmental sciences, social science, etc.) for tacking the most urgent, relevant and complex current issues (dense population, pollution, close human-animal interaction, shared environmental spaces, climate changing, etc.) for building more resilient, inclusive and sustainable communities [77]. The results of the present literature review confirms the growing integration between urban planning and health issue, especially through methods that combine spatial analysis, environmental monitoring, and interdisciplinary approaches. Nonetheless, the review has some limitations, including the exclusion of non-peer-reviewed sources and the lack of standardised evaluation criteria. Future research may explore how Urban One Health can be applied in concrete situations, through pilot projects, cross-sectoral governance and participatory planning with local communities.

Note: The research has been developed within the project “MISTRAL - a toolkit for dynaMic health Impact analysiS to predicT disability-Related costs in the Ag”- HORIZON-HLTH-2022-ENVHLTH04 - Grant Agreement Project n. 101095119 of the Polytechnic of Bari (Italy).

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