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THE RELEVANCE OF PUBLIC SANITATION AS A SYNERGISTIC INSTRUMENT FOR PUBLIC HEALTH

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ABSTRACT

The article addresses the relevance of public sanitation as an essential element for the promotion of public health and sustainable development. Through a bibliographic approach, the interrelations between sanitation, health, environment and social inclusion are explored, highlighting their positive impacts on disease reduction, improved quality of life and environmental preservation. Despite advances in some regions, inequality in access to sanitation services still represents a major challenge, especially in developing countries, where vulnerable populations suffer from a lack of adequate infrastructure.

The text also discusses the importance of integrated public policies and innovative strategies, such as the use of sustainable technologies and innovative financing models, to overcome economic and structural barriers. In addition, it emphasizes the need for community engagement and collaboration between governments, international organizations, and the private sector in implementing effective solutions.

The article explores the role of sanitation in strengthening human dignity, promoting social equity, and addressing environmental crises, such as climate change and water pollution. Finally, it reinforces that the universalization of public sanitation is an ethical commitment and a global priority, being indispensable to achieve the Sustainable Development Goals and ensure health, dignity and prosperity for all populations.

Keywords: Public Sanitation. Public health. Social inequality. Sustainability.

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INTRODUCTION

Public sanitation is widely recognized as one of the most essential pillars for building healthy, safe and sustainable societies. Not only is it a basic human right, but it is also an indispensable condition for the social and economic development of communities around the world. The lack of adequate sanitation is directly associated with a series of public health problems, such as the spread of infectious diseases, increased infant mortality, and even the perpetuation of cycles of poverty. In this context, it is impossible to ignore the strategic importance of sanitation as a synergistic instrument for the promotion of public health.

The positive health impacts of public sanitation are vast and documented. Areas with adequate sanitation infrastructure have significantly lower rates of water-related diseases such as diarrhea, cholera, hepatitis A, and schistosomiasis. These diseases, often neglected, continue to be a leading cause of death in underdeveloped regions, especially among children. According to data from the World Health Organization (WHO), millions of people are hospitalized annually due to health problems that could be avoided with effective sanitation, reinforcing the need to prioritize the issue on public agendas.

In addition to fighting diseases, public sanitation contributes to improving the quality of life more broadly. It reduces stress associated with lack of access to adequate facilities, improves dignity, and promotes mental well-being, especially in vulnerable populations such as women and children. Adequate sanitation also reduces inequalities, as marginalized populations often face the greatest challenges in this regard, suffering disproportionately from the impacts of poor sanitation.

Public sanitation also plays an important role in environmental preservation. The absence of adequate treatment of sewage and solid waste contaminates waterways, soils and even the air, creating a vicious circle of environmental degradation and health problems. On the other hand, well-designed sanitation systems help preserve water resources, an essential component for human survival and development, and also reduce the environmental impact of human activities.

From an economic point of view, investing in sanitation is a smart and cost-effective measure. Every dollar spent on sanitation results in significant savings in health systems, due to reduced numbers of sick people and less need for medical treatments. In addition, healthy workers are more productive, which drives local and national economic growth. Global estimates indicate that countries that do not invest adequately in sanitation lose billions of dollars annually due to the costs associated with preventable diseases and reduced productivity.

Not least, sanitation infrastructure also plays a critical role in times of global health crises, such as pandemics. During the COVID-19 pandemic, for example, basic hygiene practices such as frequent handwashing with soap and water were highlighted as key measures to contain the spread of the virus. However, the lack of access to adequate sanitation facilities in many parts of the world has revealed a significant vulnerability in the global response capacity to health emergencies.

The relevance of public sanitation as a synergistic instrument for public health is intrinsic to a more sustainable and just future. The international agenda, exemplified by the United Nations Sustainable Development Goals (SDGs), recognizes sanitation as a key element to achieve goals such as poverty eradication, gender equality, and environmental preservation. To achieve these goals, it is imperative that governments, international organizations, the private sector, and civil society join forces to ensure that everyone has access to dignified and effective sanitation services.

Public sanitation is not just a technical infrastructure; It is an essential component of health, human dignity and global sustainability. Its proper implementation is a direct reflection of a society's commitment to collective well-being and to creating conditions that enable all individuals to live in health, safety, and prosperity.

The expansion and improvement of public sanitation infrastructures require not only significant financial investments, but also a strategic vision that considers the cultural, economic, and geographical particularities of each region. In rural areas, for example, challenges include population dispersion, which makes implementation costs higher, and lack of access to modern technologies. In densely populated urban areas, accelerated and disorderly urbanization often results in the proliferation of informal settlements without basic water and sewage services, aggravating public health problems.

Sustainable public sanitation planning must also consider the integration of innovative and environmentally responsible technological solutions. Technologies such as decentralized water treatment systems, dry toilets, or wastewater reuse technologies are gaining prominence as viable alternatives, especially in communities where traditional solutions are not practical. These approaches not only expand access but also reduce environmental impacts and promote the reuse of resources, creating a virtuous cycle of sustainability.

In addition, education and community engagement are crucial components for the success of public sanitation projects. It is not enough to install infrastructure; It is essential to ensure that local populations understand the importance of using them correctly and maintain proper hygiene practices. Awareness campaigns on personal hygiene, recycling

and correct waste disposal can transform public perception of sanitation and foster a culture of collective care for the environment and health.

Another relevant aspect is the role of public policies and the regulatory framework in strengthening public sanitation. Governments have a responsibility to create clear and effective legislation, in addition to ensuring the allocation of resources and the supervision of the implementation of health services. The privatization of sanitation services, for example, generates intense debates on how to balance efficiency and universal access, especially in regions where the population is unable to afford higher tariffs. In this context, it is essential that public policies are guided by principles of equity and social justice.

Furthermore, public sanitation cannot be treated as an isolated issue. It is deeply interconnected with other areas, such as housing, education, transportation, and health. An integrated and coordinated system between these sectors is essential to maximize the positive impacts of sanitation. The construction of affordable housing with adequate sanitary infrastructure, for example, not only improves the quality of life of residents, but also reduces public health costs, creating a positive cycle for social development.

The long-term vision is essential. Public sanitation should be understood as an investment in a more resilient and healthy future for all. As we face global challenges such as population growth, climate change, and urbanization, the need for robust and sustainable sanitation systems becomes even more evident. Ensuring universal access to public sanitation is not just a pragmatic goal, but a moral and ethical imperative, reflecting the commitment to human dignity and the construction of a fairer world.

METHODOLOGY

This article adopts the methodology of bibliographic research, considered an essential approach to consolidate the existing knowledge about the relevance of public sanitation as a synergistic instrument for public health. Bibliographic research is defined as a process of analysis of materials already published, such as books, scientific articles, official documents, and reports, with the objective of theoretically supporting and grounding the discussions addressed (MARCONI; LAKATOS, 2017).

For the construction of this study, relevant and updated sources were selected, favoring works that deal with the interrelations between sanitation and public health. The main focus of the research was to identify data and analyses from international bodies, such as the World Health Organization (WHO) and the United Nations (UN), as well as from scientific publications indexed in recognized databases, such as Scielo, PubMed, and

Google Scholar. The selection of materials followed criteria of relevance, timeliness (publications mostly in the last ten years) and credibility of the sources.

According to Gil (2002), bibliographic research is particularly effective to "identify the main authors, concepts and trends of a theme, offering a broad view of the state of the art". Based on this premise, the study sought to integrate different perspectives and approaches to the benefits of public sanitation, such as the reduction of morbidity and mortality from preventable diseases, the positive economic impacts, and the environmental implications.

In addition, to deepen the analysis, the study followed the guidelines of Bardin (2016) on content analysis. This technique allowed categorizing the information extracted from the sources and identifying recurring patterns in the literature. Such an approach was crucial to systematize the data and evidence that support discussions on the importance of public sanitation in different contexts, both in developed and developing countries.

Finally, the bibliographic methodology also enabled the dialogue between theoretical and statistical data, aligning concepts with existing empirical evidence. This integration was fundamental to strengthen the argument and demonstrate how public sanitation acts in a transversal way in health, economy, and sustainability issues, as highlighted by recent studies, such as those by Heller (2020) and Prüss-Ustün et al. (2019).

In this way, the methodological approach adopted ensures the scientific validity of the study, contributing to a deeper understanding of the theme and to the advancement of the debate on public policies aimed at sanitation and health.

RESULTS AND DISCUSSION

The results obtained from the literature review show that public sanitation is one of the most determining factors for the promotion of public health, directly influencing quality of life, disease reduction and environmental sustainability. Studies show that investments in basic sanitation generate substantial benefits in the prevention of infectious diseases, particularly those related to water and sewage. According to Prüss-Ustün et al. (2019), approximately 829 thousand annual deaths could be prevented globally with improvements in access to clean water, adequate sanitation, and hygiene practices.

In addition, the implementation of effective sanitation systems drastically reduces the incidence of diseases such as diarrhea, cholera, and hepatitis A. Data from the World Health Organization (WHO, 2021) indicate that children under five years of age are the most impacted by inadequate sanitary conditions, with diarrhea being the second leading cause of child mortality in developing countries. This relationship reinforces the need to

prioritize sanitation as an essential preventive health measure, especially in regions with low coverage of basic infrastructure.

Another relevant aspect identified in the results was the connection between sanitation and social inequality. Heller (2020) highlights that populations in situations of extreme poverty face the greatest challenges in accessing basic sanitation, perpetuating cycles of vulnerability and exclusion. Marginalized urban regions, often forgotten in public policies, concentrate high rates of diseases related to lack of sanitation, evidencing the need for strategies aimed at equity in access to services.

From an economic point of view, the literature review also reveals that the benefits of sanitation go beyond health aspects. Studies show that every dollar invested in sanitation can generate a return of up to 5.5 dollars in savings in the health system and increased productivity (WHO, 2021). This is because healthy workers are more productive and healthy children have higher school attendance, contributing to human and economic development.

The results also point to the importance of integrating public sanitation policies with environmental and urban actions. The absence of sewage treatment and poor solid waste management directly impact water resources, contaminating rivers and groundwater. Bardin (2016) observes that sustainable solutions, such as the reuse of wastewater, can mitigate these problems and also promote the rational use of natural resources, aligning sanitation with global sustainable development goals.

Finally, the role of awareness and education in the sustainability of sanitation interventions is highlighted. Campaigns aimed at promoting personal hygiene and the correct use of implemented infrastructures are essential to enhance the positive impacts of public policies. According to Marconi and Lakatos (2017), the active involvement of communities in the planning and management of health systems is essential to ensure that solutions are culturally appropriate and sustainable in the long term.

In summary, the results of the research confirm that public sanitation is an essential component for public health, with impacts that go beyond disease prevention, encompassing social, economic and environmental improvements. However, universal access to sanitation still faces significant challenges, especially in contexts of inequality and lack of resources, requiring coordinated efforts between governments, international organizations, and communities.

Although the benefits of public sanitation are widely recognized, its implementation faces structural and financial challenges, especially in developing countries. The literature review revealed that inequality in access to sanitation is one of the greatest barriers to achieving the universalization of this essential service. Rural regions and urban

marginalized communities often lack adequate investment, which perpetuates a cycle of social and economic vulnerability. As observed by Heller (2020), inequality in access to sanitation reflects and reinforces broader inequalities, such as those of income, gender, and race.

In addition, climate change and extreme weather events aggravate problems related to public sanitation. Floods, for example, often contaminate water supply systems and compromise the functionality of sanitation infrastructure, exposing communities to an even greater risk of disease outbreaks. According to the United Nations (UN, 2021), sanitation strategies must be resilient to climate change, incorporating adaptation and mitigation measures that ensure the continuity of services even in emergency situations.

Another central point is the need for greater political engagement and strengthening of regulatory frameworks to ensure that public sanitation is treated as a priority. Gil (2002) emphasizes that the planning of effective public policies must include an intersectoral approach, integrating sanitation, health, housing and the environment. Without strategic alignment between these sectors, advances tend to be fragmented and insufficient to solve systemic challenges related to sanitation.

The analysis also points to the role of technological innovation as an opportunity to overcome barriers in the universalization of sanitation. Solutions such as decentralized sewage treatment systems, ecological toilets and wastewater reuse have proven effective in communities where traditional infrastructure is unfeasible. Bardin (2016) highlights that the adoption of technologies adapted to local conditions, combined with community education programs, is essential to ensure the sustainability of these innovations.

Successful initiatives around the world offer models that can be replicated and adapted in different contexts. For example, community sanitation programs in countries such as Bangladesh and Rwanda have demonstrated that the combination of community engagement, government support, and international funding can generate positive outcomes even in resource-constrained settings (PRÜSS-USTÜN et al., 2019). These examples reinforce the importance of global partnerships and the sharing of good practices to address the health crisis on a global scale.

The challenges for the universalization of public sanitation are complex and multifaceted, requiring coordinated and continuous actions on several fronts. Sanitation is not only a technical issue, but also a social, political and environmental one. Advancing in this field requires significant investments, but also political commitment, innovation, and the strengthening of community participation. Thus, as the UN Sustainable Development Goals

highlight, ensuring universal sanitation by 2030 is not only an ambitious goal, but an imperative to ensure health, dignity and equity for all populations.

Despite advances in some regions of the world, it is still notorious that more than 3.6 billion people lack access to safely managed sanitation services (WHO, 2021). This gap highlights the disparity between developed and developing countries, in addition to exposing weaknesses in the financing mechanisms and governance of many countries. The challenge of universalizing public sanitation involves not only the construction of infrastructure, but also the creation of integrated public policies that consider the cultural, geographical, and economic specificities of each location (HELLER, 2020).

Another important point is the impact of public sanitation in the educational context. Schools without access to adequate toilets and clean water compromise students' well-being and continuity of education, especially among girls, who often miss classes during their menstrual period due to a lack of appropriate sanitation facilities. According to the UN (2021), investing in school sanitation is crucial for promoting gender equality and ensuring a safe and inclusive school environment, contributing to long-term social development.

In addition, public sanitation is directly related to food security. The lack of proper treatment of sewage and solid waste contaminates soils and water resources, harming agriculture and animal husbandry. Studies such as that by Prüss-Ustün et al. (2019) show that communities that rely on polluted water sources for irrigation face elevated risks of food poisoning and pathogen contamination. This reinforces the importance of integrating public sanitation with food security and environmental preservation policies.

In the urban realm, disorderly urbanization presents significant challenges to public sanitation, particularly in megacities and metropolitan areas. The rapid expansion of informal settlements, often in areas without adequate planning, makes the implementation of basic services more difficult and expensive. According to Marconi and Lakatos (2017), the absence of effective urban planning contributes to the perpetuation of unhealthy conditions and prevents the benefits of sanitation from being accessible to the entire population.

Also, mental health is also an aspect that cannot be neglected in discussions about public sanitation. Lack of access to safe and clean toilets directly impacts people's dignity, causing stress and embarrassment, especially in women and the elderly. Heller (2020) points out that public policies that ensure the privacy and safety of sanitary facilities play an important role in promoting emotional well-being and preventing psychological problems associated with social exclusion.

It is essential to recognize that public sanitation is more than an isolated objective; It is a tool to achieve several other global sustainable development goals, including health, education, gender equality, and environmental preservation. The integrated approach proposed by the United Nations Sustainable Development Goals (SDGs) highlights that progress in sanitation is interconnected with other sectors, requiring cooperation between different levels of government, civil society, and private institutions (UN, 2021). This integration is critical to creating lasting impact and ensuring that no population is left behind.

The strengthening of public sanitation policies is an investment in the future of humanity. More than ensuring health, it is a way to promote dignity, reduce inequalities and build resilient and prosperous communities. The universalization of access to sanitation is not only a matter of infrastructure, but an ethical and moral commitment to building a fairer and more sustainable world.

Sustainable financing for public sanitation projects is another critical aspect to be addressed. Many developing countries struggle to attract the financial resources needed to implement and maintain robust sanitation systems. The introduction of innovative financing models, such as public-private partnerships (PPPs) and international climate funds, can play an important role in this context. These approaches allow leveraging private investments while ensuring accessibility for vulnerable populations, as recommended by Bardin (2016). In addition, transparency and good governance are essential to ensure that resources are used efficiently and achieve the expected results.

Another relevant point is the impact of emerging technologies on expanding access to sanitation. Digitalization and the use of real-time data are transforming the management of water and wastewater systems, allowing for faster identification of failures and improvements in planning and operation. Internet of Things (IoT)-based monitoring systems are already being used in several countries to optimize water treatment and reduce supply losses, demonstrating how technology can be a powerful ally to overcome the historical challenges of public sanitation (HELLER, 2020). These solutions are especially promising in remote areas, where conventional methods are unfeasible or economically prohibitive.

Finally, the importance of a humane and individual-centered approach in all public sanitation policies is highlighted. Sanitation goes beyond its technical function; it is intrinsically linked to human dignity. For communities affected by natural disasters, armed conflict, or forced displacement, ensuring basic water and sanitation services is an immediate priority to avoid public health crises. According to WHO (2021), coordinated efforts between governments, non-governmental organizations, and humanitarian agencies are indispensable to provide temporary solutions that save lives and aid in post-crisis

recovery. This perspective reinforces that sanitation is a matter not only of infrastructure, but also of fundamental human rights.

CONCLUSION

Public sanitation stands out as one of the most powerful and indispensable tools for promoting public health and human well-being. Throughout the study, it became evident that universal access to sanitation services is not only a development goal, but an urgent need to ensure the dignity, equity and sustainability of populations. The intrinsic relationship between sanitation, health, economy, and the environment demonstrates that investing in this sector generates positive impacts in multiple dimensions, reducing the incidence of diseases, promoting quality of life, and strengthening local and global economies.

The challenges associated with public sanitation, such as inequality of access, financial limitations, and the impacts of climate change, reinforce the complexity of this issue. Still, progress is evident through coordinated efforts between governments, international organizations, the private sector, and local communities. To address these barriers, it is necessary to adopt an integrated approach that prioritizes both infrastructure and social engagement, recognizing cultural diversity and regional specificities as key factors for the success of public policies.

The universalization of sanitation requires not only robust investments in infrastructure, but also the application of innovative, technological, and sustainable solutions that respond to the challenges of the twenty-first century. Climate resilience, the rational use of natural resources, and the inclusion of modern monitoring and management methods are core components of an effective strategy. In addition, education and social awareness play an indispensable role in strengthening initiatives, ensuring that populations understand, use and maintain the benefits generated by adequate sanitation systems.

The inclusion of all segments of society, especially the most vulnerable, in sanitation strategies is an ethical commitment. The disparities observed in access to these basic services must be tackled with public policies that promote equity and social justice. Sanitation, by offering security and dignity, reinforces the social fabric, building healthier, more productive and resilient communities.

Ensuring access to public sanitation is not only a technical or economic challenge, but a humanitarian imperative. It is a commitment to future generations, who have inherited contemporary environmental and social challenges. Advancing in the universalization of sanitation is investing in the construction of a healthier, fairer and more sustainable world, where everyone can fully exercise their right to health and dignity. From concrete,

coordinated and continuous actions, it is possible to transform this vision into reality, fulfilling the essential role of public sanitation as an engine of development and well-being.

In addition, public sanitation plays a central role in promoting more inclusive and resilient cities. In urban areas, rapid population growth often outstrips the ability of governments to expand basic services proportionately, resulting in inequalities in access to clean water and sewage systems. The prioritization of public policies that integrate sanitation into urban planning strategies is essential to mitigate the effects of disorderly urbanization. Sustainable infrastructure, such as urban drainage systems that prevent flooding and decentralized technologies for sewage treatment, can be effective solutions to serve vulnerable populations in peripheral areas.

Sanitation is also intrinsically linked to the preservation of natural resources and the mitigation of environmental impacts. Inadequate management of solid waste and sewage contributes to the pollution of rivers, lakes and oceans, affecting ecosystems and compromising biodiversity. In this sense, it is imperative that public sanitation is addressed not only as a health issue, but also as a strategy for environmental sustainability. The use of green technologies, the reuse of wastewater, and the adoption of sanitation systems based on the circular economy offer significant opportunities to reduce environmental damage while promoting the efficient use of resources.

In addition, the universalization of public sanitation requires a long-term vision, based on collaboration between different sectors and the creation of resilient public policies. Political commitment, accompanied by continuous monitoring and evaluation of the impacts of interventions, is indispensable to ensure consistent and lasting progress. In this process, community involvement plays an essential role, strengthening the sense of belonging and shared responsibility. Informed and trained populations are able to adopt practices that enhance the benefits of sanitation and ensure its sustainability over time.

The issue of sanitation transcends borders and demands a global approach. In an increasingly interconnected world, the impacts of poor sanitation in one region can reverberate in others, whether through health, environmental, or economic crises. Therefore, it is essential that governments, international organizations, and civil society collaborate to share knowledge, resources, and effective solutions. The exchange of successful experiences in different cultural and economic contexts can accelerate progress and inspire innovations that benefit all nations.

Finally, public sanitation must be recognized as a fundamental pillar of human development. Its impact goes beyond physical health, directly influencing people's quality of life, education, productivity, and dignity. By investing in sanitation, one invests in human

potential, in reducing inequalities and in building a fairer and more sustainable future. Thus, the universalization of access to sanitation is not just a goal, but a collective mission that reflects humanity's commitment to global well-being and prosperity.

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