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The Impact of Environmental and Social Development on Sustainable Health Development during Crises: A Field Study during the COVID-19 Pandemic

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Summary: This study examines the impact of environmental and social development on sustainable health development during crisis periods. A convenient sampling method was employed to conduct the study during the COVID-19 crisis, with data collected from a sample of 28 respondents, including doctors and paramedical assistants. Among them, 27 worked in a public hospital, while one was employed in a private hospital in a southwestern Algerian city. The study utilized the Partial Least Squares Structural Equation Modelling (PLS-SEM) approach. Descriptive statistics were conducted using SPSS version 26, while Smart PLS 4 was used for discriminant validity tests, structural model assessments, and path analysis results. The findings indicate that environmental development has a significant impact on sustainable health development, whereas social development did not show a significant effect on sustainable health development.

Keywords: Environmental Development; Social Development; Sustainable health development; Hospitals; PLS-SEM.
Jel Classification Codes : Q5; I3; I1; I11; C39.

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I-Introduction:

In the pursuit of improving healthcare outcomes, understanding the factors that influence sustainable health development within hospitals is paramount. Over time, healthcare systems have increasingly recognized the importance of going beyond traditional medical care to consider broader environmental and social factors that contribute to patient well-being. Environmental development encompasses elements such as hospital infrastructure, cleanliness, waste management, and energy efficiency, all of which contribute to creating a conducive healing environment. Meanwhile, social development includes aspects like staff collaboration, community engagement, patient education, and support services, which play a critical role in fostering a supportive and empathetic healthcare environment.

This study aims to examine the impact of these dimensions on sustainable health development in hospitals, particularly during the critical period of the COVID-19 pandemic. The pandemic has underscored the importance of resilient and adaptive healthcare systems that can effectively respond to crises. By investigating how environmental and social development influence health outcomes, this research seeks to provide valuable insights for policymakers, hospital administrators, and healthcare professionals. Understanding these relationships can inform the development of strategies that enhance hospital performance, improve patient satisfaction, and ultimately lead to better health outcomes. This study contributes to the growing body of literature on integrated healthcare approaches and underscores the necessity of holistic strategies in achieving optimal sustainable health development.

In the context of Algeria, the healthcare system faces unique challenges and opportunities. Algerian hospitals have been working diligently to improve healthcare quality and accessibility for

all citizens. However, the COVID-19 pandemic has posed unprecedented pressures on the healthcare infrastructure, highlighting the need for robust environmental and social development strategies. By focusing on the Algerian healthcare context, this study aims to explore how these development dimensions can be leveraged to address current healthcare challenges and enhance overall health outcomes. The findings will provide actionable recommendations for Algerian policymakers and healthcare leaders, helping them to build a more resilient and efficient healthcare system capable of better serving the population in both crisis and normal times.

I.1.Research Problem

This study aims to investigate the impact of both environmental and social development on sustainable health development in hospitals, specifically how these factors can influence hospital performance and improve health outcomes for patients during the critical period of the COVID-19 pandemic.

I.2.Research Hypotheses

Hypothesis 1: Environmental development has a positive and significant impact on sustainable health development in hospitals.

Hypothesis 2: Social development has a positive and significant impact on sustainable health development in hospitals.

Hypothesis 3: Gender affects the relationship between environmental development, social development, and sustainable health development.

Hypothesis 4: The job role affects the relationship between social and environmental development and sustainable health development.

I.3. Importance of the Study

This study is of great significance as it highlights the importance of both environmental and social development in improving sustainable health development in hospitals. Additionally, the study is conducted during the critical period of the COVID-19 pandemic, where environmental and social development has become more crucial than ever. Environmental and social development can significantly contribute to enhancing sustainable health development by improving the work environment, supporting the mental health of staff, and promoting communication and collaboration among medical team members. This, in turn, helps in providing better healthcare and achieving better health outcomes for patients. The study offers insights that can be valuable to policymakers and hospital administrators in developing effective strategies to improve healthcare.

I.4. Research Objectives

-Investigate the extent to which environmental development impacts sustainable health development in hospitals.

-Explore the impact of social development on sustainable health development in hospitals.

-Provide recommendations to policymakers and hospital administrators on how to enhance health performance through environmental and social development strategies.

II–Literature Review and Theoretical framework of the study

II.1. Literature Review

II.1.1.The study by Benedetto, Ferrè, & Nuti (2024) titled: Including environmental and social sustainability in the planning process of healthcare services: A case study of cancer screening programs in an inner area in Italy

This study examines an innovative approach to preventive healthcare by comparing traditional fixed-location cancer screening with a mobile screening unit in rural areas of Tuscany, Italy. The mobile model aimed to reduce non-medical costs, carbon emissions, and productivity losses. The study, which focused on the Valle del Serchio district, analyzed factors such as CO_2 emissions, transportation costs, and lost workdays. The findings revealed that the mobile screening model improved accessibility, reduced social costs by approximately €95,000 annually, and lowered environmental emissions by 98%. The study underscores the significance of integrating

sustainability into healthcare planning, particularly in underserved rural regions, to enhance healthcare delivery and reduce environmental and social burdens (Benedetto, Ferrè, & Nuti, 2024).

II.1.2.The study by Das (2024) titled: The role of socio-economic, environmental, and healthcare factors in shaping health outcomes

This study investigates the impact of socio-economic, environmental, and healthcare factors on key health indicators such as crude death rates (CDR), infant mortality rates (IMR), and life expectancy at birth (LEB) in 21 developing and emerging economies. Using panel regression analysis, the study explored the relationship between these factors. The findings revealed that non-economic factors, such as environmental pollution and income levels, had a more significant effect on health outcomes than economic indicators like GDP per capita or healthcare expenditure. For example, in ASEAN countries, increased health spending as a percentage of GDP correlated with improved CDR and IMR. Conversely, in BRICS countries, higher health expenditure was linked to worse health outcomes, including higher CDR, IMR, and lower LEB. The study emphasized the importance of non-health factors in shaping health outcomes and concluded that the relationship between health expenditure and health outcomes is highly contextual, varying by national and regional conditions. This highlights the need for tailored health policies that consider the broader socio-economic and environmental determinants of health (Das, 2024).

II.1.3.The study by Messmann et al. (2024) titled: Environmental and social sustainability in hospital systems

This systematic review of 88 studies assessed the environmental and social sustainability of hospitals. The study identified significant gaps in sustainability assessment frameworks, particularly in how sustainability indicators were defined and measured. Many of the indicators were qualitative (73%) and site-specific (78%), making cross-region comparisons challenging. The study proposed a more structured classification of sustainability dimensions, including environmental, social, and governance aspects, to improve understanding and guide future research. It also highlighted the need for more quantitative indicators for social sustainability, particularly concerning non-patient stakeholders such as hospital employees and local communities. (Messmann, Kohler, Antimisaris, Fieber, Thorenz, & Tuma, 2024)

II.1.4.The study by Wanyenze et al. (2023) titled: Sustainable health development and the Sustainable Development Goals (SDGs)

This study argues that sustainable health development is crucial for achieving the SDGs, especially in light of global challenges like the COVID-19 pandemic and climate change. It stresses the importance of environmental and social development in promoting sustainable health through collaboration across sectors. The study highlights the negative impacts of climate change, antimicrobial resistance, zoonotic diseases, and pandemics on health. It calls for global sustainable transformations and advocates for equitable partnerships between governments, the private sector, academia, and civil society to build resilient health systems. The study promotes research and innovation in sustainable health, emphasizing the need for an integrated approach to safeguard the environment and ensure health equity (Wanyenze, et al., 2023).

II.1.5.The study by Farhiha and Gaida (2018) titled: The impact of health marketing on healthcare coverage development in Algeria

This study examined the role of health marketing in improving healthcare services in Algeria. It found that health marketing practices in both public and private healthcare institutions contributed to enhancing the quality of services provided to patients. The research emphasized the importance of raising patient awareness of healthcare quality and fostering partnerships between the public and private sectors to improve health outcomes. The study also noted the growth in healthcare professionals and the expansion of private healthcare institutions, which has led to better accessibility and quality of care. The authors concluded that health marketing strategies are essential for achieving comprehensive social development (Fariha & Ghaida, 2018)

These studies collectively underscore the multi-dimensional nature of sustainable health development and sustainability, highlighting the need for a balanced approach that integrates environmental, social, and economic factors. Effective health policies, sustainable healthcare practices, and equitable resource allocation are crucial to improving health outcomes, particularly in developing and emerging economies, including Algeria.

The previous studies have highlighted the importance of environmental management practices in enhancing organizational performance and health outcomes (Smith & Lewis, 2011). Additionally, the compatibility of psychological and ecological well-being has been explored, emphasizing the role of values and lifestyle in sustainable health development (Brown & Kasser, 2005). This study builds on these foundations to examine the specific impact of environmental and social development on sustainable health development in hospitals.

Based on the previous studies, it can be seen that sustainable health development requires the integration of efforts between the environment and society to achieve sustainable improvements in the health of individuals and communities. The study by Benedetto, Ferrè, & Nuti (2024) demonstrated how sustainable healthcare models, such as using mobile screening units, can improve access to healthcare services in rural areas while reducing social costs and environmental emissions. On the other hand, Wanyenze et al. (2023) emphasized the importance of considering environmental factors in health policies, highlighting the negative impacts of climate change and environmental pollution on health, thereby reinforcing the need to integrate environmental development with health development for better sustainability.

Moreover, Das's (2024) study shows that social development plays a crucial role in improving health outcomes, as social factors such as environmental pollution and income levels have a greater impact on health than economic indicators. These findings suggest the necessity of adopting health and social policies that encompass all social, economic, and environmental aspects. Social development, focusing on improving individual opportunities and enabling self-sufficiency, should be integrated with health and environmental efforts to achieve comprehensive and sustainable development.

II.2.Theoretical framework of the study

II.2.1.Definition of environmental, social and sustainable health development

Sustainable health development refers to a multidimensional approach aimed at enhancing the health and well-being of individuals and communities, while respecting the environmental limits of the planet. Its goal is to ensure long-term health for all by implementing policies and programs that address the interconnections between society and the environment, ensuring that the health needs of the present generation are met without jeopardizing the ability of future generations to meet their own health needs (Wanyenze, et al., 2023).

Environmental development involves adopting sustainable practices, promoting conservation efforts, and managing natural resources responsibly to ensure ecological balance and the sustainability of life on Earth. This approach integrates environmental considerations into various sectors, such as the economy, society, and technology, with the aim of achieving balanced development that preserves the environment for future generations. (Greenfield, 2024)

Social development is a process aimed at improving the quality of life for individuals within a society by enhancing their capabilities, removing obstacles that hinder their progress, and providing opportunities that enable them to achieve self-sufficiency and actively participate in development. This process is centered on investing in people to ensure equal opportunities and promote social well-being, ultimately contributing to balance and prosperity for society as a whole. (Economic and Social Inclusion Corporation, 2008-2009).

Drawing from the three previous definitions, Sustainable development in health, environment, and society focuses on balancing the needs of the present while ensuring that future generations can meet their own needs. Sustainable health development aims to enhance individual and community well-being through policies and programs that consider the interconnection between society and the

environment. Environmental development seeks to maintain ecological balance by adopting sustainable practices and responsibly managing natural resources. Meanwhile, social development focuses on improving individuals' quality of life by enhancing their capabilities, removing barriers to progress, and providing equal opportunities that enable self-sufficiency and active participation in society.

II.2.2.The Impacts of Environmental and Social Development on Sustainable Health Development:

Building on the outcomes of the 1992 Earth Summit in Rio de Janeiro, several key principles were outlined to highlight the interconnectedness of environmental and social development with sustainable health. Based on these discussions, the following points can be derived: (World Health Organization, 1997)

II.2.2.1.Environmental Development and its Influence on Sustainable Health:

-The Impact of Environmental Degradation on Health: The Earth Summit emphasized that a healthy environment is a cornerstone for sustainable health. Environmental degradation, including pollution of air, water, and the accumulation of waste, directly affects public health. Diseases such as respiratory illnesses due to polluted air and waterborne diseases caused by contaminated water are major contributors to the global health burden.

-Biodiversity Conservation and Ecosystem Health: Another important aspect of the summit was the preservation of biodiversity and maintaining healthy ecosystems. The loss of natural habitats is linked to the spread of vector-borne diseases, such as malaria, which negatively affects the health of affected populations.

-Sustainable Development in the Face of Health Crises: The summit also stressed the importance of protecting the environment to prevent the emergence of epidemics and reduce the burden of chronic diseases, which in turn eases pressure on healthcare systems worldwide.

II.2.2.2. Social Development and its Contribution to Sustainable Health:

-Social Justice and Health Equity: One of the key takeaways from the Earth Summit was the call for greater social justice. Social development is a fundamental pillar in improving sustainable health outcomes, as access to essential health services, including preventive care, education, and clean water, plays a critical role in improving public health and reducing health inequalities.

-Addressing Poverty and Reducing Social Inequality: Poverty is a significant factor driving the spread of diseases. Individuals in impoverished communities face greater health challenges due to limited access to healthcare, polluted environments, and malnutrition. As such, poverty reduction and achieving social equity are essential to improving overall public health and narrowing health disparities.

-Community Engagement and Empowerment: Social development also focuses on empowering individuals and communities to take an active role in decisions related to their health and the environment. This empowerment helps communities better manage health crises and environmental challenges, contributing to improved sustainable health outcomes.

The principles outlined at the Earth Summit make it clear that both environmental and social development are crucial for fostering sustainable health. By addressing environmental challenges and ensuring social justice, significant progress can be made in improving public health and reducing health risks. Therefore, achieving sustainable health requires a coordinated approach that integrates both environmental and social dimensions to safeguard the well-being of future generations.

II.2.3. The Impacts of Environmental and Social Development on Sustainable Health Development During Crisis Periods, such as the COVID-19 Pandemic

Environmental and social development are key factors that promote sustainable health, as a healthy environment and a cohesive society provide the essential foundation for improving public health, especially during crises like the COVID-19 pandemic, which has significantly impacted all

aspects of life. Social development plays a vital role in sustainable health by improving education, healthcare, and promoting gender equality, helping individuals make informed health decisions and reduce harmful behaviors such as smoking and obesity. Additionally, improving access to healthcare services reduces health disparities. However, in the absence of adequate social support or equal access to healthcare, challenging social conditions can exacerbate health issues. On the other hand, environmental development contributes to sustainable health by reducing pollution and improving environmental conditions, thus reducing the prevalence of respiratory and waterborne diseases. Preserving the environment also helps mitigate the health impacts of climate change. However, during crises such as the COVID-19 pandemic, poor management of medical waste can increase pollution, negatively affecting both the environment and public health (World Intellectual Property Organization, 2024). (World Intellectual Property Organization, 2024).

II.2.4.Challenges of Sustainable Health Development During Crisis Periods, such as the COVID-19 Pandemic

The challenges of achieving sustainable health development related to social development and environmental development are as follows: (World Intellectual Property Organization, 2024)

Social Development: During crises, social inequalities may worsen, leading to a greater impact on vulnerable groups in society, such as women, rural communities, or low-income populations. This directly affects sustainable health by reducing access to healthcare and essential resources.

Environmental Development: Health crises, such as the COVID-19 pandemic, may lead to increased medical waste, which poses significant environmental challenges that can affect public health. Therefore, the need for environmental strategies to address the risks posed by health crises, such as developing sustainable waste management techniques, is crucial.

Environmental and social development significantly impact sustainable health, especially during crises like the COVID-19 pandemic. Social development can play a positive role in raising health awareness and ensuring equitable access to healthcare services, while environmental development helps protect public health by reducing pollution and improving the environment. However, during crises, such as the COVID-19 pandemic, certain challenges arise that require a coordinated response between environmental and social policies to ensure sustainable health outcomes.

III- Methodology

This study relies on the descriptive-analytical approach to examine the impact of environmental and social development on sustainable health development in hospitals through the following:

III.1. Study Design

A cross-sectional study design was adopted to collect data from hospital staff during the COVID-19 pandemic. This design allows for the collection of data at a single point in time, providing a snapshot of the current state of environmental, social, and sustainable health development in the hospitals studied.

III.2. Sample and Sampling Technique

Given the challenges of distributing and retrieving questionnaires during the COVID-19 pandemic-such as communication difficulties, intermittent lockdowns, and the state of emergency in most hospitals—the distribution process was difficult. For example, two doctors were infected with the Coronavirus, making it impossible to contact them due to their critical condition. Therefore, a convenient sampling technique was employed. Participants were selected from both public and private hospitals in a southwestern Algerian city, resulting in a sample of 28 respondents, including 27 from public hospitals and one from a private hospital. The sample included doctors and paramedical assistants, and the distribution of questionnaires took place during the first half of 2020.

This research leveraged convenience sampling, similar to other studies. For instance, (Robert & Dwight, 2014) focused on university students using this method. (Park, Velez, Kannan, & Chorpita, 2020) also employed convenience sampling to identify individuals' experiences and coping mechanisms related to the COVID-19 pandemic. Additionally, (Leiner, 2014) utilized

convenience sampling to gather opinions from voluntary respondents, including undergraduate and doctoral students, through the SoSci panel created by SoSci Survey, a popular platform in Germany for creating questionnaires since 2011. Convenience sampling is one of the methods described by (Saunders, Lewis, & Thornhill, 2012).

III.3. Data Collection

Data were collected using a structured a questionnaire designed to gather information on environmental development, social development, and sustainable health development. The design of the questionnaire was based on the available literature on sustainable health development, social development, and environmental development to ensure comprehensive coverage of these constructs. The questionnaire was pre-tested to ensure validity and reliability and included closed-ended questions to gather information from the respondents.

III.4. Measurement Instruments

The constructs of environmental development, social development, and sustainable health development were measured using validated scales from previous studies. Each construct was assessed using multiple indicators to ensure comprehensive coverage. The reliability and validity of the measurement instruments were confirmed through Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE).

III.5. Data Analysis

The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the Smart PLS software. This approach allows for the simultaneous examination of multiple relationships between constructs and provides robust estimates even with small sample sizes. The analysis involved the following steps:

Descriptive Statistics: Descriptive statistics were computed to summarize the characteristics of the participants and the distribution of the constructs.

Measurement Model Evaluation: The measurement model was evaluated to assess the reliability and validity of the constructs. This included examining factor loadings, Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and variance inflation factor (VIF).

Discriminant Validity Tests: Discriminant validity was assessed using the Fornell–Larcker criterion, HTMT ratio, and cross-loading analysis to ensure that the constructs were distinct from each other.

Structural Model Evaluation: The structural model was evaluated to test the hypothesized relationships between the constructs. This included examining path coefficients (β), t-values, p-values, R^2 values, and effect sizes (F^2).

Nonlinear Effects Tests: Nonlinear relationships issue was assessed using The Ramsey's RESET test to ensure the robustness of the findings.

This study relied on SPSS version 26 to extract descriptive statistics for the individuals in the study sample, while the rest of the statistical tests relied on Smart PLS 4.

IV- Results and discussion

IV.1. Results

IV.1.1. Descriptive Statistics of Participants

Based on Table 1 (see appendices), the data provide a comprehensive overview of the participants' backgrounds, ensuring the robustness and reliability of the sample used in the study. The data show that the vast majority of participants work in public hospitals (96.4%) and that the proportion of female participants is higher than that of male participants (57.1% compared to 42.9%). It is also evident that most participants are under 40 years old, with a significant portion (46.4%) being under 30 years old.

Regarding job distribution, the proportion of paramedical assistants is higher than that of doctors (57.1% compared to 42.9%). The diversity in departments reflects comprehensive coverage of different healthcare fields, with a notable concentration in the emergency department (42.9%)

and laboratories (28.6%). Additionally, the data reveals that the majority of participants have less than 5 years of professional experience (57.1%), indicating a large proportion of new workers.

IV.1.2. Measurement Model

The measurement model evaluates various constructs related to environmental, health, and social development using several indicators such as factor loadings, average variance extracted (AVE), and variance inflation factor (VIF).

The analysis began with the evaluation of the outer model, focusing on the reflective model. Table 2 (see appendices) presents the factor loadings (λ), Cronbach's alpha (α), composite reliability (CR), average variance extracted (AVE), variance inflation factor (VIF), means, standard deviations (SD), and Z-scores for skewness and kurtosis. The results show that the factor loadings for environmental development range from 0.681 to 0.809, indicating a strong relationship between the indicators and the latent construct. Cronbach's alpha (0.744), which exceeds the threshold of 0.6 (Hair, Anderson, Tatham, & Black, 1998), reflects good reliability. Composite reliability (CR) values exceed 0.708 (Hair, Risher, Sarstedt, & Ringle, 2019), and the average variance extracted (AVE) surpasses 0.5 (Hair, Risher, Sarstedt, & Ringle, 2019), indicating good convergent validity.

Additionally, the Variance Inflation Factor (VIF) values indicate the absence of severe multicollinearity among the studied variables, as they range between 1.1 and 2.9, which is below the critical threshold of 3 (Hair, Risher, Sarstedt, & Ringle, 2019). These results suggest a relative independence among the indicators of environmental development, health development, and social development, ensuring the accuracy of coefficient estimation in the model. Therefore, the study results are reliable and not affected by multicollinearity issues.

IV.1.3. Discriminant Validity

Tables 3, 4, and 5 (see appendices) collectively test the discriminant validity of the constructs and items in the study. Table 3 uses the Fornell–Larcker criterion to assess discriminant validity between the constructs. The values on the diagonal represent the square root of AVE for each construct, and higher diagonal values compared to the off-diagonal elements indicate good discriminant validity. Table 4 evaluates the discriminant validity between constructs using the HTMT ratio, where all values are below 0.90 for conceptually similar constructs (Hair, Risher, Sarstedt, & Ringle, 2019), confirming good discriminant validity. Table 5 examines the discriminant validity between items using cross-loading, ensuring that items load higher on their respective constructs than on others. The results confirm that the loadings for each item on their respective constructs are higher than on the other constructs, indicating good discriminant validity.

IV.1.4. Assessing the Structural Model

Tables 6, 7, and 8 (see appendices) provide a comprehensive evaluation of various aspects of the model. Table 6 addresses the potential multicollinearity issue within the inner model by calculating the VIF, which is below the critical threshold of 3 (Hair, Risher, Sarstedt, & Ringle, 2019) indicate that multicollinearity is not a concern, thereby supporting the model's robustness. Table 7 assesses the model's explanatory power through the R^2 value, The value of R^2 is 0.537, which is close to 0.5, i.e. a moderate value according to (Hair, Risher, Sarstedt, & Ringle, 2019), which indicates that the model represents a moderate proportion of the variance in sustainable health development. Table 8 evaluates the effect sizes of the relationships between constructs by calculating the F^2 value, which indicates that the effect size of environmental factors development on sustainable health development is substantial, while the effect size of social development on sustainable health development is moderate.

IV.1.5. Path Analysis

Based on Table 9 (see appendices), the results of the path analysis provide insights into the direct and indirect effects of the constructs on sustainable health development. The findings show that the direct effect of environmental development on sustainable health development is significant and strong ($\beta=0.625$, $P<0.001$), supporting Hypothesis 1. However, the direct effect of social development on sustainable health development is not significant ($\beta=0.197$, $P>0.05$), leading

to the rejection of Hypothesis 2. These results confirm that environmental development has a positive and significant impact on sustainable health development, while social development does not.

This study also explores the influence of personal factors on the relationship between environmental and social development and sustainable health development in hospitals. The results indicate that the impact of gender on the relationship between environmental development and sustainable health development is not statistically significant (β=0.045, P=0.893). Similarly, the impact of gender on the relationship between social development and sustainable health development is not statistically significant (β=-0.078, P=0.825). Consequently, Hypothesis 3, which states that gender affects the relationship between the environmental and social development variables and sustainable health development, can be rejected.

Furthermore, the results suggest that the functional role does not have a statistically significant impact on the relationship between environmental development and sustainable health development (β=-0.236, P=0.463). Similarly, the impact of the functional role on the relationship between social development and sustainable health development is not statistically significant (β=-0.116, P=0.785). Based on these findings, Hypothesis 4, which states that the functional role affects the relationship between the environmental and social development variables and sustainable health development, can also be rejected.

IV.1.6. Nonlinear Effects and Endogeneity Test

The robustness of the model was assessed by conducting two supplementary analyses: the test for potential nonlinearity effects and the endogeneity (Humdan, Shi, Behina, & Chowdhury, 2024).

Table 10 (see appendices) assesses the potential nonlinear relationships between the variables. For the relationship between environmental development and sustainable health development (QE (ENVDEV) → HEADEV), the table shows that the coefficient is 0.013, the T value is 0.127, and the P value is 0.899, indicating no statistical significance for this relationship, with a very small effect size ($f^2 = 0.001$). The results of the Ramsey's RESET test support this conclusion, with an F value of 0.361 and a P value of 0.701, indicating no error in the nonlinear model. For the relationship between social development and sustainable health development (QE (SOCDEV) → HEADEV), the table shows that the coefficient is -0.281, the T value is 1.174, and the P value is 0.240, indicating no statistical significance for this relationship either, with a medium effect size ($f^2 = 0.221$). Based on these results, it can be concluded that the relationships between environmental development and social development with sustainable health development are linear rather than nonlinear.

The presence of endogeneity in the independent variables was assessed following the approach proposed by (Hult, Hair, Proksch, Sarstedt, Pinkwart, & Ringle, Addressing Endogeneity in International Marketing Applications of Partial Least Squares Structural Equation Modeling, 2018). The Gaussian Copula test (Park and Gupta 2012) was conducted to examine the presence of linear endogeneity. According to this test, if the results are statistically significant (p-value < 0.05), endogeneity is present; otherwise, it is not.

As shown in Table 11, the two independent variables obtained the following values in the Gaussian Copula test: (-0.850, p-value = 0.275) for environmental development and (-0.157, p-value = 0.870) for social development. Therefore, endogeneity is not present, which supports the robustness and reliability of the structural model.

IV.2. Discussion

The study provides a comprehensive overview of participants' backgrounds, revealing that the majority work in public hospitals, with a higher proportion of female participants. Most participants are under 40 years old, with a significant portion being paramedical assistants. The measurement model shows strong relationships between indicators and constructs, with good

reliability and convergent validity. The discriminant validity of the constructs is confirmed through various criteria, including the Fornell–Larcker criterion, HTMT ratio, and cross-loading.

The structural model assessment indicates that multicollinearity is not an issue, with a moderate explanatory power ($R^2 = 0.537$). Environmental development has a substantial effect on sustainable health development, while social development has a moderate effect. Path analysis reveals that environmental development significantly impacts sustainable health development, supporting Hypothesis 1, while social development does not, leading to the rejection of Hypothesis 2. Personal factors such as gender and functional role do not significantly affect these relationships, leading to the rejection of Hypotheses 3 and 4. Nonlinear effects and endogeneity tests confirm that the relationships between environmental and social development with sustainable health development are linear rather than nonlinear.

Based on previous studies, similarities and differences between the findings of the current study regarding the relationship between environmental and social development and sustainable health development during crisis periods, such as the COVID-19 pandemic, and the studies discussed can be observed. Despite the diversity in contexts and research orientations, all studies provide valuable insights into the importance of integrating environmental and social dimensions into health policies to achieve sustainable health outcomes.

-Similarities:

Firstly, the results of the current study align with those of previous studies, such as the study by Benedetto, Ferrè, & Nuti (2024), which highlighted the importance of environmental development in improving healthcare access and reducing environmental and social costs. In their study, they compared the fixed-location screening model with a mobile screening unit in rural areas, where the mobile model was found to reduce carbon emissions and social costs, thus enhancing both environmental and health sustainability. The same trend is reflected in the current study, where the significant impact of environmental development on sustainable health during the COVID-19 crisis was observed, emphasizing the importance of considering environmental aspects for achieving sustainable health outcomes.

Secondly, Wanyenze et al. (2023) also support the idea of integrating environmental and social development into sustainable health strategies, emphasizing the importance of collaboration across sectors such as governments, the private sector, and civil society to build resilient health systems. This call for cross-sectoral collaboration aligns with the findings of the current study, which underscores the importance of developing comprehensive frameworks for sustainable health development that include environmental and social dimensions.

-Differences:

On the other hand, there are some key differences between the previous studies and the current study, particularly regarding the impact of social development on sustainable health during crisis periods. While many previous studies, such as Das (2024) and Messmann et al. (2024), have shown that social and economic factors play a significant role in shaping sustainable health outcomes, the current study found that social development did not have a significant impact during the COVID-19 crisis in Algeria. This could be due to the fact that social aspects related to sustainable health during crises require more focus on sectors like community awareness and inter-sectoral collaboration.

This difference in findings may be attributed to the specific geographical and demographic context of the current study. While studies like Das (2024) focused on a diverse group of developing and emerging economies, the current study focused on the specific effects in Algeria during a health crisis, which might contribute to the differing results due to varying economic and social contexts.

V-Conclusion:

In conclusion, this study explored the impact of environmental and social development on sustainable health during crisis periods, with a particular focus on the COVID-19 pandemic as a case study. The findings revealed that environmental development plays a crucial role in promoting sustainable health in the context of health crises, highlighting the importance of integrating environmental issues into public health strategies. Meanwhile, the study found that social development did not have a significant impact in this specific context, suggesting a need for further research to understand the role of social factors in similar situations.

Overall, this study underscores the importance of considering environmental and social dimensions in health crisis planning and response. The study recommends the formulation of comprehensive policies that account for the interaction between these factors to enhance the sustainability of healthcare systems and their capacity to respond to future crises.

- Appendices:

Table 1: Descriptive statistics of participants.

Characteristics	Frequency	Percent	Characteristics	Frequency	Percent
Hospital type			Department		
Public hospital	27	96,4	Internal medicine	1	3,6
private hospital	1	3,6	General Surgery	1	3,6
Gender			Infectious diseases	1	3,6
male	12	42,9	Pediatrics	2	7,1
female	16	57,1	Obstetrics and gynecology	1	3,6
Age			Resuscitation and anesthesia	1	3,6
Less than 30 years old	13	46,4	X-rays	1	3,6
From 30 to less than 40 years old	9	32,1	Urgencies	12	42,9
From 40 to less than 50 years old	3	10,7	laboratory	8	28,6
From 50 years and above	3	10,7	Experience		
Function			Less than 5 years	16	57,1
doctor	12	42,9	From 5 to less than 10 years	4	14,3
Paramedical assistant	16	57,1	From 10 to less than 15 years	4	14,3
			From 15 years and above	4	14,3

The source : achieved by the author based on SPSS (version 26) outputs.

Table 2: Measurement model.

ITEMS	λ	α	CR (rho_c)	AVE	VIF	Mean	SD	$Z_{Kurtosis}$	$Z_{Skewness}$
environmen		0,74	0,838	0,56					

tal developmen t		4		4				
ENVDEV1	0,681				1,350	3,786	0,939	1,77	-1,177
ENVDEV2	0,809				1,715	4,214	0,725	1,657	-0,965
ENVDEV3	0,788				1,436	2,286	1,221	0,31	0,905
ENVDEV4	0,719				1,520	4,143	0,789	-1,379	-0,273
sustainable health developmen t		0,79 3	0,867	0,62 2					
HEADEV1	0,766				1,607	3,179	1,311	-1,168	-0,351
HEADEV2	0,774				1,985	3,036	1,267	-1,195	-0,182
HEADEV3	0,688				1,363	4,286	0,839	1,911	-1,378
HEADEV4	0,911				2,957	3,071	1,361	-1,367	-0,047
social developmen t		0,61 1	0,791	0,55 9					
SOCDEV1	0,730				1,340	4,5	0,5	-2,16	0
SOCDEV2	0,697				1,131	2,5	1,35	-0,982	0,553
SOCDEV3	0,811				1,288	4,429	0,623	-0,438	-0,651

Note. λ = Outer loading, α = Cronbach's alpha, CR=Composite reliability, AVE = Average variance extracted, VIF=variance inflation factor, Mean= Arithmetic mean, SD=Standard deviationN, ($Z_{Skewness}$, $Z_{Kurtosis}$) = Z-scores of skewness and kurtosis, ENVDEV1... ENVDEV4 = Items of environmental development, HEADEV1... HEADEV 4= Items of sustainable health development, SOCDEV1... SOCDEV3 = Items of social development.

The source : achieved by the author based on Smart PLS outputs.

Table 3: Discriminant validity test using Fornell–Larcker criterion.

	ENVDEV	HEADEV	SOCDEV
ENVDEV	0,751		
HEADEV	0,711	0,789	
SOCDEV	0,434	0,469	0,747

Note. ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 4: Discriminant validity using HTMT ratio.

	ENVDEV	HEADEV	SOCDEV
ENVDEV			
HEADEV	0,891		
SOCDEV	0,623	0,666	

Note. ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 5: Discriminant validity test using cross-loading

	ENVDEV	HEADEV	SOCDEV
ENVDEV1	0,681	0,412	0,126
ENVDEV2	0,809	0,561	0,431
ENVDEV3	0,788	0,650	0,387
ENVDEV4	0,719	0,468	0,303

HEADEV1	0,647	0,766	0,265
HEADEV2	0,425	0,774	0,427
HEADEV3	0,484	0,688	0,406
HEADEV4	0,645	0,911	0,402
SOCDEV1	0,278	0,261	0,730
SOCDEV2	0,391	0,346	0,697
SOCDEV3	0,302	0,415	0,811

Note. ENVDEV1... ENVDEV4 = Items of environmental development, HEADEV1... HEADEV 4 = Items of sustainable health development, SOCDEV1... SOCDEV3 = Items of social development, ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 6**:** Variance inflation factor (VIF) of Inner model

	ENVDEV	HEADEV	SOCDEV
ENVDEV		1,232	
HEADEV			
SOCDEV		1,232	

Note. ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 7: $R^{2</i>}$ estimation.

	R-square	Category
HEADEV	0,537	Moderate

Note. ENVDEV= Environmental development.

The source : achieved by the author based on Smart PLS outputs.

Table 8: $F^{2\,i}$*Estimation.*

	f-square	Category
ENVDEV → HEADEV	0,685	Large effect
SOCDEV → HEADEV	0,068	Meduim effect

Note. ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 9: the results of the path analysis

Paths	B	SD	T value	P value	BC confidence intervals		Decision
					2.5%	97.5%	
Control variables							
Gender x ENVDEV → HEADEV	0,045	0,335	0,134	0,893	-0,498	0,769	H_3 Rejected
Gender x SOCDEV → HEADEV	-0,078	0,352	0,222	0,825	-0,803	0,533	
Function x ENVDEV → HEADEV	-0,236	0,322	0,734	0,463	-0,788	0,382	H_4 Rejected
Function x SOCDEV → HEADEV	-0,116	0,426	0,272	0,785	-0,729	0,572	

Direct effect

ENVDEV → HEADEV	0,625	0,114	5,467	0,000	0,370	0,816	H_1 Accepted
SOCDEV → HEADEV	0,197	0,178	1,111	0,267	-0,232	0,508	H_2 Rejected

Note. β = Path coefficient, SD= Standard deviation, ENVDEV = Environmental development, HEADEV = Sustainable health development, SOCDEV = Social development.

The source : achieved by the author based on Smart PLS outputs.

Table 10: Assessment of nonlinear effects.

Nonlinear relationship	Coefficient	T value	P value	f^2	Ramsey's RESET
QE (ENVDEV) → HEADEV	0,013	0,127	0,899	0,001	F(2, 23)= 0.361, P=0,701
QE (SOCDEV) → HEADEV	-0,281	1,174	0,240	0,221	

The source : achieved by the author based on Smart PLS outputs.

Table 11; Assessment of endogeneity test using the Gaussian copula approach.

Test	Construct	Coefficient	p value
Gaussian copula of model 1 (endogenous variables; ENVDEV)	ENVDEV	1,383	0,040
	SOCDEV	0,232	0,199
	^{C}ENVDEV	-0,854	0,254
Gaussian copula of model 1 (endogenous variables; SOCDEV)	ENVDEV	0,626	0,000
	SOCDEV	0,364	0,656
	^{C}SOCDEV	-0,186	0,840
Gaussian copula of model 1 (endogenous variables; ENVDEV, SOCDEV)	ENVDEV	1,380	0,049
	SOCDEV	0,372	0,661
	^{C}ENVDEV	-0,850	0,275
	^{C}SOCDEV	-0,157	0,870

The source : achieved by the author based on Smart PLS outputs.

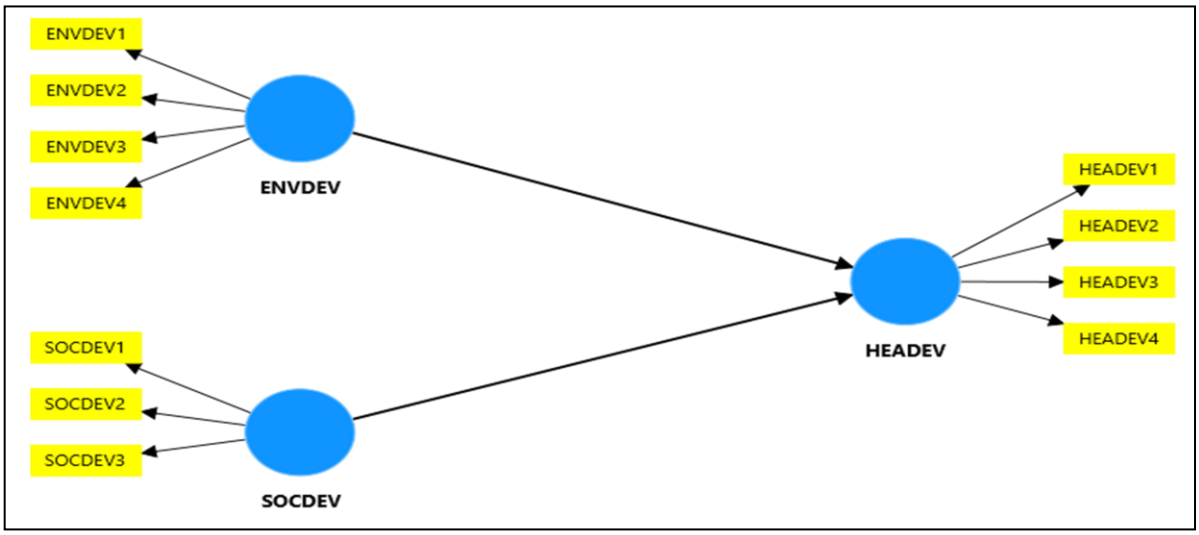
Table 12: Latent variables and its items

Latent Construct	Items
Environmental Development	The hospital works to provide healthcare to patients using methods and tools that reduce environmental pollutants. The hospital works to replace harmful chemicals with safer materials. The hospital works to reduce and dispose of waste generated from healthcare, such as first aid waste. You dispose of expired medications safely without harming the environment.
Social Development	The hospital works to achieve health equality among patients. The hospital administration strives to improve transportation methods for all employees and ensures fairness among them. You provide healthcare services to patients with respect and consideration for their different cultures and religious beliefs.
Sustainable health development	You rationally consume water, and the hospital is supplied with clean drinking water.

The hospital seriously deals with hazardous waste, such as metal waste and toxic materials, to maintain public health and the environment.
The hospital you work at provides sustainable healthy nutrition.
The hospital provides medications and ensures their safe management, such as proper storage.

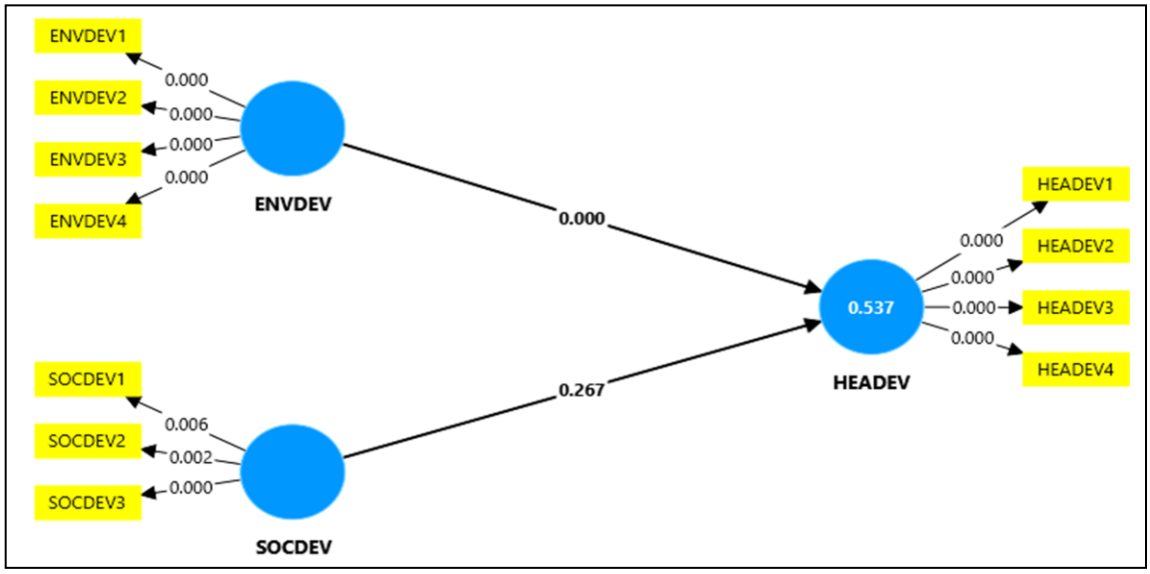
The source: achieved by the author based on Theoretical literature and previous studies.

Figure (1): Structural model of the study



The source : achieved by the author based on Smart PLS outputs.

Figure (2): Bootstrapping results



The source : achieved by the author based on Smart PLS outputs.

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