http://www.jhpr.ir
Hosp Pract Res. 2023 June;8(2):260-269
doi 10.30491/hpr.2023.425518.1408
HPR
Hospital Practices and Research
Original Article

Presenting a Redefined Model of the Spatial Pattern of Therapeutic Uses in Megacities at the time of the Emergence of a Pandemic Disease with a Resilience Approach

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Received April 19, 2023; **Accepted** June 1, 2023; **Online Published** June 15, 2023

Abstract

Background: In recent decades, some countries have experienced imbalanced and rapid development of physical spaces, leading to negative social, economic, and physical consequences. The trend towards urbanization, combined with recent disease outbreaks, has put a strain on healthcare services in large cities.

Objectives: To reduce vulnerability to natural disasters and improve adaptive capacity, it's important to evaluate, monitor, and plan for healthcare resilience. A comprehensive model for measuring hospital resilience to accidents and disasters, including the COVID-19 pandemic, is essential.

Methods: This research identifies, collects, and classifies factors that affect user resilience and spatial definition of healthcare services usage against COVID-19. To better quantify the results, the research combines the conceptual framework of the DPSIR model with the structural equation model (SEM-PLS).

Results: According to the fuzzy cognitive map, the index of economic factors with weights of 62%, 62%, and 5% respectively has a two-way and positive relationship with environmental and natural factors. This factor with a weight of 65% has a two-way and negative relationship with the index of social factors. In addition, the index of economic factors with a weight of 69% has a one-way and negative relationship with the index of physical factors.

Conclusion: The results also show that the economic factors in the model of redefining the spatial pattern of therapeutic uses of big cities at the time of the emergence of a pandemic disease with a resilience approach have more centrality than other factors.

Keywords: Economic Factors, Metropolis, Healthcare Services, Corona Virus, Resilience

1. Background

The subject under investigation requires the presentation of a model that can redefine the spatial pattern of therapeutic uses in megacities during a pandemic disease outbreak, with a focus on resilience.[1] This issue has been raised due to the significance and sensitivity of treatment systems when faced with pandemics, as well as the need for resilience and adaptability during unusual and critical situations.[2] The model aims to redefine therapeutic usage patterns in big cities by analyzing them and making necessary changes and improvements as per the needs and challenges posed by pandemics.[3] The resilience approach plays a crucial role in this model, as pandemics can cause exceptional and critical situations in medical systems, and being able to adapt to these conditions is vital. This model should provide strategies and measures to strengthen the resilience of treatment systems against pandemics.[4,5] Resilience refers to the ability to deal with adverse conditions and recover quickly after disturbances and changes in the system. It is crucial for an organization to respond quickly to such circumstances. A resilient system can withstand environmental pressures and provide optimal performance in critical situations. The healthcare services need to be resilient enough to reduce vulnerability to shocks caused by natural disasters and increase adaptive capacity through improved measures and opportunities.[6] Therefore, it is essential to evaluate, monitor and plan to improve user resilience against accidents, redefine the use of health and medical services and prepare a comprehensive model for measuring the resilience of hospitals against accidents and calamities, including the current coronavirus epidemic.[7]

2. Objectives

To achieve this, effective factors in evaluating user resilience and spatial definition of healthcare services against the coronavirus are identified, collected, and classified, followed by presenting a model for making hospitals resilient. The results of this research can be used by the managers and decision-makers of the country's health sector for better planning.

3. Methods

The current research methodology was based on the application of the structural equation model using the Partial Least Squares method (PLS-SEM) within the framework of the driving force-pressure-situation-effect-response (DPSIR) conceptual model. This is done to evaluate the redefinition of the spatial pattern of therapeutic uses in megacities during the onset of disease outbreaks. Pandemics are approached through resilience. Firstly, the study area is described, followed by an examination of the structure of the aforementioned models. Finally, the calculations related to the level of efficiency, output, and the relationship between them have been presented. The assumptions that the study is based on are as follows (according to Figure 1): H1: Driving forces have a positive effect on pressures. H2: Pressures have a negative effect on the situation. H3: The situation has a negative effect on the effects. H4: Responses have a negative effect on the effects. H5: Responses have a positive effect on driving forces. H6: Responses have a negative effect on pressures. H7: Responses have a positive effect on the situation.

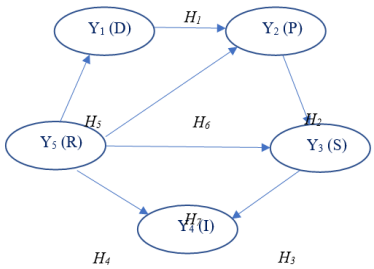

Figure 1. Research Hypotheses in the form of DPSIR Conceptual Model.

4. Results

In this study, we utilized the MATLAB software to construct a fuzzy cognitive mapping model. The software generated the model using output data from FCMapper. Figure 2 displays the resulting map created by MATLAB.

This model presents both positive and negative causal relationships. The size of the circles indicating each factor represents its degree of centrality, meaning that the larger the circle, the higher the influence and impact of that factor on other factors, and consequently, its level of centrality (Table 1).

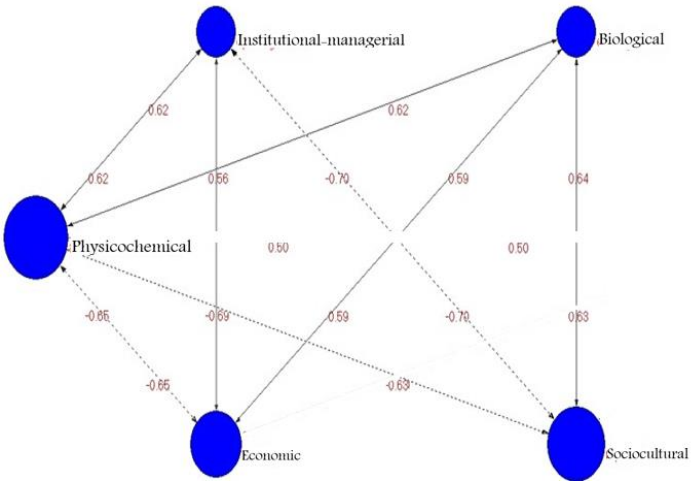

Figure 2. Fuzzy Cognitive Map Model, Engineering Factors, Management Model, Spatial Pattern, Therapeutic Uses, Big Cities, Time of Pandemic Disease.

Table 1. Results from the FCM Model

Factor	Rating	Influence	Influence	Centrality
Economic factors	1	3.07	2.46	5.53
Social factors	2	2.43	2.43	4.87
Physical factors	3	2.03	2.77	4.8
Environmental and natural factors	4	1.85	1.85	3.69

Table 2. Factor Centrality Matrix

Factor	Rating	Influence	Influence
Economic factors	3.07	3.07	6.15
Social factors	1.85	1.85	3.69
Physical factors	2.77	2.77	5.53
Environmental and natural factors	2.43	2.43	4.87

4.1. Formation of Scenarios

The comments gathered from the focus group were used to create a final matrix, which was then entered into the FCMapper software. Using the FCM_Indices section of the software, as outlined in Table 2, we were able to determine the degree of influence, influenceability, and centrality for each factor.

Based on the table, economic, physical, and social

factors have the highest centrality, in terms of their influence and influenceability. This study analyzes three different scenarios, using these three factors to examine and compare them. It is important to note that in the scenario creation section, two numbers are defined for each factor: zero means the factor is absent, whereas one means the factor is present with no change. The first scenario examines what happens when the economic factors in the target organization are zero. This results in changes in the direction and amount of the other factors.

In the FCMapper software, the first scenario indicates that if the economic factors of the target organization become zero, the environmental and natural factors will improve significantly, while the environmental natural and physical factors will decline significantly. In the second scenario, social factors have been set to zero to measure the changes in other factors (Table 4).

The results of the second scenario indicate that if social factors are eliminated, environmental and natural factors, as well as physical factors, will significantly worsen. On the other hand, economic factors will improve greatly. Moving on to the third scenario, economic factors remain the same, social factors are removed, and the effects of changes in other factors are investigated. The results of this scenario have been presented in Table 5.

The results of this scenario show that if the economic factors are one and the social factors are zero, the other factors of the management model of the spatial pattern of therapeutic uses of big cities will change in a negative direction when the pandemic disease occurs.

Table 3. Formation Matrix of the First Scenario

Agents	First stage (no change)	Second stage	Results of the first stage	Results of second stage	Code
Economic factors	1	0	0.59	0	0
Environmental and natural factors	1	-	0.75	0.61	6
Physical factors	1	-	0.55	0	6
Social factors	1	-	0.7	0.74	2

Table 4. Formation Matrix of the Second Scenario

Agents	First stage (no change)	Second stage	Results of the first stage	Results of second stage	Code
Economic factors	1	-	0.59	0.67	2
Environmental and natural factors	1	-	0.75	0.68	6
Physical factors	1	-	0.55	0.52	6
Social factors	1	0	0.7	0	0

Table 5. Formation Matrix of the Third Scenario

Agents	First stage (no change)	Second stage	Results of the first stage	Results of second stage	Code
Economic factors	1	1	0.59	1	1
Environmental and natural factors	1	-	0.75	0.71	6
Physical factors	1	-	0.55	0.47	6
Social factors	1	0	0.7	0	0

4.2. The effect of Components on the Creation Factors and the Spatial Pattern of Therapeutic Uses in Big Cities at the Time of the Outbreak of Pandemic Disease

Once a researcher has defined their research method and collected the necessary data using appropriate tools, it is time to apply statistical techniques to analyze the data and test hypotheses. The collected data must first be categorized and analyzed based on the type of variables, and creative thinking is often required to link the research topic to available information sources. The process of arranging and processing the data is also a creative one. Data analysis is a multi-step process that involves summarizing, coding, categorizing, and establishing context to test hypotheses and identify connections between data. To analyze the collected data, researchers first examine the measurement model to answer the first three research questions. Then, they fit the structural model to test hypotheses and answer the fourth and fifth questions regarding the path coefficient and t-statistic. The Smart-PLS statistical software is commonly used for data analysis.

4.3. Fitting the Measurement and Structural Model of the Research

To estimate the measurement model, it is better to focus on the confirmatory factor analysis which is a part of the measurement models. This model discusses how latent variables are measured by observed variables.

4.4. Variable Characteristics of Physical Factors

The first question: What are the main components that explain the characteristics of physical factors, the factors that create and the spatial pattern of the therapeutic uses of big cities, when the pandemic disease appears?

4.5. Analysis of Structural Equations (Model Fitting)

In this study, we have used the Smart-PLS software to test the correlation between variables. To investigate the causal relationship between independent and dependent variables and confirm the overall model, we have utilized the path analysis method, which was also conducted using Smart-PLS software. The results obtained from the

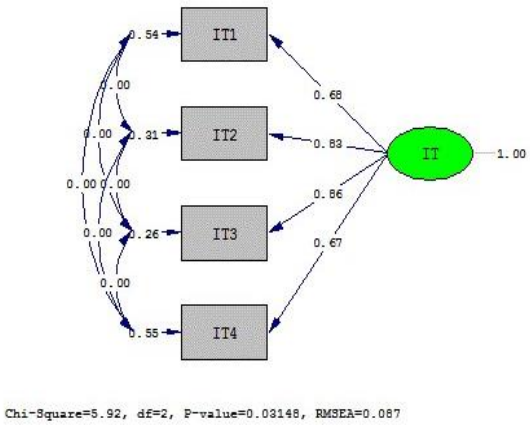

Figure 3. Measurement of the general model and determination of the components of the characteristics of the physical factors in the standard state.

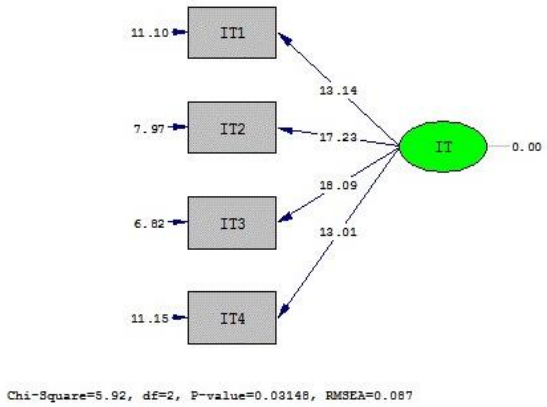

Figure 4. Measurement of the general model and determination of the components of the characteristics of physical factors in a meaningful state.

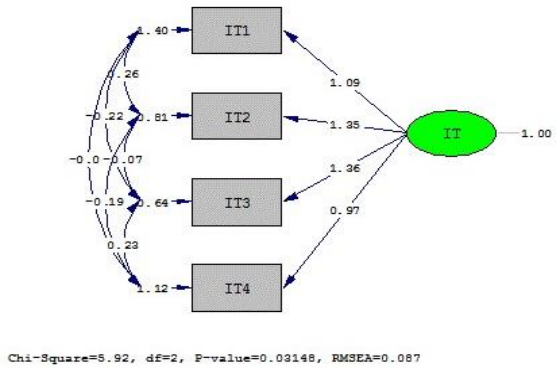

Figure 5. Measurement of the general model and determination of the components of the characteristics of the physical factors in the estimation mode.

Smart-PLS outputs indicate that the chi-square ratio to the degree of freedom is less than three, and other goodness-of-fit indices confirm that the model fits well. It is worth noting that we have used standard coefficients and significance levels to either accept or reject the hypotheses. Moreover, for all paths, the confidence factor is 95%, and the error level is 5%. Table 7 presents the significance coefficients and the results of the proposed hypotheses in brief.

Based on the statistical analysis conducted on Table 7, it has been confirmed that the invisible variable of physical factors has a significant impact on the visible variables of integration, flexibility, alignment, and management. The significance value of this relationship is greater than 1.96, indicating a strong correlation between the variables. Moreover, since the obtained significant number is positive, it can be inferred that these effects are direct. Therefore, the variables of integration, flexibility, alignment, and management play a crucial role in explaining the characteristics of physical factors in creating the spatial pattern of therapeutic uses of big cities during the pandemic outbreak.

4.6. Economic Factors Variable

Second question: What are the main components that explain the approaches of economic factors, creation factors and the spatial pattern of therapeutic uses of megacities when the pandemic disease appeared?

4.7. Analysis of Structural Equations (Model Fitting)

According to Table 9, the statistical analysis shows that there is a significant positive correlation between the invisible variable of economic factors' approaches and the visible variables of flexibility in cost, flexibility in implementation, adaptability, and return (improvement). The obtained significant number is greater than 1.96, which confirms this connection. These effects are direct because the obtained significant number is positive. Therefore, flexibility in cost, flexibility in implementation, ability to adapt, and return (improvement) are the explanatory variables for economic factors' approaches in creating factors and the spatial pattern of therapeutic uses of big cities during the emergence of pandemic disease.

4.8. The Variable of Social Factors, Creation Factors and Spatial Pattern of Therapeutic Uses of Big Cities, the Time of the Emergence of Pandemic Disease

Third question: What are the main components that explain the social factors, the creation factors and the spatial pattern of the therapeutic uses of the big cities when the pandemic disease appeared?

4.9. Structural Equation Analysis (Model Fitting)

Based on the data presented in Table 11, the relationship between the invisible variable of social factors and the visible variables of planning, continuous improvement, mutual communication, and human resources has been confirmed as significant, with a value greater than 1.96. Furthermore, since the significant number is positive, it indicates that these effects are direct. Therefore, the variables of planning, continuous improvement, mutual communication, and human resources are the key factors

Table 6. Fitness Indexes of Structural Equation Model of Physical Factors

Indicators	Full name	Reliable amount	amount	Desirability
Chi-square (χ2)	ChiSquare Divided	-	5.92	Model validation
χ2/df	ChiSquare Divided to Degrees of Freedom	$\chi^2/df < 3$	2.96	Model validation
RMSEA	Root Mean Square Error of Approximation	RMSEA ≤ 0.1	0.087	Model validation
NFI	Normed Fit Index	NFI > 0.9	0.99	Model validation
GFI	Goodness of Fit Index	GFI > 0.9	0.99	Model validation
CFI	Comparative Fit Index	CFI > 0.9	0.99	Model validation
IFI	Incremental Fit Index	IFI > 0.9	0.99	Model validation

Table 7. The Results of the Structural Equation Model for the Research Model of the Characteristics of Physical Factors

Result	meaningful	Standard	Path of communication/influence
Confirmation	13.14	0.68	Characteristics of physical-integrity
Confirmation	17.23	0.83	Characteristics of physical factors - flexibility
Confirmation	18.09	0.86	Properties of physical-alignment factors
Confirmation	13.01	0.67	Characteristics of physical-management factors

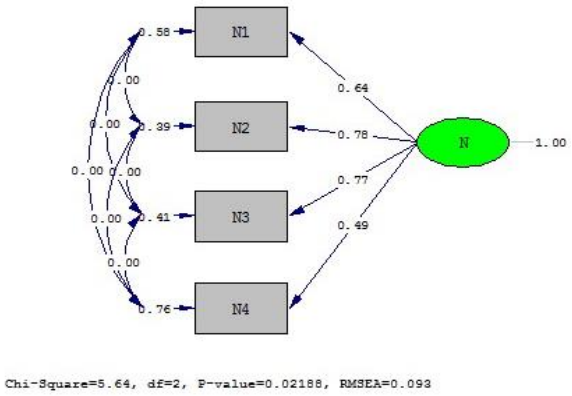

Figure 6. Measurement of the general and explanatory model of the approaches of economic factors, creation factors and the spatial pattern of therapeutic uses of megacities, the time of the emergence of the pandemic disease in the standard mode.

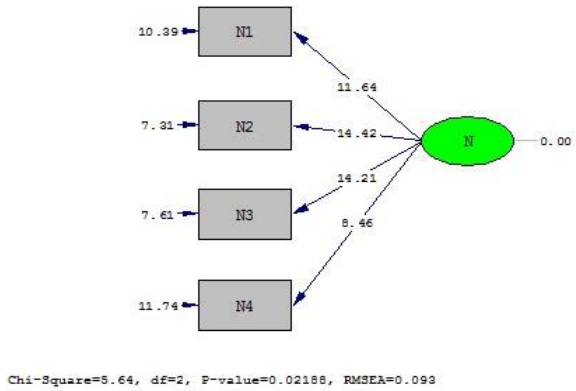

Figure 7. Measurement of the general and explanatory model of the approaches of economic factors, creation factors and the spatial pattern of therapeutic uses of megacities, the time of the emergence of the pandemic disease in a significant state.

Table 8. Structural Equation Model fit Indices of Economic Factors Approaches

Indicators	Full name	Reliable amount	amount	Desirability
Chi-square (χ2)	ChiSquare Divided	-	5.64	Model validation
χ2/df	ChiSquare Divided to Degrees of Freedom	$\chi^2/df < 3$	2.82	Model validation
RMSEA	Root Mean Square Error of Approximation	RMSEA ≤ 0.1	0.093	Model validation
NFI	Normed Fit Index	NFI > 0.9	0.98	Model validation
GFI	Goodness of Fit Index	GFI > 0.9	0.99	Model validation
CFI	Comparative Fit Index	CFI > 0.9	0.99	Model validation
IFI	Incremental Fit Index	IFI > 0.9	0.99	Model validation

Table 9. The Results of the Structural Equation Model for the Research Model of Economic Factors Approaches

Result	meaningful	Standard	Path of communication/influence
Confirmation	11.64	0.64	Approaches to economic factors - cost flexibility
Confirmation	14.42	0.78	Approaches to economic factors - flexibility in implementation
Confirmation	14.21	0.77	Approaches to economic factors - adaptability
Confirmation	8.46	0.49	Approaches to economic factors - return (improvement)

Table 10. Fit Indices of the Structural Equation Model Explaining Social Factors

Indicators	Full name	Reliable amount	Amount	Desirability
Chi-square (χ2)	ChiSquare Divided	-	4.53	Model validation
χ2/df	ChiSquare Divided to Degrees of Freedom	$\chi^2/df < 3$	2.26	Model validation
RMSEA	Root Mean Square Error of Approximation	RMSEA ≤ 0.1	0.062	Model validation
NFI	Normed Fit Index	NFI > 0.9	0.99	Model validation
GFI	Goodness of Fit Index	GFI > 0.9	0.99	Model validation
CFI	Comparative Fit Index	CFI > 0.9	1.00	Model validation
IFI	Incremental Fit Index	IFI > 0.9	1.00	Model validation

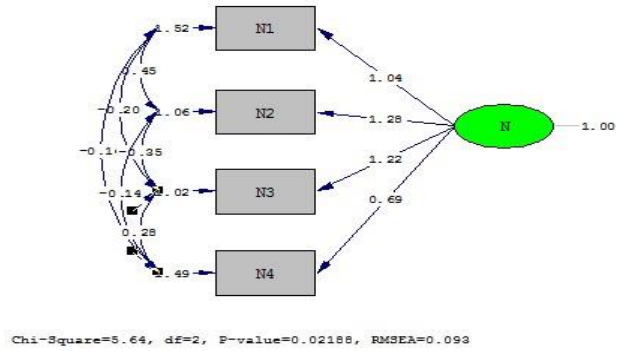

Figure 8. Measurement of the general and explanatory model of the approaches of economic factors, creation factors and the spatial pattern of therapeutic uses of megacities, the time of the emergence of the pandemic disease in an estimated state.

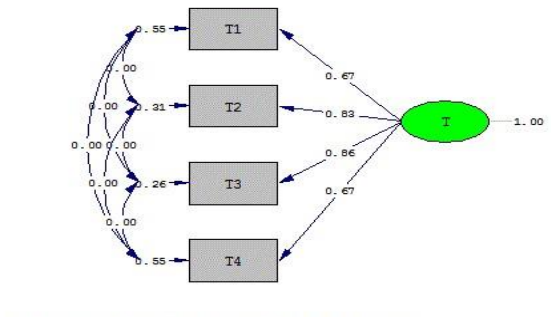

Figure 9. Measurement of the general model and determination of explanatory components of social factors, creation factors and spatial pattern of treatment uses of megacities, time of pandemic disease emergence in standard mode.

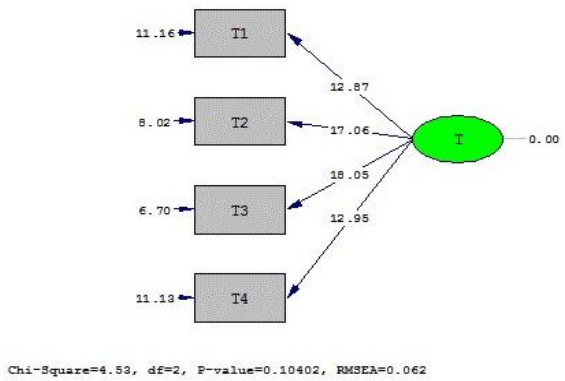

Figure 10. Measurement of the general model to determine the explanatory components of the social factors, the factors of creation and the spatial pattern of the treatment uses of the big cities, the time of the emergence of the pandemic disease in a significant state.

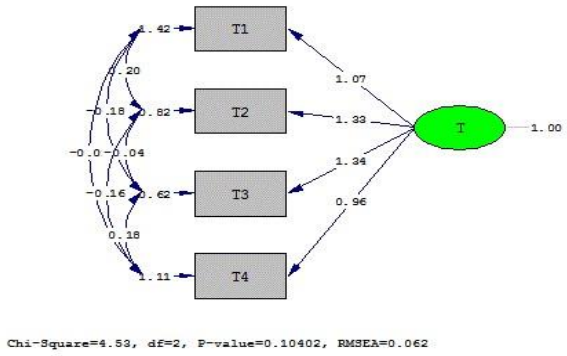

Figure11. Measuring the general model and determining the explanatory components of social factors, creation factors and the spatial pattern of therapeutic uses of megacities, the time of the emergence of the pandemic disease in an estimated state.

in explaining the redefinition of the spatial pattern of therapeutic uses of megacities during the emergence of the pandemic disease. This approach emphasizes the significance of resilience factors in creating and shaping the spatial pattern of therapeutic uses of megacities during the pandemic.

4.10. The Variable of Environmental and Natural Factors, Factors of Creation and Spatial Pattern of Therapeutic Uses of Megacities, the Time of the Emergence of Pandemic Disease

Fourth question: What are the main components that explain the environmental and natural factors, the factors that create and the spatial pattern of the therapeutic uses of big cities, and the time of the emergence of the pandemic disease?

4.11. Structural Equation Analysis (Model Fitting)

According to Table 13, the path coefficient value of the relationship between the invisible variable of environmental and natural factors and the visible variables of extent, planning, process integration, and common values is greater than 1.96, indicating a significant relationship between them. The positive value of the obtained coefficient suggests that these effects are direct. Hence, the variables of extent, planning, integration of the process, and common values play a crucial role in explaining the variable components of environmental and natural factors in the creation of therapeutic uses of big cities during the emergence of pandemic diseases and their spatial patterns.

Table 11. The Results of the Structural Equation Model for the Explanatory Model of Social Factors

Result	Meaningful	Standard	Path of communication/influence
Confirmation	12.87	0.67	Characteristics of social factors - planning
Confirmation	17.06	0.83	Characteristics of social factors - continuous improvement
Confirmation	18.05	0.86	Characteristics of social factors - mutual relationship
Confirmation	12.95	0.67	Characteristics of social factors - human resources

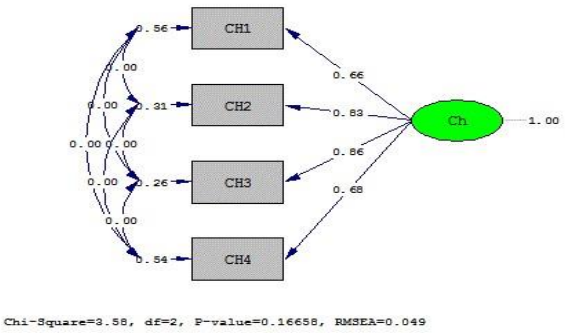

Figure 12. Measurement of the general model and determination of the components of environmental and natural factors, factors of creation and spatial pattern of therapeutic uses of megacities, the time of emergence of pandemic disease in standard mode.

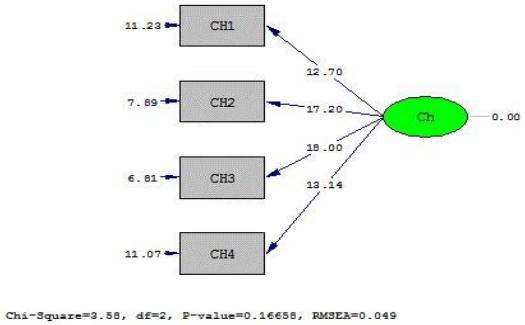

Figure 13. Measurement of the general model and determination of the components of environmental and natural factors, creation factors and the spatial pattern of therapeutic uses of megacities, the time of the emergence of the pandemic disease in a significant state.

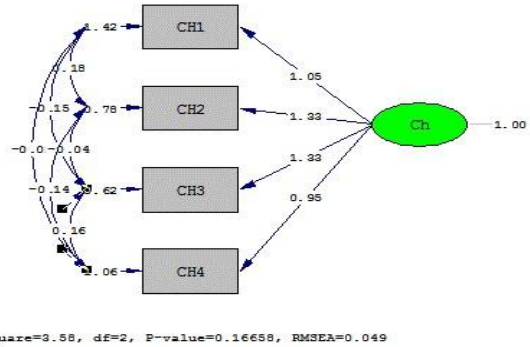

Figure 14. Measurement of the general model and determination of the components of environmental and natural factors, the factors of creation and the spatial pattern of the treatment uses of megacities, the time of the emergence of the pandemic disease in an estimated state.

Table 12. Fit Indices of the Structural Equation Model of the Components of Environmental and Natural Factors

Indicators	Full name	Reliable amount	Amount	Desirability
Chi-square (χ2)	ChiSquare Divided	-	3.58	Model validation
χ2/df	ChiSquare Divided to Degrees of Freedom	$\chi^2/df < 3$	1.79	Model validation
RMSEA	Root Mean Square Error of Approximation	RMSEA ≤ 0.1	0.049	Model validation
NFI	Normed Fit Index	NFI > 0.9	0.99	Model validation
GFI	Goodness of Fit Index	GFI > 0.9	0.99	Model validation
CFI	Comparative Fit Index	CFI > 0.9	1.00	Model validation
IFI	Incremental Fit Index	IFI > 0.9	1.00	Model validation

Table 13. The Results of the Structural Equation Model for the Research Model of the Components of Environmental and Natural Factors

Result	Meaningful	Standard	Path of communication/influence
Confirmation	12.70	0.66	Characteristics of environmental and natural factors - extent of expansion
Confirmation	17.20	0.83	Characteristics of environmental and natural factors - continuous improvement
Confirmation	18.00	0.86	Characteristics of environmental and natural factors - interrelationship
Confirmation	13.14	0.68	Characteristics of environmental and natural factors - human resources

5. Discussion

The present study aimed to understand the factors affecting the redefinition of the spatial pattern of therapeutic uses in big cities during a pandemic situation, with a focus on the resilience approach. The research was conducted in three stages. In the first stage, the Fuzzy Cognitive Map (FCM) technique was used to obtain the final success matrix. In the second stage, the matrix was entered into the FCMapper software to analyze three scenarios. Lastly, a Fuzzy Cognitive Mapping diagram was produced using MATLAB software. The results showed that economic factors have the most significant impact on the redefinition of the spatial pattern of therapeutic uses in big cities during a pandemic situation. The scenario review section revealed three scenarios that help understand the impact of economic factors. In the first scenario, if economic factors' index becomes zero, the index of social, environmental, natural and physical factors will change positively and negatively, respectively. The results of this scenario show that lack of spatial control of therapeutic uses in big cities leads to excessive reporting of new problems and issues, ultimately causing a reduction in environmental and natural factors' index. On the other hand, in the second scenario, if the social

factor's index becomes zero, the index of economic factors changes positively, and the other factors change negatively. The results of this scenario show that non-compliance with social factors leads to excessive reduction of environmental and natural factors and physical factors, making it difficult to adapt to a pandemic situation. In the third scenario, flexibility is zero, and the index of economic factors is considered as one. The results of this scenario show that with the index of social factors becoming zero and the index of economic factors remaining constant, the other factors of the redefinition model of therapeutic uses of big cities will change negatively. The study shows that economic factors play a crucial role in the resilience approach towards pandemic situations, compared to other factors. The final stage of the research produced a FCM using MATLAB software. The size of the circles related to each factor shows the degree of centrality of that factor compared to others. In this study, the circle related to the index of economic factors is the largest, indicating its centrality and importance. The index of economic factors has a positive relationship with environmental and natural factors and a negative relationship with social and physical factors. Lingam et al. (2021) conducted a study on the factors and trends in health service utilization among graduate students in Pakistan. According to their findings, Pakistan has both public and private healthcare facilities, with a majority of doctors working in urban areas and attracting a more educated population. However, the educated class tends to prioritize private healthcare over public facilities, highlighting the need for government officials to improve public healthcare accessibility.[8] In another study, Gatto et al. (2022) examined the link between poverty and access to healthcare in developing countries. Their research revealed that despite progress in healthcare accessibility, a significant proportion of the population in these countries still has limited access to healthcare. Poor countries, in particular, have a higher disease burden but typically have fewer resources to provide healthcare services. Regardless of factors such as geographical, physical, and quality of care access, recent studies indicate that improving healthcare access is crucial for developing countries.[9] Peng (2020) explored the optimal location for constructing a hospital. The study used the AHP method as one of the multi-criteria analysis methods and GIS. The hierarchical analysis process was used to determine the location, and the hospital was found to be very efficient in the study area.[10] Lewis et al. (2021) conducted a literature study to investigate the improvement of indigenous people's access to health services in urban and regional areas. The results provided information about barriers to access health and mental health services for local people living in urban and regional communities. These barriers were categorized as physical accessibility, affordability, appropriateness, and cultural acceptance.[11] Sousa et al. (2021) analyzed the equity and use of health services in Uganda by focusing on several factors (supply and demand) that affect the access and use of health services in Uganda. These factors include education, age, household expenses, use of the outpatient department, hospital capacity, and the distance from medical services. The study analyzed several measures used in policy implementation, particularly in the main areas such as malaria, tuberculosis, and HIV/AIDS. The analysis shows that despite efforts to improve health outcomes for people, there are still significant challenges. For example, living near essential health services does not necessarily ensure that health services are used as intended. Additionally, the elimination of usage costs at government centers increases the use of new healthcare facilities, especially fixed and fee-based service providers with catastrophic costs.[12] In a recent study, Joshi et al. (2022) investigated the access and use of healthcare among rural households in Nigeria. The study found that the average age of the respondents was 46 years, and the average household size was eight people. A significant portion of the respondents, 43.5%, did not have formal education, and the main occupation among them was agricultural work. The study also found that while 58% of the respondents had access to medical services and only 42.5% of them actually used these services. Moreover, most of the respondents, 40.5%, lived 5-9 kilometers away from accessing medical centers, indicating unequal access to modern healthcare facilities in the study area. To address this issue, the study recommends that rural development policies should focus on creating an organizational environment that improves participation and access to modern healthcare throughout rural areas in Nigeria.[13] McKenzie (2017) also conducted a study on the access and use of health services, but in Massachusetts, United States of America (USA), focusing on immigrant women from Brazil. The research highlights that illegal immigrant women living in Brazil are more likely to access healthcare services in countries that have health services, and they are satisfied with the global level of healthcare. However, many immigrants and ethnic minorities often lack adequate access to healthcare, increasing health risks. This study adds to the existing literature on healthcare access and use by providing new information on Brazilian immigrant women's experiences of healthcare access and use in Massachusetts, USA. It also identifies opportunities to improve the services and health of the entire immigrant population.[14] In their research, Allam et al. (2022) studied the relationship between transportation networks and healthcare services, and how they affect urban sprawl. The findings of this study suggest that there are significant relationships between these urban components and access to healthcare.[15] Similarly, in a research conducted by Das et al. (2021), the authors investigated the design of decision support

systems for access to space services, and found that improving access to healthcare can lead to reduced healthcare costs, increased healthcare equity, and better health outcomes. Through our own research, we have developed a new application-based framework for measuring access to healthcare, as well as a practical example of SDSS. Our method for obtaining the weight of population characteristics involves the use of predictive analysis using real data to assess the need for integrating non-spatial factors into existing algorithms in the creation of SPAI. The results of our research should encourage further investigation into how demographic characteristics can affect the demand for healthcare.[16] In a separate study, Cotta et al. (2020) reviewed different approaches to measuring potential spatial access to urban health services, examining the types of distances and related issues.[17] Meanwhile, Berendes et al. (2018) explored the relationship between urban status, health competence, critical issues, and exercises, concluding that if we are serious about achieving sustainable development goals, more attention needs to be given to understanding and taking action to improve urban conditions in order to promote health competence. The research showed that healthy and fair urban environments are crucial to ensure health for all, but simply focusing on built environments or risk factors alone will not address the numerous social and environmental obstacles that exist in cities today. To help improve the health and well-being of urban communities, we must collaborate and work together to analyze and solve problems. While this is not an easy task, and the evidence base for how to do so effectively is still emerging, it is crucial to strive for health justice in our increasingly urbanized world.[18]

Pak et al. (2018) conducted a study on network and spatial analysis to assess and guide decision-making regarding equal access and health services in the general patient care system in Ederdamora, Spain. They used access and coverage maps to display the relative distribution of resources in a population while indicating the coverage levels based on the time of access to physical and professional facilities, with and without administrative restrictions. This information can assist decision-makers in improving the optimal level of stocks in a region. The large geographical area with low population density is particularly valuable.[19] Coccia et al. (2020) conducted a study on the issue of access to health care by urban refugees and the host population in Uganda. The study found that health services were available every five kilometers for both refugees and the host population. However, refugees were generally unable to pay for access to health services, including transportation, research, essential drugs, and other informal costs. They also had weaker perceptions of public health services compared to the general citizen, mainly due to long-term expectations of inadequate essential medicine services, perceived discrimination, and the existence of unofficial costs paid.[20] Paris et al. (2020) conducted a study to measure the resilience of traditional societies against natural disasters. They concluded that traditional societies face natural disasters using four dimensions: nature of risk, level of resilience, cultural structure, and policies. Managers can show resistance in the face of disasters.[21] In 2022, Park et al. published an article titled "Towards Resilient Regions: Regional Development Policy". They used a descriptive-analytical method and focused on the economic dimension of resilience. They analyzed indicators such as employment rates, income, production gross, and knowledge mobility to introduce the process of making regions resilient.[22] Another study by Plastina et al. in 2019, "Regional Planning and the Future of Resilience in the Ningladder Coral Coastal Region of Australia", looked at the correlation between resilience and tourist attraction. They used indicators such as the amount of tourist attraction to study the resilience of the region.[23] In the same year, Teng et al. published an article titled "Tissue-based Identification of Old Urban Neighborhoods in Hyderabad, India Using Remote Sensing Data with a Renovation Approach". They concluded that the location map of worn-out tissue is an efficient tool in identifying vulnerable areas in densely populated cities. This method can be used for quick analysis and comparison of multi-temporal data in many developing cities around the world.[24] Acharya et al. (2017) collected articles and opinions from different people and investigated the reconstruction of built environments after disasters to increase resilience. They found that resilience should be considered a necessity during reconstruction.[25] Hasson et al. (2022) categorized urban resilience indicators from a landscape ecologist's perspective. They introduced five urban design and planning indicators, including redundancy, multi-functionality (biodiversity), urban ecological networks, adaptive design, and connection with connections. They also emphasized the combination of ecological principles and urban planning to achieve urban resilience.[26]

6. Conclusion

The results show that economic factors have a high centrality compared to other factors in the redefinition model of therapeutic uses of big cities during a pandemic situation, indicating their significant impact on other factors. This impact can help increase resilience and reduce the negative effects of other factors on the safety of the area in question.

Acknowledgments

The current study is part of the Ph.D. thesis of Hamidreza Asgari. The article's authors express gratitude to those who helped us in this research.

Author Contributions

All authors contributed as the main author with the concept

of planning the study, and performed the statistical analysis and interpreted the data. All authors wrote the manuscript. and contributed in revising the manuscript. All authors approved the final revision.

Conflict of Interest Disclosures

All authors declared that they have no conflict of interest.

Research Highlights

What Is Already Known?

- In recent decades, imbalanced and rapid development of physical spaces has led to negative consequences.
- Urbanization and disease outbreaks have strained healthcare services.
- It's important to plan for healthcare resilience and measure hospital resilience to disasters, including COVID-19.

What Does This Study Add?

The study found that economic factors are more central than other factors in the model of redefining the spatial pattern of therapeutic uses of big cities during a pandemic disease with a resilience approach.

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