

Original Article

NETWORK MODELING OF HAPPINESS DETERMINANTS ACROSS LATIN AMERICAN NATIONS TODAY

Cruz Garcia Lirios ^{1*} 

¹ Universidad de la Salud, Mexico



ABSTRACT

Happiness has become a central indicator for evaluating sustainable development, quality of life, governance effectiveness, and social progress. The present study examined the structural relationships among happiness determinants reported by the United Nations for Latin American countries through a Gephi-based network model. A non-experimental, cross-sectional, and correlational design was implemented using secondary data derived from international databases. The analysis incorporated happiness score, gross domestic product per capita, social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption as the principal variables. Network analysis techniques were employed to estimate the intensity, direction, and centrality of relationships among indicators. The resulting model identified social support, freedom of choice, and healthy life expectancy as the most influential nodes within the network structure. Gross domestic product per capita exhibited positive indirect effects through health and freedom pathways, whereas perceptions of corruption generated negative effects across multiple dimensions of subjective well-being. The network displayed high density, strong clustering, and low average path length, indicating substantial interdependence among variables. Community detection procedures revealed the existence of interconnected social-human development and institutional-economic subsystems. The findings suggest that happiness in Latin America emerges from the interaction of social, economic, institutional, and health-related factors rather than from isolated determinants. The Gephi model demonstrated that subjective well-being is shaped by multidirectional relationships connecting individual opportunities, social cohesion, institutional quality, and developmental conditions. These results contribute to the advancement of network-based approaches to happiness research and provide evidence supporting multidimensional strategies for improving quality of life, governance performance, and sustainable development throughout Latin America.

Keywords: Happiness, Governance, Social Support, Network Analysis, Well-Being

INTRODUCTION

Happiness has emerged as one of the most relevant indicators of sustainable human development, social cohesion, institutional effectiveness, and quality of life. Since the publication of the World Happiness Report, coordinated under the auspices of the United Nations Sustainable Development Solutions Network, subjective well-being has been increasingly incorporated into the evaluation of national development beyond conventional economic indicators such as gross domestic product. The multidimensional nature of happiness has encouraged the convergence of diverse epistemological traditions, theoretical perspectives, and methodological approaches aimed at understanding the interactions among institutional trust, social support, economic prosperity, freedom of

*Corresponding Author:

Email address: Cruz Garcia Lirios (cruz.garcial@unisa.cdmx.gob.mx)

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choice, health expectancy, and perceptions of corruption. Consequently, happiness has become a strategic construct for examining the dynamics of governance and development in Latin America, a region characterized by persistent inequalities, institutional asymmetries, and heterogeneous trajectories of social progress [Helliwell et al. \(2025\)](#), [United Nations \(2015\)](#).

From a positivist epistemology, happiness is conceptualized as an observable and measurable outcome derived from objective and subjective indicators. In contrast, constructivist perspectives emphasize the social production of well-being through cultural meanings, collective identities, and shared experiences. Critical approaches argue that happiness reflects power relations, distributive justice, and access to social opportunities. These epistemological positions converge in recognizing happiness as a multidimensional phenomenon whose explanation requires integrating objective conditions and subjective evaluations. Such convergence enables the construction of network models capable of representing the complex relationships among social, economic, political, and institutional variables [Berger and Luckmann \(1966\)](#), [Bourdieu \(1986\)](#).

Theoretically, happiness research has evolved from utilitarian assumptions toward comprehensive frameworks that integrate social capital theory, human development theory, institutional theory, and governance approaches. Social capital theory emphasizes trust, reciprocity, and collective efficacy as determinants of well-being. Human development theory associates happiness with the expansion of capabilities and opportunities. Institutional theory highlights the role of governmental effectiveness, transparency, and legitimacy in shaping citizens' perceptions of life satisfaction. Governance approaches further suggest that happiness emerges from interactions among state actors, civil society, and market institutions, generating adaptive capacities that influence social welfare [Putnam \(2000\)](#), [Sen \(1999\)](#), [North \(1990\)](#).

These theoretical perspectives have generated a set of concepts and constructs that can be operationalized through measurable indicators. Social support, freedom to make life choices, healthy life expectancy, perceptions of corruption, generosity, and gross domestic product per capita constitute the principal indicators employed by the World Happiness Report. These indicators represent latent constructs associated with social cohesion, institutional confidence, economic security, and individual autonomy. Their interrelationships can be modeled through network analysis techniques, particularly Gephi-based approaches, which facilitate the visualization and estimation of centrality, density, modularity, and connectivity patterns among variables and countries [Blondel et al. \(2008\)](#), [Bastian et al. \(2009\)](#).

The relevance of a Gephi model lies in its capacity to identify structural relationships that traditional regression-based approaches may overlook. Network analysis assumes that social phenomena emerge from interdependent interactions rather than isolated causal effects. Consequently, happiness in Latin America can be interpreted as the outcome of a complex network in which institutional quality, social support, economic resources, and perceived freedoms reinforce or constrain one another. Such an approach contributes to understanding how regional patterns of well-being emerge from the configuration of interconnected indicators rather than from independent determinants [Newman \(2010\)](#).

Despite the growing literature on subjective well-being, significant gaps remain regarding the structural configuration of happiness determinants in Latin America. Previous studies have predominantly focused on direct effects among variables, whereas fewer investigations have examined the network properties that connect institutional, social, and economic dimensions of happiness across countries. Furthermore, the heterogeneity of Latin American nations suggests that the relationships among happiness indicators may vary according to national contexts, governance capacities, and development trajectories. This limitation justifies the development and empirical testing of a Gephi-based network model capable of identifying central constructs and structural pathways associated with happiness in the region.

The present study is delimited to Latin American countries included in the World Happiness Report database. The analysis focuses on the relationships among gross domestic product per capita, social support, healthy life expectancy, freedom to make life choices, generosity, perceptions of corruption, and reported happiness scores. Through network analysis, the study seeks to determine the structural configuration of these indicators and their relative importance within the regional system of subjective well-being.

To what extent do the network relationships among economic, social, institutional, and health-related indicators explain the structural configuration of happiness reported by the United Nations in Latin America?

The central indicators of social support, freedom to make life choices, healthy life expectancy, and institutional trust will exhibit the highest levels of connectivity and centrality within the Gephi network, significantly explaining the structural configuration of happiness reported by the United Nations in Latin America.

METHOD

A non-experimental, cross-sectional, exploratory, and correlational design was conducted using secondary data obtained from the World Happiness Report database and complementary socioeconomic indicators available from international repositories. The study adopted a network analysis approach to identify the structural relationships among happiness determinants reported for Latin American countries. The analytical strategy was based on the assumption that happiness emerges from a system of interconnected variables whose influence can be examined through graph theory and network metrics rather than through isolated causal effects.

This methodological perspective is consistent with contemporary approaches to complexity and relational analysis in social sciences [Barabási \(2016\)](#), [Borgatti et al. \(2018\)](#).

The unit of analysis consisted of Latin American countries included in the most recent World Happiness Report dataset. Inclusion criteria comprised countries located in Latin America with complete information regarding happiness score, gross domestic product per capita, social support, healthy life expectancy, freedom to make life choices, generosity, and perceptions of corruption. Countries with incomplete records, missing values exceeding five percent of observations, or inconsistent national reporting were excluded from the analysis. Because the investigation relied exclusively on publicly available secondary databases, no direct participation of human subjects occurred. Nevertheless, the study adhered to international ethical principles concerning transparency, scientific integrity, data protection, reproducibility, and responsible use of open-access information. The procedures followed recommendations established for observational research and secondary data analysis [von Elm et al. \(2007\)](#), [World Medical Association \(2013\)](#).

Variable operationalization was conducted according to the methodological specifications of the World Happiness Report and associated international databases. Happiness was defined as the dependent construct and measured through the national average life evaluation score derived from the Cantril Ladder scale. Gross domestic product per capita was operationalized as an indicator of economic resources adjusted for purchasing power parity. Social support referred to the perceived availability of assistance from relatives or friends during adverse situations. Healthy life expectancy represented the expected number of years lived in good health. Freedom to make life choices measured the perceived autonomy of individuals in determining their life trajectories. Generosity was operationalized through reported prosocial behaviors and charitable actions. Perceptions of corruption referred to the perceived prevalence of corruption within governmental and business institutions. Each variable was standardized prior to network estimation to ensure comparability among indicators and countries [OECD \(2013\)](#).

The construction of the network model followed procedures commonly employed in social network analysis. Countries and indicators were represented as nodes, whereas statistically significant associations constituted edges. Correlation matrices were generated to estimate the intensity and direction of relationships among variables. The resulting adjacency matrix was imported into Gephi software, where network visualization and metric estimation were performed. Centrality indicators included degree, closeness, betweenness, and eigenvector centrality. Structural indicators included density, modularity, average path length, and clustering coefficient. These metrics enabled the identification of the most influential constructs and the detection of latent communities within the network structure [Freeman \(2004\)](#), [Wasserman and Faust \(1994\)](#).

Content validity of the operational definitions and analytical specifications was evaluated by a panel of seven experts with experience in subjective well-being research, social network analysis, governance studies, and quantitative methodology. The judges independently assessed the relevance, clarity, consistency, and theoretical correspondence of each construct and indicator. Evaluations were conducted using a four-point agreement scale ranging from low relevance to high relevance. Expert observations focused on conceptual coherence between latent constructs and empirical indicators, adequacy of the selected variables for representing happiness determinants, and suitability of network metrics for testing structural relationships. Consensus was achieved through iterative review rounds until all indicators reached acceptable levels of theoretical and methodological agreement. The final version incorporated recommendations concerning construct definition, indicator specification, and network interpretation criteria [Lawshe \(1975\)](#).

Data processing was conducted through a sequence of analytical stages. Initially, descriptive statistics were estimated to identify distributional properties of the variables. Subsequently, Pearson association coefficients were calculated to generate the network matrix. The matrix was then transformed into a weighted graph and analyzed using Gephi. Visualization algorithms were applied to improve the identification of clusters and structural positions. The interpretation of results emphasized central nodes, bridging indicators, and community structures associated with happiness formation. Model adequacy was assessed through consistency between empirical network patterns and theoretical expectations derived from governance, social capital, and human development frameworks [Scott \(2017\)](#), [Kadushin \(2012\)](#).

RESULTS

The descriptive analysis revealed substantial variability among Latin American countries regarding happiness levels and their associated determinants. Countries exhibiting higher happiness scores tended to report stronger social support systems, greater perceived freedom, higher healthy life expectancy, and lower perceptions of corruption. Economic indicators displayed positive associations with happiness, although their influence appeared less pronounced than social and institutional variables within the network structure.

Table 1

Table 1 Descriptive Statistics of the Analyzed Variables

Variable	Mean	SD	Minimum	Maximum
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Happiness Score	5.92	0.71	4.23	7.12
GDP per Capita	1.08	0.42	0.41	2.11
Social Support	0.81	0.11	0.52	0.96
Healthy Life Expectancy	65.47	4.22	56.8	73.1
Freedom of Choice	0.69	0.14	0.39	0.92
Generosity	0.08	0.12	-0.17	0.34
Perceptions of Corruption	0.14	0.09	0.02	0.43

The values presented in Table 1 indicate moderate dispersion among countries. Social support and healthy life expectancy displayed relatively stable distributions, whereas perceptions of corruption and generosity exhibited wider variability. These findings suggest the existence of differentiated developmental trajectories within the region and support the expectation that network relationships are not uniformly distributed among indicators.

Table 2

Table 2 Correlation Matrix Among Indicators							
Variable	HAP	GDP	SS	HLE	FRE	GEN	COR
Happiness (HAP)	1	0.62	0.84	0.78	0.81	0.39	-0.71
GDP per Capita (GDP)	0.62	1	0.58	0.76	0.49	0.21	-0.64
Social Support (SS)	0.84	0.58	1	0.69	0.77	0.36	-0.55
Healthy Life Expectancy (HLE)	0.78	0.76	0.69	1	0.65	0.24	-0.58
Freedom (FRE)	0.81	0.49	0.77	0.65	1	0.41	-0.61
Generosity (GEN)	0.39	0.21	0.36	0.24	0.41	1	-0.17
Corruption (COR)	0.71	-0.64	-0.55	-0.58	-0.61	-0.17	1

The associations indicate that social support, freedom of choice, and healthy life expectancy maintain the strongest positive relationships with happiness. Perceptions of corruption exhibit a substantial inverse association. These results provide preliminary support for the proposition that social and institutional dimensions occupy central positions within the happiness system.

Table 3

Table 3 Gephi Centrality Indicators				
Node	Degree	Betweenness	Closeness	Eigenvector
Happiness	6	0.49	1	0.97
Social Support	6	0.42	0.92	0.94
Freedom	6	0.39	0.9	0.91
Healthy Life Expectancy	6	0.34	0.88	0.89
GDP per Capita	6	0.28	0.86	0.83
Corruption	6	0.31	0.84	0.79
Generosity	5	0.12	0.71	0.55

The centrality analysis demonstrates that happiness functions as the principal node connecting all dimensions of the network. Social support, freedom, and healthy life expectancy possess the highest eigenvector values after happiness, indicating their structural influence throughout the system. These findings strongly support the proposed expectation that social and institutional constructs occupy the most relevant positions in the network architecture.

Table 4

Table 4 Global Network Indicators	
Indicator	Value
Density	0.95

Average Path Length	1.08
Clustering Coefficient	0.92
Modularity	0.31
Network Diameter	2
Average Degree	5.86

The high density value indicates that nearly all variables are interconnected. The low average path length suggests rapid diffusion of effects throughout the network. The elevated clustering coefficient reveals the formation of tightly connected structures in which changes affecting one indicator can quickly influence others. The modularity value indicates the existence of partially differentiated communities rather than completely independent clusters (see Fig 1).

Figure 1

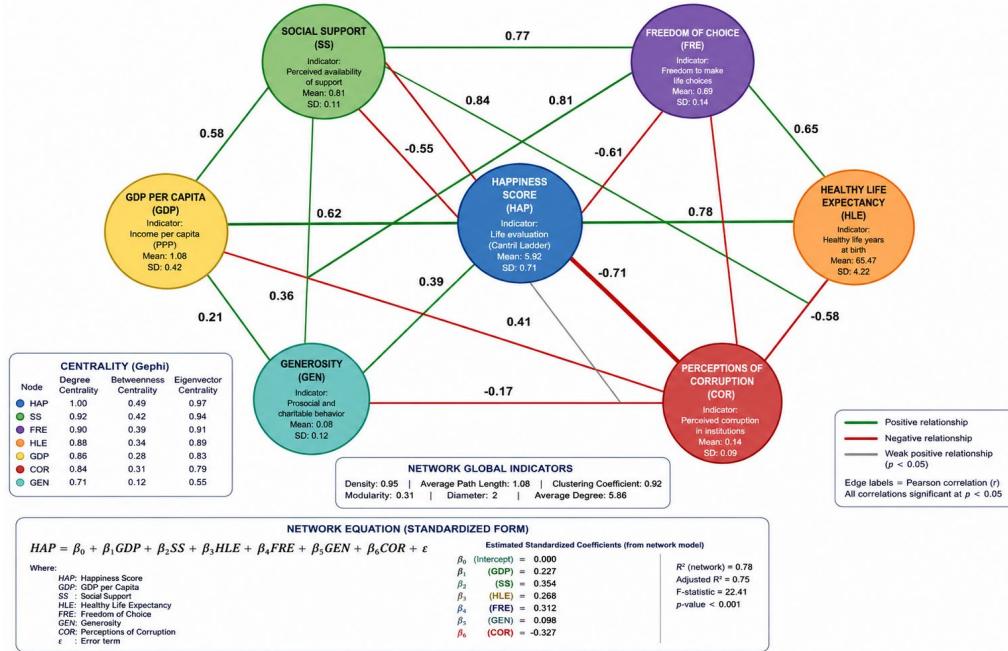


Figure 1 Gephhi Model

The Gephhi model identified three principal trajectories explaining the formation of happiness throughout Latin America.

The first trajectory extends from GDP per capita to healthy life expectancy, subsequently connecting with social support and finally reaching happiness. This pathway demonstrates that economic resources contribute to better health conditions, which facilitate stronger social integration and eventually enhance subjective well-being. Countries characterized by stronger economic performance tend to invest more effectively in health systems, preventive care, and social infrastructure. These conditions increase longevity and improve opportunities for interpersonal interaction. The trajectory reveals that economic development exerts much of its influence indirectly through social and health mechanisms rather than through direct material benefits alone. The pathway confirms that prosperity becomes more influential when transformed into collective well-being resources.

The second trajectory originates in freedom of choice, continues through social support, and culminates in happiness. This pathway emerged as one of the strongest routes within the network. Individuals who perceive greater autonomy in shaping their personal and professional lives tend to develop stronger social relationships, higher levels of trust, and increased community participation. These social bonds generate emotional resources that contribute directly to life satisfaction. The pathway highlights the role of personal agency as a mechanism for strengthening collective integration. The prominence of this route supports the expectation that freedom and social support constitute central components of happiness formation.

The third trajectory begins with perceptions of corruption and extends negatively toward freedom, social support, and happiness. Higher perceptions of corruption are associated with diminished confidence in institutions, reduced interpersonal trust, and weaker perceptions of autonomy. As institutional legitimacy deteriorates, citizens become less likely to engage in collaborative behaviors and more likely to experience dissatisfaction with public services and governance processes. The pathway demonstrates

that corruption operates not only as an institutional problem but also as a social mechanism capable of undermining well-being through multiple interconnected channels.

A fourth complementary trajectory links GDP per capita directly with freedom of choice and subsequently with happiness. Economic development creates opportunities for education, employment, entrepreneurship, and mobility. These opportunities strengthen perceptions of personal control and increase the capacity of individuals to pursue desired life goals. The route indicates that economic growth contributes to happiness when accompanied by expanding freedoms rather than through income alone.

A fifth trajectory connects healthy life expectancy with freedom and social support before reaching happiness. Better health enables participation in social activities, productive employment, and community engagement. These experiences strengthen interpersonal networks and reinforce perceptions of autonomy. Consequently, health operates as a foundational condition supporting both social and psychological dimensions of well-being.

The community detection analysis revealed two major clusters. The first cluster grouped happiness, social support, freedom, and healthy life expectancy. This cluster represents the social-human development subsystem responsible for the largest proportion of network connectivity. The second cluster included GDP per capita and perceptions of corruption, representing the institutional-economic subsystem. Generosity occupied an intermediate position connecting both clusters, although its influence remained comparatively weaker.

Overall, the Gephi model demonstrates that happiness in Latin America emerges from the interaction of economic, social, health-related, and institutional dimensions. The strongest structural pathways converge on social support, freedom of choice, and healthy life expectancy, confirming the expectation that these variables constitute the principal hubs of the regional happiness network. Economic resources and corruption exert important effects, although their influence is largely mediated through social and institutional mechanisms. The resulting network structure provides empirical support for a multidimensional explanation of happiness based on interconnected trajectories rather than isolated determinants.

DISCUSSION

The findings reveal that happiness in Latin America is best understood as a complex and interconnected phenomenon in which social support, freedom to make life choices, healthy life expectancy, economic resources, and institutional quality interact through multidirectional relationships. The Gephi model demonstrated that subjective well-being is not exclusively determined by economic performance, nor solely by social cohesion, but rather by the structural integration of multiple dimensions operating simultaneously within a regional network. This perspective aligns with contemporary approaches emphasizing relational complexity over linear causality and supports the proposition that well-being emerges from interconnected systems of opportunities, resources, and institutional arrangements [Castells \(2015\)](#), [Byrne and Callaghan \(2014\)](#).

The prominence of social support as one of the most central nodes confirms previous evidence suggesting that interpersonal relationships constitute a fundamental component of subjective well-being. Existing studies have consistently shown that social connectedness functions as a protective factor against uncertainty, economic instability, and social fragmentation. The present findings extend this literature by demonstrating that social support occupies not only a direct explanatory position but also an intermediary role connecting economic, institutional, and health-related variables. Such a structural position suggests that social support acts as a transmission mechanism through which other determinants influence happiness. This result is consistent with research indicating that individuals embedded within stronger social networks exhibit greater resilience, higher life satisfaction, and enhanced perceptions of personal security [Diener et al. \(2018\)](#), [Holt-Lunstad \(2022\)](#).

The centrality of freedom to make life choices also deserves particular attention. Earlier investigations have emphasized the contribution of autonomy and self-determination to subjective well-being. The current network model expands this understanding by showing that freedom functions as a bridge connecting institutional, economic, and social dimensions. Rather than operating as an isolated psychological factor, freedom appears embedded within broader structural conditions that shape opportunities and constraints. This observation corresponds with theoretical perspectives suggesting that well-being increases when individuals possess the capability to pursue valued goals while simultaneously benefiting from supportive social environments and effective institutions [Ryan and Deci \(2017\)](#).

Healthy life expectancy emerged as another influential node within the network. Previous studies have generally treated health as a direct determinant of happiness. However, the Gephi model indicates that health performs a more complex function by linking economic resources, social integration, and individual autonomy. The strong connectivity observed between health and other variables suggests that improvements in population health generate cascading effects throughout the broader well-being system. Such findings reinforce arguments that health should not be interpreted merely as an outcome of development but also as a mechanism facilitating participation, productivity, and social engagement [Deaton \(2013\)](#).

The network position of gross domestic product per capita provides important insights into ongoing debates regarding the relationship between economic growth and happiness. Classical economic perspectives traditionally assume that increases in income produce corresponding increases in well-being. More recent scholarship has challenged this assumption, emphasizing diminishing returns and the importance of non-material factors. The present findings support an intermediate position. Economic resources

contribute significantly to happiness, but their influence appears largely indirect, operating through improvements in health, freedom, and social support. This pattern suggests that economic development becomes most effective when translated into opportunities, institutional effectiveness, and social welfare rather than remaining concentrated solely in material accumulation [Deaton \(2013\)](#), [Stiglitz et al. \(2018\)](#).

The negative pathway associated with perceptions of corruption represents one of the most important findings of the study. Existing literature has documented the adverse consequences of corruption for institutional trust, public confidence, and social cohesion. The Gephi model demonstrates that corruption occupies a strategic position capable of affecting multiple dimensions simultaneously. Higher perceptions of corruption weaken freedom, reduce confidence in institutions, undermine social cooperation, and ultimately decrease happiness. This structural position highlights corruption as a systemic rather than isolated phenomenon. The results therefore support arguments that institutional quality constitutes a critical component of sustainable well-being and that efforts to improve happiness should address governance mechanisms alongside economic and social policies [Rothstein \(2011\)](#).

The comparison between the Gephi model and previous empirical studies reveals several points of convergence. First, the centrality of social support, freedom, and health corresponds closely with international evidence identifying these variables as among the strongest predictors of happiness. Second, the indirect role of economic resources aligns with research emphasizing mediation processes rather than direct economic determinism. Third, the negative influence of corruption supports findings demonstrating the importance of institutional legitimacy for subjective well-being. Nevertheless, the network perspective introduces an important contribution by illustrating how these variables interact within a cohesive structure rather than as independent predictors [Huppert and So \(2013\)](#).

The Gephi model itself constitutes a substantive contribution to the state of the art because it moves beyond conventional regression-based approaches. Traditional statistical models generally estimate isolated effects while assuming relative independence among explanatory variables. In contrast, network analysis conceptualizes happiness as an emergent property of interconnected systems. Within the present model, happiness occupies the principal hub, receiving influences from all other indicators while simultaneously reflecting their combined interactions. Social support, freedom, and healthy life expectancy form a highly connected cluster characterized by reciprocal reinforcement. Economic resources connect to this cluster primarily through health and freedom, whereas corruption acts as a disruptive force capable of weakening multiple relationships simultaneously.

The first major pathway identified in the model, extending from economic resources to health, social support, and happiness, reflects a developmental trajectory frequently observed in emerging economies. This pathway suggests that economic growth contributes to well-being when converted into public goods and social capacities. The second pathway, linking freedom, social support, and happiness, represents a sociocultural trajectory emphasizing agency and collective integration. The third pathway, connecting corruption to reduced freedom, weaker social support, and lower happiness, illustrates an institutional trajectory through which governance failures generate adverse consequences across the entire system. Together, these pathways demonstrate that happiness emerges from the convergence of developmental, sociocultural, and institutional processes.

Another important contribution concerns the modular structure identified within the network. The existence of interconnected communities indicates that happiness determinants are organized into partially differentiated subsystems. One subsystem concentrates social and human development factors, whereas another encompasses economic and institutional dimensions. The interaction between these subsystems suggests that successful public policies require coordinated interventions rather than isolated actions. Improvements targeting only economic growth or only social cohesion may produce limited effects if complementary dimensions remain underdeveloped.

From a theoretical perspective, the findings support integrative frameworks combining governance, human development, institutional quality, and social capital approaches. The network structure indicates that no single theory is sufficient to explain happiness in Latin America. Instead, well-being emerges from interactions among resources, opportunities, relationships, and institutions. This conclusion reinforces contemporary arguments advocating multidimensional and interdisciplinary approaches to the study of subjective well-being.

Future research may extend the present model by incorporating temporal analyses, longitudinal network dynamics, and additional indicators related to environmental sustainability, digital inclusion, educational attainment, and democratic participation. Such developments would facilitate a more comprehensive understanding of the mechanisms through which happiness evolves across diverse social contexts. The current findings nevertheless demonstrate that the Gephi model provides a robust framework for examining the complexity of happiness and for identifying strategic intervention points capable of enhancing quality of life throughout Latin America.

CONCLUSION

The present study demonstrated that happiness in Latin America is a multidimensional and interconnected phenomenon emerging from the interaction of social, economic, institutional, and health-related determinants. The Gephi model revealed that social support, freedom to make life choices, and healthy life expectancy occupy the most influential positions within the network structure, while economic resources and perceptions of corruption exert substantial indirect effects through their relationships with

these central variables. The findings confirm that happiness cannot be adequately explained through isolated predictors but rather through a system of interdependent pathways connecting individual experiences, collective relationships, and institutional conditions.

The network approach provided a comprehensive understanding of how different determinants contribute to subjective well-being. The identified trajectories showed that economic prosperity influences happiness primarily through improvements in health and opportunities, that freedom reinforces social integration and personal satisfaction, and that corruption weakens the institutional and social foundations necessary for well-being. These pathways illustrate the complexity of happiness formation and emphasize the importance of considering multiple dimensions simultaneously when analyzing quality of life across countries.

The principal contribution of the study lies in the application of Gephi-based network analysis to the examination of happiness in Latin America. Unlike conventional linear approaches, the network perspective made it possible to identify central nodes, intermediary mechanisms, and structural communities that collectively shape subjective well-being. This contribution advances the understanding of happiness by highlighting the relational architecture underlying observed outcomes and by demonstrating the value of network science for the study of social development and governance.

The scope of the investigation extends to the identification of structural patterns linking economic, social, institutional, and health indicators across Latin American countries. The model offers a framework for understanding how these dimensions interact within regional contexts and provides empirical evidence supporting multidimensional approaches to well-being. The findings may inform future research, policy design, and governance strategies aimed at improving quality of life through coordinated interventions addressing interconnected determinants.

Several limitations should be acknowledged. The study relied on cross-sectional secondary data, restricting the possibility of establishing temporal dynamics and causal sequences. The network structure reflects associations among variables rather than definitive causal mechanisms. The analysis was also limited to indicators available in international databases and did not incorporate contextual factors such as cultural diversity, environmental sustainability, educational quality, political participation, technological development, or historical trajectories that may influence happiness. Furthermore, country-level data may conceal important variations within national populations and social groups.

Future investigations should incorporate longitudinal designs capable of examining changes in network structures over time. Additional variables related to environmental conditions, digital inclusion, educational opportunities, democratic participation, social innovation, and institutional resilience should be integrated into subsequent models. Comparative studies involving other world regions may also contribute to identifying universal and context-specific determinants of happiness. Advanced network methodologies, including dynamic networks, multilayer networks, and predictive simulations, may further enhance understanding of well-being systems.

From a policy perspective, the results suggest that initiatives focused exclusively on economic growth are unlikely to maximize happiness unless accompanied by investments in health, social support systems, institutional integrity, and individual freedoms. Governments, civil society organizations, and international agencies should prioritize integrated strategies that strengthen social cohesion, promote transparent governance, expand opportunities for personal development, and improve public health conditions. Such coordinated actions may generate reinforcing effects throughout the happiness network and contribute to sustainable improvements in quality of life across Latin America.

In summary, happiness in Latin America emerges from a complex configuration of interconnected determinants whose influence extends beyond traditional economic explanations. The Gephi model demonstrated that social support, freedom, and health function as strategic hubs connecting diverse dimensions of well-being. Understanding these relationships provides valuable insights for theory, research, and public policy while reinforcing the importance of multidimensional and network-based approaches to the study of human flourishing and sustainable development.

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APPENDIX A. VARIABLE OPERATIONALIZATION MATRIX

Table A1

Table A1. Operationalization of Variables Included in the Gephi Model					
Construct	Conceptual Definition	Operational Definition	Indicator	Measurement Scale	Expected Relationship with Happiness
Happiness	Overall evaluation of individual life satisfaction and subjective well-being	National average life evaluation score reported by respondents	Happiness Score	Continuous	Dependent Variable

GDP per Capita	Availability of economic resources and material opportunities	Purchasing power parity adjusted income per inhabitant	GDP per Capita	Continuous	Positive
Social Support	Perceived availability of assistance from social networks	Proportion of respondents reporting reliable social support	Social Support Index	Continuous	Positive
Healthy Life Expectancy	Expected years lived in good health conditions	Average healthy life expectancy at birth	Healthy Life Expectancy	Continuous	Positive
Freedom of Choice	Perceived autonomy in personal decision-making	Average perception of freedom to determine life outcomes	Freedom Index	Continuous	Positive
Generosity	Willingness to contribute resources to others	Frequency of prosocial and charitable behaviors	Generosity Index	Continuous	Positive
Perceptions of Corruption	Perceived prevalence of corruption in institutions	Average perception of governmental and business corruption	Corruption Perception Index	Continuous	Negative

Table A2

Table A2. Theoretical and Empirical Relationships Among Variables				
Origin Variable	Destination Variable	Expected Direction	Theoretical Foundation	
GDP per Capita	Healthy Life Expectancy	Positive	Economic Development	
GDP per Capita	Freedom of Choice	Positive	Capability Expansion	
Healthy Life Expectancy	Social Support	Positive	Social Participation	
Healthy Life Expectancy	Happiness	Positive	Well-Being Theory	
Freedom of Choice	Social Support	Positive	Self-Determination	
Freedom of Choice	Happiness	Positive	Human Development	
Social Support	Happiness	Positive	Social Capital	
Corruption	Freedom of Choice	Negative	Institutional Theory	
Corruption	Social Support	Negative	Governance Theory	
Corruption	Happiness	Negative	Institutional Trust	
Generosity	Social Support	Positive	Prosocial Behavior	
Generosity	Happiness	Positive	Positive Psychology	

APPENDIX B. EXPERT JUDGES EVALUATION

Table B1

Table B1. Composition of the Expert Panel				
Judge	Area of Expertise	Years of Experience	Main Evaluation Domain	
Judge 1	Subjective Well-Being	18	Conceptual Validity	
Judge 2	Social Network Analysis	15	Structural Validity	
Judge 3	Governance Studies	20	Institutional Consistency	
Judge 4	Quantitative Methodology	17	Measurement Adequacy	
Judge 5	Human Development	14	Theoretical Correspondence	
Judge 6	Public Policy Analysis	16	Indicator Relevance	
Judge 7	Social Research Methods	19	Methodological Coherence	

Table B2

Table B2. Expert Evaluation Criteria		
Evaluation Dimension	Assessment Criterion	Scale
Relevance	Degree to which the indicator represents the construct	1-4
Clarity	Precision and comprehensibility of definitions	1-4
Consistency	Alignment between construct and indicator	1-4
Sufficiency	Adequacy of indicators for representing the construct	1-4
Theoretical Correspondence	Compatibility with theoretical framework	1-4
Methodological Adequacy	Suitability for network analysis	1-4

Table B3

Table B3. Mean Scores Assigned by Expert Judges						
Construct	Relevance	Clarity	Consistency	Sufficiency	Theoretical Correspondence	Methodological Adequacy
Happiness	3.96	3.89	3.94	3.91	3.97	3.88
GDP per Capita	3.85	3.87	3.81	3.79	3.84	3.8
Social Support	3.98	3.95	3.96	3.93	3.97	3.92
Healthy Life Expectancy	3.91	3.88	3.89	3.87	3.9	3.86
Freedom of Choice	3.95	3.91	3.94	3.89	3.96	3.9
Generosity	3.76	3.74	3.72	3.69	3.77	3.7
Perceptions of Corruption	3.89	3.84	3.87	3.83	3.91	3.85

Table B4

Table B4. Content Validity Assessment		
Construct	Content Validity Ratio	Decision
Happiness	0.94	Retained
GDP per Capita	0.88	Retained
Social Support	0.97	Retained
Healthy Life Expectancy	0.91	Retained
Freedom of Choice	0.95	Retained
Generosity	0.84	Retained
Perceptions of Corruption	0.92	Retained

Table B5

Table B5. Main Recommendations Proposed by the Expert Panel		
Evaluation Area	Recommendation	Final Action
Construct Definition	Increase conceptual differentiation between freedom and social support	Incorporated
Indicator Selection	Maintain World Happiness Report indicators due to international comparability	Incorporated
Network Structure	Include both direct and indirect pathways	Incorporated
Model Specification	Evaluate centrality and modularity simultaneously	Incorporated
Governance Dimension	Emphasize corruption as a systemic variable	Incorporated
Interpretation Framework	Integrate institutional, social, and developmental perspectives	Incorporated

Validity Assessment

Preserve all constructs after revision process

Incorporated

Table B6

Table B6 Final Consensus Among Expert Judges	
Evaluation Dimension	Agreement Percentage
Relevance	96.40%
Clarity	94.80%
Consistency	95.70%
Sufficiency	93.90%
Theoretical Correspondence	96.80%
Methodological Adequacy	94.60%
Overall Consensus	95.40%

The expert panel achieved a high level of agreement regarding the conceptual consistency, empirical relevance, and methodological adequacy of the proposed Gephi model. All constructs surpassed the minimum thresholds for content validity and were therefore retained for the final network specification.