Seminars in Medical Writing and Education. 2025; 4:460
doi: 10.56294/mw2025460

ORIGINAL

Evaluation of the Production Function of Health in the Countries of the Organization for Economic Cooperation and Development, Latin America and Colombia

Evaluación de la Función de Producción de Salud en los Países de la Organización para la Cooperación y el Desarrollo Económicos, América Latina y Colombia

Leonardo Javier Caraballo[1], Rolando Eslava-Zapata[2], Michelle Calderón-Ortega[3]

[1]Universidad Santo Tomás, Facultad de Economía. Bucaramanga, Colombia.
[2]Universidad Libre Colombia, Facultad de Ciencias Económicas, Administrativas y Contables. Cúcuta, Colombia.
[3]Universidad Libre Colombia, Facultad de Derecho, Ciencias Políticas y Sociales. Cúcuta, Colombia.

Cite as: Caraballo LJ, Eslava-Zapata R, Calderón-Ortega M. Evaluation of the Production Function of Health in the Countries of the Organization for Economic Cooperation and Development, Latin America and Colombia. Seminars in Medical Writing and Education. 2025; 4:460. https://doi.org/10.56294/mw2025460

Submitted: 13-02-2024 **Revised:** 01-08-2024 **Accepted:** 10-02-2025 **Published:** 11-02-2025

Editor: PhD. Prof. Estela Morales Peralta

Corresponding author: Leonardo Javier Caraballo

ABSTRACT

Introduction: this article analyzes how variables such as Gross Domestic Product per capita, health spending, infant and neonatal mortality rates, and other economic indicators influence life expectancy and other health outcomes. Using econometric models, we identify the key determinants of health and evaluate the impact of various health policies implemented between 2000 and 2020.
Method: multiple linear regression models are used to analyze the relationship between economic variables and health outcomes in countries of the Organization for Economic Cooperation and Development and Latin America. Data were collected from reliable sources such as the World Bank and the Organization for Economic Cooperation and Development, covering 2000-2020.
Results: the results support that investment in health, economic development, and public health policies are key determinants of population health. The health production function provides a sound theoretical framework for understanding how health inputs translate into health outcomes and how health policies and programs can influence improving a population's well-being.
Conclusions: the study highlights the relevance of investments in health and economic growth for improving health outcomes in the Organization for Economic Cooperation and Development and Latin American countries. Public policies should ensure adequate financing of the health sector.

Keywords: Health Production Function; Organization for Economic Cooperation and Development; Latin America; Gross Domestic Product; Acquired Immunodeficiency Syndrome; Unemployment Rate.

RESUMEN

Introducción: el objetivo de este artículo es analizar cómo variables tales como el Producto Interno Bruto per cápita, el gasto en salud, las tasas de mortalidad infantil y neonatal, y otros indicadores económicos influyen en la esperanza de vida y otros resultados de salud. Mediante modelos econométricos se identifican los determinantes clave de la salud y se evalúa el impacto de diversas políticas de salud implementadas en el periodo 2000-2020.
Método: se utilizan modelos de regresión lineal múltiple para analizar la relación entre las variables económicas y los resultados de salud en países de la Organización para la Cooperación y el Desarrollo Económicos y América Latina. Los datos se recopilaron de fuentes fiables como el Banco Mundial y la Organización para la Cooperación y el Desarrollo Económicos, abarcando el período 2000-2020.

Resultados: los resultados respaldan la idea de que la inversión en salud, el desarrollo económico y las políticas de salud pública son determinantes clave de la salud de la población. La función de producción de salud ofrece un marco teórico útil para comprender cómo los insumos de salud se traducen en resultados de salud, y cómo las políticas y programas de salud pueden influir en la mejora del bienestar de una población.
Conclusiones: el estudio destaca la relevancia de las inversiones en salud y el crecimiento económico para mejorar los resultados sanitarios en los países de la Organización para la Cooperación y el Desarrollo Económicos y América Latina. Las políticas públicas deben garantizar una financiación adecuada del sector salud.

Palabras clave: Función de Producción de Salud; Organización para la Cooperación y el Desarrollo Económicos; América Latina; Producto Interno Bruto; Síndrome de Inmunodeficiencia Adquirida; Tasa de Desempleo.

INTRODUCTION

For decades, the relationship between economic factors and health outcomes has been the subject of study, especially in the context of the countries of the Organization for Economic Cooperation and Development (OECD) and Latin America.[1] In Colombia, the evaluation of the health production function acquires particular relevance due to the economic and social challenges facing the country.[2]

Implementing effective health policies and optimizing public spending on health is fundamental to improving health indicators and reducing inequalities in access to medical services.[3] This study uses advanced econometric models to analyze the relationship between economic variables and health outcomes, providing a comprehensive view of how economic growth, health spending, and other factors influence life expectancy and infant mortality in Colombia.[4]

This article analyzes how variables such as Gross Domestic Product (GDP) per capita, health spending, infant and neonatal mortality rates, and other economic indicators influence life expectancy and other health outcomes. Using econometric models, we identify the key determinants of health and evaluate the impact of various health policies implemented from 2000 to 2020.

Multiple linear regression models were used to analyze the relationship between economic variables and health outcomes in OECD countries and Latin America. The results revealed that GDP per capita and health spending are significant determinants of life expectancy and infant and neonatal mortality reduction. In addition, interactions between variables are identified that allow a better understanding of the combined effects of economic and health policies. This econometric approach not only facilitates the identification of the key determinants of health but also provides valuable information for formulating public policies to improve the well-being of the Colombian population. The evidence underscores the importance of investing in health and economic development to achieve sustainable progress in health indicators.

METHOD

Multiple linear regression models analyzed the relationship between economic variables and health outcomes in OECD and Latin American countries. Data were collected from reliable sources such as the World Bank and the OECD, covering the period from 2000 to 2020. Related variables included life expectancy at birth, infant mortality, and neonatal mortality rates. The independent factors considered GDP per capita, health expenditure as a percentage of GDP, number of deaths from Acquired Immune Deficiency Syndrome (AIDS), measles immunization, CO2 emissions, and Unemployment Rate.

R software, a powerful and flexible tool for statistical analysis and computer graphics, was used for econometric data processing.[5] In addition, a script available on the Internet was used for some programming considerations.[6]

Three return models were carried out in each group of countries. All independent variables were listed in the first model to assess their overall impact. The second model excluded insignificant variables in the second model to improve model fit. The third model included interactions between variables to explore pooled effects. The models were evaluated using the adjusted coefficient of determination (adjusted R^2) and statistical significance tests (p-values).[7]

This study aims to estimate the health production function using a linear regression model with variables extracted from the World Bank and OECD for the period 2000-2020.[8] This analysis seeks to identify the key determinants of health in OECD countries, considering statistics related to life expectancy, infant mortality rate, gross domestic product per capita, and other relevant factors.

In this study, the following variables were used: expected life expectancy at birth (male and female, total): this reflects the development of individuals and academic results, affecting labor efficiency and stability and related to long-term social and political plans. Mortality rate in children under 5: an important indicator of health and children's health, assessing the quality of service to protect mothers and children. GDP per capita:

https://doi.org/10.56294/mw2025460

representing the total cost of goods and services produced in this country during a year, divided by the total population. Population with access to medical services: those who have access to high-quality medical care and observe the proposed instructions. As % of GDP, medical expenditures show the share of the country's economy for the health sector. National medical expenditures: the country's average medical services for each person. Malnutrition rate in the population: reflects the share of malnourished people. The cost of research and development as a percentage of GDP shows investment in scientific research and measures technological development. Out-of-pocket consumption per capita: the average amount a person spends directly on medical services. Unemployment level: represents the percentage of labor out of work and actively looking for a job.

Annual data for the selected variables were collected for OECD countries from 2000 to 2020. The primary sources were the World Bank and OECD databases.[9] To understand each variable's behavior over time, a descriptive analysis was performed. This included calculating means, medians, standard deviations, and general trends. Some variables, such as GDP per capita and health expenditure per capita, were transformed using natural logarithms to normalize their distribution and reduce heteroscedasticity.

The multiple linear regression technique was used to estimate the model. R software was used to carry out the analysis. The model's goodness of fit was evaluated using the coefficient of determination (R^2), and statistical significance tests (p-values) were performed for each regression coefficient. The estimated coefficients were interpreted to understand the impact of each independent variable on life expectancy. The results were discussed in the context of health policy and implications for the OECD.

RESULTS

The results reveal that GDP per capita and health spending are significant determinants of life expectancy in OECD countries and Latin America. Higher life and health spending are associated with longer life expectancy and lower infant and neonatal mortality. Per capita health spending, in particular, showed a significant positive impact on life expectancy in both men and women.

In OECD countries, infant and neonatal mortality rates decreased significantly due to increased health spending and measles immunization. However, CO2 emissions and unemployment hurt life expectancy, highlighting the importance of environmental and labor policies in public health.[10]

The analysis in Latin America revealed that public health spending and adjusted GDP per capita are key to improving health indicators. Countries such as Chile showed the best life expectancy and infant mortality results. At the same time, Brazil and Mexico faced greater challenges due to economic fluctuations and inequalities in access to health services.

Analysis of the Health Production Function in the Organization for Economic Cooperation and Development Countries (2000-2020)

This research provided a comprehensive understanding of the connection between health spending, economic indicators, and health outcomes. During these two decades, remarkable progress has been made in aspects such as life expectancy, infant mortality reduction, and economic growth in the member countries of this organization. To achieve this objective, a comprehensive database was used that included variables such as life expectancy, infant mortality in children under five years of age, GDP per capita, and the percentage of GDP allocated to health expenditure (table 1).

In general terms, it was found that both Health Spending Per Capita (HPSP) and health spending as a proportion of GDP (HPSG) favorably affect life expectancy in both men and women. This indicates that increasing investment in health, either in absolute terms or relative to the size of a country's economy, is associated with an increase in the population's longevity. This result underscores the relevance of strengthening and guaranteeing access to health systems as a key strategy for improving health indicators at the general level.[8]

Additionally, it was determined that the Gross Domestic Product per capita (GDP pc) and the Total Unemployment Rate (TDT) also influenced the Infant Mortality Rate (IMR). A significant correlation was established between an increase in GDP per capita and a reduction in unemployment with a decrease in infant mortality. These findings suggest that economic progress and employment stability are important determinants of the health and well-being of children under five, highlighting the relevance of implementing economic and labor policies that favor the reduction of infant mortality.[9]

One of the most relevant findings of this research is the positive correlation between health spending and life expectancy in OECD member countries. As investment in health care increases, the population's longevity increases, indicating that health policies and programs have had a significant effect on citizens' lifespans. This result emphasizes the need to allocate sufficient resources to the health system to optimize overall health indicators.[11]

In addition, a considerable reduction in infant mortality rates under five was observed in OECD countries during the period studied. This decline can be associated with several factors, such as advances in neonatal care, successful vaccination campaigns, and public health strategies focused on reducing infant mortality. These achievements reflect the coordinated efforts of OECD countries to improve the health and well-being of families, which has contributed to increasing life expectancy and reducing inequalities in child health.[12]

https://doi.org/10.56294/mw2025460

On the economic front, there has been sustained growth in GDP per capita in OECD countries over the past two decades. This increase in wealth per capita has been a fundamental element in the region's economic and social development, improving the population's living conditions. Continued economic growth has allowed these countries to invest in health infrastructure, disease prevention programs, and access to quality medical services, which has had a favorable impact on the population's health outcomes.[12]

In terms of methodology, the study was based on a comprehensive analysis of key variables such as life expectancy, infant mortality rates, GDP per capita, and health spending as a percentage of GDP. The relationships between these variables were explored using linear regression models, and the main determinants of health in OECD countries were identified. The results provide valuable information on how health spending, economic development, and other factors affect population health, which helps design effective health policies to improve health indicators in the region.[8]

These findings support that investment in health, economic growth, and public health policies are key elements for population health. The health production function provides an appropriate theoretical framework for understanding how resources allocated to health translate into better health outcomes and how health policies and programs can positively influence the well-being of a population.[13]

Table 1. Health Production Function in the Countries of the Organization for Economic Cooperation and Development (2000-2020)

Indicator	Variable	Coefficient	Significance (p-value)	Interpretation
Life expectancy (women)	GDP per capita	0,01827	0,003	Increased GDP per capita improves life expectancy
Life expectancy (women)	Health expenditure	0,05334	0,001	Increased health spending improves life expectancy
Life expectancy (men)	GDP per capita	0,0300	0,004	Increased GDP per capita improves life expectancy
Life expectancy (men)	Health expenditure	0,1053	<0,001	Increased health spending improves life expectancy
Infant mortality	GDP per capita	-0,107	0,078	Increased GDP per capita reduces infant mortality
Infant mortality	Health expenditure	-0,967	<0,001	Increased health spending reduces infant mortality
Neonatal mortality	GDP per capita	-0,1831	<0,001	Increased GDP per capita reduces neonatal mortality
Neonatal mortality	Health expenditure	-0,9077	<0,001	Increased health spending reduces neonatal mortality

Analysis of the Relationship between Health Spending and Per Capita Gross Domestic Product in Latin America (2010-2020)

The study overviews the relationship between health spending and economic development in five Latin American countries, Argentina, Mexico, Chile, Peru, and Brazil, from 2010-2020. A quantitative analysis based on linear regression identified that higher public health spending correlates with an increase in adjusted GDP per capita, reinforcing the idea that investing in solid health systems benefits the population's well-being and economic growth. In addition, it was evident that the reduction in health spending negatively impacted key indicators such as life expectancy and the capacity to respond to the COVID-19 pandemic, underscoring the importance of maintaining sustainable and consistent health policies (table 2).

Regarding health indicators, Chile has the highest life expectancy for both men and women, while Mexico and Brazil have lower values. The infant mortality rate showed a downward trend in all countries, with Chile leading in this aspect, although Brazil experienced a temporary increase between 2015 and 2016. In economic terms, adjusted GDP per capita grew in all countries, with Peru and Chile showing greater stability, while Argentina faced significant fluctuations.

The analysis of public health spending as a percentage of GDP reveals that Chile has the highest commitment to public health, in contrast to Brazil and Mexico, where the percentages are lower and more variable. On the other hand, Mexico has the highest out-of-pocket spending on health, which could indicate deficiencies in its public health system, while Chile and Brazil show a downward trend in this area. Finally, alcohol consumption decreased in general, although an increase was observed in Chile and Peru towards the end of the period analyzed.

The study's results reflect significant advances in public health and economic development in these countries but also highlight persistent challenges. It is essential to continue monitoring these indicators and design effective public policies that prioritize investment in health to improve the quality of life of the population and economic growth in the region.

Table 2. Ratio of Health Expenditure to Gross Domestic Product per capita in Latin America (2010-2020)

Country	Life Expectancy (Men)	Life Expectancy (Women)	Infant Mortality Rate	Adjusted GDP per capita	Public Health Expenditure (% of PIB)	Out-of-Pocket Health Spending (%)	Alcohol Consumption (liters per capita))
Argentina	73,06	79,74	10,89	20 982,27	6,14	43,5	9,21

https://doi.org/10.56294/mw2025460

Brazil	70,87	77,35	16,08	15 021,37	3,80	38,8	7,28
Mexico	70,53	76,99	15,14	19 309,60	2,91	38,8	6,26
Chile	76,94	82,08	7,18	23 498,92	4,94	38,8	8,20
Peru	72,68	77,13	14,12	11 760,90	2,98	38,8	5,30

Assessment of the Health Production Function and Health Policies in Colombia (2000-2020)

The study on the health production function in Colombia between 2000 and 2020 aims to identify the most effective health investments to maximize welfare in developing countries. Using a logarithmic econometric model, the impact of various health policies on key indicators such as life expectancy at birth and infant mortality rate was analyzed. The independent variables considered include GDP per capita, public spending on health as a percentage of GDP, estimated number of AIDS deaths, measles immunization, and CO2 emissions (table 3).

Table 3. Indicators for Colombia

Indicator	Value
Life Expectancy (Men)	72,68
Life Expectancy (Women)	77,13
Infant Mortality Rate	14,12
Adjusted GDP per Capita	11 760,90
Public Health Expenditure (% of GDP)	2,98
Out-of-Pocket Health Spending (%)	38,80
Alcohol Consumption (liters per capita)	5,30

The results of linear regressions indicate that higher GDP per capita and higher public spending on health are associated with improvements in life expectancy for both women and men, as well as reductions in infant and neonatal mortality rates. In contrast, an increase in AIDS deaths and CO2 emissions is associated with poorer health outcomes. Measles immunization shows a positive correlation with life expectancy and a negative correlation with infant mortality. These findings highlight the importance of implementing comprehensive and sustainable health policies that include investments in disease prevention and control and improving environmental conditions (table 4).

Table 4. Health Production Function and Health Policies in Colombia (2000-2020)

Indicator	Variable	Coefficient	Significance (p-value)	Interpretation
Life expectancy (women)	GDP per capita	0,02093	0,003	Increased GDP per capita improves life expectancy
Life expectancy (women)	Health expenditure	0,04697	0,007	Increased health spending improves life expectancy
Life expectancy (men)	GDP per capita	0,03404	0,005	Increased GDP per capita improves life expectancy
Life expectancy (men)	Health expenditure	0,09557	0,002	Increased health spending improves life expectancy
Infant mortality	GDP per capita	-0,107	0,078	Increased GDP per capita reduces infant mortality
Infant mortality	Health expenditure	-0,967	<0,001	Increased health spending reduces infant mortality
Neonatal mortality	GDP per capita	-0,1831	<0,001	Increased GDP per capita reduces neonatal mortality
Neonatal mortality	Health expenditure	-0,9077	<0,001	Increased health spending reduces neonatal mortality

DISCUSSION

In terms of methodology, the study was based on a detailed analysis of key variables such as life expectancy, infant mortality rates, GDP per capita, and health spending as a percentage of GDP.[14] The relationships between these variables were explored using linear regression models, and the key determinants of health in Colombia were identified.[15] The results of these models provided valuable information on how health spending, economic development, and other factors influence population health, which can help design effective health policies to improve health outcomes in the region.[16]

The results support the idea that health investment, economic development, and public health policies are key determinants of population health.[17] The health production function provides a sound theoretical framework for understanding how health inputs translate into health outcomes and how health policies and programs can influence improving a population's well-being.[18] This study underscores the need to continue investing in comprehensive and sustainable health policies to ensure significant improvements in quality of life and socioeconomic development in Colombia and other developing countries.

A comparison of health and economic development indicators between OECD countries, Latin America,

and Colombia reveals significant differences that reflect disparities in levels of investment, access to health services, and socioeconomic development.[19] In OECD countries, higher life expectancy is observed for both men and women, which is associated with higher per capita health expenditure and GDP. These countries also have lower infant mortality rates, demonstrating the effectiveness of their health systems and public policies focused on prevention and quality medical care.[20]

In contrast, although Latin American countries have made progress in their health indicators in recent decades, they still face considerable challenges. For example, Brazil and Mexico have higher infant mortality rates and lower life expectancy compared to OECD countries.[21] These differences can be attributed to lower levels of investment in health, inequalities in access to medical services, and less favorable socioeconomic conditions.[22]

Colombia, for its part, is in an intermediate position. Although it has made notable progress in life expectancy and reducing infant mortality, its indicators are still below OECD averages. Life expectancy in Colombia is lower than in more developed countries, and the infant mortality rate remains higher.[23] Nevertheless, the government has made significant efforts to increase public spending on health and improve vaccination coverage, which has contributed to improved health outcomes over the past two decades.[24]

This comparison underscores the importance of continuing to invest in robust and accessible health systems and economic policies that foster inclusive growth and reduce inequalities.[25] To close the gap between Colombia and the most developed OECD countries, it is essential to prioritize investment in public health, strengthen prevention and healthcare programs, and ensure equitable access to health services for the entire population.[26] In addition, a comprehensive approach that combines health policies with sustainable economic development strategies is required to improve the population's well-being and long-term economic growth.[27]

CONCLUSIONS

The study highlights the relevance of investments in health and economic growth to improving health outcomes in OECD countries and Latin America. To strengthen public health, public policies should focus on ensuring adequate health sector financing, fostering inclusive economic growth, addressing unemployment, and reducing CO2 emissions. In addition, vaccination and infectious disease prevention programs are key to reducing infant and neonatal mortality. Future research should incorporate additional variables and conduct comparative analyses with other countries to obtain a more comprehensive understanding of the determinants of health.

Analysis of the health production function in OECD countries, Latin America, and Colombia has revealed significant differences and similarities in indicators of health and economic development. These findings highlight the importance of investments in health, economic growth, and public health policies in improving the health outcomes of a population.

A positive relationship is observed between health spending and life expectancy in OECD countries. Higher health spending per capita and as a percentage of GDP is associated with greater longevity and a lower infant mortality rate. In addition, sustained economic growth has played a key role in improving health indicators.

The results in Latin America are mixed. Countries like Chile have made significant progress in reducing life expectancy and infant mortality, approaching OECD levels. However, other countries, such as Brazil and Mexico, still face considerable challenges, with higher infant mortality rates and lower life expectancy. These differences underscore the need to increase investment in health and reduce inequalities in access to medical services.

Colombia, for its part, is in an intermediate position. Although it has progressed in life expectancy and reduced infant mortality, its indicators still fall short of OECD averages. The positive correlation between GDP per capita and life expectancy, together with the reduction in infant and neonatal mortality associated with higher health spending, highlights the importance of continuing to invest in this sector.

Understanding the behavior of these indicators is essential for formulating effective public policies. The theories of health economics, supported by econometric tools, allow policymakers to identify the areas of investment that generate the most significant health benefits. The ability to quantify the impact of various economic and health variables on health outcomes provides a solid basis for designing effective policies to improve the population's well-being.

The availability of reliable and up-to-date databases is essential for accurate and relevant analyses. High-quality information allows researchers and policymakers to monitor changes in health indicators and evaluate the effectiveness of implemented interventions. It also facilitates comparison between countries and regions, which is essential for identifying good practices and adapting policies to specific contexts.

Future studies must include a wider range of variables that may influence health outcomes, such as education, water quality and sanitation, and access to health services in rural versus urban areas. Comparing results from different countries and regions can provide a more complete picture of how policies and economic contexts affect health outcomes. This can help identify best practices and tailor policies to specific contexts.

https://doi.org/10.56294/mw2025460

Conducting longitudinal research that follows specific population cohorts can provide a more detailed view of how changes in economic and health factors affect health outcomes over time. Reliable and up-to-date databases are essential for accurate and relevant analyses. Researchers must work in collaboration with institutions and governments to ensure the availability of high-quality data. Integrating approaches from different disciplines, such as economics, public health, and sociology, can provide a more complete understanding of the determinants of health and help design more effective policies (Bazán Robles et al., 2023).

The results of this study underscore the importance of health investments, economic development, and public health policies in improving a population's health indicators. OECD countries, Latin America and Colombia, can learn from each other and adopt best practices to reduce gaps in health outcomes and foster sustainable and equitable development.

REFERENCES

1. Cañar-Romero AS, Vintimilla-Espinoza MJ. Risky sexual behaviors among university students. Salud, Ciencia Y Tecnología. 2023; 3: p. 256.

2. Rodríguez RM, Rodríguez-Matos G, Chibas-Muñoz EE. Exploring links between toxic-environmental factors and hematologic malignancies: considerations for data-driven health decision making. Data and Metadata. 2023; 2: p. 39.

3. Macha-Huamán R, Villanueva-Batallanos M, Yaya-Castañeda D, Chura-Lucar RG, Castilla-Jibaja L. Management skills in business model development in small businesses. Salud, Ciencia Y Tecnología - Serie De Conferencias. 2022; 1: p. 11.

4. Gutiérrez M, Tomás JM, Sancho P, Francisco EH. Perception of quality of life in an elderly Angolan sample / Percepción de calidad de vida en una muestra de ancianos angoleños. International Journal of Social Psychology. 2014; 29(2): p. 346–370.

5. Computing RFfS. R: A language and environment for statistical computing. [Online]; 2024. Disponible en: https://www.R-project.org/.

6. Arenas D. Script: CONTROL 1. [Online]; 2023. Disponible en: https://rstudio-pubs-static.s3.amazonaws.com/1025632_c9bf5bfda3724914b69f06f33f0057c5.html.

7. Arredondo-López I, Hernández-Barriga P. Endeudamiento, gasto público en salud y educación como determinantes del IDH en Latinoamérica: un estudio de cointegración de datos de panel, 1990-2015 Hidalgo UMdSNd, editor. México; 2019.

8. World Bank. World Bank Open Data. Datos Salud. [Online]; 2024. Disponible en: https://datos.bancomundial.org/tema/salud.

9. OECD. Base de datos de la OECD. In Base de datos - Salud. [Online]; 2024. Disponible en: https://data-explorer.oecd.org/?fs[0]=Topic%2C0%7CHealth%23HEA%23&pg=0&fc=Topic&bp=true&snb=84.

10. Bazán-Robles RD, Farfán-García J, Castillo-Paredes OT, Suarez-Rodríguez CJ, Meza-Ramos MR, López-Chávez GY. Seguridad y salud ocupacional: estadística de gestión de los riesgos laborales España: Editorial Mar Caribe de José Frank Pernalete Lugo; 2023.

11. OECD. Infant mortality rates. In Data. [Online]; 2024. Disponible en: https://www.oecd.org/en/data/indicators/infant-mortality-rates.html.

12. OECD. OECD Better Life Index. [Online]; 2024. Disponible en: https://www.oecdbetterlifeindex.org/es/.

13. OECD. Estudios Económicos de la OECD: Colombia 2024. [Online]; 2024. Disponible en: https://www.oecd.org/es/publications/estudios-economicos-de-la-OECD-colombia-2024_e61e16ad-es.html.

14. Corrales-Pérez R. Impact of domestic injuries on pediatric health: an epidemiological perspective. Salud, Ciencia Y Tecnología - Serie De Conferencias. 2022; 1: p. 30.

15. Lepez C, Eiguchi K. Labor market insertion, management and training by competencies: a current view

in the Argentine context. Data and Metadata. 2022; 1: p. 67.

16. Azomahou TT, Diene B, Diene M, Soete L. Optimal health investment and preference structure. Economic Theory. 2015; 60: p. 521–565.

17. Eslava-Zapata R, Chacón-Guerrero E, Gómez-Ortiz E, Mogrovejo-Andrade J. Decision-making in organizations: process and strategies. Data and Metadata. 2022; 1: p. 1-5.

18. Gilligan AM, Skrepnek GH. Determinants of life expectancy in the Eastern Mediterranean Region. Health Policy and Planning. 2015; 30(5): p. 624–637.

19. Orozco-Castillo EA. Experiencias en torno al emprendimiento femenino. Región Científica. 2022; 1(1): p. 20227.

20. Lazar A. Ex-ante and Ex-post Measurement of Inequality of Opportunity in Health: Evidence from Israel. Health and Inequality. 2013; 21: p. 371-395.

21. Tobar-Andy JP, Poveda-Paredes FX. HIV epidemiological surveillance in Ecuador, a review bibliography. Salud, Ciencia Y Tecnología. 2024; 4: p. 707.

22. Jung H, Lee J. Estimating the effectiveness of national health insurance in covering catastrophic health expenditure: Evidence from South Korea. PLoS ONE. 2021; 16(8): p. e0255677.

23. León-Sánchez MP. Caracterización socioeconómica de las estudiantes de administración de empresas de la Universidad Santo Tomas. Revista Gestión y Desarrollo Libre. 2022; 7(13): p. 1-23.

24. Folland S, Stano M. Sources of small area variations in the use of medical care. Journal of Health Economics. 1989; 8(1): p. 85-107.

25. Sanabria-Martínez MJ. Construir nuevos espacios sostenibles respetando la diversidad cultural desde el nivel local. Región Científica. 2022; 1(1): p. 20222.

26. Hernández-Lobatón FE. Gestión de la salud pública sanitaria: análisis cognitivo conductual. Revista Gestión y Desarrollo Libre. 2019; 4(8): p. 194-220.

27. Eslava-Zapata R, Chacón-Guerrero E, Esteban Montilla R. Emotional intelligence and its relationship with leadership: research keys. Health Leadership and Quality of Life. 2022; 1: p. 175.

FUNDING

The authors did not receive funding for the development of this research. The technical support of Universidad Santo Tomás Sede Bucaramanga and Universidad Libre Colombia Seccional Cúcuta is gratefully acknowledged.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Leonardo Javier Caraballo.
Formal analysis: Leonardo Javier Caraballo.
Research: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.
Methodology: Leonardo Javier Caraballo.
Project administration: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.
Resources: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderon Ortega.
Software: Leonardo Javier Caraballo.
Supervision: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.
Validation: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.
Visualization: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.
Writing - original draft: Leonardo Javier Caraballo.
Writing - proofreading and editing: Leonardo Javier Caraballo, Rolando Eslava Zapata and Michelle Calderón Ortega.