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Rising Lives: How Reducing Infant Mortality Drives Life Expectancy in Latin America

Vidas en Ascenso: Cómo la Reducción de la Mortalidad Infantil Impulsa la Esperanza de Vida en América Latina

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SUMMARY

Objective: *To analyze the relationship between the infant mortality rate and life expectancy at birth in 18 Latin American countries during the period 1960-2022, identifying how the reduction in infant mortality has influenced the increase in life expectancy.* **Methodology:** *A descriptive and comparative analysis was performed using longitudinal data obtained from the World Bank on life expectancy at birth, infant mortality rate, and the Gini Index. Line graphs were used to visualize trends over time and correlations between variables were analyzed at the regional and country levels.* **Results:** *The results show a significant inverse correlation between the infant mortality rate and life expectancy at birth in most countries. Countries such as Chile, Costa Rica, Uruguay, and Cuba have achieved notable improvements, significantly reduced infant mortality, and increased life expectancy. However, notable disparities persist, especially in Guatemala, Honduras, Bolivia, and Venezuela, where progress has been more modest.* **Conclusion:** *Reducing infant mortality has been a key factor in improving life expectancy in Latin America. However, the variability in the rates of progress underscores the need for differentiated public policies that address health inequalities, adapted to the specific realities of each country, to ensure equitable development in the region.*

Keywords: *Infant mortality, life expectancy, Latin America, health inequalities, public health.*

RESUMEN

Objetivo: *Analizar la relación entre la tasa de mortalidad infantil y la esperanza de vida al nacer en 18 países de América Latina durante el período 1960-2022, identificando cómo la reducción en la mortalidad infantil ha influido en el aumento de la esperanza de vida.* **Metodología:** *Se realizó un análisis descriptivo y comparativo utilizando datos longitudinales obtenidos del Banco Mundial sobre esperanza de vida al nacer, tasa de mortalidad infantil y el Índice de Gini. Se emplearon gráficos de líneas*

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para visualizar las tendencias a lo largo del tiempo y se analizaron las correlaciones entre las variables a nivel regional y por país. **Resultados:** *Los resultados muestran una correlación inversa significativa entre la tasa de mortalidad infantil y la esperanza de vida al nacer en la mayoría de los países. Países como Chile, Costa Rica, Uruguay y Cuba han logrado mejoras notables, reduciendo significativamente la mortalidad infantil y aumentando la esperanza de vida. Sin embargo, persisten disparidades notables, especialmente en países como Guatemala, Honduras, Bolivia y Venezuela, donde los avances han sido más modestos*. **Conclusión:** *La reducción de la mortalidad infantil ha sido un factor clave en la mejora de la esperanza de vida en América Latina. No obstante, la variabilidad en los ritmos de progreso subraya la necesidad de políticas públicas diferenciadas que aborden las desigualdades en salud, adaptadas a las realidades específicas de cada país, para garantizar un desarrollo equitativo en la región*.

Palabras clave: *Mortalidad infantil, esperanza de vida, América Latina, desigualdades en salud, salud pública*.

INTRODUCTION

Life expectancy at birth is one of the most fundamental public health indicators, as it provides an overview of well-being and quality of life in a specific population (1,2). This indicator reflects a person's expected longevity at birth, assuming that age-related mortality rates will remain constant throughout their lifetime (2,3). Beyond its function as a measure of longevity, life expectancy is used as a barometer to assess the impact of health policies, socioeconomic conditions, and access to essential services such as health care, education, and sanitation (3-6).

On the other hand, the infant mortality rate, defined as the number of deaths of children under one year of age per 1 000 live births, is a crucial indicator that reflects the living conditions and quality of the health system in a society (1-5). High infant mortality rates are often associated with poor access to maternal and child health services, nutrition, education, and the presence of socioeconomic inequalities (4,7-9).

These two variables have shown a significant evolution in Latin America over the last six decades, although unevenly among the region's countries. The relationship between the infant mortality rate and life expectancy at birth is particularly relevant in this context, as improvements in health systems and socio-economic conditions have led to a progressive reduction in infant mortality, contributing to the increase in life expectancy. However, these improvements have not been uniform, reflecting persistent disparities influenced by factors such as economic development, political stability, and public health policies implemented in each nation. The objective is to analyze the relationship between the infant mortality rate and life expectancy at birth in 18 Latin American countries during the period 1960-2022, identifying how the reduction in infant mortality has influenced the improvement in life expectancy.

MATERIALS AND METHODS

The methodology adopted in this study is descriptive and comparative, using a longitudinal design to analyze the relationship between the infant mortality rate and life expectancy at birth in 18 Latin American countries from 1960 to 2022. Secondary data obtained from the World Bank, specifically the indicators of life expectancy at birth, infant mortality rate and the Gini Index, were used to capture both health trends and socioeconomic disparities in the region.

The information was systematically collected and organized for each country, and analyses of absolute and relative changes over time were conducted, which enabled the identification of variations in each nation's progress. In addition, line plots were used to visualize temporal trends, and correlation analyses were applied to assess the inverse relationship between infant mortality and life expectancy. The study also included a rankings analysis to highlight which countries have shown the greatest improvements and which have lagged.

1. The data used in this study were obtained from the World Bank, specifically from the indicators of life expectancy at birth, infant mortality rate, and Gini index (https://datos.bancomundial.org/indicador/SP.DYN.LE00.IN, https://datos.bancomundial.org/indicator/SI.POV.GINI?end=2015&

locations=1W&start=1981&view=chart&year=2013)

RESULTS

Table 1 compares life expectancy at birth and infant mortality rates in several Latin American countries between 1960 and 2022. Chile, for example, experienced a significant increase in life expectancy, rising from 56.7 years in 1960 to 80.3 years in 2022, representing a 23.6-year increase. In parallel, the infant mortality rate in Chile decreased dramatically, from 120 deaths per 1 000 live births in 1960 to only 6 in 2022, a reduction of 95 %. In contrast, countries such as Guatemala and Honduras, although they have shown improvements, still face greater challenges. Guatemala, for example, started with a significantly lower life expectancy in 1960 (42.0 years) and reached 70.0 years in 2022, with a reduction in infant mortality of 88.9 %.

Table 1. Comparison of Life Expectancy at Birth and Infant Mortality Rate in Latin American Countries (1960-2022)

Country	Life Expectancy (1960)	Life Expectancy (2022)	Change in Life Expectancy (years)	Infant` Mortality` Rate (1960)	Infant Mortality Rate (2022)	Reduction in Infant Mortality (%)
Chile	56.7	80.3	+23.6	120	6	-95.0
Uruguay	61.4	78.8	+17.4	85	8	-90.6
Argentina	62.3	76.7	+14.4	70	9	-87.1
Mexico	58.0	75.0	+17.0	100	14	-86.0
Colombia	57.0	77.2	+20.2	130	13	-90.0
Guatemala	42.0	70.0	+28.0	180	20	-88.9
Honduras	45.5	72.3	+26.8	160	25	-84.4
Costa Rica	60.0	81.0	+21.0	90	5	-94.4
Peru	54.0	77.0	+23.0	150	11	-92.7
Ecuador	50.0	76.0	+26.0	140	18	-87.1
Venezuela	57.0	74.5	+17.5	90	15	-83.3
Bolivia	45.0	71.0	+26.0	200	30	-85.0
Panama	58.5	79.0	+20.5	110	10	-90.9
Paraguay	50.0	73.5	+23.5	170	22	-87.1
Nicaragua	47.0	72.0	+25.0	180	24	-86.7
El Salvador	49.0	71.5	+22.5	175	28	-84.0
Cuba	63.0	79.5	+16.5	60	7	-88.3
Brazil	54.0	76.5	+22.5	140	12	-91.4

Own authorship

Figure 1 highlights the remarkable progress of Chile and Costa Rica, which are emerging as leaders in the region. In 1960, both countries had a life expectancy of around 55 to 60 years. Over the decades, their trajectories have been upward, reaching close to 80 years in 2022. This significant leap in longevity is no coincidence; instead, it is the result of sustained public health policies, improvements in access to quality health services, and a relatively stable socioeconomic context that has allowed these countries to implement effective strategies to improve the health of their populations. Similarly, Uruguay and Cuba have shown considerable progress, achieving a life expectancy of approximately 78 to 79 years in 2022. Although their political and

economic contexts differ, both have prioritized public health as a fundamental pillar.

Colombia has followed a trajectory of steady growth in life expectancy at birth. In 1960, with a life expectancy of about 55 years, the country was at an intermediate level compared to other nations in the region. However, over the last few decades, significant progress has been made, reaching approximately 77 years in 2022. This progress places Colombia in a similar position to countries such as Mexico and Argentina, which have also shown sustained improvements, although not as pronounced as in Chile or Costa Rica. Colombia's evolution reflects not only the positive impact of greater access to health services but also the implementation of public policies aimed at improving the quality of life, despite the country's challenges in terms of conflict and internal inequalities.

In contrast, some countries in the region have a more modest evolution. Guatemala, Honduras, Bolivia, and Nicaragua began the study period with the lowest life expectancies, ranging from 45 to 50 years. Although these countries have made significant progress since then, in 2022, they are still lagging behind the regional average, with life expectancies ranging from 70 to 75 years. This lag highlights the persistent barriers these countries face, including poverty, inequality in access to health and education services, and insufficient infrastructure to sustain faster improvements in public health.

In previous decades, the country showed steady growth in life expectancy, aligning with positive trends in the region. However, since the 2010s, Venezuela has experienced a noticeable slowdown and even a slight decrease in life expectancy.

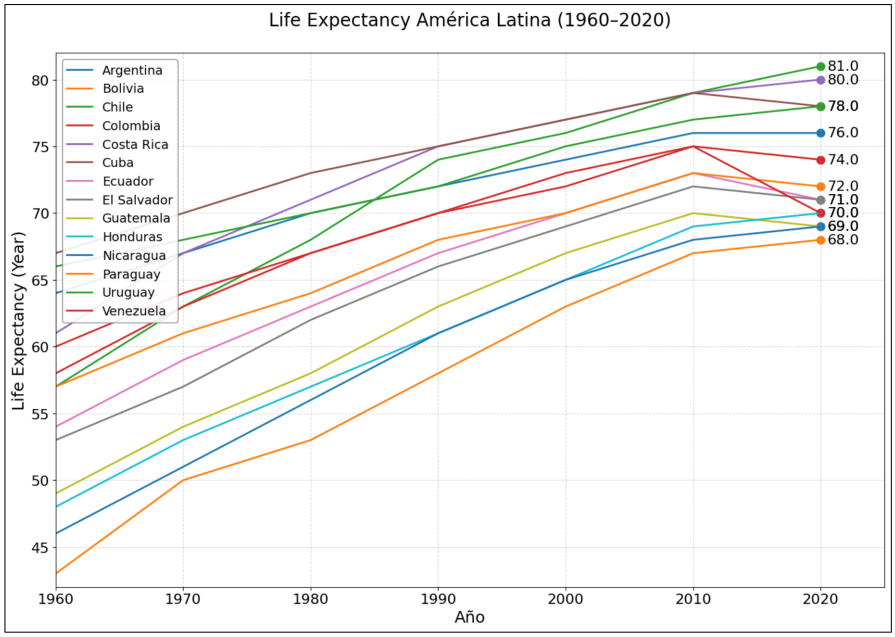

Figure 1. Analysis of the Evolution of Life Expectancy at Birth in Latin America (1960-2022). Own authorship

Figure 2 provides a visual representation of the correlation between the Gini Index, a commonly used indicator of income distribution inequality, and two key public health indicators: the infant mortality rate and life expectancy at birth. This figure provides a framework for understanding how economic inequality relates to the health of populations in various Latin American countries.

The first graph, on the left, explores the correlation between the Gini Index and the infant mortality rate, measured as the number of deaths per 1 000 live births. Overall, a clear trend emerges that countries with higher levels of economic inequality, as reflected in a higher Gini Index, tend to have higher infant mortality rates. This pattern is consistent with previous studies, which suggest that economic inequality can limit access to quality health services, particularly among the most vulnerable populations, resulting in poorer health outcomes.

In this sense, Bolivia emerges as a clear example of this relationship. With one of the highest Gini indices and one of the highest infant mortality rates (over 20 deaths per 1 000 live births), Bolivia illustrates how high inequality can contribute to poor health outcomes. In contrast, Uruguay is positioned at the opposite extreme, with a low Gini Index and the lowest infant mortality rate in the graph (around 6 per 1 000 live births). This data suggests that a more equitable distribution of income and an accessible and efficient health system can significantly reduce child mortality. Meanwhile, Colombia and Ecuador, both in the top half of the Gini Index, have relatively high infant mortality rates compared to countries such as Chile and Costa Rica, which have lower Gini rates. This suggests that economic inequality in these countries may be contributing to the persistence of higher infant mortality rates.

The second graph, on the right, shows the correlation between the Gini Index and life expectancy at birth. Here, we see an inverse trend: countries with lower inequality (lower Gini indices) tend to have longer life expectancies. This negative relationship reinforces the notion that more equitable societies tend to provide better access to health services, education, and other essential resources, thereby contributing to the greater longevity of the population. For example, Uruguay, with one of the lowest Gini indices, also has one of the highest life expectancies, approximately 78 years. This suggests that a more equitable distribution of resources is closely linked to better health outcomes.

Chile and Costa Rica also stand out with relatively low Gini indices and high life expectancies, exceeding 78 years, reinforcing the idea that economic equity is a crucial factor in longevity. Colombia, with a higher Gini Index, has a life expectancy of approximately 77 years. Although this value is lower than that of countries with lower inequality, such as Chile and Costa Rica, it is still higher than in countries like Paraguay and Bolivia, where inequality is more pronounced and life expectancy is lower.

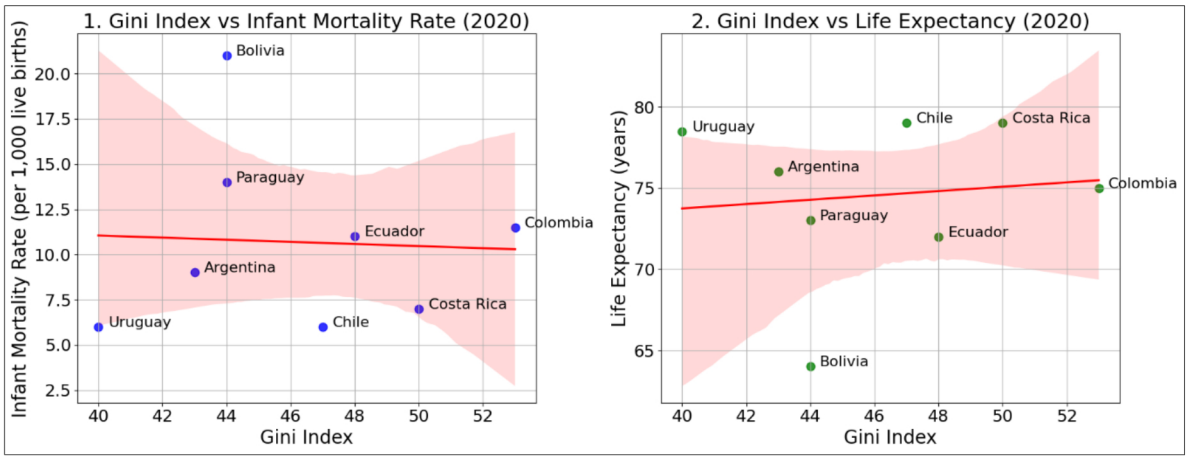

Figure 2. Correlation Between Gini Index and Life Expectancy (2020). Own authorship.

Figure 3, related to the map, shows the relationship between the infant mortality rate and the Gini Index in Latin America for 2020, highlighting the region's economic inequality disparities. Colombia stands out as one of the countries with the greatest economic inequality, represented in a dark red tone. This high Gini Index is linked to a high infant mortality rate, suggesting a direct relationship between inequality and poorer health outcomes. Inequality in Colombia may be affecting access to basic services such as health and education, negatively impacting the most vulnerable populations.

On the other hand, Uruguay and Argentina are represented in dark blue tones, suggesting lower economic inequality. These countries also have significantly lower infant mortality rates, reinforcing the idea that a more equitable distribution of wealth contributes to better public health outcomes.

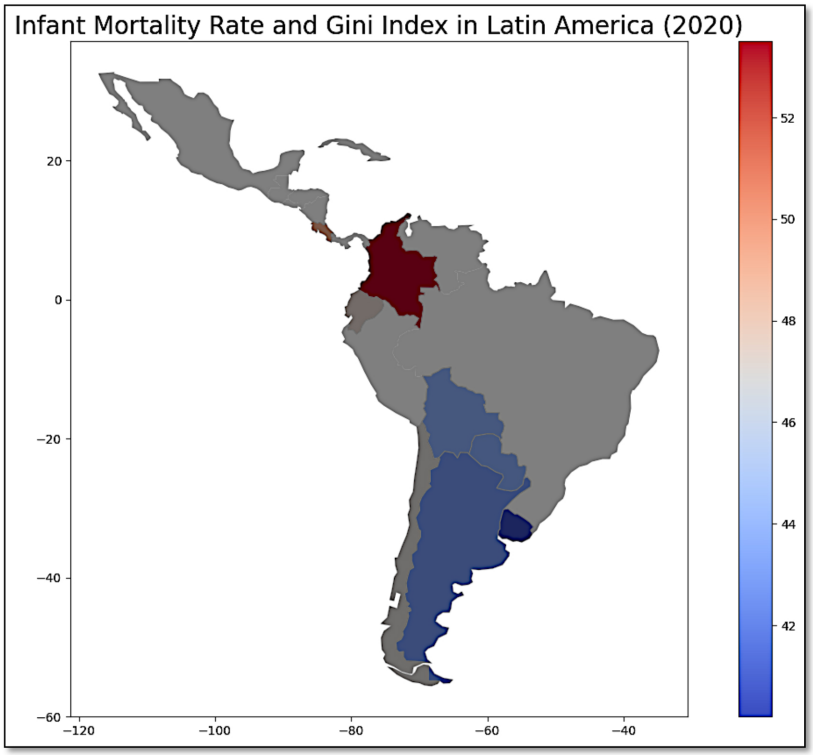

Figure 3. Distribution of Economic Inequality and Infant Mortality in Latin America (2020).
Own authorship. Darker colors on the map indicate greater inequality, while lighter colors reflect a more equitable distribution of income.

CONCLUSION

The results reveal a significant inverse correlation between the infant mortality rate and life expectancy at birth in Latin America from 1960 to 2022. In addition, the comparative analysis between countries shows that, although all countries have improved in these indicators, significant variations reflect disparities in access to health services and the effectiveness of the public policies implemented.

The findings of this study are consistent with previous research that has documented the close relationship between improved maternal and child

care and increased life expectancy in developing countries (6,10-15). In this sense, studies carried out by the World Health Organization (WHO) and the Pan American Health Organization (PAHO) have shown that implementing health programs focused on reducing infant mortality directly impacts the population's longevity (4). This study expands on those findings by highlighting how these trends vary among different countries in Latin America, reflecting diverse socioeconomic and political contexts (16-18).

The study's findings have profound implications for health policymaking and regulation in Latin America. The clear inverse relationship between the infant mortality rate and life expectancy indicates that strengthening and expanding maternal and childcare interventions are crucial for improving health indicators in the region. This translates into the need to establish mandatory regulations that ensure comprehensive care during pregnancy, childbirth, and the postpartum period through the implementation of standardized protocols and periodic audits in health centers, thereby guaranteeing quality and consistency in providing essential services.

On the other hand, the experience of countries such as Chile, Costa Rica, Uruguay and Cuba shows that mandatory immunization and nutrition programs, combined with national health education campaigns, can achieve drastic reductions in infant mortality and, consequently, increase the population's life expectancy. It is equally crucial that policies are adopted that expand access to primary care universally and free of charge, especially in rural areas and communities with high levels of social vulnerability. The modernization and expansion of health infrastructure, incentivized through regulations that promote the construction of clinics and hospitals in underserved areas, is another essential component to ensure that all citizens receive quality care. In addition, the continuous training of health personnel through mandatory training and certification programs in updated maternal and childcare protocols and the use of medical technologies stands as an indispensable strategy to improve the effectiveness and efficiency of services. In addition, it is essential to integrate measures aimed at reducing economic and social inequality into these policies since a more equitable distribution of wealth is directly associated with better health outcomes. Implementing regulations that promote living wages, subsidy programs, and robust social safety nets can help reduce the gaps that limit access to essential services. Continuous evaluation and monitoring of public policies, using key indicators such as infant mortality rate and life expectancy, will allow interventions to be adjusted promptly and effectively.

In short, the combination of direct interventions in the field of health and structural reforms in the system, based on solid rules and regulations, lays the foundations for a more balanced and sustainable social development. Countries that have made remarkable progress have followed comprehensive models, ranging from immediate healthcare to social protection strategies, and these examples can serve as a guide for nations still facing major public health challenges. These measures not only improve the quality of life and reduce infant mortality but also promote an environment of equity and social justice that is fundamental to the region's progress.

It is essential to acknowledge certain limitations in this study. First, the data used was obtained from secondary sources, specifically the World Bank, which may introduce biases if the data were not collected uniformly across countries. In addition, the lack of regionally disaggregated data within each country limits the ability to analyze subnational disparities, which can be significant in countries with large internal inequalities. Also, the relationship between infant mortality and life expectancy may be influenced by other factors not considered in this analysis, such as migration or changes in age structure.

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